



Conflict between spotted-necked otters and fishermen in Hlan River, Benin



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ABSTRACT

The spotted-necked otter (*Lutra maculicollis*) is believed to be declining across its range and, in Benin, has recently been listed as endangered. In Benin, the spotted-necked otter is largely restricted to the south of the country, where it is threatened by a number of factors, including conflict with fishermen. Understanding the nature and extent of this conflict, and the impact that it has on local fishermen, as well as identifying feasible mitigation strategies, represents a critical challenge for conservation managers. This study documents otter damage experienced by 30 fishermen in the Hlan River, in the Southern Benin wetlands. We performed hierarchical classification analysis using Ward distances to categorize fish species according to the level of otter damage suffered, and used generalized linear models to identify predictors that best explained otter damage. Our results suggest that of the 16 fish species commonly caught by fishermen in the Hlan River, otters favored the most valuable species (but these were also the most abundant in the catch). However, although otter damage was extensive, monthly total income loss attributable to spotted-necked otter damage (including fish loss and damage to equipment) was estimated at only 9% per fishermen (considerably lower than the 30% reported by a preliminary survey of 163 fishermen in the same area). Our model showed that otter damage increased significantly with the number of adult fish captured by fisherman while the cost of otter damage increased with the length of time that the fishing equipment was left unattended. We suggest that otter damage could be reduced if fishing equipment were checked at least twice a day by fishermen, and recommend a maximum interval between checks of 700 min (12 h). Long-term sustainable management of these conflicts will require an integrated approach taking into account socio-economic, political and environmental dimensions.

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1. Introduction

Conflicts between predator species and humans are well documented worldwide (Dália Freitas et al., 2007; Khun, 2012; Ogada, Woodroffe, Oguge, & Frank, 2003; Treves et al., 2004) and they arise primarily because of competition between local people and predators for shared, limited resources like space and/or food. While humans and predators have co-existed for millennia, the frequency of conflicts has grown in recent decades, largely because of

the exponential increase in human populations and the resultant expansion of human activities (Distefano, 2005). Predation on livestock is a major area of conflict (Baker, Boitani, Harris, Saunders, & White, 2008) and there is an abundant literature on conflict between livestock producers/owners and large terrestrial carnivores (Hoffmann, 2008; Perrin & Carugati, 2000). Aquaculture (fish farming) is also vulnerable to predation, and both marine carnivores (such as seals and dolphins) and semi-aquatic carnivores (such as otters and mink) conflict with commercial fish farms, as well as with commercial and subsistence fisheries that utilize natural fish stocks (Baker et al., 2008).

Otter predation on commercial and subsistence fisheries, and fishing interests, has been reported on all continents on which otters occur (e.g., Adamek, Kortan, Lepic, & Andreji, 2003; Barbieri

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et al., 2012; Conroy & Green, 1998; Dália Freitas et al., 2007; Khun, 2012; Lejeune, 1989) and is often perceived to be particularly severe in areas of the world where otters impact or damage both the harvest and the fishing equipment (e.g., Akpona, Sinsin, & Mensah, 2011; Dália Freitas et al., 2007; Khun, 2012; Kidjo, 2000). Seven of the 13 otter species worldwide are considered to be threatened, and 5 are classified as Near Threatened (IUCN, 2014). Understanding the nature and extent of conflict between otters and fishermen represents a critical challenge for conservation managers in these areas, who aim to alleviate the fundamental conflicts between human activities and protected animals (Marshall, White, & Anke, 2007).

Fishing and small-scale fisheries (using natural fish stocks) are common in many African countries, where communities depend on fish as a source of protein and/or financial income (Akpona, 2004). Due to their dependency on fish, local communities are in permanent conflict with fish predators such as the Nile crocodile (Kpéra, 2002) and otters—the cape clawless otter, *Aonyx capensis* (Kidjo, 2000), and the spotted-necked otter (Akpona, 2004), *Lutra maculicollis* (both of which are widespread in Africa, Kruuk, 2006). The spotted-necked otter feeds predominantly on fish and requires permanent water sources with high fish densities (Hoffmann, 2008 Perrin & Carugati, 2000) and comparatively large tracts of extensively used semi-natural ecosystems (Dália Freitas et al., 2007; Ogada, 2007). Spotted-necked otters are listed only as Least Concern by the IUCN; however, the population is believed to be declining across its range and its conservation status is little known (Hoffman, 2008). In Benin, the spotted-necked otter was recently classified as Endangered (Djagoun, Akpona, & Daouda, 2011), threatened by the loss and degradation of riparian habitats (due to extensive agriculture, logging, wetland drainage, and pollution due to the use of oil-based fuels), as well as hunting for food and skins, and for traditional medicinal uses (Akpona, 2004; Akpona et al., 2011 Rowe-Rowe, 1990). Although hunting spotted-necked otters in our study area was reported to be difficult (and rarely successful) due to the largely inaccessible swamp habitat, they were also occasionally killed in retaliation for fish depredation and damage to fishing equipment (pers. obs), and the use of poisoned bait at fishing sites was common; in some communities, spotted-necked otters are now locally absent (Akpona et al., 2011). Cape clawless otters do eat fish but consume mostly crabs of various species (Kruuk, 2006) and were relatively rare in our study area in Benin. Because of the local rarity and feeding preferences of cape clawless otters, our study was restricted to conflict between fishermen and spotted-necked otters.

