



# EXILE, CAMPS, AND CAMELS

Recovery and adaptation of subsistence  
practices and ethnobiological knowledge  
among Sahrawi refugees

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**Exile, Camps, and Camels: Recovery and Adaptation of Subsistence Practices and Ethnobiological Knowledge among Sahrawi Refugees**

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**Exile, Camps, and Camels: Recovery and Adaptation of Subsistence  
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**Gabriele Volpato**

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*To my mother*

## Abstract

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The study of how people adapt to social and environmental change is central to current theoretical understandings of human-nature relationships. There are recurrent cases in human history in which entire populations have been uprooted from the environments in which they live, and where it becomes exceedingly difficult for them to maintain their ways of life including their modes of subsistence, social and ecological relations, knowledge, and culture. The ways in which such people exercise their collective and individual agency to recover and adapt their relations with nature and with each other must be addressed as the planet rapidly changes, given current prognoses about the emergence of environmental refugee populations on a massive scale. Refugees who have been forced to live in camps for long periods present important case studies of human agency and adaptation. Refugee camps are places where people must engage with whatever limited resources are available, and where people confront major complex problems when attempting to establish new relations with their camp environments and maintain or revive relations with their homelands. If they succeed, they can partly free themselves from dependence on food aid and take their lives back into their own hands. In spite of the intuitive importance of refugees' subsistence practices, refugee studies have paid little attention to this process of recovery, which has also been overlooked in the disciplines of ethnobiology and human ecology.

This study was informed by the disciplines of human ecology and ethnobiology, integrating both quantitative and qualitative data collection and analysis methods drawn from anthropology, biology, and ecology. The research also incorporated insights from refugee studies, which focus on the causes and consequences of forced migration but which generally lack reference to relations between refugees and their natural environments. The study aimed to understand Sahrawi refugees' agency directed toward the recovery and adaptation of traditional subsistence and other related material and cultural practices, especially related to camel husbandry, medicinal plants, and wild foods (mushrooms). Within this, it sought to comprehend changes in the ecological and social relations associated with these practices, including access to, procurement and commodification of subsistence resources, as well as cultural change, including the loss, transmission, and revitalization of traditional knowledge, and the significance of camels and of other desert resources for refugees' cultural and political identity. Five case studies were selected to analyse Sahrawi refugees' recovery and adaptation of traditional practices in the desert environment: a study of camel husbandry, an ethnobiological study of traditional medicinal remedies and cosmetics, an ethnomedicinal study of the conceptualization of illness and change in related health beliefs, an ethnobotanical and cultural domain study of camel forage

plants, and an ethnomycological and commodity study of desert truffles. Data were collected in the Sahrawi refugee camps and in the liberated territories of Western Sahara. Instruments used included surveys, interviews, focus group discussions, participant observation, the 'walk-in-the-woods' approach, free-listings, and ethnobiological voucher specimen collection. Data analysis methods included descriptive statistics, qualitative analysis, botanical and zoological identification, and cultural consensus and multidimensional scaling analysis.

Results show that Sahrawi refugees have re-engaged in a variety of pre-exile subsistence practices by both using and transforming the desert's biotic resources for their material and cultural values and to generate income. The conditions that permit this include access to cash and means of subsistence apart from food aid, physical mobility, personal safety, and access to the former homeland (the liberated territories) or neighbouring countries with similar environments (northern Mauritania), ethnobiological knowledge, and social networks. Renewed access to part of the former homeland was key to this process in that the procurement of subsistence products largely depends on access to the land where these products are found and where traditional knowledge can be applied. Recovery was informed by the past, when livestock and the desert's natural resources constituted the material and cultural basis of Sahrawi's lives, and by Sahrawi's cultural and behavioural adaptations to desert conditions, as evident, for example, in food norms and health beliefs. With the material and political changes arising from the Ceasefire Agreement of 1991, many refugees pursued this recovery as a path toward food security and livelihood diversification, conditioned by the lack of alternative livelihood pathways in the camps and the desert environment. However, a further finding is that this recovery was accompanied by fundamental changes in social, ecological, and cultural relations around these practices and resources, especially with respect to modes of access to the desert territory, the commodification of desert subsistence resources, dormancy and revitalization of ethnobiological knowledge, and the renegotiation of cultural and political identity around the desert and its resources.

Taken together, the case study results indicate that, far from being passive recipients of food aid, Sahrawi refugees struggle collectively and individually to improve their lives and their future prospects within the constraints and opportunities presented by the camps. These results are significant both in terms of our understanding of refugees' individual and collective agency toward cultural and economic recovery, and of dispossessed pastoralists' struggles to rebuild herds and livestock husbandry. From an ethnobiological perspective, this study advances our knowledge of how refugees procure subsistence products and how procurement patterns and networks change with displacement and migration. As well, it contributes to the growing body of research about ethnobiological knowledge change in such contexts. Finally, it contributes to the literature addressing the cultural significance of traditional subsistence products, as well as the associated knowledge, skills, and practices associated with these products that serve as vehicles of refugees' shared heritage and cultural identity. All of the above is important



for comprehending the broader cultural, social, and economic processes that occur in refugee camps, as well as the role of food aid and international relief interventions within these processes, and can serve to formulate better means to address refugees' problems and support their autochthonous initiatives.

**Keywords:** Agency; Human Ecology; Ethnobiology; Refugees; Sahrawi; Western Sahara; Forced Displacement; Subsistence Practices; Ethnobiological Knowledge; Cultural Revitalization

## Preface

This thesis discusses how and why Sahrawi refugees who live in camps in western Algeria recovered their pre-exile subsistence strategies and associated knowledge after dispossession, war, and forced displacement. I hope that this study will bring increased attention to exiled Sahrawi refugees and their struggles, and that it will convey the importance of studying autochthonous initiatives of refugees living in camps in order to develop and implement policy interventions that help them in this struggle.

It all began in 2003, when I first travelled to the refugee camps of Tindouf under the auspices of the Italian NGO Africa 70 to carry out research on refugees' use of medicinal plants. At the time, I knew little about the Sahrawi, or about nomads, refugees, or camels. When Africa 70 first proposed the work, I had to locate Tindouf and Western Sahara in an atlas. In 2005, I was awarded a PhD grant from CERES Research School of Wageningen University to continue my previous research on wild food use in Cuba. For bureaucratic reasons, that research could not be carried out and, after a year and a half, I began again with a new research topic and a new location. I redirected my research toward the changes that had occurred in the Sahrawi social-ecological system with war and forced displacement. This time, no insurmountable difficulties were encountered and fieldwork went smoothly (besides certain trivial impediments, such as having to flee from a monitor lizard, becoming ill from eating too many dates, or almost losing my herbarium to torrential desert rains). While I was fortunate enough not to become lost in the desert, I did get lost in the writing process. Like those football players who become confused by the proliferation of their own dribbles, after writing some hundreds of pages full of good ideas but with no clear direction, I began anew, this time with a clear plan and taking a bit of a gambit (readers who are chess players know what I mean). This thesis is the result of that gambit; it speaks of people starting over again, including myself.

However, I did not do this alone. Over the past several years, I have greatly benefitted from numerous people who have contributed to the successful completion of this work. First of all, I am deeply indebted to my promoter and supervisor, Prof. Patricia Howard, for her valuable guidance and critical analysis, motivating discussions, and inspiring supervision. She has been of invaluable help in the development of this thesis, of my thinking process, and of my career as a scientist. I am also very thankful to my co-authors in the publications/chapters that constitute the body of this dissertation who, case by case, helped me with the study design, fieldwork, data analysis, and to improve the quality of the papers. My thanks go also to Esther Roquas for being there whenever I needed help with CERES.

Thanks are due to all those Sahrawi who opened their lives for me to scrutinise, and spent time answering my questions, showing me their camels, their desert truffle harvests, or the bags of medicinal plants that they keep in their tents. I am sincerely grateful to all these people. Sidahmed Fadel and Saleh Mohamed Lamin Saleh greatly helped me with fieldwork logistics, making contacts with camel owners, former nomads, and others, and with translations.

I am indebted to Saleh for the tirelessness and enthusiasm with which he helped me and for the way that he shared and even made his own the quests and questions that continuously arose during our interviews. On a similar note, I thank Luali Lahsen, Saleh Mohamed Lejlifa, and other Sahrawi friends who helped me during fieldwork and with Hassaniya transliterations. In the refugee camps, I relied on the logistical support of Africa 70 for accommodation and transport, and for making the necessary institutional arrangements (e.g. visas, travel permits for the liberated territories, etc.). The expatriates working with Africa 70 and other NGOs – Sara di Lello, Alessandro Broglia, Davide Rossi, Mirco Bellagamba, Letizia Bianchini, and Barbara Magdálano, among others – have offered great support and companionship, and I thank them all. I was able to travel to the liberated territories on four occasions, which presented opportunities that greatly increased the breadth of my study. I am indebted to local nomads and to the Polisario's personnel who accompanied me on these occasions; I particularly thank and remember Abdel Rahman and Mohamed el Kori.

I extend my gratitude to family and friends in Italy, especially to my father Giorgio, brother Manuel, and sister Suala. The gestation of this thesis has been long and of uncertain outcome. Many people, at some point or another, gave up on the idea that I would actually deliver anything. I do not blame them. Rather, I heartily thank those that kept faith, above all my mother Mariateresa for her encouragement, support, understanding, and love. This thesis is dedicated to her.

Gabriele Volpato  
Wageningen, The Netherlands  
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# CHAPTER 1

## Introduction

Toward the end of October, 2009, Sahrawi refugees living in the camps of western Algeria received news that much rain had fallen in the liberated territories. They imagined that the otherwise barren Western Sahara desert would be covered in colourful prairies, that Painted Lady butterflies would flutter among the greening thorn trees, and that the leaves of halophytic plants would be bursting with water. Camels, goats, and sheep would be grazing the desert plains dotted with nomads' tents. With such visions, many refugees packed up their trucks and Land Rovers and moved into the desert - the *badiya*.

Saleh, a forty year-old veterinarian who studied in Cuba and now lives in the camps, rented a truck to carry his family, four goats, tent, water tanks, cooking implements, carpets, flour, tea, sugar, and other items. His wife, two children, parents and brother longed to depart. 'I am going to bring my family to the *badiya*; it will be especially good for my sick old father,' he declared. His father, Mohamed, is seventy, a former nomad who lost most of his loved ones and all of his belongings in the war, and who has lived out the remainder of his life in refugee camps on an inhospitable desert plateau near the Algerian town of Tindouf aptly called 'the Devil's Garden'.

Saleh's family spent five months in the *badiya* enjoying the landscape, the desert's tastes and smells, chats and teas shared with visiting fellow refugees and, above all, the memories of their former lives and a great sense of freedom. Saleh returned to the camp early in order to work, but visited them again after a few months: 'You should see my father!' he exclaimed to me, 'In the camps, his face was yellow and cheerless, but in the *badiya* he is like a new man! Drinking delicious milk from the goats that feed on flowers! He also drinks fresh camel milk - every morning he gets a pot from a nearby camel herd. To him, it is like travelling back in time.' When the first summer heat came, Saleh's family returned to their mud brick house and their lives in the El Aaiún refugee camp, where they would spend much of the remainder of the year waiting to return to the *badiya*.

Saleh and his family are not alone in their seasonal sojourn – they represent an entire community of refugees who, after exile and encampment, struggled for decades to recover their lives based on pastoralism and on desert resources. This dissertation speaks of these refugees and their struggles and determination, of the forms that these have taken, the difficulties they have encountered, and of their efforts to overcome them.

This is its first chapter. It presents the background, theoretical framework, and organization of the thesis. It has three main parts, beginning with a general introduction to the human ecology (human-nature relationships) of people living in refugee camps, followed by an introduction to the case of the Sahrawi refugees, and concluding with the presentation of the research objective,

questions, and relevance. The second part presents the theoretical framework, while the third introduces the major themes that are discussed together with their analytical and methodological operationalization. The chapter concludes with the outline of the dissertation.

Research was conducted in collaboration with the Italian NGOs Africa 70 and Veterinari Senza Frontiere (Veterinarians without Borders). Data collection was carried out with the authorization of Polisario authorities pertaining to the Ministry of Public Health of the SADR (Sahrawi Arab Democratic Republic) in adherence with the codes of ethics of the American Anthropological Association (AAA 1998) and of the International Society of Ethnobiology (International Society of Ethnobiology 2006). All of those informants that participated in the study did so of their own free will and with full prior informed consent.

The interdisciplinary fields of ethnobiology and human ecology inform this research, both of which theoretically conceptualise and empirically explore the relationships between people and their living environments by means of quantitative and qualitative research methods drawn from anthropology, biology, and ecology. The research also incorporated insights from refugee studies, which focus on the causes and consequences of forced migration, but which lack much reference to relations between refugees and their natural environments. This thesis thus presents a scientific study of subsistence practices and associated ethnobiological knowledge of Sahrawi refugees living in the camps of western Algeria. In general the study seeks to advance the understanding of human-nature relationships in contexts of forced displacement and encampment by investigating how refugees living in camps exercise their agency to recover pre-exile subsistence practices, in the process adapting to new conditions, values and relations that have arisen from their experiences as refugees. It also aims to provide an innovative preliminary theoretical framework for studying the human ecology and ethnobiology of people who live in refugee camps.

### **The Human Ecology of Refugees Living in Camps**

The study of how people adapt to social and environmental change is central to current theoretical understandings of human-nature relationships (Ellen 1982; Ingold 1986; Rasmussen and Arler 2010; Brondízio and Moran 2013). Human ecology and allied interdisciplinary studies (e.g. ethnobiology, ethnobotany, ethnomedicine, ethnoecology) specifically investigate populations rooted in a specific environment with its biological resources (Posey 1999; Berkes, Colding et al. 2000; Maffi 2001). In subsistence societies, humans are intimately linked with their local environments, exploiting and transforming them (e.g. through hunting, gathering, fishing, and plant and animal husbandry) into means to subsist, such as food and feed, medicines, energy, raw materials for construction (Ellen 1982; Ellen 1994). The forms that this transformation or extraction assumes are influenced by the characteristics of the environment (e.g. its climate, biodiversity, fertility, topography, etc.). The specific ways in which humans exploit and transform the environment for food and other resources are based on specific social and ecological relations,

which permit the production, distribution, and reproduction of their means of life. This web of relations is glued together by culture, which includes the knowledge, meanings, and beliefs that the members of a population hold in relation to themselves and their place in the world (Ingold 1994), as well as the institutions that transmit culture from generation to generation (Ellen, Lycett et al. 2013). Needless to say, the culture of such a population is intimately related to the local environment, informing phenomena such as cultural identity and the knowledge necessary to exploit and transform nature in ways that do not undermine human biological reproduction over the longer term. For this reason, 'the most valuable assets of any traditional community are its lands and its culture' (Thomas 2009).

Humans must also continuously adapt their relationships with nature. Changes in the forms of human-nature relationships are part of a continuous process of adaptation to altering life conditions: humans must maintain an adaptive relationship with their ecosystems in order to survive, and they achieve this principally through action mediated by social and ecological relations and informed by culture, which evolves over generations and shapes the ways that people live (Ellen 1982; Boyd and Richerson 1985; Keesing and Strathern 1998; Richerson and Boyd 2005; Ellen, Lycett et al. 2013). Although there is a continuous process of change in human-nature relationships, there are recurrent cases in human history in which entire populations have been uprooted from the environments in which they have lived, and where the ties with the local environment have been severed (McDowell 1996; Colson 2003). When this happens, these populations generally find it exceedingly difficult to maintain their modes of subsistence; their social relations come under extreme pressure, their ecological relations are severed and much of their knowledge is rendered useless, and their culture, as well as the ability to transmit their culture to younger generations, severely challenged. *The ways in which people who have been forced to displace from their local environments and hence have been largely divorced from their environmental cognitive foundations exercise their collective and individual agency to recover and adapt their relations with nature must be addressed as the planet rapidly changes, given current prognoses about the emergence of environmental refugee populations on a massive scale.*<sup>1</sup>

Refugees, uprooted and encamped, experience dramatic change in their modes of subsistence and livelihoods. Since subsistence systems are integrated into a wider framework of social and ecological relations, this change affects these broader social and ecological relations and culture. Refugees who have been forced to live in camps present important case studies of human agency and adaptation, in that uprooted and dispossessed people must struggle to recover their lives, livelihoods, and cultural integrity as individuals and as social groups often from scratch, albeit in ways that are always informed by their past (Bascom 1998; Agier 2008; Herz 2013). Refugee camps are places of seclusion and exception (Agamben 1998), where people's lives, cultures,

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<sup>1</sup> See, e.g. the presentations and reports of the United Nations High Commissioner for Refugees (UNHCR) Expert Meeting on Climate Change and Displacement 22-25 February 2011 at <http://www.unhcr.org/pages/49e4a5096.html>

social relations, and forms of economic, social, and political organization undergo radical change, not the least of which is change in cultural knowledge and identity (Dudley 1999; Eruesto 2002; Verdirame and Harrell-Bond 2005). However, they are also places where people must engage with whatever limited resources are available, and in that process refugees confront numerous problems as they attempt to establish new relations with their refugee camp environments and maintain or revive relations with their homelands. These problems stem from dispossession and encampment, with consequent limited mobility and freedom, limited or no access to the homeland environment, and limited capacity to engage in production at all. Refugees struggle to recover and adapt their subsistence practices *in* and *from* the refugee camps (in accordance also with the camp area environment): to engage with natural resources in the area of the camp and beyond (e.g. from the homeland) and procure and use animal and vegetal species and products for a multitude of purposes (e.g. for traditional medicine, food, to earn an income) (Bodeker, Neumann et al. 2005). Such practices are informed by their culture and knowledge, which are generally adapted to very different circumstances. Through these processes, refugees partly free themselves from the dependence on food aid, taking their lives back into their own hands. In spite of their intuitive importance, refugees' subsistence practices have been given little attention in refugee studies, and have been overlooked in the disciplines of ethnobiology and human ecology. Understanding the reasons and means through which refugees in camps use the subsistence resources at their disposal is essential to addressing and supporting refugees' struggle to re-build their lives, and to inform broader theory and practice relating to adaptation of human-nature relations, especially in contexts of dramatic change.

In 2011, the United Nations High Commission for Refugees (UNHCR) registered 35.5 million displaced people, some 10 million of whom are refugees living in about 1,000 camps across the world, predominantly in Central Asia, the Middle East, and Central and Eastern Africa (Herz 2013:44-45).<sup>2</sup> A common feature of all of these refugee camps is that they arose in emergency situations provoked by war or other violence or calamity as temporary living places, where refugees would live until the international community could find a durable solution for them (Agier 2002). The UNHCR theoretically foresees three possible durable solutions: integration into the host country, repatriation to the home country (if the conditions that caused displacement have reversed), and resettlement to a third country (usually in the developed West). However, this last option is open only to a few selected refugees, while the second is too often foreclosed by the fact that the conditions in the home country that led to refugees' displacement do not change, while the first is usually not welcomed by host countries, whose Governments foresee problems for their already precarious national economies (Black and Koser 1999; Crisp 2003). As a consequence, refugee camps have, over time, become over time the only durable (albeit unwanted) solution. This is especially the case with so-called 'protracted refugee situations', defined as a populations of greater than 25,000 refugees who live together (in one or a cluster of camps) in exile for longer than

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<sup>2</sup> <http://storymaps.esri.com/stories/2013/refugee-camps/>



five years (UNHCR 2008), which is common especially in Africa (Jacobsen 2002; Crisp 2003; Loescher and Milner 2005). Many refugee populations have been living in camps for decades, heavily dependent on international aid for survival and struggling to improve their lives on the basis of very limited resources. Once they are able to establish the minimal conditions to act (e.g. with money to invest, some freedom of movement, access to some resources, security, etc.), refugees engage in trade, initiate private productive activities, establish transnational relations with their homelands and with members of the diaspora, and emigrate, further expanding their life options (Essed, Frerks et al. 2004; Horst 2006; Dudley 2010; Herz 2013).

Drawing from and contributing to human ecology, ethnobiology, and refugee studies, in this dissertation I focus on the case of Sahrawi refugees of Western Sahara living in camps in western Algeria and their estrangement from, and subsequent re-engagement with, their pre-exile pastoral mode of subsistence and other practices based on their customary desert territory. Before their exile, older Sahrawi refugees were tribal nomads, pasturing camels, goats, and sheep in the desert plains of Western Sahara and relying for food on their milk and meat, as well as on dates, sugar, and small amounts of cereals and legumes that were often procured by trading livestock and livestock products (Caro Baroja 1955; Thompson and Adloff 1980; Pazzanita 2006). Under Spanish colonial occupation (1884-1975), and particularly during its last two decades, the lives of many Sahrawi changed with increasing sedentarization (i.e. the abandonment of nomadism as a dominant mode of subsistence) and urbanization (Hodges 1983). Especially when Spain began to develop the region's phosphate resources in the 1950s, Spanish authorities promoted the sedentarization of Sahrawi nomads in order to gain greater control over them and harness their labour (Capot-Rey 1962; Norris 1964; Pazzanita 2006; García 2010; San Martín 2010). This occurred at various interacting levels, including with the disruption of the tribal social order (i.e. the abolition of tribute payments between tribes, the bans on slavery and raids), the imposition of taxes and confiscations (e.g. of camels), and the creation of national borders and consequent reduced mobility (Caro Baroja 1955; Charre 1966; Thompson and Adloff 1980; Caratini 1989). Widespread herd losses due to colonial military operations and severe droughts between the late 1950s and the 1970s also contributed to the success of Spanish colonial efforts: nomads' alternative was to sedentarize, seek food aid in the outskirts of growing Saharan towns, find salaried jobs in Spanish colonial institutions, mines, and factories, and exploit the opportunities for trade offered by growing commerce.

Nevertheless, in 1974, upon the eve of the Moroccan invasion, about half of the Western Sahara population (30,000-40,000 people) were still nomads (Censo-74 1974; Gaudio 1993; Pazzanita 2006), maintaining camel pastoralism as their main mode of subsistence. All of the changes imposed by the Spanish colonial authorities had inspired the emergence of an anti-colonialist nationalist ideology among the Sahrawi, which began to supplant tribal ideology after the 1950s (San Martín 2010). In 1975, when the Sahrawi's anticolonial and nationalistic sentiments had already begun to coalesce in the form of a new politico-military organization – the Polisario Front (Mercer



1976; Hodges 1983) – Morocco claimed the territory of Western Sahara and occupied it militarily. Fleeing refugees first gathered in provisional refugee camps within Western Sahara territory, but the Moroccan Army bombed these camps with napalm and white phosphorus (Spiegel and Qassim 2003). By early 1976, some 70,000 Sahrawi were forced to flee to refugee camps organized by the Polisario Front near the Algerian town of Tindouf (Figure 1.1).

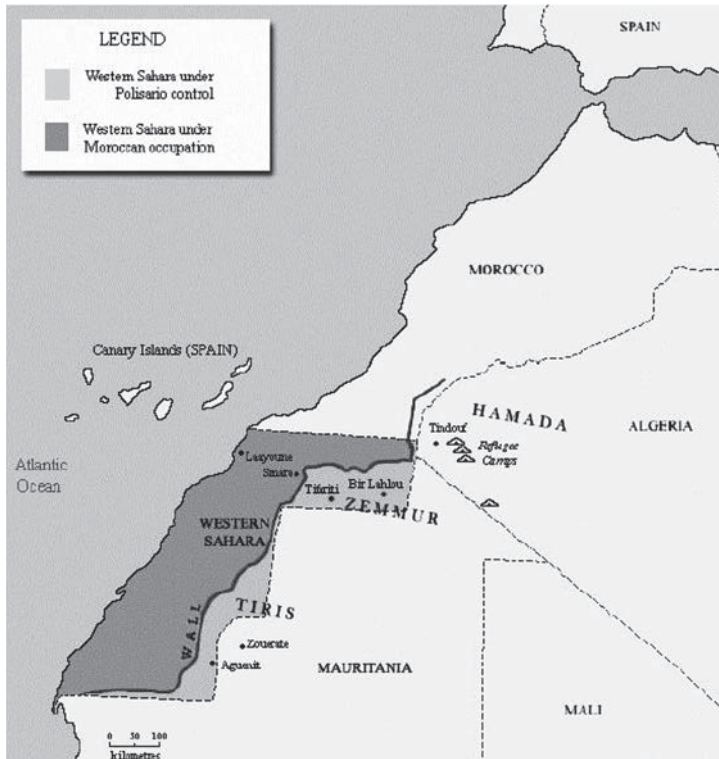


Figure 1.1 Map of the study area

Sahrawi refugees lost their means of subsistence and access to their homeland and its resources (Martín Beristain and Gonzalez Hidalgo 2012), becoming wholly sedentarised in a context where their past practices, cultural values, and knowledge had become largely irrelevant. The prolongation of exile meant that these were also only barely transmitted to the next generation, which was born and raised in the camps. Refugees were forced to rely entirely on the Polisario and on international largess and food aid (San Martín 2010). The Polisario's struggle to regain control over the Sahrawi's homeland through guerrilla warfare and international diplomacy partly paid off with the signing

<sup>3</sup> The agreement expected the parts to organize a referendum for self-determination in Western Sahara under UN guidance, while the UN was also deploying Peace Corps (so-called MINURSO) in the region. However, as a consequence of Morocco's delaying tactics and of the passive attitude of the UN toward the issue, the referendum is still on hold after more than twenty years (Zunes and Mundy 2010).

of a United Nations-sponsored Ceasefire Agreement with the Moroccan Government in 1991 (San Martin 2010)<sup>3</sup> that led to the recovery of the eastern 20% of Western Sahara territory (the so-called ‘liberated territories’) (Bhatia 2001; Volpato and Rossi 2014). Refugees began to reorient their activities away from the collective demands of warfare and in-camp survival toward individual (or family-based) efforts to improve their lives while reducing dependence on food aid (Wilson 2012). Today, there are about 150,000 Sahrawi refugees<sup>4</sup> living in canvas tents and mud brick huts in four camps, at times confronting severe shortages of water and food. The European Union, Algeria, certain bilateral donors, UN agencies (WFP, UNHCR), NGOs and several solidarity groups from across Europe provide food, shelter, and other basic commodities (López Belloso 2008; Hidalgo, Artundo et al. 2009), whose delivery and allocation is administered by the Polisario (Corbet 2008).

Although most Sahrawi refugees still largely rely on food aid (Hidalgo, Artundo et al. 2009), many have regained extra-camp mobility as well as access to cash and social networks that have permitted them to engage in production and trade (de Juan Canales 2010; Herz 2013), thus complementing aid. Within the range of opportunities that have opened up, many entail renewed exploitation of the desert environment and its resources (e.g. in the liberated territories). Within this, some refugees have maintained and some have recovered the substantial knowledge required to exploit such resources, as well as the associated cultural values. However, this renewed exploitation of the desert environment has not occurred without changes in Sahrawi socio-economic and ecological relations and culture, for example accompanying processes of commodification of subsistence resources and political renegotiation of their cultural identity in relation to the desert environment.

### **General Objective and Research Questions**

The study in general aims to advance the understanding of human-nature relationships in contexts of forced displacement and encampment by investigating the ways in which people living in refugee camps struggle to recover pre-exile subsistence practices and associated knowledge, while in the process adapting to new environmental conditions and social relations that have arisen from their experience as refugees. It also aims to provide a preliminary theoretical framework to study the human ecology and ethnobiology of refugees living in camps. Specifically, in the case of the Sahrawi, this entails understanding Sahrawi refugees’ agency directed toward the recovery and adaptation of traditional subsistence (i.e. camel husbandry) and other related material and cultural practices (i.e. herbal medicine, mushroom collection), and to comprehend associated changes in their ecological and social relations (e.g. access to, procurement and commodification of subsistence resources), and culture (e.g. loss, transmission, and revitalization of traditional knowledge,

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<sup>4</sup> Although accurate figures are not available publicly and the UNHCR has not been able to conduct a reliable census, the UNHCR and aid agencies working in the camps estimate the number of refugees at 130,000 to 160,000. For a discussion of population figures in the camps, see Chatty et al. (2010).

significance of camels and of other desert resources for refugees' cultural and political identity).

The research questions related to the general objective are:

1. Why, under which conditions, to what extent, and to what ends have Sahrawi refugees living in camps recovered their pre-exile subsistence and other practices associated with subsistence resources?
2. How and to what ends have Sahrawi refugees adapted their access to, procurement, and use of subsistence resources from the camps?
3. How and to what extent have the social relations around pastoralism and use of subsistence resources changed among Sahrawi refugees living in camps? How, why, and to what effect have subsistence resources become commoditised among Sahrawi refugees?
4. How, why, and to what extent has ethnobiological knowledge been lost, transmitted, and revitalized among Sahrawi refugees?
5. In what ways have the recovery and adaptation of pastoralism and other subsistence practices among Sahrawi refugees been tied to processes of revitalization and renegotiation of Sahrawi cultural identity?

### **Relevance of the Study**

In this section, I draw from literature on refugee studies, human ecology, and ethnobiology to demonstrate the relevance of this research – its theoretical and practical significance. First, I discuss its relevance for refugee studies, emphasizing the importance of investigating the human ecology of refugees living in camps to theoretically contribute to the study of human-nature relationships among uprooted and encamped populations, and to provide institutions working with refugees with a knowledge that can be used to support cooperation and development programmes. Then, I discuss how this study contributes to the discipline of ethnobiology, particularly to the study of migrants and displaced peoples. Finally, I discuss the contemporary scholarly literature on Sahrawi refugees and gaps in the understanding of their lives in the camps.

Over the past several decades, the study of refugees has become a major area of enquiry within several disciplines, including sociology, geography, economics, and anthropology (Malkki 1995; Colson 2003; Werker 2007). Several anthropologists have described the experiences of refugees and other people displaced in camps (Loizos 1981; Harrell-Bond 1986; Peteet 1995) and the emergence of an international diaspora and refugee social networks (Fuglerud 1999; Wahlbeck 1999; Horst 2006). A growing body of research has addressed the social and cultural lives of refugees in camps, including how they make sense of their lives, and the ways in which they exercise agency and adapt to camp contexts (Malkki 1995; Peteet 1995; Horst 2006; Agier 2008; Jansen 2011). These studies have also addressed issues related to reliance on food aid (Kibreab 1993; Reed and Habicht 1998) and refugees' agency directed toward self-sufficiency and economic independence (Harvey and Lind 2005; Horst 2006).

Forced displacement and encampment involve radical change in people's

lives, bringing feelings of powerlessness and alienation along with the disintegration of community structures, social networks, and institutions (Jacobsen 2002; Colson 2003). Such change also disrupts the ties and relationships between communities and their natural environments (Oliver-Smith 1991; Colson 2003). Refugees living in camp environments often have limited extra-camp physical mobility and reduced possibilities to pursue the lives they desire, confronting high insecurity about the present and the future (Abdi 2005; Jacobsen 2005). They are heavily dependent on food aid provided by UNHCR and other national and international organizations, as immediate basic needs cannot be met without relief assistance (Harvey and Lind 2005). However, this does not mean that refugees give up all own initiatives to provision for themselves but rather, within the constraints and limited opportunities presented by their status, they are imaginative, active, and industrious (Kibreab 1993; Bakewell 2003; Horst 2006). Indeed, refugees are engaged in every possible type of productive activity depending on the opportunities and resources available to them (CASA Consulting 2003). This is reflected in the literature on refugees' agency, which stresses that refugees use food aid within a series of strategies (e.g. migration, petty trade, casual labour, etc.) aimed at survival and recovery (Lautze and Hammock 1996; Summerfield 1999; Jacobsen 2002; Jacobsen 2005; Westoby 2008). However, such processes are not easy or straightforward; they require considerable time, energy, perseverance, and resources.

Refugees living in camps pursue productive activities and use and manage subsistence resources in order to reduce dependence on food aid, which rarely provides them with more than what is needed for mere survival; at least part of refugees' subsistence must be based on other strategies and resources (Wilson 1992; Crisp 2003). Furthermore, the distribution of aid may be unequal and its supply irregular, with a tendency on the part of donors to reduce the supply of aid in situations of protracted displacement, when refugees are no longer in the media spotlight and their ability to mobilise aid is diminished (Jacobsen 2005). As Smith (2004:45) poignantly writes, 'Refugees languishing year after year in inhospitable, dangerous, desolate no-man's lands near remote and often contested borders are no one's favored assignment or story. As a result, warehoused refugees tend to fall off the radar screen of international attention and into the Orwellian memory hole.' As a result, problems of malnutrition, anaemia, and childhood stunting, as well as violence and denial of refugees' rights, are not uncommon in refugee camps (Lopriore and Branca 2001; Smith 2004; Soriano, Domènech et al. 2011). Psychologically, refugees in camps live in limbo; they survive thanks to food aid, but that is not enough to live a fulfilling life in which individuals are able to make own choices. For all of these reasons, refugees struggle toward individual and collective emancipation from life in the camps, and in the process engage with the natural resources at their disposal and with their means to manage and use such resources, including traditional knowledge and cultural values and preferences.

The study of the ways in which refugees in camps engage with the natural resources at their disposal can inform the development of cooperation projects that consider refugees' own agency and desires as a starting point for recovery.

The main forms of assistance provided by UN organisations and NGOs, among others, are humanitarian aid and international cooperation projects. Humanitarian aid provides for refugees' survival (e.g. shelter, basic food items, etc.), and represents an indispensable safety net for most refugees who live in camps (Bakewell 2002; Slaughter and Crisp 2009). Cooperation projects rather aim to boost refugees' capacity to engage in productive activities, contributing credit and resources to promote the slow process by which refugees at least partly free themselves from aid dependency (Bakewell 2003; Meyer 2006). However, a lack of funds often forces donors to focus their contributions on the fulfilment of basic needs, and the institutions are therefore rather limited in their ability to broaden their mandates with medium- and long-term projects toward refugees' empowerment. In this context, the study of the ways refugees engage with local natural resources in the process can inform the development of cooperation projects that consider refugees' pre-exile subsistence activities, cultural practices and knowledge, as well as preferences and needs. This may further increase the likelihood that cooperation projects trigger recovery and improve refugees' long-term prospects and 'self-reliance pending return' (Crisp 2003), at the same time enhancing social and ecological sustainability (Sperl 2000; Harvey and Lind 2005; Lentz, Barrett et al. 2005).

From a human ecology perspective, this study aims to advance the understanding of how uprooted and dispossessed people recover and adapt their subsistence practices, thus informing more generally theories of change in human-nature relationships. In investigating Sahrawi refugees' recovery of camel husbandry, the study also aims to contribute to the current literature on pastoralism and its resurgence and transformation in Africa (Chatty 2006; Österle 2008; Mezhoud and Oxby 2013), for example in terms of processes of herd recovery after dispossession (McCabe 1987) and of market integration (Nori, Kenyanjui et al. 2006). Studies of herd loss and recovery among contemporary nomadic populations after drought and protracted conflicts are central to pastoralist studies (Boneh 1984; Horowitz and Little 1987; Khalif and Oba 2013; Mezhoud and Oxby 2013), yet the case of the Sahrawi is barely recorded. These studies are situated within an anthropological literature that understands sedentarization as a recurrent phenomenon within nomadic societies (Salzman 1980; Boneh 1984; Blench 2001; Adano and Witsenburg 2005); the case of Sahrawi refugees can be situated precisely within this literature. The study of pastoralists who have lost their herds and become refugees is directly relevant not only to the study of contemporary pastoralist societies that are confronted with dispossession and physical displacement, but as well to the study of refugees more generally and of their attempts to recover pre-conflict/pre-disaster livelihoods. Dispossessed pastoralists generally reconstitute herds only in the long term, which may be compared with the time frame required for refugees living in protracted situations to regain their livelihoods and cultural identity (McCabe 1987; Khalif and Oba 2013). In the process, pastoralism and nomadism are also being transformed through economic globalization (Chatty 2005; Gertel and Le Heron 2011; Bollig, Schnegg et al. 2013), where refugee herd recovery is thus accompanied by change in the material and cultural use and management of herds. From



this perspective, this study aims to contribute to the current literature on the means and extent to which dispossessed pastoralists recover their herds and their material and cultural values vis a vis the constraints and opportunities presented by their refugee status.

With regard to ethnobiology (Ellen 2006), over the past decade a branch of the discipline has been involved in studying the ethnobiological (particularly ethnobotanical) knowledge and practices of migrants, thus intersecting with studies on migration and cultural change (Pieroni and Vandebroek 2007; Volpato, Godínez et al. 2009; Muniz de Medeiros, Taboada Soldati et al. 2012; Pirker, Haselmair et al. 2012). In these studies, ethnobiology provides a platform for the convergence of diverse scientific disciplines dealing with migration and cultural studies, ecology, economy, geography, and medicine, among others. Ethnobiologists that research migrants have at times included refugees as informants within their studies, but the fate of ethnobiological knowledge and practices among refugees living in protracted situations in camps has barely been addressed. One exception is presented by Bodeker and colleagues, who investigated change in traditional medicinal practices among Karen refugees displaced from eastern Burma to camps in Thailand (Bodeker, Neumann et al. 2005; Bodeker and Neumann 2012). They show that Karen refugees struggle to maintain their traditional practices in the camps and have adapted them to the new context, e.g. by adopting medicinal plants from the new environment, or by developing networks with herbalists along the Thai-Burma border to procure traditional medicinal remedies. The authors conclude that the use of traditional remedies and health practices support refugees' wellbeing, cultural continuity, and identity (Bodeker, Neumann et al. 2005).

Other ethnobiologists have attempted to develop a framework to understand how the use of plants changes among migrant groups. Volpato et al. (2009) and Muniz de Medeiros et al. (2012) proposed that migrants' traditional medicinal knowledge is subjected to two broad change processes: 1) the adaptation of ethnomedical systems to the new cultural and ecological environment (e.g. substitution of plant species, incorporation of new species, abandonment of traditional explanatory models and beliefs around health); and 2) the development of strategies to procure and use the remedies of their homelands (e.g. through cultivation, marketing, social networks, visits to the home country, etc.). In different contexts, the choice of strategy depends on factors such as the degree of environmental similarity between home and host country, the existence and development of social networks between migrants and the home country and the degree of contact and exchange with host country populations, and the conditions for procuring plants (and other biological species/products or derived products) via the market. Within this perspective, the contribution of the current study rests in the fact that it expands the study of the ethnobiology of migrants to refugee camp contexts, i.e. in contexts of radical dispossession and environmental and cultural change. Radical change in people's environments has occurred throughout history and is occurring at present due to a variety of causes (e.g. wars, disasters, etc.) (Bradley, Moore et al. 1990), and studies on the human ecology

and ethnobiology of refugees in camps can contribute to broader research concerned with how people rebuild their lives using the natural and cultural resources at their disposal. Refugee camps are also a seemingly permanent feature of our contemporary world that deserve to be investigated beyond their humanitarian and political dimensions, so this field of study can provide insights both into refugees' lives and into the changes that their knowledge and practices undergo in such conditions, thus informing the disciplines of ethnobiology and human ecology at both practical and theoretical levels.

This investigation further greatly expands our knowledge of the human ecology and ethnobiology of the Sahrawi people. Relatively few researchers have investigated Sahrawi nomads during the pre-colonial and colonial periods, including some Spanish and French explorers and ethnographers who have described the pastoral mode of subsistence and social and ecological relations of Sahrawi tribes (Monteil 1952; Domenech 1953; Caro Baroja 1955; Boyer 1962), particularly of the largest, the Reguibat (Ba 1926; Caratini 1989; Caratini 1989; Hart 1998). A few others have focused their attention more on the traditional knowledge of these desert nomads, particularly in relation to the use of plants (Guinea 1948; Monteil and Sauvage 1953). With war and encampment, most scholars' writings about the Sahrawi have dealt with historical, humanitarian, and political aspects of the conflict and displacement (Zunes 1996; Seddon 2000; San Martin 2004; Weinberg 2005).

Although this trend has continued in recent years (Murphy 2008; Benson 2009; San Martin 2010), concurrently with the end of military operations and great economic, social, and cultural change among Sahrawi refugees, a number of anthropologists, geographers, and other social scientists have begun to carry out research within the camps. For example, Caratini (2000, 2007a,b), Clarke (2006), and Wilson (2012) have investigated changing social relations among Sahrawi refugees, Fiddian-Qasmiyeh (2010, 2011a,b, 2013) has addressed refugees' opportunities outside the camps and the evolution of Sahrawi identity among members of the Sahrawi diaspora, Crivello et al. (2005, 2006a,b) studied the ties between Sahrawi refugees and Sahrawi and Spanish families in Spain in relation to the transnationalisation of care, Caratini (1996) and Allan (2010) discussed the image of women in Sahrawi society, and Corbet (2006, 2008) and Martin-Márquez (2006) investigated the changes to and negotiation of cultural identity among Sahrawi refugees.

With respect to livestock husbandry, some researchers have investigated the functions, and knowledge and beliefs associated with camels among pre-war Sahrawi nomads (Monteil 1952; Caro Baroja 1955; Boyer 1962; Caratini 1989; Caratini 1989). However, although several have reported a recovery of livestock husbandry among Sahrawi refugees at the turn of the millennium (Bhatia 2001; Caratini 2007; Mundy 2007; de Juan Canales 2010; Herz 2013), little attention has been paid to the trajectory that pastoralism has taken with war and sedentarization in refugee camps, or to Sahrawi refugees' agentic actions to recover camel husbandry. Indeed, the Sahrawi are seldom referred to in modern literature on pastoralism; for example, they are not mentioned in Homewood (2008)'s recent book

on the ecology of African pastoralist societies and are generally absent from edited books on pastoralism (Chatty 2005; Bollig, Schnegg et al. 2013).

Also of importance to the current study, Herz (2013) described the physical changes that Sahrawi refugee camps have experienced over time, Dedenis (2005, 2006) investigated the mobility and territoriality of Sahrawi refugees while also critically addressing the role of the liberated territories and pastoral practices occurring therein, and Cozza (2010) addressed the relation between food and identity in Sahrawi refugee camps. Furthermore, two books have been written about Sahrawi refugees' use of (mostly medicinal) plants (Barrera, Ron et al. 2007; Volpato 2008) and a photographic book (in Spanish) is being published that introduces the life of the Sahrawi nomads in the liberated territories and their engagement with the local environment (Volpato and Rossi 2014). The present study constitutes part of this latter line of research about the historical and contemporary relationships between Sahrawi refugees and nomads and the Sahara desert environment, focusing specifically on the process of Sahrawi re-engagement with the local environment and of traditional Sahrawi knowledge that underpins this engagement, and thus providing primary data on an understudied region and population.

### **Theoretical Framework**

This research draws upon theory of agency and adaptation in human-nature relationships, which are applied to the study of the human ecology and ethnobiology of refugees in camps (see Figure 1.2). Individual agency, as well as the collective agency of groups, constitutes the basis of the process through which humans continuously adjust their practices and relations to cope with changing living conditions and environments, i.e. the process of adaptation. Dietz and Burns (1992:190-191) noted that the notion of agency seems to arise in critiques of reductionist and determinist positions in human-nature relations 'in response to functional and structural arguments that give social actors little room for decisionmaking, autonomy or creativity.' For example, toward the beginning of the 20<sup>th</sup> century, anthropologists and others postulated that the environment had a determining effect on human social organization, depicting humans as reacting to the characteristics of the environment, rather than also acting to shape it (Ellen 1982; Moran 2000; Schutkowski 2006). Indeed, humans are not just the product of the environment and of their life circumstances, but are unique in their power to shape these (Bandura 2006). They do so through the exercise of their agency, which relates to the capacity to make appropriate choices for action within a particular spatio-temporally and culturally defined context (structures), as well as the ability to construct appropriate courses of action and to regulate their execution (Giddens 1979; Giddens 1984; Barker 2000; Bandura 2006). In fact, agency is defined in social cognitive theory by core properties such as intentionality about action, forethought, self-reactiveness, and self-reflectiveness about the consequences of action (Giddens 1984; Dietz and Burns 1992; Bandura 2000; Bandura 2006).

Agency is a prominent concept in the social sciences; it has been used to address human-nature relationships (Moran 2005), and contemporary human



ecology also emphasizes ‘the role of decision-making at the individual level as people strategize and optimize risk, costs, and benefits’ (Bates and Tucker 2010:4). The concept of agency has also been used in recent scholarly work on refugees, particularly in relation to how they rebuild their lives within the structure of camps and within new social orders and environments (Turner 2001; Essed, Frerks et al. 2004; Horst 2006; Werker 2007; Jansen 2011). Refugees living in camps are too often treated as people without agency, autonomy, creativity, or entrepreneurial capacity – rather, they are portrayed as passive recipients of food aid. Such a portrayal can readily be challenged by field studies, and the notion of refugees’ agency lends itself particularly well to the endeavour. Within the often-restrictive set of rules and options available, refugees in camps individually (e.g. at family/household level) and collectively (e.g. politically through their representatives) act to shape their lives. This thesis departs from the idea that, once constrained in camps, refugees exercise their agency primarily to improve their wellbeing. They do so by pursuing occupational activities, not only to provide income and subsistence goods, but also to strengthen bonds, cultural identity, and inter-refugee social relations.

Although some recent academic publications have begun to address Sahrawi refugees’ agency in the decades of exile, what is often stressed is their collective agency in the management and organization of refugee camps within the context of political mobilization promoted and directed by the Polisario Front (Lippert 1992; López Belloso and Mendia Azkue 2009). Sahrawi refugees’ individual (or family-based) agency (e.g. toward food procurement) often goes unaddressed (but see Wilson 2012). During their nearly 40 years of exile, Sahrawi refugees have progressively tried to take advantage of the changes in the structure of their exile, particularly on the basis of the renewed access to part of their former nomadic territories that was permitted by the 1991 ceasefire agreement, and of access that many secured to remittances and other sources of cash.

Refugees’ relationships with the local environment are severed, and many exercise their agency to recover these relationships to the extent possible, in the process adapting to new conditions. *Adaptation* in human-nature relations includes any cultural response or process of modification that aims to maintain or reconstitute the linkages between humans and nature that constitute the foundations of production (Hamburg, Coelho et al. 1974; Ellen 1982). A population’s adaptation to social and environmental conditions is facilitated by the cumulative effect of similar behaviour traits (Ellen 1982:246), based on individual agency and culture. Adaptation may involve changes in modes of subsistence, social and ecological relations, political organization, culture, and knowledge. It may be seen as a means to preserve the conditions of existence in the face of change (Ellen 1982), and occurs through a series of *adaptive strategies* that have been developed on the basis of a long-term engagement with and understanding of the dynamic relations between human cultures and the environment (Colding, Elmqvist et al. 2003; Thornton and Manasfi 2010). Although the concept of *recovery* is sometimes subsumed under the concept of adaptation, in this thesis I use it as a distinct analytical concept to indicate the process through which refugees restore their relationships with the

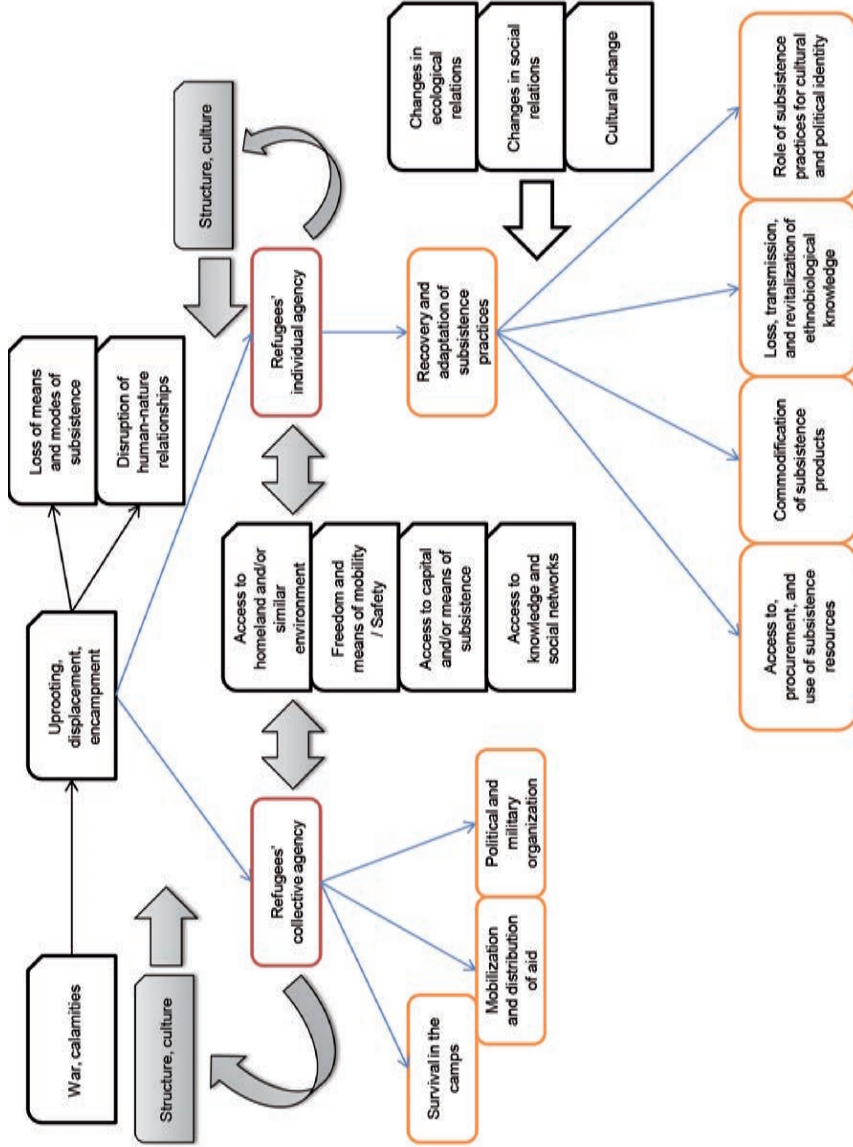


Figure 1.2 Theoretical framework with concepts and variables

environment, in the process adapting such relationships to new circumstances.

The relationships with the environment that I address in this dissertation are conceptualized here as *mode of subsistence* or *subsistence strategies/practices*.<sup>5</sup> Following Ellen (1994:198), a mode of subsistence is ‘the aggregate of extractive processes characterizing a particular population.’ It is then an abstraction ‘embedded in particular webs of social and ecological relations’ (198), which are conceptualized as ‘mode of production.’ After Ellen (1982), the concept of *mode of subsistence* is used to understand ‘specific solutions to particular environmental and social conditions over an indicated period of time, with a complex history of their own’ (259). Human populations employ techniques to modify nature to meet their culturally defined needs, and these techniques represent a combination of material artefacts (tools and machines), knowledge, and labour (including skills) (Ellen 1982; Sigaut 1994). The range of such techniques employed by a population constitutes a mode of subsistence or a subsistence strategy. Among many populations, modes of subsistence are rooted in local natural resources (i.e. hunting and gathering, pastoralism, etc.). Over at least the past two centuries, these modes of subsistence have been disrupted as small-scale subsistence societies have been penetrated by foreign economic interests, trade relations, engagement in wage labour relations, loss of key resources, confrontation with supra-regional powers, and most recently, global environmental change processes (Bradley, Moore et al. 1990; Schutkowski 2006).

Millions of people have also been severed from these modes through displacement and encamped following war, violence, and calamities often provoked by these same global processes (Sobania 1988; Nightingale 2003). Nonetheless, there have been also instances where such populations have recovered and adapted their pre-exile subsistence practices. *Subsistence practices* comprise the ways in which people appropriate and use the abiotic and biotic resources (i.e. plants, animals, insects, fungi, etc. or their parts that are useful or culturally meaningful in any way to specific human populations) at their disposal to survive and sustain their ways of life. As such, they have material functions and cultural meanings. It is important to note that, while ‘material’ and ‘cultural’ are analytically separate categories, such functions and meanings are not separable in reality, e.g. every material use of a species or species part has cultural meaning (Howard 2013 pers. comm.). Again following Ellen (1982:174), subsistence practices fulfil material functions that include not only food provision but also the provision of other non-food resources such as medicinal and veterinary remedies, firewood, etc. Material use values can be conceptually divided into *use values* (the benefits derived from their actual consumption, e.g. for food, medicine, etc.), and their *exchange value* (the cash income derived from selling these products in markets). *Cultural values* are related to the symbolic meaning attributed to subsistence practices and products, their functions in maintaining social bonds (obligations) through their exchange, and in the definition and maintenance of cultural and political

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<sup>5</sup> Subsistence strategies are enacted through subsistence practices: for example, camel husbandry, a subsistence strategy, is enacted through different subsistence practices such as milk production and consumption and the use of traditional veterinary remedies to treat camel illnesses.

identity through ritualized practices. *Meanings* derive 'from temporal and spatial relationships formed between symbols that are objectively experienced during social interaction,' where symbols are artefacts with material reality and 'every symbol participates in a web of significances that we call culture' (LeCron Foster 1994:366-369). In this dissertation, it is shown how Sahrawi refugees recovered and adapted pre-exile subsistence practices for a variety of reasons that involve both the material and cultural uses and meanings associated with different species and their products, as well as their exchange values in markets.

In subsistence societies, adaptation occurs in relation to a certain natural and social environment (Ellen 1982; Schutkowski 2006). Because subsistence is merged into a net of ecological and social connections (Ellen 1994), subsistence change is accompanied by a reorganization of social and ecological relations (Schutkowski 2006). Similarly, the processes by which refugees living in camps recover and adapt subsistence practices does not occur without fundamental changes in the underlying 1) ecological relations, 2) social relations, and 3) culture. *Social relations* are defined here as those intraspecific relations occurring between persons as intentional or wilful subjects, and *ecological relations* as the relations occurring between human beings and other species and the environment or between human beings as organic subjects (Ingold 1986). Among the changes in ecological relations that can occur among uprooted and encamped people in their struggle to recover and adapt their subsistence practices, there are the changes in the patterns of access to and procurement of subsistence resources (and associated ecological impacts), and technological changes in subsistence practices (e.g. intensification) that modify the ways in which people engage with the environment. In relation to the changes in social relations, profound changes occur in refugees' access to their customary (or other) territory and in the political organization around this access, and changes are also likely to occur in relation to social relations of exchange of subsistence products, especially through commodification. *Commodification* refers to the process of transformation of previously non-marketed or scarcely marketed goods into commodities, which entails the transformation of traditional social values and relations (e.g. based on gift-giving, inheritance, etc.) into relatively anonymous commercial relationships (Winkler 2008).

Social and ecological relations and human agency are further informed by processes of cultural change. The ability of populations to cope with change rests primarily on culture as adaptive mechanism, where *culture* can be defined as the set of learned behaviours, beliefs, attitudes, values, and ideals that are characteristic of a particular society or population (Ember and Ember 1999). Culture, cultural change, and cultural transmission, are central to the recovery and adaptation of refugees' subsistence practices. Cultural change is understood here to include changes in knowledge and in meaning. *Ethnobiological knowledge* is that cumulative body of knowledge about the living environment (i.e., about individual living organisms, such as plants, animals, and fungi, as well as relations between living organisms, including humans and other organisms, and between organisms and their environments),

which evolves as a function of adaptive processes. It represents a dynamic set of ideas that 'is constantly being developed, recreated and adapted by people everywhere in new contexts' (Morris 2004:24). It is perpetuated by cultural transmission (the 'emergence, acquisition, storage, and communication of ideas and practices' (Ellen and Fischer 2013:2 citing Cohen 2010:S194), that is, the process through which cultural elements, in the form of attitudes, values, and beliefs, are passed onto and taught to individuals and groups (Ellen, Lycett et al. 2013). As shown in this dissertation, knowledge and its transmission are critical to the recovery of subsistence practices, since they underpin them. With forced displacement, different factors influence the *cultural transmission* of ethnobiological knowledge among refugees. Cultural transmission can be disrupted (e.g. with knowledge loss and *dormancy*, i.e. knowledge is retained by elderly refugees and former practitioners, but is not used and is barely transmitted) (Ramirez 2007), but it can also be revitalized. Revitalization relates to the resumption of knowledge transmission among certain groups (Ohmagari and Berkes 1997; Volpato and Godínez 2004) where, in the process, knowledge is adapted to and modified by new circumstances (e.g. according to the environments to which refugees have access, the contact with different local knowledge systems, by the introduction of new technologies and technical relations, etc.).

Besides changes in knowledge, forced displacement and encampment also entail change in the symbolic meanings associated with subsistence practices and products. For example, in the case of the Sahrawi, such meanings have become central to processes of renegotiating refugees' cultural and political identity - to their claims to national unity and rights to territory. Cultural identity is a feeling of belonging to a specific group based on a distinctive shared language, culture, social organization, and ideology (Hurskainen 1990; Snow 2001), while political identity is the sense of belonging to a specific political configuration and its aims. Identities and their symbols are continuously constructed and reconstructed by redefining the differences between the self and the other, the cultural borders in which these differences are represented, and by abandoning or adopting different key elements of identity (Nagel 1994). Cultural identity is thus tied up with the relations with the homeland, its resources, and practices based on these resources. When these change, cultural identity is necessarily renegotiated (Corbet 2008).

### **Major Analytical Themes**

The above framework underpins the major analytical themes in this dissertation:

- Recovery of pre-exile subsistence practices
- Access to, procurement, and use of subsistence resources
- Trade and commodification of subsistence resources
- Loss, transmission, and revitalization of ethnobiological knowledge
- Subsistence practices and refugees' cultural and political identity

### ***Recovery of pre-exile subsistence practices***

Refugees living in camps lose virtually all of their means of subsistence; their

subsistence practices cease and they become largely dependent on food aid for survival. From exile, however, they struggle to recover the necessary means and practices, in historical continuity with their pasts and within the opportunities and constraints presented by their new conditions in the camps. Jacobsen (2002:106), citing Hansen (2000), reports:

Refugees rely on access to common natural resources like water (for fishing and livestock), forests (for firewood, construction materials, wild foods), and rangeland (for grazing of livestock) to support themselves and eventually to earn income. Wild products are either used for subsistence (especially in the initial stages of arrival), or for trade. When refugees have the required skills, they add value by processing. Sawyers who turn timber into planks for construction, charcoal makers, beer brewers, and restaurateurs are all examples.

The opportunities and constraints that refugees living in camps face are related to a series of attributes that enable or constrain their agency directed toward recovering their former subsistence practices. These attributes include: 1) camp location; 2) extra-camp mobility (including access to the homeland); 3) engagement in an informal economy; 4) safety and security; 5) time of camp establishment; 6) trans-camp social networks; and 7) cultural influences (Pérouse de Montclos and Kagwanja 2000; Agier 2002; Jacobsen 2002; Crisp 2003; Jacobsen 2005). All of these attributes may vary from camp to camp. The location of refugee camps and the characteristics of the environment strongly influence the range of subsistence practices that can be carried out. As well, the relative isolation of camps influences the possibility for refugees to procure subsistence resources that are not present in the environment where the camps are located. Freedom of movement, as well as the associated freedom to find employment outside of the camps and the level of physical security, largely depend on the host countries' policies toward refugees and on the level of safety for refugees beyond the camps (e.g. of not having their belongings confiscated) (Jacobsen 2002; Jamal 2003; Smith 2004). Furthermore, refugees are often very limited in their ability to engage in agriculture and livestock husbandry or in other income-generating opportunities, as they usually 'do not have access to land, they are not allowed to enter the labour market, they cannot take out commercial loans, and restrictions on their freedom of movement make it difficult for them to engage in trade' (Crisp 2003:10).

Refugee camps are located in a variety of places and environments: for example, the Ifo camp near Daabab in eastern Kenya and the Farchana refugee camp in Chad are located in dry savannah environments; Ugandan refugees live in a camp at an altitude of 2,200m in Gihembe, Rwanda; Sudanese refugees in eastern Chad are in desert camps, and the Beldangi camp lies in a forested area in a valley of Nepal (Crisp 2003; Herz 2013). In spite of their varied geographical and ecological contexts, refugee camps have certain common geographical characteristics: 1) they are often located close to national borders, in (supposedly) safe areas in host countries not far from their countries of origin; often for the same reasons that triggered displacement, these areas are



prone to civil unrest and military incursions; 2) In order to avoid competition over resources with local non-refugee populations and/or ethnic clashes, host countries often locate camps in areas that are economically and geographically marginal or isolated (e.g., far from towns, with a lack of infrastructure, etc.) and/or that are poor in natural resources and soil fertility (host country population generally already occupy the best lands for agriculture or livestock husbandry) (Jacobsen 2005; Herz 2013).

People living in refugee camps encounter major constraints in their limited freedom of movement outside of camps (e.g., to cities, agricultural fields in neighbouring areas, to visit people outside of camps, etc.). These constraints are the result both of host countries' policies, which do not encourage refugees to integrate or to interact with local and national economies out of fear that this may create social tensions, and by the need that UNHCR and other refugee aid organizations have to efficiently and equitably distribute aid (Verdirame and Harrell-Bond 2005). Extra-camp mobility can make a difference in refugees' ability to access the resources needed to recover their livelihoods (e.g. cash, means of subsistence, social networks). A high degree of mobility, coupled with access to some investment capital, allows refugees to travel to their homeland or third countries to seek employment and send remittances back that can then be invested (e.g. in trade) and to establish transnational social networks (Horst 2006). Travel to the homeland is of particular cultural and material importance; refugees return to visit relatives left behind, engage in trade and other activities, manage property, and more generally maintain and recover ties with the places to which they hope to return. Such travel can be hypothesized to also be important to refugees' subsistence practices, as they may provide refugees with biological products (e.g. herbal medicines) and strengthen social networks through which these products (as well as knowledge about them) are procured. Indeed, refugees' wellbeing often relies on wider social networks, mobility, and the broad support of extended families and kinship ties (Horst 2006; Jansen 2011). Social networks create the conditions for trade, emigration, and remittances, and as well they create ties between refugees and the wider diaspora that support and are entrenched within a shared heritage and cultural identity (Lindley 2010). Subsistence products (and associated knowledge) flow through these networks as the demand for culturally and materially important species and their products in the camps is high, as people are deprived of access to these products, which can give them some measure of control over their lives and cultural continuity (Greenberg 2003).

Before becoming refugees, the Sahrawi's main mode of subsistence was camel nomadism, where all members of society followed the herds in their customary nomadic territories throughout the year. Historically, the Sahrawi used the natural resources of the desert environment to produce or procure food, human and veterinary medicine, and miscellaneous subsistence goods. However, from 1975, herds and access to the nomadic territories were lost with war, dispossession, displacement, and encampment. Contemporary Sahrawi refugee camps are the product of a four-decade long struggle for survival. Over time, the conditions of exile changed, especially after the

ceasefire agreement of 1991, with increased access to cash, increased freedom of movement (including access to at least part of the Western Sahara homeland, i.e. the liberated territories), emigration and the development of extra-camp social networks, and a progressive diffusion of an informal economy in the camps. Sahrawi camps are relatively isolated, situated in an unproductive environment (a barren rocky desert plateau) about 30 km from the Algerian town of Tindouf and 100 kilometres from the Algeria-Western Sahara border. In the camps, motor vehicles are widely used to exploit the informal freedom of movement to and from Tindouf and Mauritania, the formal freedom to move to and within the liberated territories, and to enjoy the relative safety of the area. Travel also occurs to faraway places of the Sahrawi diaspora such as Algeria and Spain. In this study it is argued that, since the ceasefire agreement came into effect, Sahrawi refugees have struggled and managed to recover access to livestock as well as to part of their homeland and its resources, and that this (partial) recovery was triggered by a multiplicity of drivers. Many refugees pursued the recovery of pre-war subsistence practices as a path toward food security and economic independence, which was conditioned by both their cultural and material heritage and the lack of alternative pathways in the camps and in the desert environment. I further argue that this recovery or revitalisation involved adaptation to new conditions that have affected social, ecological, and cultural relations around camels and desert resources in fundamental ways. From a pastoralist perspective, the processes by which refugees recover camel husbandry and material and cultural values related to their relations with the desert environment can be understood as an extension of the long-term adaptation strategies of dispossessed nomads, albeit under new material, social, and political circumstances.

### ***Access to, procurement, and use of subsistence resources***

Forced displacement and exile sever people's existing networks for the production or procurement of traditional subsistence products as well as the ties with their customary natural environment. Refugees' ability to recover and adapt former subsistence practices and associated knowledge and skills depends on regaining access to and use of associated products. This topic has at times been addressed in the literature on refugee populations (Pérouse de Montclos and Kagwanja 2000; Jacobsen 2005), particularly in that which explores refugees' traditional medicine and healthcare practices (Ramathal and Ngassapa 2001; Bodeker, Neumann et al. 2005; Khan, Mukul et al. 2009). These products are procured through a variety of social and commercial networks as well as through direct harvest as long as access is granted to harvesting areas. Ferreira de Athayde et al. (2009), for example, document the strategies used by displaced Kaiabi people of the Brazilian Amazon to procure important fibre plants used for basketry. Confronted with the absence of their most prized fibre plants in their new environments, the Kaiabi 1) procure the plants from the original territory when they are able to return for visits; 2) transfer plants that can be cultivated in the new environment; 3) and substitute original species with other similarly functional species available in the new environment. Similarly, people living in refugee camps



struggle to regain access to subsistence products; to procure them, they seek access to customary territories (e.g. their homeland) or to areas with similar environment and biological characteristics, develop social networks with members of the diaspora who can access such resources, and seek to establish market networks from and through the refugee camps for the most important products or species. In addition to their material importance (i.e. for refugees' health and nutrition, to generate income, etc.) access to traditional subsistence products also supports and stimulates social bonds, reciprocity, and cultural identity among refugees.

The Sahrawi's traditional staple foods, milk and meat, were obtained through livestock husbandry that in turn was based on the forage plants of the Sahara desert; health practices were based on medicinal products of animal, vegetal, or mineral origin available through direct harvest or barter, and they hunted or collected and consumed wild plants and animals when faced with food scarcity. In this study I argue that, from western Algerian camps, Sahrawi refugees have struggled to gain access to livestock and livestock products, medicinal remedies, complementary foods, and cosmetics, among other products, from the desert environment and their former homeland. I further argue that, although informed by past social networks, procurement strategies have been adapted through the establishment of extra-camp market and redistributive networks between refugees, between Sahrawi refugees and nomads, and with members of the Sahrawi diaspora.

### *Trade and commodification of subsistence resources*

As happens in all contexts in which war, violence, and displacement have disrupted people's lives and forms of social organization (Nordstrom 2004), informal trade is widespread among refugees and fundamental to the functioning of refugee camps. Although unfavourable terms of trade often prevail due to constraints such as high transportation costs, isolation, and limited mobility (Jacobsen 2005; Werker 2007), refugees trade nearly anything they can access, from natural resources to food aid (Reed and Habicht 1998). They trade outside the camps whenever the opportunity to travel arises, including with their homelands. Refugee camps have a varied economic life, depending on factors such as their length of existence (recently settled camps have no or very limited economic activities), refugees' access to cash to initiate trade or productive activities, or their freedom of movement and to engage in wage labour (Jacobsen 2005; Werker 2007). Economic activities range from the most basic, such as selling food aid, to more complex endeavours such as establishing car repair shops with spare parts imported from distant places (Herz 2013). Informal trade is at the core of refugees' procurement and use of many items, and also leads to commodification. Commodification of subsistence and natural resources is increasing with globalisation and markets that extend to nearly every corner of the planet (Castree 2003; Vermeylen 2008). It refers to changes in social relations based on reciprocity within kinship, tribal, or other forms of pre-capitalist social organisation to anonymous market exchange and private income generation often with, when possible, accumulation, within a statist political framework. In refugee camps,

the commodification of natural resources has been reported (e.g. of fuelwood) (Pérouse de Montclos and Kagwanja 2000; Jacobsen 2005), although the topic has not been thoroughly investigated. Commodification of natural products provides an opportunity for some refugees to generate income and to others it creates the possibility of accessing desired products. Nonetheless, commodification can also create pressure on natural resources and harvesting may become unsustainable either ecologically (the levels and/or methods of harvesting weaken that resource's production and reproduction and/or habitat) or socially (i.e. harvesting for the market might disrupt other refugees' use of that resource for its use values).

Within a wider process in which Sahrawi refugees sought to free themselves from total economic dependence, they developed trade and an informal economy in the camps, and some sought to generate income through the commercial exploitation of livestock products and other resources formerly used for subsistence. In this study, I argue that a process of commodification of biological products in Sahrawi refugee camps has involved subsistence products such as camel milk, medicinal plants, and desert truffles, in which refugees harvest/produce these products in order to sell them in the camps or in cities (e.g. Tindouf). Trade networks have been used, adapted, or created to satisfy refugees' demand for these products. Resources that have been commodified are obtained from the desert environment and include especially products that were central to Sahrawi nomadic lives and culture for which there is high demand in the camps. Refugees use the earnings to expand their activities, set up other enterprises, and improve their material lives (e.g. to purchase food and other items not provided by international aid).

### ***Loss, transmission, and revitalization of ethnobiological knowledge***

'Throughout the world people are constantly adapting and recreating ethnobiological knowledge under changing conditions, which often include civil conflict and traumatic forms of dislocation, as well as population movements' (Morris 2004:24). The importance of this knowledge is highlighted by the fact that it is gained through generations of experience building and sharing among people living within a particular environment and social structure with all of their contextual specificities (Purcell 1998; Ellen and Harris 2000). Interest in ethnobiological knowledge has grown rapidly as it has come to be recognised that it is of paramount importance for small-scale communities across the planet and that it can contribute to scientific knowledge, biodiversity conservation, and sustainable resource use in general (Berkes 1999; Berkes, Colding et al. 2000; Anderson, Pearsall et al. 2011; Vandebroek, Reyes-García et al. 2011; Gómez-Baggethun and Reyes-García 2013; Volpato, Di Nardo et al. 2013). The continual transmission of this knowledge within local communities thus becomes of paramount importance, and transmission may decline or cease in contexts of displacement and encampment since it depends both on the continuity of social relations and social mechanisms that ensure this transmission over time while allowing for innovation and creativity, and also depends on the continued relevance

and continuity of the learning environments (Turner, Boelscher et al. 2000; Davidson-Hunt 2003; Berkes 2004; Puri 2005; Ellen, Lycett et al. 2013).

Knowledge about desert subsistence resources and how to exploit them was pivotal to nomadic Sahrawi's lives and culture. Using as case studies the Sahrawi's knowledge of medicinal remedies and conceptualization of illness and disease, camel forage plants, and desert truffles, I argue that knowledge transmission was disrupted among refugees by sedentarisation in camps and disengagement with the customary environment, but this knowledge is being revitalized as refugees re-engage with pastoralism and traditional subsistence practices. With re-engagement with the nomadic territory, its resources, and associated subsistence practices, the value of this knowledge has been recognized both by refugees and the Polisario and its transmission has resumed.

### ***Subsistence practices and refugees' cultural and political identity***

Refugees living in camps are often portrayed as powerless people without an identity other than as refugees. Recent academic literature has challenged this image (Malkki 1995; Jacobsen 2005; Horst 2006). Horst (2006:12) writes, 'In the media, quite standardised discursive and representational forms are used that create a certain image of refugees... Refugees are usually attributed a completely new identity (that of refugees) as soon as they are displaced, and treated as people without culture or history. The complex identities of these displaced people (e.g. national, ethnic, tribal, etc.) disappear' (Horst 2006). In fact, refugees act within a complex of identities and associated practices, where their concept of their identity is very different from that portrayed by institutional labelling (Zetter 1991). When traditional societies respond to displacement and social disruption, they often recreate and reaffirm their cultural identity (Oliver-Smith 2002). The same happens with refugees. When settling in camps, refugees' traditional social organisation is disrupted, their traditional knowledge may become useless, and their beliefs and values may be overturned. Although refugees may appear to occupy a cultural vacuum in the camps, this is not the case. In fact, Western culture and values are delivered together with food aid, for example in relation to culinary habits and medical systems, and governance values and beliefs. This can give rise to cultural change and divergence among refugee populations, and the process may generate tensions between different types of refugees or between younger and older refugees. In these cases, traditional knowledge and beliefs as well as refugees' cultural identity may be renegotiated and redefined.

Several authors have indicated how migrants and displaced people maintain their traditional subsistence practices in the host country, and have shown that these practices have not only utilitarian value, but also function as cultural markers and conveyors of migrants' identity and shared cultural heritage (Ceuterick, Vandebroek et al. 2008; Volpato, Godínez et al. 2009; Matos-Soto and Savo 2012). Cultural identity is rooted in subsistence practices and other relations between people and their environments, and the maintenance of these links sustains a cultural identity based on the underlying resources and the places where they are found. Concepts and practices related to cultural

identity are subject to renegotiation and appropriation for political purposes by organizations representing (or misrepresenting) refugees, thus inscribing them changing political contexts and (national) identities (Smith 1991). This is even truer in context of forced displacement and social change, when refugees may re-organize at politically in order to confront new challenges and struggle to recover what they have lost.

Sahrawi cultural and political identities have recently been investigated in relation to the process of building a nation-state promoted by the Polisario (Castellino 1999; San Martin 2005; Clarke 2006), to the Sahrawi diaspora (e.g. in Spain) (Martin-Márquez 2006), to culinary practices (Cozza 2010), and to cultural changes occurring in the refugee camps (Corbet 2008). However, the relations between Sahrawi refugees' identity and their subsistence resources and practices related to their desert environment and homeland have barely been addressed. In this dissertation, I discuss Sahrawi refugees' cultural identity in relation to their conceptualization of a folk illness (*eghindi*) and associated ethnomedicinal knowledge and practices, and in relation to the recovery of camel husbandry and of the role of the camel in Sahrawi culture and Polisario discourse. I argue that many refugees struggle to procure and use products from their homeland and to recover livestock husbandry for their cultural values, and that the maintenance of these practices reinforces a shared cultural identity and the cultural links between refugees and their homeland. I argue that the resources from the desert environment, including their tastes, smells, and cultural significance, have come to represent the Sahrawi's customary grazing areas, and hence have gained renewed importance

**Table 1.1 Analytical themes and corresponding case studies**

<i>Analytical themes</i>	<i>Sahrawi refugee case studies and respective themes</i>
Recovery of pre-exile subsistence practices	Camel husbandry, medicinal and cosmetic products, desert truffles (Themes 1, 2, 4)
Access to, procurement, and use of subsistence resources	Medicinal remedies and desert truffles; access to camels and camel products (Themes 1, 2, 4)
Trade and commodification of subsistence resources	Production and commodification of camel milk, collection and commodification of desert truffles (Themes 1, 4)
Loss, transmission, and revitalization of ethnobiological knowledge	Medicinal and cosmetic remedies, desert truffles, camel forage, and conceptualization of illness (Themes 2, 3, 4, 5)
Subsistence practices and refugees' cultural and political identity	Conceptualisation of illness and health beliefs and practices; role of the camel and associated knowledge in Sahrawi cultural and political identity (Themes 1, 3, 5)

as elements of cultural identity. The camel has re-emerged as a symbol of Sahrawi cultural identity, and has been adopted as a symbol of national identity promoted by the Polisario. Also, I argue that Western culture has been pervasive in Sahrawi refugees' lives and has had a profound influence especially on younger Sahrawi's culture and cultural identity. In spite of the revitalization of traditional knowledge and cultural identity associated with the desert and its resources, these processes have not been even and at times have created cultural divergence and intra-cultural and inter-generational tensions between younger and Western-acculturated refugees and older and conservative refugees.

### **Analytical and Methodological Approach and Roles of the Principle Author and Co-authors**

The arguments above are based on fieldwork carried out in the Sahrawi refugee camps and the liberated territories of Western Sahara between 2006 and 2009 and in Spain in 2010. Table 1.1 relates the analytical themes introduced above with the specific Sahrawi case studies presented in the dissertation, which are: a camel husbandry study (Chapter 2); an ethnobiological study of traditional medicinal remedies and cosmetics (Chapter 3); an ethnobiological study on the procurement of medicinal remedies (Chapter 4); an ethnomedicinal study of conceptualization of illness and change in related health beliefs (Chapter 5); an ethnobotanical and cultural domain study of camel forage plants (Chapter 6), and an ethnomycological and commodity study of desert truffles (Chapter 7). Table 1.2 provides an overview of the methods, instruments, data generated, sample sizes, and type of analysis performed for each of these studies. The instruments used include surveys; open, structured, semi-structured, and retrospective interviews; focus groups; participant observation; walk-in-the-wood approach; free-listings and follow-up interviews; and ethnobiological (particularly ethnobotanical) voucher specimen collection. Four main types of data analysis were used: 1) descriptive statistics using SPSS and Excel for survey and semi-structured interview data; 2) qualitative analysis using Nvivo for interviews and conversations; 3) ethnobiological analysis and botanical and zoological identification using NVivo and Excel for the species cited; 4) commodity chain analysis using Excel; and 5) cultural consensus and multidimensional scaling analysis using Anthropac. Methods of data collection and analysis are explained in detail in chapters 2, 3, 4, 5, 6, and 7.

In relation to authorship and the authors' contributions to the papers that form the body of this dissertation, I am the first author of all the papers and, for all of these studies, I took the lead in designing the methods, carrying out field work, analysing the data, composing the literature review, and drafting the manuscript. The contributions of the co-authors to each paper are highlighted below. For the camel husbandry study (Chapter 2), co-author Patricia Howard participated in the study design and the literature review, and in drafting and editing the manuscript. The ethnobiological study of traditional remedies and cosmetics (Chapter 3) was co-authored with Pavlína Kourkova, who participated in the study design and carried out part of the fieldwork, while Václav Zelený participated in the study design and contributed to drafting

the manuscript. The study of the procurement of medicinal remedies (Chapter 4) was co-authored by Abdalaha Ahmadi Emhamed, Saleh Mohamed Lamin Saleh, Alessandro Broglia, and Sara di Lello, who helped with fieldwork. For the ethnomedicinal study of illness conceptualisation (Chapter 5), Anna Waldstein helped to draft and edited the manuscript and contributed to the literature review, particularly with the ethnomedical literature. For the camel forage study (Chapter 6), Raj Puri supported the cultural domain analysis as well as with drafting and editing the paper. Finally, for the desert truffle study (Chapter 7), Davide Rossi conducted part of the fieldwork and Domenico Dentoni contributed to the commodity chain analysis and in drafting the paper.

### **Limitations of the Study**

This study has some limitations. First, it is limited to Sahrawi refugees and hence results are only partly generalizable to other refugees living in camps. Nonetheless, the results can provide further working hypotheses on how the structure of refugee camps and sociocultural change influences refugees' subsistence practices and ethnobiological knowledge. Second, in the case studies presented, not all possible interactions between refugees and their subsistence practices are discussed in detail. Rather, only exemplary interactions are addressed, either due to limitations of time and other resources or because some aspects of these relations do not lend themselves to investigation in the particular context (e.g. interactions between different ethnic groups in the same camp). A third set of limitations relates to the logistical conditions of fieldwork with refugees living in a post-war environment. Specifically, I was given permission to travel to the liberated territories only on a limited number of occasions and hence the data refugees' activities in these areas could be collected from a limited number of people. A further limitation of the study is related to the collection of quantitative data on refugees' livelihoods. These data would have helped to better understand the extent to which refugees engage in subsistence activities and their contributions to refugees' lives. However, given the almost complete informality of their activities, refugees are reluctant to answer to questions related to their economic status and either refuse to answer or provide unreliable responses. In order to avoid presenting unreliable data, I preferred to conduct interviews and use more reliable qualitative methods (where the possibility to verify answers using additional questions, to gain the respondents' trust, etc.) rather than carry out quantitative surveys and attempt to derive quantitative deductions.

