KOMODO DRAGON CONSERVATION PROJECT

FLORES PROGRAMME – 2018 REPORT

Report by

Achmad Ariefiandy Husen, M.Phil.
Project Manager
Deni Purwandana, M.Sc.
Programme Coordinator
Sanggar Abdil Nasu
Research officer

Puspita Insan Kamil, M.Sc.
Human-wildlife conflict officer
Muhammad Azmi
GIS officer

KOMODO SURVIVAL PROGRAM – An Indonesian Non-Governmental Organization
Jl. Karang Sari I, Blok G, No. 10
Denpasar Barat, 80117 Bali, Indonesia
info@komododragon.org

Dadang Suryana, M.Sc.

Eastern Lesser Sunda Central Bureau for Conservation of Natural Resources
Jl. SK. Lerik, Kelapa Lima
Kupang, 85228 NTT, Indonesia

In collaboration with

The Directorate General for Conservation of Natural Resources and Ecosystems
Direktorat Jenderal Konservasi Sumber Daya Alam dan Ekosistem (KSDAE)

Eastern Lesser Sunda Central Bureau for Conservation of Natural Resources
Balai Besar Konservasi Sumber Daya Alam (BBKSDA) *Nusa Tenggara Timur*

Supervision

Claudio Ciofi, Ph.D.
Department of Biology
University of Florence
Via Madonna del Piano 6, Sesto Fiorentino 50019 (FI), ITALY
claudio.ciofi@unifi.it

Tim S. Jessop, Ph.D.
School of Life and Environmental Sciences
Deakin University
Geelong, Victoria 3216, AUSTRALIA
t.jessop@deakin.edu.au

KOMODO SURVIVAL PROGRAM

Balai Besar Konservasi Sumber Daya Alam Nusa Tenggara Timur

EUROPEAN ASSOCIATION OF ZOOS AND AQUARIA
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2018 Financial Support

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SUMMARY

Conservation of Komodo dragons requires a multidisciplinary approach whereby wildlife population monitoring, direct protection measures, community awareness and capacity building initiatives are integrated and implemented in collaboration with government authorities and the local community. The Komodo dragon is both a keystone and an umbrella species. Protection of extant populations is pivotal for conservation of the eastern lesser Sunda Monsoon forest biodiversity and represent a potential for improving livelihoods of people coexisting with monitor lizards. Komodo dragons are currently found on five islands in south-eastern Indonesia. Four island populations occur within the world-heritage listed Komodo National Park. On the largest island of Flores, outside KNP boundaries, range contraction and population-density decrease has been documented mainly as the result of expansion of human settlements, illegal hunting of prey species and forest clearance to make way for agriculture. On Flores, Komodo dragons are protected on four nature reserves located on the western and northern coast of the island. Here, conservation efforts are conducted by the NGO Komodo Survival Program thanks to continued support from members and associates of the European Association of Zoos and Aquaria. Our conservation project is implemented in the Wae Wuul nature reserve, off the eastern boundaries of Komodo National Park in western Flores, in the three contiguous conservation areas of Wolo Tadho, Riung and Tujuh belas pulau, in the district of Pota and on the islet of Longos, in northern Flores. The northern coast of Flores constitutes the easternmost known stronghold of Komodo dragons in Indonesia and harbour a genetically diverse lizard population in a region still void of mass tourism.

The 2018 Flores programme for Komodo dragon conservation successfully implemented a number of key wildlife management and sustainable development initiatives. Population monitoring by means of passive infrared cameras recorded a relatively stable trend of Komodo dragons and main prey species in northern Flores. Deer and buffalo populations were relatively stable in western Flores, while pigs and Komodo dragons showed lower site occupancy values with respect with 2017 but still in line with period fluctuations in population densities recorded since 2013 in Wae Wuul. The programme provided training to rangers and technical staff of the Indonesian Department of Forestry in wildlife minitoring techniques. Patrolling and surveillance of nature reserves on the western and northern coast of Flores confirmed the presence of stray dogs in the reserves. The absence of dogs with collars recorded in both 2017 and 2018 could be the result of the intensive community education programme conducted since 2015 and the dog population census initiative which involves dog tagging in five villages around the reserve to make dog owner responsible for their pets. Nevertheless, the consistently high number of stray dogs recored in Wae Wuul in 2018 needs to be carefully considered for it may be the result of uncontrolled breeding and/or people purchasing additional dogs.

In December 2018 we completed the Komodo dragon distribution survey. A total of 330 camera trap sites were surveyed during a three year program, covering over 1,400 km of coastal habitats. The total survey effort provided 1,980 detection opportunities for Komodo dragons to be photographed. We successfully captured images of Komodo dragons at 81 (24.5%) of the total 330 camera trap locations. Thanks to this survey we updated the known distribution of Komodo dragons and discovered a new population on the island of Longos, in northwestern Flores.

We found no presence of the invasive Asian common toad *Duttaphrynus melanostictus* on Flores. The Asian common toad is not an autochthonous species of Flores and it is closely related to the cane toad, which has been as serious threat to Australian monitor lizards for it is toxic to ingest and caused a sharp decrease in a number of varanid populations.

Community awareness initiatives were conducted in northern Flores and included classes on environmental awareness and protection for adults and primary and secondary school kids. We maintained the course on ecotourism implemented in 2017. The course aimed at developing locals' ability to organise and conduct ecotourism services, including environmental awareness, eco-tours, walks, trekking, plant and animal indentification. We also conducted an advance session of handicraft training workshops initially held in 2017. We invited a selection of trainees in wooden handicraft from northern Flores to Komodo village, in Komodo National park, in order to continue their training in the making of wooden Komodo dragon characters for the tourist market.

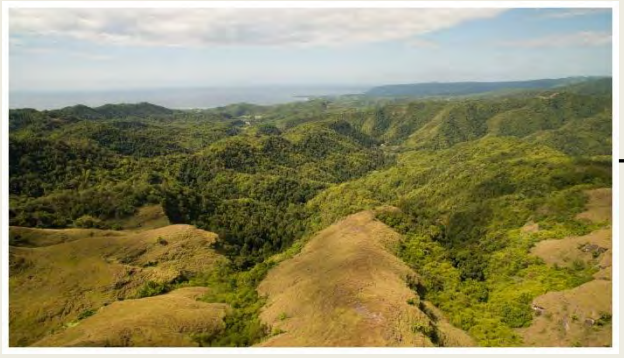
In February 2018, we conducted GIS and data analysis training for the Indonesian Central Bureau for Conservation of Nature Resources (BBKSDA) and the Forestry Board of East Nusa Tenggara Province.

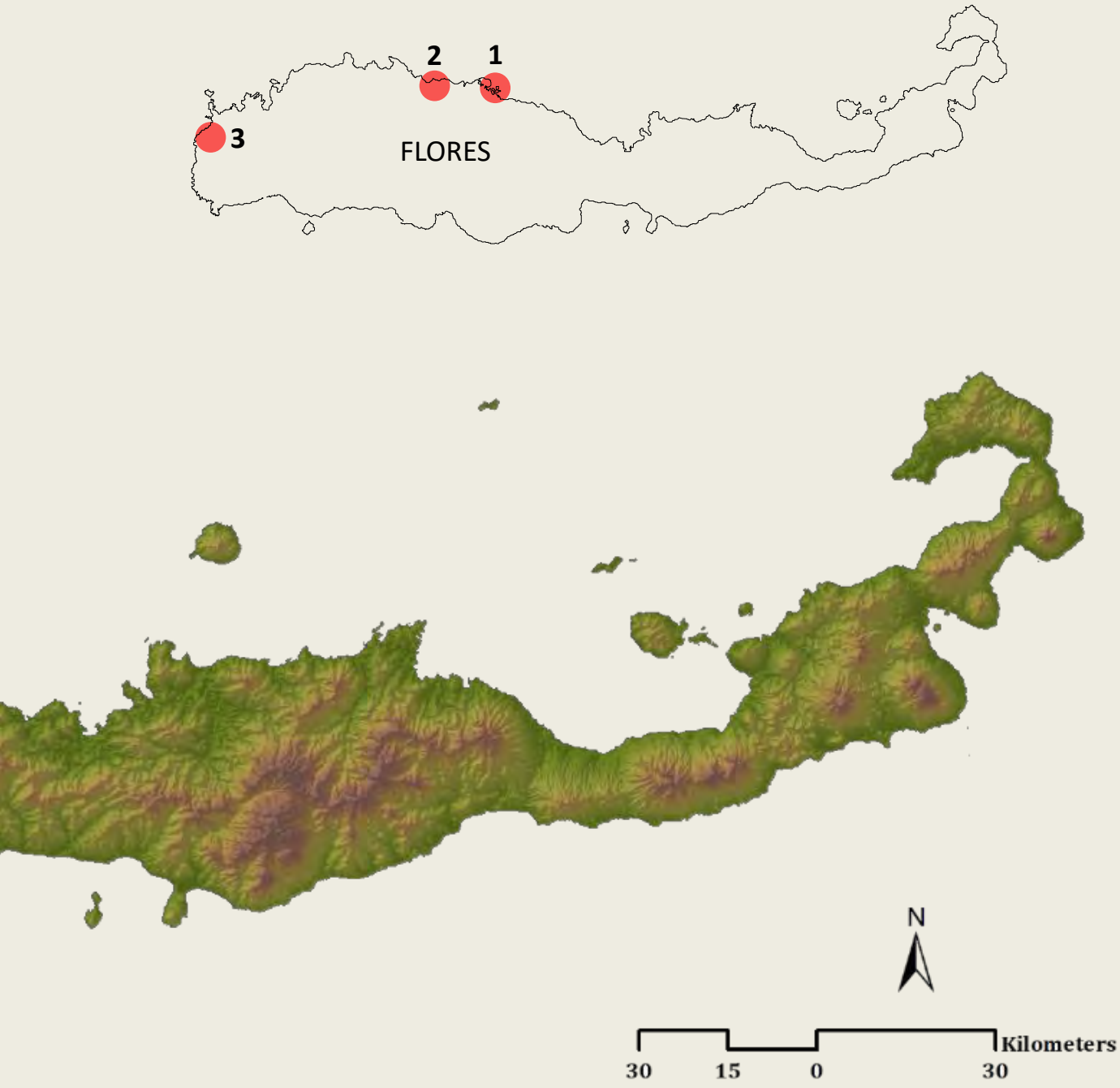
We also conducted a workshop on livestock management to mitigate/reduce conflict between human and Komodo dragons in North Flores.

A meeting was held at the BBKSDA Office Kupang to review the work conducted in 2017/2018 and present the 2019 schedule of activities. Moreover, dissemination meetings with the North Flores government authorities and stakeholders were held in Ngada and East Manggarai districts.

Finally, we initiated construction works in northern Flores for 1) a Komodo dragon Information, Education and Research Center, 2) a small auditorium and meeting hall for community awareness activities, and 3) a space for pilot projects on sustainable livestock practices, including a livestock pen, and biogas and composting installation facilities. In December 2018, the information and education center was almost finished. This building consists of 1) a main hall where information on Komodo dragon life history will be displayed, 2) one bedroom, 3) working areas, 4) a bathroom, and 5) a storage room.

