

Chapter 3

The relationships between the maned wolf and people –

Adriana Consorte-McCrea

3.1. Introduction

The maned wolf is a large carnivore, the largest one in South America. Although it was described as a wolf by early agents of the Portuguese crown, it is monophyletic and therefore difficult to mistake with any other species. The fact that the maned wolf is unique and distinctive is important if its image is to represent the Cerrado biome and all of its dwindling biodiversity. Do people's relationships with the maned wolf make it charismatic and likable enough to earn the badge of flagship species for the Cerrado conservation?

The validity of the one species approach to conservation has been questioned in favour of a focus on ecosystems. However the single species has its merits when the species in question "plays the role of keystone or umbrella species..." (Boitani et al. 2004:158; McNeely 2000; Gittleman et al. 2001; Sergio et al. 2006). The maned wolf is, arguably, a charismatic carnivore with a wide home range, qualifying it to fit both roles. Between 2005 and 2008 I conducted a field study on local people's attitudes towards the maned wolf in the state of São Paulo that helped to bring an answer to this question. The objectives of my study were to shed some light into associations between the way local people perceive the maned wolf and its decline, and to enable a comparison between such associations in urban and rural areas.

The study aimed to improve the understanding of people's relationships with the maned wolf to help the planning of conservation strategies for the species.

In this chapter I review and discuss key issues that are instrumental to the panorama of local people's attitudes towards the maned wolf in the southeast of Brazil, referring to data from my research as evidence.

3.2. Methodology and study areas

The data compiled in this research were gathered from: a literature survey; local research programmes and official records; and fieldwork based on questionnaires (total= 725) and interviews, combining quantitative and qualitative elements. Target groups were identified according to their involvement in the conservation of the maned wolf either as opinion makers, supporters, or because of their potential exposure to contact and possible conflict with the maned wolf, in both rural and urban settings (table 1).

São Paulo state is the most populous state in Brazil and of high political and economic importance in the national context. Furthermore, it houses some of the most significant remnants of maned wolf habitat within conservation areas. The research was carried out in three areas: Greater São Paulo, São Carlos and Low Mogiana region, complemented by the input of conservation units and zoo professionals and well as students from a number of other locations within the state of São Paulo (see map, figure 1.). Questionnaires targeted four different groups (table 2). The questions were designed to identify selected attitudes, beliefs and

knowledge of target groups in relation to the maned wolf, wildlife, conservation and to other target groups and to compare these factors in urban and rural areas amongst socio-demographic groups and between different locations in São Paulo state (Consorte-McCrea and Rubin 2009; Consorte-McCrea 2011).

3.3. Results and Discussion

The study of the relationships between carnivores and people is of worldwide interest. The ability of people to co-exist peacefully with wild predators is a frontier in conservation therefore understanding the multifaceted elements influencing people's attitudes towards carnivores is paramount. The following key issues which emerged from my study are transferable to the relationship between people and wild carnivores worldwide.

3.3.1. Human encroachment and habitat protection

The relationships between maned wolves and people may have been altered with changes in land use and population growth. Fossil records indicate that the maned wolf evolved in Central Brazil, during the Pleistocene Age or even earlier and it was already established in South America when the first human settlers arrived during the last Ice Age (Langguth 1975, in Dietz 1984; for historical and current distribution see Queirolo et al. 2011).

Indigenous populations were familiar with the feeding ecology of the maned wolf¹ and named it after its large size and reddish coat. Although Portuguese settlers soon identified the species as some sort of wolf (when wolves were being intensely persecuted in Europe) it apparently experienced no significant impact from the time of the arrival of the Portuguese settlers in 1500 until the mid-20th century (Miranda 2003). This time was marked by human population growth and increasing deforestation involving large areas of the southeast of Brazil.

People in the research areas

The population of the state of São Paulo has its roots in both the Portuguese and the indigenous people thrown together during the *bandeiras* movement to explore inland Brazil (between the 16th and 18th centuries, anticipating the "march towards the west" movement of the 20th century) (Arruda 2000; Candido 2001). This group originated the small farmers in the areas of mineral extraction and coffee expansion (Darcy Ribeiro 1995, in Arruda 2000) that gave birth to most of the cities in inland São Paulo. The Portuguese culture lost ground in favour of the indigenous culture, which was more adapted to the environment and to mobility. After the abolishment of slavery in 1888, the black population who previously worked the plantations migrated to urban areas (Consorte 2007). The early 20th century saw an influx of immigrants, mostly from Europe, tied up with the coffee boom and the later development of industry and commerce, adding new roots to the local population.

¹ Kamaiurá indigenous people inhabiting the high Xingú River and grasslands in central Brazil, refer to the maned wolf in one of their traditional tales as an animal that only eat fruits, or 'auaratsim' (Carvalho 1976:4, also Miller 1930). See also Felix de Azara 1700's description of species in Paraguay (Cartes et al. Chap.18)

Since the proclamation of the Republic (1889) a *march towards the west* to explore the country's inland disseminated ideas of urbanization as *progress*; in opposition to this, wild habitats were seen as *backwardness* (Villas Boas and Villas Boas 1994; Miranda 2003)- a concept that may remain in the research areas. As a consequence of the capitalist expansion the *caipira*² had to work harder: the pressure resulted in individualization and detachment from the social and economic harmony with the local environment towards a regional and national context (Candido 2001). The relationship between this group and the natural environment was thus altered and with it the knowledge and use of natural resources, giving way to an unprecedented level of environmental impact. The expansion and modernization of the agriculture in the Cerrado contributed to the decline of the populations of maned wolves.

Conservation awareness is not new to Brazil. Wildlife protection is supported by a hunting ban, in place for over 45 years. Nevertheless, only 6.3% of Brazil is protected by federal conservation units (only 2.8% have integral protection) and according to Costa et al. (2005) many protected areas may suffer from inadequate management making them vulnerable to illegal hunting, human settlement and logging. Today many endemic terrestrial carnivores are threatened with extinction because of the destruction, fragmentation or reduction of habitat, and hunting (IBAMA 2003, in Miranda 2003). As an added pressure, new technology creates short cuts in labour and pressure to increase production and, in turn, it may lower farmers' tolerance to damage as it also distances them from nature (Knight 2000; Candido 2001; Hill 2004).

² Traditional population of inland São Paulo

3.3.2. The value of the maned wolf

In Brazil the maned wolf is on the National List of Threatened Species from the Brazilian Fauna (MMA 2008). In recent years its status has moved from *vulnerable* to *near threatened* by the IUCN Red Data Book (IUCN 2009), and it is included in CITES – Appendix II. Maned wolves, like many other predators are valued for a variety of reasons. Carnivores are cited as potentially good for tourism, being an important part of cultural heritage; as a ‘keystone’ species the maned wolf plays an important role in ecosystem dynamics. The species aids in the dispersal of various species of fruit in the Cerrado, including the “wolf’s fruit” (*Solanum lycocarpum*), which shows improved germination rates after passing through the maned wolf’s digestive system, gabioba (*Campomanesia pubescens*) that are enjoyed by cattle and by people (Lombardi and Motta-Junior 1993; Courtenay 1994; Ferraz 2000; Santos et al. 2003) and many others (see Motta-Junior et al. Chap 6). The maned wolf provides a service by feeding on insects and rats that are carriers of diseases such as *hantavirus* and *leptospirosis* (Dietz 1984; Motta-Junior 2000; Anic 2002)³. Arguably, as a ‘flagship’ and ‘umbrella’ species it has the potential to champion efforts to protect its whole ecosystem where the species is found.

What is the value of the maned wolf to local people? Most local people consulted in this research (64.5%) considered the maned wolf valuable (as opposed to *worthless*). Most did not value the maned wolf for its body parts, or as game: the

³ The loss of food grains or crops to rodents has been estimated somewhere between 2 and 200 million tons worldwide per year; in South American countries the loss of sugar cane production to rodents has been estimated between 1 and 12,500 tons (in case of rodent outbreak) per year (Conover 2001).

great majority of respondents who considered the maned wolf as valuable also believed that it needs to be protected (88.3%, N=451, see table 5 for statistical analysis) and that it has an important role in nature (86.9%, N=451). This suggests they awarded the species an intrinsic value that deserves protection. The value local people award to the maned wolf puts it in a strong position to be a champion for the Cerrado biome. But is it also considered charismatic and likable?