### **Outline of the Thesis**

This thesis is organized into eight chapters. Following this introduction, Chapter 2 addresses the material and cultural importance of camels and the recovery and adaptation of camel husbandry among Sahrawi refugees as they struggle to recover traditional subsistence practices and promote a shared nomadic heritage and cultural identity. The socioeconomic, cultural, and ecological drivers and means underlying this recovery are discussed, along with the changes that occurred to camel husbandry and to the camel as a



Table 1.2 Case studies, methods, data generated, sample size, and means of analysis

Case Study	Instruments	Data generated	Informants	Analysis
All case studies	X: Participant observation	Camel husbandry, milk and meat production and distribution; social and cultural events; procurement and use of medicinal and cosmetics; desert truffle collection, consumption, and sale, eghindi treatment	Camel owners and shepherds, truffle and medicinal plant collectors, Polisario personnel, nomads	Qualitative data analysis (NVivo)
	X: Open interviews / conversations	All topics	Sahrawi refugees and nomads, Spanish and Italian NGO workers, Polisario civil and military personnel	Qualitative data analysis (NVivo)
1: Camel husbandry	X: Open interviews / conversations 1-A: Survey on camel husbandry	Camels owned, use of camels and camel products, purchases and sales, market involvement, camel management, veterinary practices, distribution of camel products, personal history of camel husbandry	camel owners: 44 refugees, 30 nomads	Descriptive statistics (SPSS)
	1-B: Semi-structured interviews on camel husbandry	Use of camels and camel products, camel management, veterinary practices, distribution of camel products, personal history of camel husbandry	36 refugee and nomadic camel owners (from the survey group)	Qualitative data analysis (NVivo)
	1-C: Focus groups on camel husbandry in the camps	Opportunities and constraints in camel husbandry in the refugee camps, refugees' histories and perceptions/values around camel husbandry	5 focus groups with refugee camel owners and older refugees	Qualitative Data Analysis (NVivo)
	2-A: Structured interviews about procurement and use of medicinal remedies	Household size and demographics, medicinal remedies held in the tent, their origin and means of procurement, use, list of remedies hard to procure	37 refugee households	Descriptive statistics (Excel), botanical and zoological identification (Excel), ethnobiological analysis (NVivo)
	2-B: Semi-structured interviews about the procurement and use of medicinal and cosmetic products	Products used for cosmetic and perfuming purposes and for skin afflictions; parts used; names in Hassaniya; type of preparation and use; purpose of use; place of procurement; ecological status of the plants and animals used	45 Sahrawi refugees	Descriptive statistics (Excel), qualitative data analysis (NVivo), botanical and zoological identification (Excel)
2: Ethnobiological study of traditional remedies and cosmetics	2-C: Retrospective interviews on patterns of procurement and use of medicinal and cosmetic products in pre-exile period	Products used for cosmetic and skin healing purposes when nomads, procurement and use	16 older Sahrawi refugees (sub-sampled from 2-B)	Botanical and zoological identification (Excel), qualitative data analysis (NVivo)
	2-D: Walk-in-the-woods with knowledgeable informants	Local medicinal plant names, uses, properties, distinguishing characteristics, ecological distribution, collection	10 informants sub-sampled from 2-B based on knowledge of medicinal plants	Botanical identification (Excel), qualitative data analysis (NVivo)
	0: Ethnobiological collection	Collection of specimens and botanical, zoological, or mineral identification of the species and products cited		Excel Database



Table 1.2 (con't.) Case studies, methods, data generated, sample size, and means of analysis

Case Study	Instruments	Data generated	Informants	Analysis
3: Ethnomedicinal study of conceptualization of illness and change	3-A: Semi-structured interviews about <i>eghindi</i>	Etiology, epidemiology, reported symptoms, treatment, and prevention of <i>eghindi</i>	38 Sahrawi refugees	Qualitative analysis (NVivo); botanical collection and identification (Excel)
	3-B: Retrospective interviews on <i>eghindi</i>	Information about <i>eghindi</i> in pre-exile pastoral life	14 Sahrawi refugees (from group above)	Qualitative data analysis (NVivo)
	0: Ethnobiological collection	Collection of specimens and botanical, zoological, or mineral identification of the species and products cited		Excel Database
4: Ethnomycological and commodity study of desert truffles	4-A: Semi-structured interviews about desert truffles	Truffle terminology, kinds, and characteristics; ecology, collection, processing, storage, food, medicinal, and veterinary uses, prices, economic actors involved	28 Sahrawi refugees	Qualitative data analysis (NVivo); commodity chain analysis (Excel); mycological identification (Excel)
	4-B: Retrospective interviews about desert truffles	Truffle use in pre-exile nomadic period	8 older Sahrawi re-fugees (sub-sampled from 4-A)	Qualitative data analysis (NVivo)
	4-C: Walk-in-the-woods with knowledgeable informants	Truffle names, properties, characteristics, ecological distribution, collection	4 informants sub-sampled from 4-A based on knowledge of and engagement with desert truffle collection	Mycological identification (Excel), qualitative data analysis (NVivo)
5: Ethnobotanical and cultural domain study of camel forage plants	5-A: Free-listing of camel forage plants	Lists of camel forage plants known by the Sahrawi	46 Sahrawi refugees	Cultural consensus analysis and multidimensional scaling for informant agreement and causes of knowledge distribution (Anthropac); ethnobotanical analysis (Excel, NVivo); voucher specimen collection, botanical identification (Excel)
	5-B: Follow-up semi-structured interviews with the free-listing exercise	Camel forage plants in Sahrawi culture, Hassaniya name, use by camels, plant properties, distribution, ecology	25 knowledgeable refugees (sub-sampled from 5-B)	Qualitative analysis (NVivo)
	5-C: Walk-in-the-woods with knowledgeable informants	Forage plant names, uses, properties, ecological distribution, distinguishing characteristics	8 informants sub-sampled from 5-B based on forage plant and camel husbandry knowledge	Botanical identification (Excel); qualitative analysis and ethnobotanical analysis (NVivo)
	0: Ethnobotanical collection	Collection of specimens and botanical identification of the species cited		Excel Database

symbol of Sahrawi cultural and political identity. Chapters 3 and 4 address the use and procurement of traditional medicinal and cosmetic products among Sahrawi refugees, exploring the transmission of associated knowledge and the development of procurement networks. I show that Sahrawi refugees have preserved and adapted their use of these products in the camps, developing a variety of networks to procure them from exile. I discuss how the conservation of traditional medicine and of ties with the Western Sahara territory (where medicinal remedies are found) contribute to maintaining a collective cultural identity based on shared knowledge and practices and, at the same time, how changes are occurring in traditional medicine and knowledge transmission among refugees. Chapter 5 explores how the conceptualization of folk illnesses and the use of associated remedies change in exile using as a case study the Sahrawi folk illness called *eghindi*. I discuss how *eghindi*, as an element of Sahrawi nomadic heritage, has been adapted in the refugee camps as a means of preserving Sahrawi food norms, and how it has become embodied within a broader process of negotiation and redefinition of Sahrawi cultural identity. Chapter 6 presents the traditional knowledge and classification of camel forage among the Sahrawi and discusses how the maintenance and revitalization of such ethnobotanical knowledge is crucial for refugees' recovery of pre-exile subsistence practices and is further tied to notions of cultural and political identity via the reappropriation of the nomadic territory and associated cultural heritage. Chapter 7 reflects on the role of subsistence practices for refugees by focusing on knowledge, use, and commodification of desert truffles. I discuss the ways in which Sahrawi refugees use truffle-associated knowledge and practices to generate income and to maintain customary redistributive practices. Finally, Chapter 8 presents a general discussion of the study and final conclusions. It begins with a reflection on the theoretical framework and continues with an overview of the major empirical findings in relation to the research questions. The chapter concludes with a reflection on the implications of the results for the fields of ethnobiology and refugee studies, and recommends areas for further research.





# CHAPTER 2

## The Material and Cultural Recovery of Camels and Camel Husbandry among Sahrawi Refugees of Western Sahara<sup>6</sup>

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### Abstract

For nearly 1500 years, Sahrawi nomads of Western Sahara held the camel on a pedestal; camels were essential to life in the desert environment, constituting both the main means of production and exchange and the keystone of Sahrawi cultural identity. The capacity to adapt to drought is crucial for the resilience of nomadic populations, which are particularly susceptible to its repeated occurrence. Knowledge of coping strategies is transmitted and embedded deeply within nomads' cultural institutions. In 1975, the Moroccan army occupied the Sahrawi's traditional nomadic territory, decimating camel herds and forcing most Sahrawi into refugee camps in Algeria where the Sahrawi became wholly dependent on foreign aid for their sustenance. However, with the signing of a ceasefire agreement in the early 1990s, the Sahrawi recovered part of their nomadic territory and the right to move within it, while at the same time new flows of capital entered the camps. Refugees began to recover camel husbandry as a livelihood strategy and the camel re-emerged as a potent symbol as refugees and the Polisario Front (the Sahrawi's political representative) struggle to assert their newfound national identity, regain access to all of their traditional territory, and reaffirm their shared nomadic cultural heritage.

**Keywords:** Camel pastoralism; Refugee camps; Forced displacement; Herd losses; Cultural identity; Livelihood strategies; Agency

### Introduction

For the past several decades, scholars and development organizations have increasingly focused on nomadic populations in part because, across the globe,

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their cultures and socio-ecological systems are threatened by the creation of political boundaries, forced sedentarisation and resource depletion, and in part because they have become aware of the complexity and efficacy of such systems in relation to resource management in harsh environmental conditions (Keenan 2003; Gauthier-Pilters 1961; Chatty 2005). Research has also been conducted on the keystone role of the camel among these populations (Köhler-Rollefson 2003), on their traditional ethnobiological and ethnoveterinary knowledge (Volpato et al. 2013a; Mohamed and Hussein 1996; Abbas et al. 2002), and on the human-camel relations from an anthropological perspective (Catley 2006).

Studies of herd loss and recovery among contemporary nomadic populations with drought and protracted conflict are central to pastoralist studies (Boneh 1984; Khalif and Oba 2013; Mezhoud and Oxby 2013). Such studies are situated within an anthropological literature that understands sedentarisation as a recurrent phenomenon within nomadic societies (Salzman 1980; Adano and Witsenburg 2005; Blench 2001). The case of the Sahrawi can be contextualised precisely within this literature. Over the past fifteen hundred years, when their camel herds were largely depleted or severely weakened by drought or military assault, Sahrawi nomads could no longer appropriate desert resources and were forced to retreat to the periphery of their nomadic territories where they sought other means to survive outside of the desert, i.e. in oases, coastal towns (where fishing was possible), or in agricultural settlements (Caro Baroja 1955). Destitute nomads relocated to other areas either near wealthy camps or settlements (offering services to them, seeking assimilation, and surviving on public slaughter and milk redistribution), or emigrating to the agricultural villages of the Oued Draa and Oued Nun or, less commonly, to the oases of central Mauritania. After herds were decimated by recurrent droughts, with the return of the rains, nomads began to repopulate the desert with their surviving herds or animals received in *mnaha* (camel loans).<sup>7</sup> Nomads who had lost all of their camels engaged in trade or other activities to acquire camels and initiate their real and metaphorical travel back towards the ‘centre of the desert.’

In the 20<sup>th</sup> century, the strategies that the Sahrawi deploy to confront the Moroccan threat to their nomadic way of life and recover camels after dispossession while in exile in essence represent an extension or adaptation of their traditional mix of strategies for dealing with drought and military assault. In 1975, for the first time in their history, the Sahrawi were forced to confront an enemy with vastly superior military power and, in the process, lost all access to their traditional pastoral territories; most lost their mobility, herds, and alternative means of livelihood. Most fled Morocco’s military assaults, taking refuge in camps where they became utterly dependent upon foreign aid for the duration of the prolonged (16-year) guerrilla war that the Sahrawi waged against the Moroccan Army. The Sahrawi experienced greater social, cultural, and political change living as refugees in a protracted situation. This time, the particular confluence of factors that permit refugees to proactively recover

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<sup>7</sup> Loans where those who borrow camels assume the costs of managing them and can use them for transport, milk production, and wool.

herds and reoccupy the desert, and the means by which they have adapted to these new conditions, signal profound changes in the economic, technical, social, and cultural relations of camel husbandry in the Western Sahara and in the Sahrawi's social formation.

The study of pastoralists who have lost their herds and become refugees is directly relevant not only to the understanding of contemporary pastoralist societies that are confronted with herd loss and physical displacement, but as well to the study of refugees more generally and of their attempts to recover pre-conflict/pre-disaster livelihoods. Dispossessed pastoralists generally reconstitute herds only in the long term, which may be compared with the time required for refugees living in protracted situations to regain their subsistence strategies and cultural identity (Khalif and Oba 2013; McCabe 1987). In refugee camps, people's individual and collective agency – their capacity and actions to 'transcend the dictates of their immediate environment and ... shape their life circumstances and the course of their lives' (Bandura 2006:165) - are severely constrained; they are deprived of access to most resources, confront limited opportunities (e.g. for mobility or education) and high levels of risk (e.g. looting, conflict, further displacement) (Jacobsen 2005). When people become refugees, their traditional productive activities and the associated knowledge, cultural practices and artefacts may be lost forever. However, once in camps, as conditions permit, refugees struggle to reassert their agency, develop productive activities, and revitalize the associated knowledge and practices. In the process, these are adapted to new environmental, social, cultural, political, and economic contexts (Golooba-Mutebi and Tollman 2004; Jacobsen 2002; Horst 2006a).

Because refugees lose everything with forced displacement into camps, recovery must occur from scratch. Studies about such autochthonous recovery processes (e.g. not purposively facilitated by aid agencies or governments) and of refugees' individual and collective agency can help to formulate policies that promote refugees' material and cultural wellbeing. The international community can support refugee's own efforts to regain access to the means of subsistence (e.g. livestock, land) by facilitating the economic means and necessary institutional conditions (e.g. mobility, security, legal entitlements) (Meyer 2006). As the case study presented here shows, aid can be instrumental to the recovery process in that it represents a safety net for refugees who have no access to other resources, removes the burden of procuring basic provisions for survival while capitals are rebuilt, and provides seed capital for refugees' own pursuits (Fiddian-Qasmiyeh 2011; Lentz et al. 2005). As Harvey and Lind (2005:26) argue for Turkana pastoralists of Kenya, 'Food aid can provide the incentive for pastoralists to hold onto animals, and thereby contribute to the livelihood recovery process after an emergency.'

As refugees' worldviews, beliefs, values, cognition (including knowledge) and social relations are strongly rooted in their pre-exile worlds, their recovery strategies are informed by pre-exile modes of subsistence, social relations, cultural values, and adaptive strategies. Especially among former pastoral and nomadic refugees, and within the constraints presented by the structure of camps and access to pastoral territories, refugees' agency is directed toward



the recovery of livestock husbandry, including a return, as far as possible, to nomadism or transhumance. At the same time, however, refugees become integrated within transregional and transnational processes through political struggles, foreign aid, emigration, and informal and formal markets for wage labour and other commodities. Pastoralism and nomadism are also being transformed through economic globalization (Chatty 2005; Bollig et al. 2013; Gertel and Le Heron 2011) and refugee herd recovery is thus accompanied by change in the material and cultural use and management of herds related to these larger transformation processes. The individual and collective struggles to recover pre-exile modes of subsistence and livestock husbandry are motivated not only by the desire to improve the material conditions of life and gain greater autonomy; pre-exile modes of subsistence have great continuing cultural significance that refugees and their political representatives may re-appropriate and adapt to promote and strengthen identity that underlie claims to national sovereignty and territory.

In this paper, we address refugees' agency toward recovering camel husbandry, the conditions that permitted this process to occur and come to fruition, as well as the transformations in camel husbandry that are emerging, focusing on the case of Sahrawi refugees living in camps near Tindouf, in western Algeria.<sup>8</sup> Historically, camels were central to the production and reproduction of Sahrawi nomadic society, providing staple food, means of transport and warfare, means of exchange, and the basis of power and prestige. With war and displacement, most of the Sahrawi who fled lost their camel herds, became refugees settled in camps, and depended on international food aid for survival. Although several authors reported the recovery of livestock husbandry among Sahrawi refugees at the turn of the millennium (Bhatia 2001; Caratini 2007b; Mundy 2007; de Juan Canales 2010; Herz 2013), little attention has been given to the trajectory pastoralism took beginning with war and sedentarisation in refugee camps, or to Sahrawi refugees' agentic actions to recover camel husbandry. Indeed, the Sahrawi are seldom referred to in modern literature on pastoralism; for example, they are not mentioned in Homewood's (2008) recent book on the ecology of African pastoralist societies and are generally absent from edited books on pastoralism (Chatty 2005; Bollig et al. 2013). We argue that, at the beginning of the 1990s, a co-occurrence of factors (renewed access to territory, military demobilization, and increased access to cash through pensions, remittances, and aid) created conditions for the redevelopment of productive activities, trade, and the emergence of an informal economy in the camps themselves. In continuity with their nomadic past, some refugees gained access to camels and resumed camel husbandry. These processes revitalized camel-associated traditional knowledge and the material and cultural bonds

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<sup>8</sup> The data and information discussed in this paper are drawn from fieldwork carried out by the first author between 2006-2010 in the Sahrawi refugee camps and in the liberated territories of Western Sahara. Fieldwork included a survey (about camels owned, use of camels and camel products, extent to which the herd is used for market-oriented activities, camel management, distribution of camel products, personal history of camel husbandry; n=74) and semi-structured interviews (n=36) with refugee and nomadic camel owners, and a survey (n=62) with refugees' households about camel meat and milk procurement and consumption. Data were analyzed using SPSS and Excel to derive descriptive statistics.

between refugees and their homeland (Volpato and Puri 2014). The camel was reappropriated as a symbol of a shared nomadic heritage and cultural identity, and camel products and associated knowledge and practices were deployed in the Polisario's and refugees' nationalistic discourse *vis a vis* Morocco as well as to reinforce national and ethnic unity. As discussed at the end of the paper, the fact that Morocco has also attempted to incorporate the camel into Moroccan national identity shows that there is a continuing struggle between the two parties to claim and monopolize Sahrawi nomadic heritage.

After presenting the current context in the background section, in this paper we: 1) describe how the Sahrawi became refugees and lost their herds; 2) discuss the historical, social, economic, cultural, and ecological processes that facilitated the recovery of camel husbandry among Sahrawi refugees; 3) characterise contemporary camel husbandry and its importance within Sahrawi refugee camps; 4) discuss the changes that occurred in camel husbandry in the process; and 5) analyse the contemporary role of camels in Sahrawi cultural and political identity.

## **Background**

The *Sahrawi*, literally 'people from the desert,' are pastoralists who traditionally inhabited coastal areas of northwestern Africa including Western Sahara, northern Mauritania, and part of southwestern Algeria. The Sahrawi were essentially nomadic, pasturing camels, goats, and sheep in the low-lying plains of Western Sahara and relying for food on livestock products as well as dates, sugar, cereals, and legumes that were bartered for livestock in markets on the periphery of their nomadic areas (Caro Baroja 1955). In 1975, the Moroccan army occupied Western Sahara, forcing about 70,000 Sahrawi to flee and settle in camps established in neighbouring Algeria (San Martin 2010). A 16-year war ensued between Morocco and the Sahrawi's armed political organization, the Polisario Front (1975-1991). Throughout this period, the Sahrawi were excluded from most of their former Western Sahara territory by means of a wall erected by the Moroccans (known as *the berm*) that cuts through Western Sahara in a North-South direction. Today, about 165,000 Sahrawi live in four refugee camps located on the Hamada desert plateau near Tindouf in Algeria (figures 2.1 and 2.2).

Refugees live in tents and mud brick huts and confront continuous problems with water, food, and energy supplies. Food, shelter, and other basic commodities are provided by the European Union, certain bilateral development programmes, UN agencies, the Algerian government, and several solidarity groups (San Martin 2010). Over the years, refugees have attempted to improve the quality of life in the camps, developing an informal economy where they market a variety of basic consumer products as well as food. They are involved in wage labour (e.g. as butchers, mechanics, construction workers, etc.) and trade between the camps and Mali, Mauritania, Algeria, and Spain (Dedenis 2005; Herz 2013). Some have migrated abroad and send remittances home. Economic activity has greatly increased since a United Nations-sponsored ceasefire agreement was signed with Morocco in 1991, which resulted in the demobilisation of Polisario troops who moved into the

camps and began to re-engage in livestock husbandry, seasonal nomadism, and trade.

With the ceasefire agreement, the Polisario Front also assumed political control over the Eastern, inland areas of the Western Sahara (Bhatia 2001), the so-called 'liberated territories' (approximately 20 per cent of the Western Sahara),<sup>9</sup> while the remaining 'occupied territories' are under the Moroccan Government's administrative authority. Pastoral areas within the liberated territories are important to the refugees' struggle to maintain or recover traditional cultural and social practices, from livestock husbandry to medicinal plant use (Volpato et al. 2012), as well as to generate income, e.g. through the sale of desert truffles (Volpato et al. 2013b). Some 20-30,000 Sahrawi who remained nomadic throughout the war by moving with their herds to safe areas in neighbouring Mauritania and Mali, also reoccupied these territories after 1991, herding their livestock and using the refugee camps and Zouérat (in Mauritania) as their main commercial hubs. Today, camel husbandry is practiced in the liberated territories as well as, to a lesser extent, in the areas surrounding the refugee camps. About 2,000 camels are raised in the camps, whereas some 40,000 are raised in the liberated territories (DNU-RASD 2007). Furthermore, the Polisario own and tend some 27,000 camels in the liberated territories, where soldiers or paid labourers act as shepherds (Broglia and Volpato 2008). In refugee camps, camel owners supplement natural forage with fodder purchased in Tindouf. In contrast, nomads (full-time and seasonal) practice extensive camel husbandry in the liberated territories, that is, husbandry that is highly dependent on pasture areas and mobility for herd production and reproduction.

Whereas, throughout their history, tribal and camp leaders (re)distributed subsistence goods and means of production in camels and organised the defence of camps, camels, and territory, today the Polisario provides and distributes aid and defends and controls the refugee camps and the liberated territories. Although refugees are highly dependent on food aid, the Polisario produces a small part of the refugees' food supply. An important part of this production comes from Polisario livestock herds,<sup>10</sup> which directly supply refugees with fresh camel milk and she-camels loaned to disadvantaged and poorer refugees, the elderly, former combatants and their families, and gift young or male camels for slaughter, e.g. for weddings. The Polisario also allocate milk-producing camels to workers in public places such as schools and hospitals. Polisario herds also supply livestock and their products for important rituals connected with social or political events. Livestock husbandry is one of the refugees' few endogenous activities developed and recovered without any consistent attention or funding from donors and development organisations. In the past decade, camels have also been the subject of international cooperation projects promoting health and nutrition through the supply of camel milk and meat (Mundubat 2007). These projects are carried out and funded by NGOs

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<sup>9</sup> See Volpato and Rossi (2014) for a photographic description of the liberated territories and of local nomads' life.

<sup>10</sup> In 2005, the Polisario held about 40,000 sheep, 30,000 goats, and 25,000 camels (DNU-RASD 2005).

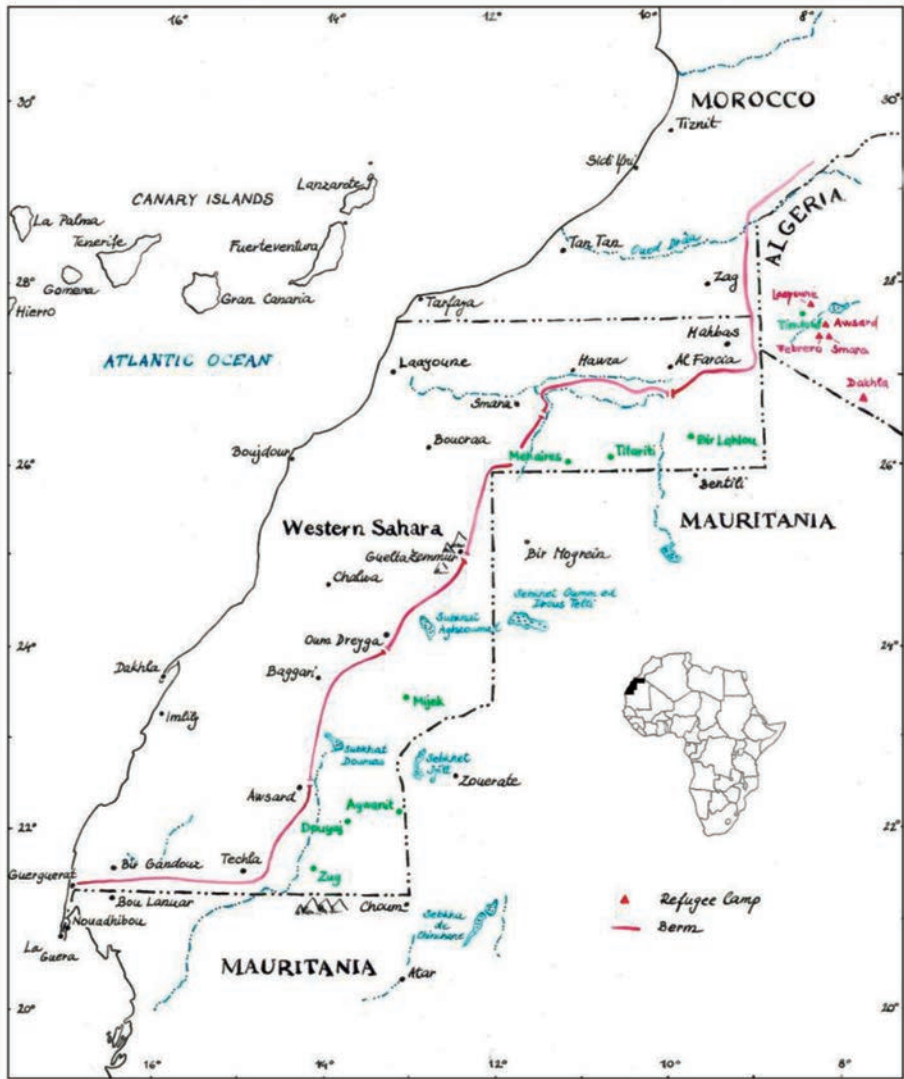


Figure 2.1 Map of Western Sahara with refugee camps and the liberated territories (P. Kourková)



Figure 2.2 Sahrawi refugee camp with livestock pens in the foreground (G. Volpato)

under the Polisario's initiative and largely mirror the forms of support that the Polisario provides with its herds.

The recovery of camel husbandry is on going in the refugee camps of the Hamada and in the liberated territories where refugees travel and nomads live. The Hamada is a barren desert plateau known historically as the 'Devil's Garden' because rainfall is scarce and edaphic conditions are poor, which explains why it has very poor forage resources, few trees, no halophytic plants, and few annuals. Across the liberated territories, the climate is also arid and continental, with summer daytime temperatures surpassing 50 degrees Celsius, while winter temperatures drop to zero at night. In the territories, rain generally occurs from the end of the summer through autumn. Average annual rainfall is 30-50 mm; however, rains are highly irregular both within and between years, and droughts are recurrent. But, in comparison with the Hamada, the liberated territories and especially the northern area, called Zemmur, are richer in biodiversity and forage plants. After the rains, they display a savannah-like environment dominated by *Acacia* trees, and flowering prairies may appear in flat gravel areas.

### **War, Sahrawi Nomads, and their Herds**

Morocco's occupation of the Western Sahara and the ensuing war led to the decimation of camel herds and a drastic reduction in the number of Sahrawi that remained nomadic. In 1974, on the eve of the invasion, there were some 75,000 Sahrawi, only 40-45% of whom were nomads (Pazzanita 2006; Censo-74 1974)<sup>11</sup> tending about 50,000 camels, as well as numerous goats and sheep (Mercer 1976b). Prolonged droughts in the 1960s and 1970s led many Sahrawi to sedentarise in the expanding urban areas in the periphery.



The number of nomads and camels had been declining in Western Sahara since at least the 1950s, but this decline assumed almost epic proportions with occupation and war, and might have led to the collapse, if not of this entire population, certainly of their way of life.

Although figures are far from certain, it is estimated that about 55,000 Sahrawi (or about 70% of the population) fled to the refugee camps (Mercer 1976a), about half of whom were nomads. The Moroccan air force bombarded temporary refugee camps in Western Saharan territory (at Oum Dreiga, Mahbes, Amgala, and Guelta Zemmour) with napalm, white phosphorus, and cluster bombs, causing Western Sahara towns to depopulate at the same time that Tindouf refugee camps swelled (Hultman 1977).<sup>12</sup> Such panic was produced among most of the Sahrawi population that they tried to escape at any cost (San Martin 2005), leaving their homes and belongings, livestock, jobs, in many cases ceding their moveable property (herds, jeeps, and trucks) to the Polisario forces that organised and carried out both the flight and the guerrilla war that ensued to recover their territory (Lippert 1992; Brazier 1997). The establishment of refugee camps behind the Algerian military outpost of Tindouf in Algerian territory meant that refugees were safe from bombings and that Polisario forces had a place to train former tribesmen and organise guerrilla war (Martin 1976).

Nomads, whose resilience and herds had already been weakened and reduced by droughts and colonialism (Capot-Rey 1962; Mercer 1976b), had to quickly decide whether to try to maintain their herds or liquidate them and flee to safety with other refugees. Apart from the bombings and well poisonings, they risked having their herds confiscated and being forced to sedentarise, having their mobility curtailed and dealing with possible lack of pasture within and across the borders of a country engulfed in war (Arkell 1991; Gaudio 1993). During the war, herds were bombed, abandoned, slaughtered, and sold off by different agents (Pazzanita 2006). The Moroccan offensive against camel herds was also meant to cut off the Polisario guerrilla's food supplies and logistical support. As a consequence, the large majority of Sahrawi nomads disbanded and joined the refugee camps soon after the invasion or within the next few years. Many attempted to sell their herds before fleeing in spite of the fact that prices had plummeted and cash buyers were difficult to find. At times, fleeing nomads abandoned herds in their customary nomadic territory in the (misplaced) hope that the animals could be recovered when stability had returned. Those who managed to reach refugee camps in Algeria with their herds often had to sell them (e.g. to local Algerian nomads) cheaply because they could not be fed and managed in the camps. Probably one of the most significant phenomena within this process was the Polisario's nationalisation of camel herds. Some nomads turned their herds over to the Polisario rather than attempting to sell them, and the Polisario also appropriated some of the abandoned herds<sup>13</sup> and sought to manage 'national' camel herds within the

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<sup>11</sup> This census might have missed between seven and ten thousand nomads (Gaudio 1993:61).

<sup>12</sup> The Moroccan Army also poisoned wells to ensure that those people and herds that were not eliminated by the bombings would be unable to occupy the territory (Lippert 1987).

nomadic territories that they could access or defend. These herds supported soldiers in the field (e.g. with meat and milk, since motor vehicles rather than camels were used for transport) and at times provided fresh meat for refugees.

Still, several thousand nomads did not lose their herds or flee to the camps. A report from the early 1980s (Camacho 1987) suggests that about 10,000 Sahrawi remained nomadic by moving to safe areas (e.g. West Algeria, Mauritania, northern Mali), making use of crossborder (or transnational) social relations based on tribal membership and solidarity with the Polisario. In the new system of social relations that emerged with the war, the Polisario became a supra-tribal power able to fight for the recovery of territory, represent the Sahrawi people as a whole internationally, and provide refugees with the necessary means of consumption through political and humanitarian support. Nomads provided the Polisario militia with milk and meat from camels and small livestock and in turn were protected from Moroccan incursions. Those nomads that survived slowly moved back to the liberated territories after the ceasefire agreement of 1991.

Refugees suffered tremendously from the war: when fleeing through the desert, many lost children to starvation, and spouses and parents succumbed to bombings, napalm attacks, and extra-judicial executions (Lippert 1992; Hernández 2013). Old people, women, and children suffered from severe malnutrition, lack of clean water, diseases and epidemic infections (Mercer 1976a). In this context it was impossible for tens of thousands of sedentarised refugees to rely on their own labour and resources for survival (Wilson 2012). Providing the population with aid in the form of food, shelter, fuel and clothing was essential (Lippert 1992). Those first years saw a collectivist war-economy develop based on international food aid managed and delivered to refugees by the Polisario and state (Sahrawi Arab Democratic Republic – SADR) institutions,<sup>14</sup> which established a national administration in exile in the refugee camps (San Martín 2010, 2005). Refugees depended on the Polisario, which assumed and transformed many of the functions played by traditional nomadic Sahrawi camps and tribes (Farah 2008). Irrespective of previous social differences (e.g. of wealth or caste), refugees all became equal in that they lost their livelihoods and property and became dependent on aid; livestock, the former basis of wealth, were nowhere to be seen. The few refugees who managed to bring livestock to the camps had to confine them in a single public pen (Wilson 2012), effectively collectivizing their scarce resources. As Herz (2013:12) argued, ‘much of the nomadic culture was discarded, as life in the camps did not lend itself to the keeping of large camel herds.’ Private trade was prohibited in the camps, and money was not used as currency. All of this began to change with the ceasefire agreement of 1991, which led to social relaxation in the camps, with greater freedom of movement of people and goods, the emergence of a private market sector and its acceptance by

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<sup>13</sup> There are no data available about the number of camels that Polisario obtained this way.

<sup>14</sup> The SADR is a partially recognised state that claims sovereignty over the territory of Western Sahara. It was established by the Polisario Front in 1976 to provide a new entity to fill the political void left by the departing Spanish colonisers. The SADR government controls about 20% of the Western Sahara territory.



Polisario authorities, and new opportunities for refugees to pursue individual and family livelihood strategies. This permitted Sahrawi refugees to exercise their agency to recover camel husbandry, as seen below.

### **Refugees' Recovery of Camel Husbandry**

The recovery of camel husbandry among refugees was triggered by different but interacting economic, political, ecological, cultural, and social drivers. The form this took was strongly informed by the past and also strongly influenced by the nature of these drivers and of the changing context. With the material and political change stemming from the ceasefire agreement of 1991 and, given the lack of alternative livelihood pathways in the desert environment, many refugees pursued camel husbandry as a path toward food security and livelihood diversification. The ceasefire agreement granted refugees access to part of their former nomadic territory (the liberated territories) and its grazing resources. Military operations ceased and Polisario soldiers were demobilised, which meant that many men with experience in camel husbandry returned to the camps and attempted to continue their activities. Sahrawi nomads also moved back to the liberated territories with camel herds that could be sold or loaned to refugees. Now firmly under the military control of the Polisario, safety and security in the camps and the liberated territories allowed refugees to invest and travel without threat to their persons and belongings, and to renew mobility by means of jeeps, which allowed them to travel to markets (e.g. Tindouf) and to their former nomadic territories. Livestock and equipment purchases were facilitated by access to cash through, among other sources, Spanish civil pensions, donations, and remittances. This also stimulated the development of productive activities and trade, leading to the growth of an informal economy in the camps, as well as widespread extra-camp trade and other economic and social interactions. Refugees emigrated (e.g. to Spain) and sent remittances or repatriated earnings while establishing transnational networks through diaspora. Camel and small livestock husbandry emerged as one of the very few means to sustainably exploit the resources of the Western Sahara, facilitated by the favourable rains of the past 10-15 years. Camel husbandry provides refugees with their traditional staple foods - fresh milk and, to a lesser extent, meat, in a context where, as in the past, agriculture is barely possible and hunting and gathering resources are very limited. Livestock husbandry traditionally provided resources for barter and now provides access to cash. Below, this process is addressed in more detail, starting with the means by which refugees gained access to camels in the camps.

### ***Access to capital and the development of an informal economy in refugee camps***

Soon after Polisario soldiers were demobilized and joined refugees in the camps, they began to engage in all sorts of informal private commercial and productive activity, boosting economic life. Up to that moment, mainly women undertook the limited economic activities in the camps as they attempted to supplement consumption; former soldiers slowly refocused household activities towards production for trade and commerce. A similar transformation occurred in

relation to livestock: traditionally, women managed small livestock production for own-consumption and they reinitiated this during the war, whereas camel husbandry and commercial livestock production can be traced in most instances to demobilized fighters (Mundy 2007).

A large number of refugees gained access to cash through Spanish pensions, remittances, funds obtained through the programme *Vacaciones en Paz*, formal and informal microcredit including loans from NGOs and other refugees, and trade (de Juan Canales 2010; Herz 2013). In 1988, the Spanish Government authorized pension payments to about 5,000 Sahrawi who had worked for the colonial Government of the Spanish Sahara (e.g. as public workers and troops). These pensions (€400-500 per month) were paid retroactively as a lump sum, so many refugees received a substantial amount, which permitted them to invest in livestock and four-wheel drive vehicles, as well as provide loans or credit to others, etc. Thus, cash began to circulate in the camps and incipient commercial activity arose with Tindouf and towns in Mauritania. Since the mid-1990s, a relatively steady number of Sahrawi refugees have emigrated to work in Spain (with smaller numbers going to other countries) to support their families in the camps, and emigration was often bankrolled by Spanish pensions. Remittances (e.g. from Spain, the Canary Islands, Algeria, and Mauritania) also provided ready cash. A more limited flow of remittances and other forms of assistance enters refugee camps from Sahrawi living in that part of Western Sahara that is under Moroccan administration.

Another important source of cash comes from Spanish families who host between 7,000-10,000 Sahrawi children per summer in Spain through a programme known as *Vacaciones en Paz* (Holidays in Peace) (Crivello et al. 2006, 2005; de Juan Canales 2009). When returning to the camps, children bring gifts for themselves (e.g. clothes, toys) and their families (e.g. solar panels, appliances, and money, on average €300 per year) provided by the host families or local solidarity associations (Morando 2006; Crivello et al. 2006). Some host families collect money to send to the children's families in the camps, thus greatly contributing to refugees' income and to the emergence of a cash economy (Crivello et al. 2006). It is estimated that this injects between €500,000 and €1,000,000 into the camps each year (Mundy 2007).

Since the 1990s, refugees have also benefitted from small grants and microcredit programmes offered by NGOs to initiate small enterprises (Elizondo et al. 2008), which has boosted productive activities and self-reliance among refugees (Cavaglieri 2005). In some cases, microcredit has directly funded camel purchases to initiate milk production (López Belloso and Mendia Azkue 2009). Besides formal microcredit, funds are provided informally by Sahrawi refugees through credit, loans, and delayed payments in market transactions, particularly to relatives and acquaintances, increasing the number of refugees with access to cash. Cash empowered refugees through forms of redistribution, as is also found with other refugee populations (Koser and Al-Ali 2001; Horst 2006b). On a smaller scale, refugees with no access to cash may sell part of the aid that they receive to purchase other food (e.g. fresh camel meat and milk) or non-food products (e.g. coal) (Corbet 2008), thus allowing them to participate in the camps' market economy.

The cash entering the camps permitted petty commerce, commodity production, and a market economy to develop in the camps (Shelley 2010; Herz 2013) involving an everincreasing number of refugees. Together, the potential to engage in long-term investment and commercial activities, and the proliferation of informal markets both within the camps and further afield, provided not only certain preconditions for the resurgence of camel husbandry, but as well ensured that the social and technical relations entailed in newfound pastoralism would be substantially different from the nomadic past.

### **The Requirements for Camel Husbandry Recovery**

Sahrawi refugees have attempted to recover livestock ever since they first settled in refugee camps. It has been shown in other contexts that one strategy used to restock is to diversify economically, as income gained in other sectors can be channelled into pastoralism (Horowitz and Little 1987). Among the Sahrawi, the recovery began with small livestock (goats and sheep) and it was only after the mid-1990s that this evolved into camel husbandry. Today, a large majority of refugee households maintain small livestock in pens around the camps (Herz 2013); compared with camels, small livestock are more economically accessible, have higher reproduction rates and fewer nutritional requirements, are more easily sold and a more convenient size for own-consumption; hence, pastoralists commonly begin with small livestock and only upscale to camel husbandry if and when conditions permit (Dahl 1979; Mace and Houston 1989). During the war, refugees generally lacked of means to access camels (raids were banned and refugees had insufficient capital to purchase camels), and also lacked pastures in areas surrounding the camps. Accumulating the cash to purchase a camel (about €400-600) is not easy, and camel husbandry in the camps is even more onerous since further initial investments are required for pens, water tanks, and fodder, while high risks of loss are entailed due to unfavourable husbandry conditions (Broglia and Volpato 2008). The material requirements of camel husbandry included access to camels, to fodder and pastures, to associated social networks (e.g. for labour, herd management, product distribution, etc.), and also access to the requisite camel-related knowledge.

While the recovery of camel husbandry is still rather limited in terms of the numbers of refugees and camels involved, it is highly relevant both materially and culturally. While most refugee households own some goats and sheep, very few (one to five per cent) own camels, totalling only a few thousand camels per camp. For almost all such refugees, camel husbandry is a productive activity that complements food aid and meets social and cultural expectations related to both camels and their products. Camel husbandry continues to be constrained by refugees' lack of capital and by the unfavourable environmental conditions of the camps.

### ***Diversity of access to camels***

With the ceasefire agreement of 1991, access to the liberated territories and the demobilization of soldiers, on the one hand, and the increased inflow of cash into the camps, on the other, began to stimulate the recovery of camel

husbandry, which was further sustained by the potential to market meat and milk in the camps. Camel purchases arose, in order of importance, in the liberated territories, Mauritania, Mali, Algeria, and Niger, and were sometimes embedded in elaborate trade involving the Sahrawi diaspora. A number of cases demonstrate both the fact that the strategies refugees use to access camels may be quite complex, involving a 'chain' of activities and investments, as well as the diverse motives for accessing camels. Camels are gifted and inherited, as is the case with a 15-year-old boy who received a gift of two she-camels from his father. They are also purchased from savings - a 50-year-old refugee living in the Aaiun camp initiated a commercial camel herd by purchasing camels in Mauritania with cash obtained from his Spanish pension. Some are obtained through barter: one refugee emigrated to Spain, bought two cars and then exchanged them in the camps for eight camels, which are pastured in the liberated territories using a hired shepherd, and which provide milk and other use values for his family when the rains come and they move to the liberated territories to live seasonally as nomads. One refugee migrated to Spain where he worked for a year in construction and, with the money he saved, bought a secondhand truck. He travelled with the truck via boat to Nouadhibou (Mauritania), and then overland to Azawad (in northern Mali), where he exchanged the truck for about 40 camels. He then travelled back to the camps and hired shepherds to bring the camels to him. Once there, the camels were sold to local butchers for a net profit. A woman who obtained remittances from her brother working in Spain bought a milk-producing camel to provide fresh milk for her widowed father. A couple with three children bought two she-camels with money that two of the children received from their hosts in Spain. Collective agency (requiring shared aims and coordination of interdependent plans of action; Bandura 2006) may also be involved in camel purchases usually, but not always, among kin; in at least one case, four neighbouring (non-kin) households in the camp of Aaiun purchased a milk-producing camel, sharing the costs as well as the milk produced.

Other refugees obtained camels through non-monetary social relations (e.g. from nomadic or refugee kin or acquaintances with herds) as gifts (in which camel ownership is transferred) or, more often, loans (in which ownership is not transferred and camels are used for milk production). Reciprocity involving camels and camel products was very important to the maintenance of social cohesion among Sahrawi nomads and occurred mainly through kinship in accordance with tribal organization. Contemporary redistributive mechanisms serve functions that are similar to those strategies (e.g. *mniha* – the act of lending milk-producing camels and their calves to fellow tribesmen, an institution embedded in nomadic Sahrawi society) that redistributed camel surpluses through a wider population, permitting destitute nomads to reconstitute herds or survive drought or raids. Similar institutions are present in different pastoral populations throughout the world (Faye 2009) and, in many cases, their demise has increased pastoralist vulnerability to droughts and other stresses (McCabe 1990) or, conversely, they have become increasingly important to the survival and functioning of these communities (Ziker 2006). Once Sahrawi refugees have managed to renew access to camels, these





Figure 2.3 Camels in a pen (G. Volpato)



Figure 2.4 Camel feeding her calf in front of a refugee's house (G. Volpato)

traditional institutions have been revitalized and adapted: camels and camel milk began to be redistributed through gifts and loans, permitting access to a larger refugee population. One refugee camel owner, for example, gave three two-year old camels as gifts, one to a family of acquaintances, another to a young man who was helping him in construction work, and a third to a cousin who gave the name of the camel owner to her new-born child. These camels may be then kept for milk production or, especially if young, slaughtered to provide meat for a wedding or baptism. However, the number of refugees receiving camels as gifts is rather limited. Loans (and delayed credit) are more widespread. *Mniha* plays an important role in the re-emergence of camel husbandry among refugees, where refugee and nomadic relatives from the liberated territories, Mauritania, and even from the Moroccan-controlled territories loan the camels, or camels may be loaned within the camps, as when a 'milk project' owner (see below) loaned a she-camel to the widow of one of his former workers.

### *Typology of camel husbandry in the refugee camps*

We have addressed how refugees managed, through economic and social means, to access camels, arguing that this access was made possible by the inflow of cash into the camps and the re-activation of social networks. Renewed access to camels, however, did not give rise to the re-emergence of traditional extensive camel husbandry among refugees, but rather led to different forms of settled or partially settled husbandry. Refugee camel pastoralists are socially differentiated, which is reflected in herd size, social-economic relations, and camel management practices. Broadly, three main forms of camel husbandry can be distinguished in the camps: 1) those who produce milk for own consumption (from two to a handful of she-camels); 2) small-scale commercial milk producers (from 10-30 camels), who sell milk after providing for own consumption and gifts; and 3) large-scale commercially oriented meat and milk producers (30-100 camels). In all cases, milk and meat are sold exclusively within the camps.

Refugees in the first category keep their camels under no-grazing conditions in a pen close to the household or on the camp's periphery (Figure 2.3). Camels are fed food scraps, hay, and fodder, and are watered from wells or potable water pipes. Refugees are strongly motivated to maintain camels for milk production (Figure 2.4) both because it is an essential staple and marker of cultural identity and because of beliefs that camel milk has health-giving and nutritional properties, especially for the ill and the elderly. These refugees consume or give away all milk produced. Milk is gifted to relatives or neighbours or given in exchange for labour (such as for camel milking). For example, soon after receiving his Spanish pension, one 60-year-old refugee and former nomad and his family moved to the periphery of the Smara camp, built a livestock pen, and bought two she-camels with their calves. Although he lost his camels after a year, he reinvested and is now very proud of his four she-camels and three calves, which provide milk for his and one of his married son's family.

Owners of medium sized herds maintain most camels in free grazing conditions in the liberated territories or in the Hamada of Tindouf, while some

are kept in the camp to produce milk for own-consumption, distribution and, at times, for sale. For example, one herder kept five milk-producing camels in the camp where besides providing for own-consumption, a small fraction of the surplus milk produced was given away, while most was sold to cover the costs of fodder and water. This group includes many demobilized soldiers who maintain a 'traditional' approach to camel husbandry: they sell relatively small quantities of milk (e.g. 10-20 litres per day), keeping some for themselves and for relatives and neighbours, while periodically distributing milk for free on a larger scale (some give all the milk produced on Fridays). The herd that is maintained in free-grazing conditions is usually loosely guarded if grazed around the camps, or tended by nomadic relatives if grazed in the liberated territories. Such herds are used to support nomadic relatives, obtain cash from the sale of males and as a form of savings.

The third group consists of those who manage private enterprises of variable size (up to 100 camels) primarily devoted to sales of fresh camel milk (up to hundreds of litres per day) and/or meat in the camps. Their organisation is more formal compared with smaller-scale producers and is based on the use of wage labour, with small quantities of milk destined for own-consumption and gifted to the workforce. Milking is done by hand, milk is unpasteurized, and is packaged in plastic bottles. It is taken to the camps by jeep and sold directly to refugees in local markets or indirectly via shops selling prepared food or groceries in the camps. Productive and non-productive she-camels are managed separately; milk-producing camels are kept on the periphery of the camps and fed mainly cut fodder, whereas the rest are kept under free grazing conditions in the liberated territories or northern Mauritania. These enterprises are sometimes called 'milk production cooperatives' since some are the result of the joint investment of various refugees who then share the earnings. Milk projects have increased in number over the past decade due to increased camel milk demand. The profits obtained have generated substantial personal wealth for some. The main constraint to initiating a milk project is the lack of financial resources required to invest in a large milk herd; the funds used to date were obtained through remittances, Spanish pensions, and/or earnings from other commercial activities.

### *Access to the liberated territories*

The Sahrawi's traditional pastoral territory was almost inaccessible to pastoralists while engulfed in war from 1975-1991 but, since then, the 'liberated' areas have been key to the re-emergence of camel husbandry and camel-related practices among refugees as they provide grazing resources for refugees' and nomads' herds, as well as a place for nomads to live and refugees to move in seasonal or 'holiday' nomadism. Refugees' use of the liberated territories and northern Mauritania (where the Sahrawi have free informal access) for pasturing herds is informed by an economic rationale related to the emergent markets for livestock and livestock products in the refugee camps, as camel herds spend fallow or fattening periods in free grazing conditions in these regions. This is especially the case for refugees with larger herds: in milk enterprises, fallow she-camels are grazed in the liberated territories as



long as forage plants are available (after rains) to ‘keep them healthy with good forage’ and save the cost of feeding them in the camps on cut fodder. In meat enterprises, especially after rains, refugee herders use the liberated territories to fatten camels and small livestock before selling or slaughtering them in the camps.

Besides enjoying milk and meat in the camps, some refugees move seasonally with their livestock to the liberated territories where they consume these products. Some move to fatten livestock, purchasing small livestock and camels before heading for the *badiya*. One family bought about 300 goats and sheep and 40 camels which were sold upon return to the camps; in at least two cases, this system was embedded in the camel trade destined to supply meat to the camps - camels are bought in Mauritania or Mali, brought to the liberated territories where she-camels provide milk for seasonal nomadic refugees, males are fattened and, at the end of the period, sold to butchers in the camps.

Besides this economic rationale, seasonal nomadism is informed by many refugees’ desire to enjoy a nomadic life in the *badiya* (Volpato and Rossi 2014). Each autumn and/or winter, depending on the location of rains, thousands of refugees move to the *badiya* (especially its northern area) together with their livestock, tents, food stocks, and various tools and other personal items, ‘to graze camel herds and get away from the camps’ (Mundy 2007:295). Dedenis (2005:86-87) and Caratini (2007a:192-193) report that trips to the *badiya* may take the form of a ‘holiday’ (i.e. periods based on consumption rather than production), where refugees plan gettogethers with their nomadic relatives or celebrate important events (e.g. childbirths, weddings). Such seasonal nomadic strategies are encountered among other pastoral populations. In Ethiopia, for example, the refugee camps in neighbouring Somaliland were incorporated into seasonal nomadic movements so that nomads could rely on the camps’ food networks during the dry season when pasture was difficult to find and milk was scarce, and refugees in turn enjoyed livestock products during the rainy season (Ryle 1992). Boulay (2004) also described the phenomenon among former nomadic inhabitants of Nouakchott and other Mauritanian cities of a ‘return to the *badiya*’ after the rainy season for a milk and meat ‘cure’.

### *Access to knowledge*

The knowledge a population holds about a mode of subsistence or productive activity is developed and transmitted across generations of engagement with a local environment and is commonly termed ‘traditional’, ‘local’, or ‘indigenous’ knowledge (Ellen et al. 2013; Vandebroek et al. 2011). As with other pastoral populations across the world, including the neighbouring Tuareg (Antoine-Moussiaux et al. 2007), over the centuries, Sahrawi pastoralists have accumulated, shared, and transmitted knowledge of camel husbandry in the desert environment of Western Sahara, including ethnobotanical knowledge about camel forage (Volpato and Puri 2014), ethnoveterinary knowledge required to diagnose and treat camel diseases (Volpato et al. 2013a), and ethnoecological knowledge about weather and rainfall patterns, soils, the location of wells and water points, distances and trajectories for transiting the desert, and many other types of knowledge. With forced displacement,

herd loss, and sedentarisation in refugee camps, knowledge transmission was disrupted. Younger people's disengagement with camels and the desert environment led to a lack of both the need and opportunities to learn. Decades of restrictions on access to nomadic territories meant there were no encounters with the learning environments in which camel and desert-related knowledge was transmitted, and knowledge acquisition and transmission became dormant (Volpato and Puri 2014). A shift in values associated with formal education, emigration, and exposure to mass media and to development schemes further alienated younger refugees from camel husbandry and the associated knowledge and cultural heritage, which some have even come to regard in negative terms.

With the resurgence of camel husbandry, which also involves young refugees who have no previous experience, many have struggled to revitalize the associated knowledge. The sources of this knowledge, principally older refugees and those who remained nomads, are involved in both vertical and horizontal knowledge transmission paths (Volpato and Puri 2014). Recipients are not only those refugees who reengage in camel husbandry, but also political organizations and NGOs that support refugees. For the first two decades after exile, the SADR government and international organizations focused on guaranteeing the supply of basic items required for refugees' survival, and the conservation of traditional Sahrawi knowledge was not an issue of public concern. However, with the recovery of part of the Sahrawi's nomadic territory, the growing reconstitution of herds and flocks, and a string of years with favourable climatic conditions, camel-associated knowledge regained importance in the public sphere. Caratini (2000:445), for example, says that 'the Polisario Front have reconstituted a camel stock [...] and it realized that the loss of knowhow in regard to livestock husbandry (based on the knowledge of the desert and of livestock needs) might represent a handicap both in the eventuality of a resumption of the war and given the perspective of peace.' In light of this, after the ceasefire agreement was signed, the Polisario involved its soldiers in a 'learning pastoral life' exercise involving nomadic shepherds (Caratini 2000). The Polisario's revalorisation of camel-related knowledge also entails the promotion of camel husbandry among younger generations and refugees as a symbol of cultural identity. For example, since 1992, *the Festival de la Cultura y de las Artes Populares* (Festival of Culture and Popular Arts) is held annually in Dakhla refugee camp, in which 'members of the older generations are actively engaged in teaching the youth a culture and traditional lifestyle that young people cannot find in school books' (SPS 2005). Besides being crucial to camel husbandry, the recovery of camel-associated knowledge and values is functional to Polisario and Sahrawi refugees' assertions of political independence and rights to their territory as discussed below.

### **Emergence of Peri-urban, Commoditised Camel Husbandry**

Technically and economically, the camel husbandry system developing in and around the refugee camps is quite similar to the peri-urban milk and meat camel husbandry systems that have developed around Saharan towns over the past few decades (Chaibou and Faye 2005; Faye et al. 2003). In

fact, across arid and semi-arid areas of Africa, camel husbandry represents a viable productive pathway and has progressively become commoditised through marketing of camels and camel products in peri-urban husbandry systems. The transformation of pastoral nomads into petty commodity or capitalist producers, and of subsistence pastoral production into commodity production, has been occurring throughout Africa to various degrees and at various scales with increasing integration of camel milk and meat markets at regional and national scales (Herren 1992; Nori et al. 2006).

Recovery among Sahrawi refugees has thus entailed very substantial changes in environmental, technical, and social relations of production and exchange compared with the nomadic past, and in several ways reflects refugees' dependence on, and engagement with, a transnational political economy. Their dependence on extra-territorial aid and income, their exposure to formal education and to formal and informal markets in the camps and abroad, their settlement in and reliance on the camps with limited access to their former territories, and the fact that not all refugees are able to access the capital required to restock camel herds, have all brought about such change. Below, we address three main aspects of this change, namely 1) the technological intensification of camel husbandry, 2) the commodification of camel products, and 3) the establishment of new social relations around camel husbandry. We then address cultural expectations and resistance associated with these changes.

### ***Changes in camel management and technological intensification***

As the relationship with the nomadic territory disintegrated, camel husbandry in the camps came to rely far less on the biological resources of the desert and far more on imported capital and fodder. While nomadic camel husbandry depends on mobility and extensive free-grazing as main strategies to feed camel herds, refugees are sedentarised and lack grazing resources, so camel husbandry in the camps is mainly based on purchased fodder as well as flour, straw, and barley grain. The economic viability of camel husbandry around the camps depends on the cost of feed and other inputs costs and access to the means to cover them. The need to purchase fodder places an economic burden on camel owners and often forces them to generate revenues from production to pay for feed; fodder is either purchased with the same sources of cash used to access camels or with revenue from milk sales.

The intensification of camel production among refugees does not occur through breeding or the use of tools or machines to substitute human labour (and thus reduce the costs of production). Rather, intensification, as understood here and as described for periurban camel systems in other parts of the world (Faye et al. 2003), refers to the substitution of extensive land use (grazing on wild forage plants) with intensive input use – essentially, camels are confined in a smaller spaces and live from purchased fodder, trucked in water supplies, and modern veterinary medicines. Different authors have noted a more general tendency in Saharan camel husbandry toward reduced mobility and grazing intake and increased consumption of fodder and supplementary feeds (Michel et al. 1997; Faye et al. 2003). Throughout the last century or



Figure 2.5 Camel riding during a political celebration in Rabouni refugee camp (G. Volpato)

so, the use of supplementary livestock feeds has increased worldwide in part as a result of the increasing availability of cheap agro-industrial by-products and mechanized transport systems capable of delivering them in bulk (Blench 2001).

In most cases, fodder is purchased in Tindouf. Travel and trade, including for fodder purchase, are facilitated by the diffusion of vehicle transport that, since the 1990s, greatly facilitated refugees' mobility (Dedenis 2005). After the war, jeeps and trucks have superseded camels as a means of transport. Camels now provide transport only on a limited scale and only among nomads, but few nomadic households regularly move to new grazing areas with their belongings packed on camels. Although, as Bulliet (1975) described so brilliantly, for two thousand years the camel managed to displace the wheel in North Africa and the Middle East, in the 20<sup>th</sup> century the wheel, now coupled with the internal combustion engine, took its revenge, and the use of camels for transport went into steep decline. The widespread use of jeeps and trucks in desert environments has had profound impacts on camel pastoralists' lifestyle (Chatty 1980, 1986). Owning a 'land rover' is a principle ambition among Sahrawi refugees and one of the first commodities they acquire when they have sufficient cash is a motor vehicle. These facilitate trade and inter-camp transit, serving as taxis and transporting goods to and from Tindouf, the liberated territories, and Mauritania. People ride camels in the camps only during SADR political or ritual celebrations when mounted camel parades are performed to demonstrate the Sahrawi's nomadic origins (Figure 2.5). The camel has become a symbol of Sahrawi cultural identity in public and political

rituals and demonstrations as, for example, in 1997, when James Baker, the former UN mediator of the Polisario-Morocco conflict, visited the camps and again in 2006, in Tifariti, for the 30<sup>th</sup> anniversary of the SADR's foundation.

The diffusion of motor vehicles has also changed camel management. Most successful refugee camel owners own a jeep or truck. Especially market-oriented camel herders use other complementary technologies such as tanker trucks, GPS, and satellite phones. Trucks make it easier to supplement camels' diets with harvested wild plants, hay, and fodder. The historical constraints related to water provision for camels are addressed by developing new wells, mechanization (pumps), and tanker trucks that bring water to the herds, which obviates the need to move herds to water. There is generally increased reliance on owned or rented tanker trucks both among refugees and nomadic herders, particularly for larger, market-oriented herds. Herds can exploit grazing resources in the liberated territories that would otherwise be too distant from water points, whereas in the camps it permits large herds to be maintained on the periphery where water is deposited in large tanks.

### *Camel milk commodification*

Although historically the Sahrawi traded surplus camels, an unprecedented process of commodification of camels and camel products is occurring among refugees. Camels are no longer bartered for food and other essentials but are sold for profit; meat is sold in butcher shops and milk, which it was formerly taboo to sell, is subject to widespread trade and high consumer demand. As trade gave rise to an informal economy in the camps, camel milk has become at least partly commoditised, as have other natural products that were previously not subject to monetary exchange, such as plant medicines and desert truffles (Volpato et al. 2013b).

Studies investigating Sahrawi refugees' dietary intake confirm that camel milk is widely consumed (Henjum et al. 2010; Grewal 2011). Refugees source camel milk in three ways: 1) own production, which is very limited due to the small number of refugees who own or maintain camels; 2) social mechanisms of redistribution in which refugee camel owners, the Polisario Front, and certain international NGOs maintain milk-producing camels in and around the camps and provide refugees with fresh milk through family, social, and/or political networks; and 3) purchase in camp shops and directly from refugee producers, which accounts for the majority of the milk consumed in the camps. About half of the refugee camel owners surveyed by the first author (n=44) sell camel milk. Nomads (n=30), however, do not sell camel milk but rather, as in the past, redistribute it through kinship and other networks, to neighbouring households that have no milk-producing camels, and to labourers that manage herds as well as to their families.

The commodification of camel milk in Sahrawi refugee camps reflects trends reported in urban markets across Saharan Africa (Faye et al. 2003), from the Western Sahara under Moroccan administration (Michel et al. 1997) and Mauritania (Abeiderrahmane 2005) to Kenya (Noor et al. 2013), Somalia (Farah et al. 2007); the same trends are found, for example, in Saudi Arabia (Faye et al. 2014). Commodification occurs through two possible



paths: through the penetration of capitalist relations of production, and/or as a necessary adaptation to husbandry in sedentary conditions. The second particularly applies to Sahrawi refugees; camels had to be fed purchased fodder. Sahrawi refugees were forced to incorporate fixed and variable capital to substitute resources otherwise obtained for free in their traditional territories. In order to obtain the capital needed to maintain camels in the camps, refugees began to sell at least part of their milk. In a few but farreaching cases, this led some refugees to develop large herds and seek profits. At the same time, these changes have been met with resistance on the part of some refugees with a nomadic background who challenge changes that have occurred such as the commodification of camel milk, which has fundamentally altered social relations and challenged traditional values and beliefs. Indeed, the Sahrawi have maintained a more traditional approach in nomadic conditions (e.g. in the liberated territories), where the redistribution of camel milk still constitutes the basis of the nomadic community, giving credibility to the idea that it is need, rather than greed, that has led to milk commodification.

### ***Social relations around camel husbandry***

Over the past 50 years, Sahrawi social relations and political organization have undergone no less than a revolution. Major social and political change commenced with colonialism and war and culminated with exile and the creation of a Sahrawi nation-state, the SADR (see footnote h). Historically, the Sahrawi were organised politically in tribes, where several inhabited the traditional territories (e.g. Reguibat, Izarguien, Oulad Delim, Oulad Tidrarin, etc.; see Briggs 1960; Pazzanita 2006) in a segmentary system that further subdivided each tribe into branches based on extended families and other kinship ties (Hart 1998; Caro Baroja 1955). Tribal relations determined access to pasture where each tribe controlled a customary nomadic area. Decisionmaking institutions and networks of mutual support functioned along tribal lines and especially within branches (Caratini 1989). The tribes of Western Sahara continuously interacted through trade, war, raids, agreements of mutual access to each others' customary areas (e.g. with drought), alliances, tribute payments, etc. Although this political organization was disrupted with colonialism, it was in the mid-1970s that it was completely overturned by events: with exile and the establishment of the camps, the Polisario banned tribes and reorganized the Sahrawi under a newly declared nation-state in which each refugee became a citizen of the SADR and pledged allegiance to the Polisario, which controls and grants refugees access to the liberated territories and manages food aid (Wilson 2012; Caratini 2003). While kinship continues to have considerable importance among contemporary Sahrawi, tribal affiliation gave way to Polisario allegiance, and the Polisario Front *de facto* assumed the functions previously assumed by tribes and extended this to incorporate other functions of the modern nation-state, e.g. international political representation. Among Sahrawi refugees, social relations have been established and/or reformulated around camel husbandry on the basis of kinship (e.g. between refugees and nomads) and on Polisario governance (e.g. for access to the liberated territories).

The process transforming tribal authority to a nation-state is exemplified by the changes that occurred in camel brands. Branding refers to cauterizing unique symbols (marks) on an animals' body to communicate information about ownership, the owner's social status, and grazing rights (Landais 2001; Humphrey 1974). Brands are also essential elements of identity in pastoral societies, as their collective character serves as an assertion of collective rights (e.g. of tribes) to specific resources (e.g. water, pastures) (Landais 2001; Bernus 1996). Among Sahrawi nomads, the process of branding camels was known as *mbar* (*nar* in Arabic) or *elama*; camels were usually branded on the neck or the thigh, or on the head or other visible part of the body (Caro Baroja 1955; Boyer 1962). Each tribe had its own brand, while larger tribes (e.g. the Reguibat in the 19<sup>th</sup> century) had different brands for major segmentary branches. Monteil (1952) recorded more than 25 brands used by Sahrawi tribes or their bands, about half of which incorporated letters or combinations of letters from the Arabic alphabet (e.g. the letters *kaf* and *qaf* for the Reguibat), the rest consisting of stylizations or abstract symbols.

The origins of brands were usually embedded in myths that tied into a single narrative the tribe's founder, the camel, and the brand (Caro Baroja 1955:89-90). Camel brands conveyed the power of a tribe not only in terms of the number of camels held but also the location of camel herds in the territory – an indicator of territorial control. The brand, then, was a message conveyed to other pastoral groups about the related priority of access (or not) to the territory where those camels grazed. Thus, for pastoralists, the brand can be considered as a functional and symbolic equivalent of national flags for claiming territorial occupation and defining which human groups are granted access.

In the social revolution from a tribal to a state organization led by the Polisario, brands were also revolutionized. Today, all camels belonging to Polisario are marked on the neck with the letters FP (Frente Polisario) followed by a number relating to a military region (from one to seven). For Polisario herds, this brand has completely displaced tribal marks, including a noticeable shift in the alphabet from Arabic to Latin, and a shift in the symbolic function of these herds' identity, from one based on tribal divisions to one based on Sahrawi unity. The Polisario adopted the branding conventions of the colonial authorities - Spanish and French colonial powers branded their herds with numbers rather than symbols. Polisario brands thus represent a rejection of traditional tribal symbols, reinforcing the ideological unity of the Sahrawi people beyond tribes and draw upon colonial symbols of state ownership. However, in continuity with the tribal past, in the liberated territories, the presence of camels marked with 'FP' indicates control over those territories and its resources and hence to whom people owe allegiance when using those resources.

With the recovery of camel husbandry and renewed access to a shared nomadic territory, refugees began to interact more intensively with nomads, often on the basis of kinship ties. Some nomads and their herds became integrated with the camel-based economy emerging in the refugee camps by functioning as reservoirs of camels (e.g. through loans) and camel-related



knowledge, and as a source of camel milk for refugees engaging in seasonal nomadism. Nomads in turn use the refugee camps as a commercial hub where they sell livestock, procure other items, access aid through refugee relatives, and exchange food with refugees. As Wilson (2012) also noted, both refugees and nomads use the liberated territories to graze herds, interacting in a vast network of solidarity and reciprocity that is strengthened by kinship ties linking nomadic and refugee households. The common interest in camel husbandry has largely defined their relationships, served to strengthen social bonds that were severed with the dissolution of tribes, and contributed to the development of a system of apparent mutual benefit.

The Sahrawi case is not the first in which refugee camps are shown to have a positive impact on regional economies by functioning as commercial hubs for local nomads who sell their surplus animals in the camps. Jansen (2011) reports the same for the Kakuma camps of Kenya. There, however, nomads and refugees are from different and rather antagonistic ethnic groups; the former are Turkana and the latter mainly Dinka, so that the relations between them are strictly based on trade. Among the Sahrawi, there is a deep interpenetration between refugees and nomads, so that patterns of exchange involve extended families and reciprocity, in addition to market exchange.

In the past, labour relations around camel husbandry were based on extended families and on structural differences within and between tribes. While poorer nomads relied on own and male kin labour, more powerful nomads and tribes (i.e. with hundreds of camels) exploited the labour of slaves and dispossessed nomads (e.g. members of a defeated tribe) (Caro Baroja 1955; Hart 1962). Today, nomads and refugees with small non-commercial herds still rely principally on family labour. However, in market-oriented enterprises, labour relations around camel husbandry have been largely commoditised, representing a break from the types of structural social differences that prevailed in the past. Commercially-oriented herders use hired labour for camel management (e.g. feeding and watering) in and around the camps and contract shepherds to tend herds in the liberated territories. In the camps, labour is mainly provided by young refugees who have little formal education. In the liberated territories, refugee youth, Sahrawi nomads (local or from Mauritania) or, in some cases, sub-Saharan migrants are contracted. Shepherds are paid in cash rather than in kind whereas, in the past, they were paid in livestock - e.g. a camel in exchange for a year's labour.

### ***Cultural expectations and resistance around camel husbandry***

Refugees do not share the same attitudes toward the recovery of camel husbandry and renewed access to camel products, nor to the changes in camel husbandry and camel management. The refugee literature identifies two contrasting processes of cultural change in situations of exile (Couldrey and Morris 1999; Volpato and Waldstein 2014). The first is a tendency toward loss or abandonment of traditional culture, which is maintained only among elderly and specific, often marginal, groups. The second is a process of maintenance or recovery of traditional culture in order to promote the maintenance or recovery of productive activities and cultural identity. Among

Sahrawi refugees, those who have been at least partly acculturated in the West and many other younger refugees who have never experienced nomadic life often express less concern about cultural continuity and regard camels and camel husbandry as 'backward' unless they are used as a means to make money. Older and more culturally conservative refugees stress the importance of livestock and livestock products, especially camel milk, and demand that their children meet their expectations by consuming camel milk and meat and traveling to the liberated territories.

Incentives to recover camel husbandry include the desire, especially of older refugees, to consume fresh camel milk and spend at least part of their lives in the *badiya*. Dedenis (2005) writes that sons continue to be motivated by the social obligation to provide fresh livestock products for their parents and to reconstitute herds; feelings of good health, pride, dignity, and freedom are associated with a 'return to the *badiya*'. For the elderly, travelling through space to the *badiya* represents travel in time back to their youths. The *badiya* and its key elements (green deserts after rains, livestock, camel milk, tents) are emblematic of the culture they represent – of nomadic Sahrawi - and of associated values such as freedom and autonomy.<sup>15</sup> Within some families, diverging expectations and desires around pastoralism and nomadism have created intergenerational struggles around the use of herds and other resources, with the elderly favouring more traditional strategies of resource allocation and livestock management.

Forms of cultural resistance also arose among refugees around technological change and intensification, where some are against the use of tanker trucks to water camels, which 'corrupts nomadic life.' Because traditional camel pastoralists have internalized camels' needs and the constraints of camel husbandry into their systems of knowledge and beliefs about the natural world, in their eyes such change goes against the laws of nature. Some believe that, although tanker truck water comes from wells, it is not as good for camel's health as water that is directly extracted from wells and that camels watered directly with well water have greater strength and stamina.<sup>16</sup> Similarly, some traditional herders are 'against fodder' and are proud of the fact that they rely exclusively on free-grazing resources, believing that purchased fodder is bad for camels' health and lowers their resistance. The dialectic between 'innovation' and 'tradition' in camel management has, in some cases, assumed the form of

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<sup>15</sup> An association between 'freedom' and the 'badiya' is often found in nomadic Sahrawi poetry, which was largely based on the description and celebration of badiya resources and landscapes. For example, the most renowned living Sahrawi poet, Mohamed Mustafa Salem (known as Badi) said, 'In the badiya a man is free to do everything he pleases, with his life, with his livestock, with his water. He is owner of himself. Who does not live in the badiya cannot be owner of himself, in any other place...Every minute of life one feels free, very free. Nothing is better in the badiya than when a friend comes, a person you esteem and to whom you can offer everything you can imagine' (cited in Gimeno Martín and Pozuelo 2010:11-12) [own translation from Spanish].

<sup>16</sup> According to Elmi (1989), Ceeldheer pastoralists of Somalia do not like to water their camels from wells with a motorised pump for two reasons: the camels do not like the water because it smells of diesel, and water stored in metal tanks is cooler than that from the bottom of the well, and thus camels do not like it and will not drink it to capacity.

an inter-generational struggle in which older men tend to favour traditional strategies. These forms of cultural resistance are probably an integral part of situations where profound change in the mode of subsistence and social relations are underway, and have also been shown to occur among Sahrawi refugees in relation to concepts of illness, health, and healing (Volpato and Waldstein 2014).

### **The Camel and Sahrawi Identity**

All the people like us are We, and everyone else is  
They (Rudyard Kipling, *We and They*, 1926)

Kohler-Rollefson (1996:283), in her work on the origin, use, and dispersal of the one-humped camel in Asia, writes, 'The function of animals in human societies is usually not restricted to utilitarian purposes; they often fulfil important and culturally distinct symbolic and ritual roles...and quite frequently develop into hallmarks of identity.' Historically, among the Sahrawi, not only was the camel the material pillar of society, but as well the cornerstone of Sahrawi tribal and nomadic identity. Several Sahrawi tribes' origin myths were based on camels (Caro Baroja 1955; Mercer 1976a); camels were central to Sahrawi beliefs, sayings, and poems (Pinto Cebrián 1997); camel ownership defined prestige and social rank; and nomads identified with and felt affection for their camels and their local camel breeds. With recovery, much of the cultural significance of the camel as a symbol of ethnic identity has been revitalised, which is reinforced by the Polisario's efforts to create and sustain a national identity based on ethnicity, cultural heritage, and territorial occupation.

*Identity* refers to feelings of belonging to a specific group based on a distinctive shared language, culture, social organization, and ideology (Hurskainen 1990; Snow 2001). Identities and their symbols are continuously constructed and reconstructed by redefining the differences between the self and the other, the cultural borders in which these differences are represented, and abandoning or adopting different key elements of identity (Drzewiecka 2002; Nagel 1994). As Corbet (2008) noted, contemporary Sahrawi are struggling in multiple ways to reconstruct their identity. The camel is a central, figurative, and symbolic element that represents the Sahrawi and differentiates them from other (non-camel pastoralist) populations. The re-establishment of a relation with the *badiya* based on pastoral and nomadic practices reaffirms Sahrawi refugees' cultural identity based on their nomadic origins.

When the Polisario overturned tribal social structure, it eliminated the basis of social differences in favour of national unity, social equality and Sahrawi collective identity and citizenship and, at the same time, the cultural and political significance of camels was undermined. This revolution was necessarily cultural as well as social; tribalism in all its forms, as well as the material basis of this tribalism, were antithetical to the Polisario's project of building the basis for nationalist claims to the territory against other nationalist claims (e.g. Morocco). The Polisario thus not only eliminated (prohibiting reference to) tribal institutions and affiliations, but as well discouraged the transmission of tribal myths of origin, which affirmed the distinct genealogical

identities of the Sahrawi tribes as well as the symbolic significance of the camel as the material and cultural basis of these tribes' existence. As the Polisario nationalized camel herds, the camel was purged of any significance as the basis of tribal or personal power in favour of a cultural identity based on the unity of all ethnic Sahrawi under a 'modern' nation-state. However, the camel was too potent a symbol both of Sahrawi ethnic identity and of Sahrawi claims to their traditional nomadic territory to discard wholly or permanently. The camel was later to be recovered as a symbol of Sahrawi unity *vis a vis* other populations, and so regained a prominent place in Sahrawi cultural identity not only among refugees and nomads engaged in camel husbandry, but as well in official Polisario discourse and practices. For the Polisario, the rebirth of the camel's symbolic significance was functional to claims of independence. Camel husbandry reinforces the Polisario's claims to nation-statehood by legitimizing control over the former territory pertaining to the Sahrawi nomadic tribes both through occupation (people and animals) and use, and by providing for the national welfare and reducing dependence on foreign aid by means of state food production and redistribution. The camel and camel husbandry also serve to legitimise claims to national identity by representing the basis of a shared ethnic, cultural, and political identity, as well as symbolizing the differences between the Sahrawi and other populations, particularly the Moroccans.

The contrasting political ideologies and claims of the Polisario, on the one hand, and of the Morocco Government, on the other, constitute a crucial axis of the dispute over control of Western Saharan territory. Under the Polisario, Sahrawi identity has been reinforced on the basis of differences between the Sahrawi and the Moroccans, whose cultural practices are explicitly and implicitly contrasted (Chamberlain 2005). The SADR's Ministry of Information produces educational and informational material for refugees that stress this contrast in terms of language, food, dress, and women's roles (Allan 2010) and, as a result, 'many aspects of everyday Saharawi existence become cultural markers' (Chamberlain 2005:27). This is also the case with ethnobotanical knowledge associated with the desert environment and camel husbandry (Volpato and Puri 2014), which contrasts with Morocco's agricultural traditions. The dispute over Western Sahara territory thus aims to 'hegemonise a collective social imaginary about what it is to be Saharawi, who the Saharawi are and who the 'others' are that delineate the frontier of 'our Sahara' (San Martin 2005:587). Camels and camel husbandry are part of this dispute and are central to the public representation of Sahrawi political identity. Camels appear in refugees' and Polisario's discourses as the basis of a 'stolen' nomadic life in the *badiya*, where 'pastures are good' and 'camels gain health,' in contraposition to neighbouring areas (e.g. Morocco to the North, central Mauritania to the South) where 'camel diseases are widespread' and 'the climate is too wet for camels.' Below, we present three examples of this re-appropriation of the camel as a symbol of cultural and national identity in relation to the figure of the *deyar* (a nomad who searches for stray camels), to the skills needed to slaughter camels, and to the use of camel milk in political contexts.

In Sahrawi nomadic culture, the *deyar* is a very knowledgeable and

experienced nomad camel tracker who locates camels that have strayed in the desert and returns them to their herds. *Deyars* read tracks in the sand and infer a great amount of information from their shape, depth, distribution, direction, etc. *Deyars* are highly respected for their knowledge, skills, and intimate relation with the desert environment. With the collapse of nomadism during the war and the changes that ensued in camel management (e.g., increased reliance on motor vehicles and binoculars), the number of *deyars* drastically declined and their skills are being lost. But if their physical presence is dwindling, their cultural significance is not: on the contrary, *deyars* have a prominent place in present-day Sahrawi literature and poetry (see for example Ebnu 2008; Boicha et al. 2003; Bahia 2007; Moure 2004), where they often represent the *badiya* itself and the lost relationship with and knowledge of Western Sahara territory. At the same time, the *deyar's* search for stray camels has come to symbolically represent the Sahrawi's search for the camels lost with the war and, in a wider sense, of the search for their lost nomadic life, independence, and freedom in the territory of Western Sahara, and hence an assertion of the claim to the territory.

Among the cultural practices that the Sahrawi contrast explicitly with the Moroccans are camel slaughter skills, which reflect the intimate relation between camels and the Sahrawi as well as the alleged Moroccan's ignorance of camels. The contrast is stressed by a young Sahrawi author who describes a camel slaughterhouse on the outskirts of El Aaiún city in Moroccan-controlled Western Sahara, where camels can be heard crying out in suffering, which he contrasts with Sahrawi practices known as *nosh* (Autores Varios 2009:89-90).<sup>17</sup> One of the *nosh* prescriptions dictates that, when slaughtering a camel, suffering must be minimal, which is possible only through the skills and experience of the slaughterer, which are transmitted between herders across generations as part of Sahrawi cultural heritage. So, for example, when a young Sahrawi attended an encounter with King Hassan II in 1979 organised by the Moroccan authorities, they sacrificed a camel: it 'was horrible, that animal was crying a lot...those people don't have any idea of how a camel must be killed' (A.A. 1979). Indeed, if the main arteries between the neck and the thorax are severed with a single cut, death occurs instantaneously, whereas if the cut is not expertly executed death is delayed and the animal suffers (Farah and Fischer 2004). In pre-colonial Sahrawi society, usually the eldest or most respected man slaughtered camels, which was forbidden to lower social groups (e.g. slaves). Thus, a contraposition that was internal to the social system (slaves-camel owners) has been conceptually reorganized as an external contraposition (Moroccans-Sahrawi), which is functional to Polisario political struggles and claims to Sahrawi unity.

Since at least 1999, the struggle for Sahrawi nationhood has extended into that part of Western Sahara under Moroccan control where the Sahrawi experience social and economic discrimination and participate in nationalistic demonstrations and riots (San Martin 2005). In this context, camels are an issue; a group of former nomads from El Aaiún is currently campaigning for

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<sup>17</sup> *Nosh* literally refers to tethering camels by grabbing them by the tail.

compensation for the camel herds that Moroccan troops killed during the war, which requires the Moroccan authorities' recognition that troops were ordered to butcher Sahrawi herds, a fact that Moroccan authorities deny (Shelley 2004). Such acts are contrasted with the Sahrawi's affection for the animal and the social and the cultural importance attached to camels and camel products. Sahrawi who struggle for independence in the Moroccan-controlled Western Sahara adopt camel milk as a symbol of their ethnic and national identity while reflecting the difference with Moroccans' sedentary lifestyles and identities. Reports show that, in April, 2006, when Moroccan authorities released Sahrawi activists from prison and again in Agadir, in 2007, when Sahrawi students were released for having publically demanded independence for Western Sahara, their Sahrawi supporters greeted them with cups of camel milk and dates (SPS 2006, 2007), just as Sahrawi nomads returning from long desert treks were received in their camps in pre-colonial times.

