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# Mardu Foraging, Food Sharing, and Gender

Douglas W. Bird

*Principal Investigator; University of Maine, Orono*

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**Final Report for Period:** 08/2001 - 07/2003

**Submitted on:** 09/29/2003

**Principal Investigator:** Bird, Douglas W.

**Award ID:** 0127681

**Organization:** University of Maine

**Title:**

Mardu Foraging, Food Sharing, and Gender

### Project Participants

#### Senior Personnel

**Name:** Bird, Douglas

**Worked for more than 160 Hours:** Yes

**Contribution to Project:**

**Name:** Bliege Bird, Rebecca

**Worked for more than 160 Hours:** Yes

**Contribution to Project:**

#### Post-doc

#### Graduate Student

**Name:** Parker, Christopher

**Worked for more than 160 Hours:** Yes

**Contribution to Project:**

Chris Parker has been involved in the Mardu Ecological Anthropology project since it began in 2000, with a total of 10 months living in the Mardu community at Parngurr. He has conducted extensive observational data collection on a wide range of traditional foraging activities, assisted in designing and conducting biodiversity surveys in Mardu estates, and is in the process of analyzing an array of data on men's use of subsistence resources and resource landscapes. He is currently conducting fieldwork and analysis to investigate the relationship between foraging, landscape burning, and gender among the Mardu. This will serve as the basis for his PhD thesis submitted to the Department of Anthropology, University of Utah.

**Name:** Bass, Bonnie

**Worked for more than 160 Hours:** Yes

**Contribution to Project:**

Bonnie spent six months at the field site in 2001 assisting with data collection. She focused mostly on conducting focal individual foraging follows with Mardu women.

#### Undergraduate Student

**Name:** Connelly, Michelle

**Worked for more than 160 Hours:** Yes

**Contribution to Project:**

Michelle spent a month in 2002 with our research team in the Western Desert, living in a Mardu camp and participating in data collection on foraging activities and sharing patterns. Since then she has assisted with data entry and analysis. She will be continuing with graduate studies in anthropology. She is planning to develop further research with Mardu participants to investigate questions about variability in cooperation and collective action.

**Name:** Creasman, Pearce

**Worked for more than 160 Hours:** Yes

**Contribution to Project:**

Pearce spent one month at the field site in 2002 assisting with data collection. He contributed to a large data set on men's hunting activities in the cool-dry season.

**Technician, Programmer****Other Participant****Research Experience for Undergraduates****Organizational Partners****Parnngurr Aboriginal Community Council**

The Parnngurr Aboriginal Community Council facilitated many aspects of the research. They hosted the researchers in the community, organized aspects of the project locally, provided access to community facilities, and ensured the overall success of the project. As a result, the work was very much a collaborative effort on the part of the researchers and Mardu participants.

**Other Collaborators or Contacts**

Teddy Biljabu: Parnngurr Aboriginal Community Council Chair.

Nola Taylor: Parnngurr Women's Association President

Mitchell Biljabu: Punmu Aboriginal Primary School President

**Activities and Findings**

**Research and Education Activities: (See PDF version submitted by PI at the end of the report)**

**Findings: (See PDF version submitted by PI at the end of the report)**

**Training and Development:**

The project has provided the opportunity for senior personnel (Doug Bird and Rebecca Bliege Bird) to operationalize a long term research project, from the organizational stage, to funding, to field work, analysis, and publication of results. The project has provided extensive research training for two graduate students: one who completed her Master's (Bonnie Bass), and one who is working on a PhD (Chris Parker). In 2002 we were also able to provide quantitative ethnographic field training for two undergraduate students from the University of Maine. Certainly one of the most important aspects of research experience has come from within the Mardu community: this grant allowed for training local Mardu in both ethnographic and ecological data collection. This has provided a unique opportunity for collaboration between researchers and Desert Aboriginal communities. Currently Rebecca Bliege Bird and one of the Mardu women are working on a co-authored book about recent changes in women's economic lives.

**Outreach Activities:**

The project involved extensive outreach activities within the Mardu community, facilitated by the Parnngurr Aboriginal Community Council (PACC). The researchers and PACC are now conducting a large scale survey of vegetative and fire mosaics that result from Mardu foraging. Primary data collected from the ethnographic project will be linked to traditional and

future land management strategies. One of the primary goals of this will be to raise public and government awareness of the important link between traditional foraging and biodiversity in the desert, especially relative to the role of women's hunting in the fire ecology. As part of these efforts we are assisting in developing a community based action plan for fire management in order to coordinate efforts between PACC, Western Desert Parntukurnuparna Aboriginal Corporation (WDPAC), the Threatened Species Network, and Conservation and Land Management. Ethnographic data from the project are also currently being used by PACC and WDPAC to substantiate a legal battle over land rights. These data demonstrate a continuing tradition of hunting, gathering, and burning in the Western Desert, and important economic and social ties that bind the Mardu to their desert estate. In conjunction with this effort, the researchers presented a preliminary consultancy report to the PACC, which it in turn submitted to the Australian Institute of Aboriginal and Torres Strait Islander Studies and the Western Australia High Court in support of their land claim.

