Lions of West Africa : ecology of lion (Panthera leo Linnaeus 1975) populations and human-lion conflicts in Pendjari Biosphere Reserve, North Benin

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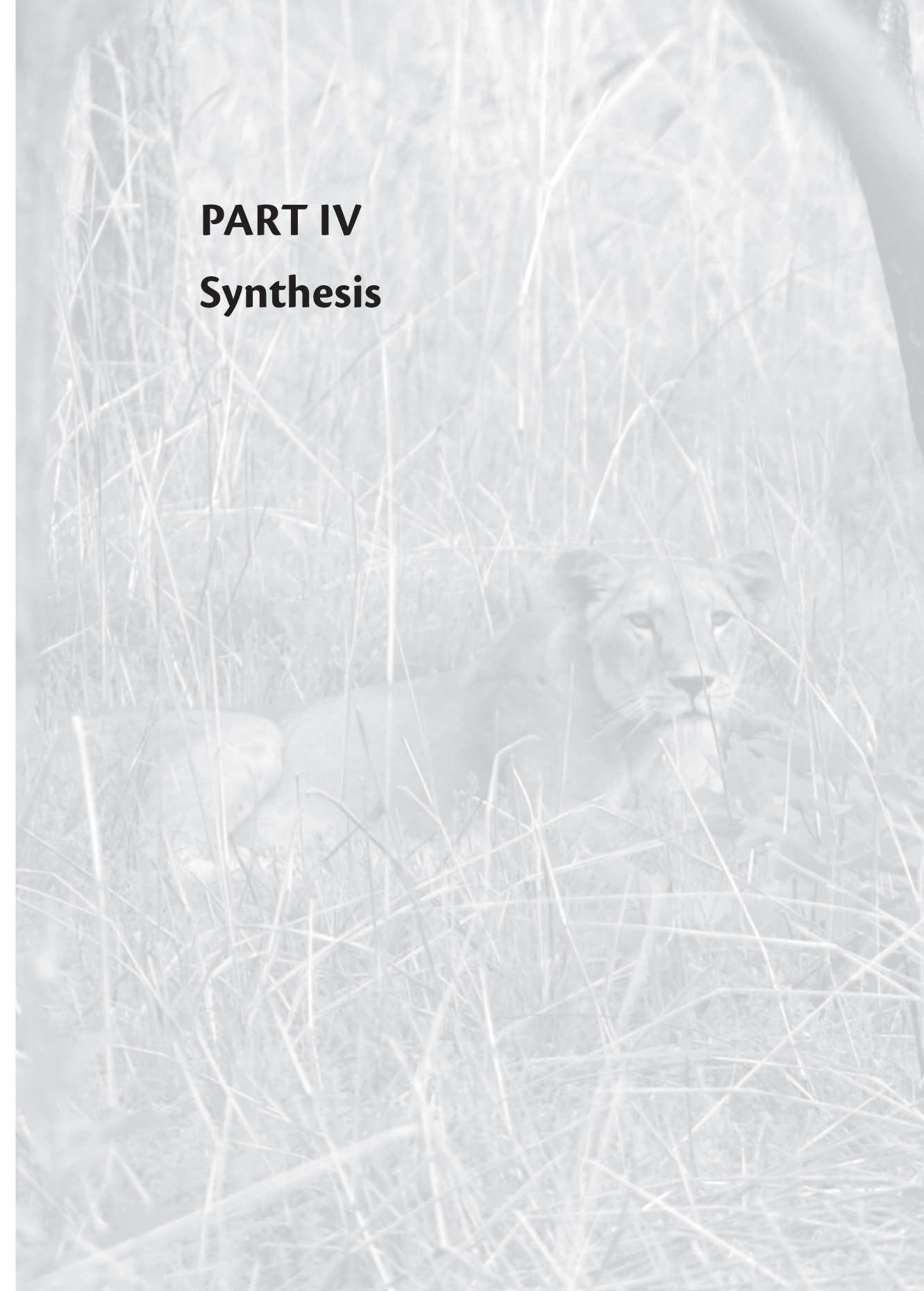

PART IV
Synthesis

7 Synthesis

7.1 Introduction

As set out in the introduction, this research aimed to address some aspects of the ecology of lions and their conflicts with humans in the Pendjari Biosphere Reserve, West Africa. The objectives of the study were to assess the characteristics of human-predator conflicts and how people perceive these conflicts, examine lion population social structure, analyse lion diet and determine habitat use by lions. We aimed at obtaining a better understanding of a typical lion population from West Africa in order to identify the threats faced by such populations, to identify challenges for their conservation and to raise awareness among policymakers so as to develop policies aimed at conserving regionally endangered lion populations.