Morocco is also promoting camel husbandry in the part of Western Sahara under its control while attempting to appropriate the camel as a symbol at a subnational (i.e. ethnic, tribal) level, thus proposing that Sahrawi nomadic heritage is part of Moroccan national heritage (Martin-Márquez 2006; Julien 2004). Polisario calls for Sahrawi unity *against* tribal identity, while Morocco tries to promote and enhance tribal identity and downplay or deny the existence of Sahrawi national unity (Corbet 2008). Moroccan authorities are attempting to undermine the Polisario's monopoly over the politicization of Sahrawi nomadic culture, exalting the camel and its characteristics. This has occurred in the context of a parallel recovery of camel husbandry in Moroccan-controlled Western Sahara which has been ongoing since the 1990s, especially with the emergence of commercial enterprises producing and selling camel milk and meat (Pazzanita 2006; Michel et al. 1997). The Moroccan Government and local authorities increasingly fund camel husbandry, supporting it through direct aid (e.g. subsidies for camel purchases), cooperation programs that distribute free veterinary medicines and vaccines, and implement applied research (e.g. epidemiological studies) (El Abrak 2000; Essemli 2008; Michel et al. 1997). Today, the Moroccan Government and media portray camel husbandry as an integral part of the Moroccan economy and promote the camel milk and meat consumption (El-Katab 2008). Among other events promoting camel meat and milk in Western Sahara, the Moroccan authorities organized an International 'Salons of the Dromedary' in 2008 and 2009 in what they call the 'Southern Provinces' or 'Moroccan Sahara' to celebrate 'the central symbol of the culture and life of Saharan inhabitants,' as the francophone Moroccan newspaper *Le Matin du Sahara et du Maghreb* (Essemli 2008) reported: a clear example of the attempt to reposition Sahrawi nomadic heritage as part of Moroccan heritage. Thus, a struggle to ideologically appropriate Sahrawi nomadic cultural heritage continues between Moroccan authorities and the Polisario, with the former aiming to incorporate it as a specific ethnic/tribal heritage *within* Moroccan national culture and the latter aiming to recover nomadic cultural heritage as the foundation of Sahrawi independence and against Moroccan claims.<sup>18</sup>



## Conclusions

This study has addressed the material and cultural importance of camels and camel husbandry among Sahrawi refugees, as well as their efforts to recover their territory and productive activities and promote their shared nomadic heritage and cultural identity. The case illustrates both how refugees struggle to recover their livelihoods in contexts of forced displacement and sedentarisation in refugee camps, and how this struggle is informed by pre-exile modes of subsistence and cultural values. The camel was central to Sahrawi nomadic society both materially and culturally. With war and forced displacement, the Sahrawi lost most of their camels - it took decades for refugees to recover camel husbandry by regaining access to camels, grazing territory, and camel-associated knowledge, and to establish reciprocal relations around camel husbandry in the liberated territories with remaining nomads. Although this recovery is sustained by traditional values and practices related, for example, to camel milk consumption and redistribution, fundamental changes have also occurred: the camel lost its traditional functions as a means of transport, warfare, and non-monetary exchange; management has intensified with the use of fossil fuels and motor vehicles, and increasing reliance on purchased fodder and other inputs rather than on desert grazing resources; and camel products as well as access to camels and labour have been largely commoditised. The camel has also been appropriated as a symbol of Sahrawi cultural identity both by refugees and in Polisario discourse and practice, which asserts the Sahrawi's nomadic cultural heritage as a key element of a national identity legitimating claims to nationhood and traditional territories for the Sahrawi people.

The findings of this study are significant for understanding both refugees' individual and collective agency toward cultural and economic recovery, and dispossessed pastoralists' struggle to rebuild herds and livestock-based forms of livelihood. We have expanded our knowledge of Sahrawi refugees' agency and their reengagement with pastoralism and the liberated territories, and also provided a framework for more generally conceptualising some of the processes by which refugees living in camps engage in productive activities, how these are informed by their culture, access to means of production and financial capital, and how they are embedded within larger-scale socio-economic change processes including commodification and migration. The findings also contribute to the understanding of human-nature relations in contexts of forced displacement and of the means by which refugees reengage with traditional productive activities, knowledge, and environmental relations, in the process adapting (and reinventing) the past to new conditions and values arising from their experience as refugees. Knowledge of these processes is important not only to understanding refugees' and displaced people's struggles, but also to comprehend broader cultural and social processes

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<sup>18</sup> See Wallerstein (1987) for a discussion of the political manipulation of concepts of identity as 'national', 'ethnic', or 'racial' where 'peoplehood' is 'in no sense a primordial stable social reality, but a complex clay-like historical product of the capitalist world-economy through which the antagonistic forces struggle with each other' (85), which seems entirely appropriate in the context of Western Sahara.



taking place in refugee camps (and, within this, the role of food aid), and to formulating ways in which the international community can address refugees' problems within these processes. NGOs working in refugee camps can use studies about the recovery of refugees' livelihoods to identify and implement means to assist this recovery.

Although the recovery of camel husbandry is rather limited in terms of the numbers of refugees and camels involved, it is likely to continue into the future as refugees continue to break the chains of food dependency, as long as it can be sustained by rains, and as long as access to camels and to the liberated territories remain assured. The strategy that refugees pursue leads toward greater integration of refugee camps with wider economic and social networks, but this depends on the continued existence of the camps and of international aid. As long as this trend continues, there will be an increasing number of camels and greater integration between refugees and nomads (often within extended families), creating a single productive network between the refugee camps and the liberated territories. If the referendum for Sahrawi self-determination is eventually held<sup>19</sup> and refugees move back to Western Sahara, some refugees might return to nomadism, merging with nomads on both side of the berm and using Western Sahara towns as commercial hubs. In this scenario, the Polisario Front might redistribute its camels to refugees, in a sort of concluding cycle in which the herds that the Polisario acquired from disbanding nomads at the beginning of the war and used to support refugees in the decades of exile, once again become the basis for a return to desert nomadic pastoralism.

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<sup>19</sup> The ceasefire agreement of 1991 included a referendum for self-determination originally scheduled for 1992, in which the Sahrawi would have the option to decide between independence and integration with Morocco. However, this referendum was never held and is still on the UN's to-do-list (Pazzanita 2006).





# CHAPTER 3

## **Healing War Wounds and Perfuming Exile: The Use of Vegetal, Animal, and Mineral Products for Perfumes, Cosmetics, and Skin Healing Among Sahrawi Refugees of Western Sahara**<sup>20</sup>

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### **Abstract**

Over the past decade, there has been growing interest within ethnobiology in the knowledge and practices of migrating people. Within this, scholars have given relatively less attention to displaced people and refugees: to the loss, maintenance, and adaptation of refugees' ethnobiological knowledge, and to its significance for refugees' wellbeing. This study focuses on cosmetics and remedies used to heal skin afflictions that are traditionally used by Sahrawi refugees displaced in South Western Algerian refugee camps. The research methods included a structured survey carried out with 37 refugee households, semi-structured interviews with 77 refugees, 24 retrospective interviews with refugees and other knowledgeable informants, and a voucher specimen collection of the plants and products cited. We recorded the use of 55 plant species, nine animal species, and six mineral products used within the three main use categories discussed in this paper: 1) Remedies for health issues that are typical of the desert environment where the Sahrawi once lived as nomads and now live as refugees (e.g. eye afflictions); 2) Remedies for wounds that are influenced by the Sahrawi's recent history of guerrilla warfare; and 3) Cosmetics and products used for body care, decoration and perfuming (e.g. hair care, teeth cleansing, *benna* use) and for aromatizing the air inside of tents and which are widely used in everyday life and social practices. We discuss the

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changes that have occurred in the patterns of use and procurement of these products with exile and sedentarization in refugee camps, and conclude that refugees are not simply passive recipients of national and international aid, but rather struggle to maintain and recover their traditional ethnobiological practices in exile. Finally, we suggest further research into the ethnobiological practices and knowledge of displaced populations.

**Keywords:** Ethnobiology; Ethnobotany; Medicinal Plants; Western Sahara; Sahrawi Refugees

## Introduction

Over the past decade, there has been growing interest within ethnobiology and especially ethnobotany studies in the knowledge and practices of migrating people (Pieroni, Muenz et al. 2005; Pieroni and Vandebroek 2007; Volpato, Godínez et al. 2009; Volpato, Godínez et al. 2009; Muniz de Medeiros, Taboada Soldati et al. 2012). Within this, scholars have paid relatively less attention to displaced people and refugees: to the loss, maintenance, and adaptation of refugees' ethnobiological knowledge, and to its significance for refugees' wellbeing and culture (Ramathal and Ngassapa 2001; Corlett, Dean et al. 2003; Bodeker, Neumann et al. 2005; Khan, Mukul et al. 2009). Specifically, the nomadic heritage and ethnobiological knowledge and practices of the Sahrawi people of Western Sahara have been largely overlooked in academic research over the past three decades. This is largely attributable to the effects of the Moroccan-Polisario war, which was fought over the control of Western Sahara, as well as to the overwhelming attention to the crisis situation that refugees confront, as the Sahrawi were forced to sedentarize in camps in Southwestern Algeria. With the end of military confrontations about 20 years ago, a window of opportunity for fieldwork has opened as logistical conditions have become more favourable, and some scholars have begun to carry out anthropological research among Sahrawi refugees and nomads. For example, Volpato et al. (2007, 2008) investigated refugees' use and procurement of medicinal plants, and Cozza (2010) addressed the significance of food for Sahrawi refugees' cultural identity. There is very little published on the Sahrawi's use of plants for skin healing, cosmetic and perfuming purposes. Useful information can be found in a recently published study on plant uses in Western Sahara (Barrera, Ron et al. 2007), as well as in certain historical sources from the colonial period (Guinea 1948; Gaudio 1952; Caro Baroja 1955). This paper will therefore contribute to the knowledge of Sahrawi ethnobiology, offering a case study of refugees' ethnobiological practices regarding medicinal and cosmetic products.

Humans have used vegetal, animal, and mineral products for cosmetic, perfuming, and skin care and healing for thousands of years (Manniche and Forman 1999; Morris 1999; Aftel 2002; Pieroni, Quave et al. 2004; Jung 2010). In ethnobotanical studies, few publications have addressed the

traditional use of plants for skin healing, as cosmetics, and for hygienic and perfuming purposes (Tammaro and Xepapadakis 1986; Pieroni, Quave et al. 2004; Saikia, Ryakala et al. 2006; Staub, Geck et al. 2011). Following Aburjai and Natsheh (2003), we define *cosmetic products* as substances or preparations intended to be applied to the external parts and mucosas of the human body in order to clean, perfume, or protect them, or to change their appearance. Besides products for skin healing, in this paper we include also products that the Sahrawi use for injuries such as snakebites and scorpion stings, for sensory system disorders such as eye and ear afflictions, and for afflictions of the upper part of the digestive system, namely lips, gums, teeth, and mouth. We exclusively focus on external applications, which include dressings, liniments, lotions, drops (e.g. eye drops), fumigants, plasters, and washes (e.g. mouth washes).

We present and discuss data about: (1) the use of products for skin afflictions and healing; (2) the use of products for cosmetic, aromatizing, and perfuming purposes; and (3) the origin and procurement of these products in a refugee context.

## **Background**

'Sahrawi', literally 'people from the desert', is the name given to nomadic and pastoral tribes that traditionally inhabited a coastal area of Northwestern Africa that includes Western Sahara, Northern Mauritania, and part of southwestern Algeria. The Sahrawi people were essentially nomadic, raising camels, goats, and sheep in the rocky and sandy low-lying plains of Western Sahara, and relying on camel milk and meat, and traded their livestock for dates, sugar, cereals and legumes in markets on the periphery of their nomadic areas (Caro Baroja 1955; Caratini 1989a,b). In 1975, after fifty years of Spanish colonial rule and following Morocco's occupation of Western Sahara, about 70,000 Sahrawi had to flee the Moroccan army, and in the process became refugees (Loewenberg 2005; San Martin 2010). After sixteen years of war (1975-1991) between Morocco and the Polisario Front, Morocco constructed and militarily defended a wall that cuts across Western Sahara in a North-South direction, excluding the nomads and the refugees from the majority of their Western Saharan territory. Nowadays, some 165,000 Sahrawi live in four refugee camps located on a desert plateau called Hamada, near the Algerian city of Tindouf (Figure 3.1).

In the camps, refugees live in canvas tents and mud brick huts, experiencing severe problems with water and food supplies, where car batteries are their main source of electricity. The European Union, certain bilateral development arrangements, UN agencies, and several solidarity groups provide food, shelter, and other basic commodities for the refugees (Loewenberg 2005). Over the years, in the search to improve the quality of life in the camps, refugees have developed an informal economy that includes marketing of many products (from clothes to personal hygiene products and food items that supplement the diet provided by humanitarian assistance), expanding camp trading routes with Senegal, Mali, Mauritania, Algeria, and Spain, where the majority of the Sahrawi diaspora reside (Bhatia 2001; Crivello, Fiddian et al. 2006;

San Martin 2010). In the process, they have also reactivated both social and market networks for procuring traditional ethnobiological products (Volpato, Ahmadi Emhamed et al. 2007).

Aside from its control over the camps, the Sahrawi's political representative, the Polisario Front, also has political control over the eastern part of the Western Sahara, which was recovered from Morocco through guerrilla warfare that ended only with the peace agreement of 1991 (Bhatia 2001). These inland areas of Western Sahara are the so-called 'liberated territories' (approximately 20 per cent of the Western Sahara), while the remaining 'occupied territories' remain under the administrative control of the Moroccan government. Within the liberated territories, pastoral areas continue to be very important to the refugees as they attempt to maintain or recover their traditional livelihoods and cultural and social practices, e.g. from livestock husbandry to medicinal plant use (Volpato, Ahmadi Emhamed et al. 2007; Broglia and Volpato 2008).



Figure 3.1 Sahrawi refugee camp (G. Volpato)

### **Methodology**

Research on medicinal products used for skin healing was carried out in Sahrawi refugee camps between 2003 and 2007 (Fieldwork A), and research on cosmetics and perfuming products was conducted over a two-month period between March and April 2008 (Fieldwork B). The research methods for the ethnobiological analysis included semi-structured and retrospective interviews with refugees and informants regarded as especially knowledgeable, a 'walk in the woods' approach conducted with these knowledgeable informants, and a voucher specimen collection of the plants and products cited (Martin 1995; Weller 1998; Cunningham 2001). The semi-structured interviews collected data concerning: products used for cosmetic and perfuming purposes (i.e. to prepare perfumes and to aromatize the environment, to wash hair, skin, and clothes) and for skin afflictions; parts used; names in Hassaniya (the Berber-



influenced Arabic language spoken by the Sahrawi); type of preparation and use; purpose of use; place of procurement; and the ecological status of the plants and animals used (if wild or cultivated/domesticated). The retrospective interviews were conducted with older informants and were aimed at understanding these products' patterns of use in pre-war nomadic livelihoods.

Regarding Fieldwork A, a survey of 37 refugee households was administered to the person in the household more knowledgeable about skin healing and medicinal remedies (mean age of 56 ranging from 26 to 84; thirty-three of them being women and four men), and 45 semi-structured interviews and 16 retrospective interviews were conducted with refugees about the use and procurement of traditional medicinal remedies. Regarding Fieldwork B, semi-structured interviews were conducted with 32 informants in the refugee camps (Aaiun, 27 de Febrero, and Smara), and retrospective interviews were conducted with six informants; respondents had a mean age of 58 (ranging from 34 to 82), and all were women, as they are the holders of knowledge of cosmetics in refugee households (Kourková 2008).

In both field studies, interviews were conducted in Hassaniya, recorded, and translated into Spanish by local research assistants (the first author is fluent in Spanish, which is the Sahrawi's second language, spoken since the time that the Western Sahara came under Spanish colonial control). In each case, prior informed consent was obtained verbally before the interview was conducted and before a camera or voice recorder was used. The study aims, methods, and outputs were explained. Throughout both field studies, the ethical guidelines adopted by the American Anthropological Association (AAA 1998) and by the International Society of Ethnobiology (International Society of Ethnobiology 2006) were followed, and specific methodological and ethical advice for research with refugees was taken into consideration (Jacobsen and Landau 2003).

Botanical species cited by informants were photographed and collected, and the first author identified the species. Cultivated species (e.g. *Lawsonia inermis*) were not collected. Some species could not be found in the field and so were identified through photographs (e.g. *Convolvulus trautmanianus*, *Neurada procumbens*). Animal and mineral products were photographed but not collected. Plant specimens were collected in the liberated territories and in the refugee camp areas, while dried specimens of the products cited during the interviews were obtained either by purchasing them in refugee camp shops or in Tindouf, or samples were donated by the interviewees. For some plants, identification was based on dried specimens and/or photos, so that identification was possible only at the genus level. For those plants that were only available as dried specimens so that species determination was not possible, informants were asked for local name as well as morphology and ecological characteristics of the plant, and these were then compared with literature (Boulos 1983; Ozenda 1991; Lebrun 1998) in order to identify a range of possible species. Photographs of these possible species were later shown to informants in order to identify the correct species (or at least their botanical genus). The identification of plant species through artifacts such

as herbarium specimens, drawings, and photos has been recently addressed by Thomas et al. (Thomas, Vandebroek et al. 2008), who found that species identification by means of photographs was highly reliable. Plant nomenclature follows the Sahara and Western Sahara botanical standard treatises for Saharan species (Ozenda 1991; Lebrun 1998), and the International Plant Name Index (www.ipni.org) for all other species. Botanical names are written in full with author(s) and family name only in Table 3.1. Voucher specimens are currently available at the first author's home address; they will be deposited in the National Herbarium of The Netherlands (Wageningen Branch – Herbarium Vadense) in February 2013.

Table 3.1 Vegetal species used by Sahrawi refugees as cosmetics and for skin healing

Species (voucher number)	Family	Name of the plant in Hassaniya	Part used / Name of the part in Hassaniya	Preparation and Means of Use*	Use	Means of procurement**	Place of procurement***
<i>Acacia ehrenbergiana</i> Hayne (1015)	Fabaceae	tamat	leaves	dried and powdered	antiseptic for wounds	C	badiya
<i>Acacia tortilis</i> (Forsk.) Hayne subsp. <i>raddiana</i> (Savi) Brenan var. <i>raddiana</i> (1010)	Fabaceae	talha	resin: el elk tamat	trituated, topical application to eyes	eye infections and conjunctivitis	C	badiya
			leaves; seeds; shumban	trituated	antiseptic for infected wounds	C	badiya
<i>Allium cepa</i> L.	Alliaceae	besla	resin: el elk talha	dried or roasted, trituated, topical application of a plaster obtained by mixing it with water, or alone in powder; a bandage is made and renewed for three days ('because el elk is each day absorbed in the wound and disappears')	snakebites, eye infection, to remove dirt from eyes, wound cicatrizer, abscesses (el elk forces the abscess toward the centre and favours its maturation)	C / P	badiya, Tindouf market, refugee camp shops
			bark: dibag	trituated	wound cicatrizer	C	badiya
			bulb	trituated	antiseptic for wounds	P	Tindouf market, refugee camp shops
<i>Allium sativum</i> L.	Alliaceae	thoum	bulb	trituated	antiseptic for wounds	P	Tindouf market, refugee camp shops

Table 3.1 (cont.) Vegetal species used by Sahrawi refugees as cosmetics and for skin healing

Species (voucher number)	Family	Name of the plant in Hassaniya	Part used / Name of the part in Hassaniya	Preparation and Means of Use*	Use	Means of procurement**	Place of procurement***
<i>Ammodaucus leucotrichus</i> Coss. et Dur. (1033)	Apiaceae	kammuna, kammuna t-rag	seeds	trituated, a plaster is made with water or fat, or applied as powder	snakebites, scorpion stings, infected boils (furun-des), to pre-vent infections in wounds (against <i>rtaarf</i> )	C / P	badiya, Tindouf market
<i>Anastatica hierochuntica</i> L. (1027)	Brassicaceae	kamsha	aerial parts	dried, triturat-ed, boiled in water, topical application when cooled down / dried, triturated and mixed with water to form a plaster	to treat vitiligo and other white spots on the skin / mycotic skin infections, particularly on hands and nails	C	badiya
<i>Argania spinosa</i> (L.) Sikeels	Sapotaceae	argan	seeds: bulez	oil obtained from the seeds applied as a cream	against aging and to hair to strengthen it	P	Morocco, Algeria (Bechar)
<i>Atriplex halimus</i> L. (1052)	Chenopodiaceae	legtaf	leaves, aerial parts	decoction, hair washes / decoction, applied as a plaster	the decoction gives a reddish tint used like <i>henna</i> for feet and hands / skin oedemas	C	badiya
<i>Balanites aegyptiaca</i> (L.) Del. (1086)	Balanitaceae	teicht	fruit: tug	roasted, peeled, an oily substance is extracted and applied to skin / the ashes obtained from burning the fruit are mixed with oil and applied topically / mouth washes with the infusion of fruit peels and leaves	to eliminate spots from the skin / mycosis / mouth infections	C	badiya
<i>Beta patellaris</i> Moq. (1075)	Chenopodiaceae	silk	seeds: habba silk	fried in oil, topical application in ears	otitis in children	C	badiya
<i>Calotropis procera</i> (Ait.) Ait. f. subsp. <i>procera</i>	Asclepiadaceae	tursha	stems	ashes from burning the stem	anti-septic and cicatrises for wounds	C	badiya, refugee camp area
<i>Cassia italica</i> (Mill.) Spreng. (1020)	Fabaceae	leaves	leaves	powdered, mixed with henna, application to hair	to make the colour of henna darker	C	badiya, refugee camp area
		seeds	seeds	powdered, application to eyes	cataracts	P	Tindouf market

Table 3.1 (cont.) Vegetal species used by Sahrawi refugees as cosmetics and for skin healing

Species (voucher number)	Family	Name of the plant in Hassaniya	Part used/ Name of the part in Hassaniya	Preparation and Means of Use*	Use	Means of procurement**	Place of procurement***
<i>Cayusea hexagyna</i> (Forsk.) M.L. Green (1031, 2068)	Resedaceae	dhenban	aerial parts	fresh, pounded, the juice extracted is mixed with oil or fat and applied topically to hair	washes to perfume hair and to treat lice, and a dressing with a cloth is made and left in place for 24 hours for hair loss and to stimulate hair growth	C	badiya
<i>Centaurea pungens</i> Pomel (1079)	Asteraceae	zreiga	leaves	tritured, application with oil	abscesses	C	badiya, Moroccan occupied territories
<i>Chamomilla pubescens</i> (Desf.) Alavi (1090)	Asteraceae	lerbien, uazuaza	flowering tops	pounded, application to aching tooth	toothache	C	badiya
<i>Cleome africana</i> Botsch. (1026)	Capparidaceae	lemkheinza, mkheinza	leaves	fresh leaves are cooked in camel hump fat and the resulting poultice is applied topically / tritured, a poultice of the fresh leaves is applied topically	wounds / toothache	C/P	badiya, Tindouf market
<i>Commiphora africana</i> (A. Rich.) Engl. (1017)	Burseraceae	dirs	stems, resin: umm nass	resin is tritured and applied topically / burnt in the tent	stems are used to clean teeth / as anti-septic for wounds and for skin infections / for perfuming and against evil eye	P	Tindouf market, Mauritanian markets and traders
<i>Convolvulus trabutianus</i> Schweinf. et Muschl.	Convolvulaceae	gandul	aerial parts	decoction	to apply to burns in order to avoid being left with a scar	C	badiya
<i>Corriola telephifolia</i> Pourret (1089)	Caryophyllaceae	taseghinit	roots	dried and tritured / soaked in colonia	burnt in the fire in the tent to perfume the air / to prepare perfumes	P	Tindouf market, Moroccan occupied territories (El-Aaiun market)
<i>Cuminum cyminum</i> L. (1073)	Apiaceae	kammuna	seeds	tritured	infected wounds, skin infections	P	Tindouf market

Table 3.1 (cont.) Vegetal species used by Sahrawi refugees as cosmetics and for skin healing

Species (voucher number)	Family	Name of the plant in Hassaniya	Part used / Name of the part in Hassaniya	Preparation and Means of Use*	Use	Means of procurement**	Place of procurement***
<i>Cymbopogon schoenanthus</i> (L.) Spreng. (1087)	Poaceae	idkhir, liedjir	aerial parts	dried aerial parts are burnt, triturated, and applied	burns	C	badiya
<i>Cyperus rotundus</i> L. (1040)	Cyperaceae	sad	tubercles; tara, tharoub	dried and triturated	burnt in the fire in the tent to perfume the air; mixed with colonia water to make perfumes for hair and skin, and to perfume the traditional women dress ( <i>melha</i> )	C / P	badiya, Tindouf market, refugee camp shops, Mauritanian traders
<i>Euphorbia calyptrata</i> Coss. et Dur. var. <i>invalucrata</i> Batt. (1080, 2035)	Euphorbiaceae	rammadah	aerial parts	dried and triturated	skin infections and oedemas	C	badiya
<i>Euphorbia granulata</i> Forsk. (1055)	Euphorbiaceae	kbidet ed-dab	latex	topical application	snakebites	C	badiya
<i>Euphorbia officinarum</i> L. subsp. <i>echinus</i> Hook.f. & Coss. (1001)	Euphorbiaceae	daghmus, sharbout (when dry)	branches, inner part	a green branch is heated on the fire, cut open, and the inner part is applied topically	boils, abscesses, skin infections, toothache	C	badiya
<i>Fenula asa-foetida</i> L.	Apiaceae	antita	resin: antita	decoction, mouthwashes, or triturated and topical application / triturated in water and applied externally	toothache, protective of teeth / snakebites, to strengthen hair, to combat hair loss	P	Tindouf market
<i>Fenula communis</i> L.	Apiaceae	fasukh	resin	dried and triturated	burnt in the fire in the tent to perfume the air; mixed with water or colonia to perfume hair and to prepare creams for skin	P	Tindouf market, Mauritanian markets, The Middle East
<i>Hammada scoparia</i> (Pomel) Ijlin. (1009, 1021)	Chenopodiaceae	remth	leaves	made into a poultice, mixed with water and inserted in the bite to 'absorb' the poison / triturated, infusion, washes / mouthwashes with the decoction	snakebites; scorpion stings / to wash hair and to combat dandruff; mixed with henna and oil and applied as a lotion to hair / 'pulsant' toothache, stomatitis, mouth infections	C	badiya

Table 3.1 (cont.) Vegetal species used by Sahrawi refugees as cosmetics and for skin healing

Species (voucher number)	Family	Name of the plant in Hassaniya	Part used / Name of the part in Hassaniya	Preparation and Means of Use*	Use	Means of procurement**	Place of procurement***
<i>Heliotropium ramosissimum</i> (Lehm.) DC. (2053)	Boraginaceae	leh-baliya	leaves	trituated / triturated leaves are mixed with oil to make a lotion applied to hair	burns, toothache, <i>ntaaf</i> / to make hair more shiny	C	badiya
<i>Launea arborescens</i> (Batt.) Maire (1071)	Asteraceae	umm lbena	latex	topical application	to eliminate warts	C	badiya
<i>Lawsonia inermis</i> L.	Lythraceae	henna	leaves	dried, triturated, mixed with warm water and applied	to dye hair, skin, and nails and perfume hair	P	Tindouf market, Mauritanian markets, refugee camp shops
<i>Lepidium sativum</i> L. (1060)	Brassicaceae	reshad	stem: mesuak seeds: habber er shed, afataash	chewed and used as toothbrush topical application to eyes	to clean teeth to eliminate dirt from eyes	P	Tindouf market, Mauritanian markets, refugee camp shops
Lichen****		tenquilit	aerial parts: ergheta	dried and triturated	added to mixtures to put in the fire and perfume hair / mixed with colonia and other plants to make perfumes	P	Tindouf market, Mauritanian traders, Moroccan occupied territories (El-Aaiun market)
<i>Lycium intricatum</i> Boiss. (1085)	Solanaceae	ghardeq	leaves	decoction is made twice, left to cool for one day and then applied in drops	cataracts and eye inflammations	C	badiya
<i>Maerua crassifolia</i> Forsk. (1007, 1048)	Capparidaceae	atli	stem: mesuak leaves: sadra el hadra	chewed and used as toothbrush burnt, ashes are applied as powder or mixed with water in a poultice	to clean and strengthen teeth cicatriser, antiseptic for wounds, boils, <i>ntaaf</i> , itching	C	badiya
<i>Mesembryanthemum cryptanthum</i> Hook. f. in Hook.	Aizoaceae	afzu	aerial parts	green aerial parts are pounded and mixed with water	used as soap for washing	C	badiya



Table 3.1 (cont.) Vegetal species used by Sahrawi refugees as cosmetics and for skin healing

Species (voucher number)	Family	Name of the plant in Hassaniya	Part used / Name of the part in Hassaniya	Preparation and Means of Use*	Use	Means of procurement**	Place of procurement***
<i>Neurada procumbens</i> L.	Rosaceae	saadan	leaves	dried, triturated, mixed with water, hair washes	to stimulate hair growth	C	badiya
<i>Nucularia perinii</i> Batt. (1047, 2042)	Chenopodiaceae	askaf	leaves	fresh leaves are smashed and mixed with water to form a poultice	skin infections and wounds	C	badiya
<i>Pancreatium trianthem</i> Herb.	Amaryllidaceae	amajij	flowers	as they are	women use the flowers for perfuming and adorning	C	badiya
<i>Panicum turgidum</i> Forssk. (1051)	Poaceae	mrokba, umm rekba	aerial parts	dried, triturated, a poultice is made with water	wound cicatrizer, applied in the ear to kill insects that entered there	C	badiya
<i>Peganum harmala</i> L. (1066)	Zygophyllaceae	harmel	roots	pounded, mixed with milk cream and applied topically for two days	head wounds, bone fractures	C	badiya
<i>Pergularia tomentosa</i> L.	Asclepiadaceae	ghalqa, umm el-jiud	seeds	triturated and fried	to eliminate quists	P	Tindouf market
			leaves	dried, triturated and mixed with water	snakebites, scorpion stings, boils	C	badiya, refugee camp area
			latex	applied topically on a bandage	to eliminate warts and skin grains	C	badiya, refugee camp area
<i>Pistacia</i> spp.	Anacardiaceae	tidikt	resin	dried	added to colonia to prepare perfumes; burnt in the fire in the tent to perfume the air	P	Tindouf market, refugee camp shops, Mauritanian markets
<i>Rhus triparitita</i> (Ucria) Grande (1023, 1064)	Anacardiaceae	shdari	leaves, bark: dbag	dried and triturated, mixed with henna and water	to dye hair with a different tone from <i>henna</i>	C	badiya
<i>Rosa damascena</i> Miller	Rosaceae	ward	petals	dried	added to perfumed waters	P	Tindouf market
<i>Salsola imbricata</i> Forssk. (1054)	Chenopodiaceae	ghasal ('the washer')	aerial parts	crushed in the hands	used as soap to wash	C	badiya
<i>Salsola tetrandra</i> Forssk. (2020)	Chenopodiaceae	laarad	aerial parts	ashed and powdered	wounds, skin infections	C	badiya

Table 3.1 (cont.) Vegetal species used by Sahrawi refugees as cosmetics and for skin healing

Species (voucher number)	Family	Name of the plant in Hassaniya	Part used / Name of the part in Hassaniya	Preparation and Means of Use*	Use	Means of procurement**	Place of procurement***
<i>Salvadora persica</i> L. var. <i>persica</i> (1070)	Salvadoraceae	lerak	stem: mesuak	chewed and used as toothbrush	to clean teeth	P	Mauritanian markets and traders
<i>Salvia aegyptiaca</i> L. (1049)	Lamiaceae	tezouknit	fruits: afatash ('the one that looks for something')	applied to eye	cataracts ('it prevents cataracts from growing'), glaucoma, to clean eyes from sand and dirt	C	badiya
<i>Santalum</i> spp.	Santalaceae	oud legmari	wood	cut or grated in small pieces	burnt in the fire in the tent to perfume the air, mixed with colonia to make perfumes	P	Libya, Egypt, Saudi Arabia
<i>Syzigium aromaticum</i> (L.) Merr. & L.M. Perry	Myrtaceae	qronfel	flower buds	dried and triturated	mixed with colonia to make perfumes for hair, creams for skin, and to perfume melhfás (melhfás are soaked in water with cloves during some days); a decoction of cloves is filtered and applied to hair to strengthen and perfume it, and to treat lice	P	Tindouf market, refugee camp shops
<i>Tamarix</i> sp. (1059)	Tamaricaceae	ar'ar	leaves	trituated, infusion or maceration in water, applied with a cloth	burns, sunstroke, especially in children	P	Tindouf markets, other Algerian markets (Algiers)

Table 3.1 (cont.) Vegetal species used by Sahrawi refugees as cosmetics and for skin healing

Species (voucher number)	Family	Name of the plant in Hassaniya	Part used / Name of the part in Hassaniya	Preparation and Means of Use*	Use	Means of procurement**	Place of procurement***
<i>Teucrium chardonianum</i> Maire et Wilceck	Lamiaceae	shendgoura	flowering tops	dried and triturated	burnt in the fire in the tent to perfume the air, mixed with water and applied to hair to perfume it and stimulate hair growth	C / P	Moroccan occupied territories
<i>Ziziphus lotus</i> (L.) Desf. subsp. <i>saharae</i> (Batt.) Maire (1002)	Rhamnaceae	sdir	root bark	decoction	snakebites, poison antidote	C	badiya
<i>Zygophyllum gaeletium</i> Emberger et Maire (1050)	Zygophyllaceae	aggaya, el barraya ('the healer')	leaves	dried, triturated, heated on the fire, a plaster is made with water and applied in frictions	varices, snakebites, scorpion stings, and all skin infections	C	badiya, refugee camp area

\* Means of use is topical application unless otherwise stated  
\*\* C = collection; P = purchase  
\*\*\* *Badiya* is the term used by Sahrawi refugees to indicate the accessible part of their former nomadic areas. Here it includes the part of Western Sahara under Polisario control, North of Mauritania, and Southwest Algeria; Refugee camp area stands for the area in and around the refugee camps  
\*\*\*\* This lichen is known to informants only in its dried and triturated form; as a consequence, we were not able to identify it even at genus level

**Table 3.2 Cosmetics and products for skin healing of animal origin used by Sahrawi refugees**

Ingredient	Hassaniya name	Preparation and means of use	Use	Provenience of the product
Ambergris (from <i>Physeter macrocephalus</i> L.)	enebra	sun dried, triturated, topical application	snakebites	Tindouf market, markets of coastal Western Sahara
Camel ( <i>Camelus dromedarius</i> L.) hump fat	ludek	heated and inserted in ears in drops and with cotton / heated, external application	otitis, earache / open wounds	refugee camps, badiya
<i>Cephalopina titillator</i> Clark (Oeastridae) - parasitic larva of camels' nostrils and upper respiratory airways	duda	larvae are squeezed into ears	strong earache in infants	refugee camps, badiya
<i>Chamaeleo</i> spp. (Chamaeleonidae) skin	buya	the dried skin is macerated in water and then applied topically for three days	boils, wounds, <i>ntiaff</i> , anti-venoms, toothache	Tindouf market, Mauritania
<i>Chamaeleo</i> spp. (Chamaeleonidae) egg	beid el buya	dried with salt or cooked, topical application	antidote for snakebites, to treat boils and skin abscesses	Tindouf market, Mauritania
Fennec ( <i>Vulpes zerda</i> Zimmermann) bone	zib	boiled, triturated, topical application	herpes, measles	badiya
Goat ( <i>Capra aegagrus hircus</i> L.) milk's cream	zibde	heated and inserted as drops in ears or nose; or heated with barley, mixed with cooked dates and kept in a young goat's leather (called <i>agreyia</i> ); this product is known as <i>dhen</i>	otitis, earache; nosebleeds	refugee camps, badiya
Ostrich ( <i>Struthio camelus</i> L.) egg*	naama	the shell is finely triturated and applied to eye / triturated to powder and sniffed	to eliminate 'the white spot' from eye (pinguecula) / nose bleeding	badiya
<i>Pimelia angulata</i> Fabricius (Tenebrionidae) - darkling beetle	anfusa	smashed, boiled in a small amount of water, topical application of drops	earache in infants	refugee camps, badiya
Urine		topical application	wound disinfectant**	
<i>Uromastix acanthinura</i> Bell (Agamidae) skin	dab	the dried skin is macerated in water and then applied topically for three days	boils, skin infections***	badiya
<i>Uromastix acanthinura</i> Bell (Agamidae) - kidneys, described as yellow fatty tissues	dab	boiled in water and inserted as eardrops	otitis and earache in infants and children	badiya
*species no longer present in the area **abandoned use ***used in substitution of less readily available chameleon				

## Results and Discussion

The plant species used by the Sahrawi refugees for perfuming, cosmetic and skin-healing purposes are reported in Table 3.1 in alphabetical order according to botanical name. For each species identified, data reported include: botanical name, botanical family, voucher number, plant name in Hassaniya, part(s) used and name(s) of these parts in Hassaniya (if any), traditional preparation and means of use, and origin of the plants and/or products used (i.e. where informants harvested, bought or otherwise obtained the plant or plant part). A total of 55 species were reported. The species belong to 32 botanical families, where Chenopodiaceae (six species), and Apiaceae, Asteraceae, Euphorbiaceae, and Fabaceae (three species each) were the most representative families. The parts used are presented in Figure 3.2: aerial parts (leaves and non-woody stems) represent almost 40% of the total, followed by seeds (12%), woody stems and branches (12%), underground organs such as roots, bulbs, and tubercles (8.9%), and resins (8.5%). Nearly all of the products are dried before use or are purchased already dried: dry material accounts for 90% of the uses and in only 10% of the cases do the Sahrawi use fresh products. Fresh products are mostly obtained from readily available plants (either harvested from the local environment or purchased in the market) such as the aerial parts of *Caylusea hexagyna*, *Cleome africana*, and *Nucularia perrinii*. About 70% of the products are also triturated using a small mortar before use.

Regarding plant uses, about half refer to treatments for skin afflictions of various kinds (e.g. wounds, burns, and warts), snakebites and scorpion stings, and toothache and mouth afflictions. More than 40% of the total plant uses for skin afflictions are for the treatment of wounds (e.g. cicatrizers, antiseptic). Another 11% are used for eye and ear afflictions. Cosmetic uses account for about 20%, and aromatizing and perfuming uses for another 16%. About 35% of the total cosmetic and perfuming uses are for hair care. Two plants (3% of the uses) are used as soaps. Several plants have multiple uses and are used in both categories (e.g. *Lawsonia inermis*, *Hammada scoparia*), and could thus be categorized as *cosmeceuticals* (Pieroni, Quave et al. 2004; Kilgman 2005).

Cosmetic and skin healing products of animal and mineral origin are presented in tables 3.2 and 3.3 respectively. For each product the following data are reported: name in Hassaniya, preparation and means of use, purpose of use, and provenience. There are twelve products of animal origin (from nine animal species) and six of mineral origin, and all are used in topical applications. While animal-based products are mainly used for therapeutic purposes (e.g. wounds), mineral-based products are also important as cosmetics, particularly the widely used red hematite and galena.

The specific uses reported in the tables and outlined above reflect: 1) the more common health issues specific to the desert environment in which Sahrawi live (e.g. eye afflictions, snakebites); 2) the specific health issues that are characteristic of nomadic life and the recent history of guerrilla warfare (e.g. wounds); and 3) the specific cultural preferences and practices of the Sahrawi in terms of cosmetics and products used for body care, decoration and perfuming (e.g. hair care, teeth cleansing, *henna* use) and for aromatizing air inside their tents. Below, these main use categories are discussed, and then

the origin of these products and the means by which Sahrawi refugees procure them are addressed.

### *Eye and ear afflictions and snakebites*

Like other populations living in desertic environments (Urbach 2001), the Sahrawi protected themselves from sun, sand and wind through loose body wraps and by covering their faces and heads with a veil or turban. In addition, women, especially but not exclusively, painted their eyelids with products that have both protective and sunscreen functions. Nonetheless, eye afflictions have always been one of the most common health problems encountered by the Sahrawi both as nomads (Brisson 1789:204) and today as refugees. For serious eye afflictions such as cataracts and glaucoma, the Sahrawi resorted to specialized healers, usually older women. These healers still practice in the refugee camps and use special treatments that at times consist of complex mixtures. For example, one healer reported using a mixture made with *Acacia* leaves, seeds of *Trigonella foenum-graecum* (one cooked and one raw), and a 'bone of the *talha*' (i.e. a bone left under an *Acacia* tree after a meal was consumed; the bone is burnt and triturated). This mixture is powdered, mixed with the blood of a spiny-tailed lizard or a young goat, and applied to eyes to treat cataracts ('eyes progressively become white,' an illness called *auar*). The patient is then advised to stay in a fresh and quiet place and to repeat the treatment for 40 consecutive nights.

Aside from such complex treatments, there are also common remedies found in the pharmacopoeia of Sahrawi families, the most well known being the fruit of *Salvia aegyptiaca*. This tiny fruit, called 'afatash' (which means 'the one who searches' because of its medicinal use) is applied to the eyes at night before sleeping, so it can 'clean' the eyes from sand and other unsanitary material. Scientific literature shows that it creates a mucilaginous coating and has the capacity to agglutinate these residues to its surface (Alfayate, Barrera et al. 2008; Volpato 2008). Some refugees report the same medicinal use for the seeds of *Lepidium sativum*, which are then also called *afatash*.

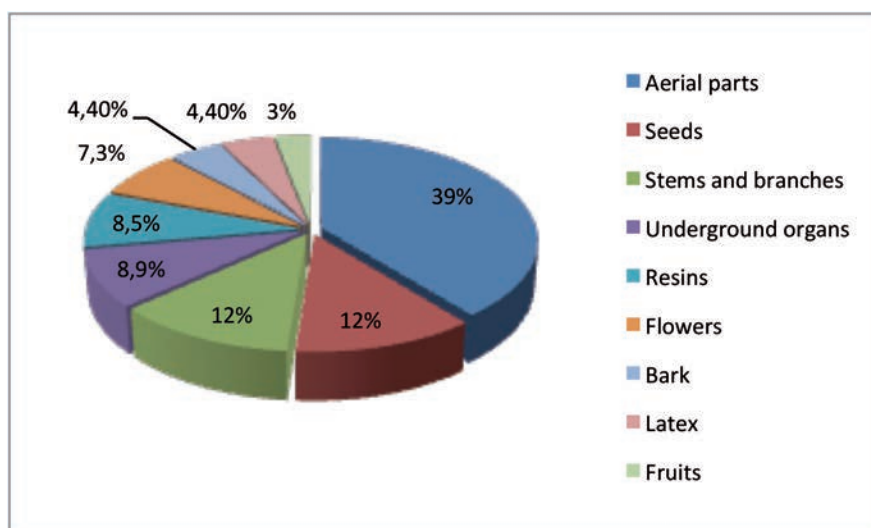
In addition, the Sahrawi widely use certain products of mineral origin to maintain or restore eye health. These are ground with a thin pointed iron and applied as eye cosmetics. Especially hematite and galena are used for these purposes, just as they have been used for millennia by the populations of North Africa and the Middle East as eye cosmetics and to treat eye diseases (Lev 2010). The use of red hematite (*hemera*, lit. 'the red one', Figure 3.3) to reduce the effect of solar radiation on the eyes and to treat cataracts and conjunctivitis deserves some notice, both because refugees commonly use it and because, according to informants, there are two types. The type that is regarded as most potent is red hematite that is believed to come from meteorites. Allegedly, these meteorites are collected in the desert, and distinguished from rocks of earth origin by their structure, relative weight, and spatial distribution that results from the fall from space.

Galena (*kehla* or *kohl*, lit. black) is mixed with fat to paint women's eyes. It is applied cosmetically mostly by older women, but older men may apply it as well, especially tribal *sheiqs* and notables, as a sign of social standing. *Kehla*



**Table 3.3 Mineral and vegetal derived cosmetics and products for skin healing used by Sahrawi refugees**

Ingredient	Hassaniya name	Preparation and means of use	Use	Provenience of the product
Charcoal		embers from an underground fire are cooled and applied externally	open wounds	refugee camps, badiya
Galena – Lead(II) sulphide (PbS)	kehla, kohl	scraped, topical application around eyes	cosmetic, to clean dirt from eyes, improve vision, treat glaucoma and cataracts	badiya
Potassium alum	shabba	put in a spoon on the fire until it becomes powdered, then mixed with water and applied topically around eyes / applied to a wound, kept in place with a cloth	to remove sand and dirt from eyes / wound cicatrizer and antiseptic (the pain concentrates toward one point until it disappears), snakebites and scorpion stings	badiya, Tindouf market
Red hematite, red ochre – Iron(III) oxide (Fe <sub>2</sub> O <sub>3</sub> )	hemera	scraped, topical application	around eyes to reduce solar radiation into eyes, to treat cataracts and conjunctivitis / on abscesses (all around the abscess) to stimulate them to mature, bone fractures (put at the junction of the break) and wounds	badiya
Red hematite	hemera tahia	same as above	same as above, but with enhanced power	badiya (but believed to come from meteorites)
Tar (of vegetal origin or bitumen)	gatran	applied on the face on the 27 <sup>th</sup> of February	to darken face colour and scare the demons	refugee camps



**Figure 3.2 Plant parts used by Sahrawi refugees for perfuming, cosmetic and skin healing purposes**

has been widely used by North African women for at least the past two to three thousand years; the practice of darkening the eyelids with galena is today encountered throughout Arabic countries and the Middle East for cosmetic, cosmeceutical and medicinal purposes, in spite of the fact that it may constitute a health hazard due to *kebla*'s lead content (Bellakhdar 1997; Hardy, Vaishnav et al. 1998; Lekouch, Sedki et al. 2001). *Hemera* and *kebla* may also be mixed with triturated *Acacia* resin to obtain a mixture known as *acaz*, which is grated, filtered, and applied to the eyelids (or to their inner side) to improve vision.

Earache and otitis are other chronic health problems caused by the harsh desert environment, especially in infants and children. Infant earache is described as a pain or itching in the inner ear and adults detect it when infants cry and continuously scratch their ears. Refugees report the use of one vegetal product – the seeds of *Beta patellaris*, which are fried and applied topically – and of five animal-derived products to treat earache and otitis. Among the latter, fatty or fat-like substances are preferred; these include camel hump fat, goat milk cream, a yellowish substance found in the internal organs of *Uromastix acanthinura* (perhaps the kidneys), the larvae of *Cephalopina titillator* (a parasitic fly inhabiting camels' nostrils and upper respiratory system), and the darkling beetle *Pimelia angulata*.

Scorpions (i.e. *Androctonus australis* L.) and vipers (i.e. *Cerastes* spp.) are fairly common in the Western Sahara desert. A common snakebite treatment among the Sahrawi consists of making a series of cuts on the limb directly above the bite in order to draw out blood containing the venom before it enters into the circulatory system. In addition, animal and vegetal products (e.g. the latex of *Euphorbia granulata*, the aerial parts of *Hammada scoparia*, the root bark of *Ziziphus lotus*, chameleon eggs, and ambergris), all believed to 'absorb the venom' and halt its effects, are applied topically to the bite or sting site. Sahrawi uses of *Ammodaucus leucotrichus*, *Hammada scoparia*, and *Zygophyllum gaetulum* to treat snakebites and scorpion stings are not reported by Hutt and Houghton (1998) and by Houghton and Osibogun (1993) in their reviews and may deserve further attention.

## Wounds

Considering the high number of reports of antiseptic and cicatrizing treatments for wounds, it seems that they have been common among the Sahrawi. Besides everyday accidents (e.g. from *Acacia* spines, iron tool use, etc.), this may be related to the fact that Sahrawi nomads traditionally engaged in raids to procure camels. Inter-tribal wars to gain access to pasture areas and caravan routes were not infrequent, and the recent guerrilla war against the Moroccan Army implied a high number of wounds and injuries, and a consequently high number of treatments and treatment episodes. Both historical sources and Polisario soldiers' memories of the war confirm this. Among Sahrawi nomads there were healers known as *tebib* who were called upon for life-threatening conditions; *tebib* who were specialized in treating fractures and wounds usually accompanied raiding and warring parties and would then take a share of the booty (Caro Baroja 1955). Sahrawi combatants in the Morocco-Polisario war continued the tradition using locally available resources to treat wounds in



Figure 3.3 Hemera (P. Kourková)



Figure 3.4 Dried chameleon skin, el buya (P. Kourková)

the battlefield, stressing the value of this knowledge and these practices in emergency situations.

The most widely reported products used to treat wounds are the resin of *Acacia tortilis* (*el elk*) and red hematite, which are also used in combination. *El elk* is collected during the hottest months from the trunks of *A. tortilis*; it is then dried and used for a variety of food and medicinal purposes (Guinea 1948; Barrera, Ron et al. 2007; Volpato 2008). The use of gum collected from *Acacia* species in topical application to treat skin infections and burns is reported among other African populations as well as in India (Saikia, Ryakala et al. 2006). Other vegetal products used as cicatrizers and antiseptics include resins from other species (e.g. *Commiphora africana*), tannin-rich bark and leaves of *Acacia* species and *Maerua crassifolia*, ashes obtained from *Calotropis procera* and *Salsola tetrandra* (Moors apply a poultice of ashes and water to treat itching and skin eruptions) (Leriche 1953), fresh leaves of *Cleome africana* and *Nucularia perrinii*, and the inner stems of *Euphorbia officinarum*, which is regarded as a panacea. Among animal-derived products, fat obtained from a camel's hump is applied to open wounds, as is dried chameleon skin (Figure 3.4), or spiny-tailed lizard skin is used in substitution. Goat milk cream is mixed with the pounded roots of *Panicum turgidum* and applied topically to treat deep wounds and fractures. These latter and other products (e.g. the triturated seeds of *Ammodaucus leucotrichus*, or a mixture composed of barley, garlic, and onion, and called *tekelkuli*) are further used to treat *ntaaf*, which is described as an infected wound that can provoke fever, or as 'a recurrence [of a wound or a sore] caused by a perfume' (Monteil 1952:35).

### **Cosmetic, aromatizing, and perfuming products**

In Sahrawi culture, the importance of cosmetics and perfuming products has been reported historically in ethnographic studies on Western Saharan nomadic tribes. Gaudio (1952:61) writes that 'women like very much to perfume themselves with special essences and herbs coming from Mauritania, and often they dye their hair, eyes, hands and feet with mineral and vegetal substances,' and Caro Baroja (1955:278) reports the use of plants to perfume the bodies of the dead before burial. Among many populations, cleansing and perfuming plants are important in ritual ceremonies such as weddings and funerals (Widjaja 1988). The attribution of great cultural value to scent and perfume is widespread among Saharan nomads, e.g. the Tuareg (Rasmussen 1999). After thirty years of exile, Sahrawi refugees continue to use traditional products for cosmetic and perfuming purposes. Older women in each household are responsible for storage, preparation, and use of these products, and they hold and transmit related knowledge and practices to younger female members.

#### *Aromatizing products*

All refugee families keep a metal recipient inside the tent where they burn charcoal or wood to make tea and where they add aromatizing products in order to fill the tent with their fumes and smell. The most prized air aromatizer is the resin of *Pistacia* species, known by the Berber name *tidikt*. Small pieces

of *tidikt* are put in the fire to perfume the air and are also added to scented alcohol-based formulations called *colonia*, where they dissolve rapidly, to prepare homemade perfumes that are also offered to guests. Other products burnt in the fire include the dried and triturated roots of *Corrigiola telephiiifolia* and the dried and triturated tubercles of *Cyperus rotundus*, which contain essential oils used as aromatic therapeutics across North Africa (Boulos 1983; Bellakhdar, Claisse et al. 1991). These are all incorporated, along with sandalwood, common stick incense, powdered perfumed soap, and *Ferula* species' resin, into a mixture called *lembor*. Sahrawi women prepare *lembor* and burn it in censers called *lembajra* (Figure 3.5).

With the same ingredients and the addition of triturated cloves, *lembor* is soaked in *colonia* and a perfume or a cream for hair and skin are prepared (Figure 3.6). *Tenquilit*, an unidentified species of lichen described as 'a kind of green plant that grows on stones and trees in areas with water', can be added. *Tenquilit* is commonly purchased in its dried and triturated form, called *ergheta*. Refugees explain that *tenquilit* is not itself aromatic but, when mixed with alcohol, it enhances other products' aroma. Although scholars have paid little attention to their use among world populations, lichens have been used and traded since antiquity as food, medicine, decoration, and in dyes and perfumes (Gonzalez-Tejero, Martinez-Lirola et al. 1995; Wang, Narui et al. 2001; Upreti, Divakar et al. 2005).

As among the Tuareg (Rasmussen 1999), some plants burnt for aromatic purposes are also used in a spiritual context to remove the evil eye from affected persons and to treat 'insanity' by inhaling the fumes. The resin of *Commiphora africana* and of *Ferula* species are burnt for these purposes, at times together with pieces of pyrite, seeds of *Peganum harmala*, seeds of *Coriandrum sativum*, and pieces of the dried skin of *Chameleon* spp. To prevent evil eye in children, the same products are placed in a small leather bag, which is hung around the child's neck.

### *Cosmetics and hair care*

Saharan and Sahelian women take much care when embellishing, perfuming, and adorning their hair (Gabus 1982). Sahrawi women aesthetically value hair that is long, shiny, and perfumed. They use several plants to accomplish this: the juice obtained by pounding the fresh aerial parts of *Caylusaea hexagyna* is mixed with oil and applied to the hair to strengthen and perfume it, and for the same purpose the dried aerial parts of *Teucrium chardonianum* are macerated in water and the hair is then washed with the water. *C. hexagyna* may be used alone or in combination with *Neurada procumbens* to stimulate hair growth, and Barrera et al. (2007:93) report a cosmetic use of *Acacia tortilis* that we did not collect: due to its pleasant aroma, women use the soft wood of old trunks, called *aharbar*, to perfume their hair. But by far the most important product in Sahrawi hair care is *henna*, the dried leaves of *Lawsonia inermis*.

*Henna* is a small tree native to the Middle East and Northwest India that, after humans introduced it into different parts of the world, is today present in many tropical and subtropical areas. At least since the time of the ancient Egyptians, it has been used as a growth accelerator, to combat hair loss, for decorating



and dyeing hair, hands, and feet, and for the treatment of skin disorders, and it is an important plant especially among Islamic populations (Aburjai and Natsheh 2003). Sahrawi women widely use *henna* to embellish their bodies. The painting of hair, hands, and feet with *henna* is an important practice in different Sahrawi refugees' social contexts, such as rites of passage, weddings, and as tribute to guests. For hair coloring, tone variation is obtained by adding other vegetal products to *henna*: for example, a darker color is produced by adding the leaves and bark of *Rhus tripartita* or, according to Barrera et al. (2007:109), by adding a powder obtained from crushing *Calotropis procera* leaves. Sahrawi women use cloves for both medicinal and cosmetic purposes: they are pulverized and macerated in water to color and perfume the hair, also in combination with *henna*. A perfume made with cloves is used to perfume traditional women's clothing – called *melhfa* – in important social gatherings such as weddings.

#### *Teeth cleansing*

Stems from *Maerua crassifolia*, *Salvadora persica*, or *Lawsonia inermis* are used to clean teeth. These stems are known as *mesuak*, which the Sahrawi mainly collect from the first tree species. Stems are carefully selected, the bark is peeled off from one tip, and this is used as a toothbrush by passing it over the teeth, softly chewing it, or just keeping it in the mouth and playing with it. *Mesuak* are today widely used in refugee camps as they were in the past among nomads, and only refugees that have adopted a more Western lifestyle use plastic toothbrushes. The use of *mesuak* from *M. crassifolia* is also reported to improve vision, which may be due to the Vitamin A that its use provides. A *mesuak* is also often offered as a gift to guests who come to the home.

#### **Product origin and procurement**

The Sahrawi refugees obtain cosmetic and skin healing products from plant species growing in the western Saharan environment (65% of the species), and those that are imported and purchased in markets, shops, or from traders (35%). The first category includes products from species such as *Acacia* spp., *Balanites aegyptiaca*, *Maerua crassifolia*, and *Ammodaucus leucotrichus*. These are also used by the Tuareg of Algeria, Mali, and Niger (Benchelah, Bouziane et al. 2000) and by Moor populations of Central Mauritania (Leriche 1953), among other African pastoral groups. In the second category are plants used in the perfume industry (e.g. *Rosa damascena*, sandalwood) or for skin treatments in wider geographical areas, and products that are constituents of Islamic medicine (e.g. *Salvadora persica*) historically obtained by Sahrawi in markets peripheral to their nomadic areas. Although these broad procurement patterns reflect those of pre-war nomadic Sahrawi, changes have occurred with displacement and exile to the refugee camps: refugees procure remedies from the former nomadic territories – known as *badiya* – by means of a variety of social networks that have developed since exile and, as well, important products that are in high demand have been commoditized and are today collected by refugees in the *badiya* and sold in the camps or to other (Algerian) traders. This is the case, for example, with the resin of *Acacia tortilis*, the seeds





Figure 3.5 Metal incense burner,  
lembarja (P. Kourková)



Figure 3.6 Refugee woman with a bottle of homemade perfume.  
Corrigiola roots are visible inside the bottle (P. Kourková)

of *Ammodaucus leucotrichus*, the leaves of *Cleome africana*, and the flowering tops of *Teucrium chardonianum*.

The places where Sahrawi refugees procure plants and vegetal products for cosmetic and skin healing purposes are presented in the last column of Table 3.1 and in Figure 3.7. More than 40% of these products come from the *badiya*, which includes the strip of Western Sahara under Polisario control (especially its northern areas of Tifariti, Bir Lehlou, and Mehris) and part of northern Mauritania. In nine percent of the cases, products are directly collected from the refugee camps (the environment in and immediately around the refugee camps); this low figure is due to the fact that the Hammada of Tindouf, where refugee camps are located, is relatively poor in biodiversity and thus offers opportunities to collect only a very limited number of species (e.g. *Calotropis procera*, *Pergularia tomentosa*, *Zygophyllum gaetulum*). Sahrawi refugees purchase products in Tindouf market (23% of the cases), in Mauritanian markets and from Mauritanian sellers (10%), in refugee camp shops (five percent), in markets in the occupied territories of Western Sahara (five percent) and, less often, in other remoter markets and places where refugees sometimes travel (e.g. the markets of Béchar or Algiers in two percent of the cases).

Displaced and migrating populations continuously adapt procurement patterns in order to gain and maintain access to culturally important products. Today some products are sold in the camp shops that opened over the past decade as a result of the ceasefire and the demobilization of Polisario troops, as well as of refugees' increased access to cash through Spanish civil pensions, remittances, or other productive activities. This, for example, is the case with *henna*, which Sahrawi nomads historically used to obtain from Morocco to the North (Morocco is still amongst the top five growers and exporters in the world) or from Mauritania and Senegal to the South. Nowadays, products of Mauritanian or Algerian origin can be found in many shops in the refugee camps. Other products are still obtained from the same markets at the periphery of the Sahrawi's customary nomadic areas as in pre-war times: for example, it is reported that, around the middle of the 20<sup>th</sup> century, Mauritania was the main source of aromatic products for the Reguibat tribe (Gaudio 1952), and Caratini (1989a:66), in her monograph on the Reguibat, says that they obtain a product known as *tara* (tubercles of *Cyperus rotundus*), described as a 'kind of nut used by women as a beauty product', from the agricultural markets of Sudan and the Sahelian regions.

Other products are obtained from as far away as the Middle East; for example, the Sahrawi return from the pilgrimage to Mecca with sandalwood. Sandalwood is mostly produced from wild trees in India and Indonesia, and India accounts for about 90% of sandal oil production in the world (Royal Botanic Gardens 2005). Trade dates back to antiquity, with sandalwood being transported (along with spices, gems, rice, and peacocks) in the first millennium BC from India to the Middle East along the coasts of the Persian Gulf and across the Arabian Desert on dromedaries. When costly products such as sandalwood are involved, Sahrawi refugees are aware of the presence of possible fakes or adulteration in the markets: they say that real sandalwood

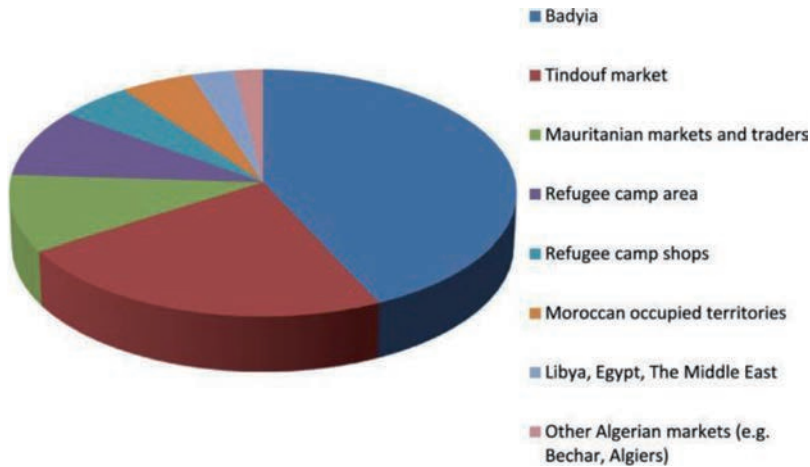


Figure 3.7 Places where Sahrawi refugees procure plants and vegetal products for cosmetic and skin healing purposes

(*oud legmari*) has a dark color, and fake sandalwood (*oud legmari el haibe*, lit. false sandalwood) is wood of a lighter color to which a colorant is added (indeed, many species of *Santalum*, and also of other genera, are today commercialized as sandalwood).

An interesting case of transnational trade is represented by mastic gum from *Pistacia* species (mainly from *Pistacia lentiscus* L., but also from *Pistacia atlantica* Desf., *Pistacia eurycarpa* Yalt., and *Pistacia palaestina* Bois.). This distinctively flavored resin, commonly known as *mastic* or *mastika*, has been used for more than two thousands years in the Mediterranean and Middle East regions as a chewing gum, a medicinal product, and as a flavoring agent for different foods and drinks (Bellakhdar 1997; Assimopoulou and Papageordiou 2007). It is today used industrially to obtain a variety of products from incense to chewing gum and glue (e.g. Italian *mastiche*). Sahrawi refugees buy packets of *tidikt* – as the Sahrawi call mastic – in the markets of Tindouf or Mauritania (e.g. in Zouérat), where they presumably come from France (as indicated from the label ‘made in France’). However, most refugees find them too expensive, and thus only welloff families use them, and less expensive sources are being sought. *Tidikt* is sometimes sent from the refugee camps to emigrants in Spain along with other traditional products such as *Acacia* resin and camel hump. Some Sahrawi traders, mainly living in the Basque Country, have recently started to procure *tidikt* directly from France, where it is allegedly found to be less expensive, and then sell it on to Sahrawi emigrants in Spain, providing evidence of Spanish Sahrawi diaspora networks.

Concerning animal and mineral products, similar procurement patterns are evident: most minerals and animal species are characteristic of the Sahrawi’s nomadic territory and are procured there (animal species are either wild – e.g. fennec, spiny-tailed lizard, darkling beetle – or domesticated – e.g. camel, goat). A few other products are procured in markets (e.g. chameleon), or substituted with more readily available products (e.g. chameleon is substituted

with the spiny-tailed lizard, which is perhaps the most common wild animal in the *badiya*). Uses of products obtained from animals no longer present in the *badiya* and not subject to trade have been abandoned. This is, for example, the case with ostrich-derived products, as ostriches have largely disappeared from the area due to drought, hunting, and the effects of Polisario-Morocco war.

## **Conclusions**

The purpose of the study was to examine Sahrawi refugees' traditional ethnobiological knowledge and practices and the changes that occurred to these and to product procurement with forced displacement. This study identified 55 plant species and 18 animal or mineral products used by Sahrawi refugees for cosmetic, aromatizing, and skin healing purposes, and gave an account of the use and importance of these products in Sahrawi culture and practices and of the means by which refugees procure them. Results show that refugees still widely use traditional products for cosmetic and skin healing purposes; that these products play an important role in their everyday practices, wellbeing, and cultural and social identity; and that procurement patterns were adapted with forced displacement. Refugees developed new procurement networks in order to maintain access to plants from the former nomadic territories – the *badiya* – and trade networks have been used, adapted, or created to satisfy refugees' demand for these products.

These results support the idea that refugees, even when constrained to one of the least productive natural environments in the world so that they are largely dependent on aid for survival, are not simply passive recipients of national and international aid, but rather struggle in many ways to maintain and recover practices based on traditionally used vegetal, animal, and mineral products. By taking products used for cosmetic and skin healing purposes as a case study, the current findings add to a growing literature on refugees' agency and on the ethnobiological practices of migrating and displaced people, and contribute to the preservation of Sahrawi ethnobiological knowledge. We suggest that more research should be carried out on traditional cosmetic and aromatizing practices among different world populations, as well as on the ethnobiological practices of displaced populations and the changes provoked by displacement.





# CHAPTER 4

## **Procurement of Traditional Remedies and Transmission of Medicinal Knowledge Among Sahrawi People Displaced in Southwestern Algerian Refugee Camps<sup>21</sup>**

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### **Introduction**

Traditional medicinal systems worldwide are based on natural resources from the surrounding environment and on the ethnobiological knowledge needed to exploit those resources. Culture is seen as the filter between man and the surrounding environment; this implies that when the latter changes, traditional knowledge and practices come under pressure. When displacements occur because of war or other calamities, migrants and refugees strive to keep the connection between cultural identity, traditional resources, and their homeland (Brainard and Zaharlick 1989; Pieroni et al. 2005). However, their cultural identity comes under threat due to the loosening of ties with the place of origin, but is also threatened by the process of integration in the host culture (see Kim 2001).

In these contexts, the main forces that drive changes in the cultural domain of traditional medicinal knowledge are: (1) the adaptation of the original knowledge to the new (host) environment; and (2) the development of strategies to obtain the original remedies. Examples of the first process are the substitution of traditional remedies with locally available ones (traditional and/or modern), and the inclusion of remedies from the host culture into

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refugees' own pharmacopoeia (with the same use[s] or new ones elaborated according to their own belief systems) (Pieroni et al. 2005). Examples of the second process are strategies for the procurement of traditional remedies, such as their cultivation, gathering (in the new environment or through trips back to the source when these are possible), marketing, and the development of social networks that link migrants and refugees to relatives and friends in the place of origin.

About 165,000 (UNHCR – United Nations High Commissioner for Refugees – 2005 figures) Sahrawi people have been living in four refugee camps located on an isolated desert plateau in southwestern Algeria since 1975 (see Figure 1.1), when Morocco occupied the former Spanish colony of Western Sahara, and they were forced to flee. In a context in which refugees find themselves in a longlasting and intractable state of limbo, with a high level of dependency from donors, and a peace process that seems to have irredeemably stagnated (Seddon 2000; Shelley 2004), Sahrawi have been fighting against identity loss both militarily and through social and cultural resistance. In the realm of traditional medicine, refugees established practices to obtain their traditional medicinal remedies through social networks within and outside the camps. These strategies permitted the continuation of traditional folk medicinal practices when this would not have been possible otherwise due to the lack of botanical resources in the area of the camps. Moreover, they represent a link between displaced people and their homeland (Western Sahara), and ultimately constitute a form of cultural resistance in the wastelands of the refugee camps.

In this chapter, we examine the process of adaptation of Sahrawi traditional medicine under the conditions of displacement, particularly focusing on the origin of remedies used in the camps and on the strategies developed by refugees to obtain them, as well as on the changes that occurred to traditional medicine in relation to knowledge transmission and cultural identity.

### **Background: Sahrawi History and Life in the Refugee Camps**

Sahrawi, literally “people from the desert,” is the name given to the tribes of nomadic and pastoral people who traditionally inhabit a coastal area of northwestern Africa called Western Sahara. The origin of the Sahrawi traces back to the fusion between the Bani Hasan Arabic groups that migrated from Yemen from the eleventh to the thirteenth century B.C. and the Sahjaha nomadic Berber group that was living in Western Sahara. A slow process of integration of Arabic migrants with the autochthonous Berbers took place until the sixteenth century, from which arose a nomadic population of Sunnite Muslims, the Sahrawi. Sahrawi people were essentially nomadic, pasturing camels, goats, and sheep in the sandy low-lying plains of Western Sahara and relying for food on camel milk and meat, dates, sugar, and small amounts of cereals and legumes (OXFAM 1995). They moved in accordance with the seasons, their routes dictated by wells, watering holes, and rains. As an informant stated, they were “people moving towards every sign of rain.”

During the 1960s, under Spanish colonization, the Sahrawi became increasingly sedentary. In 1975, following the occupation of Western Sahara

by Mauritanian and Moroccan forces (Mauritania pulled out from Western Sahara in 1979), about 70,000 Sahrawi became refugees after fleeing the Moroccan army (Loewenberg 2005; Spiegel and Qassim 2003). As most of the men joined the resistance army immediately, it was the women, children, and old people who fled to the camps (Lippert 1992). Nowadays, Sahrawi people live in the refugee camps of south-western Algeria (about 165,000), and in the part of Western Sahara under dispute (about 65,000), as well as residing as minority groups in south Morocco, Mauritania, the Canary Islands, and Algeria.

Camps are located in a desert plateau called Hamada near the Algerian town of Tindouf. The Sahrawi Arab Democratic Republic (RASD)/Frente Polisario [hereafter called “Polisario”] —the political and military organisation that represents the refugees—was granted administrative and governing autonomy over this area by the Algerian government. In the camps, refugees live in canvas tents and mud brick huts, with severe problems of water and food supply, and with car batteries as the main source of electricity. The European Union, some bilateral development cooperations, UN agencies, and several solidarity groups existing all around Europe make food, shelter, and other basic commodities available (Loewenberg 2005). Indeed, the general food ration covers only 68 percent of the estimated energy requirement of the population, and anemia caused by malnutrition is a common health problem among the general Sahrawi population, especially children and women (Branca 1997; UNHCR 2002). In spite of the efforts of the RASD and donors to build an efficient health system in the camps, the average life expectancy is around fifty, with extremely high child mortality rates mainly due to diarrhea and acute respiratory infections (Branca 1997; Mezzetti 1994).

In an attempt to cope with the situation and looking for an improvement of the quality of life in the camps, throughout the years refugees developed an informal economy with the marketing of many products (from clothing to personal hygiene products and food items to supplement the base diet provided by humanitarian assistance) from within and outside the camps (Bhatia 2001). The development and expansion of trading routes through the camps—from Senegal, Mali, Mauritania, Algeria, and Spain—brought about the emergence of small neighborhood shops and distinct commercial areas within the camps.

Besides the camps, the Polisario also has political control over the eastern part of the Western Sahara, which has been taken away from Moroccan control through a guerrilla war that lasted until the peace agreement of 1991 (Bhatia 2001). Consequently, Western Saharan territory is divided geographically and politically into two parts separated by 2,200 kilometers of earthen wall, constructed by Morocco in the late 1980s and protected by 150,000 soldiers and about one million landmines (San Martín 2004; Loewenberg 2005). The wall crosses into northwest Mauritania, physically separating the eastern portions of the territory under Polisario control. These portions are the so-called “liberated territories” (approximately 20 percent of the Western Sahara), while the remaining “occupied territories” are under the administering authority of the Moroccan government.

## Field Research Methods

The investigation of Sahrawi traditional and veterinary medicine in the Sahrawi refugee camps has been undertaken within a cooperation project funded by the European Union (“Salud animal en la tendopoli Sahrawi—Algeria,” nr. ONG-PVD/2002/020-151) and carried out by two Italian NGOs (Africa 70 and SIVtro Veterinari Senza Frontiere Italia). Fieldwork was conducted over a period of fourteen weeks in October 2003, November-December 2004, and January-February 2006. Investigation methods for ethnobotanical and cognitive-anthropological analysis were structured interviews with a random-selected sample of households, semistructured interviews with traditional healers and informants regarded as knowledgeable by local people, consensus analysis using free listings, a “walk in the woods” approach with knowledgeable informants, and a voucher specimens collection of the remedies cited (see Berlin 1992; D’Andrade 1995; Martin 1995; Alexiades and Sheldon 1996; Cotton 1996; Weller 1998; Cunningham 2001; Puri and Vogl 2004).

During the 2004 period, structured interviews were conducted with thirty-seven households (people living together in the same tent and mud brick huts) in the refugee camps of Awserd and Smara to investigate Sahrawi popular medicine. In each household, members were asked to identify the person in the household responsible for keeping and administering traditional remedies; the interview was then conducted with that person. Respondents had a mean age of 56 (ranging from 26 to 84), thirty-three of them being women and four men. Household members numbered five on average, ranging from two to ten. Informants were asked about the frequency of use of traditional remedies in the household, the remedies available within the household, their use, origin, and method of procuring, difficulties in the procuring of remedies, and the origin and transmission of their knowledge about traditional medicine. Interviews were conducted in Hassanya, the Arabic dialect with Berber substrate spoken by Sahrawi (see Cohen 1963; Quitout 1999; Ould Mohamed Baba 2004), and translated back into Spanish by local research assistants.

In every case, prior informed consent was obtained verbally before the interview was conducted and before a camera or audio-recorder was used. Participants were given an explanation of the methodology, aims, and possible outcomes of the study. Throughout the field study, the ethical guidelines adopted by the American Anthropological Association (1998) were followed, and methodological and ethical advice according to Jacobsen and Landau (2003) were taken into consideration.

During the interviews, pharmacognostic (dried) specimens, and in a few cases fresh specimens, were collected and inventoried. Voucher specimens of the plants cited coming from the Hamada and the part of Western Sahara under Polisario control were collected in the field with knowledgeable informants. Plant identification followed the Sahara and Western Sahara botanical standard treatises (Ozenda 1991; Lebrun 1998). Botanical names are written in full with author(s) and family name only the first time they appear in text or tables. Voucher specimens, digitally recorded interviews, and digital pictures of plants and remedies are available at the first author’s address.

## Sahrawi Traditional Medicine

Sahrawi traditional medicine finds its origin centuries ago, in Arabic and Islamic medicine and in the pharmacopoeia of Berber populations based on local resources from Western Sahara, but also from Senegal, Mali, and Mauritania, where nomads were moving about looking for pastures and water for their herds. At the same time, they were exchanging products with traders from Mauritania and Mali from the south and from Morocco and Algeria from the north, thus obtaining medicinal remedies not available in their nomadic areas (Guinea 1949; Monteil and Sauvage 1953; Caro Baroja 1955). In addition, remedies from the coast were marketed eastward and vice versa. With the partial sedentarization of the 1960s, the marketing of medicinal remedies in the main cities of Western Sahara, such as Laayoune and Smara, became another important source of these products.

Two types of traditional medicinal knowledge were distinguishable: a specialized knowledge practiced by experts, and a popular medicine practiced by women within families. In relation to the former type, during war expeditions there was always a male expert carrying the knowledge needed to heal wounds, to adjust broken bones, and even to carry out surgical operations (Caro Baroja 1955; Mezzetti 1994). At the same time, female specialists were responsible for reproductive health and ophthalmological problems, often through complex medicinal recipes. While specialized knowledge of women (based on medicinal plants and other remedies) has been preserved in the camps, specialized knowledge of men is quickly disappearing. In fact, the latter practices were used soon after the displacement took place to treat the effects of Moroccan bombings (Mezzetti 1994). However, at present they are contested by donors, development agencies, NGOs, and by the Polisario government as well, all of which have been trying to develop a modern biomedical system in the camps.

Popular medicinal knowledge is practiced and transmitted within families and deals mainly with common ailments such as digestive disorders, bronchopulmonary afflictions, and *eghindi*, a folk term that includes allergies and intoxications. In this chapter, we will present and discuss data only about this second type of medicinal knowledge and related traditional remedies.

Informants reported 287 citations of remedies used, with a mean of almost eight remedies each, the number of remedies cited per household ranging from zero to nineteen. Of these remedies, 240 (84 percent) are of vegetal origin, 26 (9 percent) of mineral origin and 21 (7 percent) of animal origin. Vegetal remedies correspond to 68 products belonging to 57 species and 32 botanical families, Fabaceae and Lamiaceae (five species each) being the most cited.

In spite of the forced settlement of most of the population, the almost complete absence of vegetal life around the camps, and the fact that refugees have been living in the wasteland of the Hamada for thirty years, traditional medicine has been maintained within households. About 78 percent of the households reported having used traditional remedies in the week before the interview, and this figure rises to 95 percent when the time period considered is six months prior to interviews. The person who prepares and administers the remedies, and who holds the knowledge about them, is the oldest woman

of the household in 89 percent of the cases, and the oldest man in the other 11 percent. Traditional remedies are kept dried and often triturated, enveloped in cloth pieces or in plastic bags, and form some of the few items present in the tents of the camps. This habit of conservation of remedies is characteristic of Saharan nomadic populations, who need to store the remedies as they encounter them in specific phytogeographic regions and during limited periods of the year (i.e., during the reproductive cycle of plants after the few and irregular rains), and not when the the particular remedies are needed.

Table 4.1 lists the medicinal plants that informants had in the household at the time of the interview. Plants are reported in alphabetical order of scientific name, along with botanical families, voucher specimens when available, vernacular names as collected in the refugee camps, place(s) of procurement of the remedies (in order of relative importance within each specific product's row), and percentage of quotation. The two most frequently reported species are *Acacia tortilis* and *Ammodaucus leucotrichus*; the resin and the dried leaves of the first species are reported by 76 percent and 38 percent of the informants respectively, while the dried fruits of the latter are reported by 54 percent of the informants, the species being described by Sahrawi as their "traditional antibiotic." Other frequently mentioned species are characteristic of the flora of Western Sahara and include *Cleome amblyocarpa* and *Maerua crassifolia*, as well as species of southern Sahara-Sahelian areas such as *Adansonia digitata*, or are important Arabic remedies such as the seeds of *Trigonella foenumgraecum*.

In Table 4.2, other biological remedies are presented, along with a description of the remedy, vernacular names, places of procurement and frequency of quotation. Red hematite, a mineral used as an antiseptic and cicatrizer, is reported by 35 percent of the informants, while almost 20 percent of them cited honey as a medicinal remedy.

### **Origin of the Remedies Used and Procurement Strategies**

In Table 4.3, we present the places of provenance of the remedies used in the camps along with their frequencies of mention (the number of times that remedies available in the household were obtained from a specific place) and related percentages. In discussing this table, we will start from within the camps and continue our discussion in relation to other places more distant from the camps.

