

Palawan Deer Research and Conservation Program

Technical Progress Report June 2017 to May 2018



Zoo Landau in der Pfalz



Jewelmer



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Puerto Princesa City,
Palawan, Philippines,
June 2018

TECHNICAL PROGRESS REPORT

PROJECT TITLE: Palawan Deer Research and Conservation Program

REPORTING PERIOD: June 2017 to May 2018

PROJECT SITES: Palawan, Philippines

PROJECT COOPERATORS:

Department of Environment and Natural Resources (DENR)

Palawan Council for Sustainable Development Staff (PCSDS)

Concerned agencies and authorities

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ACKNOWLEDGMENTS

We are grateful for the support of the Palawan Deer Research and Conservation Program to the North of England Zoological Society/Zoological Gardens Chester (NEZS), Zoologische Gesellschaft für Arten- und Populationsschutz (ZGAP), Wroclaw Zoo and Los Angeles Zoo and Botanical Gardens. Particular thanks to Johanna Rode-Margono, Scott Wilson and Roger Wilkinson, and their team at the North of England Zoological Society (NEZS)/Zoological Gardens Chester, Jens-Ove Heckel, Zoo Landau i.d. Pfalz, again Jens-Ove Heckel and Roland Wirth from ZGAP, as well as Radosław Ratajszczak and Anna Mekarska, Wroclaw Zoo, Jeff Holland, Center for the Conservation of Tropical Ungulates, and Christian Kern, Tierpark Berlin.

Jan Schipper, Phoenix Zoo was invaluable in designing and implementing the distance sampling study for Calamian Deer in Calauit, for which we are deeply indebted.

Equally we are grateful to PCSDS, particularly to Executive Director Nelson Devanadera, Atty. A. Villena, B. Lagrada, and all staff involved in our implementation. Thanks to Mr. Eriberto Saños CENRO Coron for support in collection of consent documents and fieldwork.

We thank for the support of Governor Jose Pepito C. Alvarez and Vice Governor Dennis Socrates. We are grateful to Mr. Franquito B. Paduga, Provincial Agriculturist, and Mr. Froilan P. Sariego, Protected Area Manager, for their support during field work on Calauit. Thanks also to Jewelmer Corporation for allowing us access to Bugsuk Island. We are indebted to the representatives of the local governments in Balabac, Coron and Busuanga, who permitted fieldwork for the project in their respective areas of responsibility. Dr. Manny and Dr. Angelita Reyes have been gracious hosts in Coron and keep supporting the project in multiple ways.

Our heartfelt gratitude goes to Sheen Hanjin Arib, Mary Chris Nieves and Anna Rose Agullo for their services and assistance provided to the project. We are equally grateful to KFI board and supporters.

ACRONYMS

Bgy.	Barangay (village)
BMB	Biodiversity Management Bureau (formerly PAWB)
CE	Conservation Education
CENRO	Community Environment and Natural Resources Office(r)
CGRWS	Calauit Game Preserve and Wildlife Sanctuary
DENR	Department of Environment and Natural Resources
ECAN	Environmentally Critical Areas Network
ENRO	Environment and Natural Resources Officer/Office
IUCN	International Union for the Conservation of Nature and Natural Resources
KFI	Katala Foundation, Inc.
LGU	Local Government Unit
MoA	Memorandum of Agreement
NAMRIA	National Mapping and Resource Information Authority
PA	Protected Area
PDRCP	Palawan Deer Research and Conservation Program
PCCP	Philippine Cockatoo Conservation Program
PCSD(S)	Palawan Council for Sustainable Development (Staff)
PENRO	Provincial Environment and Natural Resources Office
RA 9147	Republic Act 9147 otherwise known as the Wildlife Protection Act
ZGAP	Zoologische Gesellschaft für Arten- und Populationsschutz

Executive Summary

Objective 1: Conservation breeding stock of Calamian Deer acquired and managed in Katala Institute

- A major milestone on the road to establishing a conservation group of Calamian Deer was the issuance of a Wildlife Farm Permit by the Palawan Council for Sustainable Development.
- Consent from the provincial government, which manages the wildlife reserve is still needed, and the process is supported by the Palawan Council for Sustainable Management Staff.
- On February 27 and 28 we visited Calauit Island with Dr. Jeff Holland, Director of the Center for the Conservation of Tropical Ungulates. Together with the Park Manager Mr. Froilan Sariego, we discussed site and outline of two bomas as capturing devices.
- The first enclosure in Katala Institute has been finalized. The main enclosure covers 1.800m², and two separation pens which cover 330m².
- Enclosures were further improved based on Jeff's recommendations: further backfill, subdivision of larger enclosure in two, additional gates.
- An expert consultation was conducted in December with members of the European and US zoo community to further clarify methods of capture, transport and acclimation of deer.
- Using boma is still the favored means of capturing deer on Calauit Island.
- Use of tranquilizers was discussed.
- Wroclaw Zoo can provide Rototags and transponders for individual marking.
- Most partners agreed to support the project with manpower. We assume that two keepers should be available for capture, transport and acclimation (including capacity development for our keepers) and one or two vets, as well as one vet. technician should be available for capture, transport and initial phase of acclimation.
- Designs for transport crates were shared by Wroclaw Zoo, Poland.

Objective 2: Potential reintroduction sites for the Calamian Deer assessed and evaluated

- A set of parameters was developed to allow for quantitative assessment of potential deer reintroduction sites. Selection of parameters were informed mainly by the eco-ethological study conducted in Calauit, secondary information and previous experience in this field in relation with the Philippine Cockatoo.
- Dumaran Island, Iwahig Prison and Penal Farm (Puerto Princesa) and Kingfisher Park (Coron) were initially assessed. The latter is within the historical range of Calamian Deer. Quantitative evaluation will be conducted once all assessments are conducted.
- Dumaran Island seems to be very suitable for deer reintroduction; water may be a limiting factor and it needs to be explored how this could possibly be mitigated.
- The habitat within the penal farm seems to be suitable for reintroduction, however frequent incidences of illegal activities, particularly poaching and squatting need to be addressed before reintroduction could be considered. The imminent road widening is another cause for concern for wildlife.
- We keep collecting information on the biology of the deer, particularly such which could inform the selection of reintroduction sites. Herbarium specimens of food plants are collected.

Objective 3: Conservation education campaign for Calamian Deer and Balabac Mousedeer conducted

- A questionnaire for the Calamian Deer campaign was drafted, involving topics on knowledge, attitude and behavioral change. An initial concept model of the campaign was designed, based on the findings of the field work.
- The campaign will initially focus on areas in Coron and eastern Busuanga.
- A poster design for the Balabac Mousedeer and Calamian Deer was created by wildlife artist Rolito Dumalag. Both posters of the 'share a place to live' series were printed for the Balabac Mousedeer and Calamian Deer with 2000 and 5000 copies respectively.
- Two-hundred t-shirts showing Calamian Deer were produced and distributed to stakeholders.
- The Calamian Deer Conservation Education and Stakeholders meeting was held on March 1 at Capilla De San Vicente Ferrer Sitio Malbato, Brgy. Bintuan, Coron, Palawan. It was attended by 23 representatives from four out of five partner-barangays in Coron, LGU, DENR, PCSDS and staff from Katala Foundation. The participants were oriented about the Calamian Deer conservation project in Coron and presented with the initial results of the conservation activities.
- Indira discussed the concept modelling of the Calamian Deer conservation. She presented the direct threats such as hunting, predation by dogs, destruction of habitat and encroachment as well as the indirect threats such as demand for bush meat, trade, recreation and agriculture, to the conservation of Calamian Deer.
- Indira then proceeded to the presentation of the Theory of Change used in the Calamian Deer conservation project. She also identified initial solutions for barrier removal such as working closely with the LGU and eventually passing a resolution prohibiting the hunting of Calamian Deer and creating a Memorandum of Agreement with each barangay for the protection of the Calamian Deer habitat.

Objective 4: Conservation-relevant research on Calamian Deer and Balabac Mousedeer continued

- A total of 108 respondents were interviewed in nine barangays of Culion. Majority of the respondents claimed that there are Calamian Deer in their respective barangays (68.57%) while only 24.76% have not seen the species in their areas.
- Almost all the respondents said the Calamian deer's population is already declining as a result of rampant hunting for food (83.15%).
- An occupancy survey was initiated within the reporting period on Culion Island.
- Out of six barangays covered during the survey, four showed indications of deer presence. Almost all sites had evidence of human presence, particularly manifested through grassfires.
- A total of 77.47 km of transects were covered, resulting in an average of 1.43 km irregular transect per grid.
- Of 54 grids surveyed, Calamian Deer presence was detected in eight grids across four barangays. This leads to a naïve occupancy estimate of 0.1481 using software package PRESENCE. Using the single season constant model, the actual estimate of species occupancy is 0.2238. The model shows that detection probability is about a

third. This indicates that only about 220 of approximately 1000 km² of suitable habitat are occupied by the Calamian Deer in Culion.

- Based on the locations of records, Calamian Deer populations are fragmented. Luac, Osmeña, Patag and Halsey are far away from each other. Human encroachments are detrimental to the already thin population of the Calamian Deer.
- After the successful survey on Bugsuk, another distance sampling survey was conducted on Balabac. Although only a relatively small portion of the island could be surveyed, it appears that Balabac Mousedeer is still locally common, despite the considerable hunting pressure. Data are currently being analyzed.
- Camera trapping on Bugsuk Island involving originally six camera traps lasted from June 2016 to December 2017.
- A total of 300 individual mousedeer records were retrieved. Analysis of records in relation to time of the day indicated two pronounced activity peaks during dusk and dawn.
- Mother with juvenile were for the first time recorded on May 29 and again on November 25, 2017.

Proposed Next Steps

- Continued lobbying with the provincial government of Palawan as follow-up on the already granted Wildlife Farm Permit.
- Assessment of potential reintroduction sites will be continued.
- IEC will be continued.
- Distance sampling studies for mousedeer will be continued on Balabac, if security situation allows.