7.2 Carnivore-livestock conflicts

Since the improvement of conservation activities in the Pendjari Biosphere Reserve in 2000, human-carnivore conflicts have been increasing. Lion, the third livestock depredator after spotted hyaena and baboon, is responsible for 18% of livestock attacks reported in this study. Like in many other areas (Patterson *et al.*, 2004), carnivore attacks peaked in the rainy season. During this period, wild prey are randomly dispersed in the area where visibility is reduced due to the height of the grass, making hunting more difficult than during the dry season when most species are concentrated around the few remaining waterpoints. Lion predated mostly on cattle but also on small livestock. As expected, predation was higher closer to the protected area. Livestock depredation in Pendjari, like in many other areas in the region and elsewhere in Africa (Ogada *et al.*, 2003) was favoured by poor husbandry techniques. The minor significance of lion-human conflicts suggests that lions in the Pendjari region do not depend on livestock, in contrast to many other parts of Africa (Patterson *et al.*, 2004; van Bommel *et al.*, 2007) where the frequency and intensity of conflicts is greater.

People living around the Pendjari Biosphere Reserve were tolerant of conflicts. Most people supported conservation activities but they have a generally negative perception of carnivores. The local population has a moderate knowledge of

carnivore species, probably due to the proximity of the reserve and their tolerance to conflicts could be partly attributed to their cultural background, which favors the conservation of carnivore species. It is important to note that the tolerance varied according to ethnic groups: the Berba were the least tolerant, while the Waama were the most tolerant group. Other factors such as age and cultural background also affect how people perceive conflicts. With modernization and the associated loss of traditional values, more efforts should be done to encourage local communities to participate in conservation efforts. An integrated approach, combining education, the promotion of improved husbandry techniques and the development of economic incentives together with the effective participation of local populations could help to mitigate conflicts and save the threatened carnivore species of West and Central Africa. The economic incentives to be developed should be chosen after effective consultation with local people. Projects such as those of the Network for Lion Conservation in West and Central Africa (ROCAL) conflict-mitigation projects around Pendjari Biosphere Reserve (Tehou, 2009) should be developed on a larger scale. Projects should take into account the needs of each ethnic group or each socio-professional class, with special consideration for women. As it has been pointed out in chapter 3 on perceptions, people should be aware that all these projects exist because of the protected areas and that they are a form of compensation for losses and damages. Wildlife and environmental education could be added to school programs in order to develop awareness among the youth. Children are the future, and properly educating them will help to guarantee conservation of the lion and of wildlife in general.

Fortunately despite the occurrence of predator-livestock conflicts, disturbing behaviour such as the retaliatory killing of lions and other carnivores was not common in Pendjari Biosphere Reserve. Improved participation of the local population in conservation programmes helps prevent negative behaviour. The park staff is already making appreciable efforts in this direction (Tiomoko, 2007), however local peoples' perceptions revealed that these actions were not yet sufficient.

If possible, future projects should integrate traditional knowledge. A preliminary study has been done on how cultural aspects and traditional hunters could be used in conservation activities around Pendjari Biosphere Reserve (Ratié, 2010). However this initiative, that would empower local people, also carries a certain risk so it will be important to conduct it gradually and take enough safeguards to prevent any failure.

7.3 Elements of lion ecology in Pendjari Biosphere Reserve

The three top factors that threaten lions with extermination in West and Central Africa have been identified by the Lion Conservation Strategy (IUCN/SSC Cat Specialist Group, 2006) as the loss, degradation and fragmentation of the habitat, the loss of a wild prey base and human-lion conflicts. The assessment of human-carnivore conflicts in Pendjari Biosphere Reserve suggested that these conflicts were not as important as in most other parts of West and Central Africa (Bauer *et al.*, 2003; Bauer *et al.*, 2010). Other factors such as human encroachment on lion habitat and hunting have probably more impact on the survival of lion populations in this reserve.

