Banwa. 2006. 3(1&2):117-129.

Distribution and Habitat Utilization of the Visayan Leopard Cat *Prionailurus bengalensis rabori*

Ma. Renee P. Lorica[1] and William L. R. Oliver[2]

[1] Corresponding author. Fauna & Flora International-Philippines Biodiversity Conservation Programme, c/o NFEFI, South Capitol Road, Bacolod City 6100. renee_mae@yahoo.com
[2] Fauna & Flora International-Philippines Biodiversity Conservation Programme. wlroliver@aol.com

Research funded by SeaWorld & Busch Gardens Conservation Fund

Abstract

We conducted an ethnobiological survey to investigate the distribution, habitat utilization, threats and likely conservation status of the *maral* (*Prionailurus bengalensis rabori*) throughout its currently known and presumed recent range in the West Visayas faunal region. Key sites were mapped, and factors such as habitat type, distance (of non-forest habitats) from nearest forest cover, presence/absence of alternative cover, and elevation, were correlated to assess their effects. We found that these animals are not confined to forested habitats, and can indeed persist in sugar cane cultivation areas far removed from the nearest available forest habitats, but they are associated with the presence of alternate cover, and distance from nearest forest cover has an inverse relationship to the species' presence. Based on its limited range, the very high overall extent of deforestation in this region and other factors (e.g. continued hunting pressure, changing agricultural practices, etc.), it is recommended that the subspecies be included in the *Philippine List of Threatened Species* and added to the *IUCN Red List*; the latter under the status category of *Vulnerable*.

Keywords: IUCN *Vulnerable*, *Prionailurus bengalensis*, West Visayas faunal region

Abbreviations:
FFI - Fauna & Flora International
PBCP - Philippines Biodiversity Conservation Programme
FGAR - first generation anti-coagulant
GIS - Geographic Information Systems
IUCN - International Union for the Conservation of Nature and Natural Resources
NFEFI-BCC - Negros Forests & Ecological Foundation, Inc.-Biodiversity Conservation Center
SGAR - second generation anti-coagulant

Introduction

The Visayan Leopard Cat (*Prionailurus bengalensis rabori*), recently described as a distinct subspecies in 1997 (Groves, 1997), has been described as "uncommon but widespread; heavily hunted and declining" (Wildlife Conservation Society of the Philippines, 1997). Like many species of Philippine wildlife, little is known about this endemic subspecies, and recent data on its current distribution and population status were lacking from most areas (Heaney et al, 1998; WCSP, 1997). Indeed, almost the only recent confirmed records pertain to the 47 kittens donated to various Fauna & Flora International (FFI) local partners in the West Visayas, most of which were brought to the Negros Forests & Ecological Foundation's Biodiversity Conservation Center (NFEFI-BCC).

All of the kittens rescued by the BCC during the past four years were discovered (and hence orphaned) in sugar cane fields during harvesting operations. In most cases, sugar cane workers reported discovering litters sheltering alone in dense cane, though some admit to killing the mothers before uncovering the kittens. Either way, it is clear that leopard cat mothers often frequent, and give birth in, sugar cane fields; presumably attracted by dense cover and an ample supply of rats (the non-native pest species *Rattus exulans* and *R. tanezumi*) and other agricultural pests. On the other hand, it remains unclear whether pregnant cats migrate into the cane fields from neighboring forest patches to give birth, or whether some leopard cats (like urban foxes) have habituated to human presence and permanently inhabit agricultural areas. In either case, the harvesting of cane constitutes an ecological catastrophe for any females rearing litters, which they are then forced to abandon.

We conducted an ethnobiological survey to investigate the utilization of cane fields by leopard cats, particularly pregnant females. Still-forested areas in Masbate, Panay, Negros and Cebu were also visited to determine and map out the distribution of the subspecies.

Materials and Methods

Study areas

The ethnobiological survey was conducted in the known range of the leopard cat—Panay, Negros and Cebu. A total of 57 *barangays* in 24 municipalities were visited in Panay. In Negros Occidental, seven cities, three municipalities, 22 *barangays*, 24 farms (both sugar cane

and multi-crop farms) and 18 game fowl breeders were visited. Seven municipalities and 10 *barangays* were surveyed in Negros Oriental while in Cebu, 35 *barangays* in 10 municipalities were visited. Seven *barangays* and four municipalities in Masbate, an island within the West Visayas Faunal Region (Heaney, 1985) was also visited, although leopard cats have never been recorded in the area. Two other major islands of the region where visited: Ticao in Masbate, three *barangays* in Monreal in the northern part of the island; and, Guimaras, one *barangay* in each of the four municipalities.