Introduction

Three wild ungulate species occur in, and are endemic to, the Palawan Faunal Region. Whereas the Palawan Bearded Pig *Sus ahoenobarbus* is widespread in the archipelago, Calamian Deer *Axis calamianensis* and Balabac Mousedeer *Tragulus nigricans* are restricted to few low islands in the North and South of Palawan respectively. Calamian Deer inhabit mostly dry woodland and forest-grassland mosaics of the Calamian island group. These ecosystems did not receive a lot of conservation attention in Palawan, and lowlands are by default the least protected areas in the province. The deer could serve as flagship species for these highly threatened lowland vegetation formations including associated flora and fauna (Oliver and Villamor, 1992).

The Balabac Mousedeer is likewise restricted to lowland forests of the Balabac group of islands, where it is only recorded from Balabac, Ramos and Bugsuk (Romeiras et al., 2016). Since it is one of the most familiar wildlife species in this area, it has high potential to serve as flagship for the forest ecosystems of this island group.

Both species are currently listed as “Endangered” (IUCN, 2016), due to ongoing direct persecution mainly for bushmeat, habitat destruction and degradation, combined with their very small ranges.



Figure 1. Calamian Deer (left); Balabac Mousedeer (right; Photos: Peter Widmann)

The main objective of the first phase of the proposed program was to provide updated information on population and distribution of the two target species to inform future conservation interventions. This information was generated through conduct of hunter interviews and by population surveys in selected representative sites. The second phase of the program will continue parts of the research component, but will involve implementation components, most important of all the establishment of a captive population for Calamian deer as assurance against imminent danger of extinction in the wild, but also conservation education campaigns and assessments for potential reintroduction sites.

Local protected area conservation efforts exist in the ranges of both species, but do not yet sufficiently address threats caused by direct persecution and encroachment of habitats. Depending on the outcome of the surveys, possible tools to prevent further decline of the two species may involve creation of warden schemes (similar to those in place for the Philippine Cockatoo or the Palawan Forest Turtle), or alternative livelihood opportunities in combination with conservation contracts.

Given the very small range of the two species, the persisting (hunting, habitat loss) and emerging climate change threats, the feasibility of (re)introduction to other areas within the Palawan Faunal Region should be assessed. Fossils indicate that Calamian Deer got extinct from the main island Palawan relatively recently at the end of the Pleistocene, possibly due to alteration of grassland-woodland habitats to closed forests at the end of the last glaciation (Piper et al., 2011). The finalized eco-ethological study for the Calamian Deer in Calauit shed some light on the question if the anthropogenic forest-grassland mosaics in Palawan mainland or satellite islands are once more suitable for the species. The potential of reintroduction into the prehistoric range was already discussed within the Philippine conservation community, with Iwahig Prison and Penal Farm on the main island of Palawan suggested as a potentially suitable area (Widmann, in lit. May 2011, Heaney in lit. May 2011). In the meantime the Calamian Deer was suggested as one potential candidate for rewilding in the Asia-Pacific region (Louys et al., 2014).

Previous presence of a mousedeer on Palawan is also documented (Reis and Garong, 2001), but it is not clear if it belonged to the species *nigricans*.

The program will build on earlier research as described in the following paragraphs, some of which included Katala Foundation in recent years.

Almost forty years ago it was feared that the **Calamian Deer** was on the brink of extinction in its very small range due to intensive and unregulated hunting; it was estimated that not more than 900 individuals were left in the wild (Grimwood, 1976). A hunter interview survey conducted in 1992 indicated that the species was present in few populations on Busuanga and Culion and some of its satellite islands (Oliver and Villamor, 1992). The stronghold for the species then was and remains to be Calauit Island which was populated with a number of African ungulates during the 1970s. It served as private reserve for the Marcos family and was consequently declared as wildlife sanctuary. A population study on this island conducted in 1994 yielded a population of 1,123 +/- 236 (Orig and Rosell, 1994).



Figure 2. Tiny ranges of the Balabac Mousedeer in southern Palawan (yellow signature) and Calamian Deer in northern Palawan (orange signature; Map: KFI).

A MOA signed between DENR and the Zoological Society of San Diego in June 1993 resulted in a breeding loan of 15 individuals to San Diego, and conservation education activities (particularly production and distribution of posters) within the Calamianes and assistance of policy formulation to DENR spearheaded by William Oliver of then FFI. A proposed eco-ethological study on the Calamian Deer was never conducted partly caused by the then unclear mandates of the Palawan Council for Sustainable Development (PCSD) and the Department of Environment and Natural Resources (DENR). A recent survey in the Calamian Group of Islands was conducted by the Philippine Biodiversity Conservation Foundation, Inc. (PBCFI) and Katala Foundation, Inc. (KFI) in 2010, covering six sites, including those with previous records of deer (Paguntalan et al. 2010). Secondary records were obtained from four sites, but could not be confirmed in the field. The responsibility for the Calauit Wildlife Sanctuary was recently turned over from DENR to the provincial government of Palawan. A visit in December 2014 to the PCSD staff in preparation for the proposal for this program however indicated

that no active management of the area seems to be underway and technical assistance for this key area of the Calamian Deer may be required as well in a later program phase.

A hunter interview survey conducted in 1993 for the **Balabac Mousedeer** by Oliver (unpubl.) indicated that the species was still common on Balabac, Ramos and Bugsuk Islands, despite continuing hunting pressure. Introduced populations were reported from Calauit and Apulit Islands in northern Palawan, but the outcomes of these introductions are not monitored.

We are not aware of any previous population studies conducted for the species. Populations in Balabac have been reported to have declined markedly within the last years due to continuing hunting pressure, and the species is by now rare or even extinct on Ramos due to a combination of persecution and habitat destruction (Antonio, pers. comm. 2014). We regularly encounter the species on Bugsuk Island during fieldwork for the Philippine Cockatoo. The island is leased on a long term basis to Jewelmer, a pearl farm company, resulting in restricted access to the island. Bugsuk Island may well be the stronghold for the species, and it benefits from the joint conservation activities of Jewelmer and KFI in the framework of the Philippine Cockatoo Conservation Program.

Project Objectives

Program Objectives and Justification

Objective 1: Conservation breeding stock of Calamian Deer acquired and managed in Katala Institute

The natural population of the deer is declining so rapidly that the establishment of an assurance population in captivity seems to be justified to prevent the complete (i.e. global) extinction of the species in the near future. A suitable location for this purpose is the grassland/woodland area of Katala Institute in Narra, southern Palawan, which already houses several threatened and endemic species, including Philippine Cockatoo, Palawan Porcupine, Palawan Forest Turtle and two other turtle species.

Precondition for this objective is the issuance of a wildlife farming permit or a wildlife breeding loan from the Palawan Council for Sustainable Development. Given the previous experience with this agency the issuance of any of these permits will require lobbying and procurement of supporting documents, particularly Free and Prior Informed Consent Certificates of involved stakeholders.

Initially it is intended to acquire 25 animals as founder stock (more or less equal ratio male: females). Previous to capture in Calauit, the stock present around the park headquarters will be screened (genetics, diseases) which will also benefit the population remaining on the island. Capture, crating, shipment to the facility in Narra and acclimatization in the new environment will be supervised by national and international deer specialists, including from Los Angeles and Phoenix Zoo, who have first-hand experience with this species.

Animals will be accommodated in four larger enclosures with four smaller paddocks ready to separate animals if the need arises. These enclosures will be planned and constructed with expert input from the international zoo community.

The aim of this objective is to build up a viable ex-situ population of the species, which later on can be used for reintroduction. If feasible, the animals will be accommodated in two separate facilities, mainly as safeguard against disease outbreaks and similar events.

Objective 2: Potential reintroduction sites for the Calamian Deer assessed and evaluated

Calamian Deer are threatened throughout their present range in the Calamian Group of Islands, including in the previously well protected Calauit Wildlife Reserve. Some privately owned and public lands in Busuanga however, have recently developed management schemes which may be suitable to exclude poachers, and may therefore be suitable for reintroduction of the species. KFI has led talks with private landowners and secured initial consent for the project. Fossil records dating back to the late Pleistocene and the early Holocene have recently been reported from the main island of Palawan (Piper et al., 2011). This indicates that the species was formerly more widespread in the Palawan Faunal Region than presently, and suitable habitats in form of grass-woodland mosaics can be found in many other parts of Palawan.

The assessment will use quantifiable biological, socioeconomic and logistic criteria, including such for habitat, predator and poaching level, support from local governments, legal status of the reintroduction site, ease of access, and so on, which then results in a site-specific score for the location. The biological parameters are currently clarified through an eco-ethological study of the deer conducted in Calauit. The highest scoring site then will be chosen and prepared for the reintroduction project. The results of the assessment will be verified in a planning workshop involving key stakeholders. A similar process has been already successfully applied by KFI for the selection of a reintroduction site for the Philippine Cockatoo with support from IUCN-SOS (Widmann et al., 2013).

Objective 3: Conservation education campaign for Calamian Deer and Balabac Mousedeer conducted

Interviews with hunters and other forest users indicated both species have a low profile within their respective ranges. Sense of pride of having such rare and geographically restricted species in the own neighborhood is virtually absent.

We will employ Pride-campaign-based strategies using social marketing strategies to effect changes in knowledge, attitude and self-reported behavior towards the target species (Butler, 2000). These changes will be measured using standardized questionnaires before and after the intervention. KFI was the first organization to implement a Pride Campaign in the Philippines for the Philippine Cockatoo (Widmann et al., 2009).

Objective 4: Conservation-relevant research on Calamian Deer and Balabac Mousedeer continued

Research on the two species will include distance sampling to obtain absolute population numbers for Balabac Mousedeer on Balabac Island, as well as presence/absence record for Calamian Deer in areas within the present distribution which have not been covered in the first program phase (parts of Busuanga, Culion Islands). These researches strongly will depend on the consent of local government units, and on the security situation in the case of Balabac Municipality.

Observations on biology, particularly on feeding and reproduction will be continuously collected to inform assessments of reintroduction sites and conservation breeding management.

Description of Project Sites

Balabac Island Group

The Balabac archipelago is located at the southernmost end of the Palawan Faunal Region, consisting of 32 larger islands and several dozen islets. Most of these are flat and of coralline origin, but the main island of Balabac reaches 569m in altitude and has an ultrabasic bedrock. Originally all islands were covered by tall coastal forest in the interior and beach and mangrove forests along the coasts, but this gave way to coconut plantations and settlements on most of the smaller islands. Bugsuk and Ramos have remnants of seasonal rainforest in the interior portions and extensive secondary forests, which however are under increasing pressure from shifting cultivation.