The area where the refugee camps are situated is a rocky plateau about 500 meters above sea level, the Hamada, characterized by rocks eroded by sun, wind, and scarce rainfall, and almost completely without vegetal life. With less than 50 mm of rain per year, the Hamada is classified as an absolute desert of Libyan or continental type (Ozenda 1991), considered unfit for human life. Less than 1.5 percent of the remedies used are gathered in the area surrounding the refugee camps; among them, the leaves of *Acacia tortilis* (cited by one informant who gathered them from one of the very few individuals growing in the camps), the leaves of *Cleome amblyocarpa* (mentioned by two informants and gathered some kilometers north of the camps), and the aerial parts of *Hammada scoparia* (reported by one informant). Plants readily available are

**Table 4.1 Traditional phytotherapeutics stored in tents by Sahrawi people in south Algerian refugee camps**

Botanical taxon and voucher specimen code(s)	Botanical family	Folk name(s) recorded in the camps	Specific products/ Plant part(s)	Provenience(s) of the plant material	% of quotation (n=37)
<i>Acacia ehrenbergiana</i> Hayne GV1015/GV1058	Fabaceae	Tamat	resin: el-elk tamat	IWS-g	2.7
			leaves: warga tamat	IWS-g	2.7
<i>Acacia senegal</i> (L.) Willd. var. <i>senegal</i> GV1076	Fabaceae	Amour	seeds: sallaha	IWS-b/Mr-b	5.4
<i>Acacia tortilis</i> (Forssk.) Hayne subsp. <i>raddiana</i> (Savi) Brenan var. <i>raddiana</i> GV1010/ GV1025/GV1061	Fabaceae	Talha	resin: el-elk	IWS-g/RC-b/Tn-b/ Mr-b	75.7
			leaves: warga talha	IWS-g/RC-g,b	37.8
			resin (from lower part of trunk): abakak	IWS-g	2.7
			bark: dhubag	IWS-g	2.7
<i>Adansonia digitata</i> L. GV1016	Bombacaceae	Teidoum	fruit pulp: tashmaht	Mr-b/IWS-b/ oWS-b	24.3
			leaves: taghia teidoum	Mr-b	8.1
<i>Allium cepa</i> L.	Alliaceae	Besla	bulbs	Tn-b	2.7
<i>Allium sativum</i> L.	Alliaceae	Thum	bulbs	Tn-b/RC-b	16.2
<i>Ammodaucus leucotrichus</i> Coss. et Dur. GV1013/ GV1033	Apiaceae	Kammuna, kammuna t'rag	fruits	IWS-g/oWS-b	54.1
<i>Anastatica hierochuntica</i> L. GV1027	Brassicaceae	Kamsha	leaves	IWS-g	8.1
<i>Argania spinosa</i> (L.) Skeels	Sapotaceae	Argan	seeds	oWS-b	2.7
<i>Artemisia herba-alba</i> Asso GV1042	Asteraceae	Shih	flowering tops	oWS-b/Tn-b/Ag-b	8.1
<i>Asphodelus tenuifolius</i> Cav. GV1078	Asphodelaceae	Tazia	seeds	IWS-g	2.7
<i>Atriplex halimus</i> L. GV1052	Chenopodiaceae	Legtaf	leaves	IWS-g/Tn-b	10.8
<i>Balanites aegyptiaca</i> (L.) Del. GV1086	Balanitaceae	Teichat	fruits	IWS-g	5.4
<i>Calligonum comosum</i> L'Hérit	Polygonaceae	Shdida	leaves	IWS-g	8.1
<i>Cassia italica</i> (Mill.) Spreng. GV1020	Fabaceae	Fellajit	leaves	IWS-g	5.4
<i>Caylusea hexagyna</i> (Forssk.) M.L. Green GV1031	Resedaceae	Dhenban	aerial parts and flowers	IWS-g	2.7
<i>Centaurea pungens</i> Pomel GV1079	Asteraceae	Zreiga	leaves	IWS-g	5.4



**Table 4.1 (cont.) Traditional phytotherapeutics stored in tents by Sahrawi people in south Algerian refugee camps**

Botanical taxon and voucher specimen code(s)	Botanical family	Folk name(s) recorded in the camps	Specific products/ Plant part(s)	Provenience(s) of the plant material	% of quotation (n=37)
<i>Cotula cinerea</i> Del. GV1083	Asteraceae	Gartufa, rebruba	flowering tops	IWS-g	5.4
<i>Cinnamomum verum</i> J. Presl GV1072	Lauraceae	El-qarfa	bark	Tn-b	2.7
<i>Cleome amblyocarpa</i> Barr. et Murb. GV1026	Capparidaceae	Mkheinza	leaves	IWS-g/RC-g	32.4
<i>Commiphora africana</i> (A. Rich.) Engl. GV1017	Burseraceae	Dirs	resin: umm nass	Mr-b/Tn-b/oWS-b/IWS-b	16.2
<i>Coriandrum sativum</i> L. GV1073	Apiaceae	Kasbour	seeds	Tn-b	2.7
<i>Corrigiola telephiifolia</i> Pourret GV1089	Caryophyllaceae	Tassergin't	roots	oWS-b	2.7
<i>Chamomilla pubescens</i> (Desf.) Alavi GV1090	Asteraceae	Lerbien	flowering tops	IWS-g/Ag-b	16.2
<i>Cuminum cyminum</i> L. GV1073	Apiaceae	Kammuna	seeds	Tn-b/Ag-b	5.4
<i>Cymbopogon schoenanthus</i> (L.) Spreng. GV1087	Poaceae	ldkhir	aerial parts	IWS-g	2.7
<i>Echium horridum</i> Batt. GV1091	Boraginaceae	Harsha	flowers	IWS-g	2.7
<i>Eugenia caryophyllata</i> Thunb.	Myrtaceae	Qronfel	flowering buds	Tn-b	2.7
<i>Euphorbia calytrata</i> Coss. et Dur. var. <i>invoucrata</i> GV1080	Euphorbiaceae	Rammadah	roots	IWS-g	2.7
<i>Euphorbia officinarum</i> L. subsp. <i>echinus</i> GV1001	Euphorbiaceae	Daghmus	inner stem	IWS-g/oWS-g	10.8
			inner stem mixed with honey: daghmus honey	oWS-b	2.7
<i>Ferula communis</i> L.	Apiaceae	Leklekha	resin: fasoukh	Tn-b/oWS-b	10.8
<i>Hammada scoparia</i> (Pomel) Iljin. GV1009/ GV1021	Chenopodiaceae	Remth	aerial parts	IWS-g/RC-g	10.8
<i>Lavandula</i> sp. <sup>a</sup> GV1022/ GV1032	Lamiaceae	Lehzema	flowering tops	Tn-b/oWS-b	24.3
<i>Lepidium sativum</i> L. GV1060	Brassicaceae	Reshad	seeds: habb er-reshad, afatash	Tn-b/IWS-b	5.4
<i>Lycium intricatum</i> Boiss. GV1085	Solanaceae	Ghardeq	leaves	IWS-g	5.4
			fruits: asako	IWS-g	2.7
<i>Maerua crassifolia</i> Forssk. GV1007/ GV1019	Capparidaceae	Atil	leaves: sadra el-hadra	IWS-g	21.6
			stems: mesuak	IWS-g	2.7



**Table 4.1 (cont.) Traditional phytotherapeutics stored in tents by Sahrawi people in south Algerian refugee camps**

Botanical taxon and voucher specimen code(s)	Botanical family	Folk name(s) recorded in the camps	Specific products/ Plant part(s)	Provenience(s) of the plant material	% of quotation (n=37)
<i>Mesembryanthemum cryptanthum</i> Hook. f. in Hook.	Aizoaceae	Afzu	seeds	IWS-g	5.4
<i>Myristica fragrans</i> Houtt. GV1040	Myristicaceae	El-gouza	seeds	Tn-b	5.4
<i>Nigella sativa</i> L.	Ranunculaceae	Habba souda	seeds	Tn-b	13.5
<i>Nucularia perrinii</i> Batt. GV1047	Chenopodiaceae	Askaf	stems	IWS-g	2.7
<i>Panicum turgidum</i> Forssk. GV1051	Poaceae	Umm rokba	roots	IWS-g	5.4
<i>Peganum harmala</i> L. GV1066	Zygophyllaceae	Harmal	seeds	Tn-b	5.4
<i>Piper nigrum</i> L. GV1073	Piperaceae	Felfel	seeds	Tn-b	2.7
<i>Rhus tripartita</i> (Ucria) Grande GV1023/GV1064	Anacardiaceae	Shdari	leaves	IWS-g/Tn-b	10.8
			seeds: dhmah	IWS-g	2.7
<i>Rosmarinus officinalis</i> L. GV1062	Lamiaceae	lazir	aerial parts	Tn-b	8.1
<i>Salsola vermiculata</i> L. GV1093	Chenopodiaceae	Shifne	aerial parts	IWS-g	2.7
<i>Salvia aegyptiaca</i> L. GV1049	Lamiaceae	Azoukni, tezouknit	seeds: afatash	IWS-g	16.2
			flowering tops	IWS-g	8.1
<i>Tamarindus indica</i> L. GV1004	Anacardiaceae	Aganat	seeds	Mr-b	2.7
<i>Terfezia ovalispora</i> Pat. GV1008	Terfeziaceae	Terfas	rhizome	IWS-g	5.4
<i>Tetraclinis articulata</i> (Vahl) Masters GV1003/GV1059	Cupressaceae	Ar'ar	leaves	RC-b	2.7
<i>Thymus</i> sp. <sup>a</sup> GV1028/GV1029	Lamiaceae	Azoukni	flowering tops	Tn-b	5.4
<i>Trigonella foenum-graecum</i> L. GV1018/GV1044	Fabaceae	Halba	seeds	Tn-b/IWS-b	21.6
<i>Withania somnifera</i> (L.) Dunal in DC. GV1081	Solanaceae	Sekran	seeds	Tn-b	5.4
<i>Zingiber officinale</i> Roscoe GV1039	Zingiberaceae	Skenjbir	rhizome	Tn-b	5.4
<i>Ziziphus lotus</i> (L.) Desf. GV1002	Rhamnaceae	Shdir	fruits: n'beg	IWS-g	2.7
ND <sup>b</sup>		Lebtana	leaves: taghia lebtana	IWS-g	21.6

Provenience(s) of the plant material. IWS: part of the Western Sahara under Polisario control; oWS: part of the Western Sahara under Moroccan occupation; RC: refugee camps and Hamada; Tn:Tindouf market; Ag: other Algerian markets but Tindouf; Mr: markets and traders from Mauritania; g: gathered from the wild; b: bought in markets and shops, from traders or obtained for free from other people.

<sup>a</sup> Botanical identification at species level not possible, since only dry plant parts were been available

<sup>b</sup> Botanical identification not possible, since only triturated specimens of the plant could be obtained

**Table 4.2 Other biological remedies used by Sahrawi refugees in south Algerian camps**

Remedy	Folk name recorded in the camps	Provenience(s) of the material	% of cites (n=37)
Red hematite (Fe2O3)	Hemera	IWS-g/oWS-g/Tn-b/Mr-b	35.1
Honey	Lasal	Sp-b/Tn-b	18.9
Piece of salt block	Shabba	Tn-b/Mr-b	16.2
Black galena (PbS)	Kehla	IWS-g/oWS-b	10.8
Skin and fat of spiny-tailed lizard ( <i>Uromastix</i> spp.)	Dab	IWS-g	8.1
Unrefined sugar	Azucar el-har	oWS-b	8.1
Goat's fat	Adhin dsam	RC-pr	5.4
Ostrich ( <i>Struthio camelus</i> L.) egg	Naama	IWS-b/Tn-b	5.4
Sea urchin ( <i>Echinus</i> spp.)	Dghemissa	oWS-b/Ag-b	5.4
Chameleon skin	Buya	oWS-b/RC-b	5.4
Cooked camel skin	Aotype	RC-pr	2.7
Cream of goat's milk	Dsam leghem	RC-pr	2.7
Camel fat	Ludek	RC-b	2.7

Provenience(s) of the plant material. IWS: part of the Western Sahara under Polisario control; oWS: part of the Western Sahara under Moroccan occupation; RC: refugee camps and Hamada; Tn:Tindouf market; Ag: other Algerian markets but Tindouf; Mr: markets and traders from Mauritania; Sp: Spain. g: gathered from the wild; b: bought at markets and in shops, from traders and obtained for free from other people; pr: own production.

**Table 4.3 Origin of traditional remedies used in Sahrawi refugee camps**

Places of provenance	Percentage	Frequency of mention
Western Sahara under Polisario control	58.5	168
Tindouf market	20.1	58
Western Sahara under Moroccan occupation	6.7	20
Mauritania	5.6	16
Refugee camps' markets and shops	2.8	8
Algerian markets apart from Tindouf	1.8	5
Spain	1.8	5
Own production in the camps	1.4	4
Hamada (surroundings of the camps)	1.4	4
Total	100	287

usually not stored in tents but instead collected when needed. This is the case with the few medicinal plants growing around the camps, including *Pergularia tomentosa* L. (Asclepiadaceae), *Zygophyllum gaetulum* Emb. & Maire subsp. *gaetulum* (Zygophyllaceae), and *Hammada scoparia*. Their local availability is probably the reason for their absence or low scores in survey results. In addition, informants collected the aerial parts of *H. scoparia* around the camps only in one case out of four, since plant individuals growing in the Western Sahara were being regarded as “more powerful.”

Almost 3 percent of the remedies cited were bought in the camps. They are sold in food item shops and come mainly from Western Sahara or Mauritania (e.g., resin and dried leaves of *A. tortilis*), and from Algeria (e.g., leaves of *Tetraclinis articulata* and chameleon skin, a highly regarded but difficult-to-procure remedy). Common food items used as remedies such as garlic and onion are also found in these shops. The selling of these products usually occurs as the result of personal initiatives of local traders, who buy well-known remedies from other traders, herders, or from other people coming back from trips outside the camps. Given the efforts made by refugees to procure traditional therapeutics for home consumption, more medicinal products could be expected to be sold in the camp markets and shops. Nevertheless, trading in medicinal remedies within the camps has not been developed. Refugees prefer to obtain Western Saharan remedies mainly through family and other non-commercial social networks, or to buy remedies at Tindouf market, or directly from “traveling” traders. Reasons for this include the perception that remedies sold in the camps are of low medicinal quality, the high prices of remedies in camp markets and shops, and the irregularity in the supply of these remedies, which make other networks more reliable for procurement.

Given the climatic situation of the Hamada, no medicinal plants are cultivated in the camps, and the 1.4 percent of remedies from refugees’ own production is of animal origin. Remedies obtained from wild and domesticated animals are traditionally relevant in Sahrawi medicine. Camels and goats are kept profusely around the camps in spite of the extreme difficulties people have in feeding them: it is estimated that families in the camps own approximately 45,000 sheep and goats and 500 camels (DNV-RASD 2005). Remedies from these animals are the only ones that refugees can produce by themselves in the camps, and are usually given free to friends and relatives when needed.

The Algerian town of Tindouf is situated about forty kilometers from the refugee camps. This city of about 50,000 inhabitants serves as the southern headquarters for the Algerian Armed Forces and is important in trading routes across the Sahara desert. Tindouf is the pole of the refugees’ commercial networks, and informants buy about 20 percent of their remedies in markets and shops in Tindouf, and from traders in the city’s streets. Typically, these remedies are plants cultivated in northern parts of Algeria or imported from other countries and characteristic of Arabic and Islamic medicine. Examples include the highly regarded seeds of *Trigonella foenumgraecum*, *Peganum harmala*, and *Nigella sativa*, the latter being cited in the Koran as a panacea (Siouti 1994), and remedies known worldwide like *Myristica fragrans*,

*Cinnamomum verum*, and *Eugenia caryophyllata*. Among the non-vegetal therapeutics bought in Tindouf, four informants mentioned pieces of salt blocks from local salt deposits (see McDougall 1990). Apparently, the medicinal remedies' market of Tindouf has been developing with the refugee camps, and traditional Sahrawi remedies coming from the part of Western Sahara under Polisario control or from Mauritania can be found on sale increasingly in the city. Nevertheless, refugees buy these kinds of remedies in Tindouf only if they have no other possibilities of obtaining them directly. As an example, out of twenty-eight informants reporting to possess *el-elk* (the resin of *A. tortilis*) in their tents, only one bought it in Tindouf, while twenty-three informants obtained it from the liberated territories. Three people bought it in camp markets and shops and one from Mauritanian traders. Similarly, only one informant out of four bought the leaves of *Rhus oxycantha* in Tindouf, while the others obtained them from the liberated territories. Reasons for this preference again lie in the cultural ties of Sahrawi with their homeland and the perception that remedies coming without intermediation from Western Sahara or Mauritania are of better quality and more powerful than from other locations. The resin of *Commiphora africana*, for example, is bought preferentially from Mauritanian traders, informants stating that the resin sold in Tindouf is not good as a remedy. Another reason for this preference are the high prices of remedies in Tindouf; as it happens with remedies on sale in the camps, prices increase with increasing intermediation of different traders, and with increasing distance from their geographical area of production or gathering. Refugees have no source of income, and work for the military or political administration is typically unpaid. As a result, on the one hand they seek to diversify family income, with individual members separately engaged in commerce, military and administrative services, and small private activities, and on the other hand they try to establish non-commercial networks for obtaining items for living, including traditional remedies. Commercial networks are growing in the camps, and the source of the starting capital for these networks include pensions for former Spanish civil servants, and remittances from Sahrawi working abroad (mainly in Algeria, Mauritania, the Canary Islands, Spain) (Bhatia 2001). This process has expanded also the private ownership of cars and trucks, typically imported from Spain or Mauritania. Consequently, it also facilitated the movement of refugees among and between camps and Tindouf, increasing also the marketing of medicinal remedies and the supplying of these remedies in Tindouf.

Informants bought almost 2 percent of the remedies cited at other Algerian markets except Tindouf, mainly in Alger and Beshar. There, refugees obtain otherwise difficult-to-find remedies, like *Artemisia herba-alba* or crushed sea urchins. Those refugees who have the legal and economic possibility to travel across Algeria or to and from Europe, for example, buy remedies, which they bring back to the camps.

In spite of having been forced to become sedentary, Sahrawi reflect their nomadic culture by depending (in almost 60 percent of the reports) on products and species gathered from the wild in Western Sahara. Medicinal species are mostly gathered in the eastern stripe of Western Sahara under

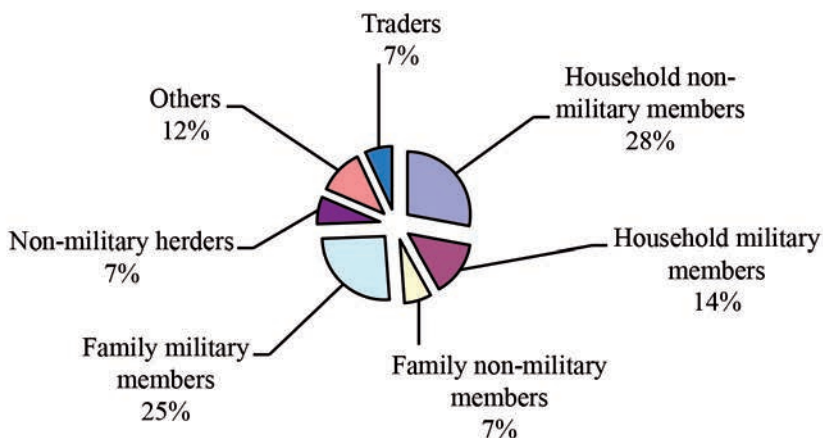


Figure 4.1 Social networks for procuring traditional remedies from the liberated territories

Polisario control. This area is characterised by a sub-oceanic desert climate where the lack of rains is partly replaced by a high hygrometric content in the atmosphere that allows more plant species to grow, and by permanently dispersed vegetation, at least in the southern part (Guinea 1949; Ozenda 1991). About 65 percent of the remedies that were cited (counting the number of remedies and not the number of citations) are procured exclusively or at least partly from these territories.

The control of this eastern strip of Western Sahara is crucial for the conservation of Sahrawi traditional medicine in the refugee camps, and refugees' families have established social networks to obtain remedies traditionally gathered in this area. Out of thirty-seven households interviewed, thirty-two (about 86 percent) have some established network to obtain remedies from the liberated territories. Figure 4.1 shows the networks through which these resources are gathered and brought to the camps as well as their respective percentages.

Household members bring more than 40 percent of the remedies to the camps. If we also include the members of the family, the figure rises to 74 percent, which shows how large parts of the networks are intrafamilial non-commercial networks. Family members who travel to the territories usually bring back to the camps a large variety and amount ("full bags") of remedies to be distributed to other family members who had asked for them. Forty percent of the family members who are in charge of bringing the remedies to the camps are combatants of the Polisario, a figure that rises to 52 percent of the total networks if we include also the combatants not belonging to the family. In fact, members of the Sahrawi population in this area are mainly combatants cantoned with their units in order to control the territory and pasture the about 27,000 camels belonging to the Polisario (DNV-RASD 2005). The number of soldiers is estimated to be between three and six thousand; at any given time, one third of them are on permission, which allows them to leave their posts at the front in order to return to their families in the camps (Bhatia 2001). These soldiers gather the plants and other remedies during favorable

seasons and store them until they go back to the camps on permission. Other than soldiers, in the territories live some Sahrawi nomads who use the area as grazing land for camels and goats. A large majority of them are people and families from the camps who travel with their herds to the territories during the cold season (from September–October and February–March) and live according to a traditional lifestyle. During favorable cold seasons, plants grow and are gathered to be used *in loco* as well as to be brought back to the camps for their own consumption or that of relatives and friends.

In some cases, these non-commercial and intrafamilial networks for procuring traditional remedies are embedded into non-familial commercial activities like the production and marketing of coal from the liberated territories to the camps, or, during favorable years, the gathering and marketing in Tindouf of the desert truffle (*Terfezia ovalispora*).

About 7 percent of the remedies coming from the liberated territories are obtained through commercial relations with traders who come from Mauritania and sell to families and combatants some specific products that are then brought to the camps. In Table 4.3, we can see that more than 5 percent of the remedies reported in the camps have been bought from traders in Mauritania (e.g., in Zouerate); these traders are an important source of specific products that are otherwise difficult to obtain. These products are mainly those characteristic of Sahelian areas, like the dried fruit pulp and the dried and powdered leaves of *Adansonia digitata*, and the resin of *Commiphora africana*. On some occasions, traders coming from Mauritania arrive in the camps to sell remedies and other stuffs (including clothes, personal products, and handicrafts).

As reported in Table 4.3, almost 7 percent of the remedies come from the territories of the Western Sahara under Moroccan occupation, on the other side of the *berm*—the Moroccan defensive wall. The western portion of the territory has a population of 200,000 Moroccan soldiers, a similar number of Moroccan settlers from the post-1975 period, and more than 65,000 indigenous Sahrawi (1997 figures) (Bhatia 2001). Most of these Sahrawi have been separated from their families for three decades, but have kept family ties in spite of the physical separation. Products are sent to the camps from relatives or are brought back to the camps by those refugees who have had the permission recently to travel to Western Sahara for visiting the family. Nevertheless, procurement of traditional remedies in the “occupied territories” is still difficult for most refugees, and usually takes place only for specific products that can not be procured in other ways. These products are usually bought at the markets of Laayoune or Smara cities, and include plants characteristic of the oceanic climate of Morocco and Western Sahara, as well as endemic species like *Argania spinosa* and *Corrigiola telephiiifolia*, and products of oceanic origin like sea urchin. Sweet remedies are highly regarded in Sahrawi culture, especially for treatment of *egbindi*, a very common folk illness. Unrefined sugar arrives in the camps from the occupied Western Sahara, probably coming from the Canary Islands. The habit of using this sugar goes back to the commercial relations that Sahrawi people living in the coast traditionally had with the people of these islands (see Caro Baroja 1955).

**Table 4.4 Medicinal plants reported as difficult to procure in Sahrawi refugee camps**

Botanical taxon and family	Folk name(s) recorded in the camps	Specific products/ Plant part(s)	% of quotation (n=37)
<i>Salvia aegyptiaca</i> L. (Lamiaceae)	Azoukni, tezouknit	seeds: afatash	13.5
<i>Artemisia herba-alba</i> Asso (Asteraceae)	Shih	flowering tops	10.8
<i>Balanites aegyptiaca</i> (L.) Del. (Balanitaceae)	Teichat	fruits	10.8
<i>Euphorbia officinarum</i> L. subsp. echinus (Euphorbiaceae)	Daghmus	daghmus honey	8.1
		inner stem	5.4
<i>Acacia tortilis</i> (Forssk.) Hayne subsp. <i>raddiana</i> (Savi) Brenan var. <i>raddiana</i> (Fabaceae)	Talha	leaves: warga talha	5.4
		resin: el-elk	5.4
<i>Lycium intricatum</i> Boiss. (Solanaceae)	Ghardeq	leaves	5.4
		fruits: asako	5.4
<i>Adansonia digitata</i> L. (Bombacaceae)	Teidoum	fruit pulp: tashmaht	5.4
<i>Ammodaucus leucotrichus</i> Coss. et Dur. (Apiaceae)	Kammuna, kammuna t'rag	fruits	5.4
<i>Commiphora africana</i> (A. Rich.) Engl. (Burseraceae)	Dira	resin: umm nass	5.4
<i>Maerua crassifolia</i> Forssk. (Capparidaceae)	Atil	leaves: sadra el-hadra	5.4
<i>Mesembryanthemum cryptanthum</i> Hook. f. in Hook. (Aizoaceae)	Afzu	seeds	5.4
ND	Lebtena	leaves: taghia	5.4

**Table 4.5 Other biological remedies reported as difficult to procure in Sahrawi refugee camps**

Remedy	Folk name recorded in the camps	% of quotation (n=37)
<i>Ambra grisea</i> , whale's fat	Enebra	45.9
Honey	Lasal	21.6
Chameleon egg	Buya	16.2
Ostrich ( <i>Struthio camelus</i> L.) fat	Naama	10.8
Yellow and hard clay	Unkel	10.8
Gazelle ( <i>Gazella</i> spp.) meat	Dama	5.4
Unrefined sugar	Azucar el-har	5.4



Beyond *el-alk* (acacia resin) and unrefined sugar, another most highly regarded sweet remedy is honey, which can sometimes be found on sale in Tindouf. Indeed, the main place of origin of the honey consumed in the camps (in six out of seven citations) is Spain, and honey is completely responsible for the almost 2 percent of remedies of Spanish provenance in Table 4.3. Honey arrives in the camps mainly through Sahrawi children who go to Spain during summer holidays under the auspices of NGOs and solidarity groups; in some cases these children bring back pots of honey to the camps.

### **Difficulties in the Procurement of Remedies**

We have shown up to now that traditional Sahrawi medicine is still practiced by refugees after thirty years of living displaced in the desert. We have identified the remedies used, and investigated the variety of solutions that have been established by refugees to procure the remedies they depend upon. The following research questions consequently arise: are there traditional remedies that are difficult to procure? If so, which are these remedies? We investigated these issues through free-listing (“please tell me which are the remedies that you would like to have but that you have been unable to procure”) The results are reported in Table 4.4 for remedies of plant origin, and in Table 5 for other biological remedies of animal or mineral origin, cited by at least two informants. On average, each informant reported about three products, ranging from zero to eight. We found no relation between the number of remedies available in the household at the time of interview and the number of remedies reported as difficult to procure by each informant.

As far as plant remedies are concerned, the list shows all the products that are most frequently used by the Sahrawi as reported in Table 1—i.e., the leaves and resin of *A. tortilis*, the fruits of *A. leucotrichus*, and the leaves of *Maerua crassifolia*—usually gathered in the liberated territories, as well as the dried fruit pulp of *A. digitata* and the resin of *C. africana*, usually bought from traders and in Mauritanian markets. These data indicate that strategies for the procurement of remedies, even for the more common remedies, do not cover all the households and/or all the year(s), and that when a household runs out of remedies it can be difficult to replace them within a short time. These difficulties increase with specific products like the seeds of *Salvia aegyptiaca*, the fruits of *Balanites aegyptiaca*, and the fruits and leaves of *Lycium intricatum*, usually collected in the liberated territories. In fact, fruits and seeds are available for gathering only during rainy years, where a sequence of years completely without rain is common. The cold season between 2004 and 2005 was characterized by an almost complete absence of rain and was not favourable for plant growing and gathering; hence, some families ran out of stock for specific remedies without being able to replace them. Informants reported some characteristic remedies from the part of Western Sahara under Moroccan control: *Euphorbia officinarum* (*daghmus*) is a common species in the oceanic regions of Western Sahara, while its presence becomes scattered as one moves east toward the Polisario-controlled area. *Daghmus* honey, a product valued by the Sahrawi, is produced and sold in the occupied territories, but only in a few cases does it find its way to the camps. Similarly,

*enebra* is a product of oceanic origin described by informants as whale's fat, whale's lees, or part of the whale's intestine and probably corresponding to the homeopathic remedy *Ambra grisea*. The Sahrawi consider *enebra* as a panacea, and half of the informants reported it as very difficult to procure, while no informants had it in the household during the survey. It can be found sometimes on sale in Tindouf, but at very high prices, whereas in the occupied territories, reportedly, it is easier to procure.

Ostrich fat and gazelle meat are difficult to obtain due to the progressive disappearance of these animals from Western Sahara following their destruction by Spanish colonialists and during the war (see Valverde 1957; Cuzin 1996). Among all the animal fats used by Sahrawi, ostrich fat is the most appreciated, especially for broncho-pulmonary infections (Caro Baroja 1955), although fats that are more easily available, i.e., from goats and camels, progressively have substituted ostrich fat. A common characteristic of non-vegetal products most cited in Table 4.5 is their very irregular supply for sale in Tindouf streets and from Mauritanian traders. The high demand in comparison with their availability raises their prices often to unaffordable levels for Sahrawi refugees and makes these remedies subject to faking by individual traders, a fact that refugees are aware of.

### **Knowledge Transmission and Cultural Identity with Displacement**

The Sahrawi identify themselves as nomadic people, depending traditionally on their camel herds and on Western Sahara territory and its resources to meet their needs for food, shelter, fuel, medicine, and other necessities of life. Due to the process of becoming sedentary and displacement to refugee camps, Sahrawi found themselves in a context where their traditional lifestyle could not be continued and most of their knowledge could not be applied or transmitted. In the camps, the conservation of traditional medicine and of ties with Western Sahara—along with other practices like the breeding of camels, sheep, and goats—contributed nevertheless to maintaining traditional Sahrawi perceptions of who they are; in other words a collective cultural identity based on shared knowledge and practices, rooted in their traditional lifestyle and nomadic activities. This link contributes to national identity and to the legitimizing of the political referent of refugees—the Polisario. As Chamberlain (2005) notes, the struggle for national liberation is tied to Sahrawi cultural life in a number of ways, and the cultural practices of the Sahrawi are implicitly and explicitly contrasted with those of the Moroccans. As a result, many aspects of everyday Sahrawi existence (including traditional medicine) become cultural markers that distinguish the Sahrawi from other cultures, and this legitimizes the Polisario's role as a defender of Sahrawi culture. In this context, traditional medicine helps to maintain Sahrawi cultural identity by reminding refugees that they are different in the way they categorize and perceive illness and in the remedies used, where these remedies are often resources of the Western Sahara, their "stolen homeland." The importance of the liberated territories obtained through a guerrilla war, of Polisario combatants in the procurement of the remedies, as well as of the campaigns organized by Polisario for gathering traditional remedies in the liberated territories to be distributed subsequently

in the camps (Mezzetti 1994): all these factors strengthen the connection between cultural and national identity.

Nevertheless, in spite of the strategies elaborated to obtain the remedies and their cultural significance, sociocultural and productive processes that occurred with displacement have affected refugees' use of traditional medicine. These processes undermined Sahrawi shared knowledge and cultural practices, especially in younger people. Half of the population—everyone under the age of 30 years—was born in the camps, and many have studied or are studying abroad, mainly in Cuba (only primary schools are present in the camps), returning to the camps only after the completion of their studies. They are acculturated into Western biomedicine, adopt Western cultural practices, and often possess only a “narrative” knowledge of Western Sahara. Once they return to the camps they often do not participate in the transmission of traditional knowledge, and thus rupture the generational legacy within Sahrawi culture. Consequently, Sahrawi medicinal knowledge transmission has weakened. Upon our asking informants whether they transmitted their knowledge about traditional medicine and, if so, to whom, 22 percent said that they did not transmit it to anyone. In spite of this trend, however, medicinal knowledge transmission has not weakened as much as might have been supposed: 57 percent of informants reported that they transmitted all or part of their knowledge to daughters, usually the youngest daughter, followed by younger sisters (12 percent) and then by friends or other people who asked for it (9 percent). Daughters are far more likely to receive traditional medicinal knowledge from former generations because the transmission of this knowledge among Sahrawi is gendered; in fact, 89 percent of the informants, or “family experts,” were women, and 83 percent of them learned their knowledge from their mothers or grandmothers. In addition, out of four male informants, three did not transmit their knowledge to anybody, indicating that the loss of gender status of popular medicinal knowledge may be related to erosion in knowledge transmission.

To test the hypothesis that the degree of conservation of traditional medicine is related to variations within refugees' generations, we cross-tabulated the age of the informants with the number of different remedies cited by each informant, and present the results in Figure 4.2.

Older informants, as expected, cited more remedies. As Zent (2001) argues, traditional ethnobotanical knowledge, under the pressure of external cultures and new living patterns, decreases with the decreasing age of informants. Generally, younger informants store in their tents only a portion of the variety of remedies stored by older informants, mainly those remedies that were most cited (Table 4.1). The Sahrawi obtain these products mainly from their cultural keystone species, i.e., species that are culturally salient and strongly shape people's cultural identity, following the definition by Garibaldi and Turner (2004). For example, the Sahrawi use *A. raddiana* in multiple ways: its parts are taxonomically differentiated with specific labels, and it plays a role in Sahrawi traditional narratives, songs, and symbolism.

Sahrawi families maintained their use of *A. raddiana* and its products in the camps, where the relation between these remedies and cultural identity

is mediated by the possibility to procure them in the Western Sahara. The households that are not integrated into effective procurement networks with the liberated territories usually buy culturally important remedies in markets, from traders or obtain them and the related knowledge for free from other tents in the camps. Exchanges of remedies eventually fortify cultural links among refugees, between refugees and the liberated territories, and between refugees and the Sahrawi living in the occupied territories.

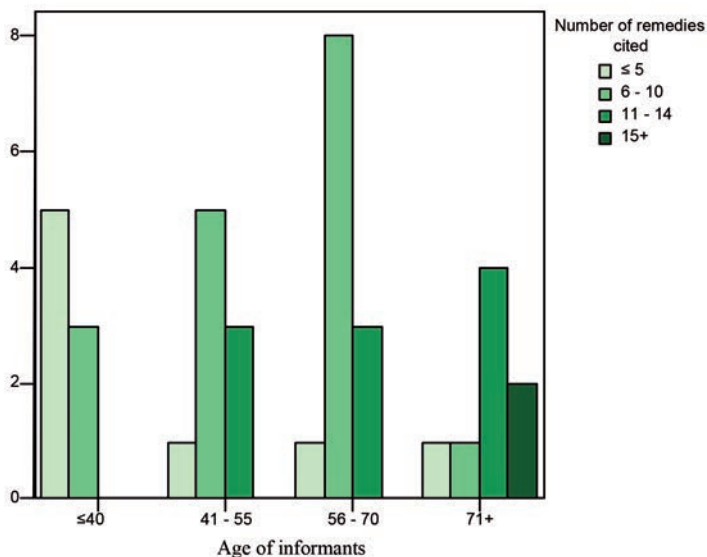


Figure 4.2 Cross-cultural bar chart between informants' age and number of remedies cited

## Conclusions

The data presented in this chapter show that Sahrawi refugees have preserved the use and knowledge of traditional medicinal remedies in the camps, and that they rely on a variety of networks in order to obtain these remedies. Most are wild plants gathered in the part of Western Sahara under control of the Polisario, and soldiers stationed there play an important role in the procurement of these remedies for refugees' families. The conservation of traditional medicine in this context represents a means to maintain cultural identity, and the procurement of remedies from the liberated territories in Western Sahara is a means for refugees to maintain ties with their place of origin. The conservation of traditional knowledge and practices also represents resistance against acculturation and despair. Many refugees report feeling that their lives have been wasted, and have abandoned hope of ever returning to Western Sahara. This, as well as the influence of different host cultures for the Sahrawi who have studied abroad, lead slowly to the loss of traditional knowledge and to the ties with Western Sahara for the younger generations, who often know and use only the most culturally relevant remedies.



# CHAPTER 5

## Eghindi Among Sahrawi Refugees of Western Sahara<sup>22</sup>

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### Abstract

*Eghindi* is an illness built around a set of pathological states experienced by Sahrawi in the desert environment of Western Sahara. Its core symptoms are caused by osmotic imbalances related to salt consumption. In 1975, many Sahrawi were exiled into refugee camps, and they have since experienced radical sociocultural changes, which are reflected in changing explanatory models of eghindi. Older and conservative refugees, attached to traditional Sahrawi culture, have expanded its conceptualization to include new pathogenic factors, while younger and progressive refugees, acculturated with Western culture, began challenging its existence. Eghindi became embodied within a broader process of negotiation of Sahrawi cultural identity. Our findings provide a framework for thinking about the evolution of illness in response to displacement, and highlight that when explanatory models evolve, intra-cultural tensions can arise within a population.

**Keywords:** Displacement; Ethnoecology; Ethnomedicine; Explanatory Models; Refugee Camps; Salt Intake

### Introduction

During the past decade, there has been a growing interest in the ways that traditional medical knowledge changes in contexts of urbanization, migration, and diaspora within the field of ethnobiology (Waldstein and Adams 2006; Pieroni and Vandebroek 2007). For example, a framework for studying the impact of migration and cultural change in the use of medicinal remedies

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has developed, which helps us to better understand the relationship between population movements and healing strategies (Volpato, Godínez, and Beyra 2009; Muniz de Medeiros et al. 2012). However, this welcomed line of research has been limited by minimal engagement with medical anthropology and the absence of studies that address the effects of sociocultural change on knowledge of disease (pathological states that manifest as signs and symptoms), of illness, the term we use to refer to individual experience of distress, and sickness, which, following Allan Young (1982), we use to refer to the socially shared construction of illness and disease. In this article, we explore the possible ways through which sickness constructions and experiences of illness are modified in response to sociocultural and environmental change. By using as a case study the Sahrawi condition called *eghindi*, we show that cultural change can lead people to create, abandon, and/or adapt health concepts and categorizations to new cultural paradigms, and that different models may be adhered to by different social strata of a single population (e.g., according to sex, age, education, lifestyle), with the possibility of creating intracultural tensions.

*Eghindi* is widely recognized among Sahrawi nomads and refugees of Western Sahara, and has no distinct biomedical equivalent. The condition includes various pathological states that result from interactions with the external environment through eating (e.g., consuming an excess of salty or bitter foods) or breathing (e.g., inhaling the scent of dead bodies). Below, after we briefly describe our methods and research site, we address *eghindi* as Sahrawi do, qualitatively describing its epidemiology, known causes, symptoms, and therapies, allowing us to build a basic explanatory model. We then consider *eghindi* as a culturally defined and constructed experience of distress with biological, social, and spiritual roots (McElroy 1996). What emerges is a distinction between ‘nomadic’ (as described in historical sources, through retrospective interviews, and by contemporary nomads) and ‘sedentary’ (as described by Sahrawi refugees) models of *eghindi*. To explain this distinction we draw on biocultural and critical medical anthropology. Biocultural aspects of *eghindi* illustrate how the understandings and experiences of the illness are shaped by the local environment and Sahrawi adaptations to it. The sedentary explanatory model reflects the changes that have occurred in Sahrawi society during the last forty years, especially as a result of forced displacement, dependence on food aid, and the assimilation by refugees of Western food and health concepts and practices. With displacement to refugee camps and the loss of their livelihoods, Sahrawi refugees found themselves in a condition where traditional knowledge, beliefs, values, and modes of subsistence could not be maintained and transmitted. Within refugee camps, the pastoral life of the Sahrawi was replaced by food aid and biomedical care. These were provided under the guidance and organization of the Polisario Front, which promoted ideas of development, based on Western concepts and practices, to prepare refugees to be citizens of a ‘modern’ Western Sahara upon return to their homeland. We discuss how these changes influenced the conceptualization of *eghindi*, and how *eghindi* was adapted and challenged at the same time.

We conclude by arguing that investigations of explanatory models should



address social and cultural changes as they relate to issues of identity and social acceptance. Constructions of sickness around various pathological states, and individual experiences of illness, are continually changing with migration, acculturation, and cultural redefinition. Moreover, changes in livelihoods and in a population's living environment may bring changes to the core pathological states of a sickness, which may cause (1) a redefinition of the pathological states involved while maintaining the narrative and explanations of the sickness, e.g., for cultural identification; or (2) an abandonment of the sickness as an explanation of pathological states, either because those pathologies are no longer present, or because alternative explanations (e.g., from other medical systems) for individual experiences of illness have been adopted. In the case of eghindi, both these processes are taking place.

### **Research Site**

'Sahrawi' is the name given to the tribes of pastoral people who traditionally inhabited a desert area of northwestern Africa including Western Sahara, northern Mauritania, and part of south western Algeria. Sahrawi people were nomadic, tending camels, goats and sheep, and relying for food on livestock products and dates, sugar, cereals, and legumes bartered for livestock in markets on the periphery of their nomadic areas (Caro Baroja 1955). In 1975, after 50 years of Spanish colonial rule, the Western Sahara was occupied by the Moroccan army and in the ensuing few years, about 70,000 Sahrawi became refugees. After 16 years of war (1975-1991), and the exclusion of refugees from most Western Saharan territories by a 2,700 km-long Moroccan-built sand wall with military posts, fences, and landmines throughout, cutting Western Sahara in a north-south direction, today about 165,000 Sahrawi people live in four refugee camps located on a desert plateau called Hamada near the Algerian city of Tindouf (San Martin 2010). There, since the ceasefire of 1991, they have been waiting for an UN-sponsored referendum for self-determination to be held, which would allow them to return to their homeland. They still wait. In the camps, refugees live in canvas tents and mud brick huts, with severe problems of water and food supply. The European Union, UN agencies, Algeria, and several solidarity groups make food, shelter, and other basic commodities available (San Martin 2010). At the same time, refugees have developed an informal economy, marketing many products (e.g., food and drinks, perfumes, cars and car parts, livestock, etc.), expanding trading routes through the camps with goods from Mauritania, Algeria, and Spain, where the majority of the Sahrawi diaspora lives (Dedenis 2005; Herz 2013). In the process they have also reactivated social and market networks of procurement of traditional ethnobiological products such as medicinal remedies and desert truffles (Volpato, Rossi, and Dentoni 2013).

Outside the camps, Sahrawi refugees – through their political representative, the Polisario Front – also have access to the eastern part of the Western Sahara, which was taken from Moroccan control during the aforementioned guerrilla war that lasted until the peace agreement of 1991 (Bhatia 2001). These inland areas are the so-called 'liberated territories' (approximately 20 percent of the total Western Sahara); the remaining 'occupied territories' are under the

administering authority of the Moroccan government. Pastoral areas of the liberated territories are important in refugees' efforts to recover traditional livelihoods and cultural and social practices, including livestock husbandry and medicinal plant use (Corbet 2008; Volpato, Kourková, and Zelený 2012).

## **Methods**

The ethnographic data used in this study were drawn from fieldwork in Sahrawi refugee camps and in the liberated territories conducted by the first author between 2005 and 2009. Fieldwork methods included semi-structured and retrospective interviews with refugees and nomads. Semi-structured interviews focused on collecting data about the etiology, epidemiology, reported symptoms, treatment, and prevention of eghindi, and were conducted to elucidate contemporary models of eghindi among refugees. Retrospective interviews were conducted mainly with older informants and aimed at obtaining information about eghindi in the pre-1975 pastoral life in order to reconstruct eghindi before forced displacement, and thus to establish a baseline of the etiology and management of eghindi to understand how it has changed. Some 38 semi-structured interviews and 14 retrospective interviews were conducted with various informants identified randomly; informants differed in terms of sex (about 60 percent were women), age (all ages), education (non-schooled refugees and nomads as well as refugees with university degrees), and main productive activity (three informants were traditional healers, others were non-working refugees, herders, shopkeepers, traders, construction workers, butchers, mechanics, and Polisario soldiers and personnel). Information about eghindi was also collected in an informal way by bringing up the topic during conversations with refugees and with expatriates working with local NGOs, mostly Spanish and Italians. This provided us with a picture of how eghindi is understood by NGO workers in the refugee camps.

Interviews were conducted in Hassaniya (the Arabic language with a Berber substrate spoken by the Sahrawi) and Spanish. In the presence of the first author, local research assistants, selected on the basis of their Hassaniya/Spanish bilingualism and familiarity with Sahrawi cultural heritage, asked the questions in Hassaniya and translated the answers into Spanish (the second most frequently spoken language among the Sahrawi, and spoken fluently by both authors). Interviews were recorded and transcribed with the help of the same research assistant to minimize translation errors and clarify information. Transcripts were then entered into Nvivo qualitative data management software, and codes, concepts, and categories were generated during analysis, allowing us to develop the theory we present below. Participants were given an explanation of the methodology, aims, and outcomes of the study, and informed consent was obtained verbally before interviews were conducted. Throughout the field study, the ethical guidelines adopted by the American Anthropological Association (1998) and by the International Society of Ethnobiology (2006) were followed. Plant nomenclature follows the Sahara and Western Sahara botanical standard treatises (Ozenda 1991; Lebrun 1998) for Saharan species and the International Plant Name Index ([www.ipni.org](http://www.ipni.org)) for all others. Voucher specimens (i.e., representative specimens of the plants,

collected during interviews, and used to confirm the identity of the species referred to in the study) have been deposited in the National Herbarium of The Netherlands (Wageningen Branch – Herbarium Vadense).

### **Sahrawi Explanatory Models of *Eghindi***

The ‘explanatory model’ concept was conceived in the late 1970s by Arthur Kleinman and colleagues as a way of systematizing cultural ideas about illness and disease and providing appropriate medical treatment to patients (Kleinman, Eisenberg, and Good 1978). Explanatory models are characterized by the following five elements: (1) an explanation of the presumed cause(s) of the malady, (2) associated signs and symptoms, (3) an explanation of the pathology and physiology involved, (4) prognosis, and (5) recommended treatments. Although based on individual experiences of illness, explanatory models are culturally determined and widely shared among members of a given culture (Weller and Baer 2001). The elicitation and construction of explanatory models allow the anthropologist to play with theoretical concepts in ways that provide insight into the evolution of illness and sickness, as they reflect changes in social and cultural life. As we will show, multiple explanatory models of *eghindi* thrive in Sahrawi refugee camps, thriving in environments full of biomedical and other global capitalist influences that deny its existence.

*Eghindi* (and its possible transliterations: *eguindi*, *ighindi*, *iguindi*, *igendi*) is mentioned only a few times in the scant ethnological reports and anthropological studies on Western Sahara nomads and refugees, in relation to the consumption of brackish/salty water (Guinea 1948; Boyer 1962) or exposure to strong smells (Caro Baroja 1955). In reviewing the ethnomedical literature, we found no evidence of *eghindi*-like illness among other nomadic and pastoral populations (including the neighboring Tuareg), and *eghindi* appears to be limited to the Hassaniya-speaking nomadic tribes of Western Sahara and Mauritania. The earliest published report of the condition (‘*iguindi*’) is among Mauritanian Moors (Comméléran 1911: 324-327), and is described as an affliction characterized by a “hard edema of the inferior members, accompanied by generally not severe gastro-intestinal problems,” and having as “unique etiological cause the consumption of brackish or salty water,” due to the prevalence of wells with salty or brackish water in the area. When nomads have no choice but to drink salty water from these wells, for instance when travelling and/or shepherding a camel herd, they become affected by various problems known as *iguindi*, treatable by consuming fresh water and food. More recent studies in Mauritania tentatively associate *eghindi* with diseases such as tuberculosis and epilepsy (Ould Taleb 2007; Traore et al. 1998). *Eghindi* has also been reported to be caused by excesses in other substances: Tauzin, for example, suggests that ‘*igendi*’ is due to the ingestion of food too salty, too bitter, or too fatty, or long exposure to the sun: “It connotes excess, sometimes inseparable from the absence of self-control” (2001:176). It may also be caused by exposure to pollutants or allergens (Mohamed Embarek 2005). The Sahrawi explanatory models of *eghindi* presented below are also based on perceived causes and effects of water and salt balance in the desert, but these have been

expanded to include other environmental agents. In Table 5.1, we list etiologic factors, reported symptoms, and treatments of eghindi as reported by Sahrawi informants and in descending order of importance.

### ***Perceived causes and reported symptoms of eghindi***

Among our Sahrawi informants, eghindi is most commonly said to be caused by foods and drinks. “The right hand is the main agent of eghindi, because one uses the right hand for cooking and eating,” in the words of one refugee. Most commonly reported, almost emblematically, food-borne eghindi is said to be caused by the ingestion of kitchen salt (NaCl), salty food, or salty/brackish water, although other etiological factors include the ingestion of pungent and bitter foods, concentrated and bitter tea, milk with a strong smell or taste, and burnt foods (e.g., meat, bread). In Table 5.2, we report a list of thirteen vegetal species that can also cause eghindi, including traditional medicinal products like the seeds of *Whitannia somnifera* and the aerial parts of *Ruta tuberculata*. Eight of the 13 plants cause eghindi by giving a strong, bitter or pungent taste to milk obtained from camels that graze on these plants (e.g., from *Anvillea radiata*, *Asteriscus graveolens*, or *Launaea arborescens*), in large amounts. According to informants, when Sahrawi were fully nomadic there were times in which everyone in the *friq* (the nomadic camp) had eghindi after consuming bitter milk due to the flora of the local grazing area. To avoid this, Sahrawi used to add sugar to the milk, or boil, and/or dilute it (and the taste) with water. Smell-borne eghindi is due to burnt smells (e.g., of burnt garbage), strong smells (e.g., of smoke), chemical smells (e.g., of chemical products, cars’ and trucks’ discharge gases), and dust.

Among Sahrawi nomads and refugees, eghindi may manifest in different ways depending on the specific cause. Based on the interviews, the most frequently reported symptoms of food-borne eghindi are swelling of the front and side of the neck, a burning feeling in the throat and sometimes the stomach, skin rashes and itching. Other reported symptoms include respiratory difficulties, tachycardia, swollen face, earache, stomach problems, and even a temporary paralysis (e.g., of the side of the face after drinking bitter tea). Smell-borne eghindi manifests with “dryness in blood circulation that does not come up in any medical analyses,” respiratory difficulties (e.g., asthmatic episodes), dry cough, sneezing, and bad dreams. Smell-borne eghindi at times also leads to neck swelling.

### ***Prognosis and treatment***

Sometimes, cases of eghindi may resolve themselves without treatment. For example, Ahmed (42 years old) recalled: “Last Friday evening I was invited for dinner and I ate part of the tripe. They were bitter, and at two or three in the morning, while sleeping, an itching in the ear started, and when this happens, it is the signal of eghindi. The day after I felt a burning feeling in the stomach, which disappeared in two or three days without a treatment; I did not take any treatment on this occasion because I knew (from experience) that eghindi from tripe would disappear in a few days.” However, when symptoms are severe, eghindi is usually treated with various products, mostly of vegetal

**Table 5.1 Overview of etiologic factors, symptoms, and treatments of eghindi among the Sahrawi of Western Sahara**

<b>Etiologic category</b>	<b>Etiologic factor*</b>	<b>Symptoms</b>	<b>Treatments</b>
Food-borne eghindi	Ingestion of salty foods and kitchen salt	Neck swelling	Plant remedies-Table 5.3
	Ingestion of pungent/spicy foods	Burning feeling	Honey and other sweet products
	Ingestion of bitter foods (e.g., tripes)	Stomach problems	Goat liver with sugar
	Ingestion of strong/bitter tea	Skin rashes and itching	Washes with sweet perfumed waters
	Ingestion of strong churned or over-fermented milk	Itching in the ear, earache	Fruit syrups (e.g. peach, melon)
	Ingestion of milk with taste at specific plant-Table 5.2	Temporary paralysis	Dry camel meat with roasted barley
	Ingestion of burnt foods (e.g., meat)	Tachycardia	
	Ingestion of too much garlic	Fever	
	Ingestion of processed foods (canned tomato, cheese)	Weakness	
	Intravenous drips	Swollen face Eye infection Headache Colitis Diarrhoea Bad dreams	
Smell-borne eghindi	Strong smells in plants, milk, and meat-Table 5.2	Dry cough	Plant remedies-Table 5.3
	Smell of corpses, dead animals	Respiratory difficulties	Sweet products
	Smell of burnt material (e.g., garbage)	Dryness in blood circulation	Drops inhalations
	Smells of paints, fuel, discharge gases, and chemical products	Neck swelling	Smoke inhalations (e.g., of mastik resin)
	Breathing smoke from an old cigar/cigarette	Bad dreams	
	Dust	Sneezing	
	Smell of manure		
*Etiologic factors cited by just one informant (e.g. spaghetti, olives) have been left out of the table			

**Table 5.2** Vegetal species that can cause eghindi among the Sahrawi of Western Sahara

Species (voucher number)	Family	Name of the plant in Hassaniya	Part involved	Effects
<i>Anvillea radiata</i> Cosson et Dr. (2039)	Asteraceae	Negd	Aerial parts	It gives milk a bitter taste that can cause eghindi
<i>Argania spinosa</i> Skeels	Sapotaceae	Argan	Aerial parts	It gives milk a bitter taste that can cause eghindi
<i>Asteriscus graveolens</i> Forssk. (2043)	Asteraceae	Tafsa	Aerial parts	It gives milk a bitter taste that can cause eghindi
<i>Astragalus eremophilus</i> Boiss.	Fabaceae	Umm harza	Aerial parts	It gives a strong and unpleasant taste to camel tripes, which may cause eghindi; tripes are washed more times before cooking to eliminate the plant's taste
<i>Citrullus colocynthis</i> Schrad.	Cucurbitaceae	Hadgit lehmar	Fruit pulp	Its ingestion can cause eghindi
<i>Cleome africana</i> Botsch. (1026)	Capparidaceae	Lemkheinza	Leaves	Leaves are used in decoction for stomach pains; the strong smell of the plant can cause eghindi when used as medicinal remedy
<i>Cotula cinerea</i> Del. (1083)	Asteraceae	Rebruba, gartufa	Aerial parts, flowers	It gives milk a bitter taste that can cause eghindi
<i>Launaea arborescens</i> (Batt.) Maire (1071)	Asteraceae	Umm Ibenza	Aerial parts	When green, it gives to camel meat and milk a bitter taste that can cause eghindi
<i>Launaea mucronata</i> Musch. (2027)	Asteraceae	El mekker	Aerial parts	It gives to camel meat and milk a bitter taste that can cause eghindi
<i>Malcolmia aegyptiaca</i> Spr.	Brassicaceae	Shgaa	Aerial parts	It gives a strong and unpleasant taste to camel tripes, which can cause eghindi
<i>Reseda villosa</i> Coss.	Resedaceae	Yamin	Aerial parts	It gives milk an unpleasant smell that can cause eghindi
<i>Ruta tuberculata</i> Forssk.	Rutaceae	Feiyel	Aerial parts	Used in decoction to treat respiratory infections; the strong smell and properties can give eghindi
<i>Withania somnifera</i> Dunal in DC.	Solanaceae	Sekran	Seeds	Used for intestinal problems and meteorism; too many seeds may cause eghindi

**Table 5.3 Vegetal species used in the treatment of eghindi among the Sahrawi of Western Sahara**

Species (voucher number)	Family	Name of the plant in Hassaniya	Part used / Name of the part in Hassaniya	Preparation and Means of Use	Medicinal use
<i>Acacia ehrenbergiana</i> Hayne (1015)	Fabaceae	Tamat	Resin: el elk tamat	Triturated, sugar is added, ingestion	Eghindi
<i>Acacia seyal</i> Del. (1076)	Fabaceae	Aureuar	Resin: el elk aureuar	Triturated, sugar is added, ingestion	Eghindi
<i>Acacia tortilis</i> Hayne (1010)	Fabaceae	Talha	Resin: el elk talha	Triturated and dissolved in milk or tea with sugar, left to cool all night long and drunk in the morning / triturated, roasted, topical application in a poultice with water	Eghindi and inflammations / earache from eghindi
			Leaves, flower: anish	Triturated, mixed with el elk, milk cream, and sugar, heated and drunk	Eghindi, colitis with bleeding
<i>Adansonia digitata</i> L.	Bombacaceae	Teidoum	Dried fruit pulp: tashmaht	Mixed with water and el elk and drunk or ingested as powder	Digestive problems by eghindi
<i>Asphodelus tenuifolius</i> Cav. (1078)	Asphodelaceae	Tazia	Seeds	A flour is obtained from the seeds and ingested	Eghindi
<i>Corrigiola telephiifolia</i> Pourret (1089)	Caryophyllaceae	Taserghinit	Roots	Cooked, pounded, mixed with sugar, ingestion	Eghindi
<i>Crocus sativus</i> L.	Iridaceae	Zafran	Stigmas	Mixed with mastik resin, burnt on the fire, smell is inhaled	Smell-borne eghindi
<i>Ficus carica</i> L.	Moraceae	Karmus	Fruits	Eaten	Eghindi
<i>Ferula</i> sp.	Apiaceae	Sinbil	Resin	Decoction and inhalations in drops	Eghindi
<i>Hordeum vulgare</i> L.	Poaceae	Zraa	Seeds: legliya	Toasted seeds are mixed with dried camel meat and eaten in small doses every day	Digestive problems by eghindi
<i>Lavandula</i> spp. (1022)	Lamiaceae	Lejzema	Flower tops	Decoction in tea	Eghindi, digestive
<i>Lycium intricatum</i> Boiss. (1085)	Solanaceae	Ghardeq	Fruits: asako, tebnina	Eaten raw	Eghindi
<i>Opuntia ficus-indica</i> Mill.	Cactaceae	Kranit	Fruits	Eaten raw	Eghindi
<i>Phoenix dactylifera</i> L.	Palmae	Tamra (dates)	Fruits	Ingestion as such or mixed with el elk	Eghindi
<i>Pistacia lentiscus</i> L.	Anacardiaceae	Tidikt (mastik)	Resin	Mixed with saffron, burnt on the fire, smell is inhaled / triturated, mixed with sugar, sniffed	Smell-borne eghindi / sinusitis by eghindi
<i>Rhus albidia</i> Schousb.	Anacardiaceae	Zauaya	Fruit: anafis	Eaten eaw	Eghindi
<i>Rhus tripartita</i> (Ucria) Grande (1023)	Anacardiaceae	Shdari	Fruit: thmagh	Eaten raw or triturated and added to tea or milk	Eghindi, digestive



origin (Table 5.3). Sahrawi use products from 17 different species, and include: sweet-tasting and good-smelling resins (e.g., from *Acacia tress* and *Pistacia lentiscus*); sweet fruits harvested from the wild (e.g., from *Lycium intricatum* and *Rhus species*) or purchased (e.g., figs, dates); products appreciated for their taste or smell (e.g., *Lavandula species*); and remedies targeting specific eghindi symptoms (e.g., baobab fruit pulp for digestive problems). Remedies are usually ingested, apart from topical applications related to earache and inhalations of pleasant smoke (from saffron and mastic resin) to treat smell-borne eghindi. The product most often used as a remedy for eghindi is the resin of *Acacia tortilis* (and less importantly from *Acacia ehrenbergiana* and *Acacia seyal*), which is mixed with dates, dissolved in tea or, more commonly, triturated and mixed with water.

Among the products of animal origin used to treat eghindi, the most important is honey. It is not produced in the desert, but is purchased in Tindouf, sent to the camps by emigrants, or brought there as gifts by Cooperation workers or Sahrawi children returning from summer holidays in Spain (Crivello, Fiddian, and Chatty 2005:19). In serious cases of eghindi (e.g., with acute neck and face swelling), goat liver cooked with sugar and dry camel meat roasted with barley grains are used as remedies. Sahrawi explain that dry products (without water or salt) like dry meat are able to “absorb the swelling from the inside.” Sultana (62 years old) recalled: “My nephew once ate the salty remnants from the bottom of the cooking pot. He swelled a lot, especially his face was swollen, his eyes were very small, and his heart was racing. His conditions were severe, and so my daughter went straight to the butchers here in the refugee camp to buy a goat liver. We baked the liver on the embers with sugar all over it, and gave it to him to eat in small pieces. Also we washed his face with peach-flavored water. The following day he was already feeling better.”

### **Biocultural Roots of Eghindi Among Sahrawi Nomads**

Biocultural perspectives in medical anthropology stress the ecological complexity of illness and disease etiology (Armélagos et al. 1992; McElroy and Townsend 1996), and so the biological, ecological, and cultural factors that influence particular conditions. The prototypical ethnomedical explanation of eghindi is a rationale for maintaining homeostasis in the desert by balancing water and sodium levels by avoiding salt consumption. Eghindi is based on the idea that high concentrations of salt in some foods or drinks create an imbalance in the body that can lead to several signs and symptoms (e.g., neck swelling, burning feeling of the stomach, etc.) and is treated with sweet remedies, in accordance with the rule of opposites. Among Western Sahara nomads, eghindi reinforces a series of food rules related to salt and other substances (spicy, bitter, burnt foods, and smells). Because the definition of a taste or smell as “good” or “bad” is culturally determined, eghindi as a cultural construct is recognized, accepted, and shared by the tribes of camel nomads of Western Sahara and northern Mauritania.

The Sahara environment is saturated with salt: there are salty crusts on the ground, salt particles in the air, salty and brackish water. To cope with this, desert animals (including humans) have physiological, morphological, and

behavioral adaptations to water shortage and salt saturation (Macfarlane 1973; Louw and Seely 1982). Humans living in these environments also have adapted culturally to reduce their salt and water consumption and maintain a rigorous homeostatic balance (Rubini 1970), and like other hunters, nomads, and pastoralists, the Sahrawi usually obtain all the salt they need from the meat and milk of wild and domesticated animals (Denton 1969; MacGregor and de Wardener 1998), who in turn obtain salt from salt licks and halophytic plants (Lev-Ran and Porta 2005). The Sahrawi are camel pastoralists, and camels consume six times more salt than any other herbivore. Camel milk and meat are therefore saltier than the milk and meats from other domesticated animals, and the consumption of camel milk and meat provide humans with sufficient salt. Sahrawi nomads tried to cope with an environment rich in salt and poor in fresh water in various ways. Mainly, they use water sparingly and avoid salt and salty food (salt consumption increases water needs) other than the milk and meat from their animals (Paque 1980).

Among Saharan nomads, the practices and norms related to salt consumption are embedded in a system of rituals and beliefs (Paque 1984). Eghindi roughly functions as a salt taboo, enforcing a set of health and food practices and rules. Like salt taboos among other populations (Neumann et al. 1977), recognizing and labeling eghindi, and practices that developed in response to it, probably began among Sahrawi in order to limit salt intake. But avoiding salty or brackish water was not easy: wells were few in Western Sahara and most had brackish water with high concentrations of chloride, sodium, and nitrates (Boyer 1962). These concentrations may be responsible for some symptoms of eghindi: water rich in chloride and sodium can cause edema, and nitrates can cause intoxication, especially if food intake does not provide enough carbohydrates to enhance the elimination of nitrates by transforming them into ammonia (Boyer).

Edema can be caused by continued or increased intakes of sodium (Neumann et al. 1977), and by changes in the hydrostatic and oncotic pressures within the body causing unbalances in fluid homeostasis. Edema caused by fluid retention is usually temporary, and it occurs when water accumulates in the body as consequence of the ingestion of salty food and high-sodium meals. Edema is also a clinical sign of hypernatremia, i.e., elevated sodium levels in the blood. After ingesting salt in excess, Sahrawi may experience hypervolemic reactions with severe elevations of sodium levels. Hypernatremia can cause seizures and coma, which may explain the correlation between eghindi and epilepsy proposed by Traore et al. (1998). Hypernatremia also triggers a sensation of thirst, precipitating increased intake of water to correct the fluid imbalance. However, due to physiological and cultural adaptations to the desert environment, Sahrawi do not ingest copious water and their sensation of thirst may be perceived as a 'burning sensation' in the mouth and upper digestive ways, as reported by many informants. This burning sensation would be treated with fresh water and various sweet products.

The use of sweet products to treat salt-borne eghindi may be because of the contrast in taste with salty (and bitter) substances, but may also have a physiological and cognitive basis. Under non-thirst conditions, waters with

about 1-2 g/l of salt have a sweetish taste, while their taste becomes salty around 4 g/l, and eventually salty and bitter around 8-12 g/l (Paque 1998:85). The preference for a sweet taste and the use of sweet remedies to treat eghindi may be derived from the relative tastes and salt concentrations of waters in the desert, and the selection for foods and drinks of sweet taste may be a behavioral adaptation to minimize salt intake. Hence, as argued by Paque, Western Sahara nomads have developed physiological 'stop signals' when too much salt is ingested. These stop signals (e.g., headaches) and their physical manifestations (e.g., edema) are the core of eghindi. They have various – sometimes personal – manifestations and, as shall be seen, are still present among Sahrawi refugees in spite of the social and cultural changes that they went through during the last forty years.

### **Eghindi and Sahrawi Food Norms**

Salt is at the core of eghindi, but our data suggest that in its evolution, eghindi has come to include other pathogenic factors (e.g., bitter flavors and strong smells, see Table 5.1) and associated symptoms. These symptoms include extrasystoles (i.e., premature ventricular contractions, with associated irregular heart beat and palpitations, among other signs) caused by adrenergic substances (e.g., tea); digestive problems due to food that is too fatty or burnt, or that is badly processed or stored; dermatitis and skin rashes caused by allergenic substances; and episodes of asthma and intoxication caused by inhaled substances (Mohamed Embarek 2005). The rationale behind salt-borne eghindi was thus extended to other pathogenic factors on the basis of cognitive association. These factors cause eghindi because of their concentration in foods, drinks, and in the local environment. At the same time, transgressions of Sahrawi food and behavioral norms, besides that of salting food, became conceptualized as eghindi. Arguably, in some cases this was a result of a process in which Sahrawi food norms were strengthened and enforced by associating them with pathological states and labeling them as a sickness. Thus, eghindi became a cultural means through which Sahrawi nomads made sense and transmitted to younger generations the rules of engagement with the desert environment and its tastes and smells.

Traditionally, the diet of Sahrawi nomads was based on pastoral products, and was limited in both variety and quantity. The voluntary or involuntary transgression of food norms would trigger eghindi, associated pathological states, and treatment practices. Avoiding eghindi includes norms for correct food consumption, especially for children (e.g., do not add salt, eat regularly, do not eat too much, etc.). Through the transmission of food norms across generations, Sahrawi are exposed to eghindi from childhood. Parents classify pathological states in children as eghindi (or not) and identify the pathogenesis, thus educating children about eghindi. Some mothers will prohibit some foods to children (e.g., cheese, olives) saying "if you eat this, you will get eghindi," and will often attribute cases of eghindi in their children to some food or drink they ingested outside the home (e.g., in other tents). Children learn to connect a desire for sweet products with eghindi. On one of the first author's travels to the camps, he brought a pot of honey as a present to a research assistant. The

research assistant took the pot, showed it to his five-year old daughter, and told her: “Look at the honey. This is good for eghindi.” Children assimilate this relationship and from the age of around 10, start themselves to use this to explain the effects of certain foods and smells.

Eghindi as an explanatory model of the risks of engagement with the desert environment is transmitted across generations and with associated cultural norms, and is shared and enforced by adults: eghindi prevention becomes a way of enforcing food rules, and hence of enacting Sahrawi cultural identity around food. This is exemplified in relation to the preparation of tea, a main ritual in Sahrawi social practices: when someone prepares a bitter tea that causes eghindi, then that person will be criticized for preparing such a tea, will be victim of scorn because the tea caused eghindi, and will not be allowed to prepare tea for the bystanders again. On a similar note, Cozza (2010:126), while discussing food and drink preferences of young Sahrawi refugees, reports that youth are reprimanded when they are not able to prepare a good tea.

### **Effects of Social and Environmental Change on Experiences and Explanatory Models of Eghindi**

The globalization of biomedicine has been effected through relationships that have developed between the medical profession, the state, and the pharmaceutical and biotechnology industries (Clarke et al. 2003). While in many parts of the world, the process of biomedicalization has largely displaced traditional medical concepts, therapeutic techniques, and even whole systems (Waldstein 2010), certain environmental, political, economic, and/or social contexts may prevent this from happening. By critically examining these contexts, we can better explain how and why certain medical concepts are adapted rather than abandoned when challenged by social and environmental changes. We have seen that eghindi is a multi-faceted condition that is part of the cultural heritage of Sahrawi nomads. Its initial conceptualization appears to have been aimed at formalizing rules regarding foods and smells, and explaining associated pathological states, in the desert environment. However, in 1975 many Sahrawi were forced into refugee camps; since then radical changes have occurred in their social organization and culture, including eghindi. As food supply, water procurement, engagement with the desert environment, and consequently the nature and intensity of pathological states changed, the explanatory power of eghindi was challenged. Different processes have acted upon the understanding of eghindi among refugees during the last forty years. Below, we examine how eghindi has been adapted in the refugee camps as a means of preserving Sahrawi food norms and cultural identity.

With the war, exile to refugee camps, and dependence on food aid initially, and then with the trade expansion and the availability of new industrial products, Sahrawi found themselves in a situation where traditional food norms were difficult to follow (Cozza 2010). This occurred as refugees struggled to retain aspects of their lost nomadic life and cultural heritage, while simultaneously younger refugees were attracted towards a Western lifestyle. The literature on refugees identifies two contrasting processes of cultural change in situations of exile (Couldrey and Morris 1999). The first is a tendency toward the loss and

abandonment of traditional culture, which is maintained only among elderly and specific (often marginal) groups. The second is a process of recovery and maintenance of traditional culture in order to promote recovery of productive activities and cultural identity. Both of these processes take place in relation to eghindi, where its conceptualization seems to have taken two paths. Some Sahrawi refugees expanded their conceptualization of eghindi by associating the new foods (e.g., canned fish, cheese, pizza) and smells (e.g., garbage, manure, chemicals) of the camps with pathological states. While refugees welcomed new sweets, candies, and concentrated juices (some of which have been adopted as eghindi remedies), they blamed an increased number of episodes of eghindi on the dressings, spices, and processed salty products introduced to them with food aid. More conservative and older refugees tend to regard most processed foods as possible causes of eghindi: some older people do not eat canned tomato and canned fish, and do not drink packed cow's milk or powdered milk. This is how Sidahmed (38 years old) explained this: "During nomadic life people relied on a few food products – milk, meat, and flour, along with tea and sugar. To older people, every change to this food pattern is harmful." Episodes of food-borne eghindi often occur when Sahrawi eat food prepared by European expatriates (e.g., pasta and pizza cooked by Italians), which they invariably regard as too salty. The list of moribific factors for eghindi in the refugee camps include intravenous drips used in the local hospital, as a Cuban doctor working in the camps explained: "Sahrawi reject salt, which they identify as a main cause of eghindi. In some cases, when admitted to hospital, they even refuse intravenous saline drips [a solution of sodium chloride at 0.9 percent concentration] if they are told that it contains salt."

Along with rejecting processed foods, older and conservative refugees emphasize the importance of traditional foods such as camel meat and milk for culture and health. These refugees challenge the value (e.g., nutritional, taste) of some new foods present in the markets and made available through food aid, and contrast these processed foods with livestock products of the nomadic territory; they regard that traditional food habits is the way to eat 'like a Sahrawi' and to prevent eghindi. Moreover, treating eghindi always involves traditional remedies; we found no case of substitution of these remedies with biomedical products. The procurement and use of traditional remedies for eghindi support the link between Sahrawi refugees and their former nomadic territories (i.e., the liberated territories and northern Mauritania) where these remedies are found. This link has been renewed in the last two decades with refugees' reengagement with pastoralism and seasonal nomadism, as Sahrawi have sought to recover their cultural heritage and its practices. To conservative Sahrawi, eghindi has come to represent (1) an assertion of which food ought to be eaten and how, and which foods and food practices should be avoided; (2) a statement of the value of traditional food products based on livestock husbandry; and (3) an attempt to educate youths about what is good food and what Sahrawi eat, as well as traditional Sahrawi values and beliefs. Eghindi came to be one element that, according to conservative Sahrawi, defines Sahrawi themselves.



Informants stress that no Sahrawi is unaware of the existence and meaning of eghindi, and that while the condition can affect all Sahrawi, it is unknown to neighboring populations such as Moroccan agropastoralists to the north. Eghindi is not just a sickness, therefore, but also an element of Sahrawi cultural identity, a feeling based on a distinctive shared language, culture, social organization, and ideology (Hurskainen 1990; Snow 2001). Identities and their symbols are continuously constructed and reconstructed by redefining the differences between the self and the other, the cultural borders in which these differences are represented, and by dropping or adopting different key elements of identity (Nagel 1994). As noted by Corbet (2008), contemporary Sahrawi society is witnessing multiple attempts of identity reconstruction. One of these is around eghindi, as illustrated by the refusal of salty and processed foods promoted by conservative refugees, challenged by young, progressive (i.e., Western educated/aculturated) refugees. The struggle is both intra-cultural and intergenerational. Younger refugees eat and appreciate processed, salty foods (Cozza 2010), are developing a cultural preference for salt, and are either not affected by eghindi symptoms or do not recognize or label the symptoms as such. People who suffer from eghindi are delegitimized by younger refugees, who deny its existence, typically asserting “I do not believe in eghindi” and regarding the reported symptoms as psychosomatic. Some may concede the existence of eghindi but only in relation to certain products, based on personal experience, and/or in nomadic conditions: “In the refugee camps everything changed, how can eghindi still be there?”

European expatriate doctors and NGO workers in the refugee camps also delegitimize eghindi. With exile and relocation in the camps, the Polisario Front and international organizations have introduced biomedical paradigms, and there is strong biomedical presence in the camps, charged with delivering basic health care and preventing epidemics. In some instances this medicalization has discouraged traditional medicinal practices and presented the nomadic Sahrawi medicinal system as ‘backward’. In interviews, some NGO workers spoke of eghindi as “a matter of ignorance,” “evil eye,” and “imagination,” and held that “Sahrawi attribute eghindi to any health symptom that they cannot explain otherwise.” Eghindi ‘believers’ of all ages resolutely refuse these interpretations, and instead call upon shared knowledge – “ask anybody around if eghindi exists or not!” – to recount long lists of examples drawn from personal experience, and invite disbelievers to see the symptoms with their own eyes, stressing not only the existence of eghindi but also its centrality to Sahrawi culture. Within an intergenerational struggle to define Sahrawi identity, eghindi has become more than a set of disruptive physiological symptoms. Rather, it is a cultural device used by older Sahrawi to teach younger refugees about traditional Sahrawi food culture and the benefits of nomadic existence, relative to life in the camps.

## **Conclusions**

We posit that the case of eghindi among Sahrawi refugees illustrates how, in contexts of social and cultural transformation, the construction and experiences of illnesses can change as much as ethnobiological knowledge about their

remedies. Among Sahrawi, eghindi is a cultural label for a set of pathological states experienced by nomads in the desert environment of Western Sahara. The core symptoms derive from osmotic imbalances related to salt and water consumption, but Sahrawi nomads gradually came to include other pathological conditions caused by strong flavors or smells in their explanatory model. In this way, cultural prescriptions for avoiding eghindi became a 'compendium' of (primarily) food related behaviors and practices that nomads should follow. With changes in Sahrawi society and settlement in the last forty years, eghindi also changed. Along with the enforced sedentarism in refugee camps, food sources changed, with traditional pastoral foods replaced by industrial products delivered through food aid. New illness experiences came to be associated with eghindi. However, although eghindi as a cultural construct changed, it did not do so in a socially uniform way. Changes in pathological states and their interpretation gave rise to an expanded understanding of eghindi, imbued with notions of cultural identity, by conservative and older refugees; and the denial of eghindi as a sickness by progressive and younger refugees, although allowing for possible existence as individual illness experiences (e.g., from few restricted agents, in nomadic conditions) and/or with a reinterpretation of associated pathological states on the basis of biomedical concepts. Eghindi, as an element of Sahrawi nomadic heritage, became embodied within a broader process of negotiation and redefinition of Sahrawi cultural identity. Refugees' views of eghindi are influenced by the degree of engagement with the desert environment (the ultimate source of the pathological states) and with Sahrawi culture (the source of the conceptualization of those pathological states).

Further epidemiological and other investigations are needed to estimate the prevalence and exact features of eghindi episodes among Sahrawi of different socioeconomic and demographic backgrounds. Nevertheless, our findings suggest that among many Sahrawi living in refugee camps, eghindi continues to be an idiom for experiencing and managing a wide range of symptoms that are linked to improper eating and exposure to polluted environments. Moreover, the findings provide a framework for thinking more generally about the evolution of illness experiences and of sickness constructions, with their own histories, subject to change as are any other cultural phenomena. As Sahrawi experience illustrates, the nature and intensity of pathological states experienced by a population can change with migration and displacement, and associated cultural and material changes. In response, part of the population may revise and/or abandon explanatory models that no longer fit with life experiences in the new environment; others extend them to incorporate new causal agents, symptoms and treatments. When explanatory models evolve or devolve, intra-cultural tensions can arise between conservative groups and those who more readily adopt global (i.e., biomedical/industrial) concepts of health and disease. Clinicians and other health practitioners working in Sahrawi refugee camps should not discount eghindi, as often occurs, as a set of puzzling somatic complaints, an imagined condition, or an irrational obsession with salt. Instead, its complex, multi-factorial explanatory models need to be understood as descriptions of the lived experiences of illness and disease, and as related intergenerational and cultural struggle within the



community. Further, experiencing an illness may transcend being a socially disvalued state and become a marker of cultural identity. In this context, we suggest further qualitative studies of eghindi among the Sahrawi diaspora, for instance in Spain and Cuba.



# CHAPTER 6

## **Dormancy and Revitalization: The Fate of Ethnobotanical Knowledge of Camel Forage Among Sahrawi Nomads and Refugees of Western Sahara<sup>23</sup>**

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### **Abstract**

Knowledge about forage is fundamental to the survival of pastoral populations around the world. In this paper, we address the knowledge of camel forage of Sahrawi nomads and refugees of Western Sahara. We analyze the distribution of this knowledge through cultural consensus analysis, and develop an explanation for intra-cultural variation based on changing processes of knowledge transmission. In total, 100 plant species were freelisted by informants, with five species (i.e., *Acacia tortilis*, *Nucularia perrinii*, *Astragalus vogelii*, *Panicum turgidum*, and *Stipagrostis plumosa*) found to be culturally highly salient. These five represent five local categories of forage that are necessary for camel management in the Western Sahara desert. The Sahrawi listed 25 forage plants that influence the taste and properties of camel milk, demonstrating that cultural values, as much as survival functions, underpin local knowledge systems. Perhaps unsurprisingly, age and nomadic experience are positively correlated with forage knowledge. Forced displacement and sedentarization are hypothesized as causes of progressive non-use of this knowledge and the lack of its transmission to younger generations of refugees. Nonetheless, across the study area, refugees are re-engaging with pastoralism and nomadism, which is leading to a revitalization of forage knowledge and its transmission. This should be regarded as an adaptation pathway for refugees.

**Keywords:** Desert adaptation; Ethnobotany; Camel husbandry; Refugee livelihood; Knowledge transmission and recovery

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## Introduction

Ethnobotanical knowledge is crucial to the production and survival of human populations around the world (Anderson et al. 2011). It is particularly central to food security among populations that depend directly on the production and harvesting of food for survival (e.g., small farmers, nomads and pastoralists, hunter-gatherers), to traditional food-producing systems (Scoones et al. 1992), and to people who strive to diversify their livelihoods to meet their material and cultural needs (e.g., migrants and refugees, see Pieroni and Vandebroek 2007). Indeed, ethnobotanical knowledge is often rich, detailed, and adaptive (Berkes et al. 2000), and it deserves as such to be recorded and its *cultural transmission* promoted (Cavalli-Sforza et al. 1982, Ellen et al. 2013). Although the literature often stresses that loss of ethnobotanical knowledge occurs within wider processes of globalization, urbanization, and displacement (Zent 2001, Folke 2004, Turner and Turner 2008), few studies have addressed the processes that occur with inactivity (knowledge dormancy) and revitalization of such knowledge for survival or cultural reasons and the resumption of transmission among certain groups (Ohmagari and Berkes 1997).

Within the corpus of plant knowledge held by pastoral populations across the world, ethnobotanical knowledge about forage<sup>24</sup> and its characteristics is among the most fundamental to survival (Fernandez-Gimenez 2000). Livestock husbandry is possible only through the rational exploitation of grassland, mountain or desert pastoral resources, and this cannot occur without detailed knowledge of these resources. The importance of this knowledge becomes even more crucial among camel pastoralists living in desert environments (Johnson 1993). In fact, 'The science of pastures is a difficult art' (Caratini 1989b:36), as it requires in depth knowledge of camel physiology and ethology, of the local vegetation (i.e., species diversity, abundance, distribution, growth rates, forage qualities, and camel preferences), and of climatic patterns, places, paths, and distances.