Ethnobiological survey

Structured interviews with the residents, farmers, farm owners, community leaders and known hunters were conducted to gather available data on the Visayan Leopard Cat. The interviewees were first asked to describe the size, color, and appearance of the animal, in order to distinguish the leopard cat from the more widely distributed Malay civet (*Viverra tagalunga*) and common palm civet (*Paradoxurus hermaphroditus*). Informants often confuse the leopard cat or *maral*, with either of the two civet species. The latter are usually referred to as the *singgarong* and *milo* (*iru* in some parts of the region) (respectively), though in some areas in Cebu, the Malay civet is also referred to as *maral*. Informants were then invited to provide details regarding recent sightings, number of individuals sighted, the location of sighting and circumstances (e.g. time of day, etc.). Supplementary questions were aimed at obtaining other anecdotal information on the species' behavior, likely threats, reasons for hunting, and local awareness of, and attitudes towards, *maral* (and other wildlife) conservation and protective legislation. Responses to the latter questions were also used in the development of awareness materials and campaigns. A photographic field guide was shown at the end of the enquiry process to validate the description provided by the interviewee.

All the coordinates were mapped using *ArcView GIS 3.2* © (Environmental Systems Research Institute, Inc.) The distances to nearest forest cover (edge) was processed using the *Nearest Feature Extension v.3.8a* (Jenness Enterprises) via the same software. Statistical analysis was performed using *Statistica* ® Statistical Package.

Results and Discussion

Distribution

The leopard cat is one of the most widespread felid, occurring from South Asia through East Asia to the Russian Far East, and Southeast

Asia to Western Indonesia and the Philippines (Nowell and Jackson, 1996). In the Philippines, the species occurs in the islands of Palawan, Calamianes, Panay, Negros and Cebu (Rabor, 1977; Taylor, 1934; Whitehead *in litt.*, 1898). The description of the species by Taylor (1934) was restricted to a mounted specimen owned by a private individual from Iwahig, Palawan, and a specimen from Negros due for mounting at the former Bureau of Science. Other than the islands mentioned above, he considered the possibility that the species may occur in Samar, though he did not provide any further explanation or proof.

The Southeast Asian Mammals Databank (SAMD) Project (2005) followed Taylor's (1934) distribution of the Visayan (and Palawan) leopard cat, but included all of the (mostly denuded) islands of Cebu and Negros, while also restricting its range to the west and north-western mountains of Panay where most forest remains. The ethnobiological surveys of Pedregosa (2005) and Cariño (2006) confirmed the species' presence in most still-forested parts of Panay and Negros, respectively. However, neither of these surveys was extended to predominantly agricultural areas so most of current data on the species' occurrence in sugar cane farms in northern Negros was previously undocumented, and it remained unclear if these animals also occur on sugar cane farms in south Negros or Panay.

Areas in the West Visayas faunal region (Heaney, 1985) found within or adjacent to a forest were visited, which included first such surveys on Masbate Island, where four municipalities and five *barangays* were visited, and the neighboring island of Ticao, where one municipality and three *barangays* were visited. Convincing reports of this species' presence were received from only two *barangays* (Igang and Batohan) in Masbate City; the former was reported to be the origin of a kitten caught and sold in the city, while the latter referred to an adult cat sighted by a rancher who mistook it for a real leopard. Most of the *barangays* where interviews were conducted were located in the hinterlands and/or contained (or were adjacent to) remnant forest fragments. However, the only other reports obtained referred to leopard cats having been seen in a small forest fragment in Brgy. Baang in Mobo, the municipality adjacent to Masbate City, where it is called *salimao*. All such informants also reported that they believed these animals are very rare.

Although these reports from Masbate have yet to be confirmed via more direct evidence (e.g. sightings by experienced investigators, camera trapping, analyses of fecal matter containing hairs or cell

tissues that can be confirmed as belonging to this species), these reports are also significant in that they also constitute the first-ever such reports of the likely presence of this species on this island.

The results for these surveys and similar data collected from Cebu, Negros (the latter including the reported origins of kittens received by the NFEFI-BCC) and Panay are shown in Figure 1, with respect to remaining forest cover, both old growth and secondary, in the study areas. Very small patches of secondary forest are not indicated in Figure 1, but were present in some places.