Pandan and Bugsuk Islands which are partly privately owned by the Jewelmer Corporation, have retained larger areas of original vegetation, due to highly restricted access to the islands and careful management of the forest resources by the company. Jewelmer is operating a pearl farm in the shallow waters of Bugsuk.



Figure 3. Aerial views on mostly intact coastal, beach and mangrove forests of Bugsuk Island (Photos: P. Widmann)

Politically, Balabac forms a single municipality with the same name, comprising 20 barangays (villages; the smallest local government unit). The population mainly consists of Molbog and Moro ethnic groups, which have strong ties to Mindanao, Sulu, Indonesia and Malaysia. These connections result in occasional security problems, caused by the insurgency in Sulu and bandit groups taking refuge or conducting illegal operations in the area.

The Balabac Mousedeer is historically recorded from Balabac, Ramos and Bugsuk only (Esselstyn et al., 2004). Until after the end of the 1940s the species was common; members of the Philippine Zoological Expedition were able to collect two specimens, and traded in three more, although they only spent 14 hours on Balabac (Hoogstraal, 1951; Sanborn, 1952).

The Balabac island group is of conservation importance because of presence of other globally threatened species, among them the critically endangered Philippine Cockatoo and several species of marine turtles.

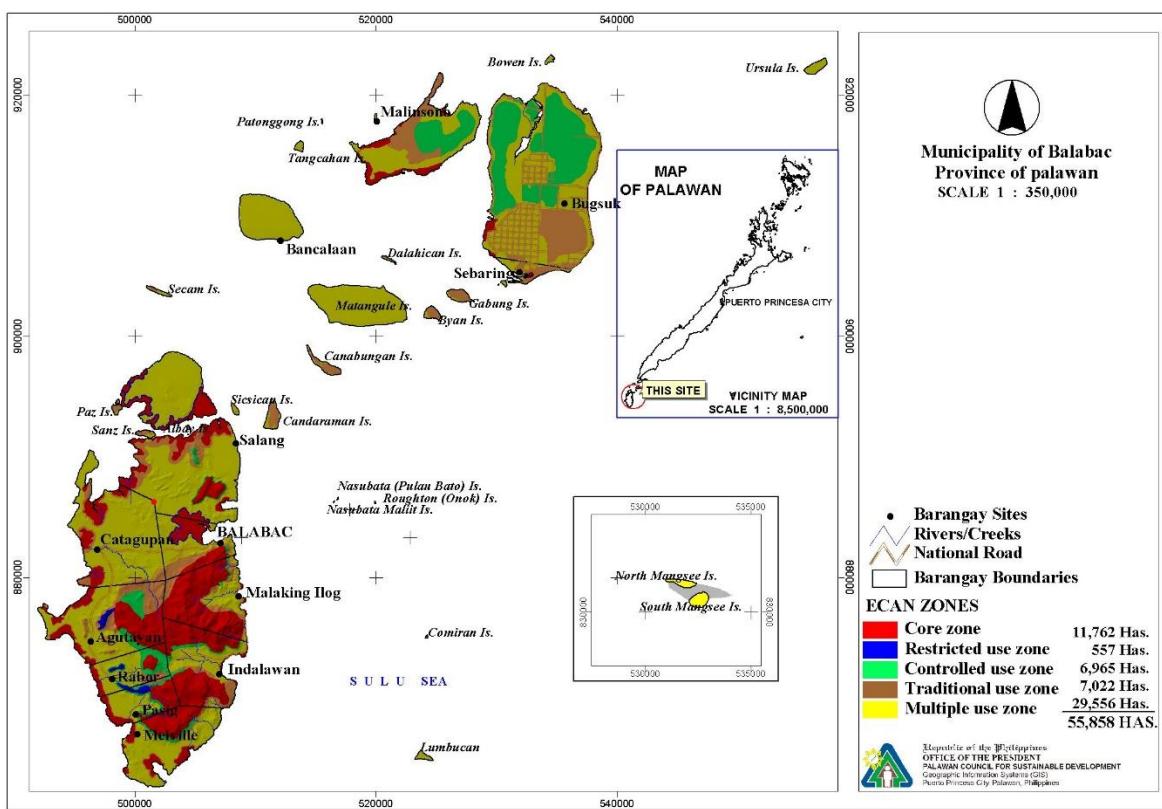


Figure 4. ECAN Zones of the municipality of Balabac. The zonation refers to restriction in land use, with highest protection awarded to core zones and lowest to multiple use zones (Map: PCSD)

Calamianes Island Group

The Calamianes are situated in the northern portion of the Palawan Faunal Region and also form the northeastern-most extension of Sundaland. The archipelago consists of about 80 larger and dozens of smaller islands. Original vegetation consisted mostly of semi-evergreen and deciduous tropical forests interspersed with natural grasslands, but these can now only be found in the more remote areas of the larger islands, for example in the Chinabayan Range of Busuanga. The Calamian group of islands has a pronounced seasonal climate with a long dry season, and this, in combination with locally high concentration of heavy metals, has led to persistence of larger areas of natural grassland and woodland/grassland mosaics, in contrast to most other areas within Palawan. Shifting cultivation and burning of vegetation for cattle ranching has increased the proportion of open vegetation, but also has resulted in large areas now covered in bamboo and pasture weeds. Extensive burning during the dry season is also done to induce new growth of grasses and in turn to attract game species, particularly deer and Palawan Bearded Pig.



Figure 5. Grassland/woodland mosaic on Calauit (left); pasture burned by informal settlers on Busuanga Island (right; photos: P. Widmann)

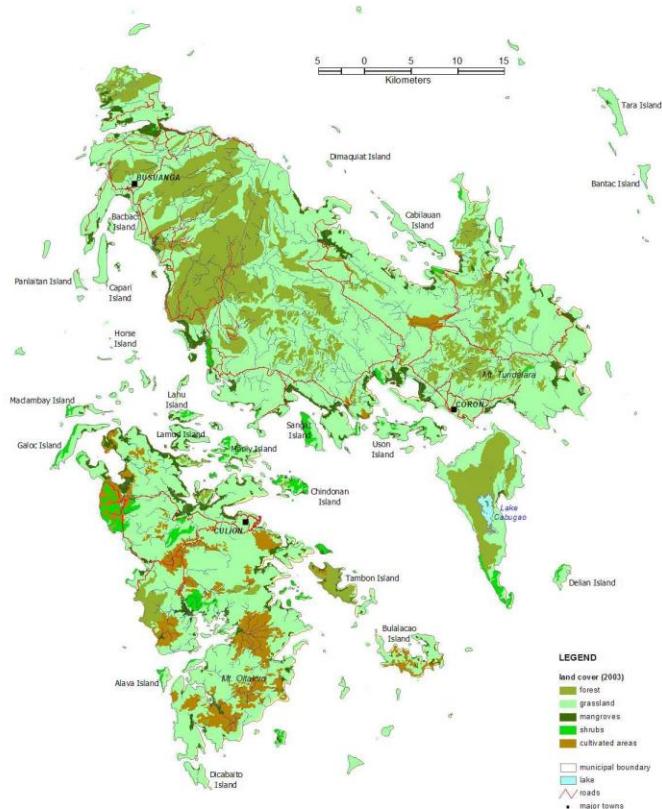


Figure 6. Vegetation map of Busuanga, Coron and Culion Islands

Calamian Deer have been historically recorded from Busuanga and Culion Islands and several satellites, including Calauit. Coron Island still is heavily forested, but possibly because of its steep limestone terrain, deer have not been recorded from there. There were several attempts to introduce deer on some of the smaller islands and also on the larger Linapacan, but most of these attempts were unsuccessful, while others need confirmation.

Politically the island group is divided into four municipalities, namely Busuanga, Coron, Culion and Linapacan. The Calauit Game Preserve and Wildlife Sanctuary (CGRWS) situated in Busuanga Municipality must presently be considered the last stronghold for the species, but is under increasing pressure, due to increasing influx of settlers.

Methods

Capture, handling, transport and establishment of ex-situ founder stock

Initially it is intended to acquire ca. 25 animals as founder stock. Previous to capture in Calauit, the stock present around the park headquarters will be screened (genetics, diseases) and possibly treated, which will also benefit the population remaining on the island. Capture, crating, shipment to the facility in Narra and acclimatization in the new environment will be supervised by national and international deer specialists, including from Los Angeles and Phoenix Zoo, who have first-hand experience with this species.

Animals will be accommodated in up to six larger enclosures. These are connected to smaller paddocks which will be used to isolate animals, if the need arises.

This objective requires substantial expert input from the international zoo community. Previous interest in the planning and implementation has been solicited from international partners. First talks with relevant agencies in the Philippines for the permitting process were positive as well.

Assessment of reintroduction sites

The assessment will use quantifiable biological, socioeconomic and logistic criteria, including, such for habitat, predator and poaching level, support from local governments, legal status of the reintroduction site, ease of access, which then results in a site-specific score for the location. The biological parameters are currently clarified through an eco-ethological study of the deer conducted in Calauit. The highest scoring site then will be chosen and prepared for the reintroduction project. The results of the assessment will be verified in a planning workshop involving key stakeholders. A similar process has been already successfully applied by KFI for the selection of a reintroduction site for the Philippine Cockatoo (Widmann et al., 2013).

Conservation education

We will employ Pride-campaign-based strategies using social marketing strategies to effect changes in knowledge, attitude and self-reported behavior towards the target species (Butler, 2000). These changes will be measured using standardized questionnaires before and after the intervention. KFI was the first organization to implement a Pride Campaign in the Philippines (Widmann et al., 2009).

Population survey Calamian Deer

Distance sampling using line transects in selected sites will be employed (Buckland et al., 1993). Outside of Calauit, densities of deer almost certainly are low. Presence/absence data will be collected using the occupancy method (MacKenzie et al., 2009). Systematic use of camera traps will be tested, if funding allows.

Habitat parameters measured will include cover of grass and woody vegetation, distance to water sources, salt licks, cultivated areas, settlements, deforestation rates (derived from Global Forest Watch data base) and hunting pressure (index derived from hunter interviews, if feasible).