3.3.3. People and carnivore's multifaceted relationship: the maned wolf within the universe of local people

Although the maned wolf was first described using its indigenous (Guarani) name: *yaguaraçú* (meaning big red canid) (Padre José de Anchieta (1534-1597) 1988, in Miranda 2003; Gabriel Soares de Souza 1587, in Ribeiro 2003) it was later categorised as a 'common species', already known, by the crown naturalists and named *lobo guará* (*guará* wolf, or red wolf). The name "wolf" might have sealed a future of unjustified antipathy on the part of the colonizers towards the maned wolf. Kruuk (2002) suggests that we have evolved innate anti-predator responses, which may manifest themselves towards 'look-alikes' – similar carnivores to the ones known by previous experiences to have caused harm or material loss. In addition, negative values related to experiences of attacks on poultry (by foxes and wolves in Europe) might have travelled with the European settlers and been transferred to their relationship with the maned wolf. This might also be true in the attribution of magical and pharmaceutical value to some of its body parts (similar to fox and wolf in Europe, in Freefy 1983; Bush 1995; Kruuk 2002). In fact, an alarming 33% of respondents believed that maned wolves' body parts were used for either fashion,

medicinal or magical purposes, and 13% (n=7) of rural respondents believed maned wolves were killed because of the sale or use of parts of their body. This potential area of conflict has been noted previously by Puglia (1978), Silva (2000), Silva and Nicola (1999), Anic (2002) and Emmons (see Chap 17). Beliefs about the use of maned wolf body parts have been collected by Dietz 1984; Figueira 1995; Anic 2002; Rodrigues 2002; Sillero-Zubiri et al. 2004; Villas Bôas and Villas Bôas 2004, and include the use of a canine tooth, piece of the hide, heart, eye and dried faeces to cure diseases and to bring good luck and protection (see review in Consorte-McCrea 2011).

Traditionally in the literature, the maned wolf has been described as timid, shy and scarce, cowardly, weak, frightened and not nearly as strong and brave as its European counterpart, except when defending pups (see Magalhães 1939; Ihering, 1968; Carvalho 1976; Dietz 1984, 1987; Ribeiro 2003). Traditional people from Central Brazil (*sertanejos*) associate the eerie sounding maned wolf's call with feelings of melancholy and sometimes of bad luck (Magalhães 1939; Villas-Bôas and Villas-Bôas 2004). Consistently research has indicated that local ranchers and rural people consider them harmless, show no negative feelings or fear towards the maned wolf and have sound knowledge of several aspects of their ecology and habitat (Carvalho 1976; Dietz 1984, 1987; Bestelmeyer 2000; Anic 2002). Beliefs about the maned wolf's diet seem however to be inaccurate. The diet of the maned wolf is composed of a similar amount of items of plant and animals origin, and the occurrence of poultry remains is very rare in scat samples (0 to 1.5%) (Motta-Junior 2000; Aragona and Setz 2001; Anic 2002; Bueno et al. 2002; Juarez and Marinho-Filho 2002; Rodrigues 2002; Santo et al. 2003; Bueno and Motta-Junior 2004).

Many respondents (39.8%) in this research correctly identified the maned wolf's favourite food items as wolf's fruit, fruits or rats, however many rural people (24%) erroneously identified chicken as its favourite item, indicating a considerable level of misconception related to carnivorous diet. When compared with field data collected from faeces, poultry remains have only been found in 0.3-1.5% of analysed scat samples. In rural areas such misconception may be associated both with inherited European beliefs about "wolves" and with the infrequent but striking occurrence of predation events.

In spite of the maned wolf's crepuscular habits and shy nature, most people (86.7%, n=504) who answered the questionnaires, and particularly rural people, were able to identify it by looking at a picture. However, significantly fewer visitors of zoos where the maned wolf is found recognized it, indicating that the potential of zoos to disseminate awareness about the maned wolf is yet to be fulfilled (see also Bizerril and Andrade 1999). On the other end of the spectrum, the data analysis shows that rural respondents knew more about the maned wolf's habits and ecology (except for feeding habits) than most other target groups, suggesting that a familiarity with the natural environment might have persisted in the rural population.

Respondents were not only familiar with the maned wolf: most of them had a positive view of its behaviour and appearance (67.8%, n=1701, out of a total of 2513 evaluative responses) (see table 3). According to Kellert et al. (1996) such perception could contribute to positive attitudes towards the maned wolf and its conservation. Perceptions of urban and rural residents were similar, challenging some of the most negative traditional portrayals of the species in the literature and

from earlier accounts. The maned wolf, though considered brave, powerful and strong, is not perceived as a threat to people. Also, its large size was not associated with fear or dislike for the species, as suggested in relation to other carnivores (Macdonald and Sillero-Zubiri 2004), but quite the opposite: respondents who considered the maned wolf big also considered it good, beautiful, brave, strong, valuable and powerful, similar to the findings of Kellert about other charismatic carnivores (1985). Positive perceptions towards the maned wolf and its successful coexistence with local people have been reported from field work carried out by other researchers (Carvalho 1976; Dietz 1984; Figueira 1995; Silva 2000; Bestelmeyer 2000; Anic 2002) and seem related in part to its overall shy behaviour in avoiding people.

Only a small minority of respondents did not like (1.7%, n=8) or did not care (6.5%, n=33) for the maned wolf. Within this latter group there were many rural residents (n=14, N=470) and the least educated (n=24, N=483). Overall, results show the more people knew about the maned wolf the better their beliefs and attitudes towards them. This was particularly true amongst rural respondents. The lack of an association between knowledge about the maned wolf and negative attitudes towards it (as found to be the case for other carnivores, in Kaczensky et al. 2004) may be due to a general absence of perceived threat in relation to the species. Research suggests a correlation between positive attitudes towards large carnivores, low fear level, and higher support for their protection (Bath and Farmer 2000), suggesting positive implications towards maned wolf conservation.

Overall, a majority of both urban and rural residents in this research demonstrated a high degree of positive attitudes towards the maned wolf. In a minority of cases negative feelings were associated with potency variables, as suggested by Kellert (1985) and maned wolves were seen as dangerous, strong, ferocious and powerful. Results suggest that lack of positive attitudes relate to lack of knowledge and to misconceptions (cognitive in nature), rather than to negative experiences of the species or values about wildlife conservation. Therefore the circulation of accurate information about characteristics of the maned wolf, such as size, weight, and its ecology, feeding habits and population numbers should improve public attitudes towards it by building more complete and informed images in people's minds, as suggested by Bath and Majic (2001).

3.3.4. Relationship between human occupied landscapes and the maned wolf.

The pressures of habitat impoverishment and fragmentation caused by human expansion may encourage some less specialised carnivores with opportunistic habits to explore human occupied landscapes, even expanding their populations. This is likely to be the case of the maned wolf whose range seems to be shifting towards the southeast (Queirolo et al. 2011). Research in Serra da Canastra National Park indicates that maned wolf populations may tolerate low level impact from human colonisation, however long term and high impact activities, such as farming and tourism, may be potentially significant and might cause changes to the behaviour and ecology of their populations (Dietz 1984; Rodrigues and de Paula 2007; see also Silva and Talamoni 2004).

The maned wolf makes use of pastures, clearings and abandoned human inhabitations. This behaviour certainly helps the capacity of the species to disperse and not to depend exclusively on natural areas to cross between habitat patches. *Lobeira* plants are abundant in altered areas, especially pastures, allowing maned wolves to use such areas for dispersal and even expanding its distribution in certain regions, making use of areas where native forests have been cleared (Dietz 1984; Motta Junior 2000; Rodrigues 2002; Santos et al. 2003).