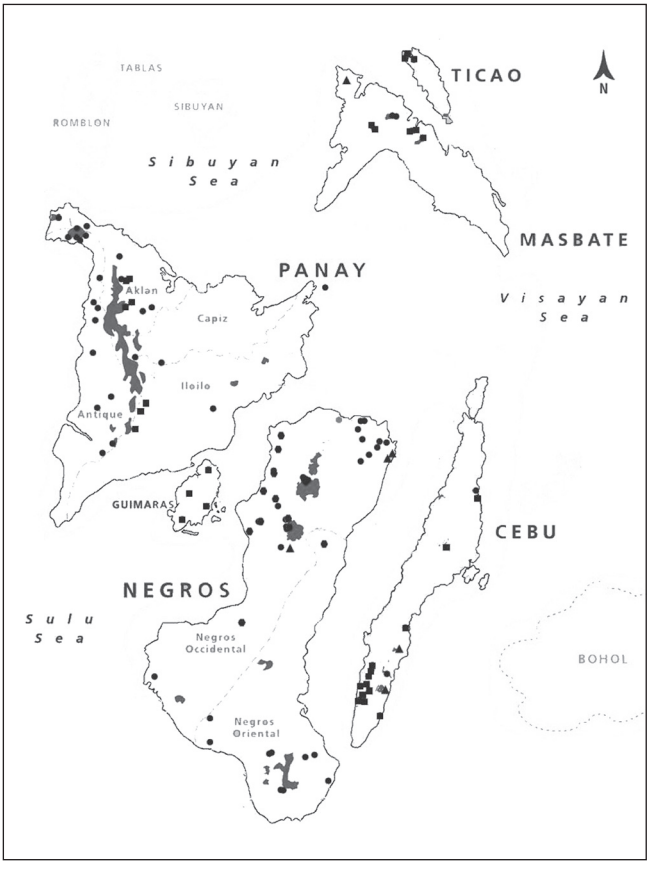

Figure 1. Areas surveyed with confirmed presence of the leopard cat are indicated by dots. The squares show areas surveyed with no reports of the species; triangles indicate historical records of leopard cats in the area; hexagons indicate places of origin of kitten donations to NFEFI-BCC. Dark areas show extent of forest cover (both primary and secondary), though photo fails to show tiny patches of remnant forest which are too small for this scale; light gray shows the extent of dry land during the last glacial period. (Modified after Heaney, 1985/FFI Photo Archive)

In Panay, a total of 13 *barangays* in six municipalities were visited in Aklan, 35 *barangays* in eight municipalities in Antique, six *barangays* in two municipalities in Capiz, and 13 *barangays* in eight municipalities in Iloilo.

All areas within the Northwest Panay Peninsula of Aklan and Antique yielded recent reports of sightings of leopard cats, the most recent being in August 2006. All of these reports claim that these animals were seen in forest (especially forest edge) habitats and in cultivated areas interspersed with mixed brush and grassland.

Municipalities and *barangays* within and close to the Central Panay Mountain Range were also visited. In Antique, all areas (with the exception of *Barangay* Aningalan and Poblacion in San Remigio) yielded positive recent reports of leopard cats. Respondents in Libacao (Aklan) also reported the presence three other kinds of carnivores; two of which were identified as *V. tangalunga* and *P. hermaphroditus*, though the identity of the fourth kind (if not dimorphism in the latter species) remains uncertain. Conversely, respondents from two *barangays* in Malinao and one *barangay* in Madalag were unfamiliar with the leopard cat, though it is possible, even likely, that these animals still exist in these area as they were reported from other *barangays* in the same region. Reports from these areas also refer to leopard cats 'inhabiting' forest and brushlands/grasslands adjacent to cultivated areas; though it remains unclear if the latter habitats support resident populations or if these reports actually refer to animals visiting these areas from nearest neighboring forest habitats.

In Capiz, all the areas visited were cultivated areas mixed with brushland/grassland, and all the respondents from those areas reported that leopard cats existed in forests adjacent to their *barangays*. All areas in Iloilo, with the exception of Mali-ao, Leon, have recent sightings of leopard cats. Leopard cats were also sighted on two separate occasions during an FFI-PBCP biodiversity survey on Sicogon Island (see Figure 1, the island is indicated by a dot off the north eastern coast of Panay, also indicating leopard cat presence) in August 2006 (Pedregosa, et al., unpublished), though none of the residents interviewed during the course of this survey was aware of the presence of these animals (Lorica and Lastica, unpublished).