Population survey Balabac Mousedeer

The survey site will be on the main island of Balabac. Distance sampling using spotlighting records will be used along transect lines (Buckland et al., 1993; Heydon and Bulloh, 1997). Surveys will be conducted during night time using strong flashlights to detect animals. Distances of spotted animals will be measured with a range finder. Research sites will be characterized according to vegetation type. Other habitat parameters include canopy height and cover, understory cover, availability of food plants, particularly *Ficus* (Matsubayashi et al., 2003), and possibly deforestation rate and hunting pressure.

Results and Progress

Objective 1: Conservation breeding stock of Calamian Deer acquired and managed in Katala Institute

Permitting process and preparation of conservation breeding management plan

A major milestone on the road to establishing a conservation group of Calamian Deer was the issuance of a Wildlife Farm Permit by the Palawan Council for Sustainable Development. The permit allows for the capture of 25 individuals from Calauit Island, the last known viable population of the species. Consent from the provincial government, which manages the wildlife reserve is still needed, and the process is supported by the Palawan Council for Sustainable Management Staff (PCSDS). Later reintroduction of the species is not covered by the permit and will have to be applied for separately.

On February 27 and 28 we visited Calauit Island with Dr. Jeff Holland, Director of the Center for the Conservation of Tropical Ungulates. Jeff is one of the few experts with own experience in captive management of Calamian Deer. Together with the Park Manager Mr. Froilan Sariego, we discussed site and outline of two bomas as capturing devices. It was decided that bomas should stay open for at least a week and be equipped with feeding station and water sources, so that animals could get used to it. Actual capture inside the boma should be done employing several persons holding a long and loose net. To minimize stress, it was discussed to hire a boat which would be large enough to transport the animals directly to the conservation breeding site. This option of course will strongly depend on weather conditions.

Jeff recommended the involvement of the following experts from outside of KFI to be present during capture, transport and initial acclimation: two keepers, one or two vets, one vet technician.

The first enclosure in Katala Institute, Narra, has been finalized with funding from Zoo Landau i.d. Pfalz, Germany. The main enclosure covers 1.800m², and two separation pens which cover 330m². The area was fenced with interlink and one row of wire, elevating the perimeter to at least 1.80m. Enclosures were partly backfilled to prevent flooding. Planting of grass and some shade trees has started. Visual barriers have been constructed within the enclosures using wooden poles and locally available branches and *Pandanus* leaves.

On March 3, Jeff and Peter visited the deer enclosure in Katala Institute in Narra. Jeff approved of the general design and size of the main enclosure and the isolation pens. He suggested to additionally backfill some areas and to install an additional gate into an isolation pen. He also recommended to subdivide the main enclosure into two equally sized areas to allow for flexibility in group composition. All these measures were in the meantime implemented, including the construction of a division fence with two separate gates.

Feeding stations and shelters for all compartments based on jointly agreed designs are currently being constructed. Jeff volunteered to provide a health risk assessment and mitigation plan for the deer in the facility, considering diseases potentially carried by water buffaloes, including Brucellosis, Bluetongue and TB.



Figure 7. Perimeter fence of main enclosure (left); connecting gate main enclosure to isolation pens (Photos: P. Widmann)



Figure 8. View on isolation pen behind pond (left); newly planted *Imperata* grass in isolation pen (right; Photos: P. Widmann)

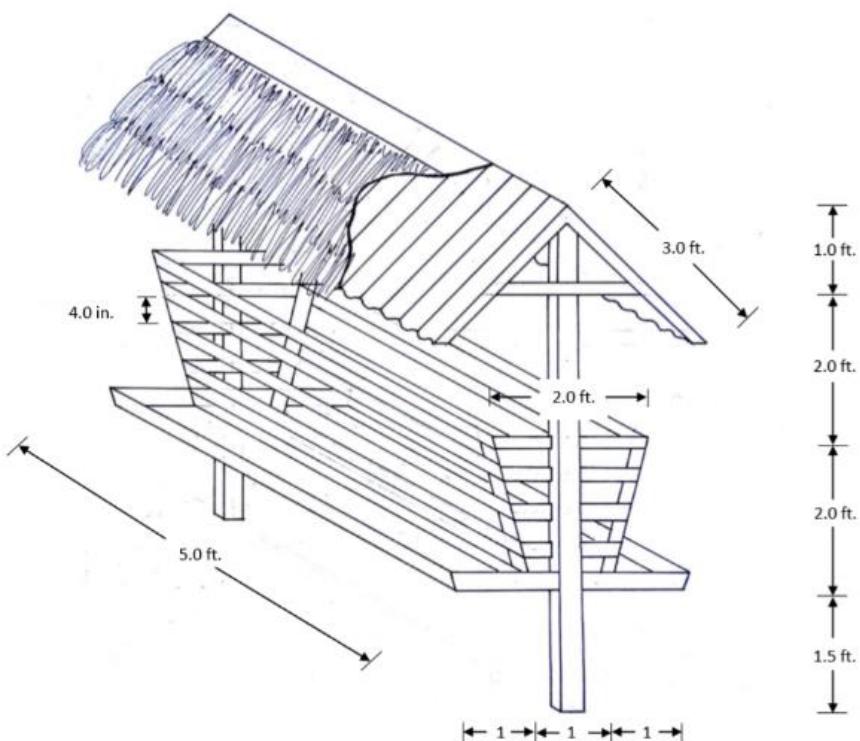


Figure 9. Design of feeding crib based on recommendations of Jeff Holland (sketch by J. Nuñez)

Expert consultation regarding capture, transport and acclimation of Calamian Deer Capture

Following up on the draft of the conservation breeding management plan, a second round of expert consultation was conducted in December 2017 to consolidate capture, transport and acclimation methods of Calamian Deer.

Using boma is still the favored means of capturing deer on Calauit Island. Raising fawns appears not practical, according to information provided by Florian, Radoslaw and Jeff, since 1) fawns need to be captured within the first one or two days after birth, which is challenging in the high weeds surrounding the Calauit central grazing area, 2) animals should be raised in a group; it is however unlikely that larger numbers can be obtained at any given time, since births occur over most of the year without discernable peaks.

A question was raised by Jens-Ove if anesthetics, tranquilizers, darts, blowpipes or immobilization guns are locally available or could be imported without problems. Dr. Emilia Lastica replied the following in a separate mail: "I use tiletamine-zolazepam (Zoletil®) in Spotted Deer, and I think this is enough for the Calamian Deer. Ketamine is a controlled drug and is very hard to come by here in the Philippines, but Zoletil® is readily available and does not require a special license to obtain. As for blowpipes and darts, I make my own because they are not locally available. I know some local vets have invested in tranquilizer guns ... The air gun I used to use when I was with the PSD Conservation Programme was flown in by William. There were two sets, both gifts from Mulhouse Zoo. I'm sure the vets from overseas can bring theirs without problems as long as they are made of plastic."

Radoslaw committed that Wroclaw Zoo can provide Rototags and transponders for individual marking. Jeff agreed to visit the Philippines (preferably Calauit) by last week of February/early March to assess the local conditions and give recommendations regarding boma construction, including site selection.

Most partners agreed to support the project with manpower. We assume that two keepers should be available for capture, transport and acclimation (including capacity development for our keepers) and one or two vets should be available for capture, transport and initial phase of acclimation. Noam committed to post request for volunteers on the Deer TAG Facebook page. Presence of international experts on the species (at the same time) would also determine the feasibility to conduct an action planning workshop for the species. Jeff will check if there are any records left in San Diego regarding William Oliver's project on Calamian Deer.

Transport

Initially the best timing for transport was initially considered to be during the height of the dry season (March/April). Recent information indicates that now the road from Calauit to Coron port is cemented throughout. This gives another window for capture and transport from mid of May to end of June. Advantage of the early rainy season would be that deer seem to be in a bit better condition, and temperatures are slightly lower, which may be advantageous during transport.

Lidia provided detailed information on transport boxes as follows: "As the Calamian deer are wild I would suggest using a crate without ventilation openings in the top part to prevent them from trying to jump inside. I assume that they will be restless when crated just like the Bawean deer. Maybe something simple like the picture below but with smaller ventilation openings (these were used to transport *Axis porcinus*; Fig. 10).

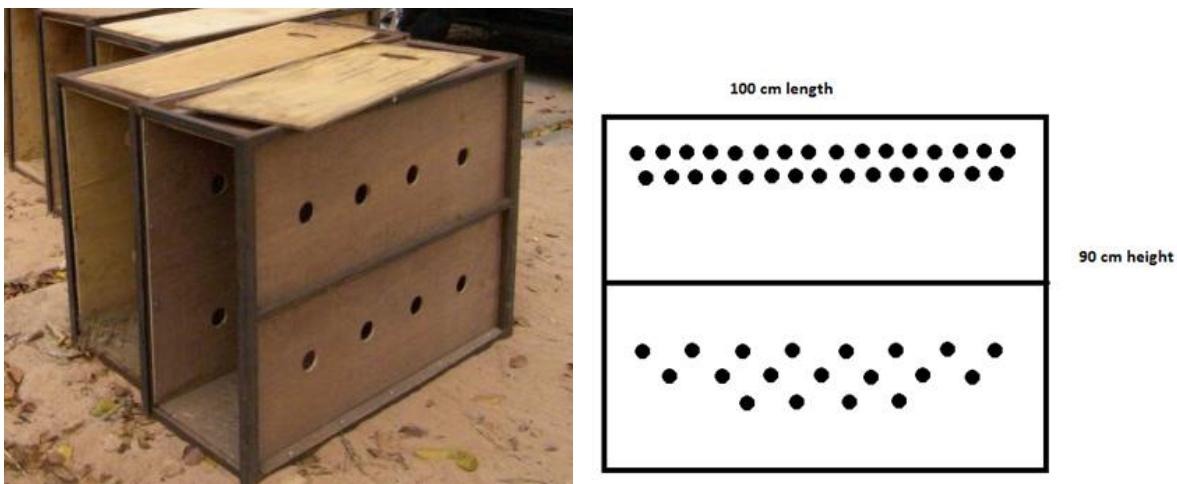


Figure 10. Recommended crate design for Calamian Deer transport (Photos: Wroclaw Zoo)

The crate dimensions: 100 cm long x 45 cm wide x 90 cm high. Ventilation openings: 3 cm diameter (small enough to prevent any part of the animal to protrude), at least 4 lines of openings on each side of the crate - 2 lines above the animal eye level and 2 lines in the down half (not too low - first line at least 15 cm from the bottom of the crate).