About people's livelihood

Despite the risks for maned wolves, in times of need human occupied environments can provide an opportunity not to be missed for readily available food, in concentration, in the minimum possible time. However, this may not be achieved without conflict. Although apparently rare due to their shy nature (Magalhães 1939; Ihering 1968; Carvalho 1976; Dietz 1984), field research has recorded occurrences of maned wolves approaching chicken pens and causing great losses during the winter months and from September to November when pups are more likely to be at den sites (Puglia 1978; Dietz 1984). On such occasions wolves were reported to be trapped, poisoned, shot at, imprisoned or killed (Puglia 1978).

The way people perceive risk may be strongly influenced by rare and extraordinary or extreme events, like 'worst case scenarios' (Hill 2004:281) and the widespread belief that maned wolves attack chicken pens with blind rage may fall into this category even amongst people who have never witnessed such an event. In fact

28.1% (n=142) of respondents believed that maned wolves attack chicken pens and livestock, amongst them a majority of rural respondents (n=45; N=502). A significant number of rural respondents also believed maned wolves are a threat to people (table 5); this may be related to isolated and rare incidents of females protecting pups (Magalhães 1939; Ihering 1968; Carvalho 1976; Dietz 1984, 1987). Could these few negative events have damaged people's attitudes towards the species?

My results suggest that despite the negative feelings of a small minority, attitudes amongst the rural respondents in the research areas indicated tolerance towards the likelihood of a maned wolf being found attacking livestock. In fact, as suspected, the great majority of the respondents and their families had not suffered damage caused by the maned wolf (91.9%, n=464), including rural respondents (77.8%, n=42). Amongst rural respondents 18.5% (n=10) alleged suffering damage caused by the maned wolf to themselves or their families. Nevertheless, only one of them believed *a maned wolf found attacking livestock must be killed or trapped* (see table 4.). Retaliation killing was not popular amongst people who had lost livestock to the maned wolf. However killing maned wolves is outlawed and some people may have refrained from expressing opinions in support of killing. The most frequent responses amongst this group was handing the culprit over to the authorities or scaring it away (33.3%, n=4).

The tolerance observed amongst rural respondents towards maned wolf consumption of domestic stock may reflect an overall sympathy for it, and may be an indication of the remnants of traditional integration between local people and the natural environment as suggested by Knight (2000). The high level of tolerance

towards maned wolves and their raids (albeit possibly rare) may also indicate that the conservation of the species is compatible with the local economy of the research sites. The fact that the increased value of Cerrado habitat has apparently not lowered the threshold of tolerance towards raids is an indication that maned wolf raids do not affect production.

3.3.5. Conflict and discourse: Changes in the relationship between local people and nature over time

Human activities in the vicinity of protected areas may impact on the populations of maned wolves in direct and indirect ways. The population model created for Brazil by the Maned Wolf Action Plan (Paula, Medici and Morato 2008) suggests the major threats to the species lie in an increase in road mortality and reduction of the carrying capacity due to habitat loss. Other human related threats are: presence of domestic and feral dogs in the vicinity of protected areas (Pontes-Filho et al. 1997; Anic 2002; Rodrigues 2002); deaths by retribution to attacks on poultry (Dietz, 1984; Rodrigues 2002) and hunting; killing for the harvesting of body parts for magical and medicinal purposes (Puglia 1978; Silva 2000; Silva and Nicola 1999; Anic 2002), and loss of genetic variability. Louise Emmons (chap 17) also points out to the threat of climate change and extended droughts as they may affect food resources and disease susceptibility.

Anthropogenic causes of maned wolf mortality

Some believe road killings of maned wolves and other wild animals may be intentionally caused (Carvalho 1976; Rodrigues 2002). When asked “why do people kill the maned wolf?” rural respondents in this research also suggested maned wolves are killed intentionally, out of people’s *badness*, and because people *feel pleasure in killing*, because they *dislike it*, or due to *ignorance*. Ignorance about the species may result in dislike of it. This may be due to fear, cultural and historical antipathies, association with more carnivorous species- such as *Canis lupus* - and blame for attacks on poultry, which in the long term may result in negative perceptions and attitudes towards the maned wolf, even as far as harming or killing. It is also possible that the dissemination of a rural development agenda may resonate in people’s feelings of dislike towards wilderness and wild predators. Such negative feelings have been linked to endemic species of the Cerrado in Brazil (Carvalho 1976; Klink and Machado 2005) and may be connected with feelings of dislike towards the maned wolf. However killing for pleasure does not derive from the same causation.

The most popular belief about human related mortality amongst rural people in this sample was that maned wolves are killed for sport (40.7%, n=22). Despite a lack of evidence from data collection in the research areas to establish the true number of maned wolves killed by sport hunters, it is possible to make some inferences about the nature of the hunting issue.

Hunting, fishing, and gathering have been described as indigenous practices adopted by the *caipira* culture as a means of subsistence and of reinforcing bonds with the natural environment (Candido 2001; Miranda 2003). Hunting has also been

described in a similar way by modern Native Americans, who also associate hunting with stress-relief, excitement, and the strengthening of social bonds (Daigle et al. 2002). Antônio Candido (2001) suggests that with the modern hunter however, for whom hunting is not part of a subsistence economy, hunting has taken on different functions. With hunting bans in place, and an increasing dependence on urban centres for manufactured goods and food, rural people almost totally limit hunting to the defence of plantations and livestock. In other instances, recreational hunters pursue wild carnivores and birds whose meat is not edible. As an added dimension, claims of damage caused by certain species have been used as justification for hunting them down, even when landowners admit having no bad feelings towards the species and even admiring their presence, as it is the case with the red fox in Britain (Marvin 2000).

The belief of 20.4% (n=11) of rural respondents that maned wolves are killed in retaliation is consistent with the alleged experiences of 18.5% that maned wolves caused damages to themselves or family members. Bearing in mind the endangered status of the species, those numbers are still worthy of consideration and suggest the need to address conflict between the maned wolf and local farmers. However rather than being a primary reason for maned wolf mortality, retaliation and prevention of attacks on livestock may have been used as a form of justification by people who actually kill the maned wolf for sport.

3.3.6. Environmental awareness and people in the vicinity of conservation areas

Over a decade ago research conducted by the Forestry Institute showed that 73% of all conservation units of over 10.000 hectares in the state of São Paulo were inhabited by traditional populations, most also housing non-traditional populations (Arruda 2000). As conflicts between people and carnivores tend to centre on human dimensions, canid education worldwide has focussed on fighting misinformation and improving people's understanding of the biology and management of species, making use of the formal school system thus targeting younger generations to foster changes in negative views (Taylor 2004). Brazilian educators such as Ligia Moreira da Rocha (1997) have emphasised that both the success of conservation initiatives and the effective long-term conservation of natural resources depend on public support, and movement towards the inclusion of local people in the planning of conservation strategies has taken shape (Strauss 2004).

Some of the problems faced by environmental education programmes relating to protected areas spring from the fact that local people do not seem to be aware of the existence of neighbouring protected areas, or know very little about their aims or the benefits that they can generate, and are consequently uninvolved in their protection (Padua and Tabanez 1997; Fiori 2006). Indeed, only 37.6% (n=190) of the respondents were familiar with the local CU, and only 6.3% (n=12) who knew it attended an environmental education course there. Environmental educators, however, advocate their practice as a way to increase knowledge, change values and improve skills; these are conditions considered as essential for the development of environmentally aware attitudes as part of a quest for an improved quality of living (Padua and Tabanez 1997; Sorrentino 1997). Some of the most successful and long-running conservation programmes in Brazil have aimed to promote self-esteem

associated with the valuing of the locality, encouraging integration between its cultural and natural resources (including the protected area) (see Almeida 1997; Castilho et al. 1997; Dietz and Nagagata 1997; Padua and Padua 1997; Bizerril, Soares, & Santos, 2011). Variables such as “ownership” (personal involvement with issues) and “empowerment” (sense that one has the power to make important changes), have been considered essential tools as information alone is not enough to promote long-lasting changes in behaviour (Hungerford and Volk 1990). Within this framework, appealing endemic flagship species have been used to attract the attention of the population to the environmental cause, by eliciting support for the preservation of that species’ habitat (Dietz and Nagagata 1997).