1. PROJECT SITES





1. WOLO TADHO, RIUNG and TUJUH BELAS PULAU Nature Reserves
2. POTA District
3. WAE WUUL Nature Reserve

2. Monitoring Activities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2.1 Komodo Dragon Population Monitoring

Camera trapping, by which animals are photographed as they walk past a stand-alone camera, is a widely used method to assess presence/absence of wildlife and population trends, particularly for rare or elusive species. Non-invasive detection of animals is also the most valid alternative to live trapping and capture-mark-recapture studies, whereby individuals are trapped and uniquely tagged for future identification. For the most part, capture-mark-recapture studies via cage trapping seems effective for documenting demographic trends. However, long-term monitoring using capture-mark-recapture methods requires considerable logistical, economic and time efforts and costs. Moreover, animals may become trap-shy and their presence underestimated simply because a lizard won't enter a trap after experiencing a number of consecutive live trapping surveys. A comparison of detection values for Komodo dragons recorded by cage traps and by cameras in Komodo National Park indicated a higher overall detection by camera traps. No significant differences was observed between probability of detection of camera traps paired with cage traps and camera traps alone, indicating that detection by camera traps was not affected by animals avoiding locations with cage traps. Data collected via camera trapping can be used to estimate site occupancy, whereby the proportion of sites occupied by an animal is assessed based on presence/absence data and can be used to provide estimates of population trends. Species detection probability is also calculated and defined as the probability of detecting at least one individual during a sampling session.

In 2018, we conducted camera trapping in the Wae Wuul nature reserve (West coast of Flores), the Island of Ontoloe (Tujuh Belas Pulau reserve) and the Pota district along the northern coast of Flores. Scout Guard and Bushnell cameras were attached to a tree approximately 40 cm above the ground and programmed to take three photos each time the animal triggered the device. A 15 minute delay was included to prevent repeated photography of the same individual. Baited aluminum boxes were placed in front of each camera in order to attract animals to the trapping site.

In Wae Wuul, a total of 26 camera traps were deployed in deciduous monsoon forest and savannah grassland. On the Island of Ontoloe, we set up eight camera traps, while 16 camera traps were installed at Pota. We used a maximum likelihood site occupancy approach implemented in PRESENCE 12.7 to estimate detection probability (number of animals captured divided by the number of capture events) and assess the proportion of sites (or sampled area) occupied by Komodo dragons based on presence/absence data. We evaluated four competing single-season models with site-specific covariates which could conceivably influence occupancy and detection probability. Three models were constructed using main prey density indexes as covariates including (i) deer, (ii) water buffaloes and (iii) deer+water buffaloes faecal densities. The fourth model considered preferred habitat area, specifically open deciduous forest coverage. All models assumed that (1) the population was closed to immigration, colonization, emigration or extinction, or other changes in occupancy during the study, (2) monitor lizards were correctly identified, (3) the probability of detecting a Komodo dragon at one site was independent of probability of detecting a dragon at all other sites, and (4) the probability of occupancy was the same for all sites.

Year	Site	Site occupancy	Detection probability
2013	Wae Wuul	0.13 ± 0.06	0,29
2014	Wae Wuul	0.49 ± 0.18	0,07
2015	Wae Wuul	0.55 ± 0.18	0,15
2016	Wae Wuul	0.38 ± 0.14	0,12
2017	Wae Wuul	0.66 ± 0.00	0,22
2018	Wae Wuul	0.28 ± 0.08	0,30
2013	Ontoloe	0.56 ± 0.18	0,43
2014	Ontoloe	0.44 ± 0.14	0,49
2015	Ontoloe	0.67 ± 0.20	0,10
2016	Ontoloe	0.57 ± 0.18	0,22
2017	Ontoloe	0.33 ± 0.00	0,42
2018	Ontoloe	0.62 ± 0.00	0,16
2016	Pota	0.25 ± 0.15	0,21
2017	Pota	0.32 ± 0.13	0,16
2018	Pota	0.44 ± 0.20	0,19

In Wae Wuul, we recorded nine total detections at four camera trapping sites. Probability of detection and proportion of the Wae Wuul area occupied by dragons were 0,30 and 0.28±0.08, respectively. Site occupancy values varied significantly from 2013 to 2018. The 2018 value was lower compared to 2017 figures but still slightly higher than the lowest site occupancy ever recorded in 2013.

On Ontoloe, we detected 11 trapping events at six camera trapping sites, whilst in Pota we detected a total of eight detections at five camera trapping stations. Detection probability and site occupancy were 0,16 and 0.62 ± 0.00, respectively. These were fairly high values and only slightly lower that the highest numbers ever recorded in 2015.

Occurrence of Komodo dragons in the Pota district, outside the nature reserves, was confirmed in the 2018 survey. Adult and sub adult individuals were recorded at 5 out of 16 camera trapping stations located in savannah and dry deciduous Monsoon forest. A slight increase of occupancy (0.44±0.20) values was recorded in 2018 with respect to 2017 and 2016 when Komodo dragons were detected at three and four out of 16 camera trapping stations, respectively.

Along the west and north coast occupancy and detection probability varied from 2013 to 2018 but maintained a relatively stable trend, there is no significant evidence of a population density decline based on encounter metrics.

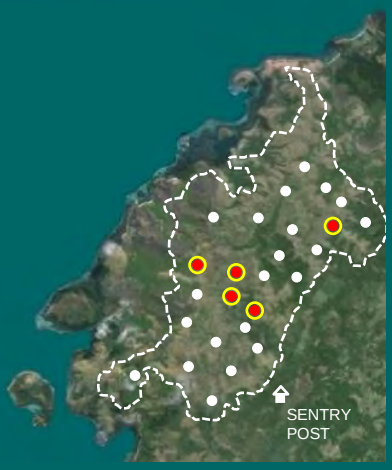
Wae Wuul Nature Reserve

● Cage / camera trap site

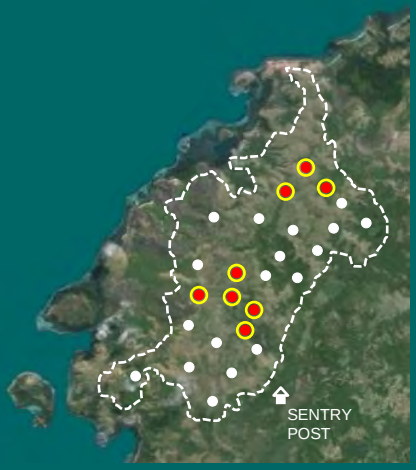
◉ Cage / camera trap site with Komodo dragon records

Komodo dragon detection at Wae Wuul

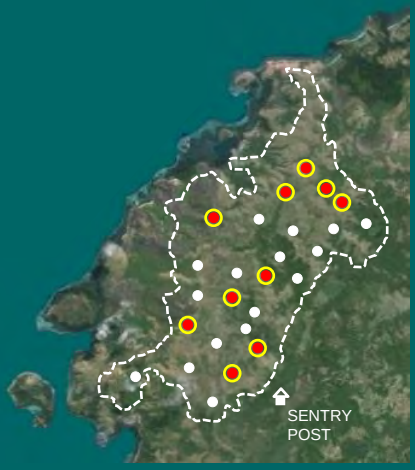
2013



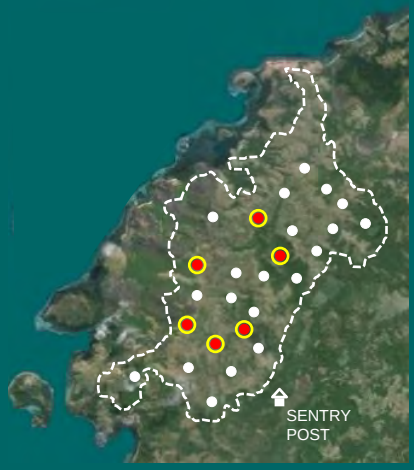
2014



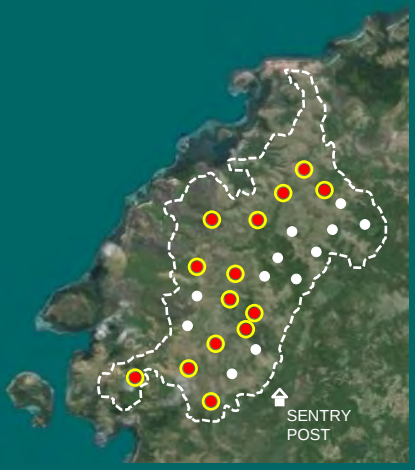
2015



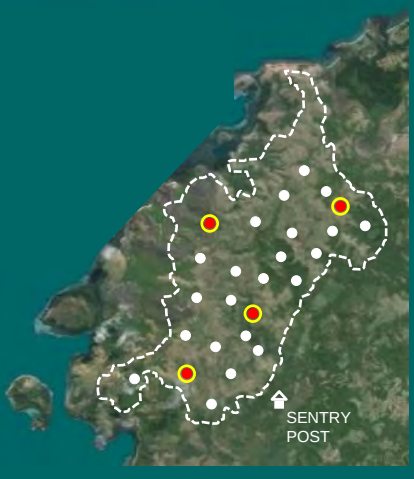
2016



2017



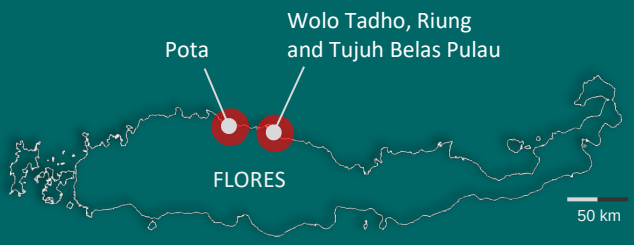
2018



N

1 km

- camera trap site
- camera trap site with Komodo dragon records



Pota & Ontoloe Island

2016

2017

ONTOLOE Island

1 km

2018

2016

2017

2018

POTA DISTRICT

N

5 km

Cage / camera trap site

Cage / camera trap site with Komodo dragon records

Biawak Komodo (*Varanus komodoensis*)
Lokasi KEE Pota, Kab. Manggarai Timur

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Biawak Komodo (*Varanus komodoensis*)
Lokasi Pulau Ontoloe, Riung , Kab. Ngada

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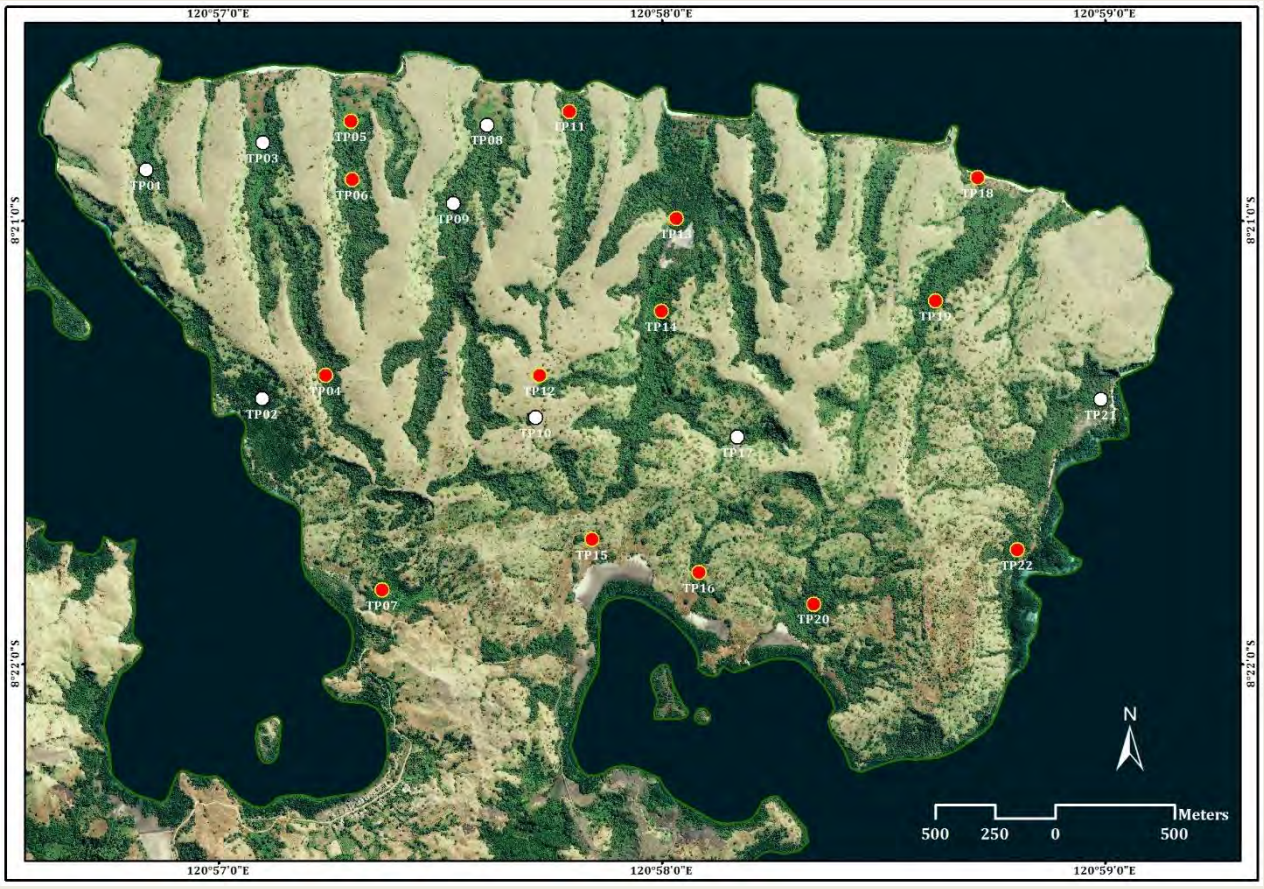
Torong Padang Peninsula