Materials:

- crate frame - must be a minimum 2,5 cm solid wood or metal bolted and screwed.
- sides and top - suitable plywood material, firmly attached to the frame, no protruding bolts
- inside- floor - solid, non-sliding surface
- doors - vertical sliding doors should be on both ends of the crate, solid plywood, no ventilation openings. The doors should be fastened in such a way that they cannot be accidentally opened (simple metal latches on the doors)
- handles - should be placed in the middle, on both sides of the crate, attached to the frame."

Christian suggested that the upper walls and ceiling should be padded to avoid injuries, for example using rubber or fabric filled with straw.

Lidia also suggested that males should have their antlers cut prior to loading and we should avoid capturing males with antlers in velvet, because they are easily broken and can result in significant blood loss. Since there seems no pronounced season of males in velvet, this consideration does not influence the timing of capture.

Radoslaw and Christian recommend tranquilizing deer during crating and transport. Currently we have not information on availability of suggested drugs in the Philippines: Perphenazine (or similar short-time tranquilizers), Haloperidol (or similar long-time tranquilizers). Emilia successfully used acepromazine granules on deer and pigs, but this drug was imported from Europe.

Acclimation

Currently two enclosure covering 900 m³ each are available, with adjacent isolation pen covering ca. 330m². The later can be subdivided into two compartments. An additional complex of similar dimension will be constructed when weather conditions allow. Roland was able to retrieve Calamian Deer husbandry guidelines from San Diego. Peter requested Noam to post requests for shelter designs in the Deer TG Facebook page.

Objective 2: Potential reintroduction sites for the Calamian Deer assessed and evaluated

Particularly the eco-ethological study, which was conducted in the last project phase, was crucial for the development of a parameter set which will be used for the assessment and evaluation of potential reintroduction sites for deer within the Palawan Faunal region (Tab. 1). A similar tool was developed and successfully employed for a reintroduction project for the Philippine Cockatoo, where 28 sites all over the Philippines were assessed using 19 parameters, covering bio-physical, socio-economic/political and logistical aspects of the sites (Widmann et al., 2013).

Parameters are formulated in a way that they can be individually scored, and that a high overall score for a site reflects a high probability for successful reintroduction.

Assessment and evaluation of potential of reintroduction sites will for the time being be restricted to municipalities outside of the current distribution of Calamian Deer, but within the historical range of the species. Excluded are all municipalities in Palawan south of Narra, due to the occasionally volatile security situation. Within the reporting period, assessments have

Table 1. Suggested parameters for the assessment of reintroduction sites for Calamian Deer within the Palawan Faunal Region

Parameter	Measurement	Means of verification	Suggested weight factor	Comments
Bio-physical				
Woodland-grassland mosaic	Length of ecotone	GIS measurement of satellite image	3	
Grassland size	Area	GIS measurement of satellite image	3	Subject to different management schemes
Woodland size	Area	GIS measurement of satellite image	1	
Permanent freshwater source	Length of creek, area of water body	GIS measurement of satellite image	3	Permanency needs to be verified during dry season
Presence of food plants	Number of species	Rapid grassland assessment	1-2	Captive data suggests that species is very adaptable in this respect
Presence of salt licks	No. of termite mounds and other mineral sources per area	Ocular inspection	1	Implied from literature sources of related deer; occupancy analysis ongoing
Presence of other vegetation (e.g. tall weeds) as shelter	Area of vegetation plots	Ocular inspection	2	
Scarcity of cultivated plots	Area and type of cultivation	GIS measurement of satellite image, ocular inspection	1	Cultivation does not seem to exclude deer, but possibility for human-deer conflicts increases
Absence of dogs	Tracks and direct observation	Transect surveys	3	
Absence of hunting and trapping	Direct and indirect observations (traps, trophies, poachers)	Transect surveys, interviews	3	High levels of poaching will exclude a site from complete assessment
Absence of wire fences	Length of fences	Transect surveys		Injured or dead deer have been found in barb-wire fences on Calauit

Absence of livestock	Counts	Transect surveys	1	Calamian Deer tolerates all kind of livestock in a wild setting; there is evidence however that the US captive population suffered heavily from a wasting disease contracted from exotic hoof stock
Absence of road network	km of roads (cemented, uncemented)	GIS measurement of satellite image	1	
Socio-economic/political				
High support of local governments	Prior informed consent	Actual documents	1	
High support from local communities/land owners	Attitude change; prior informed consent	Pre- and post-campaign surveys	2	Lacking consent from private landowners would exclude the site from further assessment
Local management capacity high	Presence of traditional knowledge, academic institutions, etc.	Interviews, data from NSO	1	
Existing efficient law enforcement	Number of groups and personnel in law enforcement	Local records	2	
Existing protected area or conservation projects	Area and type of PA, project	Declaration; management plan or similar	2	
Logistics				
Infrastructure	Costs and time requirement of reaching a site	Records from actual assessment	2	
Monitoring feasibility	Infrastructure within site, legal and security restrictions	Records from actual assessment	3	Unresolved security situation or very restricted access (e.g. on private land) would exclude a site from further assessment

¹ 1: important; 2: very important; 3: extremely important

been initially conducted for three areas, namely Dumaran Island (Dumaran Municipality), Iwahig Prison and Penal Farm (Puerto Princesa) and Kingfisher Park and surroundings in Coron on Busuanga Island. The former two areas are within existing project sites of the Philippine Cockatoo Conservation Program, though not necessarily in the same location as assessed for the deer reintroduction. Quantitative analysis and evaluation will be conducted once all potential sites have been assessed.

Dumaran Island

Dumaran is situated in north-eastern Palawan between 10°22' and 10°41'N and 119°28' and 119°55'E. Nine Barangays are situated on Palawan mainland, seven on western Dumaran Island. The island is situated in the Sulu Sea and separated by a ca. seven km wide channel from the mainland.

PCCP currently manages three areas on the island: Omoi and Manambaling Cockatoo Reserves and the traditional roosting site in Lagan. A Local Protected Area Management Committee (LPAMC) functions as its management body. Both cockatoo reserves, a buffer zone and a corridor connecting both areas was declared as critical habitat, comprising 1,500 ha.

All natural terrestrial ecosystems in Dumaran are tree-dominated. On Dumaran Island only few small and isolated forest patches remain, none of them larger than 103 ha. The most abundant formation is evergreen and semi-evergreen lowland forest with Ipil *Intsia bijuga*, Amugis *Koordersiodendron pinnatum* being emergent tree species of commercial value.

A prominent species of conservation concern is the Philippine Cockatoo, which can be found with viable population in the mangroves and forest remnants of Dumaran Island, but apparently not anymore on the mainland. The last remaining forest patches are therefore of global conservation importance. This notion is supported by the recent records of other globally threatened species, particularly the Palawan Forest Turtle *Siebenrockiella leyteensis* (CR).

Other species of conservation concern are Palawan Hornbill *Anthracoceros marchei* (VU), Blue-headed Racquet-tail (VU) and Palawan Pencil-tailed Tree-mouse *Chiropodomys calamianensis* (DD).

Habitat degradation and destruction, rather than poaching, remain the biggest challenges for cockatoo conservation in Dumaran. In the current phase ca. five hectares of secondary forest and grassland were purchased with support of the Stadtholding Landau in the course of a carbon-mitigation project. These areas have been rehabilitated and integrated in the buffer zone of the Omoi Cockatoo Reserve. Larger-scale and long-term reforestation is underway.

The Critical Habitat (CH) established through PCSD Resolution No. 14-513 connects the two existing cockatoo reserves through a corridor and extends to include remaining forest fragments in the area. This is the first critical habitat established in the Province of Palawan

Grassland areas exist, particularly on the western margins of the CH, however large areas of open terrain are covered by bamboo which is of limited use for the deer. Grasses also persist in the plantation-like land use forms, particularly of cashew and coconut. Water is scarce on the island during the dry season, but permanent water sources are present in Omoi Cockatoo Reserve. Recorded food plants are present in the grasslands. Termite mounds are existing and may serve as salt licks, but artificial salt licks may be provided at least initially.

Stray dogs are found in moderate numbers. The road network is scarce, and car traffic is virtually absent. Hunting does not have a distinct tradition among the predominantly Cuyunon population, although poaching of pangolin and other high-value wildlife has been reported. Grasslands are partly fenced to keep in livestock, particularly goats and water buffaloes and occasionally cattle.

Travel to Dumaran Island is often challenging during rainy and stormy weather. Transport on the island is restricted to motorcycles and truck provided by the municipal government. KFI maintains a field house and a wildlife warden scheme which could be utilized for a deer reintroduction scheme. Dumaran has been the site for the first-ever Pride campaign in the Philippines, and conservation education activities have been maintained. The local population therefore has a good understanding of and attitude towards conservation. The local government has been very supportive to existing conservation activities of KFI.

Overall, Dumaran Island seems to be suitable for deer reintroduction; water may be a limiting factor and it needs to be explored how this could possibly be mitigated.



Figure 11. Woodland-grassland ecotone on Dumaran Island (left); goats and a dog in front of bamboo stand (right: Photos: P. Widmann)

Iwahig Prison and Penal Farm

The area which as open prison is under the jurisdiction of the Bureau of Justice covers ca. 28,000 ha in the southern portion of Puerto Princesa. Large parts of the coastal plains are cultivated, mainly with coconuts and rice paddies, where irrigation is available. Extensive areas of disturbed grassland-forest mosaics persist, which are habitats for a surprisingly high number of Palawan endemics. One explanation for this phenomenon could be that the present vegetation resembles that of some periods in the Pleistocene. These areas are used as pastures, but also for the collection of a wide variety of forest products. Grass fires are a regular occurrence and partly the vegetation is adapted to these occurrences (*Antidesma* fire

savanna). Extensive evergreen and semi-evergreen lowland forests exist at the foot of the Victoria Anepahan Range.