Results indicate the existence of the potential of environmental education courses to effectively address misconceptions in important areas of the maned wolf ecology. Most respondents who had heard about it in *school or environmental education course* (n=20, N=505) displayed good levels of knowledge about the maned wolf indicating that these were effective, though limited in reach, as sources of accurate information about its feeding ecology.

Zoos may also contribute to the long-term construction of positive attitudes and opinions towards wild carnivores by bringing the plight of species to the public attention and by providing education programmes and accurate information about individual species and their ecology (Consorte-McCrea 1994; see Projeto Cerrado Nossa Casa, Almeida 1997; Bowkett 2009, Songsasen and Rodden 2010; Vanstreels and Pessutti 2010). In fact most of the respondents (69.1%, n=349) were familiar with the local zoo, although only 4.3% (n=15) of them were engaged in an

environmental education course offered by it. A surprising 35.8% (n=181) had seen the maned wolf live in nature and 29% of rural respondents (16 out of 51) had seen it within their own properties. However, while urban residents who had seen a maned wolf live in nature displayed more knowledge and positive attitudes and beliefs toward the species (as suggested by Kellert 1984 and Kveelen 1998), rural residents who saw the maned wolf live on their property did not (as suggested by Bangs et al. 2005). Many within this group tended to believe that maned wolf numbers were increasing and that they were a threat to livestock and to people, suggesting that the experience triggered feelings of insecurity and fear on landowners. Similar feelings have been observed when wild animals invade people's personal space (Bangs et al. 2005; Michelle et al. 2005).

Conflicts between rural and urban interests

Conflicts between rural people and urban administrations are a common issue that affect the relationships between people and protected wildlife. In São Paulo state Arruda (2000) has suggested that the use of natural resources by local people within CUs and neighbouring areas leads to conflict with the administration.

In the sample, many rural people were *sitiantes*⁴ (or part of their family units), inhabiting small holdings and selling their produce to large agricultural companies (figure 2). Such lifestyles might provide small rural producers with enough economic support to free them from reliance on supplementing their income with resources from the wild areas, giving them some leeway to withstand eventual losses to

⁴ Small rural producers

wildlife, thus reducing potential conflict with CU management. There may be associations between income, reliance on natural resources and vulnerability to wildlife related damage, and attitudes toward conservation, which could be investigated further. My results, however, provided no indication of a strong antagonism between local rural and urban interests in areas concerning the conservation of the maned wolf.

3.3.7. Human dimensions: Local people and support for the conservation of the maned wolf

It is understood that predation affects landowners differentially according to their socio-demographic conditions (Knight 2000; Breck 2004; Hill 2004). Hence the importance of understanding landowners' perceptions of conflict goes hand in hand with the importance of conservation on private land: support for the latter cannot be enlisted without consideration of the former. Large carnivores cannot survive only in protected zones as they require a vast home range, so their survival depends on linked areas of healthy habitat and on the tolerance and support of neighbouring landowners and residents of rural areas (Clark et al. 2001; Macdonald and Sillero-Zubiri 2004; Michelle et al. 2005; Woodroffe et al. 2005, Sollmann et al. 2010). Within such a picture, rural people are not the problem, but are part of the solution, and their beliefs, values and culture must be taken into account by conservation programmes (Taylor 2004, 2009).

Results from this research suggest that the great majority of local people in the sample across all target groups, locations and demographic characteristics believed

the maned wolf must be protected. The fact that coexistence between local people and the maned wolf has been consistent and uninterrupted may facilitate acceptance and tolerance towards the species, as suggested by Bath (2009). Kaczensky et al. (2004) findings suggest that in view of their positive attitudes towards the maned wolf local people may support actions favourable to them, tolerate damage caused by them (as it was indicated by rural respondents), and maintain their position in case of conflict. Research on other carnivores indicates that positive choices may occur as long as local people can make informed decisions in support of maned wolf conservation (Kellert et al. 1996; Kaczensky et al. 2004; Andersone 2005; Randveer and Mãe 2005; Bath 2009). As well as information, related peer group expectations and perceived control over their behaviours must also be considered when ascertaining the strength of people's intentions (as suggested by the Theory of Planned Behaviour, Daigle et al. 2002) towards maned wolf conservation.

3.4. Next steps in research and conservation

The success of maned wolf conservation depends on large areas of healthy habitat⁵, public support, co-existence and on the reduction of risks to them and to people to further a successful coexistence, within and outside of protected areas. Understanding people's attitudes towards maned wolves involves investigating social-cultural elements pervading this relationship, and this understanding is essential for any attempt to change or influence behaviour. In this session I suggest

⁵ "heterogeneous matrix of woody fruiting plants and grassland rodent habitat" (Castro and Emmons 2012:55)

areas for further investigation and concern, which emerged from mine and other people's research and are relevant to the maned wolf conservation scenario.

3.4.1. Towards co-existence and mitigation of conflict

Public perceptions of damaging impacts caused by a species cannot be shifted by research and knowledge alone. It is necessary to identify measures that can be perceived as effective by the local people who are involved in conflict (Woodroffe et al. 2005; Bath 2009; Majic and Bath 2010). Methods to resolve people-carnivore conflict around the world have been addressed by many authors (Musiani et al. 2002; Treves and Karanth 2003; Breck 2004; Macdonald and Sillero-Zubiri 2004; Mattson 2004, Sillero-Zubiri et al. 2004) and can be grouped as follows (Boitani et al. 2004:148):

- 1 prevention: means of avoiding conflict, by preventing carnivore attacks on livestock, including changes in husbandry; by avoiding harmful contact between people and carnivore species
- 2 mitigation: compensation for losses, making them more acceptable to people; improving tolerance of species
- 3 control: means of controlling carnivore populations, including translocations and removal of individuals.

Research into how to apply these methods to the maned wolf scenario may offer some of the answers to increase support to conservation amongst affected groups. A review of measures to address and mitigate conflict in relation to the maned wolf

scenario can be found in Consorte-McCrea 2011 (pp245-260).

3.4.2. Clarifying misconceptions and addressing negative attitudes

Although most respondents displayed positive attitudes towards the maned wolf the impact of the negative attitudes of minority groups cannot be ignored, considering the status of the species. According to Bath (2009), for some species the conflict with people may have a cognitive nature (based on a lack of knowledge or misconceptions), while for others it may be rooted in a hierarchy of values (pitching conservation against livelihood); relate to costs and benefits; or spring from a lack of trust and conflicts between interest groups themselves. In the case of the maned wolf, results suggest that negative attitudes are associated with misconceptions concerning feeding habits and to learned associations with *Canis lupus*; to a perception of threat related to the proximity of the maned wolf within people's properties; and possibly to values undermining the importance of local wildlife. Therefore conservation education programmes for the maned wolf must target knowledge as well as values.

Change in negative attitudes that have a cognitive nature (such as misconceptions), on the other hand, may be targeted by disseminating clear and accurate information about specific beliefs regarding the species (size, weight, population numbers, density and distribution patterns, threatened status) amongst some groups. Dissociating its image to the one of the European wolf and clarifying misapprehensions about their feeding habits may contribute to the elimination of fears towards the species (Dietz 1984; Motta-Junior 2000; Anic 2002, Bath 2009).

The spread of specific information about the potential benefits that maned wolves may bring to the lives of local people (the dissemination of seeds of Cerrado fruits and pest control) may contribute to increased support for the conservation of the species (Motta-Junior 2000; Anic 2002). Behavioural change may be targeted using information associated with feelings of connection with the maned wolf. This may be achieved by enlisting nationalistic feelings and developing a local pride in order to help preserve a species that belongs to the national heritage (Dietz 1986; Hungerford and Volk 1990; Sillero-Zubiri et al. 2004). The effectiveness of any educational strategies will also depend on the credibility of the information source amongst local people and on the appropriate choice of medium.

Cooperation between accurate information sources (zoos, museums, CUs and environmental education courses) and the most far reaching media (TV and radio) would help to improve the quality of information and could increase support for maned wolf conservation.