In this paper, we describe Sahrawi knowledge of camel forage in Western Sahara and discuss the role of this knowledge in the production and reproduction of Sahrawi society. We argue that the Sahrawi have a detailed knowledge of camel forage and its properties within their nomadic territories, that this knowledge is pivotal to their mode of subsistence based on camel husbandry and nomadism, and that it is underpinned by cultural values. With forced sedentarization in refugee camps and widespread loss of camel herds, this knowledge has become largely inactive although not lost in a theoretical sense. We posit that, in contexts of changes in culture and productive activities, transmission of ethnobotanical knowledge may be impaired, leading to its dormancy, i.e., it is held by former practitioners, but not used and barely transmitted. However, this dormant knowledge may be revitalized and its transmission recovered once it again becomes of material or cultural importance among people who re-engage with past livelihood

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<sup>24</sup> In this paper, we use the term 'forage' to indicate plants grazed or browsed by camels directly, whereas 'pasture' indicates the land with vegetation cover used by camels within the Sahrawi pastoral system.

and environmental management strategies. Such revitalization is occurring among the Sahrawi as refugees re-engage with pastoralism and seasonal nomadism within a wider process of livelihood diversification and cultural revitalization. We finally argue that the inability to transmit this knowledge to younger refugees might prevent their return to pastoralism and nomadism as livelihood strategies, particularly important today as food aid has decreased in recent years (Abdelrahim 2013). Processes of knowledge revitalization can be understood as *adaptation pathways* for Sahrawi populations (*sensu* Thornton and Manasfi 2010).

The paper first presents background information and research methods used in the study, after which follow the results and discussion of Sahrawi knowledge of camel forage that are presented in four parts: 1) the cultural domain of camel forage; 2) folk classification of camel forage; 3) influence of different forage plants on camel milk and meat taste, smell, and nutritional and medicinal properties; and 4) distribution and transmission of knowledge on camel forage among contemporary Sahrawi. Besides addressing the little-known ethnobotanical knowledge of the Sahrawi people, this study explores the dynamics of knowledge dormancy and revitalization among refugees, which sheds light on the general processes underlying transformations in ethnobotanical knowledge in other populations that have been either displaced in refugee camps or settled in new lands as immigrants.

## Background

*Sahrawi*, literally ‘people from the desert,’ is the autonym of the nomadic and pastoral people who traditionally inhabited coastal areas of Northwestern Africa including Western Sahara, Northern Mauritania, and part of Southwestern Algeria. The Sahrawi people were essentially nomadic, pasturing camels, goats, and sheep in the low-lying plains of Western Sahara and relying for food on livestock products as well as on dates, sugar, cereals, and legumes bartered for livestock in markets peripheral to their nomadic areas (Caratini 1989a,b, Caro Baroja 1955). In 1975, following Morocco’s occupation of Western Sahara, about 70,000 Sahrawi fled the Moroccan army (San Martin 2010), becoming refugees. Today, after sixteen years of war between Morocco and the Sahrawi’s armed political organization, the Polisario Front (1975-1991), and the exclusion of refugees from most Western Sahara territory by means of a Moroccan built wall (known as the *berm*) that cuts through Western Sahara in a north-south direction, about 165,000 Sahrawi live in four refugee camps located on a desert plateau called Hamada, near the Algerian town of Tindouf (see Figure 1.1).

In the camps, refugees live in tents and mud brick huts, and experience problems with water and food supply, using car batteries as the main source of electricity. The European Union, some bilateral development programmes, UN agencies, Algeria, and several solidarity groups provide food, shelter, and other basic commodities (San Martin 2010). Seeking to improve the quality of life in the camps, refugees have, over the years, developed an informal economy where they market a variety of products (from clothing to personal hygiene products, as well as food to supplement the diet provided by humanitarian

assistance). They engage in some kind of remunerated labor (e.g., as butchers, mechanics, construction workers, etc.), and have expanded trading routes through the camps from Mali, Mauritania, Algeria, and Spain (Bhatia 2001, Dedenis 2005, Herz 2013). Economic activity has increased greatly since the ceasefire agreement of 1991 and the subsequent demobilization of Polisario soldiers, who have moved back to the camps and began to re-engage in livestock husbandry, seasonal nomadism, and trade. Some Sahrawi have migrated abroad and send remittances home.

Besides the camps, through their political representative, the Polisario Front, the Sahrawi have assumed political control over the Eastern part of the Western Sahara, which was regained from Morocco through a guerrilla war that lasted up to the signing of the agreement in 1991 (Bhatia 2001). These inland areas of Western Sahara are the so-called 'liberated territories' (approximately 20 per cent of the total Western Sahara), while the remaining 'occupied territories' are under the administrative authority of the Moroccan Government. Pastoral areas within the liberated territories are important to the refugees' struggle to maintain or recover traditional livelihoods and cultural and social practices, from livestock husbandry to medicinal plant use (Broglia and Volpato 2008, Volpato et al. 2012), as well as to earn an income (Volpato et al. 2013b). These territories are also inhabited by 20-30,000 Sahrawi nomads who cross them with their herds and use the refugee camps at Tindouf and Zouérat as their main commercial hubs. These nomads survived the war by maintaining their herds and moving to safer areas in Mauritania and Mali; they have progressively returned to the liberated territories after the ceasefire agreement of 1991 made it safe to do so.

However, with war, most nomads were driven from their desert lands into refugee camps. Camel herds, having been already weakened and reduced by the drought of the early 1970s, were lost to bombings or abandoned in the desert. There were no livestock in the camps and no farming was possible, so that refugees were solely dependent on food aid. With time, knowledge about camel herding slowly declined through lack of use and the death of the elderly population. However, during the 1990s, some refugees managed to obtain an income (e.g., from remittances, Spanish civil service pensions, commercial activities) and, given the renewed access to part of the former nomadic territories and a decade of good precipitation, began to rebuild herds, primarily of more affordable goats and sheep, but also of camels. Presently, after the autumn rains, thousands of refugee families move with their herds to live in the liberated territories as nomads until the dry season returns (e.g., from September to February). Thus, refugees reduce their dependence on food aid by recovering a lost and much-desired way of life.

This revitalization has been supported by the renewed interactions between refugees and nomads, which have led to a degree of fluidity between these categories. Both groups are using the liberated territories (especially northern areas) to graze herds, and a vast network of solidarity and reciprocity is present in their interactions, which is strengthened by ties of kinship linking nomadic and refugee households. Today, camel husbandry is practiced in the liberated territories as well as, to a lesser extent, in the surroundings of the refugee



Figure 6.1 *Acacia-Panicum* vegetation in Zemmur (D. Rossi)

camps. Less than 2,000 camels are raised in the camps, whereas some 40,000 head are raised in the liberated territories (DNV-RASD 2007). Furthermore, the Polisario own and care for some 27,000 camels, where soldiers or paid laborers act shepherds (Broglia and Volpato 2008). In the refugee camps, camel owners supplement natural forage, which is poor on the Hamada plateau, with fodder purchases from Tindouf. In contrast, camel husbandry in the liberated territories that is practiced by nomads (full-time and seasonal) as well as the Polisario is extensive, that is, highly dependent on pasture areas and mobility for herd production and reproduction. Movements of nomads and their herds are carefully planned and managed, conceptualized as '*rataa*' that, in Sahrawi terminology, means 'following the pastures.'

Across Western Sahara and the liberated territories, the climate is arid and continental, with summer daytime temperatures surpassing 50 degrees Celsius, while winter temperatures drop to zero at night. Rainfall can be unpredictable and patchy, and generally occurs from the end of the summer through autumn. These rains represent the extreme northerly penetration of the African Monsoon from the South, or are associated with the Atlantic Westerly from the West (Brooks et al. 2005). Average annual rainfall is of 30-50 mm; however, rains are highly irregular within and between years, with recurrent droughts. Biogeographically, there are three main areas that fall within this study: 1) the Tindouf Hamada; 2) Western Zemmur; and 3) Tiris. The Hamada of Tindouf, where the refugee camps are located, is a barren desert plateau historically known as the 'Devil's Garden.' Because of the scarce rainfall and poor edaphic conditions, the Hamada is significantly poorer in forage compared with southern areas: there are few trees, no halophytic plants, and annual plants



are also relatively scarce and dominated by a few species (e.g., *Zygophyllum gaetulum* Emb. et Maire). The liberated territories lie South of the Hamada, with the northern sector, called Zemmur, running East-West between the *berm* and northern Mauritania. Sand and gravel plains predominate, with sandstone and granite occasionally surfacing in its eastern and central zones, and with higher relief and hilly terrain in the western zone. All of Zemmur, and especially the central and western areas, is gullied by inactive or occasionally active rivers that drain West into the Saguia el-Hamra, a large ephemeral river. After the rains, the Zemmur displays a savannah-like environment dominated by *Acacia-Panicum* vegetation (Figure 6.1), while flowering prairies may appear in flat gravel areas. The southern sector, known as Tiris, runs from North to South between the *berm* and the Mauritanian border, and is more arid than Zemmur, characterized by flat sand and gravel plains from which rise characteristic black granite hills in clusters or in isolation. In Tiris, there are no dry riverbeds as in Zemmur, and hence vegetation is mostly herbaceous and adventitious; halophytic plants cover large areas.

### **Methodology**

The data analyzed in this paper were collected in Sahrawi refugee camps and in the Polisario-controlled 'liberated territories' of Western Sahara between 2006 and 2009. Ethnobotanical fieldwork was carried out in accordance with standard texts (Alexiades 1996, Cunningham 2001), and also included anthropological fieldwork methods such as participant observation and interviews (Weller 1998, Bernard 2006). Interviews were conducted in Hassaniya (the Arabic language with a Berber substrate spoken by the Sahrawi) and Spanish: one local research assistant asked the questions in Hassaniya and translated the answers into Spanish, which is the second most frequently spoken language among the Sahrawi and which is spoken fluently by the first author, who conducted the fieldwork. To ensure that, during the interview process, no mistakes were made in translation and to clarify doubtful information, interviews were recorded and transcribed with the help of the same research assistant. Prior informed consent was obtained verbally before interviews were conducted. Participants were given an explanation of the aims, methodology, and outcomes of the study. The ethical guidelines followed were those adopted by the American Anthropological Association (1998) and the International Society of Ethnobiology (2006).

*Freelisting* was used to describe the Sahrawi cultural domain of *martaa lbal*, or 'camel forage', as well as to document the distribution of associated knowledge among the Sahrawi (Borgatti 1996b, Ryan et al. 2000, Quinlan 2005, Puri 2010). The freelisting exercise was conducted with 46 Sahrawi, both nomads and refugees, who were approached directly in their tents in refugee camps or in the liberated territories. Informant sampling was purposeful, in that we tried to include people across the range of socio-demographic attributes hypothesized to influence camel forage knowledge among the Sahrawi. These attributes were five: age, sex, nomadism (or not), presence/absence of camel herding at the time of the study, and total years as a nomad. In relation to this last attribute, it was found that refugees who sometimes

move to the liberated territories during the rainy season (although born in the refugee camps or relocated there as children) proudly counted the time spent as seasonal nomads (often constituted of intervals varying from a few months to a year), and provided us with a recall of the total time of these intervals, which we used for this measure. It was expected that nomads retained a wider knowledge of camel forage than refugees, and that age and years of nomadic life positively influenced knowledge maintenance too. As camel management is traditionally a male task among the Sahrawi, it was also expected that men had a greater knowledge of camel forage than women.

Freelisting generated data that both stimulated qualitative discussion about the importance of specific plants, and could be used in cultural consensus analysis (CCA) and multidimensional scaling (MDS) to study informant agreement and variation both within and between groups, and to explore the causes of such knowledge distribution (Nakao and Romney 1984; Weller and Baer 2002; Ross et al. 2007). Follow-up semi-structured interviews were conducted with 25 of the more knowledgeable informants (selected on the basis of their freelist lengths and experience with extensive camel nomadism) to check dubious items in the lists and, more importantly, to investigate in greater detail the relevance of specific forage plants, their nomenclature, classification, ecology and properties (e.g., in camel diet and health) as well as pathways of knowledge transmission.

The analysis of agreement and variation in freelists using cultural domain analysis is described and justified in detail elsewhere (Weller and Baer 2002; Quinlan 2005; Puri 2010), and several statistical software packages, including ANTHROPAC, can manage and analyze data in this way.<sup>25</sup> The main steps can be briefly summarized. Freelists are compiled in an informant-by-item matrix, which indicates both the rank order and the presence/absence of items in each informant's list. From this, the frequency of items, their average rank in the list, and a measure of salience (based on Smith 1993)<sup>26</sup> can be calculated (e.g., Table 6.3). This data indicates the contents and boundaries of the domain in question: those items that are more commonly known and/or are prototypical of the domain, and thus have salience or meaning for the group, and, for some items listed infrequently, those that may not be members of the domain at all. We can compare informants' knowledge of the domain by simply comparing the lengths of freelists; usually, the longer the lists, the more someone knows about a domain. More interesting and revealing is the variation in the items listed. Thus, we looked at the pattern of agreement in freelists for each pair of informants, measured as the percentage of items shared in their lists (a procedure known as 'positive matching' in ANTHROPAC). An interinformant agreement matrix of these percentages was then compiled, which can be visually represented using Multidimensional Scaling (MDS) and/or analyzed to determine cultural consensus and intra-cultural variation.

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<sup>25</sup> See Borgatti's *Methods Manual* (1996b) for detailed instructions for cultural domain analysis using ANTHROPAC.

<sup>26</sup> This is essentially a weighted average of the (inverse) rank of an item across multiple freelists, where each list is weighted by the number of items in the list.

MDS plots graphically depict the inter-informant agreement matrix, showing the relative distances between informants in a two- or three-dimensional space; those informants with similar freelists are located closer in Cartesian space and thus one can easily identify “groups” of informants with similar lists. Hypotheses were formed about the dimensions or variables that may underlie this distribution and several types of regression analysis were used to test their explanatory power (Borgatti 1996b: 27-38; Puri 2010). In ANTHROPAC, Property Fitting (PROFIT) was used to test metric variables (age and years as a nomad) and Quadratic Assignment Procedure (QAP) was used to test non-metric variables (sex, nomadism, camel herding), as described above (see Borgatti 1996b).<sup>27</sup>

Cultural Consensus Analysis (CCA), based on Romney, Weller and Batchelder (1986) and developed as a tool in ANTHROPAC (Borgatti 1996a), applies a principle component analysis to the informants, not the items, to determine whether consensus (or shared agreement) among informants exists. It creates a model of what the consensus answer to the question(s) posed might be (in this case, what items are in the domain ‘camel forage’), and then estimates the ability or competency of each informant to give the “culturally correct” answers. Weller and Baer (2002:11) describe CCA as follows: “In a consensus analysis, the interinformant agreement matrix is then factored by a principal axis (minimum residual) extraction method ... to obtain the competency scores. If the results indicate a single factor or single response pattern among the informants, then the consensus model is appropriate to describe the data.” Second and third factors may also be present, which often indicate patterned intra-cultural variation such as subcultures, or residual agreement. As mentioned above, we used the QAP and PROFIT tools in ANTHROPAC to test for residual agreement.

Regarding botanical methods, voucher specimens were collected with informants through a ‘walk in the woods’ approach (Cunningham 2001) in the Hamada of Tindouf and across the liberated territories, where the first author travelled on four occasions between 2006 and 2009. Plant nomenclature follows the Sahara and Western Sahara botanical standard treatises (Lebrun 1998, Ozenda 1991, Dobignard et al. 1992a,b) and the International Plant Name Index ([www.ipni.org](http://www.ipni.org)). Voucher specimens were deposited in the National Herbarium of The Netherlands (Wageningen Branch – Herbarium Vadense).

Qualitative data were coded and analyzed narratively (description, explanation, interpretation, quotations) using QSR NVivo. Codes were developed from the topics addressed during the interviews (e.g., classification of camel forage, organoleptic properties, knowledge transmission, etc.), expanded into more detailed coding (e.g., specific categories of camel forage), and inductively identified and transformed into themes (e.g., knowledge revitalization). The data was coded by the first author alone; hence, intercoder reliability was not assessed. The software packages used to analyze quantitative

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<sup>27</sup> Our analysis provides the same results as an analysis of residual agreement used to determine if there are subgroups of agreement within a general consensus (Nakao and Romney 1984, Ross et al. 2007).

data were ANTHROPAC for freelists and Microsoft Excel® for descriptive statistics.

## Results

Table 6.1 presents social and demographic data on the 46 Sahrawi informants, ten nomads and 36 refugees (16 of whom had never lived a nomadic life), who were interviewed on their knowledge of camel forage. Interviewees included 12 women and 34 men, from the ages of 12 to around 70. Ten informants herded camels, including two refugees who had been nomads, and one enterprising 12-year-old boy with no past experience as a nomadic herder.

Table 6.2 provides a list of *martaa lbal*, or ‘camel forage’, of Western Sahara according to these Sahrawi informants. About 100 plant species are reported in alphabetical order of botanical taxon, along with botanical family, voucher specimen number, local phytonym in Hassaniya, part(s) of the plant grazed, and properties attributed to the forage. About 79 botanical genera are present, where the most represented are *Stipagrostis* (four species), *Acacia*, *Astragalus*, *Fagonia*, *Launaea*, and *Salsola* (three species each). Species belong to 33 botanical families; the more represented are Asteraceae and Fabaceae (12 species each), Amaranthaceae (11 species), Brassicaceae (eight species), and Poaceae and Zygophyllaceae (seven species).

Table 6.3 presents the results obtained from the ANTHROPAC analysis of the freelists of Sahrawi informants. Informants gave a cumulative list of 83 plant names, with individual freelists ranging from one to 34, and an average length per freelist of 17 plants. The plants cited are reported in order of their frequency of mention (i.e., how many informants mentioned a plant), along with their botanical taxon, Hassaniya name, and Smith’s index of salience. *Talha*, *Acacia tortilis* (Forssk.) Hayne, the umbrella thorn tree, was mentioned by all but one informant and had the highest overall salience index. The halophytic *askaf*, *Nucularia perrinii* Batt., was the second most salient plant listed, mentioned by 75% of informants. Eight plants were mentioned by more than half of all informants, and 18 were mentioned by more than a third, which both confirms the existence of the domain and demonstrates a core of shared knowledge about its contents. Table 6.3 also shows the five plants that form the cultural consensus model of shared knowledge of the domain, as calculated by ANTHROPAC. This model represents those items of the domain most likely to be mentioned by a typical member of the sampled population, both because they were mentioned more frequently and also sooner (i.e., has a higher rank) in informant’s lists.

Table 6.4 presents results obtained from ANTHROPAC’s consensus analysis of the forage freelists (Borgatti 1996b: 39). The consensus model included the five most salient plants listed, thus informants showed a high degree of agreement (or competency) with the cultural consensus (an average competency score of 71%). The first factor explained 83% of the variation (eigen=24.74), the second factor 13% (eigen=3.86), and four percent the third factor (eigen=1.22). Since the ratio of the first factor to the second is greater than 3, this indicates high overall agreement among informants, indicating that they belong to a single culture (i.e., share knowledge of camel forage). The

second factor suggests enough residual agreement to indicate subgroups, or clusters of agreement, within the study population (Nakao and Romney 1984, Ross et al. 2007).

To visualize the individual differences in Sahrawi freelists and begin to explore subgroups of agreement and explanatory variables, a non-metric multidimensional scaling (MDS) analysis was performed on the inter-informant agreement matrix in ANTHROPAC (Figure 6.2). The plot shows similarity among informants' freelists as distance in two-dimensional space, where those with more similar lists are closer and those more dissimilar are further apart (Borgatti 1996b: 33).

The distribution shows a grouping of informants in the lower left quadrant, with the rest evenly distributed above and to the upper right of the plot, and only a few outliers. This group contains nomads and older refugees who once were nomadic, at least until 1975, as well as Polisario soldiers who have spent long periods in Western Sahara in contact with nomads or have been themselves herders (e.g., informant 34), and young refugees who took up seasonal nomadism over the past decade (e.g., informant 27). In the results of a PROFIT analysis of hypothesized explanatory variables (Table 6.5 below), the vector on the MDS plot shows the highest values for *years as a nomad* in this lower quadrant ( $R^2 = 0.56$ ,  $p < 0.001$ ), which is also very much correlated with the length of freelists. Age, not shown above, is also correlated with years as a nomad but, because even younger nomads know more than refugees who are older than them, age explains less of the variation ( $R^2 = 0.32$ ,  $p < 0.002$ ). The difference among men and women was small but significant ( $R^2 = 0.027$ ,  $p < 0.046$ ), while status as refugee did not matter ( $p < 0.39$ ) since most were former nomads, many of whom are now elderly and have retained knowledge equivalent to that of the permanent nomads interviewed (refugees with no nomadic experience had dramatically shorter freelists). For the same reasons, owning or herding camels also did not make a difference ( $p < 0.33$ ) in knowledge, but it was noted that three of the 36 refugees now herd camels and there is an expectation that more may do so in the future (Table 6.5). One more informant (number 7) had attempted to re-initiate camel husbandry about three years prior to the interview, but the she-camel that he bought had died. He said, 'I will soon get a stronger she-camel. I'll have her reproduced and her milk will be precious for my old parents.' Younger nomads and less experienced refugees are scattered somewhat evenly across the MDS plot, showing some knowledge and variation in their shorter lists. Informant 13 is a noticeable outlier on the right side of the graph who listed a single plant, *Zygophyllum gaetulum*. He is a relatively young refugee (28 years old) without any experience of nomadism or other forms of engagement with Western Sahara territory. *Zygophyllum* is in fact not a good camel forage, nor part of the cultural consensus model; nevertheless, it is the most common species growing in the surroundings of the refugee camps that was often listed by refugees as camel forage since it is one of the few plants present in the Hamada of Tindouf and thus known to refugees through direct experience. Informant 2 has very similar attributes to informant 13 and also listed *Z. gaetulum*, besides *Acacia tortilis*. The situation is not different with informant 17, who only listed

Table 6.1 Sahrawi informant socio-demographic data

Informant	AGE	SEX	REFUGEE (1)	Years as Nomad	Herd camels
1	63	2	1	30	2
2	29	2	1	0	2
3	37	2	1	0	2
4	60	2	1	26	2
5	47	1	1	20	2
6	26	1	1	0	2
7	40	2	1	5	2
8	58	2	1	32	1
9	68	2	1	38	2
10	47	2	1	35	2
11	26	2	1	10	2
12	65	2	1	9	2
13	28	2	1	0	2
14	25	2	1	5	2
15	22	2	1	0	2
16	47	2	1	10	2
17	37	1	1	0	2
18	36	2	1	10	2
19	34	2	1	2	2
20	39	2	1	0	2
21	31	2	1	0	2
22	29	2	1	2	2
23	60	2	1	45	2
24	43	2	1	25	1
25	54	2	1	0	2
26	55	2	2	55	1
27	28	2	1	3	2
28	34	1	1	0	2
29	42	2	1	15	2
30	50	1	1	25	2
31	55	1	1	0	2
32	47	1	1	0	2
33	60	1	1	0	2
34	56	2	1	40	2
35	34	1	1	0	2
36	39	1	1	0	2
37	12	2	1	0	1
38	54	2	2	54	1
39	60	2	2	60	1
40	70	2	2	55	2
41	40	1	2	40	1
42	43	2	2	30	1
43	50	2	2	45	1
44	18	1	2	18	2
45	31	2	2	31	2
46	58	2	2	52	1

**Table 6.2 Forage plants grazed by camels in Western Sahara according to the Sahrawi**

Species (voucher number)	Family	Hassaniya phytonym	Part grazed and Hassaniya name*	Properties as forage
<i>Acacia ehrenbergiana</i> Hayne (1015)	Fabaceae	tamat	le (warga tamat), fl (anish)	very good forage, with properties like <i>A. tortilis</i>
<i>Acacia senegal</i> (L.) Willd. var. <i>senegal</i> (1076)	Fabaceae	amour	ap	good forage, with properties like <i>A. tortilis</i> , but of secondary importance in Western Sahara
<i>Acacia tortilis</i> (Forssk.) Hayne subsp. <i>raddiana</i> (Savi) Brenan var. <i>raddiana</i> (1010, 1025)	Fabaceae	talha	le (warga talha), fl (anish), fr (gharrub)	main camel forage in Western Sahara, especially during hot periods when trees are among the few green food sources; the flowers are especially appreciated by calves; pods are also eaten, and given to the animals as nutraceutical
<i>Aizoon canariense</i> L. (2032)	Aizoaceae	taza	ap	it increases milk production
<i>Ammodaucus leucotrichus</i> Coss. (1033)	Apiaceae	kammuna, kammunat rag	ap	
<i>Anabasis articulata</i> (Forssk.) Moq.	Amaranthaceae	ashram	ap	as main forage it gives diarrhoea and possible colic to camels, but in a varied diet it is a good pasture
<i>Anastatica hierochuntica</i> L. (1027)	Brassicaceae	kamsha	ap	very good forage when green ('strong' food)
<i>Androcymbium punctatum</i> Baker (2065)	Liliaceae	sghaa t'nereb	ap, fl	
<i>Anvillea radiata</i> Coss. et Durieu (2039)	Asteraceae	negd	ap	good forage, it gives to camel milk a bitter taste
<i>Argania spinosa</i> Skeels	Sapotaceae	argan	ap	camels browse it, but this gives milk a bitter taste; seeds ( <i>bulez</i> ) accumulates in the rumen and may give gastritis and colic to the camel
<i>Asparagus altissimus</i> Munby	Asparagaceae	sekoum	ap	good 'sweet' forage; it gives milk a sweet taste
<i>Asphodelus tenuifolius</i> Cav. (1078)	Xanthorrhoeaceae	tazia	ap	grazed only when dry
<i>Asteriscus graveolens</i> Forssk. (2043)	Asteraceae	tafsa	ap	good forage; if grazed in big amounts, it gives to the milk a bitter taste
<i>Astragalus eremophilus</i> Boiss. (2054)	Fabaceae	umm harza	ap	good forage; camels like it especially when with flowers; when pastured alone or in main quantities it gives a strong and unpleasant taste to camel tripes, that are then washed more times before cooking
<i>Astragalus mareoticus</i> Delile	Fabaceae	umm harza	ap, fl	especially the flowers are an appreciated camel forage
<i>Astragalus vogelii</i> Bormm.	Fabaceae	ter	ap	excellent forage when green, it increases and qualitatively improves milk production, fattens camels, and gives to camel milk an appreciated taste. The ingestion of many seeds from dry plants can give camels an intoxication known as <i>fenter</i>
<i>Attractylis aristata</i> Batt. Et Trab.	Asteraceae	sherb jmel	ap	fattening forage; 'it gives big hump to camels that feed from it'



Table 6.2 (cont.) Forage plants grazed by camels in Western Sahara according to the Sahrawi

Species (voucher number)	Family	Hassaniya phytonym	Part grazed and Hassaniya name*	Properties as forage
<i>Atriplex halimus</i> L. (1052)	Amaranthaceae	legtaf	ap	important salty forage, it improves the quality of the milk and give it a salty taste; it may give nervous problems to camels that eat it in huge quantities when there are no other forages available
<i>Balanites aegyptiacus</i> Delile (1086)	Zygophyllaceae	teichat	ap	
<i>Beta patellaris</i> Moq. (1075)	Amaranthaceae	silk	ap	watery forage, not regarded as very good but important during the summer period
<i>Calendula</i> sp.	Asteraceae	gahuan	ap	
<i>Calligonum comosum</i> L'Hér.	Polygonaceae	awrash	ap	good forage when with flowers and fruits
<i>Capparis decidua</i> Edgew.	Capparaceae	ighnin	ap, fr (bujrali)	watery forage, important in the summer period for the water it provides
<i>Cayusea hexagyna</i> (Forsk.) M.L. Green (2068)	Resedaceae	dhenban	ap	good pasture
<i>Chamomilla pubescens</i> (Desf.) Alavi (1090)	Asteraceae	lerbien	ap	
<i>Convolvulus trautianus</i> Schweinf. et Muschl.	Convolvulaceae	gandul	ap	forage appreciated by camels
<i>Cornulaca monacantha</i> Delile	Amaranthaceae	had	ap	Important salty forage, especially during the summer and during droughts
<i>Cotula cinerea</i> Delile (1083)	Asteraceae	rebruba (without flowers), gartufa (with flowers)	ap, fl	it gives a bitter and not appreciated taste to camel milk
<i>Crotalaria saharae</i> Coss. (2060)	Fabaceae	fula	ap	good forage, when a camel eats it in abundant quantities then it sweats a lot and may give signs of <i>rmah</i> (craziness) and its milk takes a strong appreciated smell at fula flowers
<i>Cymbopogon schoenanthus</i> Spreng. (1087)	Poaceae	idkhir, liedjir	ap	
<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	nijm	ap	
<i>Cyperus conglomeratus</i> Rottb.	Cyperaceae	sad	ap	good forage, it increases milk production
<i>Diplotaxis pitardiana</i> Maire (2055)	Brassicaceae	deid han (without flower), karkas (with flowers, flower beds)	ap	good forage, it gives a strong smell of its flowers to the milk of pasturing camel, fact that brings calves to reduce or stop milking
<i>Echium horridum</i> Batt. (1091)	Boraginaceae	harsha	ap	sweet forage
<i>Ephedra alata</i> Dec. (1067)	Ephedraceae	shdida, alenda	ap	grazed only if better forages are absent
<i>Euphorbia balsamifera</i> Aiton	Euphorbiaceae	fernan	ap	grazed when green, but it can give camels digestive troubles
<i>Euphorbia calytrata</i> Coss. et Durieu var. <i>involutrata</i> Batt. (2063)	Euphorbiaceae	rammadah	ap	forage not much appreciated, when the camel touches the plant, its milk can cause eye irritation; grazed only by camels that are not used to the area

Table 6.2 (cont.) Forage plants grazed by camels in Western Sahara according to the Sahrawi

Species (voucher number)	Family	Hassaniya phytonym	Part grazed and Hassaniya name*	Properties as forage
<i>Euphorbia granulata</i> Forssk. (1055)	Euphorbiaceae	kbidet ed-dab	ap	not much appreciated pasture by camels; grazed only by camels that are not used to the area
<i>Fagonia glutinosa</i> Delile	Zygophyllaceae	ledesma	ap	important forage
<i>Fagonia jolyi</i> Batt.	Zygophyllaceae	tleha	ap	good forage when green, in spring
<i>Fagonia</i> sp.	Zygophyllaceae	daaishe	ap	not much appreciated by camels
<i>Farsetia aegyptia</i> Turra	Brassicaceae	zaaza	ap	pasture appreciated by camels
<i>Farsetia ramosissima</i> Helder. ex Boiss.	Brassicaceae	akshir, el gadhm	ap	good forage especially in combination with <i>askaf</i>
<i>Glossonema boveanum</i> Decne.	Apocynaceae	ashakan	ap	
<i>Grewia tenax</i> (Forssk.) Fiori	Malvaceae	leghlia	ap, yl	
<i>Gymnocarpus decandrus</i> Forssk. (1093)	Caryophyllaceae	shifne	ap	important salty forage; it gives milk a salty taste
<i>Hammada scoparia</i> (Pomel) Iljin (1021)	Amaranthaceae	remth	ap	grazed by camels only when no other forage is available
<i>Helianthemum lippii</i> (L.) Dum. Cours. (1034)	Cistaceae	erghig	ap	grazed when green
<i>Heliotropium ramosissimum</i> Sieber ex DC. (2053)	Boraginaceae	lehballiya	ap	good camel forage
<i>Ifloga spicata</i> (Forssk.) Sch. Bip. (2033)	Asteraceae	asb el-abd	ap	
<i>Launaea arborescens</i> Murb. (1071)	Asteraceae	umm lbena	ap	when green, it gives to camel meat and milk a bitter and lightly hot taste
<i>Launaea mucronata</i> Muschl. (2034)	Asteraceae	el mekker	ap	good forage when mixed with others, but it gives to camel meat and milk an unpleasant bitter taste; the name of the plant means 'the bitter one'
<i>Launaea nudicaulis</i> Hook.f. (2027)	Asteraceae	gherrema	ap	sweet forage
<i>Limonium</i> spp.	Plumbaginaceae	garza	le, fl, flower beds (azatim)	good forage, flower beds are very appreciated by camels
<i>Lotus</i> spp. (2025)	Fabaceae	atig	ap	good and fattening forage, increases and improves milk production; other informants say that it gives an unpleasant and strong taste to camel milk
<i>Lupinus digitatus</i> Forssk. (2058)	Fabaceae	umm el-feifat, boutreisira	ap	
<i>Lycium intricatum</i> Boiss. (1085)	Solanaceae	ghardeg	ap	good and 'strong' forage
<i>Maerua crassifolia</i> Forssk. (1007, 1048)	Capparaceae	atil	le (sadra el hadra)	important forage, especially the flower is appreciated
<i>Malcolmia aegyptiaca</i> Spr.	Brassicaceae	shgaa	ap	good forage, but it gives an unpleasant taste to camel meat and milk
<i>Mesembryanthemum cryptanthum</i> Hook.f.	Aizoaceae	afzu	ap	good forage

Table 6.2 (cont.) Forage plants grazed by camels in Western Sahara according to the Sahrawi

Species (voucher number)	Family	Hassaniya phytonym	Part grazed and Hassaniya name*	Properties as forage
<i>Moltkiopsis ciliata</i> (Forssk.) I.M. Johnst.	Boraginaceae	nshal	ap	appreciated by camels
<i>Monsonia nivea</i> Webb	Geraniaceae	rekum	ap	salty forage of hatba; when camels eat it alone and not in variation with other pastures, it gives colic and diarrhoea that disappear after few days
<i>Morettia canescens</i> Boiss. (2045)	Brassicaceae	tebazuaga	ap	it increases milk production in camels and it makes milk more nutritious; it is appreciated by camels also when dry
<i>Neurada procumbens</i> L.	Rosaceae	saadan	ap	good forage when green
<i>Nitraria retusa</i> Asch.	Zygophyllaceae	gherzim	ap, fl (akawar)	good forage, especially young leaves and flowers
<i>Nucularia perrinii</i> Batt. (1047)	Amaranthaceae	askaf	ap	best and 'strongest' forage for camels in Western Sahara and most important salty plant of hatba; 'it gives salts, strenght, and mass to camels' and nutraceutical properties to the milk
<i>Panicum turgidum</i> Forssk. (1051)	Poaceae	mrokba, umm rekba	ap	good forage
<i>Pergularia tomentosa</i> L.	Apocynaceae	ghalqa, umm el-jlud	ap	camels sometimes graze it when it is dry and in absence of other pastures
<i>Periploca laevigata</i> Aiton	Apocynaceae	hallab	ap	important sweet forage; drinking milk from a camel that grazed this plant is believed to protect from illness and to strenghten children
<i>Psoralea plicata</i> Delile	Fabaceae	totrat	ap	very good forage
<i>Reseda villosa</i> Coss. (1072)	Resedaceae	yamin	ap	good forage but it gives an unpleasant smell to camel milk
<i>Retama raetam</i> Webb et Berth.	Fabaceae	rtam	fl, fr	camels graze only flowers and fruits while stems are eaten only when there are no other forages and in exceptional cases; it gives to milk a slightly sour or bitter taste
<i>Rhus albidia</i> Schousb.	Anacardiaceae	zauaya	ap, fr (anafis)	
<i>Rhus tripartita</i> DC. (1023)	Anacardiaceae	shdari	le	important forage especially in periods of drought
<i>Rumex vesicarius</i> L.	Polygonaceae	hmued	ap	camels graze it but it is considered a sour forage of low quality
<i>Salsola imbricata</i> Forssk. (1054)	Amaranthaceae	ghasal	ap	camels graze it only in drought periods, it can cause colic and diarrhoea; for this it is regarded as a strong and acid plant able to treat intestinal parasites through the diarrhoea caused
<i>Salsola longifolia</i> Forssk.	Amaranthaceae	laasal	ap	important forage, rich in water
<i>Salsola tetrandra</i> Forssk. (2020)	Amaranthaceae	laarad	ap	important salty forage; if eaten alone or in huge quantities can cause diarrhoea; it eliminates intestinal parasites because it is an acid plant; it gives camel milk a salty taste
<i>Salvia aegyptiaca</i> L. (1049)	Lamiaceae	tezouknit	ap	grazed when green

Table 6.2 (cont.) Forage plants grazed by camels in Western Sahara according to the Sahrawi

Species (voucher number)	Family	Hassaniya phytonym	Part grazed and Hassaniya name*	Properties as forage
<i>Schouwia thebaica</i> Webb	Brassicaceae	yerdhir	ap	appreciated forage, but it gives to camel milk a very bitter taste
<i>Sclerocephalus arabicus</i> Boiss. (2031)	Caryophyllaceae	shamra, tamra	ap	
<i>Senecio anteuphorbium</i> Sch.Bip.	Asteraceae	shbarto	ap	good forage when green as well as when dried
<i>Spitzelia coronipifolia</i> Desf.	Asteraceae	uden naja	ap	sweet forage, it gives to milk a sweet taste
<i>Stipagrostis acutiflora</i> (Trin. et Rupr.) De Winter	Poaceae	aserdum (when green), sfar (when dry)	ap	good forage
<i>Stipagrostis ciliata</i> (Desf.) de Winter	Poaceae	ataf (when green), zigzig (when dry)	ap	good and appreciated forage, especially when dry
<i>Stipagrostis plumosa</i> Munro (2030)	Poaceae	nsil	ap	very important forage when green as well as dry, the best forage during summer
<i>Stipagrostis pungens</i> (Desf.) De Winter	Poaceae	sbat, el halfa (when dry), ilig (flowers and seeds)	ap	important forage especially during periods of drought due to the resistance of the plant; camels eat only the dry plant and the flowers
<i>Suaeda vermiculata</i> Forssk. (1082)	Amaranthaceae	sueid	ap	salty forage, but not as good as the others in the category; when eaten it paints black the lips and teeth of the camels; sometimes it can cause colic to camels, and they graze it only in absence of better forages
<i>Tamarix amplexicaulis</i> Ehrenb.	Tamaricaceae	fersig	ap	
<i>Tamarix aphylla</i> (L.) H. Karst.	Tamaricaceae	lezl	ap	
<i>Tamarix gallica</i> L. (1063)	Tamaricaceae	tarfa	ap	flowers and young stems are appreciated by camels; it is not regarded as a nutritious forage
<i>Teucrium chardonianum</i> Maire et Wilczek	Lamiaceae	sadra el-beida	ap	good forage
<i>Traganum nudatum</i> Delile	Amaranthaceae	damran	ap	important salty forage; if eaten in huge quantities may cause diarrhoea to the camels due to its salts content
<i>Trichodesma</i> spp. (2048)	Boraginaceae	harsha haibe	ap	good forage
<i>Trigonella anguina</i> Delile	Fabaceae	el gard	ap, se	complementary forage for camels when green, but very strong and toxic pasture with seeds; camel that will eat many seeds will 'explode', with colic and strong meteorism; when with flowers, these give a strong smell to the milk

Table 6.2 (cont.) Forage plants grazed by camels in Western Sahara according to the Sahrawi

Species (voucher number)	Family	Hassaniya phytonym	Part grazed and Hassaniya name*	Properties as forage
<i>Zilla spinosa</i> Prantl.	Brassicaceae	shobrak	ap	good forage
<i>Zizyphus lotus</i> Lam. (1002)	Rhamnaceae	sdir	ap	
<i>Zygophyllum gaetulum</i> Emb. et Maire (1065)	Zygophyllaceae	aggaya	ap	when green, it is a strong and acid forage that gives a salty taste to camel milk; during summer, it is a pasture for 'leisure' for camels because it is rich in water
<i>Zygophyllum simplex</i> L.	Zygophyllaceae	lemuelha	ap	it gives milk a bitter taste
n.d.		musran lehuar	ap	good forage

\* Part(s) used: ap, aerial part; fl, flowers; fr, fruits; le, leaves; sh, shoots; st, stems; wh, young whorls

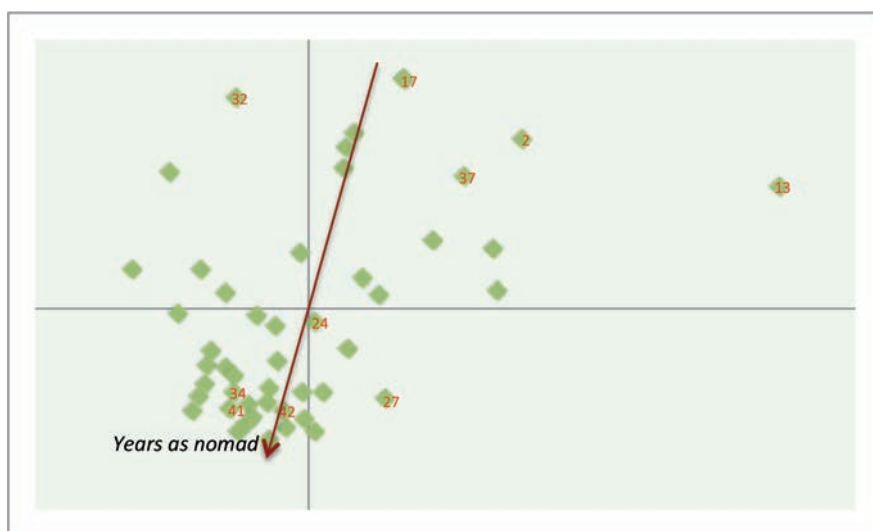


Figure 6.2 Non-metric multidimensional scaling of Sahrawi's similarity in naming camel forage plants. Each diamond on the map represents a Sahrawi informant; those with similar freelists are relatively closer in space. Only informants (diamonds) who are referred to in the text are numbered in the graph. Axes, in themselves, have no meaningful value and orientation is arbitrary; the only thing that counts is the relative distance between points. Vector represents the variable Years as *nomad* regressed on MDS plot using PROFIT program in ANTHROPAC, where value increases from top to bottom (see Table 6.5).

**Table 6.3 Results of ANTHROPAC analysis of camel forage freelists**

	<b>Item</b>	<b>Botanical taxon</b>	<b>Frequency N=46 (%)</b>	<b>Smith's Saliency Index</b>
1	Talha *	<i>Acacia tortilis</i>	45 (97.8)	0.752
2	Askaf *	<i>Nucularia perinii</i>	35 (76)	0.666
3	Ter *	<i>Astragalus vogelii</i>	30 (65.2)	0.405
4	Mrokba *	<i>Panicum turgidum</i>	28 (60.8)	0.406
5	Nsil *	<i>Stipagrostis plumosa</i>	27 (58.7)	0.411
6	Mharza	<i>Astragalus eremophilus</i>	25 (54.3)	0.305
7	Sbat	<i>Stipagrostis pungens</i>	25 (54.3)	0.356
8	Lehbaliya	<i>Heliotropium ramosissimum</i>	23 (50)	0.26
9	Tamat	<i>Acacia ehrenbergiana</i>	22 (47.8)	0.303
10	Tafsa	<i>Asteriscus graveolens</i>	21 (45.6)	0.226
11	Karkas	<i>Diplotaxis pitardiana</i>	20 (43.5)	0.227
12	Laarad	<i>Salsola tetrandra</i>	20 (43.5)	0.304
13	Ghassel	<i>Salsola imbricata</i>	19 (41.3)	0.232
14	Gartufa	<i>Cotula cinerea</i>	17 (37)	0.148
15	Sadan	<i>Neurada procumbens</i>	16 (34.8)	0.174
16	Aserdum	<i>Stipagrostis acutiflora</i>	16 (34.8)	0.173
17	Negd	<i>Anvillea radiata</i>	16 (34.8)	0.161
18	Damran	<i>Traganum nudatum</i>	16 (34.8)	0.206
19	El Had	<i>Cornulaca monacantha</i>	15 (32.6)	0.235
20	Ghardeq	<i>Lycium intricatum</i>	14 (30.4)	0.172
21	Garza	<i>Limonium spp.</i>	13 (28.2)	0.093
22	Fula	<i>Crotalaria saharae</i>	13 (28.2)	0.137
23	Ledesme	<i>Fagonia glutinosa</i>	12 (26)	0.077
24	Harsha	<i>Echium horridum</i>	11 (24)	0.106
25	Kamsha	<i>Anastatica hierochuntica</i>	11 (24)	0.06
26	Remth	<i>Hammada scoparia</i>	10 (21.7)	0.085
27	Shdary	<i>Rhus tripartita</i>	10 (21.7)	0.135
28	Lierguig	<i>Helianthemum lippii</i>	9 (19.5)	0.074
29	Atil	<i>Maerua crassifolia</i>	9 (19.5)	0.077
30	Aggaya	<i>Zygophyllum gaetulum</i>	9 (19.5)	0.125
31	Ataf	<i>Stipagrostis ciliata</i>	9 (19.5)	0.097
32	Yerdhir	<i>Schouwia thebaica</i>	9 (19.5)	0.055
33	Dhenban	<i>Caylusea hexagyna</i>	8 (17.4)	0.056
34	Ashram	<i>Anabasis articulata</i>	8 (17.4)	0.108
35	Lerbien	<i>Chamomilla pubescens</i>	8 (17.4)	0.046
36	Zaaza	<i>Farsetia aegyptia</i>	8 (17.4)	0.073
37	Atig	<i>Lotus spp.</i>	8 (17.4)	0.065
38	Legtaf	<i>Atriplex halimus</i>	7 (15.2)	0.086

Table 6.3 (cont.) Results of ANTHROPAC analysis of camel forage freelists

	Item	Botanical taxon	Frequency N=46 (%)	Smith's Saliency Index
39	Tebazuaga	<i>Morettia canescens</i>	7 (15.2)	0.069
40	Sekum	<i>Asparagus altissimus</i>	7 (15.2)	0.047
41	Totrat	<i>Psoralea plicata</i>	7 (15.2)	0.067
42	Gandul	<i>Convolvulus trautmanianus</i>	7 (15.2)	0.057
43	Sghaa	<i>Malcolmia aegyptiaca</i>	6 (13)	0.033
44	Liedkhir	<i>Cymbopogon schoenanthus</i>	6 (13)	0.026
45	Liedmin	<i>Reseda villosa</i>	6 (13)	0.05
46	Hallaba	<i>Periploca laevigata</i>	6 (13)	0.043
47	Rekum	<i>Monsonia nivea</i>	5 (10.8)	0.045
48	Gherzim	<i>Nitraria retusa</i>	5 (10.8)	0.051
49	Akshir	<i>Farsetia sp.</i>	5 (10.8)	0.036
50	Hmued	<i>Rumex vesicarius</i>	5 (10.8)	0.051
51	Butreisira	<i>Lupinus digitatus</i>	5 (10.8)	0.043
52	Tleha	<i>Fagonia jolyi</i>	5 (10.8)	0.025
53	Ashakan	<i>Glossonema boveanum</i>	4 (8.7)	0.011
54	Nshal	<i>Moltkiopsis ciliata</i>	4 (8.7)	0.056
55	Sueid	<i>Suaeda vermiculata</i>	4 (8.7)	0.05
56	Amour	<i>Acacia senegal</i>	4 (8.7)	0.033
57	Fersig	<i>Tamarix amplexicaulis</i>	4 (8.7)	0.025
58	Shifne	<i>Gymnocarpus decandrus</i>	4 (8.7)	0.023
59	Laasal	<i>Salsola longifolia</i>	4 (8.7)	0.04
60	Shobrak	<i>Zilla spinosa</i>	3 (6.5)	0.009
61	Umm Lbena	<i>Launaea arborescens</i>	3 (6.5)	0.036
62	Mekker	<i>Launaea mucronata</i>	3 (6.5)	0.022
63	Tarfa	<i>Tamarix gallica</i>	3 (6.5)	0.046
64	Tamra	<i>Sclerocephalus arabicus</i>	3 (6.5)	0.021
65	Sdir	<i>Ziziphus lotus</i>	3 (6.5)	0.014
66	Tezoukenit	<i>Salvia aegyptiaca</i>	3 (6.5)	0.011
67	Ighnin	<i>Capparis decidua</i>	2 (4.3)	0.024
68	Legliya	<i>Grewia tenax</i>	2 (4.3)	0.009
69	Tazia	<i>Asphodelus tenuifolius</i>	2 (4.3)	0.021
70	Uden Naja	<i>Spitzelia coronipifolia</i>	2 (4.3)	0.003
71	Awraash	<i>Calligonum comosum</i>	2 (4.3)	0.005
72	Gahuan	<i>Calendula sp.</i>	1 (2.2)	0.002
73	Daaishe	<i>Fagonia sp.</i>	1 (2.2)	0.001
74	Henna	<i>Lawsonia inermis</i>	1 (2.2)	0.016
75	Rtem	<i>Retama raetam</i>	1 (2.2)	0.006
76	Umm Halluz	<i>Lotus jolyi</i>	1 (2.2)	0.011



**Table 6.3 (cont.) Results of ANTHROPAC analysis of camel forage freelists**

	Item	Botanical taxon	Frequency N=46 (%)	Smith's Saliency Index
77	Sad	<i>Cyperus conglomeratus</i>	1 (2.2)	0.013
78	Afzou	<i>Mesembryanthemum cryptanthum</i>	1 (2.2)	0.011
79	Argan	<i>Argania spinosa</i>	1 (2.2)	0.009
80	Shbarto	<i>Senecio anteuphorbium</i>	1 (2.2)	0.011
81	Taza	<i>Aizoon canariense</i>	1 (2.2)	0.014
82	Lezl	<i>Tamarix aphylla</i>	1 (2.2)	0.001
83	Gherema	<i>Launaea nudicaulis</i>	1 (2.2)	0.002
* Plant included in the cultural consensus model				

**Table 6.4 Consensus analysis results for Sahrawi freelists on camel forage**

Average Competency Score	0.717 (St.Dev. = 0.153)		
Eigenvalues Factor	Value	Percent	Ratio
1	24.742	83	6.414
2	3.857	12.9	3.161
3	1.22	4.1	
	29.82	100	

**Table 6.5 Summary statistics from PROFIT and QAP analysis**

Variable	R-Squared	Probability
Age	0.323	0.002*
Sex	0.027	0.046*
Group (refugee or nomad)	0.004	0.39
Ever lived nomadic	0.406	0.0001**
Years spent as nomad	0.561	0.001**
Present camel herding	0.004	0.33

\*Significant at  $p < 0.05$ ; \*\*Significant at  $p < 0.001$

*A. tortilis*, and informant 32, who listed four species including *A. tortilis*; both are refugees with no nomadic experience, who are 37 and 47 years old, respectively. Informant 37 is a 12-year-old boy who was born and has lived all his life in the El Aaiún refugee camp, and who owns two she-camels with their calves. Despite his short freelist of plants present around the camp (e.g., *Z. gaetulum*, *Tamarix gallica* L., *Anvillea radiata* Coss. et Durieu) as well as *A. tortilis*, he is, like many more boys and young adults in the refugee camps, interested in acquiring more herding knowledge, an exemplar of the desire to revitalize livelihoods and lifestyles once thought to be forever lost.

To summarize, our analysis of the freelists pertaining to the domain of camel forage indicates that nomadic experience and, to some extent, age are the most important factors underlying the differences among informants. Interestingly, men and women differ little in their knowledge scores (for a discussion, see below). While we expected refugees to have less knowledge than nomads, this is clearly only the case for those who were raised in refugee camps. Despite being unable to herd camels for such a long time, elder refugees have not lost their knowledge of camel forage, and the fact that there is a broad consensus among the entire study population of the most salient plants means that some knowledge is being passed on to younger refugees, but certainly not as much as might be. Whether this holds into the future is of interest both to us, as researchers interested in knowledge transmission and transformation, and to older Sahrawi, who are concerned about the loss of camel herding, knowledge, meaning and identity that is evident all around them in refugee camps. As one informant put it, 'We are people of the desert, we know the desert, its plants, its animals, its landscapes; we know our camels. A refugee camp is no place for us!'

## Discussion

### *Forage species in the cultural consensus model*

According to the results of the cultural consensus analysis, five species (i.e., *Acacia tortilis*, *Nucularia perrinii*, *Astragalus vogelii* Bornm., *Panicum turgidum* Forssk., and *Stipagrostis plumosa* Munro) make up the cultural consensus model, i.e., they are the most salient plants in the domain and most Sahrawi are likely to list them as camel forage. Indeed, according to Sahrawi herders, these particular plants are the most important camel forage in Western Sahara. Below, each of these species and their congeners is briefly discussed in terms of their ecology and use.

Acacias are important forage trees in arid and semi-arid areas of Africa (Wickens 1995) as well as Western Sahara (Gauthier-Pilters 1961). In the consensus analysis, *Acacia tortilis* was the camel forage that the Sahrawi most often cited (97.8%). *Acacia ehrenbergiana* Hayne was cited by 22 informants (47.8%), and *Acacia senegal* (L.) Willd. by four (8.7%), this order well representing the relative presence and distribution of the three species in Western Sahara. *A. tortilis* – called *talha* – is by far the most common tree species, growing to 10 meters in height and occupying the dry riverbeds of the Zemmur. *Talha* is of utmost importance to livestock as well as to humans; the Sahrawi use its parts and derived products in food, medicine, construction, and

veterinary medicine (Barrera et al. 2007, Volpato et al. 2012). *Talha* especially is the main browser for camels in Western Sahara during the autumnal months, before and just after the first autumn rains, similar to neighboring Saharan areas (Gauthier-Pilters 1961). During the cold season, it is reported that camels favor *Acacia* because then it bears fruit. In fact, *Acacia* pods – called *garrub* – are said to be nutraceutical, able ‘to fatten camels rapidly,’ so the Sahrawi and the Moors of Mauritania collect and feed them to camels (Leriche 1953).

*Nucularia perrinii* – called *askaf* – is the second most salient plant, mentioned by 35 informants (76%). There is very little information in the literature about this small halophytic shrub of the Amaranthaceae family; there are no studies about its ecology, its current geographical distribution, or its chemical content, and it is usually cited only in ethnographic accounts about Sahrawi tribes and in regional plant lists (Boyer 1962, Caro Baroja 1955, Guinea 1948, Lebrun 1998, Ozenda 1991). The plant is endemic to Western and Central Sahara and is known to Arabic-speaking pastoralists as *askaf* (or *âskâf*, *âskâf*; Ould Mohamed Baba 2006) and to Tamasheq-speaking Tuareg as *tassak* (Benchelah et al. 2000). *Askaf* reaches its maximum diffusion in the rocky plains of Western Sahara, particularly in Tiris where it is the dominant ‘salt’ species and may form monospecific populations (Correra 2006, Guinea 1945). Sahrawi herders widely acknowledge that *askaf* is resistant to drought and is a crucial source of salts and water for camels (Figure 6.3). Indeed, it is considered as a panacea: ‘Camels don’t fall sick if there is *askaf* to graze, and they recover from an illness if they graze *askaf*,’ one informant explained; it is ‘the most curative and important forage, which gives strength and stamina to camels,’ according to another. More than a half a century ago, observers recorded that *askaf* plays a fundamental role in camel diets in Western Sahara, especially in the cold season, that is, after the rains and before annuals have sprouted (Caro Baroja 1955, Doménech 1946). In this period, camels switch to the ‘cure of *hatba*’ (i.e., ‘salt cure’), a diet based on *askaf* and other halophytic plants, which ‘cleans camels’ blood’ due to its purgative effect, and gives to camel meat a red and firm texture and a taste of *askaf* (Boyer 1962).

*Astragalus vogelii*, known as *ter*, is a very common annual herb in the inland plains of Western Sahara and is the third most salient taxa cited by 30 informants (65.2%). A congeneric, *Astragalus eremophilus* Boiss. (*mbarza*), is sixth, cited by 25 informants (54.3%). *A. vogelii* is considered to be the most important green forage for camels in Tiris, where it becomes very abundant in some areas after rains, forming prairies over many kilometers. It is reported that camels grazing green *ter* have increased milk production and weight gain.

The fourth and the fifth plants that make up the consensus model are two grasses, *Panicum turgidum* (*mrokba*) and *Stipagrostis plumosa* (*nsil*), which are sometimes respectively referred to as the ‘king’ and ‘queen’ of camel forage. The clumping bunchgrass *P. turgidum*, along with *Acacia tortilis*, form the *Acacia-Panicum* association characteristic of the dry riverbeds of the Zemmur, where they are the most common species. In contrast, *S. plumosa* is characteristic of Tiris, where it grows on minimal sand deposits and may form prairies after rainfall. *S. plumosa* was cited by 27 informants, *Stipagrostis pungens* (Desf.) De Winter by 25, *Stipagrostis acutiflora* (Trin. et Rupr.) De



Figure 6.3 A camel feeds on a plant of *Nucularia perrinii* (askaf) in Zemmur (G. Volpato)

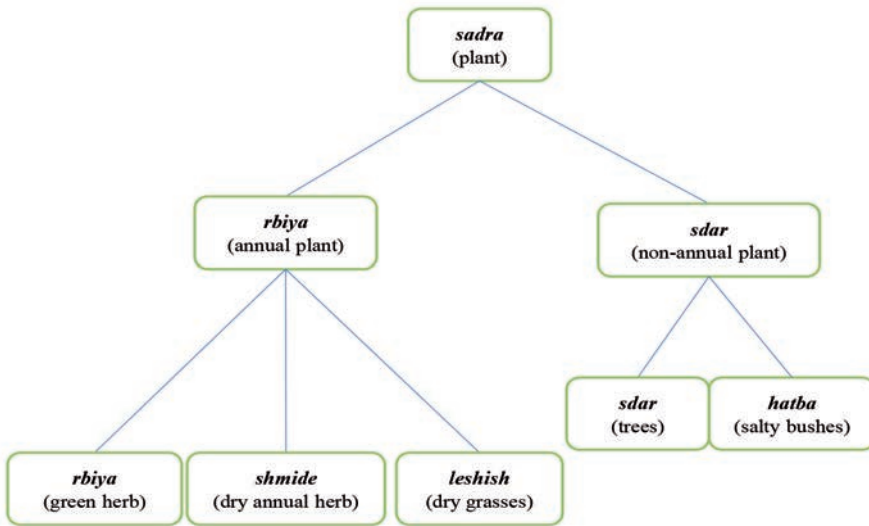


Figure 6.4 Sahrawi classification of camel forage

Winter by 16, and *Stipagrostis ciliata* (Desf.) de Winter by nine informants. These are important camel forage species in sandy areas of South and East Western Sahara (e.g., there are vast populations of *S. pungens* in the sandy region of Mijek).

### **Folk classification of camel forage in Sahrawi culture**

The Sahrawi classify camel forage into a series of functional and morphological categories that were investigated through semi-structured interviews. The classification of camel forage by the Sahrawi is schematically represented in Figure 6.4. Each of the plants that form part of the cultural consensus model is prototypical of high ranking (or more inclusive) Sahrawi plant life form categories (Berlin 1992): *Acacia tortilis* of *sdar* (i.e., 'trees'), *Nucularia perrinii* of *hatba* (i.e., 'halophytic plants'), *Astragalus vogelii* of *rbiya* (i.e., 'annual herbs') and *shmide* (i.e., 'dry annual herbs'), and *Panicum turgidum* and *Stipagrostis plumosa* of *leshish* (i.e., 'grasses'). Below, each of these categories is briefly discussed, starting with the categories of *rbiya* and *sdar*, which appear to divide *sadra*,<sup>28</sup> the unique beginner equivalent of 'plant'. The term *rbiya* indicates annual plants 'that grow with the rain' (i.e., 'herbs'); *sdar* defines 'all those plants that do not come out with the rain' (i.e., 'trees' and 'bushes'; see also Ould Mohamed Baba 2006). *Sdar* is further divided into two main sub-categories: *sdar*, which are trees, and *hatba* (or *summa*),<sup>29</sup> which includes all other non-annual plants, most of which are halophytic bushes.

Forty-three out of 100 (43%) species reported in Table 6.2, and 35 out of 83 (42%) species reported in the consensus list, are *rbiya*. A large share of *rbiya* species consists equally of Fabaceae (e.g., *Astragalus* spp., *Crotalaria saharae* Coss., *Lotus* spp.) and Asteraceae (e.g., *Chamomilla pubescens* (Desf.) Alavi, *Cotula cinerea* Delile, *Spitzelia coronipifolia* Desf.). Other *rbiya* are *Heliotropium ramosissimum* Sieber ex DC., *Diplotaxis pitardiana* Maire, *Limonium* spp. (Figure 6.5), *Echium horridum* Batt., and *Helianthemum lippii* (L.) Dum. Cours. *Rbiya* are annual herbs when green and mature (i.e., with flowers, or with the green parts fully developed); instead, the sprouting first leaves from the cotyledon that appear soon after rains are known as *zerrea*, while shoots are called *zad'f*, and both are considered to be too weak to be grazed. Dobignard et al. (1992a:116) define *rébia* as 'temporary vegetation appearing after the rains, constituted essentially by ephemerophytes, but that may include also some hemicryptophytes and geophytes,' and further note that this category corresponds to that of *acheb* used in East Morocco and South Algeria. These new herbs are important to camels since they are especially high in nutrients and low in less-digestible fibers (Dobignard et al. 1992a). In Western Sahara, they take from one to three months to complete their reproductive cycle and produce new seeds; after that, with the increasing late spring temperature, they dry quickly and become a camel food resource known to the Sahrawi as *shmide*.

<sup>28</sup> *Sadra* (i.e. plant) is the singular of *sdar* (i.e. trees) in Hassaniya, while in Arabic the generic term plant is *nabaat*. Thus, the Sahrawi use the same term to indicate trees and plants in general.

<sup>29</sup> *Summa* largely overlaps with *hatba* category, although the first is used to address plants in general terms, while the latter is used in reference to camel forage.





Figure 6.5 Camels grazing on a prairie of *Limonium* species (azatim) in Mehris (D. Rossi)

The category of *shmide* includes all those *rbiya* that grow after the rains of the previous winter and are present in dry form during the summer and up to a year after rains. Thus, *shmide* may include dry populations of *Cotula cinerea*, *Limonium* species, or *Diploaxis pitardiana*, among others. *Shmide* is considered to be rich in salts and nutrients, and an important resource for camels during summers and through the following winter in the absence of new rains.<sup>30</sup> Some herders also state that a very light winter rain may be worse than no rain at all, as it is not enough to stimulate the growth of *rbiya*, and at the same time it washes out salts and nutrients from *shmide*, reducing its quality as a forage. Likewise, although spring and early summer rains may regenerate part of the green forage (new *rbiya*), they are sometimes regarded as harmful to the quality of *shmide*, as they 'roast' the plants (Boyer 1962). In the words of one informant, 'while there is no rain, *shmide* will at least fill and sustain the camels.'

Besides *shmide*, the Sahrawi distinguish another kind of dry forage, *leshish*. *Leshish* (lit. 'that can be cut') refers to dry annual and perennial grasses (e.g., *Panicum turgidum*, *Stipagrostis* spp.) and is regarded as an important camel food source, especially during summer and as a last source of fodder during droughts: in the words of two Sahrawi, 'without rains, camels may feed for years from *leshish*,' and '*leshish* and plenty of water are enough for camels during the hottest months.' The term comes from the fact that these plants can be cut, harvested, and fed to camels as fodder. The importance and specific function of dry grasses for camels is not only stressed by their inclusion in a specific category, but also by the use of different taxonomic terms to contrast the green (lit. 'without seed') and dry (lit. 'with seed') individuals of the same species. *Stipagrostis* species, for example, are described as drought resistant

<sup>30</sup> In the annals of Sahrawi tribes there are years called 'the year of *shmide*', due to its abundance following the previous year's heavy rains (Caro Baroja 1955).

and of particular importance to camels when they are dry. Given the differential importance of *Stipagrostis* species as a forage when green or dry, the Sahrawi identify them with two different phytonyms (e.g., *aserdum* versus *sfar*, *ataf* versus *zigzig*, *sbat* versus *el-halfa*), according to their status. It is reported that camels never eat *S. pungens* when it is green, but only when it is dry. In the past, in spring, camels were brought to a 'cure of *ilig*' – the dry inflorescence of *S. pungens*; during this cure, which lasted about three weeks, camels would gain strength and become prepared for the heat of the summer (Boyer 1962).

*Shmide* and *leshish* are important especially throughout summer, whereas in late summer and autumn (before the rains and the growth of *rbiya*) herds rely largely on trees – *sdar*, which include 16 species in Table 6.2 (e.g., *Acacia* spp., *Maerua crassifolia* Forssk., *Rhus* spp., *Tamarix* spp.), and on salty and drought-resistant plants – *hatba* – of the Amaranthaceae family (i.e., *Nucularia perrinii*, *Salsola* spp., *Traganum nudatum* Delile, *Cornulaca monacantha* Delile). Thirteen species in Table 6.2 are salty forage plants belonging to the category *hatba*. All belong to the Amaranthaceae family, except for *Lycium intricatum* Boiss. (Solanaceae) and *Monsonia nivea* Webb (Geraniaceae). According to informants, the most important member of *hatba* is *N. perrinii*. After that, at least half of the informants listed *Salsola tetrandra* Forssk. and *Salsola imbricata* Forssk., *Traganum nudatum*, *Cornulaca monacantha*, and *Lycium intricatum*. Notably, populations of different species preferentially occupy different areas of Western Sahara: *N. perrinii* grows in the extended rocky steppes of the interior, *C. monacantha* grows in sandy soils and dune areas, *S. tetrandra* is predominant in some areas of Zemmur, and *Atriplex halimus* L. grows along the coast (Dobignard et al. 1992a). In Sahrawi camel dietary terms, *hatba* plants are said to be 'like meat for humans,' food 'that makes camels grow.' According to informants, in good years where different forage plants are available, camels rely largely on *rbiya* and *hatba*, feeding alternatively from plants from these categories and grazing on *hatba* plants preferentially in the mornings or the late afternoons.

It is known from other studies that camels graze often and preferentially on salty (halophytic) species, especially on plants with fleshy leaves that are characteristically high in protein and low in fiber content, and which have the advantage of developing green aerial parts during dry as well as during wetter periods (Gauthier-Pilters and Dagg 1981, Wilson 1989). In fact, to absorb and store water, camels need about six to eight times as much salt as other herbivores; consequently, halophytic plants can contribute up to one third of the total diet of camels in the Sahara, with an even larger share during dry seasons and periods of drought (Gauthier-Pilters and Dagg 1981). Because of their need for salts, Sahrawi herders brought camels to 'salt cures' of about ten days in December, January or February, and sometimes in spring (April, May), after having grazed on *rbiya*. Similarly, it is known that other African nomadic pastoralists (e.g., Moors, Tuareg, and Somali) take camels annually to a 'salt cure' (Correra 2006, Farah et al. 2004, Farid 1989).

As the above discussion indicates, the specific categories of camel forage recognized by the Sahrawi play different roles in camel nutrition throughout the year. Following the analysis of Boyer (1962:46) for the Reguibat tribe, that



of Gauthier-Pilters (1961) for nomads in North-western Sahara, and our own data and observations in the field, four nomadic seasons and respective patterns of camel dietary preferences among Sahrawi nomads can be distinguished: 1) a winter rainy season (beginning of December – end of February), when ‘camels fatten’ by grazing on *rbiya* as well as other green forages of *sdar* and *hatba*; 2) spring (beginning of March – beginning of June), when camels progressively move from a diet based on green plants to one based on dry plants (*shmid*e and *leshish*), with the ‘cure of *ilig*’ (the inflorescence of *Stipagrostis pungens*) in between; 3) summer (beginning of June – beginning of September), when camels rely heavily on dry forage and on drought-resistant *hatba* plants; and 4) autumn, when camels rely largely on *hatba* and *sdar* before rains ‘green’ the desert again.

The data show that a vast folk knowledge about the forage plants of Western Sahara (i.e., morphology, ecology, properties) is embedded in Sahrawi folk classification. This knowledge is essential for the patterns and cycles of movement of Sahrawi nomads and their herds, and to the optimal exploitation of western Saharan foraging resources, which are scarce both in time and space. The classification system also reveals much about the nomadic practices that embed and are embedded in Sahrawi ethnobotanical knowledge, and that form the basis of the Sahrawi’s complex adaptive management system. In fact, as other authors note in reference to patterns of nomadism and seasonal migration in the Sahara and the Sahel (Niamir-Fuller 1998, Berkes et al. 2000), annual cycles of livestock movement to different pasture areas and forage resources provide a rotational management system that enables the production and reproduction of livestock (and of human societies based on that livestock), and aims at a rational use of forage resources and the recovery of heavily grazed areas. This knowledge is thus crucial to the survival of Sahrawi nomads engaging in extensive husbandry, and should be seen as foundational knowledge for refugees that seek a path toward independence and recovery of lost nomadic livelihoods through seasonal nomadism.

### ***Forage and camel milk and meat***

Because camel milk was the main output of camel husbandry and a staple food in the Sahrawi pastoral system, it is not surprising that the Sahrawi recognize in detail the relations between forage and the taste, smell, or health and nutritional properties of camel milk. The taste of milk is particularly influenced by the plants that milking camels graze, and some plants transmit their characteristic (pleasant or not) smell and flavor to camel milk. Of the 100 plants reported in Table 6.2, Sahrawi informants recognized a relation between 25 of them and the organoleptic or medicinal/nutraceutical properties of camel milk. *Aizoon canariense* L., *Astragalus vogelii*, *Cyperus conglomeratus* Rottb., *Lotus* spp., and *Morettia canescens* Boiss. – the latter being very abundant in Western Sahara plains soon after the first rains – are regarded as galactogen plants (i.e., they increase the production of milk of the she-camels grazing them), whereas *Atriplex halimus* and *Periploga laevigata* Aiton, among others, are believed to improve the milk’s nutraceutical properties. Generally speaking, camel milk is believed to retain the medicinal properties of the plants that she-camels graze.

Most of the relations reported between forage and camel milk are related to the latter's organoleptic properties. The Sahrawi distinguish the taste given to camel milk by sweet, salty, watery, and bitter forage. In normal grazing conditions, camels move from grazing one kind of species to another in accordance with their needs (Gauthier-Pilters and Dagg 1981). The taste and smell of the plants grazed in each area and season is then reflected in the taste and smell of milk. The taste and smell of the milk, in turn, tells the nomad which plants the camels have grazed and, given the different relative presence of forage plants across nomadic circuits, also where the camel has grazed. Through this process, the taste and smell of camel milk become representative of, and attached to, customary grazing areas, and hence also become an element of cultural identity. For example, Sahrawi nomads perceived that the 'perfect' light-salty taste of *Nucularia perrinii* in camel milk (and meat) is characteristic of Western Sahara, in contrast with other nomads (e.g., Tuareg), their territory (where the plant is absent), and the taste of the milk. The Sahrawi also appreciate the sweet taste given to camel milk by 'sweet forage' such as *Asparagus altissimus* Munby and *Spitzelia coronipifolia*. They also praise the smell of flowers that is given by *Astragalus vogelii* and *Crotalaria saharae*. However, strong flower perfumes in camel milk may also have negative consequences; if a camel consumes too much *Diplotaxis pitardiana* which, after rains, forms yellow flower beds of many kilometers square in Zemmur, calves may stop suckling due to the strong smell of the plant in the mother's milk. Finally, several plants (e.g., *Anvillea radiata*, *Asteriscus graveolens* Forssk., *Launaea* spp., *Reseda villosa* Coss.), especially when grazed in large quantities and/or with little variation in species, are reported to give camel milk a bitter (other times defined as 'heavy' or 'unpleasant') taste, which the Sahrawi do not appreciate at all. Another plant that gives camel milk a bitter and 'heavy' taste if consumed in abundance is *Schowia thebaica* Webb; according to Gast et al. (1969), it confers a taste similar that of cabbage. According to Sahrawi informants, drinking milk with a strong bitter taste imparted by these plants may cause a folk illness called *eghindi*, which is an health condition characterized by somatic reactions with a variety of symptoms (e.g., skin rashes, burning sensations, weakness, edema, etc.) due to exposure to several environmental agents (e.g. smells) or dietary sources (e.g., salty or bitter foods, burned meat) (Volpato and Waldstein 2014).

Camel meat's organoleptic, nutritional and medicinal properties are also influenced by the plants that camels consume. For example, the tripe of a camel fed largely from *Astragalus eremophilus* is said to have a strong and unpleasant taste, which requires them to be washed more. Similarly, *Launaea mucronata* Muschl. is called *el mekker* (lit. 'the bitter one'), and passes an unpleasant bitter taste to camel meat. Boyer (1962:37) also discusses variation in camel meat's taste related to forage among the Reguibat: salty pastures are reported to give meat a 'natural seasoning,' *N. perrinii* a 'rubbery' texture and 'herbal' taste, and the presence of *Cotula cinerea* in pastures gives the meat a 'minty' taste.

Knowledge about forage plants that influence the taste and properties of camel milk and meat indicates one way in which cultural values underpin local

knowledge systems. Sahrawi practices around the taste and smell of camel products are not only the result of cumulative personal preferences; they are embedded in Sahrawi cultural values and identity. In these tastes and smells, the Sahrawi recognize those of their (lost and partly recovered) homeland and of their customary nomadic territories, and further associate such tastes and smells with concepts such as freedom (e.g., of crossing the desert with camels, access to their homeland) and belonging (e.g., to a group of people with specific food practices and preferences).

### ***Distribution and transmission of knowledge about camel forage among contemporary Sahrawi***

Results from consensus and PROFIT analysis performed on camel forage freelists have shown that forage knowledge is unevenly distributed within the Sahrawi study population, and that this distribution can be explained by nomadic experience and age as the most important underlying factors. Thus, elderly refugees, who were once camel herders, retained much of their knowledge of forage, knowledge that is comparable to that of present day nomads. However, as might be expected, the disengagement of most Sahrawi refugees from camels and nomadism as a consequence of forced displacement and sedentarization has led among younger refugees to a lack of opportunity, and need, for learning about forage. Moreover, decades of prohibition on access to nomadic territories meant a loss of the setting where forage knowledge was typically transmitted in the past. Even in the refugee camps, past pathways of transmission that might have conveyed some of the theoretical knowledge of the elders to the young have been broken or ignored for a variety of reasons.

Based on participant observation and interviews, it is argued that several factors, including exclusion from learning environments, have led to dormancy in the process of knowledge transmission. The establishment of formal primary schools in the refugee camps and many refugees' pursuit of higher education in other countries have also contributed to a reduction in time spent with elders and with others still engaged in camel husbandry, and thus fewer opportunities for knowledge to be passed on. There has also been a noticeable shift in values associated with education, emigration, and exposure to mass media and development schemes; many younger refugees have no interest in camel husbandry, nomadism, and the associated knowledge and cultural heritage, and have even come to view these in negative terms, as backward and useless. This is not uncommon within populations who live on the margins economically, socially and environmentally, and a number of researchers have addressed similar threats to the cultural transmission of knowledge that are associated with abandoned lifestyles in contexts of socio-cultural change and globalization (Robinson 2003, Zent 2001, Brodt 2001, Maffi and Woodley 2010).

In spite of these observations, many Sahrawi are increasingly struggling to revitalize their nomadic heritage, practices, and associated knowledge. This process appears to have begun with the ceasefire agreement of 1991, the demobilization of Polisario soldiers, the renewed access to cash (e.g., through Spanish civil pensions, remittances, private enterprises, trade, etc.), free access

to the liberated territories, and strings of rainy years that began in the 1990s. All of these contributed to the resurgence of camel husbandry among nomads and refugees as well, and to the revitalization of camel-related knowledge and nomadic heritage (Volpato and Howard 2014). An increasing number of young refugees are taking up seasonal nomadism and learning the associated traditional knowledge. The competence scores in the CCA of all young refugees that have engaged in seasonal nomadism in recent years were good, suggesting that knowledge transmission is indeed being revitalized amongst such refugees. According to semi-structured interviews conducted with these 'new' nomads, they learned about camel forage once they began to engage in camel husbandry and nomadism, acquiring this knowledge from their fathers or uncles if these were once nomads, or from peers and coworkers if they were not, employing both vertical and horizontal paths of knowledge transmission. Learning occurs through participation, observation, sharing activities, and instruction, similar to what has been found in other studies (Lozada et al. 2006). Knowledge is once again being used - it can be revitalized in practice because older refugees and former nomads never lost such knowledge, and thus it can now be passed on to a new generation of camel herders.

This revitalization seems to have also included women. In fact, although results confirmed the impression that men have a little more knowledge of camel forage than women, variation is low (about three per cent). This suggests that, in spite of the fact that camel herding is traditionally a male activity, women have almost as much knowledge of camel forage as men. There are two plausible explanations for this: first, historically and contemporarily, men travel for long periods (e.g., to markets) and leave their wives (or other women) in charge of the camel herd, at least part of which remained close to the nomadic camp. Thus, women would know nearly as much as men, at least with regard to the principle forage plants in the customary nomadic territory. Second, women also count among those refugees who acquired camels in the refugee camps (e.g., to provide fresh camel milk to the family or household), and these women would have learned about camel forage and scored better than men who never engaged in camel husbandry.

Processes of revitalization of traditional knowledge have been addressed in the literature, for example in reference to bush skills and knowledge among Cree women of Subarctic Canada (Ohmagari and Berkes 1997). In the Sahrawi case, the transmission of traditional camel forage knowledge was partly revitalized because it is crucial to pastoralism and nomadism, which are once again becoming viable livelihood activities as the political and economic conditions change. For many, livestock husbandry represents a means to regain a sense of control over their lives, presenting the possibility of reducing their dependency on food aid. Moreover, the revitalization of livestock husbandry (and the recovery of associated traditional knowledge) reinforces the Polisario's claims to nation-statehood: it provides for national welfare and reduces dependency on food aid via state food production and redistribution, and, drawing upon a shared cultural heritage, it legitimates claims to ethnic unity and national identity (Caratini 2000, Volpato and Howard 2014).

## Conclusions

This paper has given an account of Sahrawi ethnobotanical knowledge of camel forage plants in Western Sahara with a focus on their identification, properties, and classification. The results show that, emerging from their historical engagement with Western Sahara environment and camel husbandry, the Sahrawi developed a rich and detailed knowledge of camel forage and elaborated strategies of temporal and spatial mobility on the basis of this knowledge in order to provide their camels with the best available forage at any given moment within the accessible pasture areas. Cultural consensus analysis and multidimensional scaling suggest that this knowledge has been retained among nomads and refugees who live or once lived nomadic lives, but its transmission was disrupted among refugees by sedentarization in refugee camps and disengagement with traditional extensive camel husbandry. Thus, the transmission of camel forage knowledge entered into a state that can be characterized as 'dormancy', where it was retained by elderly refugees as 'theoretical' knowledge and still nomadic populations as applied knowledge, and thus still available for further transmission to non-knowledge holders given the right conditions. A process of revitalization of knowledge transmission is occurring with refugees' re-engagement with nomadism and pastoralism as political, economic and even climatic contexts have shifted since the ceasefire agreement of 1991.

Taken together, these results suggest that: 1) knowledge about forage is critical to pastoralists' success and survival in arid environments, since technical husbandry strategies (e.g., movement patterns) depend on this knowledge; 2) in contexts of pastoral population sedentarization, forced displacement, and associated changes in culture and productive activities, transmission of this knowledge may be impaired, leading to its maintenance as theoretical knowledge held by former practitioners, such as elders; and 3) this dormant knowledge may be revitalized and its transmission recovered once it again becomes of material or cultural importance among people who re-engage with past livelihood or environmental management strategies. Of course, in the case of knowledge dormancy, one critical element is the time lag between the loss of relevance and the desire for revitalization; the more time passes, the more likely it is that this dormant knowledge will be permanently lost unless otherwise documented. The time lag might also be important in relation to processes of economic (e.g. competition-driven technological change, change in market demand), cultural (change in cultural values and expectations), and ecological change (e.g., variation in species distribution and communities, in climatic conditions). The longer the time span and the greater the rapidity of change, the more traditional knowledge will need not only to be recovered and transmitted, but also updated or transformed. Sahrawi nomads, who maintained both camels and knowledge of camel forage throughout the war, have also helped refugees to reinitiate camel husbandry and seasonal nomadism by contributing camels (e.g., as camel loans) and knowledge. This has occurred within a more general re-establishment and revitalization of social relations between nomads and refugees based on former tribal affiliation, kin group, bonds of friendship, or commercial relations (e.g., in marketing fresh camel

milk in the refugee camps). In this sense, nomads have served as a reservoir of knowledge and engagement with the desert for refugees, i.e., as a minority holding on to a life 'as it should be.'

These findings enhance our understanding of the critical role of knowledge among pastoral populations and of its value to refugees in recovering and revitalizing their productive and cultural heritage. While many questions remain, including those concerning interventions that can support refugees' aims and agency, from an academic point of view, much more information is needed to understand such processes of knowledge transformation, and thus follow up studies are recommended to document what happens with this knowledge over the next generation as the revitalization process gains strength or wanes.