Freshwater is available all-year-round in several creeks which feed into Iwahig River. Plants recorded as forage for deer are present. Natural salt licks are present in forest areas. Termite mounds can occasionally be found in grassland areas. Some areas are covered in tall weeds, probably as result of overgrazing. Due to the status as penal colony, cultivation was until recently restricted to the vicinities of the sub-colonies, but illegal encroachment is increasing, particularly along the newly concreted cross-island road to Napsan. Consequently, also hunting and poaching, as well as occurrences of stray dogs seem to be increasing. Livestock kept includes goats, cattle, water buffaloes and horses, but all in low density. However, adjacent to the penal farm is a government-run cattle and water buffalo experimental farm. Few fences still exist in the area, with the exception of a large barb wire fence around the environmental estate of the City of Puerto Princesa. A national highway dissects potential deer habitat. It may pose an even bigger threat for wildlife since it is currently expanded from two to six lanes. A newly cemented road across the mountain range of the island has resulted in marked increase of motorized traffic in the area.

The administration of the penal farm has been supportive to conservation efforts of KFI in the past. Conservation education campaigns are ongoing and knowledge and attitudes towards conservation are slowly increasing among stakeholders. A proposal for a Critical Habitat covering ca 16,000 ha is in preparation.

The area is well connected to the road network of Palawan, however due to the number of illegal activities in the area, existing patrolling schemes of KFI partly require support from armed members of WESCOM. KFI supports a wildlife warden scheme in Iwahig and was spearheading a SMART patrolling system utilizing GIS function of smartphones.

The habitat within the penal farm seems to be suitable for reintroduction, however frequent incidences of illegal activities, particularly poaching and squatting need to be addressed before reintroduction could be considered. The imminent road widening is another cause for concern for wildlife.

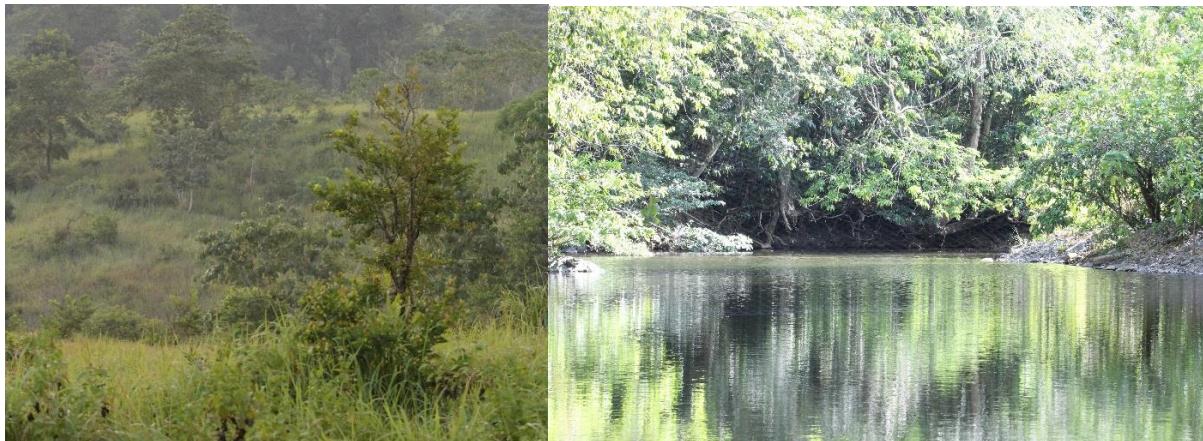


Fig. 12. Fire savanna (left) and creek in IPPF (right; Photos: P. Widmann)

Kingfisher Park and surroundings, Coron, Busuanga Island

The location comprises a privately owned lowland forest- grassland mosaic in Bgy. Bintuan, Coron, on Busuanga Island. Grasslands are mostly situated on the hilltops, and woody vegetation in the valleys. Forests are mostly dry or semi-evergreen. Dominant tree species include Ipil *Intsia bijuga*, Amugis *Koordersiodendron pinnatum* and strangling figs *Ficus* spp. Grasslands are said to be partly of natural origin due to pronounced seasonality of precipitation and partly high soil metal content, and partly man-made through burning. Scattered trees within the grasslands therefore are fire-resistant species, particularly Ironwood *Xanthostemon verdugonianus* and *Antidesma ghaesembilla* and *Vitex pubescens*. An indication that some of the grasslands are either natural or at least very old is the presence of diverse wildflower assemblages in some locations, including pitcher plants *Nepenthes* sp. Some repeatedly burned areas, possibly in combination with overgrazing, developed into dense stands of bamboo *Schizostachyium lumampao*. Intertidal flats are covered with mostly intact and diverse stands of mangrove. Freshwater creeks in the valleys are partly permanent even during severe droughts.

According to secondary information, Calamian Deer were present until the 1960s or 70s. They reportedly became extinct due to overhunting and uncontrolled burning. Palawan Bearded Pig are still present in the area however. Poaching for other wildlife, particularly Philippine Pangolin, is still occurring. Part of the area was awarded to settlers in the course of agrarian reform. Squatting was a severe problem in the past but is now checked through the presence of a security force in strategic locations. Termite mounds can be commonly found in grass and woodland.

Fires remain a problem in dry years. A national road dissects the area, but traffic is only moderate. Some adjacent areas are fenced with hog and barb wire. Dogs are present around settlements but were only rarely encountered in the interior. Cattle and water buffalos are present near farms.

The management of the area is very supportive of the PDRCP and generally manages the area with biodiversity conservation in mind. The presence of the security force is beneficial for the monitoring of the area. The area is well connected through a national road to the municipal capital of Coron.

Overall the habitat seems still very suitable for the species. As in all other locations within the historical range of the Calamian Deer, hunting remains a problem which needs to be addressed through conservation education and enforcement well before any reintroduction is undertaken.



Figure 13. Wood-grassland mosaic in Kingfisher Park, Coron (Photos: P. Widmann)

Collection of biological data to inform site assessments

Although the eco-ethological study was concluded, we still gather data on biology of the deer during surveys, particularly on feeding biology. As was indicated in the former study, the species is predominantly a grazer feeding on a wide variety of grasses and herbs. Herbarium specimens still need identification, but most of these plants are so common and widespread that availability of food plants is unlikely to be a limiting factor, once suitable grassland areas have been identified during assessments.



Fig. 14. Some examples of Calamian Deer food plants preserved as herbarium samples (Photos: J. Nuñez)

Objective 3: Conservation education campaign for Calamian Deer and Balabac Mousedeer conducted

Pre-campaign questionnaires covering knowledge, attitude and self-reported behavior of and towards the two species were prepared and field-tested. Its conservation campaign is carefully planned to avoid issues later similar to that of what happened for the Tamaraw *Bubalus mindorensis*, the wild cattle from Mindoro, for which no conservation breeding program exists, despite being critically endangered, because animals are not allowed to be brought outside of the island. There are no such concerns for the mousedeer, but security situation in Balabac is currently delaying the campaign implementation.

A poster design for the Balabac Mousedeer and Calamian Deer was created by the wildlife artist Rolito Dumalag. The former shows the mousedeer together with other typical wildlife from the coastal forest of Bugsuk Island: Palawan Porcupine, Common Palm Civet, Nicobar Pigeon, Philippine Cockatoo, Saltwater Crocodile and Malay Lacewing Butterfly. The latter shows typical species of grassland-woodland mosaics together with the deer, including cockatoos, King Quail, King Cobra, Philippine Pangolin and a pack of Asian Wild Dogs, which were present until the early Holocene in Palawan, but now are extinct.

Both posters of the ‘share a place to live’ series were printed for the Balabac Mousedeer and Calamian Deer with 2000 and 5000 copies respectively.

Two-hundred t-shirts showing Calamian Deer were produced and distributed to stakeholders.

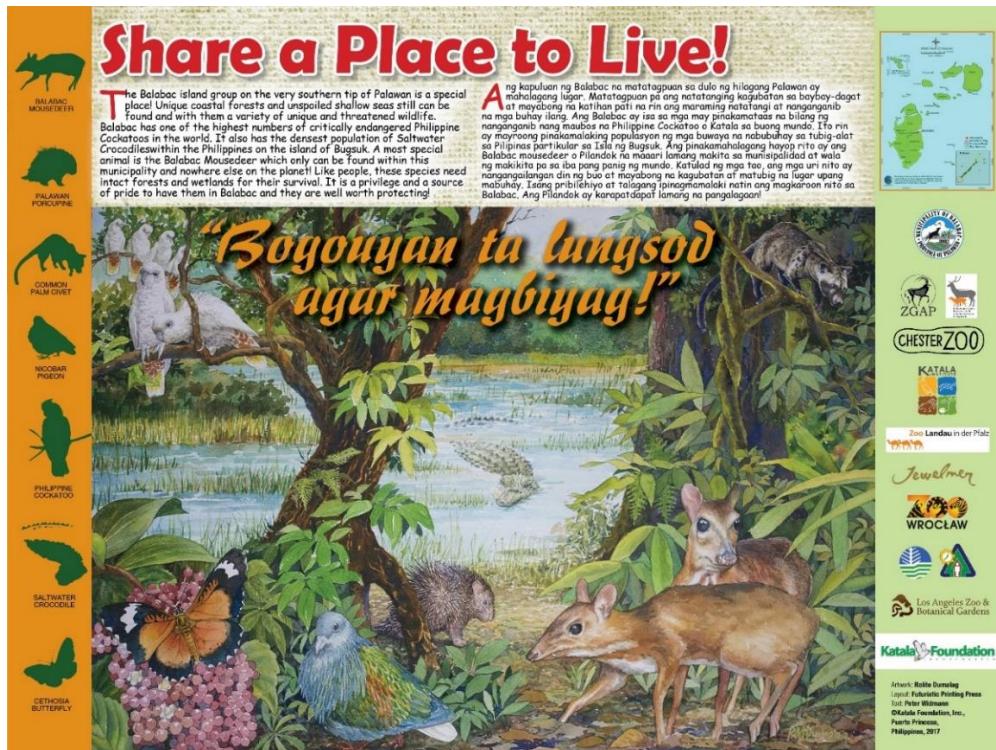


Figure 15. Final design for poster “share a place to live” for the Balabac Mousedeer