On December 2018, we also successfully conducted a survey across the Torong Padang Peninsula, an additional site for monitoring the population of Komodo dragons and their prey in Northern Flores, off the western border of the Tujuh belas pulau Nature Reserve.
This is an area of approximately 850 ha and may serve as an important ecological corridor for Komodo dragon populations in northern Flores. We installed camera traps at 22 locations and detected the presence of Komodo dragons at 14 distinct trapping sites with an estimated 23 ± 6 individuals (95% CI = 13 - 40) including adults, sub-adults and juveniles. This preliminary survey confirms that Torong Padang is an important ecological corridor between the three nature reserve located east of the peninsula and the district of Pota to the west of the study site. These results also advocate the importance of protecting Torong Padang as an area suitable for Komodo dragons that still is outside the current network of protected areas of northern Flores.



● Cage / camera trap site ◉ Cage / camera trap site with Komodo dragon records

2.2 Komodo Dragon Distribution Survey

Since the first description of the Komodo monitor *Varanus komodoensis* in 1912, a number of surveys were conducted from 1926 to 1959 as first attempts to assess the species distribution in south-eastern Indonesia. In 1981, Walter Auffenberg from the Florida State Museum provided the first detailed, although not comprehensive account on the extent of the species' range during a survey conducted between 1969 and 1972. The Komodo monitor was recorded on the islands of Komodo, Rinca, Padar, Gili Motang, Gili Dasami and Flores. The survey conducted by Auffenberg reported a continuous, narrow distribution of Komodo dragons along the southwest coast of Flores, from Nangalili to Labuan Bajo. In North Flores, Auffenberg described a scattered distribution of Komodo dragon north of the town of Labuan Bajo, then in the bay of Terang, and from the town of Reo eastwards to the village of Riung. A survey conducted by Ciofi, De Boer and Sastrawan in 1997 and 1998 confirmed the south-western range of the species and reported a decrease of the northern distribution of the Komodo monitor to approximately 45 km of coastline, between the Pota district and the Wolo Tadho reserve.

A comprehensive survey along the northern, western, southern and eastern coastlines of Flores is of particular significance for mapping once and for all the presence of extant Komodo dragon populations. Such endeavour is largely facilitated by the deployment of camera traps, which, unlike cage traps, can be easily carried in the field and deployed in different locations within a relatively short amount of time.

Field based habitat assessment and species habitat occupancy will be also used to conduct predictive modelling approaches (e.g. species distribution models) to identify and prioritize remaining habitat with the forward looking view of developing additional reserves that provide habitats resilient to anthropogenic and climate induced environmental change for Komodo dragons.

In 2018, we completed the Komodo dragon distribution survey on Flores. A boat was rented and off road motor bikes were prepared for coastal survey following meetings and final approval by local government officials. A total of eight members of BBKSDA participated in the survey and stayed with the monitoring team for the entire duration of the journey. At each trappinf locations, Bushnell cameras (Trophy Cam HD 119678) were attached to a tree 40 cm above the ground. Cameras were programmed to take three photos and one-minute video each time the animal triggered the device. A 15 min delay was included to prevent repeated photography of the same individual lizard. Goat meat (~0.5 kg) was placed in aluminum boxes (25x15 x15 cm LxWxH) and positioned three-four meters in front of each camera to lure lizards into the camera's field of view. In addition, additional bait was(~5 kg) placed into plastic bag and suspended 2–3 meters above the bait box to further attract dragons to camera detection stations. At each detection station, cameras were run continuously for 3 days. We divided camera sampling into morning (8–12 pm) and afternoon events (2–5 pm). All Komodo dragon images captured were used to denote the presence of lizards at a camera detection station. Cumulatively this sampling design provided 570 detection opportunities for Komodo dragon to be photographed.

The first session of the third and last part of the survey was conducted on the southern coast from Borong to Ende. Natural habitat consists of savannah, savannah woodland, and grassland limited inland by Monsoon and semi-evergreen forest edges. Other areas include settlements, non intensive and intensive cultivations as well as secondary forest. Most of natural habitats along the first 25 km from Borong to Wae Lengga has been converted to livestock grazing grounds. We set up 5 camera trap stations. The following 50 km from Wae Lengga to Mauponggo were mostly taken by secondary forest and cultivated areas, a few patches of natural deciduous Monsoon forest and settlements. This area was subject to recent volcanic activity of Mount Inerie and Mount Ebulobo. We set up 9 camera traps. Finally, the coast from Nangaroro to Ende is an encroached region with paved roads. Here, we set 6 trap stations close to cultivated fields and settlements.

We found no evidence of V. komodoensis from Borong to the town of Ende. This is probably due to the medium to high level of disturbance to Monsoon forest, and land conversion from savannah to cultivates and rice field. Human settlements are rapidly expanding around Borong and Ende areas and land is being cleared and converted to plantations. Additional human disturbance including deer poaching make these areas unsuitable for Komodo dragons. We recorded the presence of water monitors (V. salvator) on 4 out of 20 camera trap locations (20%). The water monitor is a generalist and quite common on Flores, especially in areas where its competitor V. komodoens is absent. Several dogs (stray and domesticated) were found at most (60%) camera trap locations, especially in the disturbed areas around Borong and Ende.

The second and final session of the survey was conducted from Ende through Larantuka and Maumere to the Detusoko peninsula. We positioned a total of 93 Bushnell camera traps along 450 km of coastline

Habitat type from the town of Ende to the village of Sikka consists of Monsoon forest on steep mountain ridges and in narrow valleys, and patchy savannah woodland. The remaining habitat has been converted into settlements, non intensive and intensive cultivated areas and secondary forest. Along approximately 75 km of coastal areas, almost all savanna habitat has been converted into pastures for cows, buffalos, goats and few groups of sandalwood horses. In this survey area we set up 20 camera traps .

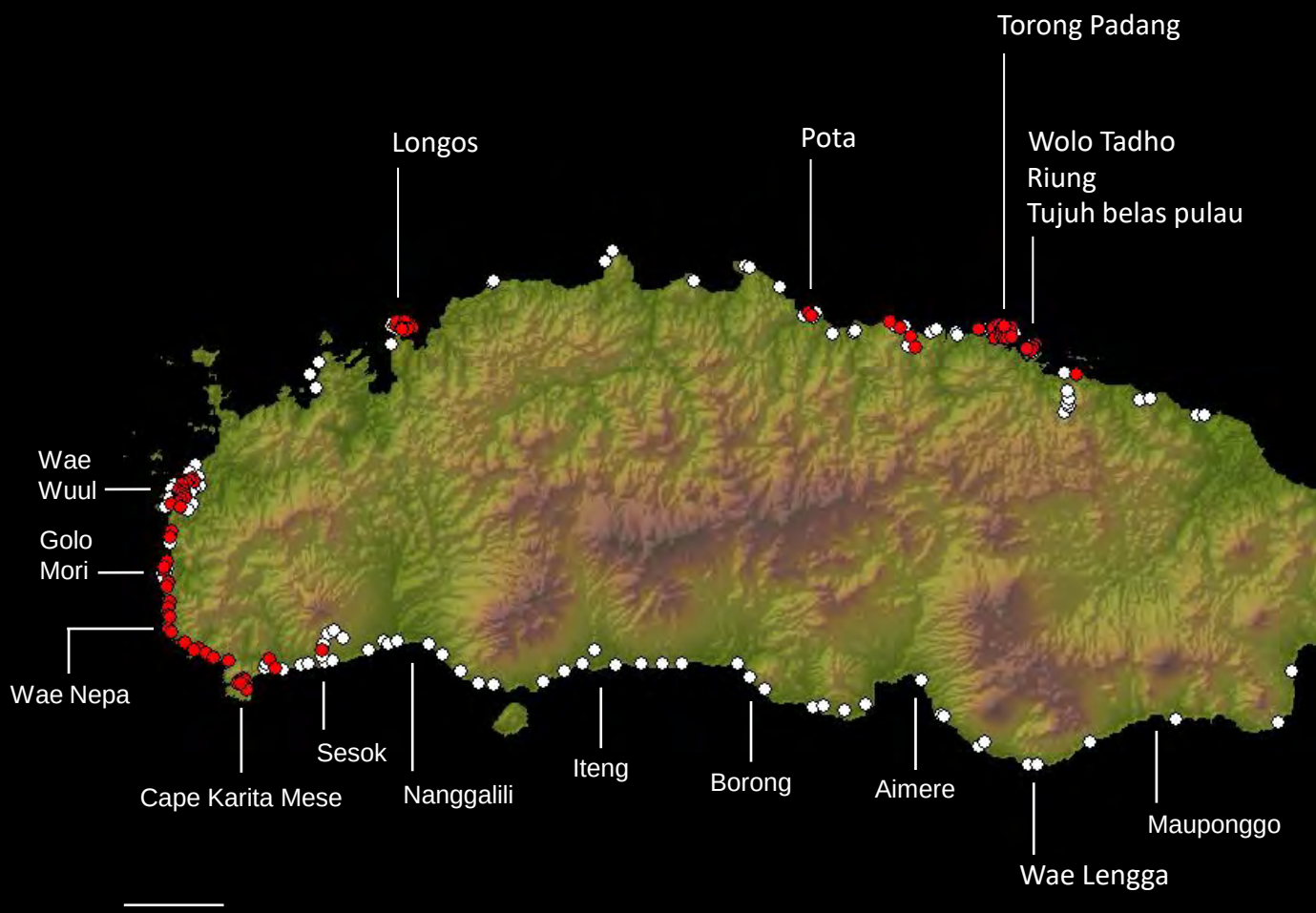
The habitat type along approximately 100 km from Sikka to Larantuka is mostly dominated by secondary forest and coconut farms, which are very close to the coast line. There are also patchy deciduous monsoon forest and a few settlements. This region is affected by sporadic volcanic activity of Mount Egon. We set up 23 camera traps across this survey area.

The northeastern part of Flores from Larantuka to Tanjung Bunga is dominated by agriculture crops such as cashew nut farm and coconut. A number of traditional Larantuka villages are still found in this area. The coast from Tanjung Bunga to Maumere has several human settlements and only a few patches of grassland and secondary forest. Along this survey segment approximately 200 km long, we set up 45 camera traps.