Maned wolf mortality was associated with lack of appreciation and ignorance towards the species, which may be linked to an agenda for rural development for the Cerrado. Hunting, nevertheless, may be ingrained in indigenous roots and cultural traditions of local people, or sport. Further research into local people's attitudes towards hunting may help to identify which groups are the potential foci of conflict with maned wolf conservation.

Neutral attitudes were more common than negative attitudes in my research (see table 4.), and were particularly strong amongst sixth-form students. They provide a good opportunity for advances in coexistence and are the most likely to be influenced positively, making them a good target for conservation programmes.

Based on most people's positive attitudes towards the species, its attractive characteristics and on its potential as umbrella, the maned wolf could be an effective flagship for the conservation of the Cerrado habitat. Local people's self-esteem may be promoted by fostering integration between natural resources and cultural values; existing bonds between species such as the maned wolf and environment which contribute to feelings of ownership, themselves important components in behavioural change, could be strengthened in favour of wildlife conservation.

Attitudes towards other interest groups

The ability of conservation programmes to foster change to the present scenario of decline will rely on the relationships between bio/education professional and local people. Bonding may be achieved by the inclusion of diverse local groups in the development of plan directives and in the identification of local needs, which may also be addressed by conservation programmes. Assistance from rural people who display the highest levels of positive attitudes towards maned wolf conservation, should be enlisted to help foster positive changes in attitudes amongst their peer group. By enlisting the local expertise, conservation professionals can promote a rich exchange of information with people who hold traditional knowledge about the local natural environment.

Professionals from schools, zoos and conservation units, in this sample, consistently displayed negative expectations of the attitudes of people living in the neighbourhood of reserves and such feelings must also be addressed. This is to prevent the creation of negative bias in their contact with local people, with consequent alienation (Taylor 2004). Thus educational initiatives will need to target bio/education professionals as well as local communities. Information, reflection and critical thinking are favoured as a way forward together with emphasis on reciprocity and cooperation on the exchange of expertise about the local environment.

3.5. Acknowledgments

I would like to thank the CCCU for funding my research, and Dr Mike Nicholls and Rona Rubin for supervising. Thanks to Stephen Scoffham for his insights and for revising this chapter, and to John Hills for making the map. Thanks to São Paulo Zoo, the IF-SP, Juquery State Park, UFSCar and to all the organizations and individuals who took part in the research for their support, infrastructure and for responding the questionnaires.

References

- Andersone, Z., 2005. *People and carnivores in Latvia: attitude survey*. Wolf Print 23, p17.
- Anchieta, J. De, 1988. Cartas. Informações, fragmentos históricos e sermões. EDUSP, São Paulo, SP, in E.E de Miranda, 2003. *Natureza, Conservação e Cultura*. Metalivros, São Paulo.
- Anic, C.C., 2002. *Conhecimentos e crenças de algumas populações rurais no sudeste do Brasil frente ao lobo-guará Chrysocyon brachyurus, Illiger, 1815 (Mammalia; Canidae)*. Dissertação de Mestrado, Instituto de Biociências da USP, Departamento de Ecologia. 73 pp.
- Ajzen, I, & Fishbein, M., 1980. *Understanding attitudes and predicting social behaviour*. Englewood Cliffs N.J., Prentice-Hall. 278p
- Almeida, C.X., 1997. *Importância da auto-estima no Projeto Cerrado, Casa Nossa, do Jardim Botânico de Brasília*, in Padua, S.M., Tabanez, M.F.(eds), 1997. *Educação ambiental: caminhos trilhados no Brasil*. IPE, Instituto de Pesquisas Ecológicas, Brasil, pp: 201-210.
- Aragona, M. & Setz, E.Z., 2001. *Diet of the maned wolf, Chrysocyon brachyurus, (Mammalia; Canidae), during wet and dry seasons at Ibitipoca State Park, Brazil*. Journal of Zoology, v.254 (1):131-136.
- Arruda, R.S., 2000. *“Populações tradicionais” e a proteção dos recursos naturais em unidades de conservação*, in Diegues, A.C.S., 2000. *Etnoconservação. Novos rumos para a proteção da natureza nos trópicos*. São Paulo, SP. Editora Hucitec, NUPAUB-USP, pp:273-290.
- Bangs, E. E., Fontaine, J.A., Jimenez, M.D., Meier, T.J., Bradley, E.H., Niemeyer, C.C., Smith, D.W., Mack, C.M., Asher, V., and Oakleaf, J.K, 2005. *Managing wolf-human conflict in the northeastern United States*. . In: Woodroffe, R., Thirgood, S., Rabinowitz, A., (eds) 2005. *People and wildlife: conflict or co-existence?* Conservation Biology 9. Cambridge University Press, pp 340-356.
- Bath, A.J., 2009. *Working with People to Achieve Wolf Conservation in Europe and North America*, in Musiani, M., Boitani, L. and Paquet, P.C., 2009 (eds), *A new era for wolves and people: wolf recovery, human attitudes and policy*. Energy, Ecology and the Environment Series. University of Calgary Press, pp:173-199.
- Bath, A., and Farmer, L., 2000. *Europe's carnivores - a survey of children's attitudes towards wolves, bears and otters*. WWF UK Campaign for Europe's Carnivores 7. WWF-UK Report, March 2000.

- Bath, A., and Majic, A., 2001. *Human dimensions in wolf management in Croatia: understanding attitudes and beliefs of residents in Gorski kotar, Lika and Dalmatia toward wolves and wolf management*. Report, Large Carnivore Initiative for Europe.
- Bestelmeyer, S.V., 2000. *Solitary, reproductive, and parental behaviour of maned wolves (*Chrysocyon brachyurus*)*. PhD Dissertation, Department of Biology, Colorado State University, USA.
- Bizerril, M.X.A. and Andrade, T.C.S., 1999. Knowledge of the urban population about fauna: comparison between Brazilian and exotic animals. *Ciência e Cultura* 51(1): 38-41.
- Bizerril, M. X., Soares, C. C., & Santos, J. P., 2011. *Linking community communication to conservation of the maned wolf in central Brazil*, *Environmental Education Research*, 17:6, 815-827
- Boitani, L., Asa, C. and Moehrensclager, A., 2004. *Conservation tolls for Canids*, in Macdonald, D. and Sillero-Zubiri, C. *The Biology and Conservation of Wild Canids*, Oxford University Press, pp 143-162.
- Bowkett, A.E., 2009. *Recent captive-breeding proposals and the return of the ark concept to global species conservation*. *Conservation Biology*, 23 (3):773-776.
- Breck, S.W., 2004. *Minimizing carnivore-livestock conflict: the importance and process of research in the search for coexistence*, in Fascione, N., Delach, A., Smith, M., 2004. *People and Predators: from conflict to coexistence*. Island Press, Washington DC, pp:13-27.
- Bueno, A.A., Belentani, S.C.S., Motta-Junior, J.C., 2002. *Feeding ecology of the maned wolf, *Chrysocyon brachyurus* (Illiger, 1815) (Mammalia: Canidae), in the ecological station of Itirapina, São Paulo state, Brazil*. *Biota Neotropica* v2(n2).-
- Bueno, A.A. and Motta-Junior, J.C., 2004. *Food habits of two syntopic canids, the maned wolf (*Chrysocyon brachyurus*) and crab-eating fox (*Cerdocyon thous*), in southeaster Brazil*. *Revista Chilena de historia Natural* 77: 5-14.
- Bush, R.H., 1995. *The wolf almanac*. The Globe Pequot Press.USA.
- Candido, A., 2001. *Os parceiros do Rio Bonito*. 9ª edição, Coleção Espi'rito Cri'tico, Duas Cidades, Editora 34, Brasil.
- Carvalho, C.T., 1976. *Aspectos faunísticos do cerrado- o lobo guará (*Chrysocyon brachyurus*)*. IFSP, Bol. Tec., São Paulo , 21:1-18, jun.
- Castilhos, J.C, Alves, D.A.R., and Silva, A.C.C.D., 1997. *Resgate cultural e conservação de tartarugas marinhas*, in Padua, S.M., Tabanez, M.F.(eds), 1997. *Educação ambiental: caminhos trilhados no Brasil*. IPE, Instituto de Pesquisas Ecológicas, Brasil, pp:147-156.