### Journal Publications

Bird, D.W., R. Bliege Bird, C.H. Parker, and B. Bass, "Aboriginal burning regimes and hunting strategies in Australia's Western Desert.", *Human Ecology*, p. , vol. , ( ). Submitted

Bird, D.W. and J.F. O'Connell, "Behavioral Ecology and Archaeology", *Journal of Archaeological Research*, p. , vol. , ( ). Submitted

### Books or Other One-time Publications

Bird, D.W. and R. Bliege Bird, "Mardu children's hunting strategies in the Western Desert, Australia: implications for the evolution of human life histories.", ( ). Book, Accepted  
 Editor(s): B.S. Hewlett and M.E. Lamb  
 Collection: Culture, Ecology and Psychology of Hunter-Gatherer Children.  
 Bibliography: New York: Aldine de Gruyter

Bird, D.W. and R. Bliege Bird, "Evolutionary and ecological understandings of the economics of desert societies: comparing the Great Basin USA and the Australian Deserts.", ( ). Book, Accepted  
 Editor(s): P. M. Veth and M. Smith  
 Collection: Desert Societies  
 Bibliography: London: Blackwell Scientific

Bliege Bird, R., D.W. Bird, "Human hunting seasonality: a case from Australia.", ( ). Book, Accepted  
 Editor(s): D. Brockman and C. van Shaik  
 Collection: Primate Seasonality  
 Bibliography: Cambridge: Cambridge University Press

## Web/Internet Site

## Other Specific Products

### Contributions

#### **Contributions within Discipline:**

For anthropology, the Mardu data clearly demonstrate that differences in the foraging strategies of men and women, and the sexual division of labor in general, are not necessarily designed for more effective household provisioning. Women's hunting and gathering strategies are very efficient relative to short term goals in providing daily sources of meat and fruit. They vary their subsistence activities and landscape burning strategies depending on changing opportunity costs in different seasons. Men's activities differ: while they sometime cooperate with women in acquiring small game, during much of the seasonal round, men focus their attention on pursuing large game. In so doing they pass over opportunities to increase the rate at which they could deliver food to their hearth group. Men's foraging often provides unreliable but very 'public goods': game whose distribution is not controlled by the acquirer and shared out widely beyond the immediate family.

Mardu children's foraging activities also challenge longstanding anthropological assumptions about the role of learning in the evolution of human life history. It is commonly assumed that our especially long juvenile period (and attendant cooperative breeding patterns) evolved in order to learn the skill intensive subsistence strategies that typify human societies. The Mardu data show that when size allows, children can learn complex hunting skills very quickly. Humans may gain extensive experience because they have long juvenile periods, but their extended childhood may have been designed for reasons other than for more learning to occur.

#### **Contributions to Other Disciplines:**

Our findings are especially relevant for fire ecology and land management policy for the Western Desert. Mardu burn the arid savanna for many reasons, but our data suggest that the resulting vegetative mosaic is maintained in no small part by women's small game hunting. During the cool-dry season, women always burn while hunting in their desert estates. There are very obvious and immediate benefits for increasing foraging efficiency if they burn the overburden of old growth spinifex grass. Whether this is part of a long-term land management strategy is not yet clear, but nevertheless, their activities result in a patchwork of vegetative regrowth that many researchers suggest increases biodiversity in the desert. Thus, incorporating women's subsistence goals, knowledge, and cooperation will be critical in forming operational fire and land management policy in the Western Desert.

#### **Contributions to Human Resource Development:**

The results from this project have contributed to human resource development by forging an lasting collaboration between the Mardu Traditional Owners and researchers. Many members of the Mardu community have a strong desire to contribute to projects that document the importance of traditional resources in their lives - promoting the preservation of cultural knowledge and encouraging youth to recognize and maintain their heritage. Their heritage, in turn, is intimately tied to the practice of using their estate and its resources. Foraging, sharing, and gender are a critical components of this. The implications of continuing these practices for maintaining biodiversity in the desert have yet to be fully appreciated by the public. An important goal of this project is to foster increased awareness of the dynamic and changing

relationship between Aboriginal societies, land use practices, and the sensitive biotic web in this remote part of Australia's desert. Doing so has immediate and important implications for practical concerns about developing effective land use and conservation policy.