Lion occurred in Pendjari Biosphere Reserve at a density of 1.6 lions/100 km^2. In contrast to most populations in West and Central Africa (IUCN/SSC Cat Specialist Group, 2006; Tumenta *et al.*, 2009; Henschel *et al.*, 2010), the lion population in the Pendjari Biosphere Reserve is increasing. This reserve thus offered a more effective protection to lion populations than most protected areas in the region. The mean group size of 2.6 individuals was significantly higher in the National Park than in the hunting zones. Although pride size has not been estimated, we know that lions do form prides in West Africa. Human disturbance, mainly through poaching and sport hunting led to high mortality and considerable edge effects, thereby contributing to the small group size of lions in West Africa. Surprisingly, the sex ratio was not in favour of females as it is normally observed in lion populations. This may be partly due to the monitoring method used that could lead to overestimate males' proportion in the population. However the low proportion of females and cubs suggested a high mortality and pressure on lions in the reserve. This sex ratio suggested particularly a high female mortality that could not be explained in Pendjari. This implies that either the threat comes from adjoining reserves in Burkina Faso or there is poaching of lionesses in Pendjari that is unknown to us. Considering that the hunting quotas are relatively low and that the known poaching level is also low, it is likely that the pressure may come from neighbouring areas. Indeed Pendjari is part of an ensemble of five protected areas with their annex zones in four countries: W in Benin, Burkina Faso and Niger, Arly in Burkina Faso, Oti-Mandouri and Kéran in Togo. Currently Pendjari and probably the Niger part of the W transboundary reserves are the best-protected parts of the complex. Pendjari is just adjacent to the hunting zones of Burkina Faso, where the protection status is lower than in Benin (UICN/PACO, 2009). One of the indicators of this lower protection level in Burkina Faso is the large number of poachers and herders that come into Pendjari from the Burkina Faso side. In addition, in the neighbouring areas in Burkina Faso, the lion hunting quota is the highest in the region: more than 20 lions annually (IUCN/PACO, 2009). Similarly, in the neighboring W Benin reserve, there are more conflicts with humans than in Pendjari due to the fact that cattle herders often frequent the park. In contrast to Pendjari, evidence of retali-

atory killing of lions has been found in the past in W Biosphere Reserve in Benin and herders from W admitted to poisoning lions that kill their cattle. The Pendjari lion population probably serves as a source population and the lion population in Burkina Faso and W Benin as a sink. All of this has raised the question of transboundary management of adjoining protected areas. This form of management is very important, as any effort in one country could be destroyed by a lack of action in a neighbouring country. In spite of the relatively good state and increasing trend of the lion population in Pendjari Biosphere Reserve, this population is vulnerable to threats from neighbouring protected areas.

The home range of lionesses in Pendjari reserve is relatively large, but lower than in several other parts of the region (Bauer & de Iongh, 2005). This suggests that prey populations are in a relatively good state. It also probably confirms the lower pressure on lions in the Pendjari Biosphere Reserve. However, considering the size of the territories and the location of most known lions groups or prides in the area, lion populations are vulnerable, due to the edge effects described by Loveridge *et al.* (2007; 2010). Most prides are relatively close to borders, making them vulnerable to sport hunting in Benin, and poaching and sport hunting in Burkina Faso and in the neighbouring W Benin. The size of the home range confirmed that lions from the Park could easily move to hunting zones or to neighbouring protected areas. The role of source population played by Pendjari lion population proves the importance of concerted transboundary management of protected areas between Benin and Burkina Faso.

Assessment of lion diets revealed that diet was predominantly composed of medium-sized prey (60.7% of lion diet) in Pendjari while large-sized prey comprised 38.2% of the diet. However, despite the small group size of lions in the Pendjari, the dominant prey species is large: buffalo, which comprised 21.5% of the prey species in the diet and 50% of the prey biomass. Thus, large groups of lions do not appear to be necessary to capture large prey in Pendjari in contrast to what has been observed elsewhere (Lamprecht, 1978; Packer *et al*., 1990). The most preferred prey were all rather large, i.e., hartebeest and waterbuck, whereas smaller prey such as duikers, oribi and baboon were avoided as was also found by Hayward & Kerley (2005). Therefore, the predominance of small prey in the lion diet in West Africa as found by Bauer *et al*. (2008) is not a consequence of lion preference for small prey but of the greater availability of small prey. The absence of livestock in the diet confirms the relatively low importance of livestock in lion diet inside the Pendjari Biosphere Reserve, contrary to many other areas of the region (Bauer *et al*., 2008; Tumenta *et al*., 2009). Therefore, in a stable habitat with sufficient prey base in West and Central Africa, lions do not frequently prey on livestock even if they are present and represent easy prey. The increasing poaching and illegal grazing level observed recently in the reserve are worrying, as they could affect the predator-prey equilibrium and could be detrimental to large predators such as lions.