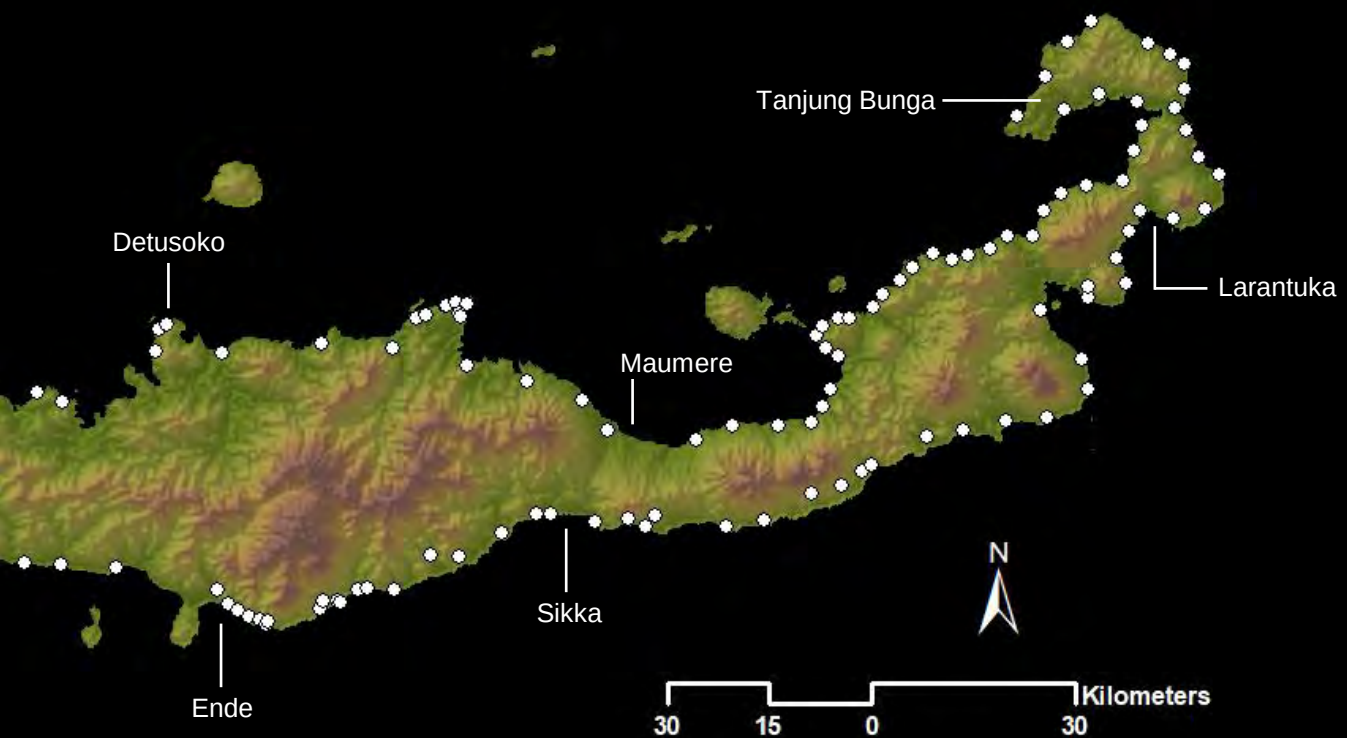
Coastal habitat from Maumere to Detusoko is characterized by small valleys and hills of up to 400 metres in altitude, and mountains of more than 1,000 metres further inland. Grasslands and savannah dominate the coastal area, with strips of dry deciduous monsoon forest occurring along streams. Grassland and savannah on hills and in valleys are subject to frequent burning. Eight camera traps were set up along 75 km of coastal area.

We found no evidence of *V. komodoensis* from Ende to Larantuka and from Larantula to Detusoko through the town of Maumere. This is again due to the medium to high level of disturbance to the Monsoon forest and land conversion from Savannah and grassland to cultivates and rice field. Human settlements are rapidly expanding around Maumere and Larantuka. Secondary forest are being cleared and converted to plantations. We record the presence of water monitor (*V. salvator*) at 21 camera trap locations (22%) and several stray and domesticated dogs were found at most (73%) camera trap locations, especially in the disturbed areas around Maumere and Larantuka.

In December 2018 we completed the Komodo dragon distribution survey. A total of 330 camera trap sites were surveyed during a three year program, covering over 1,400 km of coastal habitats. The total survey effort provided 1,980 detection opportunities for Komodo dragons to be photographed. We successfully captured images of Komodo dragons at 81 (24.5%) of the total 330 camera trap locations.



Komodo Dragon
Flores distribution survey



- Trapping site with Komodo dragon recorded on camera
- Trapping site with no Komodo dragon recorded on camera

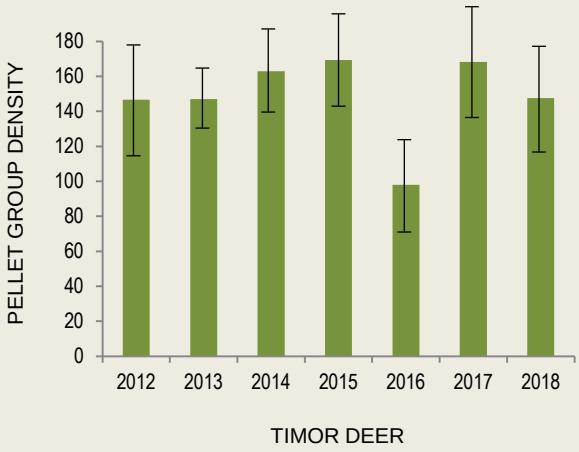
2.3 Komodo Dragon Prey Monitoring

Adult Komodo dragons mainly prey upon ungulate species, particularly the Timor deer *Rusa timorensis* and the water buffalo *Bubalus bubalis*. Illegal hunting of deer has been one of the main indirect threats affecting Flores distribution and abundance of Komodo dragons. Previous work has shown that the maximum size of Komodo dragons increases with increasing ungulate prey density. Estimates of changes in the abundances of deer and other prey species are therefore of significant importance for the viability of extant Komodo dragon population on Flores.

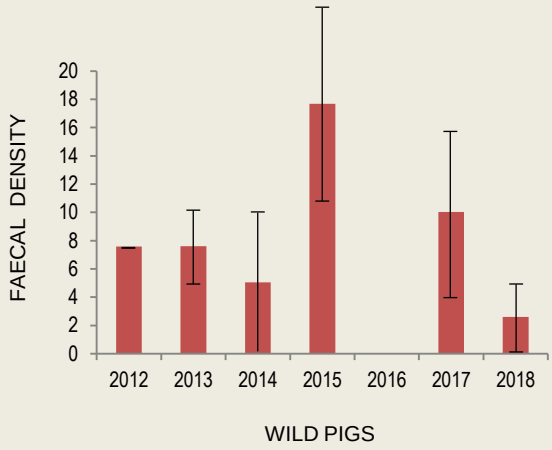
Direct counts of prey species such as deer and buffalo from vantage points are difficult to implement due to the presence of trees hiding a large proportion of animals in Monsoon forest. Other direct survey methods (e.g. distance sampling) are also inappropriate as on the island of Flores animals are quite elusive and such methods would likely generate negatively biased estimates of abundance. As for previous years, in 2018 we used faecal pellet group counts as an index of relative abundance of the main prey species of Komodo dragons in Wae Wuul, in the Pota district and on the Island of Ontoloe in the Tujuh Belas Pulau nature reserve. The relationship between this index and known densities of preys has been widely evaluated and generally has shown that pellet group density is positively correlated with prey density. A useful advantage of this methodology is that, because it is undertaken in the late dry season in the near absence of rain for several months, faecal decay rates are presumed very low, providing a long-term index of prey availability.

We used a table of random numbers to locate start points across grid referenced digital maps for 42 linear transects across the Wae Wuul nature reserve, 32 transects in the Pota district and 10 transects on the island of Ontoloe. The 150 m long transects consisted of thirty 3.14m^2 circular plots (i.e., a radius of 1 m) at 5 m intervals. The plots were thoroughly searched and the total number of deer pellet groups recorded on each plot. We only counted intact pellets, and those groups with ≥50% of pellets inside the plot. We also counted the number of intact faeces in each plot. We navigated to the start point of each transect using a Global Positioning System. A 150-m nylon cord with flagging tape at 5m intervals delineated each transect. A plastic peg was pushed into the ground at the plot centre and a 1-m string was used to delineate the perimeter of the plot. A density index based on average number of pellet groups or faeces per transect (which covered an area of 94.2 m^2) was calculated by dividing the number of pellet groups (or faeces) found along each transect by the number of transects.

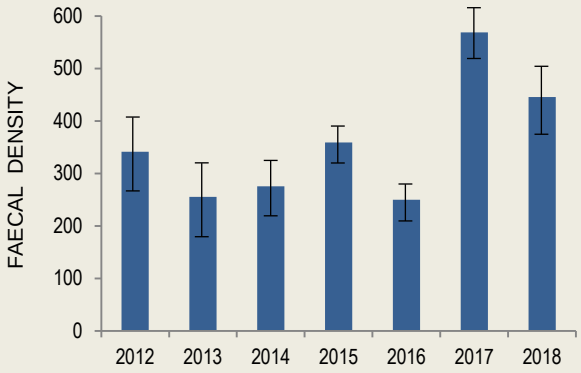
In Wae Wuul, we found a slight decrease in mean Timor deer pellet group density (148 pellet groups per ha) with respect to 2017. However, 2018 figures were quite consistent with past values recorded from 2012 to 2015 and higher than those recorded in 2016. This is a generally stable population trend of a main prey item and an indication of resource availability for *V. komodoensis.* That is, at the same time, a possible indirect index of regular, so far successful involvement of Komodo Survival Program staff and the local community in the Flores conservation programme for safeguarding of the Wae Wuul nature reserve.



TIMOR DEER



WILD PIGS



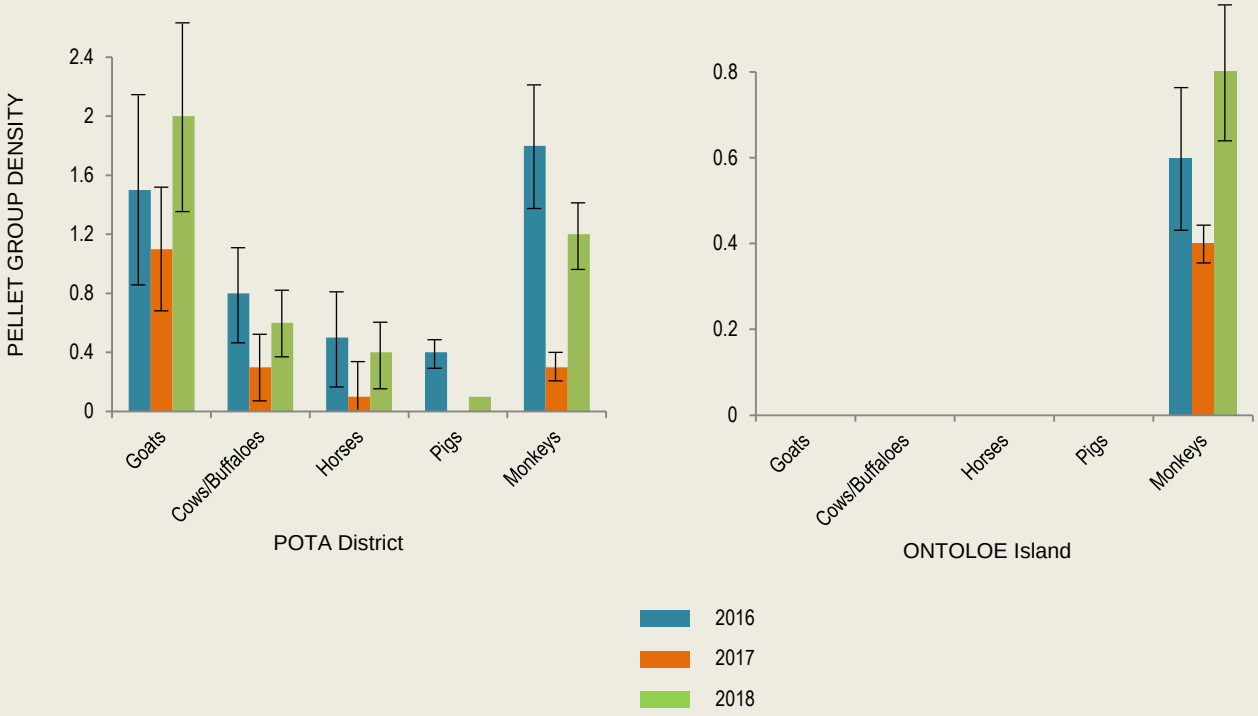
WATER BUFFALOES

Since 2012, we recorded a relatively stable trend for *B. bubalis* until 2016, then a sharp increase in 2017. In 2018, the number of faeces recorded per ha (445.4) was slightly lower than in 2017 (56836) but still higher than figures recorde from 2012 to 2016. Relatively high densities of water buffalos may compensate for lower densities of other ungulates. In Wae Wuul, water buffalos are mainly part of tamed herds owned by people from nearby villages. Members of the local community mark animals with ear tags and let them graze in the Wae Wuul reserve. Villagers also try to capture and tame wild individuals but with low success rates. Both tame and wild water buffalos represent a valuable prey for Komodo dragons in Wae Wuul. Compensation plans have yet to be considered by the local government for owners that lose part of the herd to predation. However, in Wae Wuul, monitor lizards rely mainly on weak or ill individuals, which are easy to ground, rather than attacking full grown and healthy buffalos.