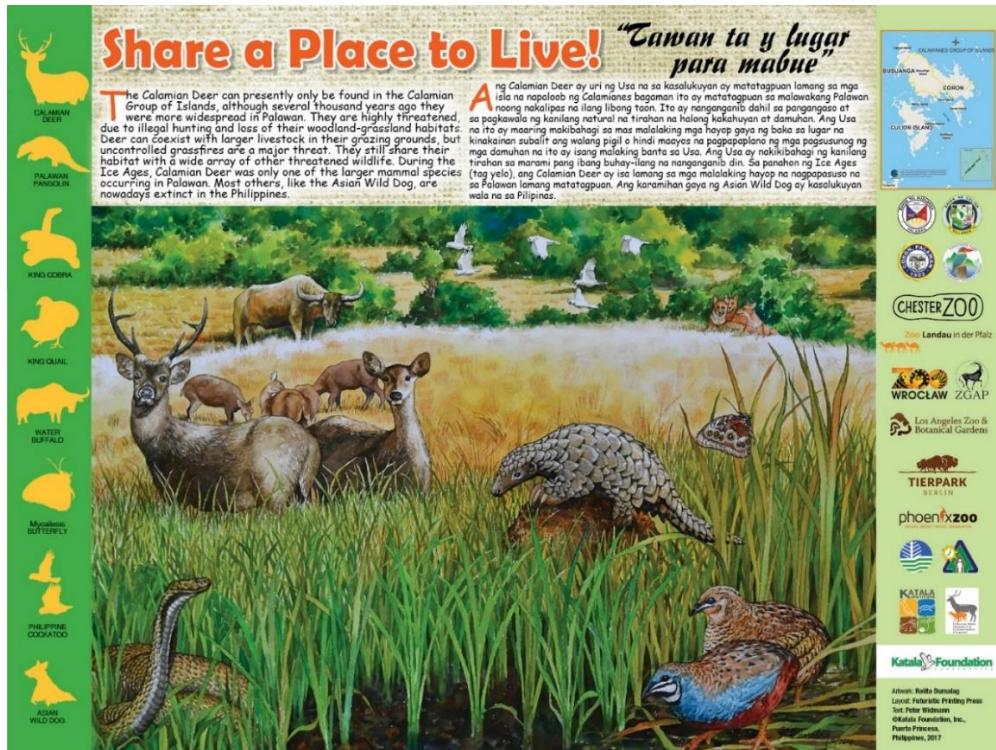


Figure 16. Final design for poster “share a place to live” for the Calamian Deer

Stakeholders Meeting in Coron

The Calamian Deer Conservation Education and Stakeholders meeting was held on March 1 at Capilla De San Vicente Ferrer Sitio Malbato, Brgy. Bintuan, Coron, Palawan. It was attended by 23 representatives from four out of five partner-barangays in Coron, LGU, DENR, PCSDS and staff from Katala Foundation. The participants were oriented about the Calamian Deer conservation project in Coron and presented with the initial results of the conservation activities.

Joshuael Nuñez, presented the results of the hunters/forest user's interviews and Calamian Deer population survey conducted in Coron. The status of Calamian Deer in Calauit Island was briefly discussed. He reported that despite of the protection of the species inside the park, they are continually persecuted. He also added that occupancy surveys were conducted in barangays Bintuan and San Jose in Coron, where presence of the species were confirmed only in the latter. Hon Joel Moreno, barangay captain of San Nicolas, volunteered that surveys should also be conducted in Brgy. San Nicolas where he claimed that deer are still existing. Josh wrapped up his presentation with the next steps of the project: 1) continued occupancy survey in Culion, 2) IEC in the barangays of Coron, 3) establishment of an ex situ breeding stock, and 4) identification and assessment of reintroduction sites within mainland Palawan. Indira added that the reintroduction sites are not yet identified and are still being assessed.



Figure 17. Group photo of stakeholders meeting participants (left) and introduction to workshop (right); Photo: KFI)

Indira discussed the concept modelling of the Calamian Deer conservation. She presented the direct threats such as hunting, predation by dogs, destruction of habitat and encroachment as well as the indirect threats such as demand for bush meat, trade, recreation and agriculture, to the conservation of Calamian Deer. She said that all the threats were mainly because of lack of opportunity and awareness of the community in Coron. The final concept model is shown in Annex 1. The group concluded that to address the problems, communities in Coron must be educated primarily on wildlife conservation laws. Indira added that this will be done through extensive Information Education Campaigns (IECs). The participants agreed that IECs are important to address the issues regarding Calamian Deer hunting. They also asked for campaign materials and/or resource persons for their own IECs within their respective areas.



Figure 18. Presentation on research findings (left) and development of final concept model (right; Photos: KFI)

Indira then proceeded to the presentation of the Theory of Change used in the Calamian Deer conservation project. She explained that this concept was the basis for the structure of the pre-survey interview questionnaire. She said that by increasing the knowledge and awareness of the community regarding Calamian Deer conservation, there would be a positive change in attitude. She also identified initial solutions for barrier removal such as working closely with the LGU and eventually passing a resolution prohibiting the hunting of Calamian Deer and creating a Memorandum of Agreement with each barangay for the protection of the Calamian Deer habitat. She urged the leaders to involve the community in reporting hunting and kaingin incidences and to volunteer in monitoring Calamian Deer sightings. According to her, that in this way, threats would be reduced and increase the chances of achieving the goals of the project which is to increase the Calamian Deer population and to protect their habitat. Hon. Antonio Villoga, one of the barangay official of San Jose in attendance, shared that indigenous peoples prohibit Calamian Deer hunting.

Certificates of Participation, Calamian Deer t-shirts and posters were given to the attendees. Ms. Indira Widmann formally closed the meeting thanking everyone for the time and participation of the event as well as the people behind the success of the activity.

Other Activities

An abstract on status on conservation of the Calamian Deer on Busuanga was submitted for the Research Symposium of the Palawan Council for Sustainable Development.

Objective 4: Conservation-relevant research on Calamian Deer and Balabac Mousedeer continued

Hunter and forest user interviews on Culion Island

A total of 108 respondents were interviewed in nine barangays of Culion. Majority of the respondents claimed that there are Calamian Deer in their respective barangays (68.57%) while only 24.76% have not seen the species in their areas.

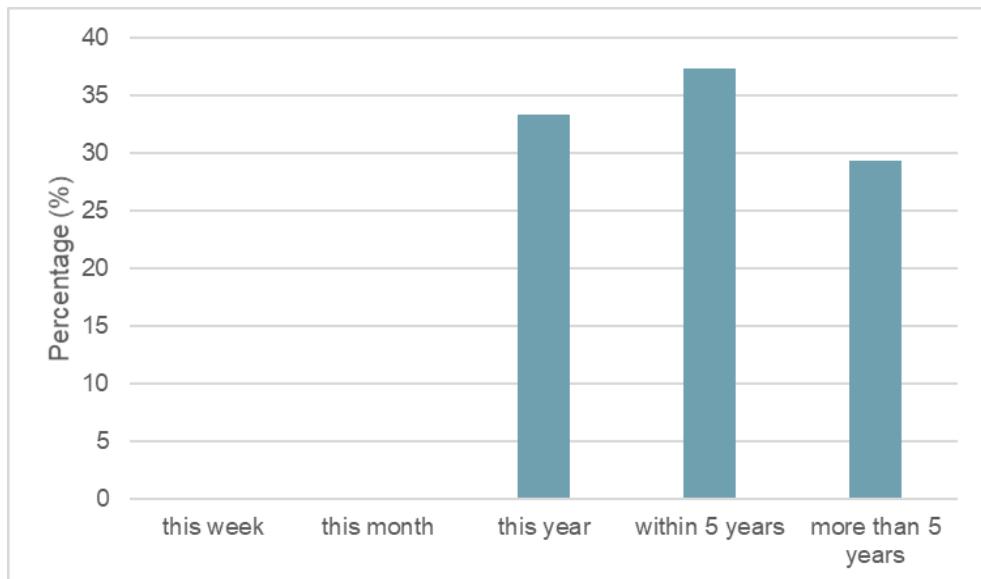


Figure 19. Period of Calamian Deer sightings

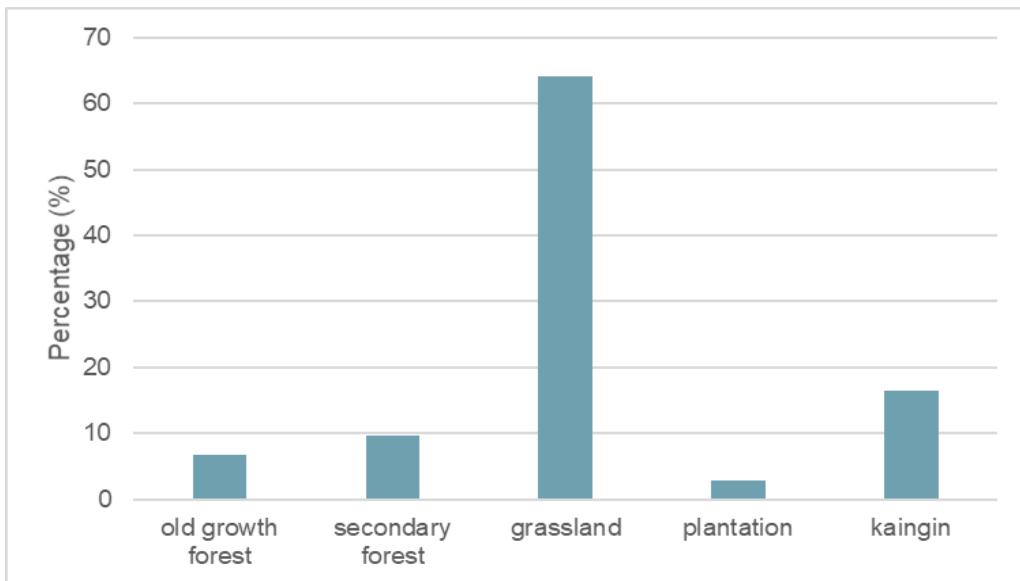


Figure 20. Perception on Calamian Deer habitat

About one third of the respondents were claiming to have seen the deer within the year of the survey while the rest reported sighting within or more than five years ago. Respondents who have seen the species perceived that the species favors the grassland areas (64.08%) and

sometimes can be found on *kaingin* areas (16.5%). This is probably because of better visibility in open vegetation compared to woodlands and also hunting activities in *kaingin* or burned areas.