- Castro, J.M. and Emmons, L.H., 2012. *Variation in Diet and Resources*. The Maned Wolves of Noel Kempff Mercado National Park, 37-55. Smithsonian Contributions to Zoology No. 639, 2012
- Clark, T.W., Mattson, D.J., Reading, R.P, & Miller, B.J., 2001. Interdisciplinary problem solving in carnivore conservation: an introduction. In Gittleman, J. *et al.*, 2001. *Carnivore Conservation*: 223-240. Cambridge University Press.
- Consorte, J.G., 2007. *The Black Question in Brazil: An Issue Denied*. In *Routes of passage- Rethinking the African Diaspora*, ed: Ruth Simms Hamilton. Volume 1, part 2. African Diaspora Series Endowment at Michigan State University.
- Consorte-McCrea, A.G., 1994. The maned wolf in captivity. *Canid News*, 2:8-12. The IUCN/SSC Canid Specialist Group.
- Consorte-McCrea, A. G. (2011). *Conservation of the maned wolf (Chrysocyon brachyurus): carnivore and people relationships in the southeast of Brazil*. Canterbury: Thesis submitted to the University of Kent for the degree of Doctor of Philosophy, CCCU.
- Consorte-McCrea, A.G. and Rubin, R., 2009. *Attitudes of zoo visitors and professionals towards the conservation of the maned wolf in southeast Brazil*. *Canid News* 12.1 (online). The IUCN/SSC Canid Specialist Group.
- Conover, M., 2001. *Resolving human wildlife conflicts: the science of wildlife damage management*. CRC Press.
- Costa et al 2005: Costa, L.P., Leiter, Y.L.R., Mendes, S.L., Ditchfield, A.D., 2005. Conservação de mamíferos no Brasil. *Megadiversidade*, 1(1):103-112.
- Courtenay, O., 1994. *Fruitful relations in a changing environment*. *Canid News*, 2:41-43.
- Daigle, J.J., Hrubes, D. and Ajzen, I., 2002. *A comparative study of beliefs, attitudes, and values among hunters, wildlife viewers, and other outdoor recreationists*. *Human Dimensions of Wildlife* 7(1)/ Spring:1-19. Taylor & Francis.
- Dietz, J.M., 1984. *Ecology and social organization of the maned wolf (Chrysocyon brachyurus)*. *Smithsonian Contributions to Zoology*, No 392, 51pp.
- Dietz, J.M., 1987. *Grass roots of the maned wolf*. *Natural History*, 96(3): 52-59.
- Dietz, L.A.H., and Nagagata, E.Y, 1997. *Programa de Conservação do Mico-Leão Dourado: atividades de educação comunitária para a conservação da Mata Atlântica no Estado do Rio de Janeiro*, in Padua, S.M., Tabanez, M.F.(eds), 1997. *Educação ambiental: caminhos trilhados no Brasil*. IPE, Instituto de Pesquisas Ecológicas, Brasil, pp:133-146.
- Ferraz, E., 2000. *Ecologia alimentar e dirpesão de sementes realizada por Chrysocyon*

brachyurus em uma região rural do sudeste do Brasil (Carnivora – Canidae). Protocolo de manejo, III workshop do lobo-guará *Chrysocyon brachyurus*, Sociedade de Zoológicos do Brasil- SZB, pp 42.

- Figueira, C.J.M., 1995. *Ocorrência, relações gerais com residentes e comportamento alimentar do lobo-guará (Chrysocyon brachyurus) em zona rural do estado de Minas Gerais*. UNESP, Rio Claro, SP. Monografia (Bacharelado em Ecologia) 35pp.
- Fiori, A.de, 2006. *A percepção ambiental como instrumento de apoio de programas de educação ambiental da Estação Ecológica de Jataí (Luiz Antonio, SP)*. Tese de doutorado, UFSCar, São Carlos, SP. 113p.
- Freefy, R., 1983. *Man and beast: the natural and unnatural history of British mammals*. Blandford Books Ltd, UK.
- Gittleman, J.L., Funk, S.M., Macdonald, D., & Wayne, R.K., 2001. *Carnivore Conservation*. Cambridge University Press, Cambridge, UK.
- Hill, C., 2004. *Farmers' perspectives of conflict at the wildlife-agriculture boundary: some lessons learned from African subsistence farmers*. Human Dimensions of Wildlife 9(4)/Winter. Taylor & Francis.
- Hungerford, H.R. & Volk, T.L., 1990. *Changing learner behavior through environmental education*. Journal of Environmental Education 21 (3): 8-21.
- Ihering, R., 1968. *Dicionário dos animais do Brasil*. Brasília, DF., Ed. Universidade de Brasília.
- IUCN, 2009. Red Data Book. www.iucnredlist.org/
- Juarez, M.K., and Marinho-Filho, J., 2002. *Diet, habitat use, and home ranges of sympatric canids in central Brazil*. Journal of Mammalogy, 83(4):925-933.
- Kaczensky, P., Blazic, M., Gossow, H., 2004. *Public attitudes towards brown bears (Ursus arctos) in Slovenia*. Biological Conservation 118:661-674.
- Kellert, S. R. (1984). Urban American perceptions of animals and the natural environment. *Urban Ecology*, 209-228.
- Kellert, S.R., 1985. *Public perceptions of predators, particularly the wolf and coyote*. Biological Conservation 31:167-189.
- Kellert, S.R., Black, M., Rush, C.R., Bath, A.J., 1996. *Human culture and large carnivore conservation in North America*. Conservation Biology 10 (4): 977-990.

- Klink, C.A. and Machado, R. B., 2005. *Conservation of the Brazilian Cerrado*. Conservation Biology, 19 (3):707-713.
- Knight, J., 2000. *Natural enemies: people-wildlife conflicts in anthropological perspective*. Routledge, London.
- Kruuk, H., 2002. *Hunter and hunted, relationships between carnivore and people*. Cambridge University Press.
- Kvaalen, I, 1998. Acceptance of lynx by sheep farmers- a sociological comparison. Council of Europe Publishing. Strasbourg Cedex.pp. 59-64.
- Lombardi, J.A., & Motta-Junior, J.C., 1993. *Seed dispersal of Solanum lycocarpum St.Hil. (Solanaceae) by the maned wolf, Chrysocyon brachyurus Illiger (Mammalia, Canidae)*. Ciencia e Cultura 45(2):127.
- Macdonald, D.W., & Sillero-Zubiri, C., (eds.) 2004. *The biology and conservation of wild canids*. Wildlife Conservation Research Unit, University of Oxford, Oxford University Press. 432pp.
- Magalhães, A.C., 1939. *Ensaio sobre a fauna brasileira*. Secr. Agric. Ind. Com. SP. Brasil.
- Majic, A., & Bath, A. J. (2010). Changes in attitudes toward wolves in Croatia. *Biological Conservation*, 155-260.
- Mattson, D.J., 2004. *Living with fierce creatures? An overview and models of mammalian carnivore conservation*, in Fascione, N., Delach, A., Smith, M., 2004. *People and Predators: from conflict to coexistence*. Island Press, Washington DC, pp.=151-178.
- McNeely, J.A., 2000. *Practical approaches for including mammals in biodiversity conservation*. Priorities for the Conservation of Mammalian Diversity: Has the Panda Had its Day? Eds: A. Entwistle and D. Dunstone. Pp 355-367. Cambridge University press, Cambridge, Uk.
- Michelle, D., Nikolaev, I., Goodrich, J., Litvinov, B., Smotnov, E., Suvorov, E., 2005. *Searching for the coexistence recipe: a case study of conflicts between people and tigers in the Russian Far East*. In: Woodroffe, R., Thirgood, S., Rabinowitz, A., (eds) 2005. *People and wildlife: conflict or co-existence?* Conservation Biology 9. Cambridge University Press. 305-322.
- Miller, F.W., 1930. Notes on some mammals of southern Matto Grosso, Brazil. J. Mammalogy, v.11:10-22.
- Miranda, E.E.de, 2003. *Natureza, Conservação e Cultura*. Metalivros, São Paulo.