As in the case of Masbate and Ticao Islands (see earlier text) there are no known accounts of leopard cats ever having occurred on both islands. However, given that Guimaras is located between Panay and Negros, and the proximity of Ticao to Masbate, it is possible that

leopard cats have been extirpated from these islands after sea levels rose 10,000 years ago, resulting in what is now the West Visayan Islands.

In Negros Occidental, seven cities, three municipalities, 22 *barangays*, 24 farms (both sugar cane and multi-crop farms) and 18 game fowl breeders were visited. Seven municipalities and 10 *barangays* were surveyed in Negros Oriental whilst in Cebu, 35 *barangays* in 10 municipalities were visited.

Of the 18 game fowl farms visited, only five were visited by leopard cats, six were frequented by wildlife other than leopard cats while the rest experienced no depredations from any wildlife (excluding commensal rodents).

All of the sugar cane farms visited in Negros Occidental had reported sightings of leopard cats, five of which farms had also donated kittens to the NFEFI-BCC. The other areas visited (*barangays* and cities) also have reported sightings of the cats. In Negros Oriental, all the areas visited were either inside a forested area or adjacent to it, and all areas have reported sightings of leopard cats. Accordingly, the possibility of leopard cats also occurring in sugar farms or other, predominately agricultural areas has yet to be investigated.

Only six areas visited in Cebu supported remaining forest fragments. Two of these, *Barangay* Nug-as in Alcoy, and *Barangay* Catang in Argao, yielded historical records of these animals, which were last sighted in 1988 and 1962, respectively. The forest wardens of Dalaguete and the respondents from *Barangay* Caurasan, Carmen reported five and four kinds of carnivores, respectively, in their areas. Despite some inconsistencies in the vernacular names given for these animals, and the likelihood that at least some of these variants actually refer to distinct pelage color morphs in *Paradoxurus*, it is also likely that leopard cats are among the species described in these areas. In *Barangay* San Jose and Santican in Catmon, respondents reported seeing leopard cats as recently as 2005; these animals being locally referred to as *maray* and *marapion*, respectively. In the reforested area of El Pardo, Boljoon, respondents also described animals most easily ascribed to leopard cats, though these reports are also unconfirmed at the present time.

Habitat utilization

Almost all informants in Panay, Negros and Cebu confirmed that leopard cats were predominately found in forest areas, especially in forest edges, though the latter may simply reflect the greater

likelihood or chance sightings in these areas. The only major exceptions were the animals inhabiting (or perhaps frequenting?) *cogon* (*Imperata cylindrica*) grasslands and/or sugar cane farms; both of which also provide dense cover and, presumably, ample prey. However, even in these areas some informants also referred to the proximity of these areas to neighbouring forest patches or the presence of some alternative cover (e.g. mixed scrub, mixed species tree plantations and bamboo brakes) in which the animals might take refuge during cutting or burning operations. In any event, it is certain that leopard cats are able to utilize, and possibly adapt to disturbed habitats and agricultural areas, though it is not yet clear whether these areas support resident populations or whether leopard cats migrate between these areas and remnant forest patches or other dense cover.

The correlation between distances from nearest forest cover to number of reported sightings was plotted. These were tested using Pearson Product Moment Correlation and showed a value (r) of -.80 with a probability value of 0.016. This indicates a significant inverse relationship (α=0.05), meaning that the greater the distance between the sugar cane farm and nearest available forest cover the lesser the frequency of the species' presence (Figure 2). Conversely, no such correlation was found between Pearson values for elevation *versus* species' presence (Figure 3).