Fishing in Benin is carried out on an artisanal basis using a number of different types of simple fishing equipment including nets (stalled nets, trailing nets, cast nets and gill nets), hoops (fish hoops and shrimp hoops) and lines (simple lines and long lines); equipment is setup continually and left unattended, and the harvest collected a few hours, or up to a day, later. Otter damage is frequent in areas where fishing activities are intense (Akpona, 2004) but is variable in extent, and little is known about which, if any, factors influence, and thus could be used to predict, the likelihood or severity of damage. Our aims were to identify the factors influencing interactions between spotted-necked otters (hereafter otters) and fishermen along the Hlan River in southern Benin. We considered the effect of the type of fishing equipment, the setup duration of the equipment (i.e., the period of time that equipment was left unattended), the proximity of the fishing site to the village, and the size and species composition of the harvest, on the likelihood and extent of otter damage. We hypothesized that (1) otter damage depends on the type of fishing equipment as some are more vulnerable to damage, or more accessible to interference, than others, (2) otter damage will be higher when the harvest consists of a large proportion of small or juvenile fish (because the presence of spotted-necked otters is associated with an abundance

of small fishes, Lejeune & Frank, 1990), and (3) otter damage will be greater when the equipment is left unattended for longer and when the village is further away. To describe conflict between otters and fishermen, we carried out daily conflict monitoring, whereby fishermen that had recently reported otter damage were followed every day and their activities recorded over three months. Our overall objective was to provide guiding principles to help reduce conflict between otters and fishermen. Specifically, we aimed to identify simple practical recommendations for reducing conflict, but also to assess to what extent conflict is perceptual, and thus attempt to distinguish between the need for educational actions versus practical actions.

2. Methods

2.1. Study area

The study was carried out in two villages (Hon and Kpomè) in the Hlan River valley, Southern Benin (between 6°46' and 7°8' North, 2°5' and 2°7' East, Fig. 1). The main sources of livelihood of the local communities in this area are fishing, crop production and livestock farming. Kpomè and Hon were selected as study sites due to the diversity of habitats in the vicinity of these villages, the importance of local fishing practice (Montchowui, Niyonkuru, Ahouansou, Chikou, & Laleye, 2007), and the frequent occurrence of conflict between fishermen and otters (Akpona, 2004; Akpona et al., 2011 Kidjo, 2000).

The Hlan River is 6–10 m wide and 30 km long, and has a particularly rich ichthyofauna for its size, due partly to its seasonal connection with the Ouémé River (the largest river in Benin) during the floods, when fish can move between the two rivers. The Ouémé River includes 122 species belonging to 50 families (Lalèyè, Chikou, Philippart, Teugels, & Vandewalle, 2004); 43 of these (belonging to 35 genera and 22 families) have been identified in the Hlan River (37 in Kpomè, Montchowui et al., 2007). Cichlidae species were the most represented in the Hlan River with 8 species (20.5% of all fish fauna of the river), followed by Mormyridae, Cyprinidae and Claroteidae with 5, 3 and 3 species, respectively. The Polypteridae, Notopteridae, Characidae, Clariidae, Aplocheilidae and Channidae were each represented by two species and the remaining 12 families by only one species (Montchowui et al., 2007).

The river crosses two forests: a fully-protected 2-ha sacred forest located upstream of Kpomè and a 1115-ha complex of swamp forest (Koussoukpa, Lokoli, Dèmè) downstream (Montchowui et al., 2007). In the area of Kpomè, the Hlan River forms a small lake with a surface area that increases dramatically during the flood period creating a connection with the Ouémé River. The lake forms a floodplain that is covered by grassy herbaceous vegetation (dominated by *Echinochloa pyramidalis* and *Brachiaria mutica*) when it is not flooded.

2.2. Data collection

In November 2011, we conducted a survey among 163 fishermen to investigate local fishing activities (fishing equipment used, fishermen family size, the optimum time of year for fishing activities and the time of year when conflict occurred) and to assess local fishermen perceptions of income loss due to otter predation. An English translation of the original survey questionnaire which details were discussed in Akpona et al. (2011) is given in the Appendix A.

Thirty (30) fishermen were then selected on a voluntary basis to take part in a detailed investigation of actual otter damage to fish and fishing equipment. Each of these fishermen was followed daily between November 2011 and January 2012 (a period when

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