# CHAPTER 7

## **A Reward for Patience and Suffering – Ethnomycology and Commodification of Desert Truffles Among Sahrawi Refugees and Nomads of Western Sahara<sup>31</sup>**

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### **Abstract**

This paper reflects on the role of ethnobiological knowledge and practices for refugees' agency by focusing on the use and commodification of desert truffles among the Sahrawi refugees of Western Sahara. Historically, desert truffles of the genera *Terfezia* and *Tirmania* have been an important food and medicinal resource for Saharan nomads. Today, after becoming refugees following war and forced displacement, the Sahrawi still harvest truffles for their use values, but most are sold in the Algerian town of Tindouf. This paper addresses Sahrawi food, medicinal, and veterinary uses of desert truffles, and the ongoing process of commodification sustained by a high international demand and the need for cash income. This process of commodification has both helped refugees to generate income and triggered a recovery of traditional knowledge around desert truffles. However, it has also led to increasing harvesting pressure and competition among truffle collectors, thus giving rise to the risk of unsustainable harvest levels.

**Keywords:** Terfez; Terfezia; Tirmania; Medicinal Use; Value Chain; Sahrawi Refugees

*'He decided to settle there...because he had discovered another treasure – desert truffles...Once a man has tried such truffles, he spends the rest of his life longing to taste them again...The truffles were like a reward for all his patience and suffering' (Al-Koni 2008, 128)*

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## Introduction

Over the past decade or so there has been increasing interest in the knowledge and practices of migrating and displaced people within the fields of ethnobotany and ethnobiology (Pieroni and Vandebroek 2007, Voeks and Rashford 2013). On the other hand, refugee studies have long addressed issues related to refugees' dependency on food aid and their agency (i.e., the capacity of individuals to act independently, making their own free choices) toward self-sufficiency and economic independence (Harvey and Lind 2005, Horst 2006). In spite of both of these trends, scholars have paid relatively little attention to the significance of ethnobiological knowledge and practices for refugees' agency and wellbeing (Bodeker et al. 2005, Volpato et al. 2012). This study aimed at investigating refugees' use of traditional ethnobiological knowledge to earn income and reduce their dependency on aid, using Sahrawi refugees of Western Sahara and their use of desert truffles as a case study.

Desert truffles are hypogeous mushrooms of the Pezizaceae family (Pezizales, Ascomycetes), while the more prominent among them belong to the genera *Terfezia* and *Tirmania* (Kagan-Zur and Roth-Bejerano 2008). Desert truffles have been used as food for thousands of years (Feeney 2002, Shavit 2008); currently, their fruit bodies are collected and appreciated in Saudi Arabia, Kuwait, the Maghreb, across the Sahara, in Spain, in the Kalahari and in the Australian Outback (Mandee and Al-Laith 2007, Rodríguez 2008, Trappe et al. 2008, Trappe et al. 2008). Saharan and Middle Eastern nomads have long used desert truffles as a source of food, as a food delicacy, and as an emergency resource in times of food scarcity (Gast 2000), and have marketed them in desert towns for hundreds of years (Feeney 2002, Lepp 2009).

In spite of the importance of desert truffles, scholars have paid little attention to their use among desert inhabitants. In contemporary North Africa and the Middle East, desert truffle collection is a temporary occupation that is as widespread as desert truffles themselves (Feeney 2002). Truffles are harvested and sold in local rural markets and for national and international trade (Kagan-Zur and Roth-Bejerano 2008) in places as diverse as Morocco (Khabar et al. 2001), Algeria (Gast 2000), Bahrain (Mandee and Al-Laith 2007), and Saudi Arabia (Awameh and Alsheikh 1979). There is an ongoing process of *commodification* (i.e., the process of transformation of previously non-marketed or scarcely marketed goods into commodities) of desert truffles across their range. Recently, a number of studies have addressed wild mushroom commerce and commodification in a global trade (e.g., Sitta and Floriani 2008, Winkler 2008), but, to our knowledge, the process of commodification of desert truffles has not been studied.

In this paper, we address the historical and contemporary use of desert truffles by the Sahrawi nomads of Western Sahara. Because most Sahrawi nomads became refugees following the occupation of their nomadic territory by the Moroccan Army in 1975, we also address the use and economic importance of truffles in their livelihoods, and argue that commercial truffle exploitation represents an important source of income for many. We present and discuss data about: 1) desert truffles' taxonomy and ecology according to the Sahrawi,

and their harvesting practices; 2) food, medicinal, and veterinary uses; and 3) Sahrawi refugees' engagement in the process of truffle commodification that has occurred for the past two decades, and its possible local social and environmental implications.

## **Background**

### ***Historical background***

'Sahrawi' is the name given to the tribes of nomadic pastoralists who traditionally inhabited a coastal area of north-western Africa including Western Sahara, northern Mauritania, and part of south-western Algeria. The Sahrawi were nomadic peoples who pastured camels, goats, and sheep, and relied for food on livestock products as well as on dates, sugar, and cereals bartered for livestock in markets on the periphery of their nomadic areas (Caro Baroja 1955). In 1975, following Morocco's occupation of Western Sahara, about 70,000 Sahrawi fled the Moroccan army and became refugees in south-western Algeria (San Martin 2010). Today, after 16 years of war (1975-1991) that brought further refugees to the camps as well as high population growth, about 165,000 Sahrawi live in four refugee camps located in a desert plateau called Hamada near the Algerian town of Tindouf (see Figure 1.1).

In the camps, refugees live in tents and mud brick huts, experiencing problems with both water and food supplies. Car batteries provide the main source of electricity. The European Union, bilateral development cooperation from certain countries, UN agencies, and several solidarity groups provide the refugees with food, shelter, and other basic commodities (San Martin 2010). In an attempt to improve the quality of life in the camps, over the years the refugees have developed an informal economy based on petty commerce by expanding trading routes through the camps from Mali, Mauritania, Algeria, and Spain (Bhatia 2001, Dedenis 2005).

The refugees' political representatives – the SADR (Sahawi Arabic Democratic Republic) Government and the Polisario Front – have political control over the eastern part of the Western Sahara, which was wrested from Moroccan control by means of a guerrilla war that lasted until the peace agreement of 1991 was signed (Bhatia 2001). These inland areas of Western Sahara (the so-called "liberated territories," which comprise approximately 20 percent of Western Sahara) are separated from the remaining "occupied territories" under the administering authority of the Moroccan government by a militarily defended earthen wall.

In their efforts to improve their conditions, refugees have struggled in many ways to maintain or recover traditional livelihoods and cultural and social practices, from livestock husbandry to medicinal plant use (Volpato et al. 2007). Pastoral areas within the territory are important for these ends. These territories also continue to be inhabited by about 20,000-30,000 Sahrawi nomads who cross them with their herds and use the refugee camps, Tindouf, and Zouérat as their principle commercial hubs.

### ***The study area and its climate***

The area under consideration in this study – i.e., the area where the Sahrawi

collect and market desert truffles – includes the liberated territories of Western Sahara, northern Mauritania, and the refugee camp area in the Hamada of Tindouf. Across these areas, the climate is arid and continental: summer daytime temperatures surpass 50 degrees Celsius, while winter night time temperatures drop to zero. Precipitation is torrential, unpredictable, and patchy, with an annual average of 30-50mm. Generally occurring at the end of the summer and throughout autumn, these rains represent the extreme northerly penetration of the African Monsoon from the South, or are associated with the Atlantic Westerlies from the West (Brooks et al. 2005). However, rainfall is highly irregular both annually and across the years, where droughts are recurrent phenomena.

Three main biogeographical areas can be distinguished: 1) The Tindouf Hamada; 2) Western Zemmur; and 3) Tiris. The Hamada of Tindouf, where the refugee camps are located, is a barren desert plateau where temperatures fluctuate between - 5°C in winter to greater than 50°C in summer. Vegetation is poor, with scattered *Acacia* trees and tufts of annual or perennial herbs. The northern sector of the liberated territories – and the most important for truffle collection – is called Zemmur, which is characterized by sand and gravel plains in its eastern part, and by higher relief in its central and western parts, where it is gullied by inactive and occasionally active rivers. After rains, Zemmur exhibits a savannah-like environment dominated by *Acacia-Panicum* vegetation, while flowering prairies may appear on flat gravel areas. The southern sector, known as Tiris, is more arid than Zemmur and is characterized by flat sand and gravel plains from which characteristic black granite hills rise in clusters or in isolation. There are no dry riverbeds and hence the vegetation is mostly herbaceous and adventitious, and includes large areas covered by halophytic plants (Soler et al. 1999).

## **Methodology**

Research was conducted within Sahrawi refugee camps and in the liberated territories between 2006 and 2009. Methods included semi-structured and retrospective interviews (Weller 1998) with refugees and nomads, as well as a ‘walk in the woods’ approach carried out with knowledgeable truffle harvesters (Cunningham 2001). Semi-structured interviews were developed on the basis of ethnomycological models (Yamin-Pasternak 2011) and collected data about truffle terminology, kinds, and characteristics; their ecology; collection; processing; storage; food, medicinal, and veterinary uses; and cultural and economic importance. Retrospective interviews were conducted with older informants and were aimed at understanding truffle use in nomadic livelihoods before the war and forced displacement. About 28 semi-structured interviews and eight retrospective interviews about desert truffles were conducted with nomads and refugees. The ‘walk in the woods’ approach was carried out with four informants in the northern part of the ‘liberated territories’ (i.e., in Bir Lehlou and Tifariti), where four truffle harvesting sites were visited. During these visits and other interviews when truffles were at hand, informants were asked to separate them into ‘kinds’ (if any) with the corresponding local names, uses, properties, and distinguishing characteristics.

Truffle harvesters and knowledgeable informants were identified through snowball sampling (i.e., we asked an initial pool of informants found randomly to point us to other collectors and knowledgeable informants they knew). Interviews were conducted in Hassaniya (the Arabic language with a Berber substrate spoken by the Sahrawi) and Spanish: local research assistants asked the questions in Hassaniya and translated the answers into Spanish, which is the second most frequently spoken language among the Sahrawi and which is fluently spoken by the first two authors, who conducted fieldwork. To ensure that, during the interview process, no mistakes were made with the translation and to clarify doubtful information, interviews were recorded and listened to again and transcribed with the help of the same research assistant. Transcripts were then entered into the qualitative data management software program Nvivo and coded, allowing us to explore Sahrawi knowledge and practices around desert truffles. Truffle prices in the refugee camps and in Tindouf were collected from vendors, while prices paid to Sahrawi truffle harvesters were obtained by interviews with the collectors themselves. On the basis of these prices and qualitative data, we used value chain analysis to discuss the commodification of desert truffles among the Sahrawi. Value chain analysis synthesizes the flow of a commodity from the production or collection stage up to final consumption, also considering the required inputs (Gereffi et al. 2005). This helps to understand where competition among suppliers or buyers may intensify, or where the predominance of one actor over the others (e.g., through the control of required resources, such as transport, processing, or storage) may create power dynamics within the chain and/or potential social or environmental tensions (Kaplinsky 2000, Gereffi et al. 2005). For each interview, prior informed consent was obtained verbally after participants were given an explanation of the methodology, aims, and outcomes of the study and before the interview was conducted. Throughout the field study, the ethical guidelines adopted by the American Anthropological Association (AAA 1998) and by the International Society of Ethnobiology (2006) were followed.

## **Results and Discussion**

### ***Taxonomy***

The taxonomy and ecology of desert truffles are far from being completely understood. With regard to Africa, while there has been a good deal of research on desert truffles in the Mediterranean areas, little research has been conducted further south in the Sahara desert. From what is known, it seems that the number of truffle species diminishes when moving southwards from the Mediterranean coast towards the inner Sahara desert. There, only the most xerothermophile species are found, namely *Terfezia claveryi*, *T. boudieri*, *Tirmania pinoyi*, and *T. nivea*, as is the case in Morocco (Khabar et al. 2001), southern Algeria (Fortas and Chevalier 1992), and in the Libyan Sahara (Chatin 1891). In western Africa, desert truffles grow as far south as nearly to the fringes of the Sahel, and it is likely that *Tirmania* species prevail in very arid areas.

The geographical area dealt with in this paper is known to the Sahrawi as the *badiya* (i.e., where the 'Bedouins' live). To date, no mycological study has identified the species of desert truffles present in the *badiya*, or in neighbouring areas such as northern Mauritania or in that part of Western Sahara that is under Moroccan occupation. The identification of desert truffles used by the Sahrawi at species level was not among the aims of this study, so that this task remains for other scholars to complete. Rather, we focus on classification at the genus level and on Sahrawi ethnotaxonomy of desert truffles. Two types of truffles are well known, commonly recognized, and found in the *badiya*: the first and most common, described as large and externally whitish or cream coloured, is called *terfez*, and corresponds to *Tirmania* truffles; the second is reddish or dark red and smaller, is called *shoba*, and corresponds to *Terfezia* (e.g., *Terfezia clavervyi* Chatin) truffles (Table 7.1, Figures 7.1 and 7.2).

However, the Sahrawi often use the name *terfez* as a generic to refer to both *Terfezia* and *Tirmania* truffles. In fact, although the classical Arabic name for desert truffles is *kamaa*, they are referred to by their Berber name – *terfez* (or *terfes*, *terfas*) – in Morocco and Western Sahara. Rather than regarding *terfez* and *shoba* as different truffles, a minority of informants consider the latter to be the younger and smaller form of the former. In any case, there is general agreement about truffles' relative presence in the *badiya*, with *shoba* indicated as less common than *terfez* in the Western Sahara environment: the former grows preferentially in rocky deserts and plateaus such as in the Hamada of Tindouf, whereas the latter is said to grow in sandy soils or top soils such as those found in many areas of the liberated territories.

### **Ecology**

Desert truffles of the genus *Terfezia* and *Tirmania* establish mycorrhizal symbiosis mostly with roots of members of the family Cistaceae, such as several annual and perennial species of the genus *Helianthemum* (Gutiérrez et al. 2003). All Sahrawi informants identify a plant named *erguig* as the only host for truffles in the *badiya*. *Erguig* is the small perennial bush *Helianthemum lippii* (L.) Dum. Cours. (Cistaceae) (Figure 7.3). It is a Saharo-Sindian species that grows in gravel plains, sandy areas, and silted plateaus across all of the Sahara (Ozenda 1991). In the *badiya*, it is particularly common in Zemmur (in north-eastern Western Sahara and northern Mauritania), where it grows and flowers after rains, thus permitting mycorrhiza formation with vigorous hosts and fruiting of truffles. Indeed, the Sahrawi indicated this region (besides non-accessible areas of Western Sahara, e.g., in the surroundings of the capital El Aaiún) as the area where truffles are most abundant.

Across their range, desert truffles need an adequate amount of rain to fruit, estimated at about 150-200mm per year (Awameh and Alsheikh 1979, Feeney 2002). Similar to the Tuareg of south-east Algeria (Benchelah et al. 2000), the Sahrawi indicate that two or three intense rains over a period of one to three months are needed for fruiting, and that harvests begin about one month after the second or third rain. In the words of one informant, 'After three rains, the desert has a present for us!' As rains in Western Sahara usually occur between September and December, the truffle harvesting season there can be broadly



Table 7.1 Truffle species identified during the ethnomycological study in Western Sahara

Species	Hassaniya name	Occurrence frequency	Colour	Size
<i>Tirmania</i> spp.	Terfez	Very common	White	Large
<i>Terfezia</i> spp.	Terfez, shoba	Common	Reddish	Medium



Figure 7.1 *Terfezia* and *Tirmania* truffles in a cardboard box (G. Volpato)



Figure 7.2 Harvest of *Tirmania* truffles near Tifariti (D. Rossi)

defined as ranging from November to April, with a peak between January and March.

When truffles grow, they need to be located in order to be harvested. To do so, Sahrawi harvesters rely on their personal experience and on their ethnoecological knowledge of the *badiya* at a progressively specific level. They organize for the hunt about two to four weeks after the second rain: collectors move to areas of the *badiya* with specific soil characteristics that support *erguig* and truffle growth. Once there, they first locate *erguig* plants (which often form loose populations dispersed over an area of tens of square metres), because ‘where *erguig* grows, you can find *terfez*.’ Some define *erguig* as the male plant and *terfez* as the female one, to stress their ecological association. *Terfez* may be found at a distance of between a few decimetres up to a few meters from *erguig*. Once *erguig* has been located, truffle harvesters locate the cracks produced by the growing truffles and scoop out the ground there, in much the same way that all desert truffle collectors do (Taylor et al. 1995). Then, they dig by hand and extract the truffle, usually just a few centimetres under the soil’s surface.

### ***Food, medicinal, and veterinary use***

On the basis of retrospective interviews with older Sahrawi, local nomads’ pattern of desert truffle use can be outlined and, on this basis, truffle use as it probably existed for at least fifteen hundred years can be inferred. Truffles were harvested for their food and medicinal uses. Although no historical report was found in the literature that deals with Western Sahara nomads’ collection and use of desert truffles, retrospective interviews indicated that all Western Sahara tribes ate and appreciated desert truffles, and that there were years in which they were abundant and constituted an important food resource. Men, women, and children alike collected truffles, either during expeditions carried out specifically for this purpose, or while carrying out other activities such as collecting firewood or tending livestock. Contemporary nomads in the liberated territories do much the same. Truffles are prepared for consumption by washing and cutting them into slices, and are then roasted in embers with goat or camel meat, cooked in a sauce (Figure 7.4), or roasted or boiled and consumed with butter or with camel hump fat. They are highly appreciated, having a taste described as ‘aromatic’ and ‘similar to meat.’ Besides being consumed as a delicacy, truffles were also used as a complementary and/or emergency food in times of scarcity. The Sahrawi recalled this in terms such as, ‘When nothing was left, dried *terfez* was our bread and our meat.’ For this reason, truffles were sliced, dried in the shade, and stored in a dry shady place (e.g., inside the tent) for up to one or two years. Tuareg nomads of the Hoggar Mountains make similar uses of desert truffles (Gast 2000). Today, desert truffles are harvested and consumed by Sahrawi nomads and refugees alike, especially by older refugees and former nomads for whom truffles recall ‘the taste of the *badiya*,’ and, by association, their lost nomadic youth.

Truffles are also used as medicinal foods and in the preparation of medicinal and veterinary remedies. As a medicinal food, truffles are regarded as good against colds and respiratory afflictions caused by the harsh winter



Figure 7.3 Population of *Helianthemum lippii* near Tifariti. Note the earth moved by a truffler in the center-right of the picture (D. Rossi)



Figure 7.4 Goat meat and a truffle and carrot sauce served with *merifissa* (the Sahrawi underground-baked round bread) (D. Rossi)

temperatures. Also, consumption of hot truffle soups is considered to be good for treating 'bone and articular afflictions' such as rheumatism. As a medicinal remedy, the Sahrawi use truffles as a treatment for arthritis, rheumatism, and eye infections such as conjunctivitis and trachoma. To treat arthritis and rheumatism, truffles are washed, sliced, boiled, and applied topically, or a poultice obtained from mashing the boiled slices is made and kept in place with a bandage. These treatments are said to 'draw the cold out of the body.' In order to prepare an eyewash to treat eye infections, which are very common in the desert environment, truffles are boiled and the resulting water is stirred and applied as eyedrops, or a piece of truffle is boiled and then squeezed so that the resulting drops fall in the affected eye as eyewash. Sahrawi refugees have maintained the use of truffles for eye afflictions, and about five per cent of the refugees' tents that Volpato et al. (2007) surveyed for medicinal remedies had desert truffles in store to be used for ophthalmic problems. This medicinal use of truffles is generally well-known in Islamic medicine and among Saharan nomads and Arab populations of the Middle East (Alsheikh and Trappe 1983, Mandeel and Al-Laith 2007). In Sahrawi veterinary medicine, truffles are used to treat mastitis (inflammation of the udders) and metritis (inflammation of the wall of the uterus) in livestock. To treat metritis, truffles are boiled and mashed with onion and garlic and then applied as a poultice inside the uterus (e.g., after parturition) with oil. To treat mastitis and other external inflammations, the Sahrawi topically apply slices that had been simmered for half an hour with a bandage, or make washes with the water in which truffles have been boiled. If no water is available to boil truffles, they are mashed when raw, heated on embers, and applied as a poultice with some oil or animal fat. The treatment is repeated for at least three days, or until the inflammation recedes. For nomads, the use of desert truffles to treat mastitis is especially important in relation to camels, since camel milk is a staple food and mastitis (e.g., due to frequent milking) is one of the primary causes of decreasing milk production.

### ***Truffle commodification***

Scholars use the term *commodification* to describe, among others, the process of commercialization of traditional knowledge and of plants, animals, and mushrooms formerly used for subsistence (Castree 2003, Vermeylen 2008). Below, we discuss the commodification of desert truffles among the Sahrawi using value chain analysis. The value chain for desert truffles originating in the liberated territories is presented in Figure 7.5.

Over a period of almost 20 years, with war and sedentarization in refugee camps, Sahrawi refugees lost access to truffles, to the capital required to collect truffles, and to a truffle harvesting territory. However, over the past fifteen years or so, within a wider process in which many Sahrawi refugees sought to free themselves from a condition of economic dependency, some sought to regain access to desert truffles (and other traditional products of the *badiya*, Volpato et al. 2007) both for their use value and especially in order to earn income. Refugees required three main resources (inputs) to enable them to engage in truffle harvesting and marketing: 1) knowledge about truffles, their ecology, and how, when and where to find them; 2) territories where truffles grow;

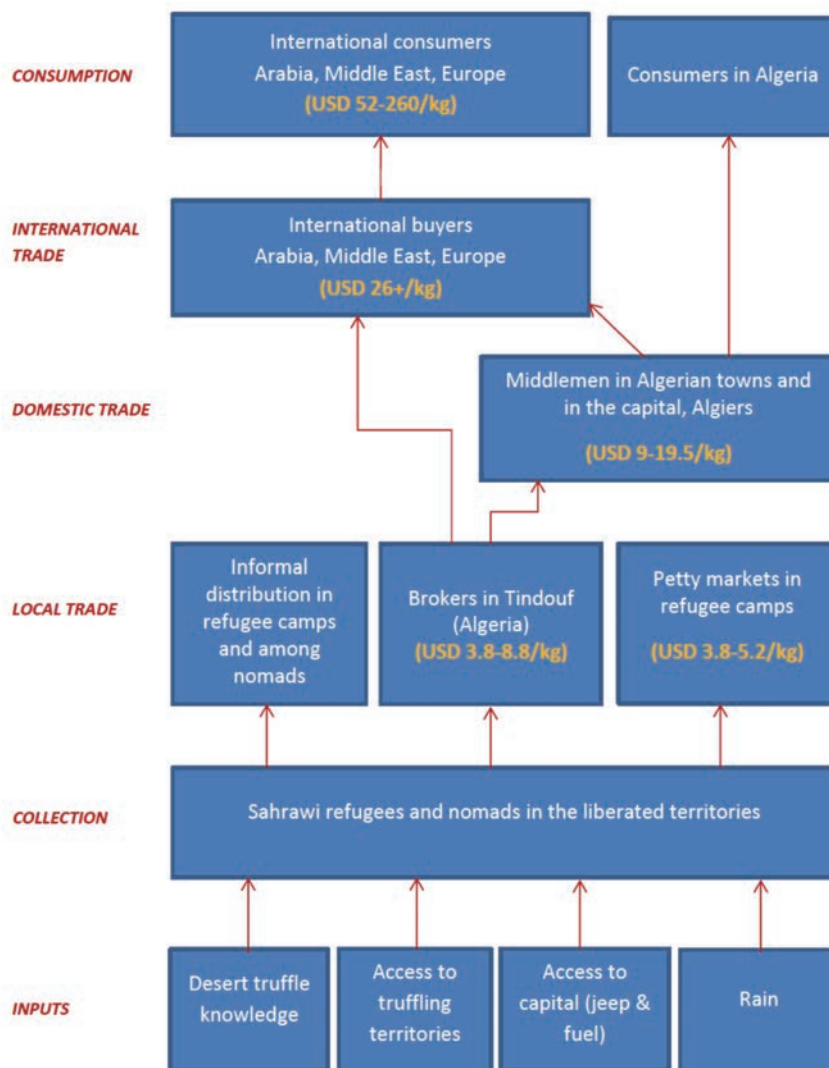


Figure 7.5 Value chain of desert truffles among the Sahrawi. Note: Exchange rate USD 1 = DZD 79.60 = 0.77 Euros on October 8, 2012.



and 3) the capital necessary for truffle harvesting (e.g., a jeep to travel to the *badiya*). In 1991, when the peace agreement allowed refugees to have access to at least part of their former nomadic territory (i.e., the liberated territories), these conditions began to be met. The agreement also brought about the demobilization of Polisario soldiers, who had meanwhile gained knowledge of the *badiya* after 15 years of surviving in the area as guerrilla combatants. New refugee harvesters and demobilized soldiers also gained knowledge through conversations with older refugees (e.g., relatives and acquaintances who lived as nomads before exile), who knew the *badiya* and its resources from their nomadic youth. The transmission of ethnoecological knowledge (e.g., how to locate truffles, when to search, where truffles have grown even with limited rains, etc.) has been particularly important to commercial truffle collectors, since it confers an advantage over improvised collectors who do not have such knowledge. For this reason, aspects of this knowledge (e.g., the location of specific truffle collecting areas) are kept secret to avoid competition.

Refugees also needed access to a capital to invest in the enterprise. This became available as refugees, in the search for income-generating opportunities, engaged in productive and trade activities (e.g., mechanics' workshops, food shops, livestock husbandry, etc.). Such opportunities were made possible by new means of access to initial capital provided through Spanish civil pensions (paid by the Spanish Government since 1992 to those Sahrawi who had worked for the Spanish colonial administration or army before 1975), through remittances from the Sahrawi diaspora (e.g., in Spain), through donations from Spanish families (e.g., under the children hosting plan known as 'Holidays in peace', see Crivello et al. 2006), or by means of cash obtained from the liquidation of other assets (e.g., of a camel herd) or from the earnings of other enterprises. In order to begin commercial truffle harvesting, refugees first needed to purchase a jeep and often did buy a used jeep in Mauritania or Spain. A fourth condition required to enable truffle collection was rain, and indeed a string of rainy years from 1990-2010 produced an abundance of truffles in the liberated territories.

These four main factors allowed several refugees to initiate commercial truffle harvesting. Half of the informants in this study were commercial truffle collectors; their mean age was 26, and ranged from 16 to 51. They were all refugees (we found no nomad engaging in commercial harvesting), and four were Polisario soldiers. The latter sometimes engage in truffle harvesting during the three-to-six month period that they spend as cantoned soldiers in the liberated territories. But mostly, commercial truffle collectors are young refugees with only elementary formal education (i.e., they attended primary school in the refugee camps and then abandoned their studies), but with a deeper knowledge of the *badiya* and a higher level of engagement with the desert in comparison with more educated refugees (e.g., those that attended university abroad). Refugee truffle collectors, during the harvesting season, leave the refugee camps and travel to the liberated territories. The duration of harvesting journeys is usually one to two weeks, with truffle collectors trying to harvest as many truffles as possible (up to tens of kilograms) in just a few days to sell them while they are still at their peak quality. These journeys

are repeated throughout the harvesting season. At the well of Bir Lehlou in January, 2007, one of the authors (GV) met three young refugees who were travelling through the liberated territories with a cat in an old Land Rover. The back of the Land Rover was packed with bags full of truffles, which they were hoping to sell in Tindouf. One of them explained, 'The business is very good. Every year after rains we leave the camps to harvest truffles in the *badiya*. This time we brought a cat with us in order to keep gerbils away from the harvested truffles at night.'

What do refugees do with the harvest? Three routes are taken by truffles collected by refugees: 1) a large majority is sold to Algerian intermediaries in Tindouf for onward sale; 2) collectors sell truffles to shop owners in the refugee camps or directly to other refugees for final consumption; and 3) collectors redistribute truffles for final consumption in the refugee camps through kin and informal networks of exchange and reciprocity. Most truffle collectors engage in all of them, consuming, redistributing, and selling truffles at the same time. In Tindouf, truffles pass into the hands of Algerian intermediaries who then sell them in town or have a network of buyers across Algeria. During favourable years, there are lively truffle markets in Tindouf as well as in other Algerian towns as far north as Algiers, and the prices commanded by Algerian intermediaries are higher than those paid by consumers in the camps. Because of this, truffles are not often found for sale in camp shops, which happens only in periods of great abundance. But even in this case, truffle collectors may store part of the harvest in containers (e.g., a fuel tank filled with sand) in order to sell at a higher price once the period of high supply is over. Thus, the Sahrawi are the primary producers in a value chain in which they work as harvesters and sellers, and are more rarely active as buyers, as they make direct use of part of the harvest. Refugees use the earnings from small-scale truffle marketing to expand truffle collection (e.g., purchasing better means of transport) or as a supplementary income used for other businesses, as well as for livelihood expenses (e.g., to buy food and other items not provided by food aid).

Refugees sell their harvest to Algerian intermediaries rather than directly to Algerian customers in Tindouf because of legal barriers to entering the Algerian economy and territory outside the refugee camp area (e.g., refugees are not allowed to travel across or to take up a paid occupation or establish productive activities in Algerian territory unless they have an Algerian identity card). The limitations to travel in Algerian territory make it a risky business for refugees to collect truffles there. At least in one case reported to us, members of the Algerian Police Force, in implementing these policies, halted refugee truffle collectors in Algerian territory and confiscated their harvest. Instead, refugees are allowed to move freely within the liberated territories where they possess unregulated usage rights as citizens of the Sahrawi republic in exile (the SADR), and as well they are informally allowed free movement to and from Mauritania. Although they have access to an extensive truffle collecting territory, refugees encounter a bottleneck in their limited ability to engage directly with Algerian and international consumers, leaving them with little alternative to selling their harvest to intermediaries in Tindouf.

This value chain is sustained by high demand for desert truffles in Algeria and



abroad, which translates into the higher prices that such foreign consumers are willing to pay for these delicacies. For example, in spring, 2008, Sahrawi sold truffles to Algerian traders in Tindouf at about 300-700 Algerian Dinars (DZD)/kg (about 3.8-8.8 USD/kg), and these traders would then resell them to consumers in Tindouf or other Algerian towns (e.g., Béchar, Ghardaïa, Algiers) at twice the price or more (i.e., 800-1500 DZD/kg). Throughout Algeria, this trade has become very lucrative in recent years due to the high demand from Algerian city dwellers (who consider truffles as an exotic food, a delicacy, or a purported aphrodisiac) and also from Europeans and Middle Eastern consumers (Ouali 2006). In 2009, a very good year, this trade assumed very substantial proportions: trucks drove into Houari Boumediene Airport in Algiers every day loaded with truffles destined for the Arabian Peninsula, the Gulf States, and Syria, where prices paid were from 25-50 USD/kg (Fethi 2009). Demand for desert truffles in Europe can be traced back to the growth of its North African and Middle East populations. Also, part of this export may be due to attempts by some traders to sell (or blend) *Tirmania nivea* truffles as the far more valuable Italian white truffle (*Tuber magnatum*), because of their similar appearance (Rodríguez 2008). Whichever the case, the commercial harvest of Sahara truffles is well-established, as indicated by the numerous websites on the Internet advertising Sahara truffles for international sale.

### ***Social and environmental impact of truffle commodification***

The high demand for desert truffles in Algerian and international markets and their high prices combine to make truffle harvesting a lucrative activity for Sahrawi refugees. However, as other studies of wild mushroom commodification demonstrate (Winkler 2008), the increasing harvesting pressure for commercial purposes might raise issues of sustainability. Although field data was not collected on the possible social and ecological impacts of commercial harvesting in the *badiya*, concerns arise from the increased competition among commercial Sahrawi truffle collectors (reported by collectors themselves), and between commercial truffle collectors and nomads who harvest truffles for subsistence purposes. Increasing market demand may also exacerbate inequalities, since truffle collectors with more financial resources have greater access to collection. An Algerian truffer from the region of Béchar expressed similar concerns to the Magharebia newspaper: 'I learned this job from my father, who learned it from his father. We know the desert like the back of our hand. But now that the businessmen are into truffles, there's competition. Sometimes, you have to use force to defend your territory. Sometimes, you have to sneak out at dawn to make sure no one follows' (Fethi 2009).

At least partly, harvesting dynamics may be self-compensatory in the *badiya*: with greater harvesting pressure, there is decreasing availability, so that fewer Sahrawi resort to truffle harvesting as a source of income. But in the presence of constant high demand and high prices, this may create the conditions for truffle harvesting to have a long-term negative impact on truffle populations. Intensive commercial truffle collection might lead to habitat disturbance (e.g., loosening of the soil, increased wind erosion, Steinmann 1998) and

unsustainable harvesting. It may be especially so if truffle collectors do not follow sustainable harvesting practices, such as recapping the ground after harvest. Increased market demand may also threaten desert truffle populations and reproduction since truffle collectors have incentives to collect and sell truffles before they are fully ripened, which may have a negative effect on spore dispersal through wind or animals, which occurs upon truffles' maturity. This may lead to a lower abundance of desert truffles that may be produced and collected in one season. One day in January, 2006, near Tifariti, after very good rains the previous December, a truffle collector told us: 'everyone should wait until March, when truffles will be far bigger than now; but there is such demand and so many truffle collectors that nobody waits.' Competition among truffle collectors and high demand trigger an early harvest of unripe truffles, which consequently are smaller and less valuable. This is reinforced by the fact that truffle prices vary throughout the harvesting season: truffles can be found on sale at double the price or more at the beginning of the season (in January-February) compared with the end of the season (April-May).

## **Conclusions**

This paper has given an account of the historical and contemporary use of desert truffles among Sahrawi nomads and refugees of Western Sahara. First, truffle taxonomy, ecology, and harvesting knowledge and practices were addressed, and then the food, medicinal, and veterinary uses were described. The process of truffle commodification among the Sahrawi was described and it was argued that this occurred within a wider process in which refugees strove toward economic independence, which included the commercial exploitation of desert resources formerly used for their use values. The commodification process occurred not only due to refugees' search for an income, but also because of the high demand for desert truffles in North Africa, including Algeria, and the Middle East. From this perspective, Sahrawi truffle collectors are the primary producers in a value chain that provides desert truffles as a food delicacy to a growing number of consumers.

The results of this research show that desert truffles have played important functions among Sahrawi nomads as complementary and emergency foods, as medicinal foods, and as a source of medicinal and veterinary remedies. Although these uses continue, the most relevant use of truffles at present is as a source of income. With the cash obtained from remittances or other sources, a number of Sahrawi refugees have purchased jeeps and began harvesting truffles for sale. These dynamics might lead to competition among truffle collectors and increase the likelihood of unsustainable truffle harvesting levels.

The findings from this study make several contributions to the current literature. First, they contribute to the ethnomycology of desert truffles within a geographical and cultural context not addressed by previous ethnomycological investigations. Second, they describe the local process of truffle commodification, thus providing a case study for other research and theory about human-nature relations in a globalized planet. And third, they provide insights and a case study on the means through which Sahrawi refugees and other refugees in general combine their knowledge about the

local environment with access to their customary territories in order to generate income. These results support the idea that refugees are not simply passive recipients of food aid, but rather struggle to maintain and recover their ethnobiological knowledge and practices, which they use to earn an income as well as for gift-giving and direct use values. By studying desert truffles and their commodification, the current findings add to a growing literature on refugees' agency and on the ethnobiological practices of migrating and displaced people. Our findings are subject to at least three limitations. First, a detailed taxonomy of desert truffles in Western Sahara is still missing, and only preliminary data are provided here. Second, field data was not collected on the possible social and ecological impacts of commercial harvesting in the *badiya* and, until further studies are conducted, these remain speculations. Third, field data was not collected on the relative contribution of truffle sales to collectors' household income. Nonetheless, findings from this study can be used by NGOs and policy makers to develop targeted interventions aimed at supporting refugees' agency while addressing possible social, economic, and environmental implications of commercial truffle harvesting among the Sahrawi.





# CHAPTER 8

## General Discussion and Conclusions

### Introduction

The general aim of this study is to advance the understanding of human-nature relationships in contexts of forced displacement and encampment by investigating refugees' efforts to recover pre-exile subsistence practices and associated knowledge, while in the process adapting to new environmental conditions and social relations that have arisen from their refugee experiences. It seeks to provide a preliminary theoretical framework for studying the human ecology and ethnobiology of refugees living in camps. This framework was developed in part to examine Sahrawi refugees' agency as they sought to recover and adapt their former traditional subsistence and other related material and cultural practices (i.e. camel husbandry, herbal medicine, mushroom collection), as well as the associated changes in their ecological and social relations (such as access to, procurement and commodification of subsistence resources), and culture (the loss, transmission, and revitalisation of traditional knowledge, significance of camels and of other desert resources for refugees' cultural and political identity).

The research questions related to the general objective were:

1. Why, under which conditions, to what extent, and to what ends have Sahrawi who live in camps recovered their pre-exile subsistence practices?
2. How and to what ends have Sahrawi who live in camps adapted their access to, procurement, and use of subsistence resources?
3. How and to what extent have the social relations around pastoralism and the use of subsistence resources changed among Sahrawi refugees? How, why, and to what effect have subsistence resources become commodified?
4. How, why, and to what extent has ethnobiological knowledge been lost, transmitted, and revitalised among Sahrawi refugees?
5. In what ways have the recovery and adaptation of pastoralism and other subsistence practices been tied to processes of revitalisation and renegotiation of Sahrawi cultural identity?

The study departed from the disciplinary perspectives of human ecology and ethnobiology, which were combined with refugee studies, and integrated quantitative and qualitative data collection and analysis methods drawn from anthropology, biology (botany and zoology), and ecology. In Chapter 1, the

theoretical, analytical, and methodological frameworks and background were presented, as well as the aims, justifications, and significance of the study. Chapters 2, 3, 4, 5, 6, and 7 present the results of fieldwork conducted in Sahrawi refugee camps and the liberated territories.

In Chapter 2, I presented and discussed the recovery and adaptation of camel husbandry among Sahrawi refugees, providing evidence related to research questions 1 (recovery and adaptation of subsistence practices), 2 (access to, procurement, and use of subsistence resources), 3 (commodification of subsistence products), and 5 (subsistence practices and cultural identity). For decades, Sahrawi refugees struggled to recover livestock husbandry. Once they managed to gain access to cash and other resources, they re-engaged in productive activities and recaptured part of their nomadic culture from the camps. This process was examined specifically in relation to camels and camel husbandry and it was shown how refugees regained access to camels and small livestock through economic and social mechanisms, leading to the intensification of camel management, renewed seasonal nomadism, and commodification of camel products in the camps. The cultural and social motivations underlying camel husbandry revitalisation were discussed, where it was shown that two principle motives were refugees' need for productive activities to complement food aid; and older and more conservative refugees' desire to recover traditional pastoral life with its associated knowledge and values. Camel and camel products are now used by Sahrawi refugees and the Polisario Front to promote a specific Sahrawi cultural and political identity *vis a vis* Morocco and its claims on the Western Sahara territory.

Chapters 3 and 4 presented and discussed Sahrawi refugees' procurement and use of traditional medicinal remedies, providing evidence and arguments related to research questions 2 and 4 (loss, transmission, and revitalisation of ethnobiological knowledge). Recovery and adaptation were related to the use of medicinal remedies, especially their contribution to refugees' well-being and social practices. As was the case as well in their nomadic past, many of these remedies are still obtained from the Western Sahara desert environment, specifically from the liberated territories. Their procurement and use strengthens and re-activates cultural bonds between refugees and their former nomadic territories and sustains the revitalisation of associated knowledge and beliefs.

Chapter 5 focused on the folk illness *eghindi* and the changes that occurred in this explanatory model with forced displacement and sedentarisation, providing evidence and arguments relating to research questions 2, 4 and 5. The case of *eghindi* makes it clear that, in contexts of social and cultural transformation, the construction and experiences of illnesses can change. Processes of redefinition of health beliefs and practices involving *eghindi* are not socially uniform; traditional practices and values have been promoted or challenged by different refugee groups. Changes in pathological states and their interpretation gave rise to an expanded understanding of *eghindi* among conservative and older refugees, while progressive and younger refugees deny *eghindi*. As an element of Sahrawi nomadic heritage, *eghindi* became embodied within a broader process of negotiation and redefinition of Sahrawi cultural identity.



Chapter 6 addressed the identification, classification, and cultural salience of camel forage plants among the Sahrawi. It discussed changes in knowledge of camel forage among refugees and hence provides evidence and arguments related to research questions 4 and 5. It was posited that, given their nomadic mode of subsistence based on camel husbandry, the Sahrawi's knowledge of camel forage resources in their nomadic territory would be profound, and integral to a system of camel management aimed at rationally exploiting the desert environment's biota. With displacement, this knowledge had become 'dormant' and was revitalised and newly transmitted as Sahrawi refugees re-engaged with pastoralism and nomadism.

In Chapter 7, I discussed refugees' collection, use, and commodification of desert truffles, providing evidence and arguments related to research question 2, 3, and 4. The case illustrates refugees' use of the recovered liberated territories to generate income, the process of commodification that accompanies this, and how this process is embedded within transnational trade. Harvesting is based on the traditional knowledge of desert truffles that is in turn embedded in the culinary and medicinal traditions of Sahrawi nomads, where truffle commodification has revitalised associated ethnomycological knowledge.

The aim of the present chapter is to integrate the findings across the various chapters and understand their implications both for the individual research questions and for the study's main objective. The first section reflects on the agency refugees' exercise as they recover and adapt subsistence practices and associated knowledge. The second section presents an evaluation of the main empirical findings with respect to the research questions. The third discusses the practical implications of the study. The fourth presents a reflection on the analytical approach and provides recommendations for future research, while the fifth and final section presents the overall conclusions.

### **Reflections on the Theoretical Framework**

The findings presented herein provide evidence that confirms and expands the postulations presented in the framework proposed in Chapter 1 (Figure 1.2) that theorises the role of agency in refugees' recovery in exile. The framework drew upon the theory of agency in human-nature relationships, where individual and collective agency is seen as the basis of adaptation, that is, the continuous adjustment of practices and relations in response to changing circumstances and opportunities. Such individual and collective action, however, does not occur in a vacuum – rather, it is conditioned and structured by changing social relations, living conditions, and environments. Chapters 2, 3, 4, 5, 6, and 7, which present the results of fieldwork, have shown that Sahrawi refugees have indeed exercised agency to recover and adapt their pre-exile subsistence practices and ethnobiological knowledge. In what follows, I refer to that framework and develop it further. First, I reflect on refugees' agency and its relation with the structure and rules of the refugee camps. Then, each of the major analytical themes presented in Chapter 1 are addressed: the processes of re-engagement with the customary territory/homeland (Figure 8.1), the significance of subsistence practices and ethnobiological knowledge for people living in refugee camps (Figure 8.3), refugees' procurement and

use of subsistence products (Figure 8.4), and the changes that occur to ethnobiological knowledge in contexts of encampment (Figure 8.5).

### *Structure and agency in refugee camps*

Sahrawi refugees recovered pre-exile subsistence practices and associated knowledge by exercising their collective and individual agency within the structure of the camps and the rules and norms defined by their political organisation and culture. In the camps, collective and individual agency interacts, where the former creates the conditions for the exercise of the latter. At the outset, upon exile, refugees collectively organised into a nationalistic political organisation - the Polisario Front - which managed the camps to guarantee refugees' survival and which engaged in military and diplomatic struggle to recover access to and control of the lost homeland. The few resources initially available to refugees were mobilised and distributed through the Polisario and, subsequently, the SADR, the newly established republic in exile. This collective agency was confined and informed by the rigid structure of the camps, especially by the fact that international aid was the only available resource available to refugees, leaving extremely limited room for personal initiative or mobility.

These collective efforts succeeded not only in guaranteeing refugees' survival, but also in changing the structure of exile in terms of the choices and actions available to refugees. With the Ceasefire Agreement of 1991, these efforts largely paid off, providing refugees with access to the liberated territories and establishing the conditions for refugee's renewed access to resources not mediated by collective institutions. These conditions enabled refugees to initiate productive activities and trade and, more generally, to exercise a measure of individual (and family-based) agency toward livelihood diversification. It is in this phase that refugees' agency progressively shifted toward private (versus public) domains (Wilson 2012), including the recovery and development of productive activities, trade and migration, while maintaining a focus on Sahrawi cultural identity. Natural resources again became central to many Sahrawi lives once they regained access to the desert territory and its associated resources for their use, market, or cultural values. This process was greatly aided by changes brought about by collective military effort leading to the recovery of part of the former nomadic territory. It depended on access to resources provided collectively (e.g. international solidarity) and through individual and family initiatives (e.g. remittances); individuals and families chose to invest such resources both in capital and in each other. In a sense, the initial collective mobilisation under conditions of emergency is eventually functional to the exercise of individual, family-based, or other forms of subcollective agency by creating the conditions for refugees to act independently. In the Sahrawi case, for example, regaining access to the customary territory as a consequence of a collective military effort was key to establish the conditions for individual agency around subsistence practices to occur.

This shift toward the primacy of individual agency is epitomised by the change in ownership of the means of production and control over labour.

While in the emergency phase, which was characterised by collective agency (1975-1991), the Polisario owned and managed all means of production and controlled refugees' labour while, in the post-1991 phase, a number of refugees individually accessed the means of production and re-organised their labour and exchange relations partly based on kinship and partly based on capitalist labour relations.

The results demonstrate the importance of including and understanding the structure (e.g. the physical constraints and the social relations within which agency is exercised) that subsumes and influences refugees' subsistence practices. In Chapter 1, I proposed that collective and individual forms of agency are exercised within the social structure and rules (i.e. culture, norms, expectations, etc.) within which a population acts (Dietz and Burns 1992). I also asserted that the exercise of agency changes the social structure and rules, so that people confront not only changes in the physical structure of the reality in which they act, but also in the social reality that conditions their behavioural options. A population's culture determines in part what is acceptable or not among the options available. Forced displacement and encampment challenge or redefine accepted norms and behaviours and this redefinition of rules can create social tensions and cultural struggles within the population. Among Sahrawi refugees, this is exemplified by the redefinition of the norms around camel milk. When camel husbandry began to be revitalised, some sought to earn income through camel milk sales in the camps, which was considered taboo in nomadic Sahrawi society where milk surpluses were redistributed according to kin and tribal affiliation based on reciprocity, allegiances, and tributes that excluded monetary transactions. These norms were challenged by political, cultural and material change in and around the camps and although some cultural conservatives (especially older refugees and former nomads) continue to portray sales of camel milk as unacceptable, today the majority of refugees accept the practice and source fresh camel milk through markets. Thus, once the physical and social structures of the camps permit (e.g. adapting norms and behaviours and also allowing mobility within and outside of the camps), refugees struggle to engage with the local environment and available natural resources to improve their consumption, generate income, and strengthen identity and cultural continuity, also for political reasons, as discussed in Chapter 2 and in the sections below.

### **Evaluation of Research Findings**

Sahrawi refugees have re-engaged in a variety of pre-exile subsistence practices using and transforming the desert's biotic resources for their material and cultural values and to generate income. The conditions that permit this include access to cash and/or means of subsistence apart from food aid, mobility and access to part of the former homeland or neighbouring countries with similar environments and biotic resources, ethnobiological knowledge about those resources, and personal safety and social networks. However, a further finding of this study is that this recovery did not occur without fundamental changes in the social and ecological relations and culture around these subsistence practices and resources. Rather, these relations have been

adapted to the new context, including forms of access to the desert territory and its resources, commodification of subsistence resources, revitalisation of ethnobiological knowledge, and renegotiation of cultural and political identity around these resources. Below, the major empirical findings are presented and discussed according to the order of the five analytical themes introduced in Chapter 1, namely: 1) recovery of pre-exile subsistence practices; 2) access to, procurement, and use of subsistence resources; 3) trade and commodification of subsistence resources; 4) loss, transmission, and revitalisation of ethnobiological knowledge; and 5) subsistence practices and refugees' cultural and political identity.

### *Recovery of pre-exile subsistence practices*

The results of retrospective interviews confirmed what was previously reported by geographers, ethnographers, and others who wrote about Sahrawi nomads in the pre-colonial and colonial periods - the Sahrawi used the desert's natural resources for numerous purposes (e.g. food, human and veterinary medicine, construction, etc.) and these resources constituted the material and cultural basis of their lives. The Sahrawi's main mode of subsistence - livestock pastoralism and, especially, camel nomadism - was rooted in these resources and especially in desert forage. Camels and, secondarily, goats and sheep, were the keystone species in the production and reproduction of Sahrawi nomadic society, providing staple foods, means of transport and warfare, and means of exchange; camels were also the source of power and prestige. Nomads complemented livestock husbandry by harvesting wild plants and mushrooms and hunting, as well as through trade. In relation to food procurement, these complementary subsistence strategies were of particular importance in times of drought, when the capacity of herds to support humans with milk was reduced. In these cases, for example, wild plant seeds were milled and used as flour, and desert truffles were dried and stored or consumed as emergency food. In relation to non-food subsistence resources, the Sahrawi's medicinal and veterinary systems were based on the biological and mineral resources of the desert environment as well as on products obtained through trade. The production, reproduction, and distribution of these means of subsistence took place within a framework of tribal social relations, which underpinned nomads' access to the nomadic territories and the procurement of subsistence resources that was sustained by knowledge of these resources and associated meanings (e.g. camels were central to the tribes' foundation myths).

The study found that the Sahrawi were adapted culturally and behaviourally to the desert environment. Besides holding vast knowledge about desert resources and their exploitation (see below), Sahrawi nomads were also equipped with beliefs, norms, and behaviours that were adapted to the specificities of the desert environment in relation to health and fitness. This is exemplified in this study by the discussion of the biocultural roots of the Sahrawi folk illness called *eghindi*. Because high levels of salt are present in the desert together with little fresh water, and because nomads need to reduce their consumption of salt to a minimum to maintain their physiological balance, *eghindi* reinforced a series of food rules restricting the consumption of salt and other substances

(spicy, bitter, burnt foods, and smells). The Sahrawi use water sparingly and, through norms, behaviours and practices associated with *eghindi*, avoided salt and salty food other than milk and meat from their animals. These food norms were strengthened and enforced by their association with pathological states and their classification as an illness. *Eghindi*, as an explanatory model of the risks of engagement with the desert environment, was transmitted together with associated cultural norms across generations and was both transmitted and enforced by adult nomads.

Although Sahrawi nomads' subsistence patterns were already moving toward increased sedentarisation and reliance on wage labour and trade in the colonial period, this process was radically speeded up and reinforced with war and forced displacement. The Sahrawi lost their herds and other property, access to desert resources and to their nomadic territories, as well as their mobility. Within a tribal social organisation, they could not confront the threats posed by supra-regional powers nor direct an international effort to recognise their rights to their homeland; their anti-imperialist struggles begot a Sahrawi nationalist ideology, which in turn led to a social revolution, with attendant cultural change in Sahrawi's relations and political allegiance. War between the Moroccan Army and the Polisario Front ensued, while Sahrawi refugees (mainly children, women, and the elderly) had to rely on food aid for survival in the camps of western Algeria. However, since the Polisario Front's military efforts partly paid off with the UN-brokered ceasefire agreement of 1991 and the recovery of part of the former nomadic territory (the liberated territories), Sahrawi refugees have struggled to recover access to their homeland, its resources, and livestock. During this period, the conditions of exile changed, leading to increased access to cash, increased freedom of movement (including access to at least part of the Western Sahara homeland, i.e. the liberated territories), emigration and the development of extra-camp social networks, and a progressive diffusion of an informal economy in the camps. In continuity with the past and within the opportunities and constraints of their condition as refugees, the Sahrawi recovered access to, procurement, use, and meaning of pre-exile subsistence practices and products to improve their lives, in the process adapting procurement patterns, the technology involved, forms of use, and culture around these resources.

The recovery of pre-exile subsistence practices was triggered and informed by historical, economic, cultural, social, political, and ecological drivers. The studies of camel husbandry, medicinal remedies, and desert truffles addressed this point. With material and political change related to the Ceasefire Agreement of 1991, many refugees pursued this recovery as a path toward food security and livelihood diversification, conditioned as well by the lack of alternative livelihood pathways in the camps and in the desert environment. For example, although some of the original functions of the camel were lost (e.g. as a means of mobility and warfare), camel husbandry is one of the only means to sustainably exploit the resources of the Western Sahara (e.g. to provide milk and meat), and has been sustained by favourable rains for the past 10-15 years. The Ceasefire Agreement, the demobilisation of Polisario soldiers and their return to the camps, and the emergence of new sources of capital to invest

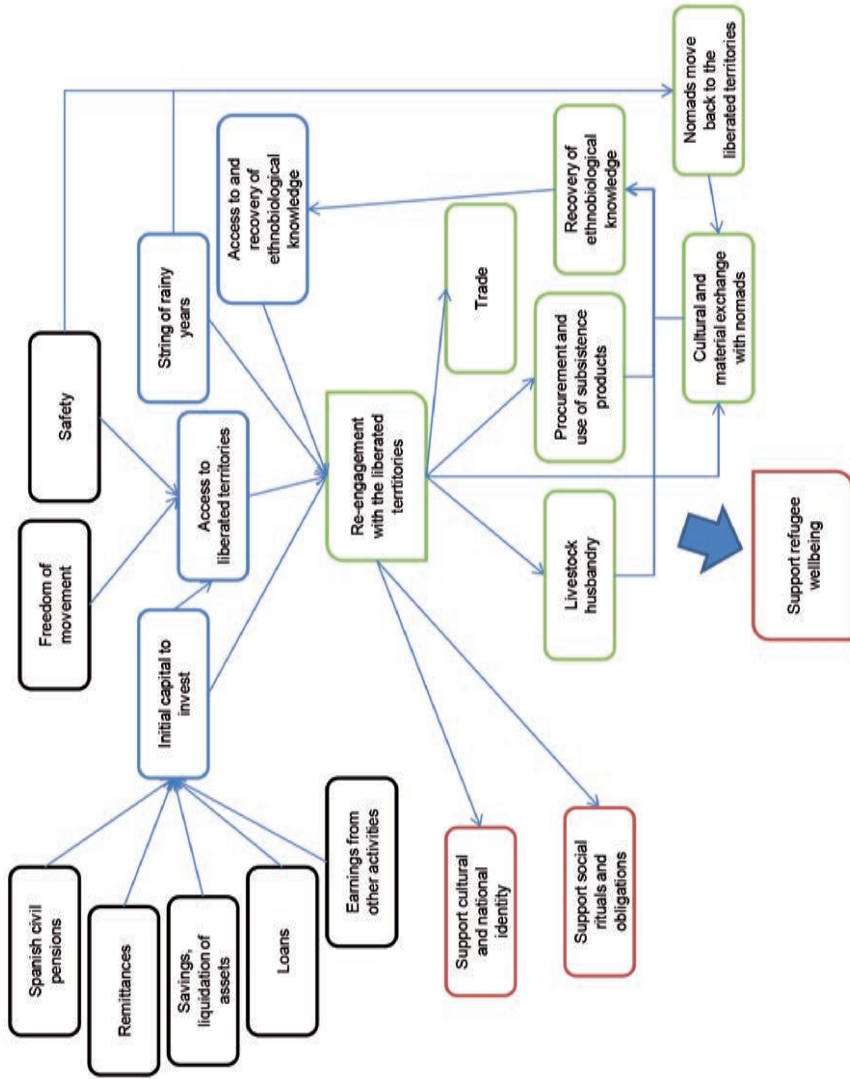


Figure 8.1 The re-engagement of Sahrawi refugees with the liberated territories



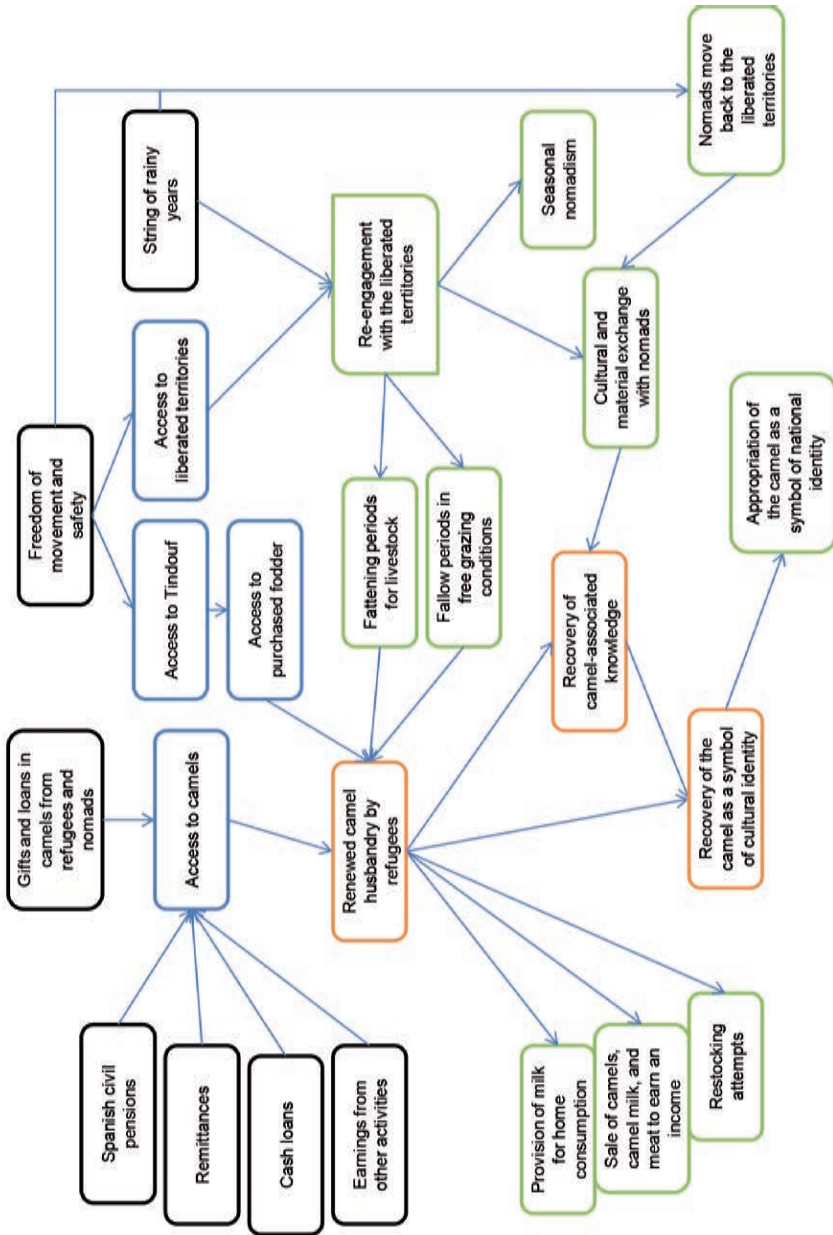


Figure 8.2 The recovery and adaptation of camel husbandry and associated knowledge among the Sahrawi



(e.g. with remittances, pensions, donations), accompanied by the widespread redistribution of this capital through networks (e.g. of kin and acquaintances) and, coupled with access to Tindouf and the liberated territories, increased the movement of goods and people to and from the camps and provided opportunities for refugees to re-engage with traditional subsistence practices. As is the case with other refugees (Horst 2006), the Sahrawi obtained small amounts of capital through civil pensions, remittances, savings, earnings from other activities or liquidation of assets and property, as well as through loans and credit from other refugees. With this capital, they initiated different income-generating activities in the camps or, using the camps as a hub, migrated and engaged in wage labour and, in so doing, re-activated or developed new networks that inevitably became transnational. Also, they partly recovered their relations with the customary nomadic territory (e.g. through forms of seasonal nomadism, using it as reservoir of livestock and subsistence resources), where this involves harvesting valuable products and their distribution or sale to other refugees in the camps and to Algerian merchants in Tindouf (see below). Although in general this process of recovery displays strong historical and cultural continuity with the past, adaptation to new conditions have affected social, technical, ecological, and cultural relations around subsistence resources in fundamental ways, for example in the social relations established around commodification and access (see below). Livestock and other subsistence products are now partly commodified and social relationships have been forged and/or reformulated, which has also reinvented the relationships with the traditional nomadic territory through the incorporation of new technologies.

In discussing the conditions that allowed Sahrawi refugees to re-engage with subsistence practices, besides access to capital and cash, the results highlight the critical role of access to land (i.e. the liberated territories) and to mobility. Indeed, one of the key issues in refugees' efforts to pursue productive activities and subsistence strategies is access to land (e.g. to grow crops and graze livestock) (Jacobsen 2005). This is where the Sahrawi refugees' free access to grazing land and natural resources of the liberated territories (as well as the unregulated access to Mauritania, with a similar environment and markets where subsistence products could be traded) becomes crucial. It is clear that the refugees' procurement of subsistence products largely depends on their access to the land where these products are found, whether these are homeland territories or other accessible areas with similar biological resources. But this process is not straightforward - it is enmeshed within a complex set of interacting variables affecting the opportunities and constraints of refugees in camps.

Figure 8.1 represents schematically how this process took place among Sahrawi refugees in relation to the liberated territories. Access to the liberated territories and re-engagement with the resources and people found therein is permitted by factors such as the presence of social networks allowing resources to be mobilised, extra-camp mobility, and the ability to obtain initial capital to invest and thus act on the possibilities to re-engage with the desert. Access to extra-camp territories depends on safety and freedom of movement for refugees,

both of which are often limited by host and own country's policies as refugees often do not, collectively or through their political representatives, control those territories nor are they recognised as having rights to them. Therefore, Sahrawi refugees' access to the liberated territories through the Polisario Front and SADR political control is crucial to the recovery of subsistence practices and re-engagement with the desert territory. Moreover, people living in camps may experience insecurity and hostility from local populations and host countries' authorities (Kibreab 1996; Abdi 2005). Especially due to the social organisation in the camps under Polisario leadership, Sahrawi camps have provided overall security for refugees. In turn, this security facilitated the development of refugees' productive activities.

In the process of recovery, and in tight connection with renewed access to the liberated territories, Sahrawi refugees also began to recover their main pre-exile subsistence strategy, livestock husbandry, once again gaining access to camels, goats, and sheep and their products. The process of re-engagement with camel husbandry is schematised in Figure 8.2. Recovery began with small livestock (goats and sheep) and only later evolved into camel husbandry. Refugees required access to camels, nomadic territories, social networks with other refugees and nomads, and camel-related knowledge. From a pastoralist perspective, the processes by which refugees recovered camel husbandry and the material and cultural values of related desert resources can be understood as an extension of the long-term adaptation strategies of dispossessed nomads, albeit under new material, social, and political circumstances. Similar to other dispossessed (e.g. by drought) and sedentarised nomads, Sahrawi refugees re-engaged with their customary territory once the climatic and environmental conditions permitted - with the presence of sufficient rains - which are unpredictable and erratic in Western Sahara. Indeed, there has been above-average precipitation in the liberated territories and northern Mauritania over the past decade and a half. These rains have drawn many refugees toward the liberated territories and their greening resources in the search of income or of a taste of a past lifestyle.

Furthermore, rains have also attracted those Sahrawi nomads who have been moving with their herds in neighbouring countries (Mauritania, Mali). These nomads, who are often related to refugees by kinship, former tribal affiliation, or shared support for the Polisario, managed to maintain their livestock and associated subsistence strategies throughout the war and now constitute a source of material and cultural exchange for refugees, for example, providing livestock and transmitting ethnobiological knowledge and skills. Indeed, the social networks between refugees and nomads represent one of the paths through which ethnobiological knowledge is recovered and revitalised (see below). Overall, refugee's re-engagement with the liberated territories and livestock husbandry supports their well-being in several ways. It provides paths for livelihood diversification and means to reduce dependency on outsiders and aid; it allows products (e.g. foods, herbal remedies) to be procured that meet social expectations and obligations of mutual benefit; it supports rituals that strengthen cultural and political identity around a shared heritage and associated practices (thus also strengthening social bonds and the feeling of

belonging to a community); and it provides refugees with a measure of control over their lives in accordance with their culture and desires.

The results of this study also attest to the importance of mobility and social networks (Dedenis 2005; Horst 2006). Many refugees across the world spend decades in camps in so-called protracted refugee situations (Crisp 2003), as is, for example, the case with the Sahrawi, with Somali refugees in Dabaab camps in Kenya (Abdi 2005), Rwandan refugees in Tanzania, Cambodians and Laotians in Thailand, and Mozambicans in Malawi (Loescher, Milner et al. 2008). These refugees are often marginalised within the host countries and depend for their survival on international relief and development agencies. After forced displacement and encampment, refugees find themselves in a situation where survival is critical and it is imperative to rebuild their lives from exile. However, this must be done within a large set of constraints and insecurities, including limited freedom of movement (Abdi 2005; Jacobsen 2005). Constraints on movement extremely problematic when it is considered that, at least in Africa, most refugees are pastoralists whose main technical subsistence and survival strategy consists of movement (Homewood 2008). In some cases, such as in the Kakuma camps of Kenya (Jansen 2011), refugees are not allowed to move out of the camps and thus have no access to natural resources (e.g. fuelwood, medicinal plants) within the local environment. On a similar note, these refugees were not allowed to keep livestock, as this required grazing on surrounding Turkana nomads' land, with an associated risk of violence (Jansen 2011:53). In these cases, refugees confront grave difficulties travelling to markets to trade and buy goods and to establish productive activities (e.g. livestock husbandry) for lack of access to grazing lands.

Indeed, the recovery of productive activities owes much to the mobility that the Sahrawi inherited from the past and achieved once the war was over (Dedenis 2005). Although they are not formally allowed to move to Algerian territory outside of the immediate vicinity of the camps<sup>32</sup> and cannot take up employment there, refugees interface strongly with the Algerian city of Tindouf, where they can travel and trade, and have freedom of movement to and from the liberated territories as well as informal freedom of movement in and out of Mauritania. Arguably, this freedom of movement was also the result of refugees' access to cash (e.g. through pensions) and in turn created the conditions for a further flow of cash into the camps (e.g. through trade, remittances, etc.) and for the development of petty markets and the recovery of productive activities such as livestock husbandry.

### ***Access to, procurement, and use of subsistence resources***

The recovery of subsistence practices depends on the procurement of associated resources and access to the territories where these resources are found. This study has shown that Sahrawi refugees struggled to regain access to livestock and their desert homeland and its resources (medicinal plants, complementary foods, fuelwood) and thus to procure products for both material and cultural

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<sup>32</sup> As evident in the case of desert truffle, limitations of movement within Algerian territories prevent refugees from exploiting natural resources outside of the near vicinity of the camps, or to obtain better prices for their harvests by travelling to cities other than Tindouf (e.g. Algiers).

values. When forced into exile, refugees are stripped of their property, freedom of movement, and social and market networks. Most refugees, including the Sahrawi, arrive in the camps ‘with little to help them start economic activities’ and ‘only with their labor power, skills, and experience’ (Jacobsen 2005:24). Refugees may bring with them important subsistence products such as medicinal remedies, seeds and/or cuttings of valuable plants, or live animals. The Sahrawi were forced to flee without time to organize and, nonetheless, their pockets were not empty: a few valued products were salvaged and used with parsimony as refugees sought to establish networks for further procurement from the camps. This occurred, for example, with medicinals such as the seeds of *Ammodaucus leucotrichus* and the resin of *Acacia tortilis* (*el elk*). At the beginning of exile, with the loss of access to the customary nomadic territory (where most products were found), to traditional procurement networks, with no possibility of movement, and with most able men at the war front, refugees had almost no access to traditional subsistence products. The few products available were obtained from the few species present in the rocky plateau where the camps are located (e.g. aerial parts of *Zygophyllum gaetulum* used as medicinal remedy). The first procurement networks that refugees developed involved Polisario soldiers who moved between the war zone and the refugee camps and on occasion would bring products to their families in the camps, or refugees who occasionally were able to travel to Tindouf or other areas (e.g. Mauritania), where such relations were based on reciprocity. Only a rather limited in number and quantity of products were procured in this manner, and supplies were unstable. Nonetheless, they had an important cultural function; especially for former nomads, they represented not only traditional use values but as well material links with the lost nomadic territory.

Displaced and migrating populations continuously adapt procurement patterns in order to gain and maintain access to materially and culturally important products (Bodeker and Neumann 2012; Muniz de Medeiros, Taboada Soldati et al. 2012). Throughout the decades of exile, Sahrawi refugees rebuilt the relevant social and market networks as demonstrated by the case studies on medicinal remedies, desert truffles, and camel husbandry. Although informed by past social networks, procurement patterns have been adapted, for example with the establishment of extra-camp market and non-market networks. This is well exemplified by the case of traditional medicinal remedies, where the patterns of procurement and use of traditional remedies reflect the health issues typical of the desert environment and of Sahrawi culture. Some remedies were sourced from the camps’ immediate environment, where local substitutes were found for certain hard-to-procure remedies through collection or trade. New remedies that became available through aid organisations were also incorporated into their own pharmacopoeia. As well, refugees procured remedies from their former nomadic territories by direct harvest and by developing new procurement networks with other refugees and nomads. For products in high demand and whose harvest could generate income, trade networks have been used, adapted, or created to satisfy refugees’ demand for these products, which have then been commodified (see below). Sahrawi refugees also purchase products in markets in Tindouf, Mauritania and from

Mauritanian merchants, in refugee camp shops, in markets in the occupied territories of Western Sahara and, less often, in other remoter markets where refugees travel. For certain expensive and hard-to-find products, transnational procurement networks have been developed with the Sahrawi diaspora. In spite of all of these procurement strategies, the findings also show that such networks do not provide all subsistence products or involve all refugee households. Some subsistence products could not be procured or substituted and use was discontinued, as is the case with ostriches and their eggs, which were important complementary foods and sources of medicinal remedies for Sahrawi nomads, but which today are no longer present in the *badiya* and are not subject to trade. Furthermore, strategies for the procurement of subsistence products such as medicinal remedies and camel milk are not available to all households or year-round and, when a household runs out of resources, it can be difficult to renew them quickly as steady supplies are difficult to organise from the camps.

It has been noted in the literature that migrants tend to replace and incorporate new medicinal remedies in the host country in accordance with the ecological characteristics of the new environment (Volpato, Godínez et al. 2009; Muniz de Medeiros, Taboada Soldati et al. 2012; Voeks and Rashford 2013). The case of the Sahrawi refugees is specific in the sense that they have been displaced to a virtually uninhabited area that is markedly poor in floristic diversity and where almost no cultivation is possible. As a consequence, they had little opportunity to procure plants and other products from the host ecosystem, or to substitute plants from the homeland with locally available species. As replacement or substitutions were not possible, refugees relied largely on extra-camp procurement networks. However, they applied what might be defined as 'secondary replacement', as they replaced hard-to-procure traditional remedies with new remedies (e.g. selected on the basis of similar organoleptic properties or similar use) purchased in the markets of Tindouf. This can be seen as incorporation from a host culture mediated by marketing. The procurement of traditional remedies can be very problematic for refugees in camps, which might endanger traditional medicinal practices and medicinal knowledge transmission. Bodeker, Neumann et al. (2005), for example, reported that Karen refugees in Thailand return to Burma in spite of the dangers associated with the journey and bring medicinal plants and remedies back to the refugee camps, where there is substantial demand. At the same time, refugees indicated that the distances that separate them from their traditional networks, knowledgeable relatives, and familiar medicinal plants meant that some traditional medicinal practices were difficult to maintain in exile (Bodeker, Neumann et al. 2005).

Sahrawi refugees face similar problems, and have developed a variety of social and market networks centred on the liberated territories where most of these remedies are found, to procure traditional remedies. As is the case with other refugee populations worldwide, the Sahrawi have over the years established transnational and extra-camp networks with members of the 'wider diaspora' (Koser and Van Hear 2003), e.g. in Spain, Algeria, and Mauritania. Although it was beyond the scope of this research to investigate the Sahrawi diaspora's



plant procurement networks (e.g. in Spain), the data collected indicate that such networks extend far beyond the refugee camps and Western Sahara, and include areas of Sahrawi diaspora in Spain and Algeria. These networks are active in both directions: culturally-important products (e.g. acacia resin) are sent from refugee camps to Spain and other countries and then are distributed as gifts to relatives and acquaintances; and products that refugees seek (e.g. honey for the treatment of *egbindi*) are procured abroad by travellers and migrants and brought to the refugee camps.

Social and commercial imports are significant for Sahrawi refugees living in camps, which have been sustained over the past 20 years or so by a continuous flow of people from the refugee camps to the liberated territories and *vice versa*. In turn, such flows have been sustained by refugees' efforts to revitalise pastoralism and expand trade, the renewed links between refugees and nomads, access to cash, and by a string of rainy years with abundant resource production in the *badiya*. The refugee camps' demand for the *badiya*'s traditional products, coupled with the limits on local product procurement, have led to the development of petty markets for those products that have great cultural value (e.g. camel milk), important use value (e.g. acacia), and important exchange value (e.g. desert truffles).

### ***Trade and commodification of subsistence resources***

Within a wider process in which Sahrawi refugees sought to free themselves from economic dependence, they developed productive activities and an informal economy in the camps, and some sought to generate income through the commercial exploitation of subsistence resources such as livestock products, desert truffles, and medicinal remedies. In the 1990s, cash began to flow into the camps and petty trade emerged; today, the camps sport vibrant commerce and markets (de Juan Canales 2010; Herz 2013). These phenomena further stimulated the development of an informal economy in the camps, which created opportunities to exploit subsistence products to generate income, as subsistence resources in high demand that were previously exploited only for their use values became commodified. However, this commodification process occurred only once the necessary conditions existed. With respect to the commodification of desert truffles, for example, this required: 1) knowledge about truffle ecology, including how, when and where to find them; 2) access to territories where truffles grow; 3) the capital necessary to harvest (e.g. to buy a jeep); 4) access to markets; and 5) favourable climatic conditions (rains). Refugees use the earnings from sales of subsistence products to expand their productive activities (e.g. purchasing better means of transport) or as to support other enterprises, and for consumption (e.g. to buy food and other items not provided by food aid).

The camel husbandry study showed that camels and camel products have also been commodified; some refugees purchase camels in areas where prices are lower (e.g. Mali) and sell them at a profit to refugee camp butchers. The demand for camel milk has increased in the camps and, over the past decade, specific forms of peri-camp camel husbandry have arisen in response. Rather than representing a return to full nomadism, camel husbandry closely resembles

peri-urban camel husbandry in Saharan towns. Refugee camel pastoralists are internally differentiated according to herd size, socio-economic relations, and camel management, with a large portion involved in meat and milk marketing. These results support assertions that informal trade is the most common economic activity in refugee camps (Callamard 1994; Pérouse de Montclos and Kagwanja 2000; Jacobsen 2005), and that trade expansion takes place in protracted refugee situations when the emergency phase (mainly based on collective agency) gives way to evolution of petty markets and productive activities (mainly based on individual agency), as refugee camps becomes cultural and commercial hubs (Herz 2013). This occurs in spite of the fact that the camps' constraints pose difficulties (e.g. high transportation costs, unfavourable terms of trade) for refugees' economic activities (Jacobsen 2005; Werker 2007), as seen here in relation to Sahrawi refugees' marketing of desert truffles and the limitations they face obtaining higher prices in Algerian markets other than Tindouf. The specific constraints that refugees confront when living in camps (e.g. isolation, limitation of movement, etc.) create, in Werker's terminology, 'economic distortions' that make refugees' recovery more difficult. (Werker 2007:469) reports that, 'isolation, combined with a low level of capital, results in a small local market and exploitative links with the outside market.' Moreover, in agreement with other refugee studies (Jansen 2011; Herz 2013), the findings suggest that Sahrawi refugee camps in many respects mirror Saharan cities; they are a source of all kinds of products obtained from the Saharan environment (e.g. camel meat) and its biodiversity (e.g. medicinal remedies, desert truffles), especially from the liberated territories, and as well from a variety of other places as far away as the Middle East (e.g. Saudi Arabian blankets) and China (e.g. green tea). This should not come as a surprise if one considers, as (Herz 2013) did, that Sahrawi refugee camps, with their 150,000 inhabitants, are among the largest settlements in the Sahara desert.<sup>33</sup>

Commodification refers to changes in social relations from exchange based on reciprocity within kinship, tribal, or other social frameworks to those based on monetary exchange generally occurring between anonymous agents. Commodification of natural products among refugees provides some with the opportunity to generate income and others the possibility of accessing products through markets that they could not otherwise obtain. Nonetheless, commodification can generate pressure on natural resources and harvesting can become unsustainable either ecologically (i.e. the levels and/or methods of harvesting weaken that resource's production and reproduction and/or its habitat) or socially (i.e. harvesting for market purposes might exclude use by poorer refugees). Increasing harvesting pressure for commercial purposes might threaten the wild species involved and their populations and lead to increased competition among collectors (e.g. of desert truffles) and between commercial collectors and nomads or other refugees who harvest these products for subsistence purposes. At the same time, and while providing

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<sup>33</sup> For comparison, Tindouf itself has about 50,000 inhabitants, Zouérat (Mauritania) about 40,000, and Tamanrasset (Algeria) almost 100,000. Tifariti, the largest settlement in the liberated territories, has no more than 2,000-3,000 inhabitants.



some refugees with a path for livelihood diversification, commodification of subsistence products also brings about changes in the social values of those products and in their circuits and patterns of production and consumption (Ferreira de Athayde, Kaiabi et al. 2009). Eventually, these processes might lead to social differentiation within the refugee population, creating social and cultural tensions, as well as renewed renegotiation of knowledge and cultural identities. The fact that the commodification of camel milk is contested within the camps and that it continues to be distributed according to traditional norms among nomads and within the *badiya*, signals social resistance to the emergence of 'creeping capitalism' and the threats it poses to Sahrawi cultural and social organisation.

### ***Loss, transmission, and revitalisation of ethnobiological knowledge***

Forced sedentarisation in refugee camps not only brought about not only changes in the Sahrawi's social and ecological relationships but also provoked much cultural change, including lack of use (dormancy) and revitalisation of ethnobiological knowledge, and the renegotiation of traditional norms and beliefs (e.g. in relation to *eghindi*) and of cultural identity embedded in subsistence practices and resources (e.g. in relation to camels). This occurred in a context where traditional knowledge, beliefs, and values could not be easily maintained and transmitted and, in some cases, were challenged, due to the altered conditions of life in the camps.

The recovery of pre-exile subsistence practices was sustained by the ethnobiological knowledge that the Sahrawi held around these practices and associated resources. With forced displacement and encampment, the transmission of such knowledge (e.g. in relation to herbal medicine or livestock husbandry) was disrupted and the environmental and cultural settings in which it was transmitted were lost. Knowledge transmission also weakened as younger refugees emigrated to the West and were educated in Western educational institutions. For example, forage knowledge was no longer applied and its transmission dwindled with loss of camels and of the productive and environmental setting where it was typically transmitted. Western concepts were introduced together with Western aid, for example, in relation to health and medicine. Ethnobiological knowledge could be lost if the trend had continued, and it effectively became dormant as transmission weakened at least until 1991 when refugees began to recover the subsistence practices that were underpinned by this knowledge. Knowledge continued to be held by elderly former nomads and by Polisario soldiers who managed Polisario camels and engaged with the desert environment as part of their military service. With the re-engagement with the nomadic territory, its resources, and related subsistence practices, Sahrawi ethnobiological knowledge transmission was revitalised and its value recognised by refugees and the Polisario alike. For example, the recovery of camel husbandry required revitalisation of camel-associated ethnoecological and ethnoveterinary knowledge, and the harvesting and use of desert truffles for commercial purposes was supported by the renewed transmission and active use of associated ethnomycological and ethnoecological knowledge.

The loss of much traditional knowledge about local environments and

subsistence resources and practices across the globe due to the changes that traditional societies have undergone over the past few centuries, and the risk of continued loss with even greater environmental and cultural change, have been much reported in ethnobiological and other literature (Zent 2001; Ramirez 2007). This knowledge is of particular since it accumulated through generations of experience and transmitted within groups living within a local environment and a social structure with all of their contextual specificities (Purcell 1998; Ellen and Harris 2000). Knowledge transmission may be reduced in contexts of displacement and encampment as it depends on the continuity of social relations and mechanisms that ensure this transmission and allow for innovation (Turner, Boelscher et al. 2000; Ellen, Lycett et al. 2013). Less attention has been given the revitalisation of traditional knowledge and of knowledge transmission (Ohmagari and Berkes 1997) especially in contexts of forced displacement, when people need to adapt their knowledge given radically changing conditions.