- Marvin, 2000. *The problem of foxes: legitimate and illegitimate killing in the English countryside*. In: Knight, J. (ed). *Natural enemies: people-wildlife conflicts in anthropological perspective*. Routledge, London, 189-211.
- MMA, 2008. Ministério do Meio Ambiente. Accessed 20-10-08. <http://www.mma.gov.br/sitio/>
- Motta-Junior, J.C., 2000. Variação temporal e seleção de presas na dieta do lobo-guará, *Chrysocyon brachyurus* (Mammalia: Canidae), na Estação Ecológica de Jataí, Luiz Antônio, SP. Pp. 331-346. In: Santos JE & JSR Pires (eds) *Estudos integrados em ecossistemas. Estação Ecológica de Jataí. Volume 1*. Rima Editora, São Carlos, Brasil.
- Musiani, M., Mamo, C., Boitani, L., Callaghan, C., Cormack Gates, C., Mattei, L., Visalberghi, E., Breck, S., Volpi, G., 2002. *Wolf depredation trends and the use of fladry barriers to protect livestock in western North America*. *Conservation Biology* 17, 6:1538-1547.
- Padua, S.M., and Padua, C.V., 1997. *Um programa integrado para a conservação do mioc-leão-preto (*Leontopithecus chrysopygus*)- pesquisa, educação e envolvimento comunitário*, in Padua, S.M., Tabanez, M.F.(eds), 1997. *Educação ambiental: caminhos trilhados no Brasil*. IPE, Instituto de Pesquisas Ecológicas, Brasil, pp:119-132.
- Padua, S.M., Tabanez, M.F.(eds), 1997. *Educação ambiental: caminhos trilhados no Brasil*. IPE, Instituto de Pesquisas Ecológicas, Brasil.
- Paula, R.C.; Medici, P.; Morato, R.G. (org). 2008. *Plano de Ação para a Conservação do Lobo-Guará -Análise de Viabilidade Populacional e de Habitat*. Brasília: Centro Nacional de Pesquisas para Conservação dos Predadores Naturais-CENAP/ICMBio, 158p.
- Pontes-Filho, A., Silva, C.B.X., Lange, R.R., & Cavalcanti, R.K., 1997. *Projeto Lobo-guará-contribuição à conservação ambiental dos Campos Gerais do Paraná, Brasil*. Congresso Brasileiro de Unidades de Conservação, Curitiba, PR., vol II:848-860.
- Puglia, L.R.R., 1978. *O lobo guará em cativoiro*. *Revista de Zoológico*, n.1, Sorocaba, 1978. 6 p.
- Queirolo, D., Moreira, J.R., Soler, L., Emmons, L.H., Rodrigues, F.H.G., Pautasso, A.A., Cartes, J.L. and Salvatori, V., 2011. *Historical and current range of the Near Threatened maned wolf *Chrysocyon brachyurus* in South America*. *Oryx*, 45, pp 296-303
- Randveer, T., and Mäe, K., 2005. *Whose afraid of the big bad wolf in Estonia?* *Wolf Print* 23, p.12-13.
- Ribeiro, R.F., 2003. *Bestiário Brasílico: a nossa fauna no imaginário colonial*. PUC Minas Gerais, Dept. Antropologia.
www.anppas.org.br/encontro_anual/encontro2/GT/GT16/gt16_ricardo_ferreira.pdf

- Rocha, L.M., 1997. *Unidades de conservação e organizações não-governamentais em parceria: programas de educação ambiental*, in Padua, S.M., Tabanez, M.F.(eds), 1997. *Educação ambiental: caminhos trilhados no Brasil*. IPE, Instituto de Pesquisas Ecológicas, Brasil, pp:237-246.
- Rodrigues, F.H.G., 2002. *Biologia e conservação do lobo-guará na Estação Ecológica de Águas Emendadas, DF*. Tese de doutorado em Ecologia. Instituto de Biologia da Universidade Estadual de Campinas.
- Rodrigues, F., and de Paula, R., 2007. *Biologia Comportamental e Conservação do Lobo-Guará (*Chrysocyon brachyurus*) no Cerrado de Minas Gerais*. Pró-Carnívoros, Instituto para a conservação dos carnívoros neotropicais. <http://www.procarnivoros.org.br/acoes.php>
- Santos, E.F., Setz, E.Z.F., Gobi, N., 2003. *Diet of the maned wolf (*Chrysocyon brachyurus*) and its role in seed dispersal on a cattle ranch in Brazil*. *Journal of Zoology* (2003), 260: 203-208 Cambridge University Press.
- Sergio, F., Newton, I., Marchesi, L. and Pedrini, P., 2006. Ecologically justified charisma: preservation of top predators delivers biodiversity conservation. *J. Appl. Ecology* (43): 1049-1055.
- Sillero-Zubiri, C., Hoffmann, M. and Macdonald, D.W. (eds). 2004. *Canids: Foxes, Wolves, Jackals and Dogs. Status Survey and Conservation Action Plan*. IUCN/SSC Canid Specialist Group. Gland, Switzerland and Cambridge, UK. x + 430 pp.
- Silva, C.B.X. 2000. Projeto lobo guará – uma contribuição à conservação dos Campos Gerais no Paraná, Brasil. Em: *workshop do lobo guará*, 3, 1998, São Bernardo do Campo. Protocolo de manejo do lobo guará mantidos em cativeiro. Sorocaba: Sociedade de Zoológicos do Brasil. p.43-49
- Silva, C.B.X, Nicola, P.A., 1999. *Observações sobre o lobo guará no Parque Estadual de Vila Velha, Ponta Grossa, Paraná, Brasil*. In: Congresso Brasileiro de Conservação e Manejo da Biodiversidade, 23, Ribeirão Preto, anais.
- Silva, A.J. and Talamoni, S.A., 2004. *Core area and centre of activity of maned wolves, Chrysocyon brachyurus (Illiger) (Mammalia, Canidae), submitted to supplemental feeding*. *Revista Brasileira de Zoologia* 21(2):391-395.
- Sollmann, R., Furtado, M.M., Jácomo, A.T.A., Tôrres, N.M., Silveira, L., 2010. *Maned wolf survival rate in central Brazil*. *Journal of Zoology* 282:207-213.
- Songsasen, N. and Rodden, M.D., 2010. *The role of the Species Survival Plan in maned wolf Chrysocyon brachyurus conservation*. *Intl Zoo Yearbook* 44:1-13.
- Sorrentino, M., 1997. *Educação Ambiental e Universidade: um estudo de caso*, in Padua, S.M., Tabanez, M.F.(eds), 1997. *Educação ambiental: caminhos trilhados no Brasil*. IPE,

Instituto de Pesquisas Ecológicas, Brasil, pp:43-54.

- Strauss, A., 2004. *Carnivore Education: beyond biology*. . Carnivores 2004: expanding partnerships in carnivore conservation. 5th Defenders of Wildlife Conference. November 14-17, Santa Fe, New Mexico, p.38.
- Taylor, D., 2004. *Conservation Education and its Relevance to Wild Canids*, in Sillero-Zubiri, C., Hoffmann, M. and Macdonald, D.W. (eds). 2004. *Canids: Foxes, Wolves, Jackals and Dogs. Status Survey and Conservation Action Plan*. IUCN/SSC Canid Specialist Group. Gland, Switzerland and Cambridge, UK, pp 298-305.
- Taylor, D., 2009. *Education as a conservation strategy: exploring perspective transformation*, in Musiani, M., Boitani, L. and Paquet, P.C., 2009 (eds), *A new era for wolves and people: wolf recovery, human attitudes and policy*. Energy, Ecology and the Environment Series. University of Calgary Press, pp:161-172.
- Treves, A. and Karanth, K., 2003. *Human-carnivore conflict and perspectives on carnivore management worldwide*. *Conservation Biology* 17, 6: 1491-1499.
- Vanstreels, R.E.T & Pessutti, C., 2010. *Analysis and discussion of Maned Wolf *Chrysocyon brachyurus* population trends in Brazilian institutions: lessons from the Brazilian studbook, 1969-2006*. *Int. Zoo Yb* 44: pp. 121-135.
- Villas-Bôas, O, & C. Villas-Bôas, 2004. *A marcha para o Oeste: epopeia da expedição Roncador- Xingu*. 6^a edição, Editora Globo, Brasil.
- Woodroffe, R., Thirgood, S., Rabinowitz, A., (eds) 2005. *People and wildlife: conflict or co-existence?* *Conservation Biology* 9. Cambridge University Press.