Almost all the respondents said the Calamian Deer's population is already declining as a result of rampant hunting for food (83.15%), followed by the destruction and loss of their natural habitat (10.52%), whereas few of the respondents stated dogs and hunting for medicine as factors for the deer's population decline.

Out of all 108 interview respondents only six admitted that they were hunting and trapping Calamian Deer and Palawan Bearded Pig. It is also worth mentioning that respondents never reported sightings of Palawan Porcupine (*Thecurus pumilus*) which are common in the neighboring Busuanga Island.

Occupancy study for Calamian Deer on Culion Island

An occupancy survey was initiated within the reporting period on Culion Island, which after Busuanga and Calauit is among the larger islands with recent records of Calamian Deer. Transects were conducted on foot at known hunting grounds and good habitat on Culion, covering as much area as possible. Trails walked were recorded on a GPS device. Calamian Deer signs that were found, such as droppings and foot prints were also recorded on a GPS. Co-parameters such as salt licks, vegetation, presence of people and water sources, were also recorded. The time and date as well as weather conditions were noted. The analysis of data will be done through *Presence* software.

Pictures of deer signs were taken using both a digital camera and the Geocam app on a smartphone. Whenever possible, local hunters were hired as guides during the surveys.



Figure 21. Culion still has large intact habitat for Calamian Deer, but the few records indicate massive decline due to hunting (Photos: J. Nuñez)

Out of six barangays covered during the survey, four showed indications of deer presence. Almost all sites had evidence of human presence, particularly manifested through grassfires. All deer records were from grasslands. Interviews with hunters and other forest users indicate that hunting pressure on Culion is possibly less intense than on Busuanga. Deer records probably positively correlated to presence of termite mounds (which serve as salt licks) and water sources. This however needs to be confirmed by the ongoing data analysis.



Figure 22. Deer droppings in burned grassland (left) and deer trail in high *Imperata* grass (right; Photos: J. Nuñez)

A total of 77.47 km of transects were covered, resulting in an average of 1.43 km irregular transect per grid. Deer records were made on open grasslands close to water sources and termite mounds. Water sources and salt licks were only observed in areas with trees and not in open grasslands. Termite mounds are considered future salt licks, since termites concentrate plant materials and therefore minerals. Houses, plantations and *kaingin* areas indicate the presence of people. Small huts that serve as resting places for farmers growing crops such as rice, corn, cassava and vegetables were noted in areas surveyed. These are also commonly located far from the villages.

These farmers are usually accompanied by their dogs. Other than humans, dogs are known as predators of the Calamian Deer. In fact, hunters bring dogs to help them flush out Calamian Deer and Philippine Pangolin (*Manis culionensis*). The farmers also utilize water sources nearby to water their crops. This creates competition of resources, as water is also important to the Calamian Deer and other wildlife in the area for survival.

Water sources such as rivers, creeks and water holes were also recorded during the surveys. Most of the smaller creeks were dry, especially the ones situated in grasslands while a few creeks and rivers on larger forest patches still had water year-round.

Covariates will also be used in the assessment of the Calamian Deer reintroduction sites in the Calamian group of islands and in mainland Palawan.

A camera trap was installed in Brgy. Osmeña for a total of nine days in August and September 2017 and another nine days in January 2018. Only one Calamian Deer image was captured for the whole duration of camera trapping.

Two detection models were analyzed in *Presence*: Single Season 1) Constant model and the 2) Survey Specific model (Table 1). The constant model ($\psi(\cdot), p(\cdot)$) assumes the probability of occupancy is the same for all grids and probability of detection is the same in all surveys. Whereas the survey specific model, (1 group, Survey-specific P), accounts for the fact that the probability of detection may have differed between surveys.

Based on the Akaike's Information Criterion (AIC) and AIC weight (AIC wgt), the single season: constant model is the best fit for the analysis compared to the survey specific model. However, the two models do not vary greatly in terms of AIC and AIC wgt.

Of 54 grids surveyed, Calamian Deer presence was detected in eight grids across four barangays. This leads to a naïve occupancy estimate of 0.1481. Using the single season constant model, the actual estimate of species occupancy is 0.2238. The model shows that detection probability is about a third. This indicates that only about 220 of approximately 1000 km² of suitable habitat are occupied by the Calamian Deer in Culion.

Effects of water sources and saltlicks to deer occupancy were analyzed using the constant probability of detection $\psi(.), p(.)$ for covariates. Correlating salt licks with probability of deer occupancy ($\psi(\text{saltlick}), p(.)$), the model shows that the odds of Calamian Deer occupancy is 8.25 times (odds ratio/OR) higher in grids with saltlicks ($\alpha_2 = 2.11$) than grids without saltlicks. On the other hand, the probability of deer occupancy is inversely correlated to presence of people ($\alpha_2 = -0.289$). This indicates that Calamian Deer tend to move away from settlements and other human activities.

The results confirm the presence of Calamian Deer in parts of Culion. Reports collected through the interviews confirm presence of the species in barangays Luac, Osmeña, Patag and Halsey. Based on the locations of records, Calamian Deer populations are fragmented. Luac, Osmeña, Patag and Halsey are far away from each other. Human encroachments are detrimental to the already thin population of the Calamian Deer. Creating protected areas, particularly Critical Habitats (CH) in Culion is recommended to prevent further population decline and the risk of extinction.

Distance sampling on Balabac for Balabac Mousedeer

After the successful survey on Bugsuk, another distance sampling survey was conducted on Balabac. Selection of possible sites was limited by security considerations and recommendations of the SB (Municipal council) of Balabac. Although only a relatively small portion of the island could be surveyed, it appears that Balabac Mousedeer is still locally common, despite the considerable hunting pressure. If the security situation will allow, additional surveys will be conducted. Analysis of data is still ongoing.

Continued camera trapping on Bugsuk Island for Balabac Mousedeer

Camera trapping on Bugsuk Island involving originally six camera traps lasted from June 2016 to December 2017. Batteries were changed in all cameras and photos retrieved in April 2017. Towards the end of the trapping season, three camera traps had been destroyed by Long-tailed Macaques, which showed a keen interest in the devices, as documented by hundreds of close-up photos. Despite being protected by steel casings, the animals were able to chew on the lenses and sensors.

A total of 300 individual mousedeer records were retrieved. Analysis of records in relation to time of the day indicated two pronounced activity peaks during dusk and dawn (Fig. 23). Animals were somewhat active throughout the night. Mousedeer activity during daytime was rarely recorded and only from a single camera trap. Reasons for this are unclear, but predator avoidance (people, monkeys, dogs) or density of vegetation cover could play a role.

Mother with juvenile were for the first time recorded on May 29 and again on November 25, 2017. Records of two individuals in one picture frame, with usually the male following the female were recorded almost throughout the year (February, April, May, June, July, August, October, November, December), indicating that mating may occur throughout the year.

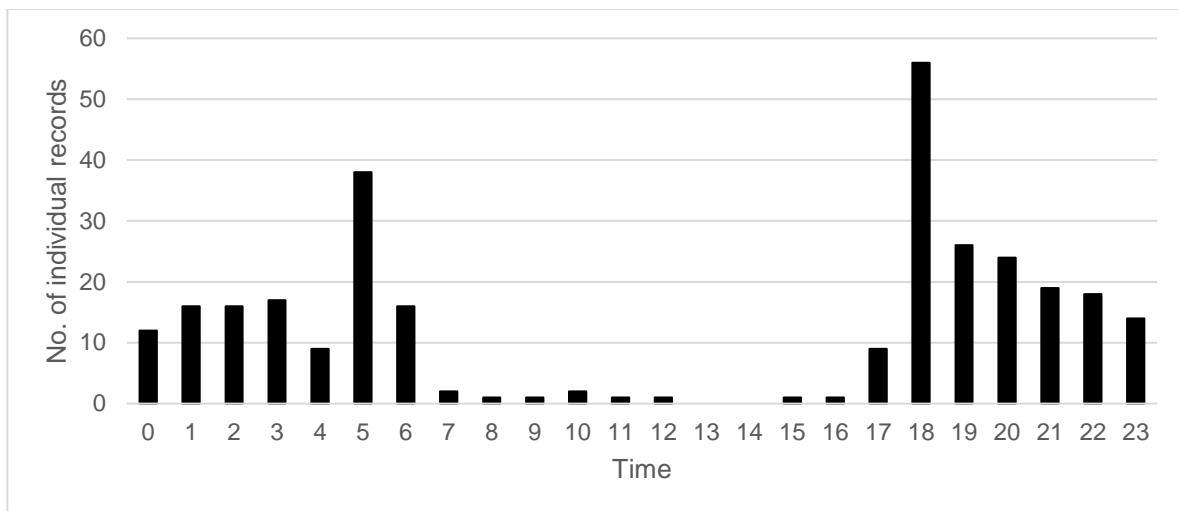


Figure 23. Activity patterns of Balabac Mousedeer during 24 hour-periods based on camera trap individual records (n=300)



Figure 24. Despite most of the camera traps being protected by metal casings (left), Long-tailed Macaques were persistent enough to destroy three of them (right; Photos: KFI)



Figure 25. First-ever photo in the wild of Balabac Mousedeer with offspring (left); records of two mousedeer in the same picture may give indications for breeding seasons of the species: the male on foreground, discernible by enlarged canines follows the female (right; Photos: KFI)



Figure 26. Balabac Mousedeer (eye shine center right) and Palawan Porcupine (foreground right corner) in the same picture. The mousedeer did not show a flight reaction since the camera trap took a series of photos with the two animals (left); one of the rare occasions a mousedeer was photographed during daytime (right: Photos: KFI)

Other wildlife recorded during the second phase from April to December 2017 included all the species reported earlier and in addition Greater Coucal *Centropus sinensis* and an unidentified rhinolophid bat *Rhinolophus* sp.

Proposed Next Steps

- Continued lobbying with the provincial government of Palawan as follow-up on the already granted Wildlife Farm Permit.
- Assessment of potential reintroduction sites will be continued.
- IEC will be continued.
- Distance sampling studies for mousedeer will be continued on Balabac, if security situation allows.

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Appendix 1 Concept model for Calamian Deer education campaign