Although with a much lower occurrence (only one transects out of 42) than deer and buffaloes, we also recorded an average scat density of 2,6 faeces per ha for wild pigs, lower than values ever recorded, but course higher than 2016 data, when no evidence of boars was recorded in Wae Wuul.

In northern Flores, no evidence of deer was recorded in the Pota district and on the Island of Ontoloe. This finding corroborate interviews with local people by which it appears that main ugulates are becoming rare in the coastal forest, increasingly disturbed by human activities,. That may affect Komodo ragon distribution, although no studies have been conducted so far on that matter, and/or led to a shift of diet for individuals which home ranges remain within the first 5-10 km from the coast. In the Pota district, we found faecal remains of goats, cows, buffaloes, horses, wild pigs and monkeys.

On the Island of Ontoloe we recorded monkey droppings only. In 2016, we found Komodo dragon droppings on Ontoloe which contained undigested bat claws. Ontoloe island harbours a conspicuous colony of *P. vampyrus*, which counts a total of approximately 30,380 individuals. The findings of flying fox remains in Komodo dragon droppings, a consistent amount of macaque faeces and no evidence of large prey species may be an indication of a shift in main diet components of Komodo dragons in the Tujuh belas pulau reserve with respect to other Flores and Komodo National Park populations.

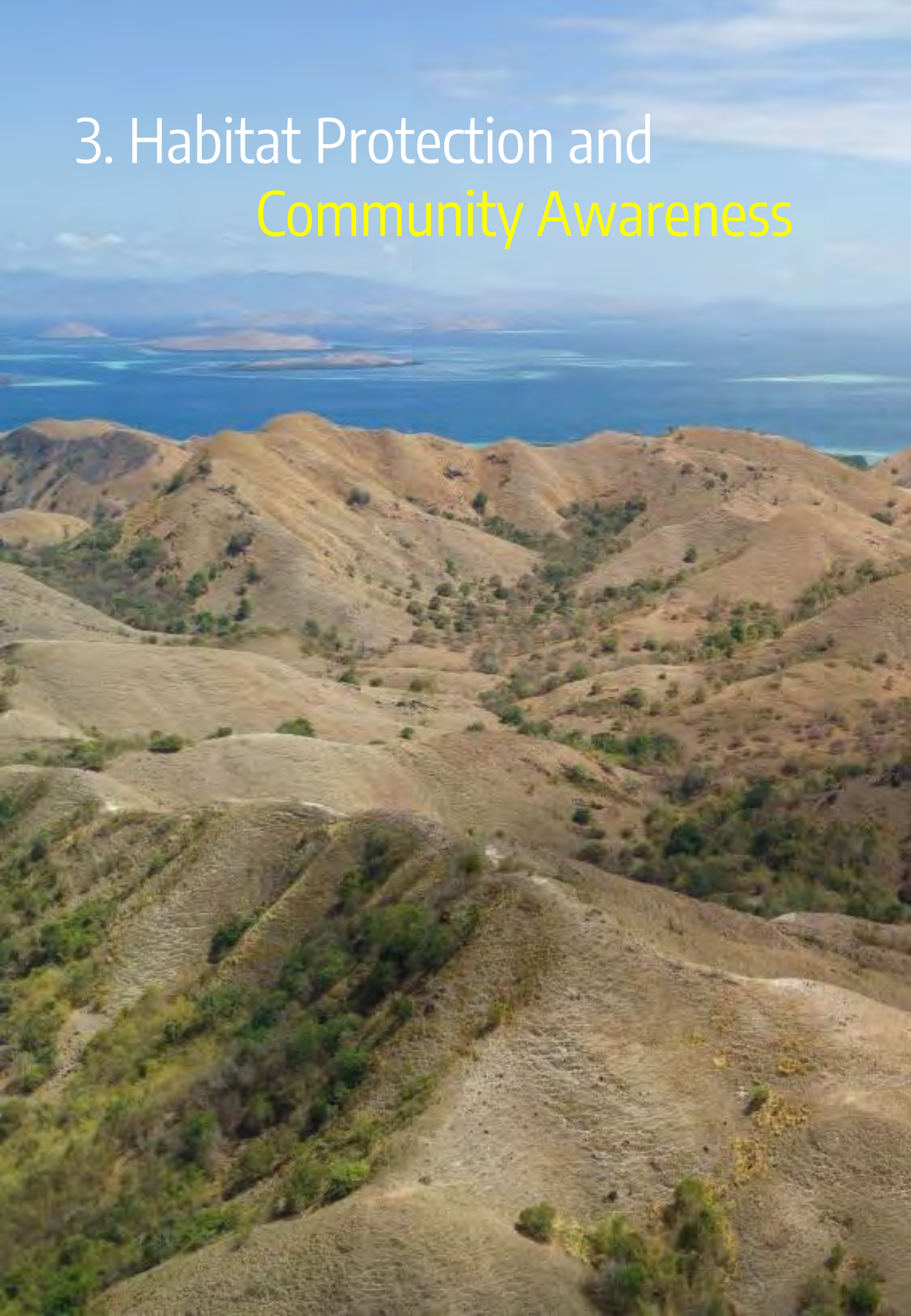


2.4 Invasive species survey

From February to May 2018, Komodo Survival Program, working in collaboration with the Agricoltural University of Bogor (Institut Pertanian Bogor - IPB), conducted a survey to assess presence and distribution of the invasive Asian common toad *Duttaphrynus melanostictus* across the Komodo dragon distribution range. The Asian common toad is not an autochthonous species of Flores and it is closely related to the cane toad, which was recently introduced to Australia. The cane toad has been as serious threat to Australian monitor lizards for it is toxic to ingest and caused a sharp decrease in a number of varanid populations. Presence of the Asian common toad on Flores and in Komodo National Park could pose a similar threat to extant Komodo dragon populations.

We used visual encounter survey method along 400m transects, conducted by five observers in 49 days totalling 93 hours of observations. We surveyed the island of Rinca (Kampung Rinca, Loh Buaya and Loh Baru) and Komodo (Kampung Komodo, Loh Liang and Loh Wau) in Komodo National Park, then the area around Labuan Bajo and Cumbi Village in western Flores, and Sape on the Island of Sumbawa, approximately 30 km off the west coast of Komodo Island. We did not record the presence of *D. melanostictus* in either Komodo National Park or Flores. However, the common toas was abundant on the East coast of Sumbawa Island, and this represent an actual threat in terms of a potential invasion to the east across the current Komodo dragon distribution range.

3. Habitat Protection and Community Awareness



3.1 PATROLLING AND SURVEILLANCE

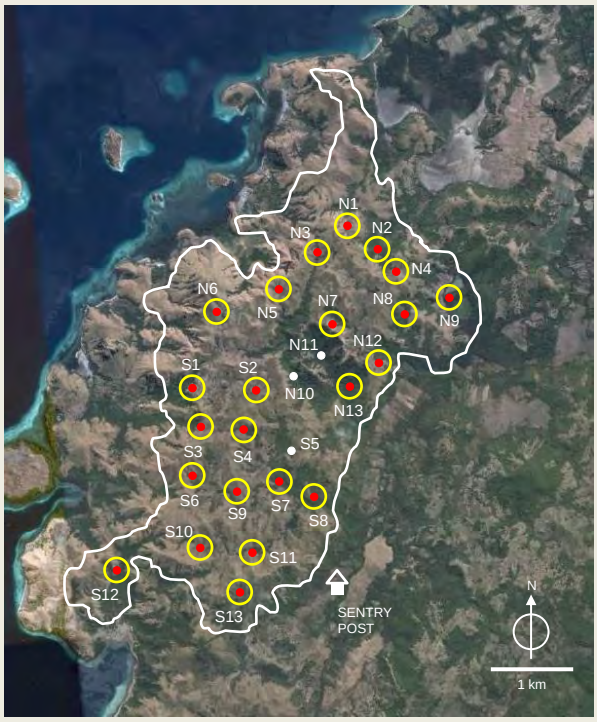
In 2018, patrolling activities were conducted in the Wae Wuul reserve, western Flores, and the Tujuh belas pulau reserve, northern Flores, particularly on the island of Ontoloe. Patrolling and surveillance included the involvement of a *Masyarakat Peduli Api* (MPA), a task force made of 10 people of the local villagers living close to the nature reserves. The MPA was successfully established in 2014 and helped BBKSDA staff patrolling protected areas. Patrolling activities consisted of regular hiking along established trails in the Wae Wuul and Tujuh belas pulau nature reserves to spot and prevent bushfires, illegal hunting of ungulate prey species and wood harvesting. This initiative involved staff from BBKSDA, the NGO Komodo Survival Programme and selected members of the local community (MPA), and was conducted in full agreement with local government authorities. Weekly briefings provided opportunities for staff of BBKSDA to discuss team rotations and solutions to problems encountered during surveys with village representatives. Locations of patrolling trails in Wae Wuul were similar to those defined since 2014 and included five paths covering key areas of the reserve. The starting and ending point of each path was the sentry post located on the southeastern boundary of the reserve. The village of Menjaga, on the western boundary of the Wae Wuul reserve, was used as temporary base by teams following paths number 1 and 2. In the Tujuh belas pulau reserve, three patrolling trails were established on the island of Ontoloe.

Patrols were conducted from 7 am to 11 am and then again from 4 pm to 6 pm. Field schedule was followed pretty regularly with no major inconveniences. No illegal wood harvests were reported, however, a number of wild fires were recorded and later extinguished in Wae Wuul.

The MPA reported a number of illegally poles positioned in the ground to intentionally misguide local people in the establishment of boundaries of cultivated fields close to the reserve. Poles were removed from the ground and the original, official reserve boundary boards reinstalled in the correct locations. In the last five years, the population of the nearby town of Labuan bajo has increased significantly mainly as a result of immigrants from western Indonesia and eastern Flores attracted by job opportunities linked to the increased popularity of Komodo National Park, particularly among Indonesian nationals. Land price and population density lead locals to claim pastures and cultivated fields around and sometime inside the Wae Wuul reserve. This issue is currently being tacked by funding additional, part time rangers to patrol the reserve in collaboration with the Central Bureau for Conservation of Nature Resources (BBKSDA).