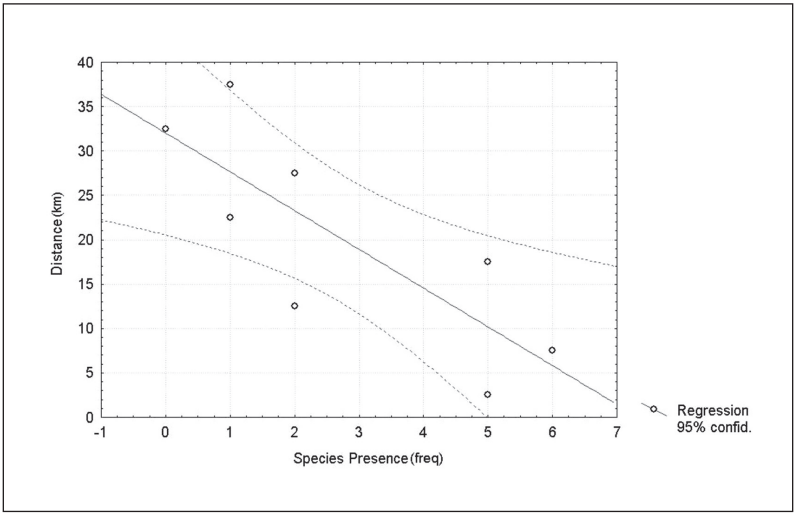

Figure 2. Correlation between species presence and the distance from sugarcane farm to nearest forest cover

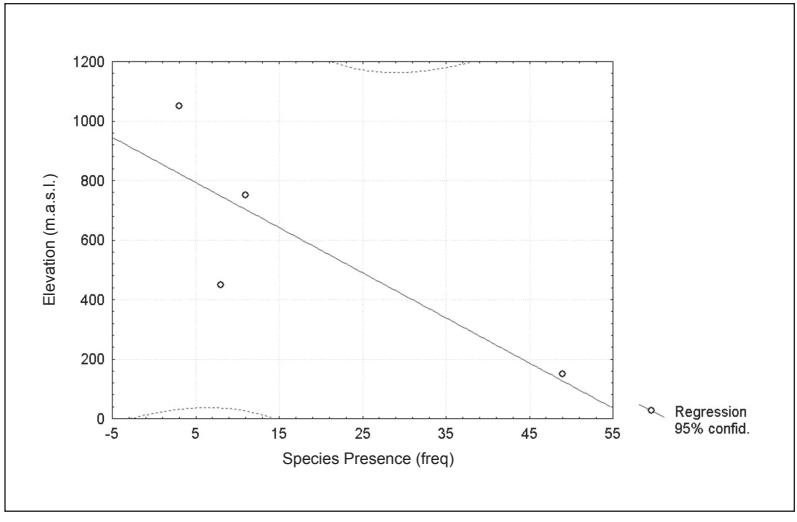

Figure 3. Correlation between species presence and elevation

Published accounts of leopard cats in other countries also refer to their occurrence in dense secondary growth, which includes logged-over areas, rubber tree and oil palm plantations and other agricultural areas (Davies and Payne, 1982; Harrison, 1974; Khan *in litt.* 1991; Santiapillai and Suprahman, 1985; Scott and Gemita, 2004). The species has also been reported to frequent and breed in hill coffee plantations in southern India (Banks, 1949; Santiapillai & Suprahman, 1985; Karanth *in litt.* 1993). Some researchers (e.g. Banks, 1949; Santiapillai and Suprahman, 1985) have speculated that secondary forest may be preferred to primary forest. Leopard cats can even live close to rural settlements, occasionally raiding poultry, and have recently been reported from the outskirts of Beijing where they were previously thought to have disappeared (Bangjie *in litt.* 1991).

Threats and conservation status

The predominant threats to these animals are hunting pressure and the gross loss and increasing fragmentation of their native forest habitat. The West Visayas faunal region (Heaney, 1985) is not only notable for its high degree of species' endemism, but also for the fact that it has been subject to far higher rates of deforestation than any other comparable region in the Philippines. Thus on the three main islands of Panay, Negros and Cebu, old-growth forest cover has been reduced to less the 6%, 4% and 0.05% of land area, respectively.

Precise data are still lacking, especially on small patches of second growth forest, though the total amount of remaining forest on these islands is probably less than 180,000 ha, of which well over two-thirds is located in the mountains of western and north-western Panay (Cariño et al., unpublished; Mallari et al., 2001;). By the same token, the remaining three islands of Guimaras, Masbate and Ticao have all been virtually denuded, but tiny pockets of degraded forest persist in some inaccessible areas on steep hill sides, gulleys and/or on privately owned or leased lands in Masbate. Unfortunately, however, even these last few remaining forest blocks are still subject to mining claims and continued attrition through illegal expansion of human settlements and agricultural encroachment – especially slash-and-burn or *kaingin* cultivation and, in the case, of Masbate, conversion to cattle pasture.