Target groups	Total
students 12-13 year olds	176
students 16-17 year olds	174
zoo visitors	110
CU visitors	39
school prof	36
zoo prof	66
CU prof	31
rural population	54
International Paper	35
other	04
Total	725

Table 1. Interest groups sampled in the research

Type of questionnaire	Frequency	Percent
Q1-General public and students who recognized the maned wolf	451	62.2
Q2-General public and students who did not recognize the maned wolf	77	10.6
Q3-Biology, conservation and education professionals	143	19.7
Q4-Rural population	54	7.4
Total	725	100.0

Table 2. Frequency and percentages of respondents for each separate questionnaire from the total of 725 individuals who completed the questionnaires

What do you think about the maned wolf? Ex: Bad <u>1</u> ; <u>2</u> ; <u>3</u> ; <u>4</u> ; <u>5</u> ; <u>6</u> ; <u>7</u> Good				
Evaluative factors	negative<4	neither	positive>4	No answer
Bad/good	22	52	300	77
Ugly/beautiful	38	51	297	65
Coward/brave	21	66	254	110
Dangerous/harmless	77	78	193	103
Aggressive/defensive	59	77	204	111
Worthless/valuable	22	50	291	88
Ferocious/tame	109	90	162	99
Evaluative factors total (respondents=451; responses=2513)	348	464	1701	653
Potency factors	<4	neither	>4	No answer
Weak/strong	27	88	253	83
Powerless/powerful	105	85	142	119
Small/big	70	119	163	99
Potency factors total (respondents=451; responses=1015)	202	292	521	301
Total (respondents=451; responses= 3528)				

Table 3. Q1 respondents' beliefs about the maned wolf according to evaluative and potency factors. Respondents were asked to rate objects in terms of bipolar adjectives, based on Osgood's Semantic Differential Method (Ajzen and Fishbein, 1980)

If a maned wolf is found attacking livestock:	Experience of damage		Total responses
	No damage	Damage caused by maned wolf or other animal	
it must be trapped	2	1	3
it must be killed	3	1	4
it must be handed over to the authorities	18	4	22
body parts must be harvested one must set the dogs after it	0	0	0
one must scare it away	2	3	5
one must reinforce chicken pen	9	4	13
	2	0	2
Total responses	36	13	49
Total respondents	42	12	54

Table 4. Rural respondents' (Q4) attitudes towards maned wolves found attacking livestock, by damages

Aspect	Result	Chi squared Statistics
Knowledge		
Positive identification of maned wolf from photo	All respondents from São Paulo State Rural respondents > zoo visitors	20.6; df=5, p=0.001
Wrongly identified chicken as favourite food item	Educated up to sixth-form < other education groups Rural respondents > other groups	40.4; df=6; p<0.001 95.8; df.=15; p<0.001
Knowledge score		
high	(Q1) Saw maned wolf live in nature > no use of this source	13.5; df=1; p<0.001
low	Saw maned wolf live in nature < no use of this source Information from school or environmental education course < no use of this source	23.9; df=1; p<0.001 11.8; df=1; p=0.001
Attitudes towards m.w.		
Don't care about maned wolf	Rural residents > urban residents Educated up to year 10 > more educated	12.1; df=1; p=0.001 23.2; df=3; p<0.001
Value associated with biodiversity	Belief that mw needs protection it plays a role in conserving the ecosystem	39.3; df=3; p<0.001 33.0; df=3; p<0.001
Negative attitudes		
Mw scares and attacks people	Rural respondents > other target groups	11.6; df=5; p=0.041*
Mw attacks chicken pens and livestock	Rural respondents > sixth-form students, CU visitors Rural residents > urban residents	101.2; df=5; p<0.001 41.9; df=1; p<0.001
Sources of information about mw		
Saw the mw live in nature	Belief that mw attacks chicken pens and livestock Belief that mw must be protected Belief that mw attacks and scares people	15.5; df=1; p<0.001 17.8; df=1; p<0.001 11.9; df=1; p=0.001
zoos, museums and CU	Belief that mw must be protected	19.9; df=1; p<0.001

Table 5. Summary of strong statistical associations per question category

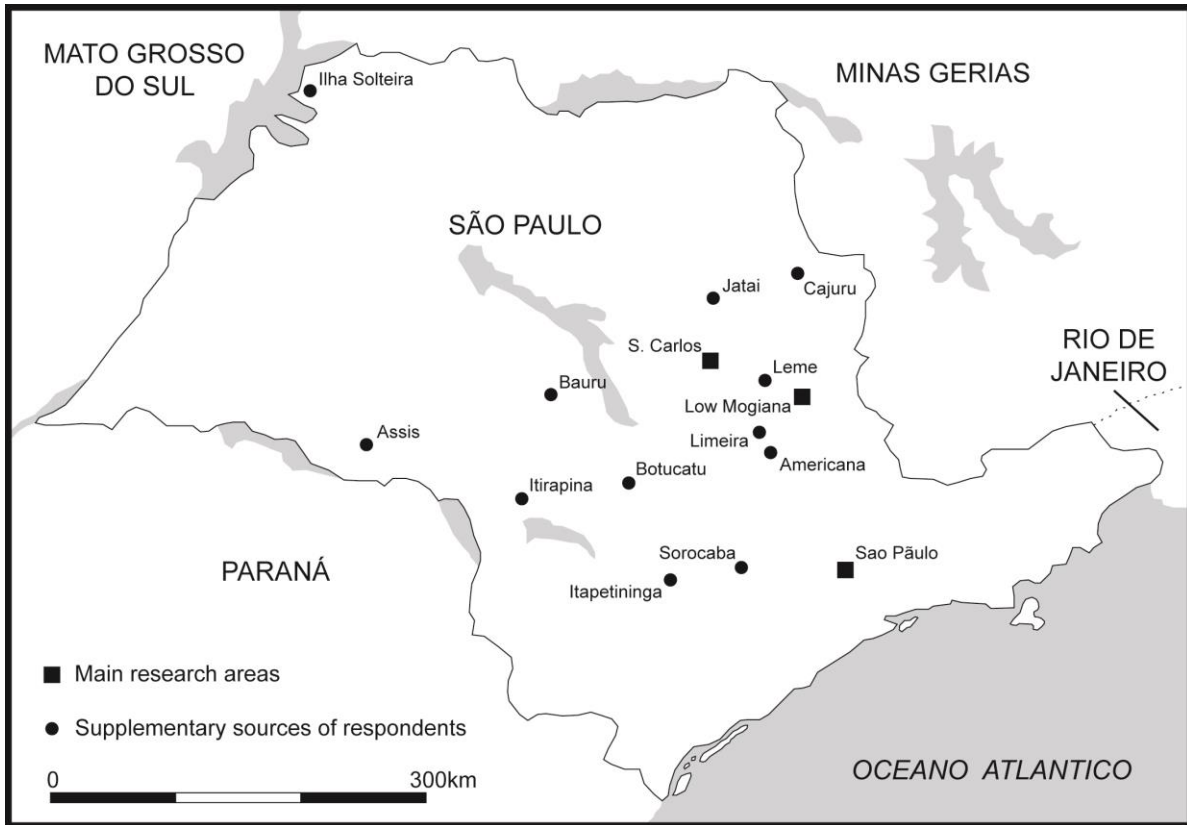


Figure 1. Research sites (main and supplementary information sources). Map by John Hills, 2012.



Figure 2. a. orange plantations in the Low Mogiana region are the main crop in rural areas surrounding conservation units, followed by sugar cane plantations; b. sugar cane plantations in rural São Carlos are responsible for most of the agricultural revenue.