#### **Contributions to Resources for Research and Education:**

In addition to the general results discussed above, this project has contributed specific resources for continuing research and education in the Parnngurr-Mardu community. In 2002 our research team submitted 'A Preliminary Report on Mardu Subsistence Activities and Land Use: hunting and burning in the Great Sandy Desert, Western Australia,' to the Ngatatjarra Land Council, Alice Springs, NT, the Parnngurr Aboriginal Community, WA, and the Australian Institute of Aboriginal and Torres Strait Islander Studies, Canberra, ACT. In addition we have started a permanent visual record (photographs and video on CD-rom) of contemporary hunting and gathering activities conducted by Mardu men, women, and children. Copies of these are housed at both the Parnngurr Community Center and the Parnngurr Primary School to be used for educational purposes, outreach programs and preservation of cultural knowledge.

#### **Contributions Beyond Science and Engineering:**

The results have been especially important in informing a larger public of the daily importance of women's and children's economic activities for contemporary Desert Aborigines. The consequences of maintaining these practices will be profound for developing successful, collaborative land management policy for the region. Doing so will assist in evaluating the complex (sometimes conflicting) interests in relationships between Traditional Owners, commercial efforts, tourists, and government agencies.

#### **Categories for which nothing is reported:**

Any Web/Internet Site

Any Product

This project has focused on collecting quantitative data on contemporary hunting and gathering activities, land use, and food sharing among the Mardu Aborigines of Australia's western desert. The senior investigators and students from University of Maine and University of Utah spent a total of 41 person-months living with Mardu participants in the heart of their desert estate.

1. Contemporary Foraging: In the Outstation communities of Parnngurr, Punmu, and Kunawarritji, Mardu obtain about 25% of their calories from wild foods, and in temporary camps away from the communities 80% of their calories comes from wild foods. We recorded variability in the acquisition of these from a broad sample of Mardu participants, mostly from the community at Parnngurr. All participants, including the children, spent most of their lives in the desert, and the formative years of those aged 35 and older were spent as full-time foragers. During our study, foraging parties traveled by vehicle from Parnngurr (on trips that ranged from 1 to 22 days) to field camps throughout much of the Mardu estate, and from those camps, walked or drove to a wide range of foraging locations. Data are available from 101 camp-days over three field seasons between 2001-2002, with observational data from all months but November. We recorded foraging party composition (age, sex, and relationship of participants), routes to foraging locales, and camp locations. During foraging trips the PI and Co-PI, graduate students from University of Utah, and undergraduate students from University of Maine were able to conduct detailed focal individual follows: each researcher accompanied a single individual and noted all time allocated to travel, search, pursuit, collecting and processing, along with the weight of each item (if game) or parcel (if fruit, vegetable, or insects) captured at the end of foraging. Foraging paths were recorded with GPS on many of the focal follows. A total of 801 focal individual follows (481 women, 282 men, and 38 children) were conducted. In addition to the focal follows, we recorded the duration of all foraging episodes and the weights (by item or type) of all food captured by all camp or trip participants. A total of 2248 foraging hours were recorded from 28 different women, 15 different men and 17 different children.

2. Food Sharing: At the end of each foraging episode, we recorded all of the primary transfers of resources as they were delivered to the camp. This is the first stage of distribution: the transfer of food from the person who acquired it someone else (who may prepare it, consume it, or distribute it to others). A total of 608 observations of primary transfers were recorded with details on the nature of the resource (species, size, and in some cases weight), the acquirer (sex, age) and the recipient(s). In many cases, the recipients of primary transfers were not the only consumers. Therefore, we attempted to record as many secondary (and in some cases tertiary) transfers as possible. This was done either through direct observation (when an investigator was able to track a single item from the acquirer, to the distributor, to the consumer) or through quick interviews after meals. We have yet to enter all of the secondary food transfers into a data set, but the sample size includes well over a hundred events.