Leopard cat kittens are usually sold or kept as pets, with prices ranging from PhP50 to 1,300 (US$1-25); whereas adult leopard cats are often eaten. Cariño, et al. (2006) described similar practices by local hunters on Negros, and also reported the use of dogs to chase and kill adult cats and two variations of the trigger-type snares referred to as *balag-ong* and *lit-ag*; the latter method also being reported from Cebu.

However, being small-bodied and cryptic, leopard cats are seldom targeted as bushmeat, unlike the Visayan Spotted Deer (*Cervus alfredi*; IUCN *Endangered*), Visayan Warty Pig (*Sus cebifrons*; IUCN *Critically Endangered*) and Visayan Writhed Hornbill (*Aceros waldeni*; IUCN *Critically Endangered*), so they are mostly hunted on an opportunistic (i.e., chance encounter) basis, or are caught in snares intended for other animals, such as the Red Junglefowl (*Gallus gallus*), which is hunted for both food and game fowl breeding purposes, and monitor lizards (*Varanus salvator*), which is hunted for food.

The widespread use of agricultural poisons – both rodenticides and herbicides – especially on larger farms, poses other direct or indirect threats to cats inhabiting sugar cane fields. Sugar cane is particularly prone to rodent attack by non-native pest species (*Rattus exulans* and *R. tanezumi*) during the sixth to seventh months of growth, when the rats not only consume cane, but cause secondary damage through disease or fermentation resulting in loss in sucrose content in damaged stalks (SRARD, 1991). During milling, the juice of rat-damaged stalks contaminates undamaged stalks resulting in poor quality sugar (Hoque and Sanchez, 2000).

Various kinds of rodenticides are used to counter these losses. First generation and second generation anticoagulants, such as

Ratoxin® (Nu-Gro Brantford, Ontario, Canada) and Racumin® (Bayer Philippines, Calamba, Laguna), are most widely used in Negros Occidental. These poisons are added to baits or *binlid*, comprised of mixtures of corn grits and low quality or broken rice grain. Rats consuming these baits become extremely thirsty, though all excretory activities are disabled by the poison, leading to death from systemic haemorrhage, usually three to four days later. Another popular first generation anticoagulant rodenticide (FGAR) is zinc phosphide, which is mixed with cooked rice wrapped in dried banana leaves or plastic. This poison is more humane in that it usually results in death a few minutes after ingestion of a mere 4-7 grams of the bait. Two other second generation anticoagulant rodenticides (SGAR) in local usage are Broudifacoum [Klerat®] and flucoumafen [Storm®]; which are marketed in wax block baits, though these also cause protracted deaths lasting up to five days after ingestion of lethal doses. Apart from issues pertaining to humane use, any anticoagulant rodenticides that cause protracted deaths also obviously pose an increased threat to potential predators, such as leopard cats, which are not only susceptible to such poisons, but also more likely to encounter rodents in weakened states.

Leopard cats were included in the *IUCN Red List of Threatened Species* for the first time in 2002, albeit with the status category of *Least Concern* (LC), based on the species' relatively large distribution and deduced global population size (Nowell, 2002). The species was omitted from the *2004 Red List*, but included in the 2006 edition, though with the same LC categorization based on its 2002 evaluation.

Conclusions

Meaningful population estimates are yet to be done, given the obvious difficulty of studying the leopard cat in the wild. Hence, evaluating the current conservation status of the subspecies will depend on the limited findings of this study. Given the steady decline of old-growth forest habitat for the leopard cat in most of its already limited range, and the continuous existence of the factors threatening the survival of its remaining populations in anthropogenic habitats, we strongly recommend that the subspecies be included in the *IUCN Red List of Threatened Species* under the category *Vulnerable*.

What is known about habitat preferences and utilization, diet and socio-reproductive biology of these animals in the Philippines is mostly based on anecdotal accounts from local hunters and

other informants, and extrapolation of data pertaining to capture records and chance sightings. Such data are needed to guide and assist formulation of relevant management plans, particularly in and around native forest fragments, private reserves and on sugar cane farms. Further research is therefore needed, with emphasis on population studies.

Acknowledgements

Our sincerest thanks to SeaWorld & Busch Gardens Conservation Fund and FFI-US. To all our local partners in Panay (BioCon, Inc., and WVSU-CAF Mari-it Conservation Park), Negros (NFEFI and SU-CenTrop) and Cebu (CBCF), all our informants, the LGUs of our areas of study, the DENR and its local offices, and the individuals who were instrumental in seeing this part of the project through, our deepest gratitude. To Dr. Larry Heaney, who reviewed this paper, many thanks.

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