7.4 What future for lions in West Africa?

The lion population in the Pendjari Biosphere Reserve has been recovering over the past decade. If the threats to lions can be maintained at a relatively low level, this could help to recolonize the whole WAPOK complex. However even though the lion population is in good condition in Pendjari Biosphere Reserve, it is vulnerable to anthropogenic activities mainly from neighbouring protected areas. In West Africa, two LCUs offer the best hope for lion conservation. These are the W-Arly-Pendjari (WAP) (Benin-Burkina Faso-Niger) and the Niokolo complex (Senegal-Guinea). In each of these conservation units, research efforts and management actions should be implemented in close cooperation. If this is not done, efforts in one country could be easily offset by the lack of action in the neighbouring country. Decision-makers and politicians should be aware of the importance of concerted actions, not only for the conservation of lion and other large carnivores but also for biodiversity in general. A start has already been made, with projects such as the European Union supported WAP project or the European Union project ECOPAS which have been implemented in at least the three countries Benin, Burkina Faso and Niger covered by the WAPO complex. But more efforts are needed. Activities such as periodic and concerted anti-poaching patrols could be organized along the borders by a team with members from several countries. Research should also be conducted in close collaboration with staff of all involved countries. For example, in 2008, hundreds of cattle coming from Burkina Faso were killed in the Pendjari National Park by rangers and military personnel. The effects of cattle on wildlife are known (Fritz *et al*., 1996; Treydte *et al*., 2005) and if efforts had been made in Burkina Faso to protect their area, these cattle would not have intruded into the Pendjari National Park.

Livestock depredation occurred at different densities in the various parts of the complex of protected areas. It seemed to be worse in parts where human encroachment was higher (Sogbohossou, pers.obs) however this needs to be confirmed by further studies. Increased attention to conflicts with particular consideration of human needs would contribute to saving lions and large carnivores in West Africa.

One limit to carnivore conservation is the poor monitoring system of prey species and carnivore populations in many protected areas. The methods used (call-ups or questionnaires) are not always suitable, and the way they are used do not always yield reliable results. It is necessary to organize a reliable and continuous monitoring of wildlife (predators and prey) and habitats in the protected areas of Benin and other countries of West and Central Africa. Limited financial resources are the reason often cited by managers of protected areas for the absence of reliable monitoring programmes. However it would be better to try to secure sufficient funding than to collect incomplete data that cannot be reliably used.

Another limiting factor for large mammal conservation in Benin and in West Africa is the low number of funding organizations working in the area. Scientists and managers should approach international conservation organizations to secure more funding.

In summary, the survival of lions in West Africa depends on concerted management actions and research efforts. Safeguarding protected areas and developing research to improve knowledge of the lion and other species that share its habitat are crucial for the improved conservation of the species.

7.5 Research needs

This first long-term study on lions in West Africa has provided initial information about lions' home range and their habitat use and has contributed to a better knowledge of the species ecology. However, in order to save lions and other carnivores in West Africa, several aspects still need to be investigated.

- Home ranges, movements and habitat use of lions should be extended to the WAPOK complex to assess the impact of anthropogenic pressures on the structure of populations and the dispersal of individuals. This would also help to measure the difference in impacts within one complex.
- Monitoring of sport hunting and its impact on carnivores and prey populations would enable the assessment of its sustainability.
- The investigation of the determinants of livestock-carnivore conflicts should continue in order to find appropriate and sustainable solutions for West Africa.
- Further phylogenetics and morphology studies should contribute to measuring how much the environment of the region influences the genes and the morphology of lions in West and Central Africa.
- A continuous monitoring of prey populations would elucidate their population dynamics and how they interact with lions and other carnivore populations.
- Other carnivores that inhabit the ecosystem should be studied to find out how predators limit each other.

It is important to note that studies should be conducted in the whole complex, as all protected areas are connected.

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