3. Land use: Mardu subsistence is closely linked with landscape burning. Mardu systematically fire older growth spinifex grass at nearly every camp. This results in a patchwork of vegetation at various stages of regrowth. During focal follows, each research recorded if burning occurred and the location of each fire (a sample of 725 events). To characterize habitat mosaic and burn regimes around foraging locales we chose a straight two-km transect in a random direction from each residential camp. A researcher walked the transect and noted the number of times they passed from one patch of vegetative regrowth to another. This provided a sample of 246 focal follows for which we can characterize the vegetative mosaic. Fine-grained mosaics around camps were defined as those in which a researcher passed into three or more types of regrowth patches on a single transect. This type of mosaic results from moderate anthropogenic burns at regular intervals. Medium-grained mosaics at camps are defined as habitats in which a researcher passed into two patches of regrowth on a transect. These habitats result from larger fires (some greater than 20 km<sup>2</sup>), usually at intervals of >3 years but <10. Coarse-grained mosaics around camps are dominated by a single patch: either old-growth spinifex (>3 years old) over a very large area, or a recent very large burn (>50 km<sup>2</sup>). In these areas a researcher never crossed into another stage of regrowth over a two km transect.

Our primary findings can be grouped into three general categories: sex-linked differences in foraging and sharing, children's foraging strategies, and landscape burning practices.

**1. Sex-linked foraging and sharing:** Among contemporary Mardu of Australia's Western Desert, during the cool-dry season (May-August) women spend a great deal of their foraging time hunting burrowed goanna lizards and collecting Solanum fruit in the sand plain and dunes. In contrast, men spend almost all their foraging time hunting mobile game (bustard, kangaroo, and emu) across a range of habitats. During this season women's resources are 'owned' by the acquirer and shared with a relatively small group of dependants. Conversely, if successful, male hunters make no claim to the animal: the game is usually given to an elder (often to a spouse's father) who takes responsibility for wide distributions. Primary sharing of kangaroo and emu is often dictated by kinship categories, but thereafter the appropriate recipient shares freely with anyone who desires a portion.

The pattern of Mardu subsistence is notably different during the hottest part of the year (January-April). During this time, sand goanna (Varanus gouldii) and perenti (V. giganteus) are more commonly encountered on the surface, and women and men sometimes coordinate their hunting activities. If men have been unsuccessful in hunting larger game, they sometimes shift strategies and search for game resources targeted by women, something they very rarely do at other times of the year. Large game is encountered less often during this season, and sharing patterns for men during the hot season tend to be more narrowly focused.

We have begun to investigate the hypothesis that in some circumstances men may choose particular foraging activities and patches that maximize the efficiency of social display rather than some nutritional or provisioning currency. Certain foraging activities, especially those that require a high degree of skill and cost, can be an important means of advertising underlying, difficult to detect, qualities of the forager (in the parlance of behavioral ecology, these activities serve as 'costly signals'). Such displays are especially efficient when they draw a large audience, by providing widely shared 'public goods' for example. Both the signaler and the recipient can benefit when the cost of the activity ensures the 'honesty' of the information advertised in the display.

We suggest that certain aspects of men's foraging may be consistent with a costly signaling hypothesis. During the cool-dry season men would increase their foraging return rates significantly if they stopped their search for larger game (2125 kcal/hr-searching and handling) to dig for sand goanna and pick Solanum fruit (post encounter returns = 5318 and 4217 kcal/hr-handling, respectively). Only on very rare occasions did we observe men discontinue their search to pursue these resources. We hypothesized that during this season the benefits of displaying the skills of tracking mobile animals may make larger game



especially attractive to certain men; and the fact that these game are shared widely ensures a broad audience (in spite of the extreme modesty of the hunters). In the hot season small game is more mobile and the opportunities to track them greatly increase. During this time men often interrupt their search for larger game to pursue sand goanna. We suggest that men may prefer mobile game in all seasons because only tracking has the potential to discriminate skill levels among hunters. While Mardu ascribe no political power to skilled trackers, they do make overt distinctions in skill for male and female trackers. We're now investigating possible benefits associated with these distinctions. Nevertheless, the data clearly bring into question the common assumption that the sexual division of labor for hunter-gatherers is necessarily designed to provision a household: in the course of hunting large game, Mardu men often pass over opportunities to increase their efficiency with game that will more likely be shared with their wives and offspring.

**2. Children's foraging:** A long childhood is the focus of many scenarios of human evolution because as apes go, human life histories are extreme. Among our closest ape relatives the juvenile period, from weaning to first reproduction, lasts from between 6 to 8 years and is supported mostly by the juvenile's own foraging effort. In humans the juvenile period is nearly twice as long. And during that time children's consumption of resources greatly exceeds what they produce for themselves. What selection pressures might have lengthened the period of dependency and delayed reproduction among humans? Two hypotheses are prominent in the literature. One is that humans need an extra long time to learn complex subsistence strategies, and the other is that long juvenility is the pleiotropic effect of selection for long life-spans.