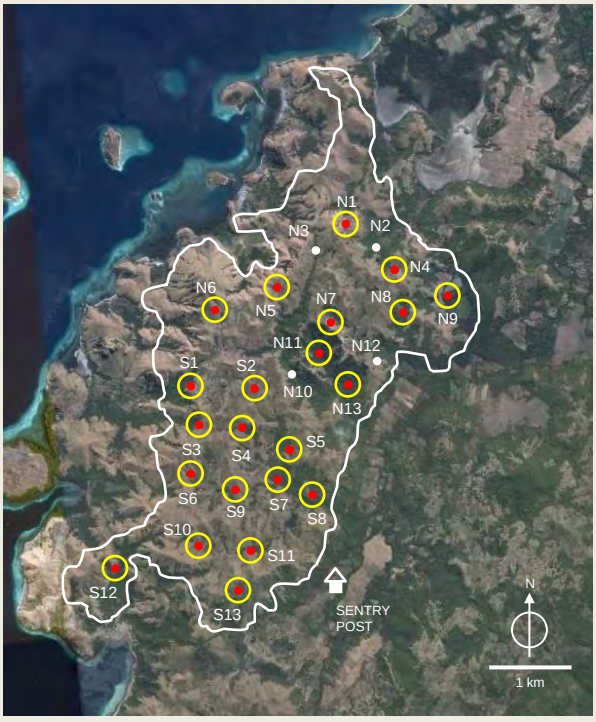
In the Wae Wuul nature reserve, feral dogs are still recorded either as single individuals or in small packs. We employed passive infrared cameras to assess presence of dogs and feral dogs in the Wae Wuul reserve. In 2015 we recorded dogs at 23 locations. This figure decreased significantly in 2016, when only 12 locations had records of dogs. Of these, six traps had feral dogs with no tag, three traps close to the boundary of the reserve recorded domestic dogs bearing collars, and two traps had both feral and domestic dogs. In 2017, we recorded dogs at 22 out of 26 camera trapping locations, and during the 2018 survey 21 out of 26 trapping sites had dogs recorded on cameras. Almost all dogs worn no tags. The observed reduction of dogs recorded in 2016 and the absence of dogs with collars recorded in 2017 and 2018 could be the result of the intensive community education programme conducted since 2015 and the dog population census initiative which involves dog tagging in five villages around the reserve to make dog owner responsible for their pets. Nevertheless, the consistently high number of stray dogs recored in Wae Wuul in 2018 needs to be carefully considered for it may be the result of uncontrolled breeding and/or people purchasing additional dogs. The increasing human population density in the Labuan bajo area could have also resulted in additional stray dogs entering the reserve.

2015

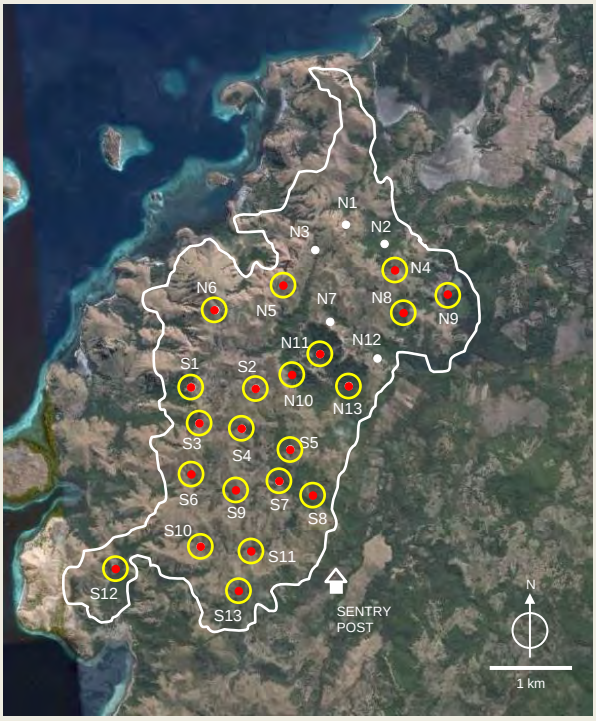


2016

2017



2018



○ camera trap site

● camera trap site with dog records

On the island of Ontoloe, we found a few home made wooden traps for wild pigs and monkeys that were promptly removed and destroyed, for hunting is prohibited in the Tujuh belas pulau reserve and traps and snares can harm Komodo dragons. Limited direct threats to the local Komodo dragon population was recorded in northern Flores compared to the western coast.

3.2 Community Awareness

In 2018, community awareness activities were focused particularly on seminars for teachers and primary school classes in the Latung and Marotauk Village, Riung district, in northern Flores. Seminars were held by staff of the NGO Komodo Survival Program (KSP), while children were addressed by both KSP staff and primary school teachers. The general aim was to give pupils a general background knowledge on the terrestrial biodiversity, and assess whether education activities can be of an importance on their perception and attitude toward biodiversity conservation. We held a first session on environmental education and awareness in the village of Pota and a second session in the town of Riung, just off the southern boundary of the Tujuh belas pulau nature reserve. The two sessions were attended by five teachers, who also collaborated during classes, and 35 and 30 children (7th to 9th grade classes) from MTs Muhammadiyah school of Marotauk village and SDK Mbarungkeli school from Latung village, respectively.

In 2018, three community awareness sessions were also carried out in the villages of Marotauk, Sambinasi and Latung, Riung District, close to the Riung nature reserve in North Flores to reiterate the importance of sustainable use of natural habitats and commitment of national and international sponsors in sustainable development program. The team conducting community awareness sessions included staff of the Indonesian Central Bureau for Conservation of Nature Resources (Balai Besar Konservasi Sumber Daya Alam – BBKSDA) and KSP. Sessions were attended by religious leaders (mainly Muslim), village chiefs and community members. The programme emphasized the importance of minimizing levels of encroachment to monsoon forest and savannah habitat and the beneficial, long-term effect of preventing intensive poaching on Komodo monitor prey species. Staff from BBKSDA and KSP gave a presentations on the importance of nature reserves and law enforcement activities in protected areas. This was followed by a summary on research and monitoring programme conducted by KSP staff in 2017 and early 2018.

4. Capacity Building


Pelatihan SIG dan Analisis Da
untuk Monitoring Populasi
Labuan Bajo, 7 - 8 Februar
ASSOCIATION OF ZOOS & AQUARIUMS
EAZA
OPCF

4.1 GIS AND DATA ANALYSIS WORKSHOP

In February 2018, KSP conducted GIS and data analysis training for BBKSDA, and the Forestry Board of East Nusa Tenggara Province. A total of 10 technical staff from three government bodies were involved and trained in Geographical Information System and Camera trap data analyses using the software Presence. Teaching material included a copy of the software to be installed on personal computers, handbooks, printouts and teacher guides.

The two days in class training consisted of 1) Basic GIS and mapping course, use of GPS, transferring data to ArcGIS, design sampling and creating a digital map, 2) field methodology for Komodo dragon monitoring, camera traps, setting camera traps, design sampling and data analyses using site occupancy methods and the software PRESENCE 12.7.

List of trainees:

1. Ande Kevi (Komodo National Park)
2. Maria R. Panggur (Komodo National Park)
3. Naoma Yunita Banamtuan (Komodo National Park)
4. Sahudin (BBKSDA NTT)
5. Koko Suwandi (BBKSDA NTT)
6. Andreas Avelinus Dos (BBKSDA NTT)
7. David Daeng (BBKSDA NTT)
8. Arakib B. Wuran (BBKSDA NTT)
9. Ahmadin (Bureau of Forestry NTT)
10. Hasan (Bureau of Forestry NTT)

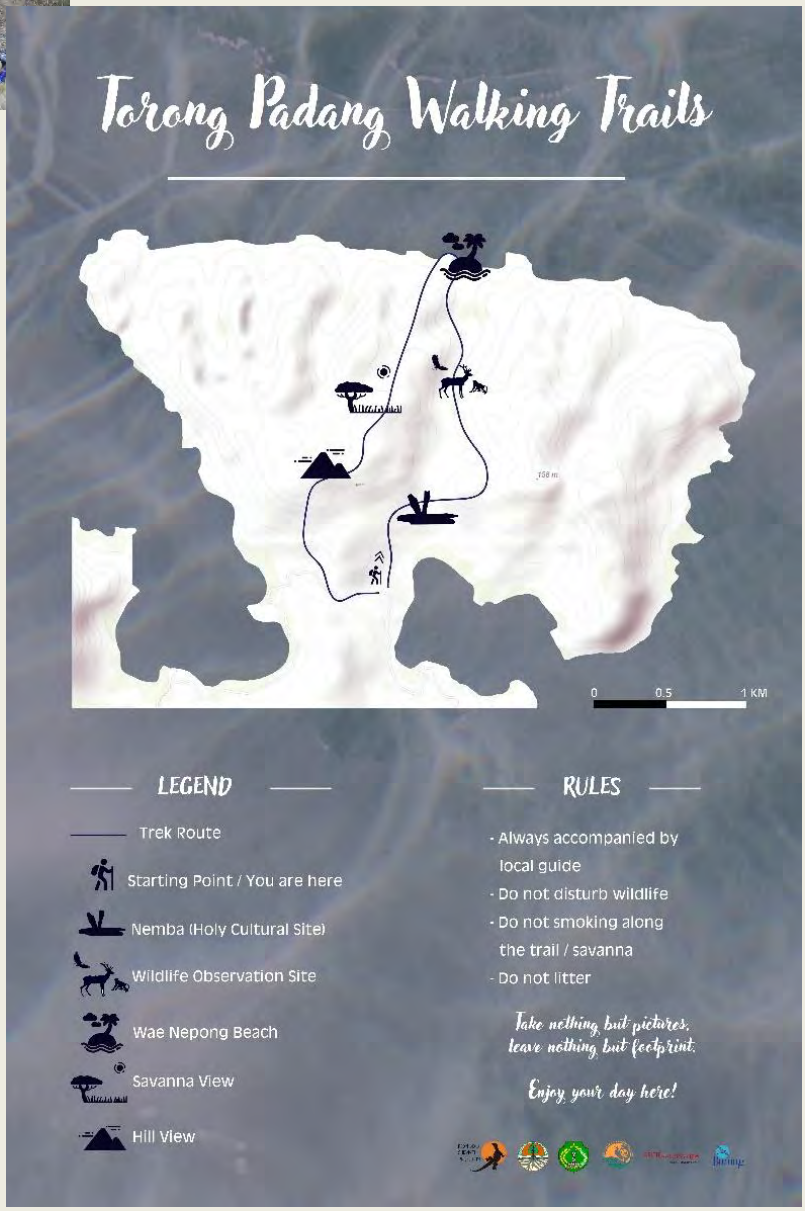
4.2 Community-Based Ecotourism Initiatives

Ecotourism embodies two major goals of environmental conservation: sustainable use of resources and protection of natural habitats. Modern ecotourism ought to be sustainable, so that human activities that take place in areas of interest should strive to maintain a balance between sustainable development and preservation of ecosystems.

Although ecotourism has developed widely in recent years, such endeavour is still in its infancy in south-eastern Indonesia. In Komodo national Park, increased tourism to sensitive natural areas has been limited through appropriate planning and management in order not to jeopardize the integrity of ecosystems and local cultures. The same growth may create significant opportunities for both conservation and local communities on the Island of Flores. Ecotourism can provide a viable economic development alternative for local communities with few other income-generating options, particularly on the northern coast of Flores. Ecotourism on Flores can also increase the level of education and activism among Indonesian travellers, who are rapidly catching up with foreign visitors as far as time spent visiting natural heritage.