The revitalisation of ethnobiological knowledge among refugees and displaced populations is of paramount importance for their capacity to re-engage with subsistence practices and improve their lives. As shown above, ethnobiological knowledge and skills underpin refugees' ability to grow, harvest, and use biotic resources for multiple purposes. For example, refugees may apply their ethnobiological knowledge in livestock husbandry for the production and direct consumption of milk and meat (where this knowledge includes knowledge about livestock physiology, ethology, veterinary, forage plants, etc.), and they may use knowledge about the medicinal plants, animals, mushrooms, and minerals to improve their health, as well as for fuel, construction, handicrafts, cosmetic, and other direct uses. When such products and resources are commodified, ethnobiological knowledge also becomes crucial to refugees' ability to generate income. Revitalisation of traditional knowledge involves the resumption of knowledge transmission within refugee households (e.g. vertical transmission) and among refugee peers and members of the joint ventures established around subsistence resources (horizontal transmission). However, this revitalisation does not occur mechanistically, but rather depends on conditions for its existence and challenges to its maintenance. The challenges among Sahrawi refugees revolve around three main factors: 1) access to means of subsistence and/or cash to invest in the recovery of subsistence activities; 2) access to the productive and cultural settings where this knowledge was transmitted and used (including access to the territories of their homeland); and 3) degree of cultural change in the refugee camps, especially in relation to the younger generations and their desire for products based on traditional subsistence practices. A revitalisation of ethnobiological knowledge is required and pursued as long as the recovery of subsistence practices continues and as long as this knowledge has cultural importance (e.g. for identity) and paths of knowledge transmission are maintained or developed among refugees and the diaspora, including those that have maintained traditional modes of subsistence.

As also happens with subsistence practices, with revitalisation, ethnobiological knowledge must be adapted to new contexts. The Sahrawi

case has shown that revitalisation and adaptation of this knowledge includes changes in its modes and lines of transmission, with increasing importance of horizontal transmission and changes in symbolic meaning. This has been reported in the literature in relation to changes in knowledge transmission and in symbolic meanings attached to plants and products (e.g. with changes in technology, substitution in inputs, etc.) (Volpato and Godínez 2004; Ferreira de Athayde, Kaiabi et al. 2009; Volpato, Godínez et al. 2009). These changes can further create gender, intergenerational, and/or social tensions and challenges to traditional knowledge and values within communities, as discussed in this study in relation to the explanatory model of *eghindi* among Sahrawi refugees.

The results of this study provide insights into the fate of ethnobiological knowledge among forcibly displaced and encamped populations, showing that this knowledge is not necessarily lost, although it becomes dormant, and can be revitalised as long as the conditions exist for refugees to exploit it for its material and cultural value. In the Sahrawi case, the revitalisation of ethnobiological knowledge has especially been triggered by the renewed access of refugees to part of their homeland where associated resources are found. Also, this recovery must be understood within the context of cultural revival among Sahrawi refugees, particularly in ethnic and political terms as this knowledge is appropriated by Polisario discourses to represent the shared heritage of Sahrawi people and their ties with the Western Sahara territory in contrast with Moroccans.

### ***Subsistence practices and refugees' cultural and political identity***

The recovery and adaptation of subsistence practices and the revitalisation of associated ethnobiological knowledge among Sahrawi refugees had not only material value but cultural value as well. Pre-exile subsistence practices, associated products and resources, the territory where these are found, the knowledge held around these resources and, more generally, Sahrawi's nomadic cultural heritage, were all used in refugees' and Polisario's discourses and rituals to renegotiate and strengthen Sahrawi cultural and political identity. Cultural recovery involves the re-appropriation of the camel and other species or products as symbols of Sahrawi cultural identity, which reinforces a shared cultural heritage and the cultural links between refugees and their homeland where most of these resources are found. Resources from the desert environment such as medicinal remedies and forage plants, as well as their tastes and smells, became representative of, and attached to, customary grazing areas. Sahrawi practices around the taste and smell of livestock and other products from the desert environment were embedded in Sahrawi cultural values and identity. More generally, the set of relations that nomads established with the desert territory were central to culture and cultural identity. This centrality was lost with war and the decimation of herds, but it regained strength over the past two decades with renewed interest on the part of refugees and the Polisario Front in pastoralism, and in the desert territory and its resources. Through the reestablishment of a relation with the *badiya* based on pastoral and nomadic practices, Sahrawi refugees reaffirm their cultural identity based

on their nomadic origins. The liberated territories became the place where refugees can express this culture. In turn, the revitalisation of traditional culture and the renewed availability of subsistence products accompanied the recovery of social and cultural motivations and expectations based on these products, at least among the more culturally-conservative refugee population.

Traditional subsistence strategies and associated products, knowledge, and meanings also emerged as a symbol of national identity and unity promoted by the Polisario. For example, camel husbandry reinforces the Polisario's claims to nation-statehood, legitimating control over territory through both physical presence (people and animals) and use, providing for national welfare and reducing dependency on foreign food aid via state food production and redistribution, and legitimating claims to ethnic unity and national identity. The contest between Morocco and the Polisario for dominion over the Western Sahara entails a struggle to appropriate key elements of Sahrawi cultural identity and heritage, where one of these key elements is the camel. To defend its claims to nationhood and to territory, the Polisario attempts to represent its population in terms of a shared cultural/political identity based on a nomadic heritage tied to Western Sahara, stressing their differences *vis a vis* other populations, particularly the Moroccans. At the same time, Morocco is promoting camel husbandry in the occupied territories of Western Sahara and attempting to appropriate the camel as a symbol at a subnational (ethnic, tribal) level, thus proposing Sahrawi nomadic heritage as part of Moroccan national heritage.

In spite of the revitalisation of traditional culture and cultural practices among Sahrawi refugees, these processes were uneven and at times created cultural divergence and intra-cultural and inter-generational tensions between younger and Western-aculturated refugees and older and more conservative refugees. For example, the desire for repastoralisation, renomatisation, the consumption of camel products, and the use of traditional medicinal remedies is not evenly distributed among refugees; Western acculturated and younger refugees show less interest in cultural continuity and no longer identify themselves as 'traditional' Sahrawi. Similarly, as an element of Sahrawi nomadic heritage, *eghindi* became embodied within a broader process in which Sahrawi cultural identity was being negotiated and redefined. Within an intergenerational struggle to define Sahrawi identity, *eghindi* is a cultural device used by older Sahrawi to teach younger refugees about traditional Sahrawi food culture and the benefits of nomadic existence relative to life in the camps.

The literature on the ethnobiology of migrants highlights the significance of the culture and knowledge of the host countries' populations in shaping migrants' knowledge and practices (Volpato, Godínez et al. 2009; Van Anandel and Websters 2010; Van Anandel, Mitchell et al. 2012). Because refugee camps are commonly isolated and refugees may have rather limited cultural exchange with host country populations (unless they belong to the same tribe or ethnic group), Western culture is often identified as the host culture. Western organisations fund projects in the camps according to Western paradigms (e.g. about health, food consumption), and many refugees migrate to Western

countries (e.g. Spain), becoming at least partly acculturated and promoting Western values and beliefs. In Sahrawi refugee camps, Western culture indeed functions as the host culture. In this respect, the presence of Western culture is a driving force of change in the subsistence practices and associated knowledge and beliefs of Sahrawi refugees, giving rise to dynamics around their maintenance, abandonment, and/or adaptation. Refugees' traditional health beliefs and illness experiences may be challenged due to the different life conditions in the refugee camps (e.g. different moribogenic factors) and to the effect of the host (e.g. Western) culture, and at the same time may be maintained in order to strengthen cultural identity and emphasize refugees' cultural heritage. These dynamics, in turn, are tied to Sahrawi cultural identity and their nationalistic claims, within a process of renegotiation of their cultural and political identity and their boundaries. These processes may occur, to different degrees, in other refugee camps, as most have are managed in accordance with Western paradigms and values. For example, in relation to health, refugee camps are usually run by international organisations promoting biomedical concepts and practices. Traditional medicine may thus be abandoned in favour of biomedicine, may co-exist to varying degrees, and/or may be maintained and adapted for their use value and to stress cultural identity (Capps 1994; Muniz de Medeiros, Taboada Soldati et al. 2012). As Bodeker and Neumann (2012:22) noted in relation to Karen refugees in Thailand, 'Exposure to the refugee camp systems is, for many refugees, their first exposure to the "West"—creating a micro-scenario of urbanisation and Westernisation within this contained setting.'

The results presented in this dissertation have shown that refugees are not people without culture or identity other than that of refugees. Rather, and in agreement with recent academic literature (Zetter 1991; Malkki 1995; Oliver-Smith 2002; Horst 2006), they confirm that refugees act in a complex web of identity (involving ethnicity, age, occupation, sex, political affiliation, etc.), and the associated practices, and rituals, and knowledge. They struggle to recreate and reaffirm their cultural identity from exile. The same occurs with refugees living in camps whose identity, often based on pre-exile subsistence practices and customary territories, is challenged and must be renegotiated, for example *vis a vis* Western culture and values delivered with food aid and with respect to the appropriation of this identity or aspects of it on the part of various political agents. These findings also confirm that displaced people and, more generally, migrants, recover or maintain subsistence practices in the host environment, practices that serve as cultural symbols and vehicles of migrants' identity (Pieroni and Vandebroek 2007; Ceuterick, Vandebroek et al. 2008; Volpato, Godínez et al. 2009; Matos-Soto and Savo 2012). When the recovery of these practices involves maintaining ties with the place of origin, this process also sustains a cultural identity based on the homeland and the resources therein. A further finding is that rituals, symbols, and practices related to cultural identity are amenable to appropriation by political organisations that purport to represent refugees, thus inscribing them within a larger, often contested, subnational or national framework (Smith 1991). In these contexts, subsistence products and practices may become symbols of

a collective cultural identity in refugee camps, and of refugees' claim to the forcibly abandoned homelands. Concurrently, changes in cultural identity become a marker of refugees' experience, informing about the new reality of life in the refugee camps. As Sutton (2001) and Keeler (2007) remarked in relation to the food and foodways of displaced people, traditional subsistence products preserve refugees' cultural memory, serve as material reminders the lost homelands, and convey both cultural identity and the emotional attachment to that homeland.

### **Reflection on Critical Scientific Issues in Refugee Studies and in Ethnobiology**

This section addresses the contributions of this study to a number of critical scientific issues within refugee studies, human ecology, and ethnobiology. First, the contributions to refugee studies and especially to the understanding of refugees' agency are discussed, followed by contributions to the human ecology of refugees, especially in relation to once-nomads and once-pastoralist peoples. I then turn to the contributions made to ethnobiology especially in relation to the production, procurement and use of subsistence (at times referred to as 'ethnobiological') products and to the changes occurring in migrants' and displaced peoples' ethnobiological knowledge.

#### ***Contributions to refugee studies***

By investigating the subsistence practices and associated ethnobiological knowledge of Sahrawi refugees, this study has contributed to the growing body of research on refugees, especially on their economic, social, and cultural lives (Loizos 1981; Harrell-Bond 1986; Peteet 1995), the agency that they exercise, and the ways that they adapt to camps and their contexts (Malkki 1995; Peteet 1995; Horst 2006; Agier 2008; Jansen 2011). In addressing the struggle of Sahrawi refugees toward economic independence and cultural recovery, this study contributes to debates about refugees' dependence, reliance on food aid, and agency toward self-sufficiency (Kibreab 1993; Reed and Habicht 1998; Harvey and Lind 2005; Horst 2006). Although the findings confirm the difficulties that refugees living in camps confront when attempting to rebuild their lives that are related to the disintegration of community structures and social networks, the severing of most links between refugees and their natural environments, the lack of mobility and safety, and the heavy dependence on food aid (Colson 2003; Abdi 2005; Harvey and Lind 2005), they also contribute to the study and understanding of refugees' autochthonous initiatives. The findings show that Sahrawi refugees, like other refugees living in camps (Kibreab 1993; Bakewell 2003; Horst 2006), are active and industrious within the camps' constraints and opportunities and engage in all sorts of activities for production and exchange, using food aid embedded in turn in a range of strategies (e.g. migration) aimed at survival and recovery (Lautze and Hammock 1996; Summerfield 1999; Jacobsen 2005; Westoby 2008). Within this particular research field, this dissertation provides a detailed case of refugees' motives and the means employed to re-engage with pre-exile subsistence strategies and associated knowledge that demonstrates



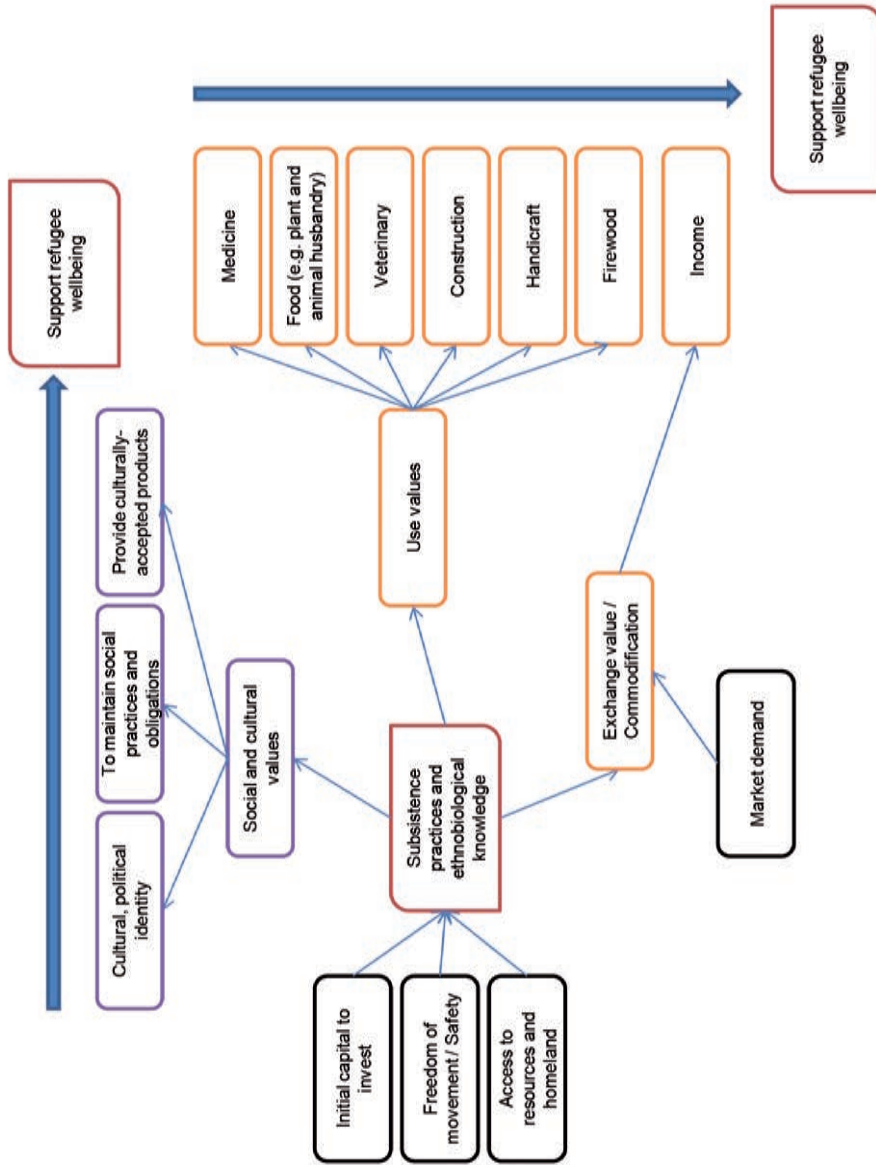


Figure 8.3 Roles of subsistence practices and ethnobiological knowledge among refugees living in camps



the importance of re-engagement for refugees' material and cultural well-being. This focus is rare in refugee literature, but its importance should not be underestimated as the number of refugees living in camps is on the rise. In this study, the recovery of subsistence practices and associated knowledge was shown to have several functions, outlined in Figure 8.3. Such recovery is triggered and dependent on minimal conditions that allow refugees to act (e.g. freedom of movement, access to the homeland or similar environment, small amounts of initial investment capital) and, once established, provide for refugees' material and cultural well-being in at least three interacting ways: subsistence resources are used for their material use value (e.g. as medicinal remedies, food, etc.), for their exchange value (which, in connection with market demand and commodification, provides refugees with flows of income), and for their social and cultural value (e.g. in terms of cultural identity, for meeting social obligations, etc.). It is clear then that subsistence practices and associated knowledge can play a diverse and critical role in improving the lives of refugees living in camps.

### ***Contributions to perspectives on the human ecology of pastoralists and nomads***

From a human ecology perspective, this study has advanced the understanding of how uprooted and dispossessed people recover and adapt their subsistence practices, thus informing more generally theories of change in human-nature relationships. Specifically, in addressing the recovery of subsistence practices (including livestock husbandry) among Sahrawi refugees, and in light of the fact that the Sahrawi were nomadic pastoralists, this study has contributed to the literature on pastoralism and its transformation in Africa (Chatty 2006; Österle 2008; Mezhoud and Oxby 2013). Studies of herd loss and recovery among contemporary nomadic populations with drought and protracted conflicts are central to pastoralist studies (Boneh 1984; Horowitz and Little 1987; McCabe 1987; Khalif and Oba 2013; Mezhoud and Oxby 2013), and the Sahrawi case can be situated within this literature. Livestock recovery can be a long process, and varies in accordance with factors such as the nature of the crisis, the coping strategies adopted, and the livestock species involved (McCabe 1987; Harvey and Lind 2005). This study of camel husbandry recovery after dispossession shows that Sahrawi refugees struggled for decades first to recover small livestock husbandry and to regain access to their grazing territories and then to regain access to camels, establish camel husbandry and initiate seasonal nomadism, while in the process adapting the social, ecological and technical relations of camel husbandry, including increasing intensification and commodification. Regarding the latter, this study contributes to the literature addressing changes in livestock husbandry and pastoralism with increasing commodification (Nori, Kenyanjui et al. 2006), urbanisation and sedentarisation, and globalisation more generally (Chatty 2005; Gertel and Le Heron 2011; Bollig, Schnegg et al. 2013). It especially contributes to the understanding of camel husbandry as practiced in peri-urban Saharan contexts (Faye, Bengoumi et al. 2003), by presenting the case of an understudied pastoral population and a framework for conceptualising more generally

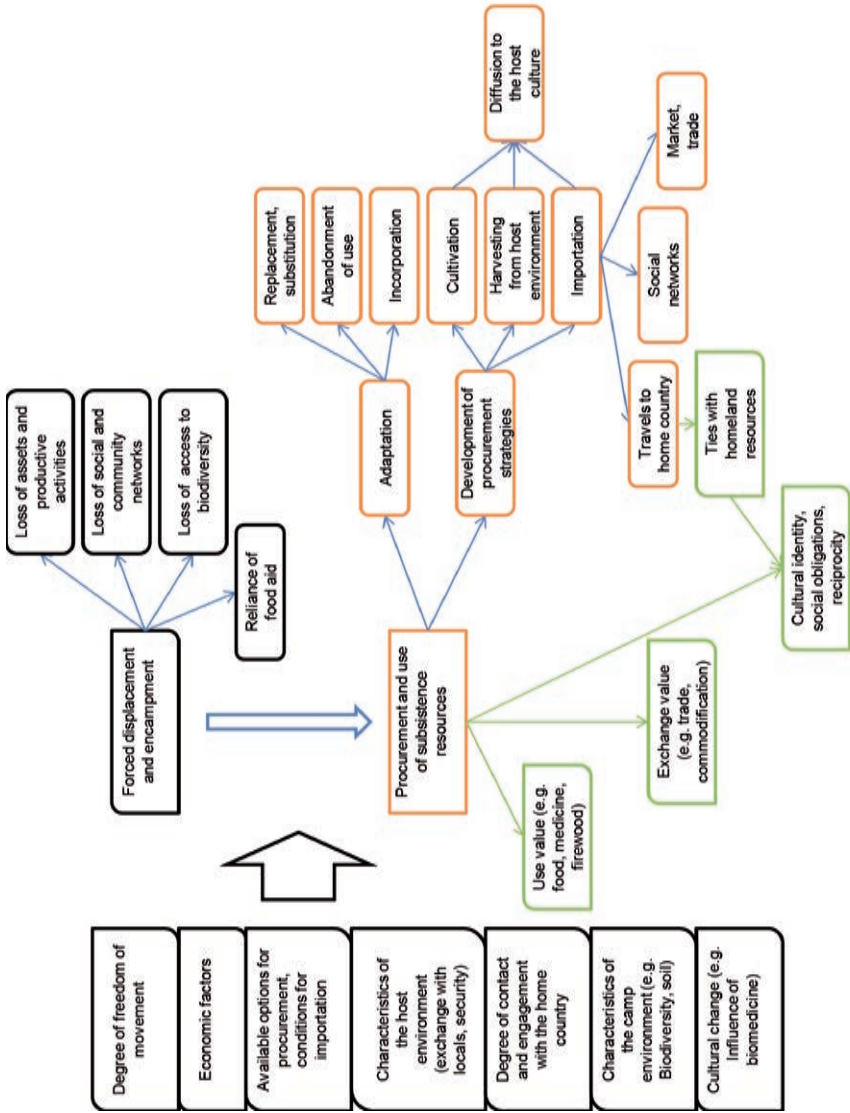


Figure 8.4 Use and procurement of subsistence products by refugees in camps

the complexity of the recovery process of a contemporary nomadic society. It also shows that dispossessed pastoralists' recovery of livestock husbandry and access to grazing territories is related to other subsistence practices that complement and sustain this recovery.

A further contribution of this dissertation to the human ecology of pastoralists is that it tells the story of Sahrawi refugees from a 'pastoral' perspective, investigating the ways in which the establishment of Sahrawi refugee camps and their organisation, the radical shift in power relations and in social/political organisation, the coping strategies adopted, and the mobilization and direction of refugees' agency, can be understood as a pastoral system struggling to survive and recover, and indicates at least in part how the strategies represent an adaptation of past nomadic behaviours and institutions. Surprisingly, this perspective has rarely or only tangentially been addressed in the literature on the Sahrawi.<sup>34</sup> Sahrawi refugee camps can be seen as the result of a political and social revolution in which younger nomads 'pre-inherited' political power and transformed a tribal society into an egalitarian nation-state under the impetus of war and dispossession. This revolution allowed two of the main coping strategies historically used by Sahrawi nomads in times of crises (e.g. in case of raids or warfare and drought) to be dramatically upscaled: military capacity (by assembling men from all Sahrawi tribes) and, while men were fighting and moving herds to distant safe pastures, the sedentarisation of women, the elderly, and children in locations where they are able to survive. Historically, different tribes would join forces against other tribes and, in times of drought, nomadic camps would separate from their herds, which shepherds would move to distant pastures, and settle, in a coping strategy known as *azib*. Understanding the processes that were led by the Polisario Front as a scaling up of nomads' coping strategies helps to develop possible scenarios about the direction of refugees' agency toward pastoralism and nomadism. The time for Sahrawi refugees to return fully to pastoral nomadism has not arrived, however, with the recovery of subsistence practices, associated knowledge, and a shared cultural heritage, some have managed to rebuild herds of camels and small livestock and move seasonally to the *badiya* as nomads. This can be understood as recovery long-term return to desert nomadic pastoralism after yet another crisis in which nomads that lost their means of subsistence and use of their customary territory and struggled to recover both. At least some have achieved their aims, albeit after a forty year hiatus. It has been argued that, during the a times long time lapse between loss and recovery, destitute pastoralists should be supported with substantial amounts of food aid to allow them to regain the ability to recover enough livestock to produce enough livestock products to meet their needs and support natural herd growth through reproduction (Bush 1994). These observations are pertinent to the Sahrawi case, as will be seen below when the fundamental role that aid played among the Sahrawi refugees for livestock recovery is discussed.

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<sup>34</sup> For example, Dedenis (2005) discussed Sahrawi refugees' mobility in light of their nomadic background.

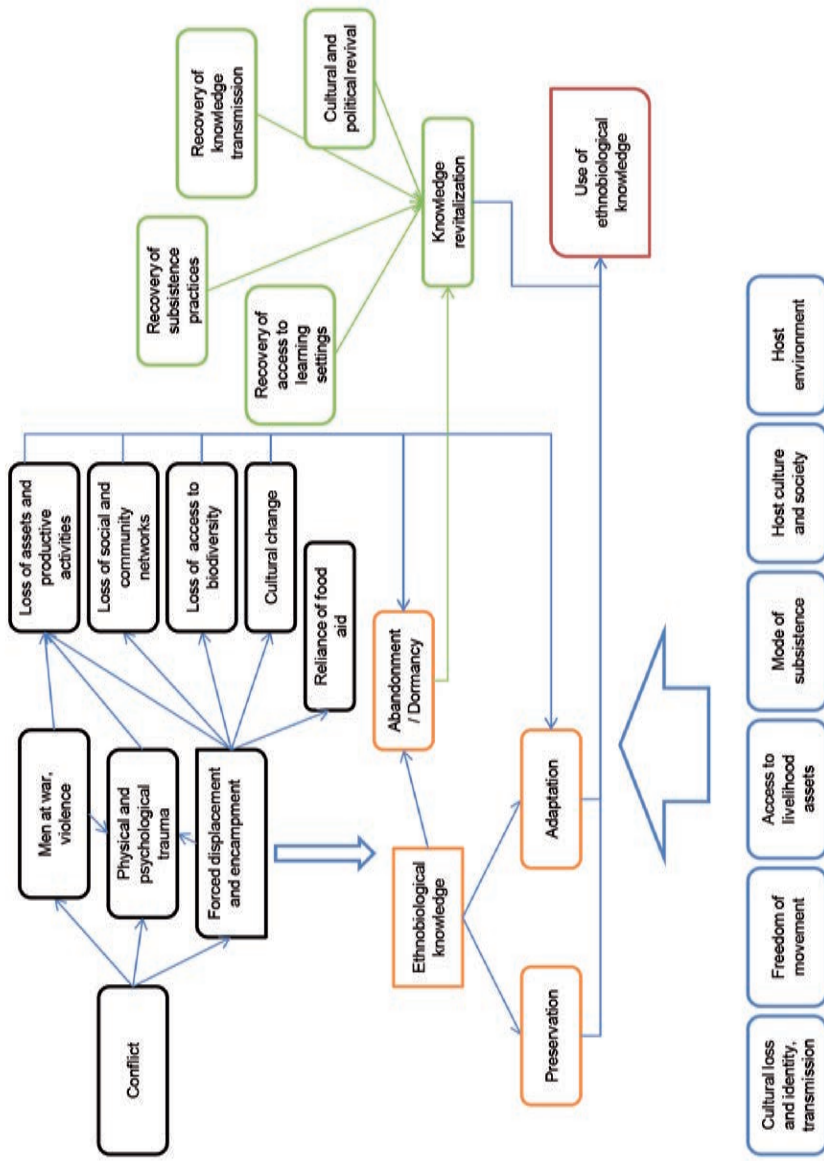


Figure 8.5 Changes in ethnobiological knowledge among refugees in camps

### ***Contributions to perspectives on ethnobiology***

This study makes a substantial contribution to the growing body of literature on the ethnobiology of migrants and displaced people and, more specifically, on change and adaptation of ethnobiological knowledge, of patterns of procurement of associated products, and of the significance of these practices for migrants' and refugees' cultural identity. Below, these contributions to the fields of ethnobiology and ethnobotany are presented and graphic models on the relations between ethnobiological knowledge and practices and the variables involved in the processes of migration and displacement are presented and discussed.

### ***Contributions to perspectives on refugees' and migrants' procurement of subsistence products***

Chapter 1 presented and discussed a number of studies that have addressed migrants' and displaced peoples' procurement of traditional subsistence products in their new environments, as well as a basic conceptual model that has been proposed about these relationships (Ferreira de Athayde, Kaiabi et al. 2009; Volpato, Godínez et al. 2009; Muniz de Medeiros, Taboada Soldati et al. 2012). Here, this model is expanded to incorporate ethnobiological knowledge and subsistence practices and integrate these with concepts from refugee studies. The contexts and variables that are hypothesised to influence the procurement of subsistence products by refugees living in camps and the relations involved are presented in Figure 8.4. The figure represents the processes in general terms, drawing from literature on the ethnobiology of refugees and migrants as well as the findings of the Sahrawi case study.

Following forced displacement and encampment, refugees struggle to procure subsistence resources and products for their use, exchange, and cultural values. From the camps, refugees must adapt their pre-exile procurement patterns and develop new procurement strategies to the new context. Adaptation occurs through: 1) replacement or substitution, in which products that are no longer readily available with others (e.g. with similar properties or characteristics) that are easier to procure in camp contexts; 2) abandonment where, in association with cultural change, some products are no longer used as their procurement is too difficult or expensive and no acceptable replacement is available; and 3) the use of new subsistence products made available in the camps and their incorporation into refugees' own cultural practices. When products do continue to be available, often new procurement strategies must be developed through 1) cultivation/ husbandry in and around the camps; 2) harvesting from the wild in the host environment; 3) imports, through harvesting, production, or trade from extra-camp locations, including the homeland. Although all of these strategies may be used simultaneously to different degrees by different refugee populations, this and other studies indicate that imports of products from extra-camp locations, especially from refugees' homelands, are of paramount importance to refugees' material and cultural recovery. Also, harvesting and imports from extra-camp locations are embedded in and contribute to refugees' social and trade networks with other members of the same culture (e.g. those who remained in the homeland). These

often involve refugees' travel to the homeland and thus strengthen refugees' ties with the home territory, its resources, and culture. These processes then pave the way towards the recovery of a cultural (ethnic, national) identity based on the homeland and its subsistence resources, and toward the maintenance of social relations (including social obligations and reciprocity) based on these resources.

*Contributions to perspectives on change in ethnobiological knowledge among refugees and migrants*

As suggested in other studies and corroborated by the findings of this study, ethnobiological knowledge and its transmission among displaced populations may be lost or become dormant but, under certain conditions, may also be revitalised. This study has also advanced the understanding of the role and importance of such knowledge for displaced populations. Figure 8.5 represents graphically the processes occurring in relation to ethnobiological knowledge among refugees living in camps. Knowledge transmission is impacted by factors such as the loss of traditional subsistence practices that underpinned this knowledge, and of networks and institutions through which knowledge was transmitted and embodied, loss of access to the environmental setting where this knowledge was learned and enacted, and also processes of cultural change that affect younger generations, which then manifest no or little interest in traditional subsistence practices and the associated knowledge, and therefore do not participate in its reproduction. In such contexts, ethnobiological knowledge may be preserved (with continued use and transmission), adapted (its content as well as modes of transmission change), and abandoned, thus becoming dormant (only held in the memory of some members, but not used and barely or not transmitted so that, if the trend continues across generations, knowledge is lost).

The factors identified here as influencing the fate of ethnobiological knowledge among refugees living in camps include all those that constrain the recovery of the subsistence activities that are underpinned by this knowledge (e.g. lack of economic means, limited mobility, etc.). Among other influences, this includes the environmental characteristics of the camp (where traditional subsistence activities may or may not be practiced), social and cultural change more generally (where cultural values associated with the traditional activities and products may or may not be transmitted to those who are raised in the camps and exposed most strongly to the host and/or Western culture), and social reorganisation, which may disrupt the social networks and institutions that are important to the continuous transmission of ethnobiological knowledge.

This dissertation contributes to the anthropological and ethnobiological literature that addresses the role of socio-cultural change and displacement in the transmission and adaptation of traditional knowledge (Ellen and Harris 2000; Ferreira de Athayde, Kaiabi et al. 2009; Ellen, Lycett et al. 2013). Worldwide, the causes of knowledge loss have been identified as globalisation, cultural homogenisation, loss of biological diversity, and the desire for modernisation (Castles 2002; Ramirez 2007). It is true that, with forced displacement, encampment, loss of access to the means of production



and to their homelands, refugees have great difficulty maintaining their ethnobiological knowledge. Nonetheless, the long-term impacts of forced migration on traditional knowledge transmission are poorly understood (Chatty and Colchester 2002). These processes can have diverse implications for ethnobiological knowledge. Rather than being lost, ethnobiological knowledge may be revitalised and its transmission resumed, as demonstrated in this dissertation and also as recently acknowledged and addressed in the literature (Ferreira de Athayde, Kaiabi et al. 2009; Volpato, Godínez et al. 2009). First, this may occur since ethnobiological knowledge can sustain new processes of commodification, including new patterns of production and consumption and second, ethnobiological knowledge may become embedded in redefinitions of notions of authenticity and cultural identity and used to access new social and material resources. Nevertheless, within such processes of revitalisation, ethnobiological knowledge is transformed and its patterns of transmission and distribution change.

### **Practical Implications of the Research Findings**

The findings from this study have several practical implications in that they suggest that agencies seeking to support refugees should consider their autochthonous initiatives, agency, and culture when developing and implementing cooperation projects and other interventions (e.g. education, health delivery systems, and micro-finance). The results can be used to: 1) develop targeted interventions to support refugees' own agency toward recovering their subsistence activities, for example by facilitating the economic means (e.g. through microcredit and livestock loans),<sup>35</sup> as well as the necessary institutional conditions (e.g. mobility, security, legal entitlements) (Meyer 2006); 2) develop interventions that are socially and culturally acceptable and that promote refugees' material and cultural recovery (e.g. in relation to health care practices, the understanding of local health systems and associated norms and beliefs; in relation to culinary traditions and food-related practices, supporting production and distribution of traditional foodstuffs such as camel milk and meat rather than providing imported non-traditional foods); and, 3) identify and strengthen those factors that sustain refugees' agency, for example by increasing mobility and addressing increasing social differentiation with targeted interventions that serve to reduce social tensions. Such interventions would be not only welcome, but are also urgent as, at least in the case of the Sahrawi, the aid provided through public and private channels has reduced in recent years (López Belloso 2008; Abdelrahim 2012), and thus refugees urgently need to find alternative livelihood pathways. As Ralf Gruenert, UNHCR Representative in Algeria<sup>36</sup> recently said, 'We are calling on the international community, including humanitarian and development actors, to work together on a livelihoods strategy that will strengthen the resilience and

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<sup>35</sup> The importance of an initial capital for refugees who have been stripped of all their assets is sometimes stressed in the literature (Jacobsen 2005), and the Sahrawi case provides a good example. Sources of credit for refugees are generally scarce, and include credit programmes, in-kind loans, social networks for lending and borrowing, informal credit associations, and remittances (Ahmed 2000; Jacobsen 2004).

<sup>36</sup> <http://www.unhcr.org/52ea22659.html>



selfreliance of Sahrawi refugees, in order to give them back their dignity and some prospects for the future.' This study serves to demonstrate that resilience and self-reliance are necessarily based principally on refugees' autochthonous initiatives (Crisp 2003), and understanding how these initiatives develop is of crucial importance to better assist and support refugees. Nonetheless, relief and development agencies seldom take into account the contribution of subsistence practices for the wellbeing of Sahrawi refugees, and this is largely the case for most encamped refugees. In fact, outsiders who do not take local socio-cultural context and refugees' own desires, perceptions and views into account too often plan refugee policies. As a result, many of these policies fail to become sustainable over time and have little impact on refugees' long-term recovery.

In addressing the diverse issues related to human ecology, ethnobiology, and forced displacement, this study tackles major themes in contemporary applied anthropology. Over the past few decades, ethnobiologists have influenced a 'new' applied anthropology which, following Sillitoe (2006:129), may be called 'ethnobiological applied anthropology,' which is bottom-up, emphasises sustainability and poverty alleviation, and entails local knowledge systems and endogenous solutions (Ellen 2006; Sillitoe 2006). Within this trend, in which it is recognised that traditional knowledge contributes to development (Antweiler 1998; Purcell 1998; Sillitoe 1998), opportunities have increased for ethnobiologists and anthropologists to make a difference in the lives of their research subjects. In a recent paper, Sillitoe (2007) discusses opportunities and constraints for the application of anthropology in a globalised world, and points to some areas of scientific inquiry where anthropology may make specific contributions. These include livelihoods strategies, the political ecology of resource management, and local health and wellbeing. This thesis touches on the three of these topics when discussing Sahrawi refugees' subsistence practices and ethnobiological knowledge. Results from anthropological research integrating refugee studies, human ecology, and ethnobiology can make substantial contributions to the wellbeing and development of refugees' communities.

In line with what other anthropologists have proposed (Keen 1999; Sillitoe 2006; Sillitoe 2007), applied research involves collecting data about the processes affecting refugees' lives and their implications and, on the basis of such data, influencing policy makers, donors, and NGOs that work with refugees. This may make positive contributions especially in contexts where misunderstandings between policy makers and refugees have given rise to recurrent distrust between them (Kibreab 1993; Harvey and Lind 2005). Scholars can and should work to help professionals and policymakers develop interventions that consider refugees' cultural context and promote participation (Rao and Walton 2004). However, in spite of a dramatic increase in academic work on refugees over the past three decades, this has often failed to achieve significant policy impacts (Black 2001). Studies such as those presented in this dissertation can give voice to refugees' own ideas for development and cooperation, promote interventions that respect refugees' identities and cultural heritage, and demonstrate the critical importance of refugees' own

knowledge. Cultural studies should also aim at identifying cultural patterns and conflicts within refugee communities, so that cooperation and relief agencies may better design and implement their programmes (Dudley 1999).

The results of this study speak both to the anthropologist and to the policy-maker. To the first, they show that refugee studies is a field where applied anthropology can help to improve people's lives. To policy-makers, they show that refugees are not passive recipients of aid, but rather struggle in many ways and continuously seek and exploit opportunities to improve their lives. Refugees' autochthonous initiatives should not be suppressed but rather promoted and supported (e.g. intervening in the case of increasing social inequality by stimulating traditional forms of wealth redistribution and reciprocity). This is even more imperative considering that many cooperation projects lack cultural and social sustainability and function only as long as there is direct control, management, and material support on the part of external organisations. It is too often the case that these projects are estranged from the motivations and aspirations of their target groups, so that refugees participate only as long as there is direct remuneration. As Dudley (1999), for example, discussed in relation to Karenni refugees encamped along the Burma-Thailand border, the participation of an anthropologist in planning and implementation of assistance programmes may contribute to these programmes' sustainability and outcomes as these thus come to recognise social and cultural specificity, differences, and dynamics in the refugee camps, facilitating understanding between relief workers and refugee communities, as well as among different groups of refugees. The inclusion of cultural element may well help to mitigate refugee distress and cultural conflict (Dudley 1999).

Refugees are active agents using their endogenous knowledge to foster self-sufficiency and sustainability (Lederach 1995). Ethnobiological and anthropological studies in refugee contexts can inform this perspective, for example by addressing means to promote refugees' agency and empowerment (Craig and Lovel 2005; Westoby 2008). It can also further inform the self-reliance strategies for refugees that the United Nations High Commission on Refugees has been implementing since the 2000s (Crisp 2003; Jacobsen 2005). This should directly involve refugees in planning and developing relief programmes (Westoby 2008). Given the increasing numbers of refugees worldwide, this is an urgent task:

It seems unlikely that the numbers of refugees will decline in the immediate future, given the continuing violence and inter-ethnic conflict in many parts of the world, let alone the obscene divisions of income and wealth, which characterize the so-called global economy. If this is the case, the need for careful, theoretically informed, methodologically sound and ethically appropriate work with refugees will continue and grow (Craig and Lovel 2005:135).

The empowerment of Sahrawi refugees through investment capital, income generation opportunities, and renewed access to subsistence resources has been uneven, creating the potential for increased social tensions, stratification,

and diverging interests within the refugee population. Such phenomena are already apparent, for example, among Somali refugees in Dabaab camps in Kenya, where Abdi (2005) reports, 'Only a small number of refugees receiving remittances from the diaspora and those involved in petty trade/business are able to supplement these meager rations. Affording meat and milk [...] is a luxury very few refugees can afford.' These processes can create social stratification in the camps (in contrast with the rigidly egalitarian emergency structures imposed at the beginning of exile) and, with this, social tensions increase. Among Sahrawi refugees, data are lacking on the relative contribution of aid and other resources that refugees have obtained in other ways (e.g. remittances, petty trade, etc.) to their livelihoods, and on their distribution within the community (i.e. wealth differences). However, it is clear that aid is still a major source of sustenance for most refugees. In this light, the arguments presented in this dissertation should not be used to support the notion that it is time to reduce the amount of aid given to Sahrawi refugees, as has occurred recently. Decreasing aid without thoroughly investigating the possible effects beforehand could have numerous negative effects; it could threaten the survival of the most vulnerable refugees, undermine the sustainability of already established private activities by removing critical productive resources, and increase tensions in the refugee camps by creating conditions for maladaptive coping strategies that erode social cohesion such exploitation, violence, crime, and ultimately fuel the growth of groups that might seek to re-initiate military hostilities. Rather, aid should be delivered and managed in a way that supports livestock husbandry and that sustain livelihood activities based on common resources in an environmentally sustainable way, and that supplement pastoralism (Jacobsen 2002). As the case studies presented here show, aid can be instrumental to this process of recovery in that it represents a safety net for refugees who have no access to other resources, removes the burden of procuring basic provisions for survival while capitals are rebuilt, and provides seed capital for refugees' own pursuits (Lentz, Barrett et al. 2005; Fiddian-Qasimiyeh 2011). As Harvey and Lind (2005:26) argue for the Turkana pastoralists of Kenya, 'Food aid can provide the incentive for pastoralists to hold onto animals, and thereby contribute to the livelihood recovery process after an emergency.'

### **Recommendations for Further Research**

The analytical and methodological approaches used in this research were presented in Chapter 1 and in each of the subsequent chapters devoted to the specific case studies. Approaches used were interdisciplinary, in that they drew from and integrated different disciplines to capture the complexity of the processes occurring in relation to Sahrawi refugees' subsistence strategies and associated knowledge, and provided detailed data relating to a number of fields (e.g. mycology, ethnomedicine, pastoralism), while touching on a variety of academically relevant topics. However, this study also presents some limitations and shortcomings that can be addressed in future research. First, it has focused only on Sahrawi refugees, and thus the findings are only partially generalizable to other refugees living in camps. The degree to which

the findings presented can be extended to other populations of refugees living in camps is difficult to assess unless other similar investigations are carried out in different encampment contexts. Nonetheless, this study provided a framework and a series of variables for conceptualising refugees in camps and the recovery of subsistence practices that can be applied, refined, or refuted by further studies.

A second limitation concerns the specificity of subsistence practices that were investigated where, with more time and resources, these could be expanded to include, for example, small livestock husbandry, fuelwood harvesting and sales, as well as hunting in the liberated territories, among others. In relation to ethnobiological knowledge and its role among Sahrawi refugees, further studies could investigate the fate of specialised knowledge and associated products or artefacts (e.g. related to health and healing, camel saddle making, etc.) with forced displacement and encampment, which were beyond the scope of the present study. These would add to the body of knowledge that has begun to develop on the interplay between forced displacement and changes in social relations on the one hand, and specialised knowledge and skills, on the other.

A third set of limitations relates to the social and environmental impacts of Sahrawi refugees' recovery of subsistence practices. Some aspects have been addressed tangentially in this study, and deserve further attention. In relation to the social effects, questions remain regarding the extent to which this recovery is distributed across the refugee population, the variables that influence this distribution, and the forms that this distribution takes in terms of social stratification, which is indeed increasing among Sahrawi refugees. Further research could shed light on this and also provide a framework for understanding processes of social stratification among refugees living in camps, including the significance of pre-exile social relations (e.g. tribal and kin relations) and how they influence access to and exploitation of subsistence resources and networks. Further research can target camps with incipient or relatively simple forms of social stratification, such as the Kakuma refugee camps in Kenya (Jansen 2011), in order to explore the ways in which social stratification influences the agency of different groups of refugees. In relation to the environmental impact of Sahrawi refugees' recovery of subsistence practices, the sustainability of some practices may become an issue given increasing commodification. Some harvesting practices may threaten the reproduction of species and their local populations, and commodification can also create tensions between commercial harvesters and those refugees who seek these resources for their use value. Further ecological and anthropological research should investigate these themes among the Sahrawi as well as in other refugee camps and in other cases where the re-engagement with local natural resources is driven by processes of commodification.

The shortcomings of this study just mentioned are related to a fourth set of limitations, i.e. the lack of economic data on the refugee population and the difficulties inherent in collecting such data. These difficulties are recognised in the refugee literature (Jacobsen and Landau 2003); factors such as economic informality and refugees' reluctance to disclose information about their income

and property for fear of losing access to aid impede data collection on refugees' income and wealth. This limits our understanding of how wealth and income are distributed and redistributed, to what extent subsistence practices and aid contribute to refugees' lives, and how changing economic relations shape refugees' social, cultural, and political relations. Further studies are needed on these issues and, more generally, on the economic life of refugees living in camps, which present distortions and peculiarities related to phenomena such as freedom of movement, security and safety, access to cash, dependence on aid and other subsidies, etc..

Since the Ceasefire Agreement of 1991, Sahrawi refugees' mobility within and outside of the camps, the extensive informal economy within the camps, their access to their homeland and physical safety, have all contributed to the recovery of subsistence practices and to the development of networks for procuring subsistence resources. However, this is not the case for all Sahrawi refugees or for all refugees living in camps; many refugees are not allowed to travel outside of camps, while others, including some Sahrawi, do not have the resources to do so. Refugee camps differ to the degree that informal economic activities, transnational networks, productive activities, freedom of movement, and safety are present or absent, and to what degree. These characteristics – that is, the structure of the camps – influence the possibility that refugees have to engage in traditional practices based on natural resources. By comparing refugee camps that have different types of organisation and stages of development (e.g. recent camps versus protracted situations) and by observing how this organisation and refugees' lives change over time, it can be inferred which variables or combination thereof influence and affect recovery, which can lead to the development and implementation of strategies to better address refugees' needs.

Comparative studies of different refugee camps would help not only to understand refugees' subsistence strategies and their relation with camps' structural features, but differences relating to the revitalisation of subsistence practices and traditional knowledge. For example, studies among refugees that confront severe constraints on their mobility, or who have access to land for agriculture, would permit exploration of the ways that refugees' agency varies under different conditions, and how knowledge, practices, and well-being vary accordingly.<sup>37</sup> Comparative studies of this kind would provide data that would aid discussion of the opportunities and constraints that different refugee populations face, and which of these can be addressed by NGOs and policy makers to support refugees' own agency. Also, such studies would contribute to understanding the processes and actions through which people rebuild their lives and their relationships with nature after disasters (e.g. loss of properties, displacement, etc.).

As this study shows, refugee camps can also be intriguing places for ethnobiological research, where it is possible to test hypotheses and investigate cultural change and knowledge transmission within a clearly defined population,

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<sup>37</sup> In conflict-affected areas, organised criminals can target natural resources for profit, as Jacobsen (2002) has shown in relation to fuelwood collection and sales in Kakuma and Dadaab refugee camps. This suggests that another area for further research is the ways in which refugees' access to subsistence resources may be entrenched in illegal activities and violence.

*vis a vis* the host culture, biocultural adaptation, changes in cultural identity, etc. For example, a possible line of ethnobiological research among refugees would investigate ethnobiological knowledge exchange and interaction among different groups in the same refugee camp, such as in the Kyangwali Refugee Settlement in Uganda (Werker 2007) with its Congolese, Sudanese, Kenyan, Ethiopian, Rwandan, Somali, and South Sudanese groups, as well as the fate of ethnobiological knowledge and the extent and forms of its revitalisation where this occurs. More studies are needed to understand processes of transformation in ethnobiological knowledge and its transmission, and thus follow up studies among the Sahrawi refugees also are recommended in order to document ethnobiological knowledge transformation in the next generation as the revitalisation process gains strength or wanes. Other paths of further research in this sense include the role of subsistence practices in maintaining social bonds among refugees, and the role of remittances in the recovery of subsistence practices.

### **Final Conclusions**

This study set out to seek answers to a number of questions related to Sahrawi refugees and more broadly address the subsistence practices and associated ethnobiological knowledge of refugees living in camps, in particular, how they recover and adapt these from exile. Questions addressed changes in social relations (e.g. in access to customary territory, in the commodification of subsistence products), ecological relations (e.g. in the procurement and production/harvesting of subsistence products), in knowledge (e.g. in the dormancy and revitalisation of ethnobiological knowledge, and in the culture (e.g. in the renegotiation of a shared cultural heritage and identity) around these practices and products. These are not trivial academic questions when related to refugee camps, where human rights, suffering and survival are at stake. Rather, these questions and their answers are central to understanding refugees' lives and suggest ways in which policy makers and development planners can better address refugees' needs as well as the recovery of their lives and livelihoods in the longer term.

This dissertation has provided an account of the motives, means, conditions, and outcomes entailed in Sahrawi refugees' recovery of their pre-exile subsistence practices, including how they adapt access to, procurement, and use of subsistence resources, revitalise and transmit their ethnobiological knowledge, and use subsistence practices and products to strengthen and renegotiate their cultural identity. The results show that Sahrawi refugees exercise their collective and individual agency towards this recovery. At the beginning of exile, this agency took a collective military form and aimed at guaranteeing refugees' survival through the mobilisation of international aid and at fighting to recover their customary territory and homeland. After these efforts partly paid off with access to the liberated territories and, for some, to cash to invest in productive activities and trade, refugees directed their agency toward diversifying their livelihoods, including toward recovering pre-exile subsistence strategies at individual (household, family) level.

From the camps and, exploiting their access to the liberated territories, the



Sahrawi re-engaged with livestock husbandry, procured traditional medicinal remedies, and harvested desert truffles and other complementary foods. This process of re-engagement with nature, however, took new forms compared to the pre-exile past, as changes in the Sahrawi's social and ecological relations as well as culture occurred with flight and sedentarisation in refugee camps. As social relations changed from a tribal-based society to a statist framework, access to the desert and its resources was no longer defined by tribal allegiance but of allegiance to the Polisario and the SADR – the Sahrawi Republic in exile. Concurrently, within a process of market expansion and rapidly expanding intra- and extra-camp commercial trade, the exchange of subsistence products, previously based on reciprocity, tribal allegiance, tribute, barter, and use values, came to be largely commodified and based on monetary value. From exile, the Sahrawi also adapted their ecological relations, changing the conditions of exploitation of the desert resources through technological intensification (e.g. watering camel herds via tanker trucks, relying on motor vehicles, etc.).

Cultural changes occurred both in the knowledge needed to use subsistence resources and in their symbolic meaning. Ethnobiological knowledge was revitalised after a period of dormancy and its transmission resumed, both vertically and horizontally, and knowledge about camel forage and desert truffles, to mention only two examples, regained importance as well as a key role in Sahrawi refugees' lives. A recovery of the meaning of traditional resources for cultural identity accompanied its transformation into an emerging national identity, and elements of the pastoral life were re-appropriated as symbols of a shared cultural heritage and material representations of a cultural specificity that sustains claims to nationhood and national territory. However, these processes occurred unevenly among the refugee population, many of whom have not been able to re-engage with pre-exile subsistence resources due to the lack of cash and other capital, mobility, etc., or who are no longer interested in an historical Sahrawi lifestyle. This has, in some instances, created cultural tensions and an inter-generational struggle around subsistence resources and their meaning, for example in terms of conflicting explanatory models in the conceptualisation of illness and of diverging opinions and beliefs about camels, their products, and a nomadic desert existence.

Taken together, results indicate that the Sahrawi refugees are not passive recipients of food aid, but rather take initiative within the constraints and opportunities presented by the camps, in the process engaging with desert subsistence resources that have both material and cultural importance. The case also illustrates how refugees' struggle to rebuild their lives is informed by pre-exile modes of subsistence and cultural values, and is associated with and triggered by refugees' access to cash and other means of subsistence, to greater mobility and safety, and to extra-camp social networks. These results are significant both in terms of what they imply for refugees' individual and collective agency toward cultural and economic recovery, and for understanding of dispossessed pastoralists' struggles to rebuild herds and livestock husbandry.

From a human ecological and pastoralist perspective, Sahrawi refugees' recovery of camel husbandry reflects the well-known long-term adaptation strategies of dispossessed pastoralist nomads, albeit under new material, social,



and political circumstances. It advances knowledge and understanding of the means that refugees use to procure subsistence products and how patterns and networks of procurement change with displacement and migration. As well, it contributes to the growing body of ethnobiological research on change in ethnobiological knowledge among migrants and displaced peoples, on processes leading to loss and dormancy, as well as of revitalisation, in which knowledge is transformed, and its transmission is resumed among part or all of the study population. Finally, the study contributes to the literature addressing the meanings and cultural significance of traditional subsistence products and associated knowledge, skills, and practices among refugees as vehicles of a shared heritage and cultural identity.

At the broader theoretical level, this study contributes to the current theoretical understandings of human-nature relationships and of how people rooted in a specific environment adapt to social and environmental change. Results indicate that, even when radical disruptions occur in the social and ecological relations of a population whose mode of subsistence and culture are based on local natural resources, at least part of that population struggle to recover these practices and to maintain the associated cultural meanings and practices as well as the requisite knowledge.

The understanding of the processes through which people living in refugee camps recover and adapt their subsistence practices and associated ethnobiological knowledge is important also to understanding broader cultural and social processes that occur in refugee camps, the role of food aid and international relief interventions within these processes, and to formulate ways in which the international community can address refugees' problems and support their autochthonous initiatives. As the planet rapidly changes, and given current prognoses about the emergence of environmental refugee populations on a massive scale, the ways in which people who have been forced to displace from their local environments exercise their collective and individual agency to recover and adapt their relations with nature must be addressed. NGOs working in refugee camps can use such studies to find and implement ways to support this adaptation and recovery and at the same time promote social and environmental justice and sustainability, learning from local knowledge and resource management systems and institutions.

In this dissertation, I have focused my attention on those Sahrawi refugees who did re-engage with natural resources and the customary territory. However, only a minority of refugees have managed to do so, while most are still too poor and lack the means to overcome the constraints presented by life in the camps. Especially for this majority, but not only, food aid continues to be of crucial importance. The recovery of subsistence practices is an ongoing process and is likely to continue into the future as refugees attempt to break free from food dependency, gain access to cash and own means of subsistence, and use the liberated territories, at least as long as there are rains. The direction pursued by refugees leads toward greater integration of refugee camps with wider economic and social networks, but this depends for its continuity on the existence of the camps and of international aid, which compensate for refugees' past losses and current lack of opportunities. While it would be

auspicious for more refugees to re-engage with their traditional subsistence practices, this process nevertheless contains the seeds of potential social and ecological sustainability. Further studies should be carried out around these issues.

Further research is needed both on Sahrawi refugees and on other populations living in refugee camps in order to further advance our understanding how, why, and to what effect encamped people rebuild their relationships with nature from exile, and of the present and future trajectories of this re-engagement. Further studies would be welcomed on the revitalisation of ethnobiological knowledge among Sahrawi refugees, the unevenness of this re-engagement within the population, and its social and ecological effects. Although the Sahrawi case may seem rather exceptional at first glance, millions of people living in refugee camps, especially across Africa and Asia, confront similar situations after forced displacement due to war, drought, etc. In this light, this study may inform other research about refugees' struggles to reconstitute their lives. Studies similar to this should be conducted also among other populations of refugees living in camps in order, for example, to identify those factors (e.g. access to capital, mobility, knowledge, etc.) that support or constrain refugees' efforts and, on this basis, develop and implement better aid policies. Although questions remain about the extent to which the results from this study can be generalised to other populations living in camps (e.g. how the recovery of subsistence practices occurs among refugees with an agricultural rather than pastoral background, or among refugee populations with very limited mobility and no access to their homeland, or among populations living in multicultural camps), nevertheless these findings enhance our understanding of the complexity of the lives of refugees living in camps. They also provide a framework for thinking more generally about refugee populations and changes that occur in human-nature relationships in contexts of forced displacement and encampment.

This dissertation began with the story of Saleh, a Sahrawi refugee who was praising life in the *badiya*. How many are like Saleh, struggling to recover their lives, provide for their parents, and teach their children what life should be like, in refugee camps across the world? All of those who are like Saleh provide vivid examples of the deep relations between humans and their local environments, of the efforts and ingenuity of people who confront terrible losses, and of the length to which people are willing to go to recover that which has meaning to them. Saleh and other refugees like him bring hope and positive examples to those who are dispossessed and chased away; their stories and their heroic efforts deserve to be recorded, told, and learned.

## References

- A.A. 1979. La extraña aventura de Chefid Mohamed. Madrid: El País.
- Abbas, B., A.A. Al-Qarawi, and A. Al-Hawas. 2002. The ethnoveterinary knowledge and practice of traditional healers in Qassim Region, Saudi Arabia. *Journal of Arid Environments* 50:367-379.
- Abdelrahim, J. 2012. La crisis asfixia a los saharauis. El País, Madrid. Accessed 27 April 2013.
- Abdi, A.M. 2005. In limbo: dependency, insecurity, and identity amongst Somali refugees in Dadaab camps. *Canada's Journal on Refugees* 22(2):6-14.
- Abeiderrahmane, N. 2005. Modern dairy products from traditional camel herding: an experience in Mauritania. In *Desertification Combat and Food Safety*, eds. B. Faye, and P. Esenov. Series I: Life and Behavioural Sciences, vol. 362. Amsterdam: IOS Press.
- Aburjai, T. and F. Natsheh. 2003. Plants used in cosmetics. *Phytotherapy Research* 17:987-1000.
- Adano, W.R. and K Witsenburg. 2005. Once nomads settle: Assessing process, motives and welfare changes on Marsabit Mountain. In *As Pastoralists Settle: Social, Health, and Economic consequence in Marsabit District Kenya*, Eds. E. Fratkin and E.A. Roth, 105-136. New York and London: Kluwer Academic/ Plenum Publishers.
- Aftel, M. 2002. *Essence and Alchemy: A Book of Perfume*. North Point Press, London.
- Agamben, G. 1998. *Homo Sacer: Sovereign Power and Bare Life*. Redwood City, CA, Stanford University Press.
- Agier, M. 2002. Between war and city. Towards an urban anthropology of refugee camps. *Ethnography* 3(3):317-341.
- Agier, M. 2008. *On the margins of the world: the refugee experience today*. Cambridge, Polity Press.
- Ahmed, I. 2000. Remittances and their economic impact in post-war Somaliland. *Disasters* 24:380-389.
- Alexiades, N.M. and J.W. Sheldon, eds. 1996. *Selected guidelines for ethnobotanical research: A field manual*. New York Botanical Garden, New York.
- Alfayate, M.C., I. Barrera, E. Ron, R. García Jiménez, S. Pajarón, and M.J. Pérez-Alonso. 2008. La mixocarpia de *Salvia aegyptiaca* L. y su aplicación etnobotánica. *Botanica Complutensis* 32: 213-216.
- Allan, J. 2010. Imagining Saharawi women: the question of gender in POLISARIO discourse. *The Journal of North African Studies* 15(2):189-202.
- Al-Koni, I. 2008. *Gold dust*. Arabia Books, London.
- Alsheikh, A.M. and J.M. Trappe. 1983. Desert truffles: The genus *Tirmania*. *Transactions of the British Mycological Society* 81:83-90.
- American Anthropological Association (AAA). 1998. Code of ethics of the American Anthropological Association. Accessed 15 March 2006, <http://www.aaanet.org/profdev/ethics/upload/ethicscode1998.pdf>.
- Anderson, E.N., D.M. Pearsall, E.S. Hunn, and N.J. Turner, eds. 2011. *Ethnobiology*. John Wiley and Sons, Hoboken, NJ.
- Antoine-Moussiaux, N., B. Faye, and G.F. Vias. 2007. Tuareg ethnoveterinary treatments of camel diseases in Agadez area (Niger). *Trop. Anim. Health Prod.* 39:83-89.
- Antweiler, C. 1998. Local knowledge and local knowing: an anthropological analysis of contested 'cultural products' in the context of development. *Anthropos* 93:469-494.
- Archer, M.S. 1988. *Culture and Agency: The Place of Culture in Social Theory*. Cambridge, Cambridge University Press.
- Arkell, T. 1991. The decline of pastoral nomadism in the Western Sahara. *Geography* 76(331):162-166.

- Armelagos, G.J., T. Leatherman, M. Ryan, and L. Sibley. 1992. Biocultural synthesis in medical anthropology. *Medical Anthropology* 14(1):35-52.
- Assimpoulou, A.N. and V.P. Papageordiou. 2007. Oleoresins from Pistacia species: chemistry and biology. Natural products II, Recent progress in medicinal plants. J.N. Govil and V.K. Singh. Houston, TX, Studiu. 18:145-202.
- Autores Varios. 2009. *La Fuente de Saguia. Relatos de a Generación de la Amistad Saharaui*. Imprenta Provincial de Zaragoza, Zaragoza.
- Awameh, M.S. and A.M. Alsheikh. 1979. Laboratory and field study of four kinds of truffle (kamah), Terfezia and Tirmania species, for cultivation. *Mushroom Science* 10:507-517.
- Ba, M.A. 1926. *Étude sommaire sur les Régueibat*. Nouakchott, A.N., A.P.E./2/77.
- Bahia, M.A. 2007. *Versos refugiados. Poesía Saharaui Contemporanea*. Universidad de Alcala, Alcala de Henares.
- Bakewell, O. 2002. *Refugee Aid and Protection: Working in Parallel or Cross-Purposes?* Geneva, UNHCR.
- Bakewell, O. 2003. Community Services in Refugee Aid Programmes: A Critical Analysis. *UNHCR New Issues in Refugee Research*, Working Paper 82.
- Bandura, A. 2000. Exercise of Human Agency through Collective Efficacy. *Current Directions in Psychological Science* 9(75).
- Bandura, A. 2006. Toward a Psychology of Human Agency. *Perspectives on Psychological Science* 1(2):164-180.
- Barker, C. 2000. *Cultural Studies. Theory and Practice*. London, SAGE Publications.
- Barrera, I., M.E. Ron, S. Pajaron, and R. Sidi Mustapha. 2007. *Sahara Occidental. Plantas y usos. Usos y costumbres del pueblo saharauí relacionados con los recursos vegetales. Estudio etnobotánico del Sahara Occidental*. Universidad Complutense de Madrid y Ministerio de Cultura de la República Árabe Saharaui Democrática, Madrid.
- Bascom, J.B. 1998. *Losing place. Refugee populations and rural transformations in East Africa*. New York, Berghahn Books.
- Bates, D.G. and J. Tucker, Eds. 2010. *Human Ecology: Contemporary Research and Practice*. New York, Springer.
- Bellakhdar, J. 1997. *La pharmacopée marocaine traditionnelle*. Paris, Ibis Press.
- Bellakhdar, J., R. Claisse, J. Fleurentin, and C. Younos. 1991. Repertory of standard herbal drugs in the Moroccan pharmacopoeia. *Journal of Ethnopharmacology* 35:123-143.
- Benchelah, A.C., H. Bouziane, M. Maka, and C. Ouahes. 2000. *Fleurs du Sahara. Voyage ethnobotanique avec les Touaregs du Tassili*. Ibis Press-Atlantica, Paris.
- Benson, E. 2009. Confidence-building measures in Western Sahara. *Forced Migration Review* 33:56-58.
- Berkes, F. 1999. Sacred ecology. *Traditional ecological knowledge and resource management*. Philadelphia and London, Taylor and Francis.
- Berkes, F. 2004. Knowledge, learning and the resilience of social-ecological systems. IACSP '04 (Tenth Biennial Conference of the International Association for the Study of Common Property), Oaxaca, Mexico.
- Berkes, F., J. Colding, and C. Folke. 2000. Rediscovery of traditional ecological knowledge as adaptive management. *Ecological Applications* 10(5):1251-1262.
- Berlin, B. 1992. *Ethnobiological classification: Principles of categorization of plants and animals in traditional societies*. Princeton University Press, Princeton, NJ.
- Bernard, H.R. 2006. *Research methods in anthropology. Qualitative and quantitative approaches*. 4th ed. Altamira Press, Lanham, Maryland.

- Bernus, E. 1996. Marques de propriété touarègues et pierres tombales (plaines au sud-ouest de l'Air). *Sahara* 8:7-18.
- Bhatia, M. 2001. The Western Sahara under Polisario control. *Review of African Political Economy* 28:291-298.
- Black, R. 2001. Fifty years of refugee studies: from theory to policy. *International Migration Review* 35(1):57-78.
- Black, R. and K. Koser, Eds. 1999. *The End of the Refugee Cycle? Refugee Repatriation and Reconstruction*. Oxford, Berghahn Books.
- Blench, R. 2001. 'You can't go home again' Pastoralism in the new millennium. London, Overseas Development Institute.
- Bodeker, G. and C. Neumann. 2012. Revitalization and development of Karen traditional medicine for sustainable refugee health services at the Thai–Burma Border. *Journal of Immigrant and Refugee Studies* 10(1):6-30.
- Bodeker, G., C. Neumann, P. Lall, and Z. Min Oo. 2005. Traditional medicine use and healthworker training in a refugee setting at the Thai–Burma border. *Journal of Refugee Studies* 18(1):76-99.
- Boicha, L., L. Lehsan, S. Ebnou, S. Abdalahi, A.S. Iselmu, and C. Mahmud. 2003. *Bubisher. Poesía Saharawi Contemporánea*. Puentepero, Las Palmas de Gran Canaria.
- Bollig, M., M. Schnegg, and H. Wotzka. 2013. *Pastoralism in Africa: Past, Present and Future*. Oxford: Berghahn.
- Boneh, D. 1984. Returning to pastoralism: three cases from the Negev Bedouin. *Nomadic Peoples* 15:41-50.
- Borgatti, S.P. 1996a. *ANTHROPAC 4.0*. Analytic Technologies, Natick, MA.
- Borgatti, S.P. 1996b. *Methods Manual for ANTHROPAC 4.0*. Analytic Technologies, Natick, MA.
- Boulay, S. 2004. Quand un objet change de statut: trajectoire de la tente dans la société maure (Mauritanie). *Ethnographiques.org* 6.
- Boulos, L. 1983. *Medicinal plants of North Africa*. Algonac, Michigan, Reference Publications.
- Boyd, R. and P.J. Richerson. 1985. *Mechanisms of cultural evolution*. Chicago, University of Chicago Press.
- Boyer, J.R. 1962. *Contribution à l'étude de l'élevage camelin au Sahara Occidental. Le Regueibat et son chameau*. Faculté de Médecine de Paris. Paris, Ecole Nationale Veterinaire D'Alfort. Diplome d'Etat.
- Bradley, C., C.C. Moore, M.L. Burton, and D.R. White. 1990. A cross-cultural historical analysis of subsistence change. *American Anthropologist* 92:447-457.
- Brainard, J. and A. Zaharlick. 1989. Changing health beliefs and behaviors of resettled laotian refugees: ethnic variation in adaptation. *Social Science and Medicine* 29:845–852.
- Branca, F. 1997. *The health and nutritional status of Saharawi refugees*. Istituto Nazionale della Nutrizione, Rome.
- Brazier, C. 1997. Light in the darkness. *New Internationalist magazine* 297. doi:<http://www.newint.org/features/1997/12/05/light/>.
- Briggs, L.C. 1960. *Tribes of the Sahara*. Harvard University Press, Cambridge, MA.
- Brisson, P.R.d. 1789. *An historical narrative of the shipwreck and captivity of Mr de Brisson, an officer belonging to the Administration of the French Colonies, with a description of the deserts of Africa, from Senegal to Morocco*. Perth and Edinburgh, R. Morison and Son and G. Mudie.
- Brodt, S. 2001. A systems perspective on the conservation and erosion of indigenous agricultural knowledge in central India. *Human Ecology* 29(1):99-120.

- Broglio, A. and G. Volpato. 2008. Pastoralism and displacement: strategies and limitations in livestock raising by Sahrawi refugees after thirty years of exile. *Journal of Agriculture and Environment for International Development* 102(1/2):105-122.
- Brondízio, E.S. and E.F. Moran, Eds. 2013. *Human-Environment Interactions*. Human-Environment Interactions, Springer.
- Brooks, N., I. Chiapello, S. Di Lernia, N. Drake, M. Legrand, C. Moulin, and J. Prospero. 2005. The climate-environment-society nexus in the Sahara from prehistoric times to the present day. *The Journal of North African Studies* 10(3-4):253-292.
- Bulliet, R. 1975. *The Camel and the Wheel*. Harvard University Press, Cambridge.
- Bush, J. 1994. The role of food aid in drought and recovery: Oxfam's North Turkana (Kenya) drought relief programme, 1992/1994. Nairobi, OXFAM.
- Callamard, A. 1994. Refugees and local hosts: a study of the trading interactions between Mozambican refugees and Malawian villagers. *Journal of Refugee Studies* 7(1):1-23.
- Camacho, A. 1987. *Pastores en la guerra*. Madrid: El País.
- Capps, L.L. 1994. Change and continuity in the medical culture of the Hmong in Kansas City. *Medical Anthropology Quarterly* 8(2):161-177.
- Capot-Rey, R. 1962. *The present state of nomadism in the Sahara*. Paris, UNESCO.
- Caratini, S. 1989a. *Les Rgaybat (1610-1934)*. 1: *Des chameliers à la conquete d'un territoire*. Paris, L'Harmattan.
- Caratini, S. 1989b. *Les Rgaybat (1610-1934)*. 2: *Territoire et société*. Paris, L'Harmattan.
- Caratini, S. 1996. The role of women in the Western Sahara. *Pensee* 308:115-124.
- Caratini, S. 2000. Système de parenté Sahraoui. L'impact de la révolution. *L'Homme* 154-155:431-456.
- Caratini, S. 2003. *La republique des sables: anthropologie d'une revolution*. Editions Harmattan, Paris.
- Caratini, S. 2007a. La prison du temps. Les mutations sociales à l'oeuvre dans les camps de réfugiés sahraouis. Première partie: la voie de la révolution. *Afrique contemporaine* 1(221):153-172.
- Caratini, S. 2007b. La prison du temps. Les mutations sociales à l'oeuvre dans les camps de réfugiés sahraouis. Deuxième partie: l'impasse. *Afrique contemporaine* 2(222):181-197.
- Caro Baroja, J. 1955. *Estudios Saharianos*. Madrid, Consejo Superior de Investigaciones Cientificas.
- CASA Consulting. 2003. The Community Services Function in UNHCR: An Independent Evaluation. Geneva, UNHCR Evaluation and Policy Analysis Unit.
- Castellino, J. 1999. Territory and identity in international law: The struggle for self-determination in the Western Sahara. *Millennium-Journal of International Studies* 28(3):523-551.
- Castles, S. 2002. Migration and community formation under conditions of globalization. *International Migration Review* 36:1143-1168.
- Castree, N. 2003. Commodifying what nature? *Progress in Human Geography* 27(3):273-297.
- Catley, A. 2006. Use of participatory epidemiology to compare the clinical veterinary knowledge of pastoralists and veterinarians in East Africa. *Tropical Animal Health and Production* 38:171-184.
- Cavaglieri, S. 2005. *Livelihood strategies and food security in refugee camps*. University of Roma Tre, Rome.
- Cavalli-Sforza, L.L., M.W. Feldman, K.H. Chen, and S.M. Dornbusch. 1982. Theory and observation in cultural transmission. *Science* 218(4567):19-27.
- Censo-74. 1974. Censo. Censo y estadística, servicio de registro de población, El-Ayoun.



- Ceuterick, M., I. Vandebroek, B. Torry, and A. Pieroni. 2008. Cross-cultural adaptation in urban ethnobotany: the Colombian folk pharmacopoeia in London. *Journal of Ethnopharmacology* 120(3):342-359.
- Chaibou, M. and B. Faye. 2005. Fonctionnement des élevages camélins de la zone périurbaine d'Agadez au Niger: enquête typologique. *Revue d'élevage et de médecine vétérinaire des pays tropicaux* 58(4):273-283.
- Chamberlain, R. 2005. Stories of a nation: Historical Narratives and visions of the future in Sahrawi refugee camps. *Refugee Studies Centre, RSC Working Paper 29*, University of Oxford.
- Charre, J.P. 1966. Les Reguibat L'Gouacem. Systeme juridique et social. *Revue de Géographie Alpine* 54(2):343-350.
- Chatin, A. 1891. Terfas ou truffes d'Afrique et d'Arabie, genres *Terfezia* et *Tirmania*. *Bulletin de la Société Botanique de France* 38:59-64.
- Chatty, D. 1980. The pastoral family and the truck. In *When Nomads Settle: Processes of Sedentarization as Adaptation and Response*, Ed. P. Salzman, 80-94, Praeger, New York.
- Chatty, D. 1986. *From camel to truck: The Bedouin in the modern world*. Vantage Press, New York.
- Chatty, D., Ed. 2006. *Nomadic Societies in the Middle East and North Africa: Entering the 21st Century. Handbook of Oriental Studies, Section One, The Near and Middle East*. Leiden and Boston, Brill.
- Chatty, D. and M. Colchester, Eds. 2002. *Conservation and mobile indigenous peoples. Displacement, forced settlement, and sustainable development*. Oxford, Berghahn Books.
- Chatty, D., E. Fiddian-Qasmiyeh, and G. Crivello. 2010. Identity with/out territory: Sahrawi refugee youth in transnational space. In *Deterritorialized youth: Sahrawi and Afghan refugees at the margins of the Middle East*, Ed. D. Chatty, 37-84, Oxford, Berghahn.
- Clarke, A.E., J.K. Shim, L. Mamo, J.R. Fosket, and J.R. Fishman. 2003. Biomedicalization: technoscientific transformations of health, illness, and U.S. biomedicine. *American Sociological Review* 68(2):161-194.
- Clarke, K. 2006. Polisario: resistance and identity. *L'Ouest Saharien* 6:129-140.
- Cohen, D. 1963. *Le dialecte Arabe Hassaniya de Mauritanie*. Librairie C. Klincksieck, Paris.
- Cohen, E. 2010. Anthropology of knowledge. In *Making Knowledge*, Ed. T.J.H. Marchand, Special Issue of *Journal of the Royal Anthropological Institute*:S193-S202.
- Colding, J., T. Elmqvist, and P. Olsson. 2003. Living with disturbance: building resilience in social-ecological systems. In *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*, Eds. F. Berkes, J. Colding and C. Folke, 163-173, Cambridge University Press, Cambridge.
- Colson, E. 2003. Forced migration and the anthropological response. *Journal of Refugee Studies* 16(1):1-18.
- Comméleran, M. 1911. L'"iguindi", oedème dur des membres inférieurs chez les populations de la Mauritanie. *Annales d'Hygiène et de Médecine Coloniale* XIV:324-330.
- Corbet, A. 2006. Les campements de réfugiés sahraouis en Algérie: de l'idéal au réel. *Bulletin de l'Association de Géographes Français* 83(1):9-21.
- Corbet, A. 2008. *Nés dans les camps. Changements identitaires de la nouvelle génération de réfugiés sahraouis et transformation des camps*. Paris, École des Hautes Études en Sciences Sociales. Thèse de Doctorat, Anthropologie Sociale et Ethnologie.
- Corlett, J.L., E.A. Dean, and L.E. Grivetti. 2003. Hmong gardens: Botanical diversity in an urban setting. *Economic Botany* 57(3):365-379.
- Corraera, A. 2006. *Dynamique de l'utilisation des ressources fourragères par les dromadaires des pasteurs nomades du Parc National du Banc d'Arguin (Mauritanie)*. Ecologie et gestion de la



- biodiversité, Museum National d'Histoire Naturelle de Paris, Paris.
- Cotton, C.M. 1996. *Ethnobotany. Principles and applications*. Wiley and Sons, Chichester.
  - Couldrey, M. and T. Morris, Eds. 1999. *Culture in Exile. Forced Migration Review* 6. The Refugee Studies Centre in association with the Norwegian Refugee Council/Global IDP Project, Oxford.
  - Cozza, N. 2010. Food and identity among Sahrawi refugee young people. In *Deterritorialized Youth. Sahrawi and Afghan refugees at the margins of the Middle East*, Ed. D. Chatty, 119-141, Berghahn Books, Oxford.
  - Craig, G. and H. Lovel. 2005. Community development with refugees: towards a framework for action. *Community Development Journal* 40(20):131-136.
  - Crisp, J. 2003. No solution in sight: the problem of protracted refugee situations in Africa. *New Issues in Refugee Research Working Paper* 75.
  - Crisp, J. 2003. UNHCR, refugee livelihoods and self-reliance: a brief history. PDES Background Documents, Retrieved June 17, 2013 from <http://www.unhcr.org/cgi-bin/texis/vtx/search?page=search&docid=3f978a894&query=refugee%20livelihoods%20self%20reliance>.
  - Crivello, G., E. Fiddian, and D. Chatty. 2005. *The transnationalisation of care: Sahrawi refugee children in a Spanish host program*. Refugee Studies Centre, Oxford.
  - Crivello, G., E. Fiddian, and D. Chatty. 2006. Holidays in peace: Sahrawi children visit Spain. *Forced Migration Review* 25:59-60.
  - Crivello, G., E. Fiddian, and D. Chatty. 2006. Mobility and the Care of Sahrawi Refugee Youth. *Anthropology News* 47(5):29-30.
  - Cunningham, A.B. 2001. *Applied ethnobotany. People, wild plant use and conservation*. London, Earthscan Publications Ltd.
  - Cuzin, F. 1996. Répartition actuelle et statut des grands mammifères sauvages du Maroc (primates, carnivores, artiodactyles). *Mammalia* 60:101-124.
  - Dahl, G. 1979. *Suffering grass: Subsistence and society of Waso Borana*. Stockholm Studies in Social Anthropology, University of Stockholm.
  - D'Andrade, R. 1995. *The development of cognitive anthropology*. Cambridge University Press, Cambridge.
  - Davidson-Hunt, I. 2003. *Journeys, plants and dreams: adaptive learning and social-ecological resilience*. University of Manitoba, Winnipeg, PhD Thesis.
  - de Juan Canales, D. 2009. Imaginación y reacción en los campamentos de refugiados saharauis: construcción de la cotidianidad e identidad frente al otro extranjero (nasrani) en el contexto de la diáspora. *Periferia - Revista de recerca i formació en antropologia* 10:1-24.
  - de Juan Canales, D. 2010. Emergencia civil y economía del refugio en los campamentos de refugiados saharauis de Argelia. *Gazeta de Antropologia* 26(1):11.
  - Dedenis, J. 2005. *La mobilité régionale de la société sahraouie des camps de réfugiés. Une ressource pour un mieux-vivre?* Master Thesis (in International Migrations and Inter-ethnique Relations), Université de Poitiers, Poitiers, France. [http://ykouzmine.free.fr/IMG/pdf/Master2\\_Dedenis\\_2005.pdf](http://ykouzmine.free.fr/IMG/pdf/Master2_Dedenis_2005.pdf) (24 May 2012).
  - Dedenis, J. 2006. Les caractères de la territorialité des camps de réfugiés sahraouis. In *Territoires d'exil: les camps de réfugiés*, Ed. V. Lassailly-Jacob, 22-34, Bulletin de l'Association des Géographes Français.
  - Denton, D.A. 1969. Salt appetite. *Nutrition Abstract Review* 39(4):1043-1049.
  - Dietz, T. and T.R. Burns. 1992. Human Agency and the Evolutionary Dynamics of Culture. *Acta Sociologica* 35:187-200.
  - DNV-RASD. 2005. *Census 2005*. República Árabe Democrática Sahrawi, Rabuni, Polisario

- refugee camps: Dirección Nacional de Veterinaria, Ministerio de Salud Pública Sahrawi, RASD.
- DNV-RASD. 2007. *Census 2007*. República Árabe Democrática Sahrawi, Rabuni, Polisario refugee camps: Dirección Nacional de Veterinaria, Ministerio de Salud Pública Sahrawi, RASD.
  - Dobignard, A., F. Jacquemoud, and D. Jordan. 1992. Matériaux pour la connaissance floristique du Sahara occidental et de l'Anti-Atlas méridional. I. Pteridophyta à Rosaceae. *Candollea* 47(1):113-179.
  - Dobignard, A. 1992. Matériaux pour la connaissance floristique du Sahara occidental et de l'Anti-Atlas méridional. II. Leguminosae à Compositae. *Candollea* 47(1):397-481.
  - Doménech, A. 1946. Algo sobre el Río de Oro. Madrid.
  - Doménech, A. 1953. Sahara Español, Del vivir nómada de las tribus. *Cuadernos de Estudios Africanos* 21.
  - Drzewiecka, J.A. 2002. Reinventing and contesting identities in constitutive discourses: Between diaspora and its others. *Communication Quarterly* 50(1):1-23.
  - Dudley, S. 1999. 'Traditional' culture and refugee welfare in north-west Thailand. *Forced Migration Review* 6:5-8.
  - Dudley, S. 2010. *Materialising Exile: Material Culture and Embodied Experience among Karenni Refugees in Thailand*. Berghahn Books, Oxford.
  - Ebnu, A. 2008. *Nómadas en el exilio. Asociación Cultural Almenara*, Marbella.
  - El Abrak, A. 2000. Encadrement sanitaire du cheptel camelin au Maroc. In *Maladies parasitaires et infectieuses du dromadaire*, Ed. A. Dakkak, 9-14, Actes Editions, Rabat.
  - Elizondo, L., C.M. Mehdi, and M. Sanz. 2008. *Microcréditos en el Sáhara. Manual para la solicitud de crédito en los campamentos saharauis*. Hegoa, Bilbao.
  - El-Katab, A. 2008. La viande du dromadaire, un produit sahraoui jusque-là inexploité. Rabat: Libération.
  - Ellen, R. 1982. *Environment, Subsistence and System. The Ecology of Small-scale Social Formations*. Cambridge, Cambridge University Press.
  - Ellen, R. 1994. Modes of subsistence: hunting and gathering to agriculture and pastoralism. In *Companion encyclopaedia of anthropology. Humanity, culture and social life*, Ed. T. Ingold, 197-225, Routledge, London.
  - Ellen, R., Ed. 2006. Ethnobiology and the science of humankind. *Journal of the Royal Anthropological Institute*, Blackwell Publishing Limited, Oxford.
  - Ellen, R. and H. Harris. 2000. Introduction. In *Indigenous environmental Knowledge and its Transformations: Critical Anthropological Perspectives*, Eds. R. Ellen, P. Parkes and A. Bicker, 1-33, Harwood, Amsterdam.
  - Ellen, R. and M. Fischer. 2013. Introduction: on the concept of cultural transmission. In *Understanding Cultural Transmission in Anthropology: A Critical Synthesis*, Eds. R. Ellen, S.J. Lycett and S.E. Johns, 1-54, Berghahn, Oxford.
  - Ellen, R., S.J. Lycett, and S.E. Johns, Eds. 2013. *Understanding cultural transmission in anthropology: a critical synthesis. Methodology and History in Anthropology*, Berghahn Books, Oxford.
  - Elmi, A.A. 1989. *Camel husbandry and management by Ceeldheer pastoralists in Central Somalia*. Botany and Range Science Department, Faculty of Agriculture, Somali National University, Mogadishu.
  - Ember, C.R. and M. Ember 1999. *Anthropology*. Upper Saddle River, NJ, Prentice Hall, Inc.
  - Emirbayer, M. and A. Mische 1998. What is agency? *American Journal of Sociology* 103(4):962-1023.
  - Eruesto, J. 2002. The breakdown of cultures in refugee camps. *Forced Migration Review* 14:20.