Mardu children are active and independent foragers: they hunt goanna lizards and collect a wide array of plants on a regular basis, often targeting prey that adults avoid. Their efforts are unsupervised without direct instruction by adults. Their skills and decisions, while praised by their elders, are more directly influenced by other children. So far our data show that for children's goanna (Varanus acanthurus) hunting in the rocky outcrops, forager size is a more important effect on hunting success than their experience. Moreover, children's decisions to hunt in rocky outcrops as opposed to the sandhills (that adults target) are not likely to be the result of learning constraints. By focusing their efforts in rocky outcrops, children (who walk slower than adults) can encounter prey at a higher rate. On average, this provides return rates for children that are equivalent to those they might expect if they hunted in the sandhills, while avoiding the long search distances involved in sandhill hunting. Only when walking speeds approach the adult average does hunting in sandhills consistently offer higher efficiency.

We suggest that these data are not consistent with the argument that prolonged human juvenility evolved in order to learn complex hunting strategies; rather, children may learn a lot because they have a long time to do so. This calls into

question a host of assumptions about the function of our peculiar life-history, especially those related arguments that complex hunting may be the key to understanding our especially slow paced development, long lives, and cooperative breeding patterns. If size permits, Mardu children can learn very complex hunting skills very quickly. This study should promote renewed interest in evaluating how learning and size influence age-linked variability in extractive subsistence activities in many different ethnographic contexts.

**3. Burning practices:** A large complement of Australia's biotic web is dependent on a regular regime of burning, much of which is the result of firing by humans. Many researchers have suggested that moderate and repeated burning by Aborigines is a tool designed to enhance hunting efficiency. We conducted the first formal test of this hypothesis with data on Mardu burning and hunting strategies in the arid spinifex (*Trodia* spp.) savanna during the cool-dry season (May-August).

Sandplains and dunes dominate Mardu landscapes. Areas that have remained unburned for longer than three years are dominated by (>80%) old growth spinifex with characteristic "donut" shaped hummocks. Mardu systematically fired older growth spinifex on nearly every foraging trip during the cool-dry season. Following a fire, the proportion of visible spinifex is reduced to nearly zero, and with any rain, plant diversity in a recently disturbed patch increases dramatically. Mardu pay close attention each fire: most adults can recount when, where, and by whom every fire was lit (with details of fire intensity and progression) over at least the three previous seasonal cycles within a radius of about 100 km from the three Outstations. The result of this systematic regime of burning is a mosaic of vegetation in various stages of regrowth.

Our results show that there is strong positive effect of mosaic burning on the immediate efficiency of hunting burrowed prey, which is primarily conducted by women who target large sand goanna (*Varanus gouldii*). However, for men, who target larger mobile game, we find no effect of burning on their hunting efficiency. We suggest that regular anthropogenic disturbance through burning in Australia's Western Desert may be important for sustaining biodiversity and habitat mosaics, but these effects may be maintained primarily by women's short term goals related to hunting burrowed game. We are now investigating the possible long term advantages of maintaining the desert mosaic for gathering certain key plant resources through remote sensing and GIS technologies.

The results add to a growing appreciation of the problems involved in attempting to distinguish between "natural" and "artificial" landscapes, or that somehow we might find a single strategy for the optimal management of pristine environments. For all intents and purposes, Australian "wilderness" is a product of a dynamic relationship between people and the physical environment. The Mardu data demonstrate that fire policy in the arid savanna needs to focus on a systematic

analysis of Aboriginal burning practices to inform and buttress land management prescriptions.

Effective fire and land management in this region of the Western Desert will fail along most fronts without incorporating Mardu participation and objectives. This will require a broad anthropological and ecological approach, building from within communities and taking into consideration different levels of cultural meaning, temporal and spatial ecological variability, individual conflicts of interest, and tradeoffs associated with different goals – all of which influence burning strategies and their consequences. The Mardu data show that even within a single community, different people face different (and not necessarily complementary) tradeoffs relative to their subsistence and burning purposes. If Mardu burning is a long term land management strategy, it does not appear to be designed to enhance men's large game hunting, but rather to promote the productivity of key small animal and plant species. And certainly while many aspects of burning may be designed for land management, other goals also influence the frequency and extent of human-initiated fire. Thus, incorporating both women's hunting goals and men's social and religious priorities into fire policy will be critical for current conservation efforts in the Western Desert. This is more than necessary for developing operative policy: it will provide an opportunity for cooperation between land management agencies and remote Aboriginal communities that retain the skills and knowledge associated with burning and subsistence.