In 2018, we maintained our grass root project in northern Flores which, based on ongoing community awareness activities, will hopefully set the pace to engage local participation in decision-making, bring sustainable benefits to local communities and eventually keep supporting local conservation efforts. We focused our efforts on ecotourism guide training trying to address some of the main, classical principles of ecotourism: 1) minimize negative impacts to the environment; 2) increase the awareness and understanding of an area's natural and cultural systems and the subsequent involvement of visitors in issues affecting those systems; 3) contribute to the conservation and management of protected and other natural areas; 4) maximize the early and long-term participation of local people in the decision-making process that determines the kind and amount of tourism that should occur; 5) direct economic and other benefits to local people that complement rather than overwhelm or replace traditional practices; 6) provide special opportunities for local people and nature tourism employees to utilize and visit natural areas and learn more about the environment that visitors come to see.

In 2018, KSP successfully established a trekking path on Torong Padang in order to initiate promotion of the area as another potential eco-tourism location in northern Flores. This was achieved in collaboration with the tourism board of the Ngada Province and the involvement of approximately 90 people from the local Sambinasi village. This effort was intended to increase awareness of conservation efforts among the local population close to the Torong Padang peninsula and promote the area as an additional site to observe Komodo dragons in North Flores. Following this event, we encouraged and helped the local community to develop a sustainable ecotourism strategy.



In October 2018, in collaboration with the Tourism Board of the Ngada Regency, we helped organizing the annual expo on the Ngada Regency Development by the Ngada Regency Government of Bajawa. We aimed at raise awareness in Komodo dragon conservation in northern Flores by increasing the involvement of local communities in promoting ecotourism activities and local merchandise. During the event, we introduces the northern Flores ecotourism potential by showing posters on eco-trekking paths, a map with eco-tourist atteactions from Pota to Riung as well as the ongoin program on handicraft training.

We also invited representatives from the Sambinasi village from northern Flores who had been trained in handicraft making, namely Muksim Gantong and Setia Bombong. Gantong is a local citizen who attended our wood carving workshop in 2017 and early 2018. Bombong is a weaver from West Sambinasi. Both showed to the public the process of making local merchandise and received very positive feedback from the Ngada Regency Government.

During the same period, in collaborated with the Ngada Regency Tourism Board, we invited three weavers from Sambinasi Raya Village: Riyanti Dema (West Sambinasi), Johar Goma (Middle Sambinasi), and Vivin Mediyanti (Sambinasi) for a crafting art group event to support local tourism and culture. This event was led by a crafting professor from the Bandung Institute of Technology (west java), Dr. Ratna Panggabean, and held in a training centre in Bajawa operated by the Ngada Regency Tourism Board, to build the capacity of local communities in crafting and creating new forms of arts such as necklaces, bracelets and other accessories to address the demand for touristic merchandise of the Ngada Regency.

4.3 Handicraft Training Workshops

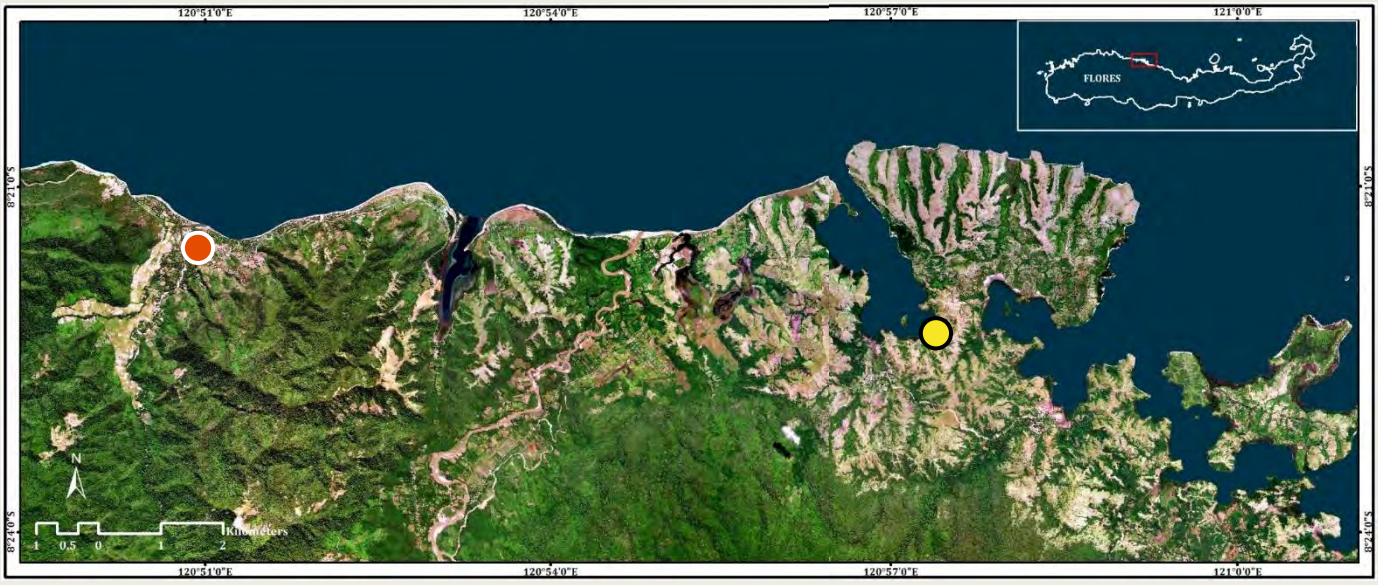
In northern Flores, direct and indirect threats to Komodo dragons have been gradually but significantly reduced thanks to an integrated environmental conservation approach with a strong community education component, particularly in primary and secondary schools. An additional, important component of such an integrated approach is the possibility of implementing sustainable development through alternative livelihoods as for Komodo National Park, where the making of wooden handicrafts is now a small-scale economic asset of the region.

In July 2018, we conducted the third edition of the handicraft training workshop for villagers from Riung. The main aim of the initiative is to create a system similar to that currently in place in Komodo National Park, whereby members of the local community, mainly from Komodo village, who have shown specific wood carving skills, produce and sell handicrafts. In fact, tourists can now find hand wood carved Komodo dragon characters in shops and airports. Wood carving activity, based on sustainable or strictly monitored wood harvesting, is one remunerative activity for people living within the boundaries of Komodo National Park and it is our plan to create a similar sustainable activity in northern Flores.

Muksim Gantong (a former trained local member from Sambinasi village in northern Flores) was invited to learn advance wood carving skills in Komodo Village. He spent seven days learning how to improve his skill on komodo wood carving. Upon his return to Sambinasi village, he is now a trainer for other local community members and is encouraging more local people to support ecotourism initiatives in the area. KSP will continue mentoring such programs to secure implementation of past training initiatives and develop new ones among local community members.

4.4 Live Stock Management Training

We conducted a workshop on livestock management to mitigate/reduce conflict between human and Komodo dragons in North Flores. This activities was primarily funded by the WWF Russel E Train Education for Nature and co-funded by EAZA. Training was conducted in March 2018 in two areas of North Flores. The two sites were chosen as two among the areas where Komodo dragon predation on livestock is particularly high because of minimal livestock management practice and efforts from local owners. A total of 46 participants attended from both areas.



1st Location: Tompong, POTA

2nd Location: Ruki, RIUNG

Komodo dragons prey upon livestock mostly during the mating period, when male and female monitor lizards are actively searching for a mate or oviposition sites, respectively. That is between June and September. During this period, herders are encouraged to keep goats in a pen and feed them rather than leave them free to graze in the savannah where they can be easy prey for Komodo dragons. To help compensating for this effort and extra expenses, this project aimed at teaching alternative revenues such as production of fertilizers and biogases from the accumulation of livestock dung. At the same time, we conducted a survey to assess people satisfaction before and after the training.

Tompong Village,
POTA
EAST MANGGARAI

Ruki Village,
RIUNG
NGADA

Community encouraged to keep livestock in pens and collect manure/dung

Community provided with training and infrastructures to establish and manage biogas installations

Community provided with training and infrastructures to make organic fertilizer from goat manure

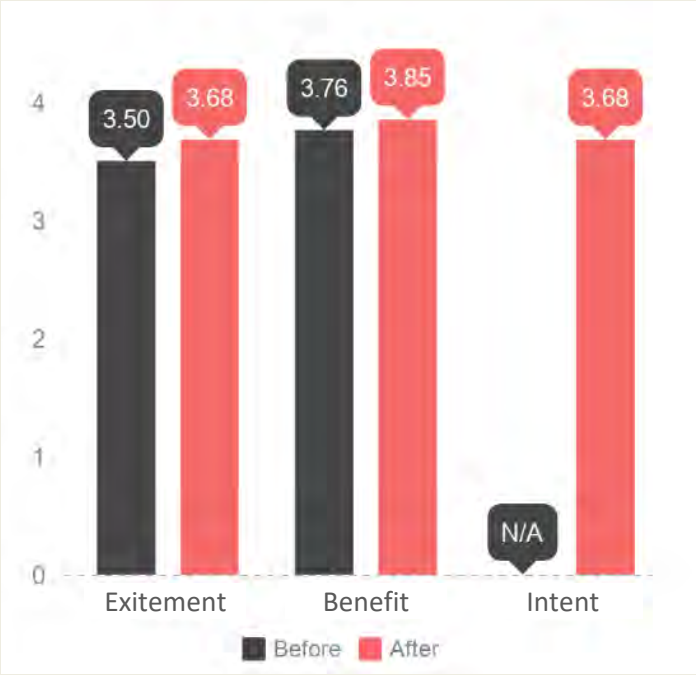
Pre-test and post-test measurement to assess community satisfaction

RESULTS

Pre-Post test

The training increased both exitement and perceived benefits of participants, although only the test on satisfaction was statistically significant (P<0.05).

A relatively high number of people attending the training showed intention to adopt the proposed livestock management procedures.



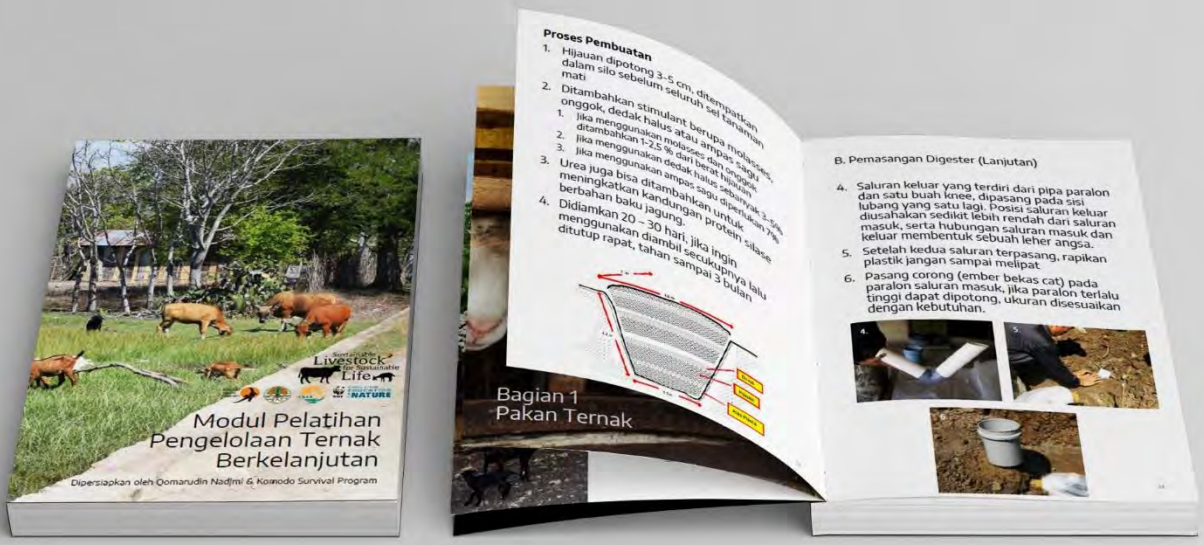
Maximum Score = 4.00

Questions:

1. Exitement: Do you feel excited to join this training? (1. NOT AT ALL, 2. NO, 3. YES, 4. VERY)
2. Benefit: Do you feel you can obtain benefits from joining this training? (1. NOT AT ALL, 2. NO, 3. YES, 4. VERY)
3. (Post-only) Intent: Will you apply what you have learned from this training? (1. NOT AT ALL, 2. NO, 3. YES, 4. CERTAINLY

We successfully trained 45 local farmers and ranchers in making their own liquid organic fertilizers and biogas installations. This task of the Komodo dragon conservation project aimed at converting part of livestock practices in northern Flores into integrated ranching in order to reduce predation events by Komodo dragons. Results of the test pre and post training are promising.