- Essed, P., G. Frerks, and J. Schrijvers, Eds. 2004. *Refugees and the Transformation of Societies: Agency, Policies, Ethics and Politics*. Berghahn Books, Oxford.
- Essemlali, M. 2008. Provinces du Sud: Le dromadaire symbole central dans la culture sahraouie. Rabat: Le Matin.
- Farah, K.O., D.M. Nyariki, R.K. Ngugi, I.M. Noor, and A.Y. Guliye. 2004. The Somali and the camel: Ecology, management and economics. *Anthropologist* 6(1):45-55.
- Farah, R. 2008. Refugee camps in the Palestinian and Sahrawi national liberation movements: a comparative perspective. *Journal of Palestinian Studies* 38(2):76-93.
- Farah, Z. and A Fischer. 2004. *Milk and meat from the camel. Handbook of products and processing*, vdf Hochschulverlag AG, Zurich.
- Farah, Z., M. Mollet, M. Younan, and R. Dahir. 2007. Camel dairy in Somalia: limiting factors and development potential. *Livestock Science* 110:187-191.
- Farid, M.F.A. 1989. Water and minerals problems of the dromedary Camel (an overview). *Options Méditerranéennes - Série Séminaires* 2:111-124.
- Faye, B. 2009. Pauvreté et solidarité chez les peuples pastoraux. In *L'élevage, richesse des pauvres*, Eds. G. Duteurtre and B. Faye, 77-87, QUAE publ., Versailles.
- Faye, B., M. Bengoumi, and A. Barkat. 2003. Le développement des systèmes camélins laitiers périurbains en Afrique. In *Lait de Chamelle pour l'Afrique*, 115-125, Atelier sur la filière laitière caméline en Afrique, Niamey.
- Faye, B., H. Madani, and A.H. El-Rouili. 2014. Camel milk value chain in Northern Saudi Arabia. *Emir. J. Food Agric.* 26(4):359-365.
- Feeney, J. 2002. Desert truffles galore. *Saudi Aramco World* 53.
- Fernandez-Gimenez, M.E. 2000. The role of Mongolian nomadic pastoralists' ecological knowledge in rangeland management. *Ecological Applications* 10(5):1318-1326.
- Ferreira de Athayde, S., A. Kaiabi, et al. (2009). Weaving power: displacement and the dynamics of basketry knowledge amongst the Kaiabi in the Brazilian Amazon. Mobility and migration in indigenous Amazonia: contemporary ethnoecological perspectives. M. Alexiades. New York, Berghahn: 249-274.
- Fethi, N. 2009. Algerian truffles gain international fame. *Magharebia*.
- Fiddian-Qasmiyeh, E. 2010. When the self becomes other: representations of gender, Islam and the politics of survival in the Sahrawi refugee camps. In *Dispossession and displacement: Forced Migration in the Middle East and North Africa*. Eds. D. Chatty and B. Findlay, 171-196, Oxford University Press, Oxford.
- Fiddian-Qasmiyeh, E. 2011. The pragmatics of performance: putting 'faith' in aid in the Sahrawi refugee camps. *Journal of Refugee Studies* 24(3):533-547.
- Fiddian-Qasmiyeh, E. 2011. *Protracted Sahrawi displacement. Challenges and opportunities beyond encampment*. Refugee Studies Centre, Oxford Department of International Development, University of Oxford.
- Fiddian-Qasmiyeh, E. 2013. *The inter-generational politics of 'travelling memories': Sahrawi refugee youth remembering home-land and home-camp*. *Journal of Intercultural Studies* 34(6):631-649.
- Folke, C. 2004. Traditional knowledge in Social-Ecological Systems. *Ecology and Society* 9(3):7.
- Fortas, Z. and G. Chevalier. 1992. Effect of culture conditions on the mycorrhization of *Helianthemum guttatum* by three species of desert truffles of the genera *Terfezia* and *Tirmania* of Algeria. *Canadian Journal of Botany* 70:2453-2460.
- Fuglerud, Ø. 1999. *Life on the outside: The Tamil diaspora and long distance nationalism*. Pluto Press, London.
- Gabus, J. 1982. *Sahara. Bijoux et techniques*. Ed. A la Baconière, Neuchatel.

- García, A. 2010. *La historia del Sáhara y su conflicto*. Los libros de la catarata, Madrid.
- Garibaldi, A. and N. Turner. 2004. Cultural keystone species: implications for ecological conservation and restoration. *Ecology and Society* 9:1.
- Gast, M., J.L. Maubois, and J. Adda. 1969. *Le lait et les produits laitiers en Ahaggar*. Arts et Metiers Graphiques, Paris.
- Gast, M. 2000. *Moissons du désert. Utilisation des ressources naturelles au Sahara Central*. Ibis Press, Paris.
- Gaudio, A. 1952. Apuntes para un estudio sobre los aspectos etnológicos del Sahara Occidental. - Su constitución básica. *Cuadernos de Estudios Africanos* 19:57-65.
- Gaudio, A. 1993. *Les Populations du Sahara Occidental*. Paris: Editions Karthala.
- Gauthier-Pilters, H. 1961. Observations sur l'écologie du dromedaire dans le Sahara Nord-Occidental. *Mammalia* 25(2):195-280.
- Gauthier-Pilters, H. and A.I. Dagg. 1981. *The Camel. Its evolution, ecology, behavior and relationship to man*. The University of Chicago Press, Chicago.
- Gereffi, G., J. Humphrey, and T. Sturgeon. 2005. The governance of global value chains. *Review of International Political Economy* 12:78-104.
- Gertel, J. and R. Le Heron, Eds. 2011. *Economic Spaces of Pastoral Production and Commodity Systems: Markets and Livelihoods*. Farnham, Ashgate Publishing Limited.
- Giddens, A. 1979. *Central problems in social theory: Action, structure and contradiction in social analysis*. Macmillan, London.
- Giddens, A. 1984. *The Constitution of Society*. Polity Press, Cambridge.
- Giddens, A. 1995. *Politics, sociology, and social theory: encounters with classical and contemporary social thought*. Polity Press, Cambridge.
- Gimeno Martín, J.C. and L.M. Pozuelo. 2010. Memorias orales en el Sáhara Occidental: la poesía en hasanía. 7th Congress of African Studies, Lisboa 21:1-27.
- Golooba-Mutebi, F. and S.M. Tollman. 2004. Survival to livelihood strategies for Mozambican refugees in South Africa. *Forced Migration Review* 20:28-29.
- Gómez-Baggethun, E. and V. Reyes-García. 2013. Reinterpreting change in traditional ecological knowledge. *Human Ecology* 41(4):643-647.
- Gonzalez-Tejero, M.R., M.J. Martinez-Lirola, M. Casares-Porcel, and J. Morelo-Mesa. 1995. Three lichens used in popular medicine in Eastern Andalucía (Spain). *Economic Botany* 49:96-98.
- Greenberg, L.S.Z. 2003. Women in the garden and kitchen: the role of cuisine in the conservation of traditional house lot crops among Yucatec Mayan immigrants. In *Women and Plants. Gender Relations in Biodiversity Management and Conservation*. Ed. P. Howard, 51-65, Zed Books, London.
- Grewal, N.K. 2011. *Iodine status and thyroid function among lactating women in Saharawi refugee camps, Algeria*. Akershus University College, Akershus, Norway.
- Guinea, A. 1945. *Aspecto forestal del desierto. La vegetación leñosa y los pastos del Sahara español*. Instituto Forestal de Investigaciones y Experiencias, Madrid.
- Guinea, A. 1948. *Catálogo razonado de las plantas del Sahara español*. Anales del Jardín Botánico de Madrid 8:357-442.
- Guinea, A. 1949. *El Sahara Español*. Instituto de Estudios Africanos, Consejo Superior de Investigaciones Científicas, Madrid.
- Gutiérrez, A., A. Morte, and M. Honrubia. 2003. Morphological characterization of the mycorrhiza formed by *Helianthemum almeriense* Pau with *Terfezia claveryi* Chatin and *Picoa lefebvrei* (Pat.) Maire. *Mycorrhiza* 13:299-307.

- Hamburg, D.A., G.V. Coelho, and J.E. Adams. 1974. Coping and adaptation: steps toward a synthesis of biological and social perspectives. In *Coping and adaptation*, Eds. G.V. Coelho, D.A. Hamburg and J.E. Adams, Basic Books, New York.
- Hansen, A. 2000. *Dependency and spontaneity in refugee livelihoods*. Rose Marie Rogers Seminar Series on Refugees and Forced Migration, Fletcher School of Law and Diplomacy, Tufts University, Boston.
- Hardy, A.D., R. Vaishnav, S.S.Z. Al-Kharusi, H.H. Sutherland, M.A. Worthing. 1998. Composition of eye cosmetics (kohl) used in Oman. *Journal of Ethnopharmacology* 60:223-234.
- Harrell-Bond, B. 1986. *Imposing Aid. Emergency Assistance to Refugees*. Oxford University Press, Oxford.
- Hart, D.M. 1962. The Social Structure of the Rgibāt Bedouins of the Western Sahara. *Middle East Journal* 16(4):515-527.
- Hart, D.M. 1998. The Rgaybat: Camel nomads of the Western Sahara. *The Journal of North African Studies* 3(4):28-54.
- Harvey, P. and J. Lind. 2005. *Dependency and humanitarian relief. A critical analysis*. Humanitarian Policy Group, Overseas Development Institute, London.
- Henjum, S., I. Barikmo, A.K. Gjerlaug, A.M. Lehabib, A. Oshaug, T.A. Strand, and L.E. Torheim. 2010. Endemic goitre and excessive iodine in urine and drinking water among Saharawi refugee children. *Public Health Nutrition* 13(9):1472-1477.
- Hernández, R. 2013. La semilla de la verdad. Sáhara Documental. <http://www.elmundo.es/elmundo/2013/10/20/internacional/1382244113.html>. Accessed October 20 2013.
- Herren, U.J. 1992. Cash from camel milk: The impact of commercial camel milk sales on Garre and Gaaljacel camel pastoralism in Southern Somalia. *Nomadic Peoples* 30:97-113.
- Herz, M., Ed. 2013. *From camp to city: Refugee camps of the Western Sahara*. ETH Studio Basel, Lars Müller Publishers, Zürich.
- Hidalgo, S., C. Artundo, E. Toft, and M. Abdeslam. 2009. Evaluation of DG ECHO's action in the Saharawi refugee camps, Tindouf, Algeria (2006-2008). ECHO, Madrid.
- Hitlin, S. and G.H.J. Elder. 2007. Time, self, and the curiously abstract concept of agency. *Sociological Theory* 25(2):170-191.
- Hodges, T. 1983. The Origins of Saharawi Nationalism. *Third World Quarterly* 5(1):28-57.
- Homewood, K. 2008. *Ecology of African Pastoralist Societies*. James Currey Ltd, Oxford.
- Horowitz, M.M. and P. Little. 1987. African pastoralism and poverty: Some implications for drought and famine. In *Drought and Hunger in Africa: Denying famine a future*, Ed. M. Glantz, Cambridge University Press, Cambridge.
- Horst, C. 2006a. *Transnational nomads. How Somalis cope with refugee life in the Dadaab camps of Kenya*. Berghahn Books, Oxford.
- Horst, C. 2006b. Refugee livelihoods: continuity and transformations. *Refugee Survey Quarterly* 25(2):6-22.
- Houghton, P.J. and M. Osibogun. 1993. Flowering plants used against snakebite. *Journal of Ethnopharmacology* 39:1-29.
- Hultman, T. 1977. The struggle for Western Sahara. Issue: *A Journal of Opinion* 7(1):27-32.
- Humphrey, C. 1974. Horse brands of the Mongolians. A system of signs in a nomadic culture. *American Anthropologist* 1:471-488.
- Hurskainen, A. 1990. Levels of identity and national integrity: The viewpoints of the pastoral Maasai and Parakuyo. *Nomadic Peoples* 25-27:79-92.
- Hutt, M.J. and P.J. Houghton. 1998. A survey from the literature of plants used to treat scorpion

- stings. *Journal of Ethnopharmacology* 60:97-110.
- Ingold, T. 1986. *The Appropriation of Nature: Essays on Human Ecology and Social Relations*. Manchester University Press, Manchester, UK.
  - Ingold, T. 1994. *Introduction to Culture*. In *Companion Encyclopedia of Anthropology*, Ed. T. Ingold, 329-349, Routledge, London.
  - International Society of Ethnobiology. 2006. ISE Code of Ethics (with 2008 additions). From <http://ethnobiology.net/code-of-ethics/>.
  - Jacobsen, K. 2002. Livelihoods in Conflict. The Pursuit of Livelihoods by Refugees and the Impact on the Human Security of Host Communities. *International Migration* 40(5):95-123.
  - Jacobsen, K. 2004. *The Alchemy Project. Final Report 2001 - 2004*. Medford, MA, Tufts University.
  - Jacobsen, K. 2005. *The Economic Life of Refugees*. Bloomfield, CT, Kumarian Press.
  - Jacobsen, K. and L. Landau. 2003. *Researching refugees: Some methodological and ethical considerations in social science and forced migration*. UNHCR, New Issues in Refugee Research, Working Paper 90, Geneva.
  - Jamal, A. 2003. Camps and freedoms: long-term refugee situations in Africa. *Forced Migration Review* 16:4-6.
  - Jansen, B.J. 2011. *The accidental city: violence, economy and humanitarianism in Kakuma refugee camp, Kenya*. Department of Social Sciences, Wageningen University. PhD Dissertation.
  - Johnson, D.L. 1993. Nomadism and desertification in Africa and the Middle East. *GeoJournal* 31(1):51-66.
  - Julien, Z. 2004. L'identité sahraouie en questions. In *L'Ouest saharien*, Eds. A. Abjean and Z. Julien, 131-231, L'Harmattan, Paris.
  - Jung, D. 2010. *An Ethnography of Fragrance*. The Perfumery Arts of 'Adan/Lahj, BRILL.
  - Kagan-Zur, V. and N. Roth-Bejerano. 2008. Desert truffles. *Fungi* 1:32-37.
  - Kaplinsky, R. 2000. Globalisation and unequalisation: What can be learned from Value Chain Analysis? *Journal of Development Studies* 37:117-146.
  - Keeler, S. 2007. Hackney's 'ethnic economies' revisited. Local food culture, ethnic 'purity,' and the politico-historical articulation of Kurdish identity. In *Traveling cultures and plants: the ethnobiology and ethnopharmacy of human migrations*, Eds. A. Pieroni and I. Vandebroek, 166-185, Berghahn, New York and Oxford.
  - Keen, I. 1999. The scientific attitude in applied anthropology. In *Applied anthropology in Australasia*, Eds. S. Toussaint and J. Taylor, University of Western Australia Press, Nedlands.
  - Keenan, J. 2003. The last nomads. Nomadism amongst the Tuareg of Ahaggar (Algerian Sahara). *Journal of North African Studies* 8(3-4):163-192.
  - Keesing, R.M. and A.J. Strathern. 1998. *Cultural Anthropology. A Contemporary Perspective*. Harcourt Brace College Publishers, New York.
  - Khabar, L., L. Najim, M. Janex-Favre, and A. Parguey-Leduc. 2001. Contribution à l'étude de la flore mycologique du Maroc. Les truffes marocaines (Discomycètes). *Bulletin trimestriel de la Société mycologique de France* 117:213-229.
  - Khalif, Z.K. and G. Oba. 2013. 'Gaafa dhaabaa - the period of stop': Narrating impacts of shifaa insurgency on pastoral economy in northern Kenya, c. 1963 to 2007. *Pastoralism: Research, Policy and Practice* 3:1-14.
  - Khan, M.S., S.A. Mukul, M.S. Uddin, M.G. Kibria, and F. Sultana. 2009. The use of medicinal plants in healthcare practices by Rohingya refugees in a degraded forest and conservation area of Bangladesh. *International Journal of Biodiversity Science and Management* 5(2):76-82.
  - Kibreab, G. 1993. The myth of dependency among camp refugees in Somalia. *Journal of Refugee Studies* 6(4):321-349.



- Kibreab, G. 1996. Eritrean and Ethiopian refugees in Khartoum: what the eye refuses to see. *African Studies Review* 39(3):131-178.
- Kilgman, A.M. 2005. Cosmeceuticals: A broad-spectrum category between cosmetics and drugs. In *Cosmeceuticals and Active Cosmetics. Drug versus Cosmetics*, Eds. P. Elsner and H.I. Maibach, 1-9, Taylor and Francis, Boca Raton, FL.
- Kim, Y. 2001. *Becoming intercultural. An integrative theory of communication and cross-cultural adaptation*. Sage Publications, Thousand Oaks.
- Kleinman, A., L. Eisenberg, and B. Good. 1978. Culture, illness, and care: Clinical lessons from anthropological and cross-cultural research. *Annals of Internal Medicine* 88(2):251-288.
- Koser, K. and N. Al-Ali. 2001. *New approaches to migration? Transnational communities and the transformation of home*. Routledge, London.
- Koser, K. and N. Van Hear. 2003. *Asylum migration: implications for countries of origin*. United Nations University/World Institute for Development Economics Research Discussion Paper DP 2003/20.
- Kourková, P. 2008. Aromatické rostliny užívané etnikem Sahrawi (Alžírsko) a jejich možné využití v okrasném zahradnictví. Fakulta agrobiologie, potravinových a přírodních zdrojů, Prague, Česká zemědělská univerzita v Praze.
- Köhler-Rollefson, I. 1996. The one-humped camel in Asia: origin, utilization and mechanisms of dispersal. In *The origins and spread of agriculture and pastoralism in Eurasia*, Ed. D.R. Harris, 282-292, London: UCL Press.
- Köhler-Rollefson, I. 2003. A treatise on life with camels. *German Research* 1:15-19.
- Landais, E. 2001. The marking of livestock in traditional pastoral societies. *Revue scientifique et technique de l'Office international des épizooties* 20(2):445-462.
- Lautze, S. and J. Hammock. 1996. *Coping with Crisis: Coping with Aid*. Feinstein International Famine Center, Tufts University, Medford, MA.
- Lebrun, J. 1998. Catalogue des plantes vasculaires de la Mauritanie et du Sahara Occidental. *Boissiera* 55:1-322.
- LeCron Foster, M. 1994. Symbolism: The foundation of culture. In *Companion Encyclopedia of Anthropology*, Ed. T. Ingold, 366-395, Routledge, London.
- Lederach, J.P. 1995. *Preparing for Peace: Conflict Transformation across Cultures*. Syracuse University Press, New York.
- Lekouch, N., A. Sedki, A. Nejmeddine, and S. Gamon. 2001. Lead and traditional Moroccan pharmacopoeia. *The Science of the Total Environment* 280:39-43.
- Lentz, E., C.B. Barrett, and J. Hoddinott. 2005. *Food aid and dependency: implications for emergency food security assessments*. IFPRI Discussion Paper 12(2).
- Lepp, H. 2009. Desert truffles - Middle East and Mediterranean. <https://www.anbg.gov.au/fungi/case-studies/desert-truffles.html> (18 January 2012).
- Leriche, A. 1953. Phytothérapie maure. De quelques plantes et produits végétaux utilisées en thérapeutique. *Mémoires de l'Institut Français d'Afrique Noire* 23:267-306.
- Lev, E. 2010. Healing with minerals and inorganic substances: a review of Levantine practice from the Middle Ages to the present. *International Geology Review* 52(7-8):700-725.
- Lev-Ran, A. and M. Porta. 2005. Salt and hypertension: a phylogenetic perspective. *Diabetes/ Metabolism Research and Review* 21:118-131.
- Lindley, A. 2010. *The Early Morning Phonecall: Somali Refugees' Remittances*. Berghahn Books, Oxford.
- Lippert, A. 1987. The Human Costs of War in Western Sahara. *Africa Today* 34(3):47-59.



- Lippert, A. 1992. Sahrawi Women in the Liberation Struggle of the Sahrawi People. *Signs* 17(3):636-651.
- Loescher, G. and J. Milner, Eds. 2005. *Protracted refugee situations: Domestic and international security implications*. Oxford University Press for the International Institute for Strategic Studies, Oxford.
- Loewenberg, S. 2005. Displacement is permanent for the Sahrawi refugees. *The Lancet* 365(9467):1295-1296.
- Loizos, P. 1981. *The heart grown bitter: a chronicle of Cypriot war refugees*. Cambridge University Press, Cambridge.
- López Belloso, M. 2008. Humanitarian aid for the Sahrawi people: The impact and limitations of aid policies for refugees. *Global Society* 6.
- López Belloso, M. and I. Mendia Azkue. 2009. Local Human Development in contexts of permanent crisis: Women's experiences in the Western Sahara. *Journal of Disaster Risk Studies* 2(3):159-176.
- Lopriore, C. and F. Branca. 2001. *Strategies to fight anaemia and growth retardation in Sahrawi refugee children*. Italian Nutrition Institute, Rome.
- Louw, G. and M. Seely. 1982. *Ecology of Desert Organisms*. Longman, London.
- Lozada, M., A. Ladio, and M. Weigandt. 2006. Cultural transmission of ethnobotanical knowledge in a rural community of northwestern Patagonia, Argentina. *Economic Botany* 60(4):374-385.
- Mace, R.H. and A.I. Houston. 1989. Pastoralist strategies for survival in unpredictable environments: a model of herd composition which maximises household viability. *Agricultural Systems* 30.
- Macfarlane, W.V. 1973. Water and Electrolyte Economy of Desert Aboriginals and New Guinea Melanesians. 1. Desert Survival and the Functions of Aboriginal Nomads in the Summer Desert. Agricultural Research Institute, Adelaide, Australia.
- MacGregor, G.A. and H.E. de Wardener. 1998. *Salt, Diet and Health*. Cambridge University Press, Cambridge.
- Maffi, L., Ed. 2001. *On Biocultural Diversity: Linking Language, Knowledge, and the Environment*. Smithsonian Institution Press, Washington, DC.
- Maffi, L. and E. Woodley. 2010. *Biocultural Diversity Conservation. A Global Sourcebook*. Earthscan, London.
- Malkki, L. 1995a. *Purity and exile: violence, memory, and national cosmology among Hutu refugees in Tanzania*. University of Chicago Press, Chicago.
- Malkki, L. 1995b. Refugees and exile: from "refugee studies" to the national order of things. *Annual Review of Anthropology* 24:495-523.
- Mandeel, Q.A. and A.A. Al-Laith. 2007. Ethnomycological aspects of the desert truffle among native Bahraini and non-Bahraini peoples of the Kingdom of Bahrain. *Journal of Ethnopharmacology* 110:118-129.
- Manniche, L. and W. Forman. 1999. *Sacred luxuries: Fragrance, Aromatherapy and Cosmetics in Ancient Egypt*. Opus Publishing, London.
- Martin, G.J. 1995. *Ethnobotany*. Chapman and Hall, London.
- Martin, P. 1976. *Tribesmen swell Polisario ranks*. London: The Times.
- Martin-Márquez, S. 2006. Brothers and others: fraternal rhetoric and the negotiation of Spanish and Saharawi identity. *Journal of Spanish Cultural Studies* 7(3):241-258.
- Martín Beristain, C. and E. Gonzalez Hidalgo. 2012. *El Oasis de la Memoria: Memoria Histórica y Violaciones de Derechos en el Sáhara Occidental*. Hegoa, Bilbao.

- Matos-Soto, Y.K. and V. Savo. 2012. The transplanted Peruvian culture in Rome: An assessment through images. *Ethnobotany Research and Applications* 10:95-108.
- McCabe, J.T. 1987. Drought and recovery: Livestock dynamics among the Ngisonyoka Turkana of Kenya. *Human Ecology* 15(4):371-390.
- McCabe, J.T. 1990. Success and failure: the breakdown of traditional drought coping institutions among the pastoral Turkana of Kenya. *Journal of Asian and African Studies* 25(3-4):146-160.
- McDowell, C., Ed. 1996. *Understanding Impoverishment: The Consequences of Development-Induced Displacement*. Berghahn Books, Oxford.
- McDougall, E.A. 1990. Salts of the Western Sahara: Myths, mysteries, and historical significance. *The International Journal of African Historical Studies* 23:231-257.
- McElroy, A. 1996. Medical Anthropology. In *Encyclopedia of Cultural Anthropology, 1096-1099*, Eds. D. Levinson and M. Ember, Henry Bolt, New York.
- McElroy, A. and P. Townsend. 1996. *Medical Anthropology in Ecological Perspective*. Westview, Boulder, CO.
- Mercer, J. 1976a. *Spanish Sahara*. George Allen and Unwin Ltd, London.
- Mercer, J. 1976b. The cycle of invasion and unification in the Western Sahara. *African Affairs* 75(301):498-510.
- Mezzetti, A. 1994. *L'Organizzazione Sanitaria nei Campi Profughi Sahrawi*. Università degli Studi di Bologna, Bologna.
- Meyer, S. 2006. The 'refugee aid and development' approach in Uganda: empowerment and selfreliance of refugees in practice. *New Issues in Refugee Research* No. 131.
- Mezhoud, S. and C. Oxby. 2013. *Disentangling 'forced displacement' from pastoral mobility: Recovery and reconstruction in the Sahel and in South Sudan*. In *Modern Pastoralism and Conservation: Old Problems, New Challenges*, Eds. T. Sternberg and D. Chatty, The White Horse Press, Cambridge.
- Michel, J.F., M. Bengoumi, P. Bonnet, K. Hidane, K. Zro, and B. Faye. 1997. Typologie des systèmes de production camélins dans la province de Laâyoune, Maroc. *Revue d'élevage et de médecine vétérinaire des pays tropicaux* 50(4):313-323.
- Mohamed, HA, and AN Hussein. 1996. Pastoralists: their knowledge untapped. *Journal of Camel Practice and Research* 3:143-145.
- Mohamed Embarek, F. 2005. *Iguindi y aurag vistos por la ciencia*. Ministerio de Salud Pública de la RASD, Rabuni, Algeria.
- Monteil, V. 1952. *Essai sur le chameau au Sahrara Occidental*. Centre IFAN – Mauritanie, Saint-Louis du Senegal.
- Monteil, V. and C. Sauvage. 1953. Contribution à l'étude de la flore du Sahara Occidental. De l'Arganier au Karité. Catalogue des plantes connues des Tekna, des Rguibat et des Maures. *Bulletin del Institute des Hautes Etudes Maroquine, Notes and Documents* 6:1-147.
- Moran, E.F. 2000. *Human adaptability. An introduction to ecological anthropology*. Boulder, Westview.
- Moran, E.F. 2005. *People and Nature: An Introduction to Human Ecological Relations*. Wiley-Blackwell.
- Morando, M. 2006. *La diaspora Saharawi in Italia*. Università degli Studi di Bologna, Bologna.
- Morris, B. 2004. Ethnobiology, social change and displacement. *Anthropology Today* 20(6):23-24.
- Morris, E.L. 1999. *Scents of Time: Perfume from Ancient Egypt to the 21st Century*. Prestel, New York.
- Moure, G. 2004. *La zancada del deyar*. El Cobre, Barcelona.

- Mundubat. 2007. Acta de la II mesa de coordinación y concertación. In Mesa de concertación de soberanía alimentaria del Sahara, Madrid.
- Mundy, J.A. 2007. Performing the nation, prefiguring the state: the Western Saharan refugees, thirty years later. *Journal of Modern African Studies* 45(2):275-297.
- Muniz de Medeiros, P., G. Taboada Soldati, N. Leal Alencar, I. Vandebroek, A. Pieroni, N. Hanazaki, and U.P. Albuquerque. 2012. The use of medicinal plants by migrant people: adaptation, maintenance, and replacement. *Evidence-Based Complementary and Alternative Medicine* 1-11.
- Murphy, C. 2008. Permanent resistance in Western Sahara. *Le Monde diplomatique* (English edition). Paris.
- Nagel, J. 1994. Constructing ethnicity: Creating and recreating ethnic identity and culture. *Social Problems* 41(1):152-176.
- Nakao, K. and A.K. Romney. 1984. A method for testing alternative theories: an example from English kinship. *American Anthropologist* 86:668-673.
- Neumann, T.W., M.L. Arnott, P.T. Baker, P.A. Dahlquist, I.D. Desai, P.L. Gouletquer, L.E. Grivetti, et al. 1977. A biocultural approach to salt taboos: the case of the Southeastern United States [and Comments and Reply]. *Current Anthropology* 18(2):289-308.
- Niamir-Fuller, M. 1998. The resilience of pastoral herding in Sahelian Africa. In *Linking social and ecological systems: Management practices and social mechanisms for building resilience*, Eds. F. Berkes, C. Folke and J. Colding, 250-284, Cambridge University Press, Cambridge.
- Nightingale, A.J. 2003. Nature-society and development: cultural, social and ecological change in Nepal. *Geoforum* 34:525-540.
- Noor, I.M., A.Y. Guliye, M. Tariq, and B.O. Bebe. 2013. Assessment of camel and camel milk marketing practices in an emerging peri-urban production system in Isiolo County, Kenya. *Pastoralism: Research, Policy and Practice* 3(28).
- Nordstrom, C. 2004. *Shadows of war: violence, power and international profiteering in the twenty-first century*. University of California Press, Berkeley.
- Nori, M., M.B. Kenyanjui, M.A. Yusuf, and F.H. Mohammed. 2006. Milking drylands: the marketing of camel milk in North-east Somalia. *Nomadic Peoples* 10(1):9-28.
- Norris, H.T. 1964. The wind of change in the Western Sahara. *The Geographical Journal* 130(1):1-14.
- Ohmagari, K. and F. Berkes. 1997. Transmission of indigenous knowledge and bush skills among the Western James Bay Cree women of Subarctic Canada. *Human Ecology* 25(2):197-222.
- Oliver-Smith, A. 1991. Involuntary resettlement: resistance and political empowerment. *Journal of Refugee Studies* 4(2):132-149.
- Oliver-Smith, A. 2002. Theorizing disasters: nature, culture, power. In *Culture and Catastrophe: The Anthropology of Disaster*, Eds. S. Hoffman and A. Oliver-Smith, The School of American Research Press, Santa Fe, New Mexico.
- Ouali, M. 2006. Algerians are wild about terfez, the desert truffle! [http://magharebia.com/en\\_GB/articles/awi/features/2006/04/30/feature-01](http://magharebia.com/en_GB/articles/awi/features/2006/04/30/feature-01) (28 May 2012).
- Ould Mohamed Baba, A.S. 2004. Los Berberismos del dialecto Árabe Hassāniyyā de el-Gəblā. *Anaquel de Estudios Árabes* 15:175-184.
- Ould Mohamed Baba, A.S. 2006. Los fitónimos más frecuentes en el dialecto hassāniyyā. *Anaquel de Estudios Árabes* 17:173-187.

- Ould Taleb, M. 2007. *Santé, vulnérabilité et tuberculose en milieu nomade sahélien: étude des représentations sociales de la tuberculose chez les populations nomades de la Mauritanie et du Tchad*. Université de Cocody, Abidjan, Côte d'Ivoire.
- OXFAM. 1995. *Western Sahara*. OXFAM Belgium and Comité Belge de Soutien au Peuple Sahraoui, Bruxelles.
- Ozenda, P. 1991. *Flore et Végétation du Sahara*. CNRS Éditions, Paris.
- Österle, M. 2008. From cattle to goats: the transformation of East Pokot pastoralism in Kenya. *Nomadic Peoples* 12(1):81-91.
- Paque, C. 1980. Saharan Bedouins and salt water of the Sahara: A model for salt intake. In *Biological and Behavioral Aspects of Salt Intake*, 31-47, Eds. M.R. Kare, M.J. Fregly and R.A. Bernard, Academic Press, New York.
- Paque, C. 1984. Infant salt taboos in Morocco. *Current Anthropology* 25(2):237-238.
- Paque, C. 1998. *L'Homme, l'Eau et le Sel. Désert et Conditions de Vie Extremes*. Éditions Frison-Roche, Paris.
- Pazzanita, A.G. 2006a. *Historical Dictionary of Western Sahara*. The Scarecrow Press, Inc., Oxford.
- Pazzanita, A.G. 2006b. Western Sahara: anatomy of a stalemate. *International Journal of African Historical Studies* 39(1):151-154.
- Pérouse de Montclos, M.A. and P.M. Kagwanja. 2000. Refugee camps or cities? Camps in Northern Kenya. *Journal of Refugee Studies* 13(2):205-222.
- Peteet, J.M. 1995. Transforming trust: dispossession and empowerment among Palestinian refugees. In *Mistrusting Refugees*, Eds. E.V. Daniel and J. Knudsen, University of California Press, Berkeley.
- Pieroni, A., C. Quave, M. Villanelli, P. Mangino, G. Sabbatini, L. Santini, T. Bocchetti, et al. 2004. Ethnopharmacognostic survey on the natural ingredients used in folk cosmetics, cosmeceuticals and remedies for healing skin diseases in the inland Marches, Central-Eastern Italy. *Journal of Ethnopharmacology* 91:331-344.
- Pieroni, A., H. Muenz, M. Akbulut, K. Hüsniü Can Başer, and C. Durmuşkahya. 2005. Traditional phytotherapy and transcultural pharmacy among Turkish migrants living in Cologne, Germany. *Journal of Ethnopharmacology* 102:69-88.
- Pieroni, A. and I. Vandebroek, Eds. 2007. Travelling Cultures and Plants. *The Ethnobiology and Ethnopharmacy of Migrations*. Berghahn, Oxford.
- Pinto Cebrián, F. 1997. *Proverbios Saharauis*. Miraguano Ediciones, Madrid.
- Pirker, H., E. Haselmair, C. Schunko, and C.L. Vogl. 2012. Transformation of traditional knowledge of medicinal plants: the case of Tyroleans (Austria) who migrated to Australia, Brazil and Peru. *Journal of Ethnobiology and Ethnomedicine* 8(44).
- Posey, D., Ed. 1999. *Cultural and Spiritual Values of Biodiversity*. UNEP and Intermediate Technology Publications, Nairobi.
- Purcell, T.W. 1998. Indigenous knowledge and applied anthropology: questions of definition and direction. *Human Organization* 57:258-272.
- Puri, R.K. 2005. *Deadly Dances in the Bornean Rainforest: Hunting Knowledge of the Penan Benalui*. KITLV Press, Leiden.
- Puri, R.K. 2010. Documenting local environmental knowledge and change. In *Conducting research in conservation: a social science perspective*, 126-152, Ed. H. Newing, Routledge, London.
- Puri, R.K. and C. Vogl. 2004. *A methods manual for ethnobiological research and cultural domain analysis*. Department of Anthropology, University of Kent, Canterbury.

- Quinlan, M.B. 2005. Considerations for collecting freelists in the field: Examples from ethnobotany. *Field Methods* 17(3):219-234.
- Quitout, M. 1999. *Initiation à l'Arabe Maghrébin*. Vocabulaire Bilingue. Paris.
- Ramathal, D.C. and O.D. Ngassapa. 2001. Medicinal plants used by Rwandese traditional healers in refugee camps in Tanzania. *Pharmaceutical Biology* 39(2):132-137.
- Ramirez, C.R. 2007. Ethnobotany and the loss of traditional knowledge in the 21st century. *Ethnobotany Research and Applications* 5:245-247.
- Rao, V. and M. Walton, Eds. 2004. *Culture and public action*. University Press, Stanford.
- Rasmussen, K. and F. Arler. 2010. Interdisciplinarity at the human-environment interface. *Danish Journal of Geography* 110(1):37-45.
- Rasmussen, S. 1999. Making better "scents" in anthropology: aroma in Tuareg sociocultural systems and the shaping of ethnography. *Anthropological Quarterly* 72(2):55-73.
- Reed, B.A. and J. Habicht. 1998. Sales of food aid as sign of distress, not excess. *The Lancet* 351:128-130.
- Richerson, P.J. and R. Boyd. 2005. *Not by genes alone: how culture transformed human evolution*. The University of Chicago Press, Chicago and London.
- Robinson, F. 2003. *Distribution and transmission of traditional botanical knowledge in the changing social environment: a study of a Kenyah Dayak community in interior Borneo*. Anthropology Department, University of Kent, Canterbury, UK.
- Rodríguez, A. 2008. Desert truffles. <http://www.trufamania.com/desert-truffles.htm> (3 June 2012).
- Romney, A.K., S.C. Weller and W.H. Batchelder. 1986. Culture as consensus: a theory of culture and informant accuracy. *American Anthropologist* 88:313-338.
- Ross, N., D. Medin, and D. Cox. 2007. Epistemological models and culture conflict: Menominee and Euro-American hunters in Wisconsin. *ETHOS* 35(4):478-515.
- Royal Botanic Gardens of Kew. 2005. Sandalwood. Retrieved 24 May, 2011, from [http://www.kew.org/plant-cultures/plants/sandalwood\\_landing.html](http://www.kew.org/plant-cultures/plants/sandalwood_landing.html).
- Rubini, M.E. 1970. Mariposa, salt, and thirsting. *The American Journal of Clinical Nutrition* 23(7):861-864.
- Ryan, G.W., J.M. Nolan and P.S. Yoder. 2000. Successive free listing: using multiple free lists to generate explanatory models. *Field Methods* 12(2):83-107.
- Ryle, J. 1992. Notes on the repatriation of Somali refugees in Ethiopia. *Disasters* 16(2):160-168.
- Saikia, A., V. Ryakala, P. Sharma, P. Goswarni, and U. Bora. 2006. Ethnobotany of medicinal plants used by Assamese people for various skin ailments and cosmetics. *Journal of Ethnopharmacology* 106:149-157.
- Salzman, P.C., Ed. 1980. *When nomads settle. Processes of sedentarization as adaptation and response*. Praeger, New York.
- San Martin, P. 2004. Briefing: Western Sahara: road to perdition? *African Affairs* 103(413):651-660.
- San Martin, P. 2005. Nationalism, identity and citizenship in the Western Sahara. *The Journal of North African Studies* 10(3):565-592.
- San Martin, P. 2010. *Western Sahara: The Refugee Nation*. University of Wales Press, Cardiff.
- Schutkowski, H. 2006. *Human Ecology: Biocultural Adaptations in Human Communities*. Springer, New York.
- Scoones, I., M. Melnyk, and J. Pretty. 1992. *The hidden harvest: wild foods and agricultural systems. A literature review and annotated bibliography*. The Sustainable Agriculture Programme and International Institute for Environment and Development, London.

- Seddon, D. 2000. Western Sahara – point of no return? *The Review of African Political Economy* 27(84):338-340.
- Shavit, E. 2008. Truffles roasting in the evening fires: pages from the history of desert truffles. *Fungi* 1:18-23.
- Shelley, T. 2004. *Endgame in Western Sahara: What Future for Africa's Last Colony?* Zed Books, London.
- Shelley, T. 2010. Sons of the clouds. <http://www.redpepper.org.uk/sons-of-the-clouds/>. Accessed 2 September 2011.
- Sigaut, F. 1994. Technology. In *Companion Encyclopedia of Anthropology*, Ed. T. Ingold, 420-459, Routledge, London.
- Sillitoe, P. 1998. The development of indigenous knowledge: a new applied anthropology. *Current Anthropology* 39:223-252.
- Sillitoe, P. 2006. Ethnobiology and applied anthropology: rapprochement of the academic with the practical. *Journal of the Royal Anthropological Institute* 12(S1):S119-S142.
- Sillitoe, P. 2007. Anthropologists only need apply: challenges of applied anthropology. *Journal of the Royal Anthropological Institute* (N.S.)(13):147-165.
- Siouti, J.E. 1994. *La Medecine du Prophete*. Al Bourak.
- Sitta, N. and M. Floriani. 2008. Nationalization and globalization trends in the wild mushroom commerce of Italy with emphasis on porcini (*Boletus edulis* and allied species). *Economic Botany* 62:307-322.
- Slaughter, A. and J. Crisp. 2009. *A surrogate state? The role of UNHCR in protracted refugee situations*. UNHCR - Policy Development and Evaluation Service, Geneva.
- Smith, A.D. 1991. *National Identity*. Penguin Books, London.
- Smith, J.J. 1993. Using ANTHROPAC 3.5 and a spreadsheet to compute a free-list salience index. *Cultural Anthropology Methods Journal* 5(3):1-3.
- Smith, M. 2004. Warehousing refugees: a denial of rights, a waste of humanity. *World Refugee Survey* 2004:38-56.
- Snow, D.A. 2001. Collective identity and expressive forms. In *International Encyclopedia of the Social and Behavioral Sciences*, 2212-2219, Eds. N.J. Smelser and P.B. Baltes, Elsevier Science, Oxford.
- Sobania, N.W. 1988. Fisherman herders: Subsistence, survival, and cultural change in northern Kenya. *Journal of African History* 29:41-56.
- Soler, N., C. Serra, J. Escola, and J. Unge. 1999. *Sahara Occidental: pasado y presente de un pueblo*. Universidad de Girona, Girona.
- Soriano, J.M., G. Domènech, J. Mañes, A.I. Catalá Gregori, I.E. Barikmo. 2011. Disorders of malnutrition among the Saharawi children. *Revista Española de Nutrición Humana y Dietética* 15(1):10-19.
- Sperl, S. 2000. International refugee aid and social change in Northern Mali. UNCHR, Geneva.
- Spiegel, P.B. and M. Qassim. 2003. Forgotten refugees and other displaced populations. *The Lancet* 362:72-74.
- SPS. 2005. Segunda jornada del Festival: inauguración del Mukkayem tradicional. Accessed 29/04/2006.
- SPS. 2006. Recibimiento triunfal a Tamek en Assa. Assa: Sahara Press Service. Accessed 29/04/2006.
- SPS. 2007. Acogida triunfal a los estudiantes saharauis en la universidad Ibn Zohr de Agadir (Marruecos). Agadir: Sahara Press Service. Accessed 14/02/2008.



- Staub, P.O., M.S. Geck, and C.S. Weckerle. 2011. Incense and ritual plant use in Southwest China: a case study among the Bai in Shaxi. *Journal of Ethnobiology and Ethnomedicine* 7(43).
- Steinmann, S.H. 1998. Gender, pastoralism, and intensification: changing environmental resource use in Morocco. *Yale Forestry and Environment Bulletin* 103:81-107.
- Summerfield, D. 1999. A critique of seven assumptions behind psychological trauma programmes in war-affected areas. *Social Science and Medicine* 48:1449-1462.
- Sutton, D.E. 2001. *Remembrance of repasts: an anthropology of food and memory*. Berg Publishing, Oxford.
- Tamaro, F. and G. Xepapadakis. 1986. Plants used in phytotherapy, cosmetics and dyeing in the Pramanda district (Epirus, North-West Greece). *Journal of Ethnopharmacology* 16:167-174.
- Tauzin, A. 2001. *Figures du Féminin dans la Société Maure (Mauritanie)*. Karthala, Paris.
- Taylor, F.W., D.M. Thamage, N. Baker, N. Roth-Bejerano, and V. Kagan-Zur. 1995. Notes on the Kalahari desert truffle, *Terfezia pfeilii*. *Mycological Research* 99:874-878.
- Thomas, E., I. Vandebroek, and P. Van Damme. 2008. What works in the field? A comparison of different interviewing methods in ethnobotany with special reference to the use of photographs. *Economic Botany* 61(4):376-384.
- Thomas, W.H. 2009. The Forest Stewards Initiative: a new institution for safeguarding traditional ecological knowledge in Papua New Guinea. *Journal of the Royal Society of New Zealand* 39(4):187-191.
- Thompson, V. and R. Adloff. 1980. *The Western Saharans*. Barnes and Noble, Totowa, NJ.
- Thornton, T.F. and N. Manasfi. 2010. Adaptation – Genuine and spurious: demystifying adaptation processes in relation to climate change. *Environment and Society: Advances in Research* 1(1):132-155.
- Traore, H., M. Diagana, C. Debrock, A. Ba, B. Alqad, and P.M. Preux. 1998. *Approche socioculturelle de l'épilepsie en Mauritanie. Médecine tropicale* 58(4):365-368.
- Trappe, J.M., A.W. Claridge, D. Arora, and W.A. Smit. 2008. Desert truffles of the African Kalahari: ecology, ethnomycology, and taxonomy. *Economic Botany* 62:521-529.
- Trappe, J.M., A.W. Claridge, D.L. Claridge, and L. Liddle. 2008. Desert truffles of the Australian Outback: ecology, ethnomycology, and taxonomy. *Economic Botany* 62:497-506.
- Turner, N., I.M. Boelscher, and R. Ignace. 2000. Traditional ecological knowledge and wisdom of aboriginal peoples in British Columbia. *Ecological Applications* 10(5):1275-1287.
- Turner, N.J. and K.L. Turner. 2008. "Where our women used to get the food": cumulative effects and loss of ethnobotanical knowledge and practice; case study from coastal British Columbia. *Botany* 86(2):103-115.
- Turner, S. 2001. *The barriers of innocence. Humanitarian intervention and political imagination in a refugee camp for Burundians in Tanzania*. Roskilde, Roskilde University, PhD Dissertation.
- UNHCR, United Nations High Commissioner for Refugees. 2002. *Anthropometric and micronutrient nutrition survey in Saharawi refugee camps, Tindouf, Algeria*. UNHCR, WFP, Center for International Child Health, Geneva.
- UNHCR, United Nations High Commissioner for Refugees. 2005. 2004 *Global refugee trends*. Population and Geographical Data Section, Division of Operational Support, UNHCR, Geneva. Retrieved 24 January 2006 from <http://www.unhcr.ch/statistics>
- UNHCR, United Nations High Commissioner for Refugees. 2008. Protracted refugee situations: a discussion paper prepared for the High Commissioner's dialogue on protection challenges. UNHCR, Geneva.
- Upreti, D.K., P.K. Divakar, and S. Nayaka. 2005. Commercial and ethnic use of lichens in India. *Economic Botany* 59(3):269-273.



- Urbach, F. 2001. The historical aspects of sunscreens. *Journal of Photochemistry and Photobiology B: Biology* 64:99-104.
- Valverde, J.A. 1957. *Aves del Sahara Español*. Estudio ecologico del desierto. Instituto de Estudios Africanos, Consejo Superior de Investigaciones Cientificas, Madrid.
- Van Andel, T. and P. Websters. 2010. Why Surinamese migrants in the Netherlands continue to use medicinal herbs from their home country. *Journal of Ethnopharmacology* 127:694-701.
- Van Andel, T., S. Mitchell, G. Volpato, I. Vandebroek, J. Swier, S. Ruyschaert, C.A. Rentería Jiménez, and N. Raes. 2012. In search of the perfect aphrodisiac: parallel use of bitter tonics in West Africa and the Caribbean. *Journal of Ethnopharmacology* 143:840-850.
- Vandebroek, I., V. Reyes-García, U.P. Albuquerque, R. Bussmann, and A. Pieroni. 2011. Local knowledge: who cares? *Journal of Ethnobiology and Ethnomedicine* 7(35).
- Verdirame, G. and B. Harrell-Bond. 2005. *Rights in exile. Janus-faced humanitarianism*. Berghahn Books, New York.
- Vermeylen, S. 2008. From life force to slimming aid: exploring views on the commodification of traditional medicinal knowledge. *Applied Geography* 28:224-235.
- Voeks, R. and J. Rashford, Eds. 2013. *African Ethnobotany in the Americas*. Springer, New York.
- Volpato, G. 2008. *Plantas Medicinales Saharawi*. ONLUS Africa 70, Milano.
- Volpato, G. and D. Godínez. 2004. Ethnobotany of prunella, a traditional Cuban refreshment. *Economic Botany* 58(3):381-395.
- Volpato, G., A. Ahmadi Emhamed, S.M. Lamin Saleh, A. Broglia, and S. Di Lello. 2007. Procurement of traditional remedies and transmission of medicinal knowledge among Sahrawi people displaced in south-western Algeria refugee camps. In *Traveling cultures and plants: the ethnobiology and ethnopharmacy of migrations*, Eds. A. Pieroni and I. Vandebroek, 245-269, Berghahn Books, Oxford.
- Volpato, G., D. Godínez, A. Beyra, and A. Barreto. 2009. Uses of medicinal plants by Haitian immigrants and their descendants in the Province of Camagüey, Cuba. *Journal of Ethnobiology and Ethnomedicine* 5(16).
- Volpato, G., D. Godínez, and A. Beyra. 2009. Migration and ethnobotanical practices: the case of tify among Haitian immigrants in Cuba. *Human Ecology* 37(1):43-53.
- Volpato, G., P. Kourková, and V. Zelený. 2012. Healing war wounds and perfuming exile: the use of vegetal, animal, and mineral products for perfumes, cosmetics, and skin healing among Sahrawi refugees of Western Sahara. *Journal of Ethnobiology and Ethnomedicine* 8:49.
- Volpato, G., A. Di Nardo, D. Rossi, S.M. Lamin Saleh, and A. Broglia. 2013a. 'Everybody knows', but the rest of the world: the case of a caterpillar-borne reproductive loss syndrome in dromedary camels observed by Sahrawi pastoralists of Western Sahara. *Journal of Ethnobiology and Ethnomedicine* 9(5).
- Volpato, G., D. Rossi, and D. Dentoni. 2013b. A Reward for patience and suffering – Ethnomycology and commodification of desert truffles among Sahrawi refugees and nomads of Western Sahara. *Economic Botany* 67(2):147-160.
- Volpato, G. and A. Waldstein. 2014. Eghindi among Sahrawi refugees of Western Sahara. *Medical Anthropology: Cross-Cultural Studies in Health and Illness* 33(2):160-177.
- Volpato, G. and D. Rossi. 2014. *Badiya – Los Nómadas Saharawí en los Territorios Liberados del Sáhara Occidental*. Smashwords Eds.
- Volpato, G. and R. Puri. Accepted. Dormancy and revitalization: the fate of ethnobotanical knowledge of camel forage among Sahrawi nomads and refugees of Western Sahara. *Ethnobotany Research and Applications*.

- Volpato, G. and P. Howard. Accepted. The material and cultural recovery of camels and camel husbandry among Sahrawi refugees of Western Sahara. *Pastoralism: Research, Policy and Practice*.
- Wahlbeck, Ö. 1999. *Kurdish diasporas: a comparative study of Kurdish refugee communities*. Macmillan Press, London.
- Waldstein, A. 2010. Popular medicine and self-care in a Mexican migrant community: Toward an explanation of an epidemiological paradox. *Medical Anthropology* 29(1):71-107.
- Waldstein, A. and C. Adams. 2006. The interface between medical anthropology and medical ethnobiology. *Journal of the Royal Anthropological Institute* 12(S1):S95-S118.
- Wallerstein, I. 1987. The construction of peoplehood: racism, nationalism, ethnicity. *Sociological Forum* 2(2):373-388.
- Wang, L., T. Narui, H. Harada, C.F. Culberson, W.L. Culberson. 2001. Ethnic uses of lichens in Yunnan, China. *The Bryologist* 104(3):345-349.
- Weinberg, B. 2005. Endgame in the Western Sahara: what future for Africa's last colony? *Middle East Policy* 12(3):178-181.
- Weller, S.C. 1998. Structured interviewing and questionnaire construction. In *Handbook of methods in cultural anthropology*, Ed. H.R. Bernard, 365-409, Altamira Press, Walnut Creek, CA, USA.
- Weller, S.C. and R.D. Baer. 2001. Intra- and intercultural variation in the definition of five illnesses: AIDS, diabetes, the common cold, empacho, and mal de ojo. *Cross-Cultural Research* 35(2):201-226.
- Weller, S.C. and R.D. Baer. 2002. Measuring within-and-between-group agreement: Identifying the proportion of shared and unique beliefs across samples. *Field Methods* 14(1):6-25.
- Werker, E. 2007. Refugee camp economies. *Journal of Refugee Studies* 20(3):461-480.
- Westoby, P. 2008. Developing a community-development approach through engaging resettling Southern Sudanese refugees within Australia. *Community Development Journal* 43(4):483-495.
- Wickens, G.E. 1995. Role of Acacia species in the rural economy of dry Africa and the Near East. *FAO Conservation Guide* 27, FAO, Rome.
- Widjaja, E.A. 1988. Ethnobotany of the funeral ceremony of the Torajanese. *Economic Botany* 42(2):250-254.
- Wilson, A. 2012. Households and the production of public and private domains: Revolutionary changes in Western Sahara's liberation movement. *Paideuma* 58:19-43.
- Wilson, K.B. 1992. Enhancing refugees' own food acquisition strategies. *Journal of Refugee Studies* 5(3/4):226-246.
- Wilson, R.T. 1989. The nutritional requirements of camel. *Options Méditerranéennes - Série Séminaires* 2:171-179.
- Winkler, D. 2008. Yartsa Gunbu (*Cordyceps sinensis*) and the fungal commodification of Tibet's rural economy. *Economic Botany* 62(3):291-305.
- Yamin-Pasternak, S. 2011. Ethnomycology: fungi and mushrooms in cultural entanglements. In *Ethnobiology*, Eds. E.N. Anderson, D. Pearsall and E. Hunn, 213-230, John Wiley and Sons, Inc., Hoboken, New Jersey.
- Young, A. 1982. The anthropologies of illness and sickness. *Annual Review of Anthropology* 11:257-285.
- Zent, S. 2001. Acculturation and ethnobotanical knowledge loss among the Piaroa of Venezuela. In *On Biocultural Diversity*, Ed. L. Maffi, 190-211, Smithsonian Institution Press, Washington.
- Zetter, R. 1991. Labelling refugees: forming and transforming a bureaucratic identity. *Journal of Refugee Studies* 4(1):39-62.

- Ziker, J.P. 2006. The social movement of meat in Taimyr, Northern Russia. *Nomadic Peoples* 10(2):105-122.
- Zunes, S. 1996. Western Sahara: peace derailed. *Current History* 95(601):228-233.
- Zunes, S. and J.A. Mundy. 2010. *Western Sahara: war, nationalism, and conflict irresolution*. Syracuse University Press, Syracuse.

## Summary

The study of how people adapt to social and environmental change is central to current theoretical understandings of human-nature relationships. There are recurrent cases in human history in which entire populations have been uprooted from the environments in which they live, where it becomes exceedingly difficult for them to maintain their ways of life including their modes of subsistence, social and ecological relations, knowledge, and culture. The ways in which such people exercise their collective and individual agency to recover and adapt their relations with nature and with each other must be addressed as the planet rapidly changes, given current prognoses about the emergence of environmental refugee populations on a massive scale. Refugees who have been forced to live in camps for long periods present important case studies of human agency and adaptation under such conditions. Refugee camps are places where people must engage with whatever limited resources are available, and where people confront major complex problems when attempting to establish new relations with their camp environments and maintain or revive relations with their homelands. If they succeed, refugees can partly free themselves from dependence on food aid and take their lives back into their own hands.

The general objective of the study was to advance the understanding of human-nature relationships in contexts of forced displacement and encampment by investigating the ways people living in refugee camps struggle to recover pre-exile subsistence practices and associated knowledge, while in the process adapting to new environmental conditions and social relations arising from their experience as refugees. It also sought to provide a preliminary theoretical framework for studying the human ecology and ethnobiology of refugees living in camps. Fieldwork was conducted among Sahrawi refugees in western Algeria, and involved collecting data on Sahrawi refugees' agency toward the recovery and adaptation of traditional subsistence and other related material and cultural practices, as well as to understand associated changes in their ecological and social relations, and culture. Five case studies were selected: a general study of camel husbandry, culture and livelihoods, an ethnobiological study of traditional medicinal remedies and cosmetics, an ethnomedicinal study of the conceptualization of illness and change in related health beliefs, an ethnobotanical and cultural domain study of camel forage plants, and an ethnomycological and commodity study of desert truffles.

This thesis is organized into eight chapters. Chapter 1 introduces the general background of the study, including the problem statement, objective and research questions, relevance, theoretical framework, analytical themes (i.e. recovery and adaptation of subsistence practices; access to, procurement, and use of subsistence resources; commodification of subsistence products; loss, transmission, and revitalisation of ethnobiological knowledge; and subsistence practices and cultural identity) and the methodological approach, and an outline of the thesis.

Chapter 2 addresses the material and cultural importance of camels and the recovery and adaptation of camel husbandry among Sahrawi refugees as

they struggle to recover traditional subsistence practices and promote a shared nomadic heritage and cultural identity. This process is examined specifically in relation to camels and camel husbandry and it is shown how refugees regained access to camels through economic and social mechanisms, leading to the intensification of camel management, renewed seasonal nomadism, and commodification of camel products in the camps. The cultural and social motivations underlying the revitalisation of camel husbandry are discussed, where it is shown that two principle motives were refugees' need for productive activities to complement food aid, and older and more conservative refugees' desire to recover traditional pastoral life with its associated knowledge and values.

Chapters 3 and 4 address the use and procurement of traditional medicinal and cosmetic products among Sahrawi refugees, exploring the transmission of associated knowledge and the development of procurement networks. Sahrawi refugees have preserved the use of these products in the camps, developing a variety of networks to access them from exile. In continuity with their nomadic past, many of these remedies are still obtained from the Western Sahara desert environment, specifically from the liberated territories. Their procurement and use strengthens and re-activates material and cultural bonds between refugees and their former nomadic territories and sustains the revitalisation of associated knowledge and beliefs.

Chapter 5 explores how the conceptualization of folk illnesses and the use of associated remedies change in exile, using as a case study the Sahrawi folk illness called *eghindi*. It shows that *eghindi*, an element of Sahrawi nomadic heritage, has been adapted in the refugee camps while still preserving Sahrawi food norms. The case of *eghindi* makes it clear that, in contexts of social and cultural transformation, the construction and experiences of illnesses can change. Processes of redefinition of health beliefs and practices involving *eghindi* are not socially uniform; traditional practices and values have been promoted or challenged by different refugee groups. Changes in pathological states and their interpretation gave rise to an expanded understanding of *eghindi* among conservative and older refugees, while progressive and younger refugees deny *eghindi*. As an element of Sahrawi nomadic heritage, *eghindi* has become embodied within a broader process of negotiation and redefinition of Sahrawi cultural identity.

Chapter 6 presents the traditional knowledge and classification of camel forage among the Sahrawi and discusses how the maintenance and revitalization of such ethnobotanical knowledge is crucial for refugees' recovery of pre-exile subsistence practices. It is also tied to notions of cultural and political identity and the re-appropriation of the nomadic territory and associated cultural heritage. It was posited that, given their nomadic mode of subsistence based on camel husbandry, the Sahrawi's knowledge of camel forage resources in their nomadic territory would be profound and integral to a system of camel management aimed at rationally exploiting the desert environment's biota. With displacement, this knowledge became 'dormant' and was revitalised and newly transmitted as Sahrawi refugees re-engaged with pastoralism and nomadism.

Chapter 7 reflects on the significance of traditional subsistence practices for refugees by focusing on knowledge, use, and commodification of desert truffles, and on the ways Sahrawi refugees use truffle-associated knowledge and practices to generate income and maintain customary redistributive practices. The case illustrates refugees' use of the recovered liberated territories to generate income, the process of commodification that accompanies this, and how this process is embedded within transnational trade. Harvesting is based on traditional knowledge of desert truffles that is in turn embedded in the culinary and medicinal traditions of Sahrawi nomads, where truffle commodification has revitalised associated ethnomycological knowledge.

Chapter 8 presents a general discussion of the study and final conclusions. It begins with a reflection on the theoretical framework, continues with an overview of the major empirical findings in relation to the research questions, and reflects on the agency refugees' exercise as they recover and adapt subsistence practices and associated knowledge. The chapter concludes with a reflection on the implications of the results for the fields of human ecology, ethnobiology, and refugee studies, and recommends areas for further research before presenting the overall conclusions.

Results show that Sahrawi refugees have re-engaged in a variety of pre-exile subsistence practices by both using and transforming the desert's biotic resources for their material and cultural values and to generate income. The conditions that permit this include access to cash and means of subsistence apart from food aid, physical mobility, personal safety, and access to the former homeland (the liberated territories) or to neighbouring countries with similar environments (northern Mauritania), to ethnobiological knowledge, and to social networks. Renewed access to part of the former homeland was key since the procurement of subsistence products largely depends on access to the areas where the respective biological resources are found and where traditional knowledge can be applied. Recovery is informed by the past, when livestock and the desert's natural resources constituted the material and cultural basis of the Sahrawi's lives, and by Sahrawi's cultural and behavioural adaptations to desert conditions, as made evident, for example, in food norms and health beliefs. With the material and political changes arising from the Ceasefire Agreement of 1991, many refugees pursued this recovery as a path toward food security and livelihood diversification, conditioned by the lack of alternative livelihood pathways in the camps and the desert environment. Taken together, results indicate that, far from being passive recipients of food aid, Sahrawi refugees struggle collectively and individually to improve their lives and their future prospects within the constraints and opportunities presented by the camps. Results are significant for comprehending the broader cultural, social, and economic processes that occur in refugee camps, as well as the role of food aid and international relief interventions within these processes, and can serve to help formulate better means to address refugees' problems and support their autochthonous initiatives.

## Samenvatting

Onderzoek naar hoe mensen zich aanpassen aan sociale veranderingen en veranderingen in de leefomgeving staat centraal in het huidige theoretische begrip van menselijke relaties. Er zijn terugkerende gevallen in de menselijke geschiedenis waarin hele bevolkingsgroepen ontworteld zijn van hun leefomgeving, waarin het steeds moeilijker voor ze wordt om vast te houden aan hun manier van leven, inclusief vormen van levensonderhoud, sociale en ecologische relaties, kennis en cultuur. De manieren waarop deze mensen hun collectieve en individuele zelfredzaamheid uitoefenen om te herstellen en hun relaties met de natuur en met elkaar aan te passen dienen besproken te worden, omdat de planeet snel verandert volgens de huidige prognoses over de massale toename van grote groepen milieuvluchtelingen. Vluchtelingen die gedwongen zijn geweest om voor lange perioden in kampen te leven vormen belangrijke casestudy's voor menselijke zelfredzaamheid en aanpassing onder dergelijke omstandigheden. In vluchtelingenkampen zijn mensen gedwongen om te werken met de beperkte middelen die beschikbaar zijn en worden mensen met grote, complexe problemen geconfronteerd wanneer zij nieuwe relaties met de kampomgeving proberen op te bouwen en relaties met hun thuisland proberen te behouden of herstellen. Als zij daarin slagen kunnen vluchtelingen zich gedeeltelijk bevrijden van de afhankelijkheid van voedselhulp en hun leven weer in eigen handen nemen.

Het algemene doel van dit onderzoek was om het begrip van menselijke relaties in de context van gedwongen verplaatsing en kamphuisvesting te vergroten door de manieren waarop mensen in vluchtelingenkampen worstelen om hun vormen van levensonderhoud en daarmee geassocieerde kennis te herstellen, terwijl ze zich in het proces bevinden van aanpassing aan nieuwe omstandigheden en sociale relaties die voortkomen uit hun status als vluchtelingen. Er is ook geprobeerd om een voorlopig theoretisch kader te verschaffen voor onderzoek naar menselijke ecologie en ethnobiologie van vluchtelingen die in kampen leven. Er is veldonderzoek uitgevoerd onder Sahrawi-vluchtelingen in West-Algerije waarin gegevens werden verzameld over de zelfredzaamheid van Sahrawi-vluchtelingen om traditionele vormen van levensonderhoud en culturele praktijken te herstellen en aan te passen. Het onderzoek had ook als doel om de daarmee geassocieerde veranderingen in hun ecologische en sociale relaties en cultuur te begrijpen. Er zijn vijf casestudy's geselecteerd: een algemeen onderzoek naar kameelhouderij, cultuur en levensonderhoud, een ethnobiologisch onderzoek naar traditionele geneesmiddelen en cosmetica, een etnogeneeskundig onderzoek naar de conceptualisatie van ziekte en verandering in gerelateerde ideeën over gezondheid, een etnobotanisch en cultureel onderzoek naar voedergewassen voor kamelen, en een etnomycologisch- en grondstoffenonderzoek naar woestijntruffels.

Dit proefschrift is opgedeeld in acht hoofdstukken. In hoofdstuk 1 wordt de algemene achtergrond van het onderzoek geïntroduceerd, waaronder de probleemstelling, het doel en de onderzoeksvragen, relevantie, theoretisch kader, analytische thema's (bijv. herstel en aanpassing van vormen van



levensonderhoud; toegang tot, aanschaf en gebruik van levensmiddelen; commercialisering van levensmiddelen; verlies, overdracht en herstel van etnobiologische kennis; en vormen van levensonderhoud en culturele identiteit) en de methodologische aanpak en een overzicht van het proefschrift. In hoofdstuk 2 wordt het materiële en culturele belang van kamelen besproken en het herstel en de aanpassing van kameelhouderij onder Sahrawi-vluchtelingen terwijl ze worstelen om traditionele vormen van levensonderhoud te herstellen en een gedeelde nomadische overlevering en culturele identiteit te bevorderen. Dit proces wordt specifiek onderzocht met betrekking tot kamelen en kameelhouderij en er wordt aangetoond hoe vluchtelingen opnieuw toegang tot kamelen verkregen door economische en sociale mechanismen, wat heeft geleid tot de intensivering van kameelbeheer, hernieuwd seizoensgebonden nomadisme en de commercialisatie van kameelproducten in de kampen. De culturele en sociale beweegredenen achter het herstel van kameelhouderij worden besproken, waarin twee hoofdmotieven worden aangetoond: de noodzaak van vluchtelingen om productieve activiteiten uit te voeren om voedselhulp aan te vullen, en het verlangen van oudere en meer conservatieve vluchtelingen om het traditionele agrarische leven met de daarmee geassocieerde kennis en waarden te herstellen.

In hoofdstukken 3 en 4 wordt het gebruik en de aanschaf van traditionele geneesmiddelen en cosmetische producten onder Sahrawi-vluchtelingen besproken, en wordt de overdracht van daarmee geassocieerde kennis en de ontwikkeling van aankoopnetwerken onderzocht. Sahrawi-vluchtelingen hebben het gebruik van deze producten in de kampen behouden en een verscheidenheid aan netwerken ontwikkeld om toegang tot deze middelen te verkrijgen. In continuïteit met hun nomadische verleden worden veel van deze geneesmiddelen nog steeds uit de woestijnomgeving van de Westelijke Sahara verkregen, met name uit de bevrijde gebieden. De aanschaf en het gebruik van deze middelen versterkt en heractiveert materiële en culturele banden tussen vluchtelingen en hun voormalige nomadische territoria, en ondersteunt het herstel van de geassocieerde kennis en geloofsovertuigingen.

In hoofdstuk 5 wordt onderzocht hoe de conceptualisatie van volksziekten en het gebruik van geassocieerde geneesmiddelen veranderen in ballingschap, aan de hand van een casestudy van een volksziekte van de Sahrawi genaamd *eghindi*. Het toont aan dat het concept *eghindi*, een element van de nomadische overlevering van de Sahrawi, aangepast is in de vluchtelingenkampen terwijl de voedselnormen van de Sahrawi behouden zijn gebleven. Het geval van *eghindi* maakt duidelijk dat de constructie en ervaringen van ziekten kunnen veranderen in contexten van sociale en culturele transformaties. Processen van herdefiniëring van ideeën over gezondheid en praktijken die *eghindi* betreffen zijn niet sociaal uniform; traditionele praktijken en waarden zijn door verschillende vluchtelingengroepen bevorderd of bekritiseerd. Veranderingen in ziektebeelden en hun interpretatie zorgden voor een uitgebreider begrip van *eghindi* onder conservatieve en oudere vluchtelingen, terwijl progressieve en jongere vluchtelingen het bestaan van *eghindi* ontkennen. Als element van de nomadische overlevering van de Sahrawi

belichaamt *Eghindi* het bredere proces van de bespreking en herdefiniëring van de culturele identiteit van de Sahrawi.

In hoofdstuk 6 wordt de traditionele kennis en classificatie van voedingsgewassen voor kamelen onder de Sahrawi gepresenteerd, en wordt besproken hoe cruciaal het behoud en herstel van zulke etnobotanische kennis is voor het herstel van de vormen van levensonderhoud van de vluchtelingen. Het is ook verbonden aan opvattingen over culturele en politieke identiteit en de hertoe-eigening van het nomadische territorium en de geassocieerde culturele erfenis. Er werd gesteld dat, gegeven hun nomadische vorm van levensonderhoud op basis van kameelhouderij, de kennis van de Sahrawi's over voedingsgewassen voor kamelen in hun nomadische territorium diepgaand zou zijn, en integraal zou zijn aan een systeem van kameelbeheer dat gericht is op het rationeel exploiteren van de biota uit de woestijnomgeving. Met de verdringing is deze kennis 'latent' geworden en werd het nieuw leven ingeblazen en opnieuw overgeleverd toen Sahrawi-vluchtelingen zich opnieuw gingen bezighouden met agricultuur en nomadisme.

In hoofdstuk 7 wordt gereflecteerd op de betekenis van traditionele vormen van levensonderhoud voor vluchtelingen door te richten op kennis, gebruik, en commercialisering van woestijntruffels, en op de manieren waarop Sahrawi-vluchtelingen met truffels geassocieerde kennis en praktijken gebruiken om inkomsten te genereren en de gebruikelijke manieren van herverdeling te behouden. Het geval illustreert hoe de vluchtelingen de teruggekregen bevrijde gebieden gebruiken om inkomsten te genereren, het proces van commercialisering dat hiermee gepaard gaat, en hoe dit proces is opgenomen in de transnationale handel. Het oogsten geschiedt volgens traditionele kennis van woestijntruffels, dat is ingebed in de culinaire en medische tradities van de Sahrawi-nomaden, waardoor de commercialisering van truffels de daarmee geassocieerde etnomycologische kennis nieuw leven heeft ingeblazen.

In hoofdstuk 8 wordt een algemene discussie van het onderzoek en de eindconclusies gepresenteerd. Het begint met een reflectie op het theoretisch kader, gevolgd door een overzicht van de belangrijke empirische bevindingen in relatie tot de onderzoeksvragen, en reflecteert op de zelfredzaamheid die vluchtelingen uitoefenen terwijl ze vormen van levensonderhoud en daarmee geassocieerde kennis herstellen en aanpassen. Het hoofdstuk wordt afgesloten met een reflectie op de implicaties van de resultaten voor de onderzoeksgebieden menselijke ecologie, etnobiologie en onderzoek naar vluchtelingen, en er worden aanbevelingen gedaan voor gebieden voor vervolgonderzoek voordat de algemene conclusies gepresenteerd worden.

Uit de resultaten blijkt dat Sahrawi-vluchtelingen zich opnieuw hebben beziggehouden met een verscheidenheid aan vormen van levensonderhoud van voor de ballingschap door de biotische hulpbronnen van de woestijn te gebruiken en te transformeren voor hun materiële en culturele waarden, en om inkomsten te genereren. De omstandigheden die dit toestaan omvatten toegang tot geld en middelen voor levensonderhoud behalve voedselhulp, fysieke mobiliteit, persoonlijke veiligheid en toegang tot het voormalige thuisland (de bevrijde gebieden) of tot buurlanden met vergelijkbare omgevingen (Noord-Mauritanië), toegang tot etnobiologische kennis en

sociale netwerken. Hernieuwde toegang tot delen van het voormalige thuisland speelde een sleutelrol omdat de aanschaf van middelen voor levensonderhoud in grote mate afhangt van toegang tot de gebieden waar de respectievelijke biologische hulpbronnen gevonden worden en waar traditionele kennis toegepast kan worden. Het herstel wordt bepaald door het verleden, toen vee en natuurlijke hulpbronnen de materiële en culturele basis vormden van het leven van de Sahrawi's, en door de aanpassing van de cultuur en het gedrag aan de woestijnomgeving, zoals bijvoorbeeld duidelijk wordt in voedselnormen en ideeën over gezondheid. Door de materiële en politieke veranderingen die plaatsvonden na de Wapenstilstand van 1991 streefden veel vluchtelingen naar dit herstel als een weg naar voedselveiligheid en diversificatie van levensonderhoud, geconditioneerd door het gebrek aan alternatieve vormen van levensonderhoud in de kampen en de woestijnomgeving. Bij elkaar genomen wijzen de resultaten erop dat Sahrawi-vluchtelingen geen passieve ontvangers van voedselhulp zijn, maar collectief en individueel worstelen om hun levens en vooruitzichten te verbeteren binnen de beperkingen en mogelijkheden die de kampen bieden. Resultaten zijn beduidend voor het begrijpen van de bredere culturele, sociale en economische processen die in vluchtelingenkampen plaatsvinden, evenals de rol van voedselhulp en internationale ontwikkelingshulp binnen deze processen, en kunnen dienen om betere manieren te formuleren om de problemen van vluchtelingen te bestrijden en hun autochtone initiatieven te ondersteunen.

Name of the learning activity	Department/Institute	Year	ECTS*
<b>A) Project related competences</b>			
Literature review on: - camel reproductive loss syndromes, - Saharan caterpillars/moths, - piebald camels and camel domestication, - root tonics	WUR	2007-2014	2
Literature review for the original PhD project in Cuba	WUR	2005-2006	3
Writing of project proposal 'Recovery and adaption of subsistence practices and ethnobiological knowledge by Sahrawi refugees living in camps of western Algeria'	WUR	2007	3
Writing of project proposal 'Continuity and change in wild food gathering and use in Cuba with economic crisis and relocalisation: a study in new ethnobotany'	WUR	2005	3
Working visit for literature review	Kent University in Canterbury	2008	3
Working visit for literature review	Oxford University and Kew Botanical Gardens	2009	3
Teaching in the course 'Ethnopharmacology' (MSc programme Ethnobotany)	Kent University in Canterbury	2008	4
'Use of medicinal plants in Sahrawi refugee camps'	SADR Ministry of Public Health, Rabuni, Sahrawi refugee camps, Algeria	2007	1
'Livestock health and plants used for veterinary purposes among the Sahrawi people'	SADR Ministry of Public Health, Rabuni, Sahrawi refugee camps, Algeria	2008	1
'The role of camel illnesses in Sahrawi culture – Examples from Western Sahara'	University of Bologna	2010	1
<b>B) General research related competences</b>			
Workshop 'The last stretch of the PhD Programme'	WGS	2013	0
Intensive course 'Cultural domain analysis and Anthropic Software'	WUR	2005	1
Workshop 'NVivo Software'	London	2005	1
<b>C) Career related competences/personal development</b>			
Workshop 'Scientific integrity'	WGS	2013	0.2
Workshop 'Mobilising your scientific network'	WGS	2013	1.0
Workshop 'How to write a convincing research proposal'	Wageningen in'to Languages	2013	0.3
Course 'Voice matters: voice and presentation skills training'	WGS	2013	0.3
Course 'People and plants: approaches to the study of homegardens and bio-cultural diversity'	WUR	2006	1
Review of papers for the following scientific journals: Journal of Ethnobiology and Ethnomedicine (Editorial Board), Economic Botany, Human Ecology, Ethnobotany Research & Applications, Etnoecológica	WUR	2007-2014	2
<b>Total</b>			<b>30,8</b>

\*One credit according to ECTS is on average equivalent to 28 hours of study load

## **Curriculum vitae**

Gabriele Volpato was born the 3rd of July, 1972, in Montebelluna, Italy. In 2000 he obtained an Italian Laurea in Biological Sciences (MSc degree equivalent) from the University of Padova, Italy, with specializations in Botany and Ecology. For his thesis, he conducted research in plant ecology to assess the impact of agricultural and extracting activities on riparian vegetation along the Brenta River, North-East Italy. In 2001, he worked at the Department of Biology of the University of Padova conducting an ethnobiological and karyological study on two food and medicinal plants used by the Upper Orinoco Amerindians of Venezuela. In 2002, he obtained a grant from the Museum of Natural History and Archaeology of Montebelluna to investigate the medicinal and food uses of traditional home-made herbal liquors in Northeast Italy. In 2003, he obtained a grant from the CERES Programme for Innovative PhD Research at Wageningen University to conduct ethnobotanical research in Cuba. There, his research focused on two different themes: the use of traditional food and medicinal plants among Cubans and their role and significance within the Cuban economic crisis and food transition, and conservation and change in Haitian immigrants' traditional ethnobotanical knowledge in the province of Camagüey. In the same period, an Italian NGO, Africa 70, employed him to carry out research on the traditional medicinal and veterinary practices and knowledge of the Sahrawi people living in refugee camps in western Algeria. In 2005, CERES Research School of Wageningen University awarded him a PhD fellowship and, between 2006 and 2009, he conducted fieldwork in Sahrawi refugee camps and in Western Sahara investigating the subsistence practices and ethnobiological knowledge of Sahrawi refugees and nomads. His research experience and interests are highly interdisciplinary and include social and cultural anthropology, human-nature relationships and human ecology, ethnobiology and ethnobotany, social-ecological systems, biocultural diversity, and pastoralism. He has some fifteen scientific papers published in nationally- and internationally-refereed journals, two book chapters, and has authored two books written for the general public. He is reviewer for several scientific journals and is on the Editorial Board of the *Journal of Ethnobiology and Ethnomedicine*.



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