We also produced a detailed guide on how to build and implement biofertilizers and biogas devices and better manage livestock herds.

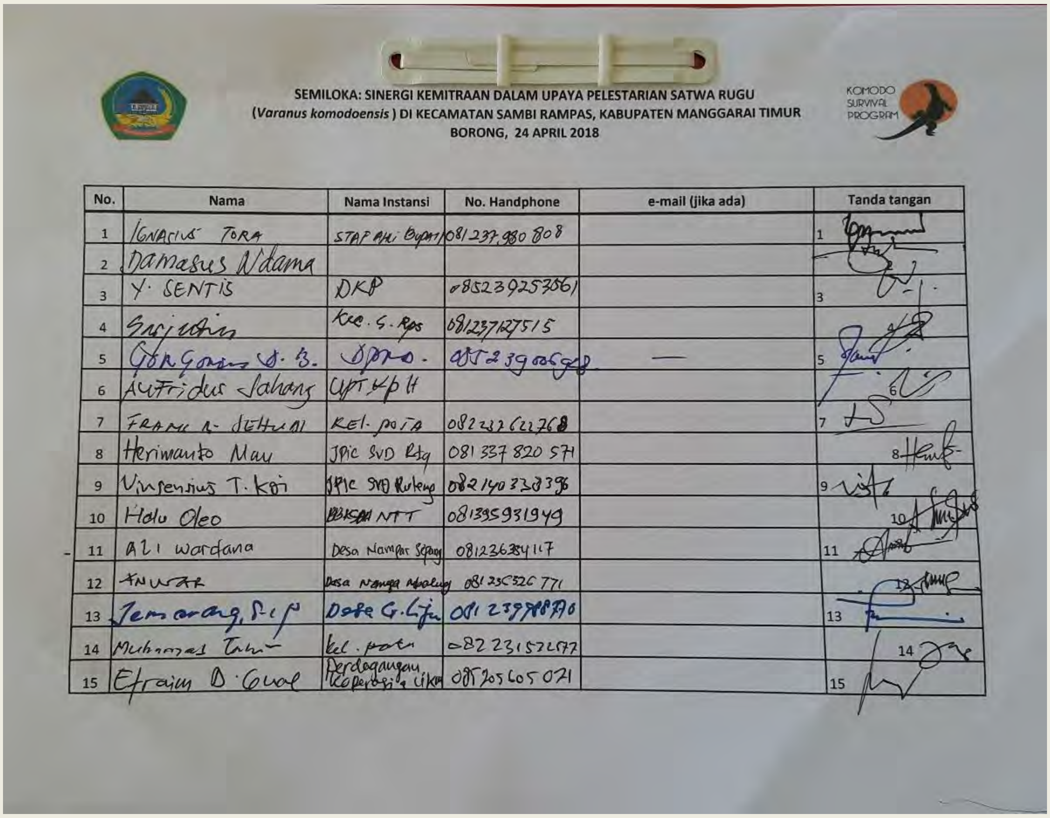


5. Dissemination Meetings


SEMILOKA:
SINERGI KEMITRAAN DALAM UPAY
PELESTARIAN SATWA RUGU
(Varanus komodoensis)
DI POTA, KECAMATAN SAMBI RAMP
KABUPATEN MANGGARAI TIMUR
BORO PRIL 2018
KOMODO SURVIVAL
CRITICAL ECOSYSTEM
Burung
KINABUBI TORA
Rugu (Varanus komodoensis)
Kec. Sambi Rampas, Kab. Manggarai Timur
KOMODO SURVIVAL PROGRAM

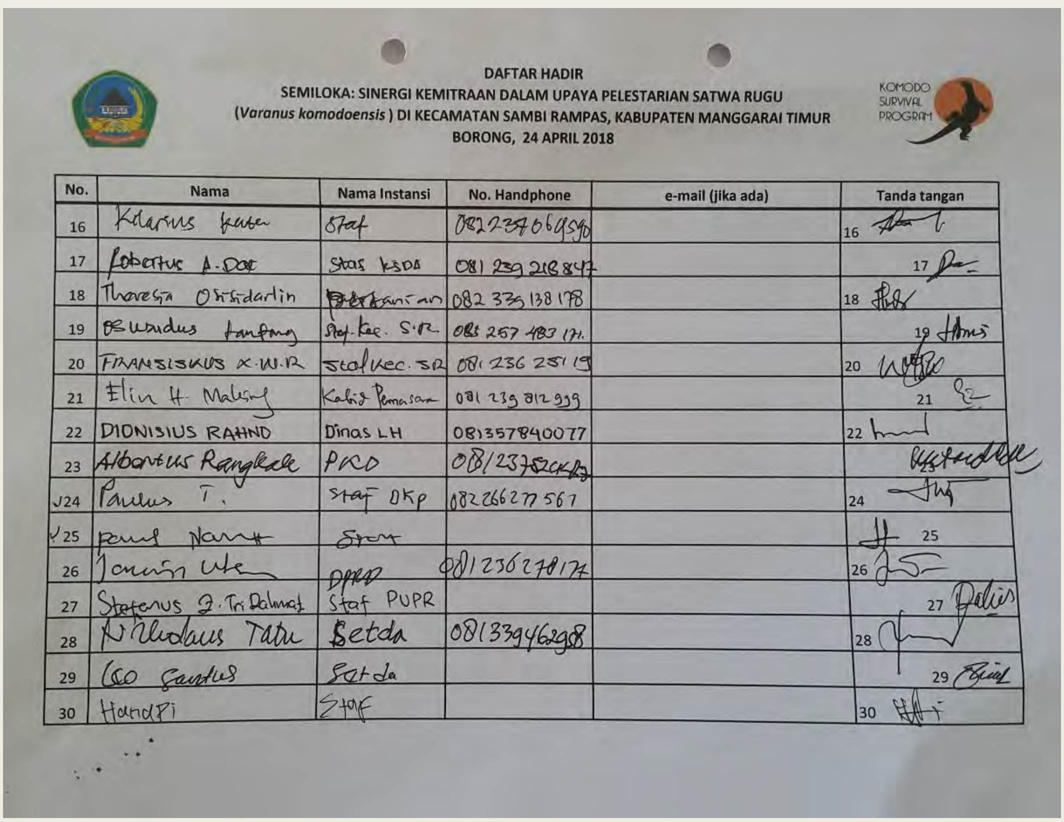
Meetings with Government Authorities and Dissemination

Annual meeting with government authorities are necessary for continued implementation of wildlife monitoring, community education, capacity building, infrastructure development and law enforcement initiatives. In 2018 we held a dissemination meeting with stake holders from North Flores. The meeting was attended by BBKSDA, Ngada Regency and Riung district authorities, local NGO's and heads of villages from North Flores. The meeting was used to disseminate our findings and conservation initiatives and seek agreement and commitment from Ngada regency authorities and other stakeholders in conservation and community awareness activities to preserve and protect extant Komodo dragon populations in northern Flores.



SEMILOKA: SINERGI KEMITRAAN DALAM UPAYA PELESTARIAN SATWA RUGU
(*Varanus komodoensis*) DI KECAMATAN SAMBI RAMPAS, KABUPATEN MANGGARAI TIMUR
BORONG, 24 APRIL 2018

No.	Nama	Nama Instansi	No. Handphone	e-mail (jika ada)	Tanda tangan
1	IGNASIUS TORA	STAF Ahli Bupati	081 237 980 808		1
2	Damasus Ndama				2
3	Y. SENTIS	DKP	085239253061		3
4	Sarjuhin	Kec. S. Rps	081237127515		4
5	Gorgonius S. B.	Dpmd.	085239006948	—	5
6	Alfridus Jahang	UPT KPH			6
7	FRANS A. JEHUDI	KEL. POTA	082237622768		7
8	Herimanto Mau	JPIC SVD Rtg	081 337 820 571		8
9	Vinsensius T. Koi	JPIC SVD Ruteng	082140338396		9
10	Halu Oleo	BBKSDA NTT	081395931949		10
11	Ali wardana	Desa Nampar Sepang	081236384117		11
12	ANWAR	Desa Nanga Mbaling	081 236326 771		12
13	Jemarang, S.Ip	Desa G. Lijun	081 239788770		13
14	Muhammad Tahir	kel. pota	082231572577		14
15	Efraim D. Guae	Perdagangan Koperasi & Ukm	085205605071		15



DAFTAR HADIR
SEMILOKA: SINERGI KEMITRAAN DALAM UPAYA PELESTARIAN SATWA RUGU
(*Varanus komodoensis*) DI KECAMATAN SAMBI RAMPAS, KABUPATEN MANGGARAI TIMUR
BORONG, 24 APRIL 2018

No.	Nama	Nama Instansi	No. Handphone	e-mail (jika ada)	Tanda tangan
16	Kolarius Jeuten	Staf	082237069590		16
17	Robertus A. Doe	Staf KSDA	081 239 218 847		17
18	Theresia Oktidarlin	Pertanian	082 339 138 178		18
19	Oswaldus Janfong	Staf Kec. S.R.	085 257 483 171.		19
20	FRANSISKUS X. W.R	Staf Kec. SR	081 236 251 19		20
21	Elin H. Malising	Kabid Pemasaran	081 239 812 999		21
22	DIONISIUS RAHMD	Dinas LH	081357840077		22
23	Albertus Rangkale	PKO	08123752		23
✓24	Paulus T.	Staf DKP	082266277567		24
✓25	Paul Nanu	Staf			25
26	Jonuin Ute	DPRD	081236278174		26
27	Stefanus J. Tri Dalmat	Staf PUPR			27
28	Nikolaus Tatu	Setda	081339462908		28
29	Leo Santus	Setda			29
30	HandRi	Staf			30

List of representatives attending the meeting

6. Construction of Community Awareness and Education Center


O / RUGU

Construction of Community awareness, Education and Research Station at Pota, North Flores

In 2018 KSP signed a cooperation agreement with local authorities from the town of Pota, northern Flores for using part of their land for community awareness, education and Komodo dragon conservation projects. The agreement enables KSP to build facilities and use infrastructures for a minimum of 15 years. Staring from 2018 KSP is building an integrated community awareness and education facilities which will also serve as base for operation for wildlife monitoring activities in northern Flores. The project consists of 1) a Komodo dragon Information, Education and Research Center, 2) a small auditorium and meeting hall for community awareness activities, and 3) a space for pilot projects on sustainable livestock practices, including a livestock pen, and biogas and composting installation facilities. In December 2018, the information and education center was almost finished. This building consists of 1) a main hall where information on Komodo dragon life history will be displayed, 2) one bedroom, 3) working areas, 4) a bathroom, and 5) a storage room.


+6.30
+6.20
+3.70
+0.30
±0.00
4400
3700
8100
TAMPAK DEPAN
SKALA 1:100


+6.30
+3.70
+0.30
±0.00
3700
5.00
TAMPAK BELAKANG
SKALA 1:100


+6.30
+3.70
+0.30
±0.00
2000
3600
2140
3600
9340
TAMPAK SAMPING KIRI
SKALA 1:100

Wae Wuul nature reserve, West Flores
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