

ASSESSMENT OF THE TAMARAW DISTRIBUTION IN THE INNER MINDORO ISLAND

Case Study on the Methodology Undertaken, Results and Findings

Fernando Garcia Gil – Emmanuel Schütz

July 2023

INTRODUCTION

The tamaraw (*Bubalus mindorensis*) was known to be once widespread across the island of Mindoro to which it is endemic. However, its distribution has shrunk throughout the last century due to pressure from new Filipino settlers, resulting in deforestation, trophy hunting, cattle ranching and diseases from domestic cattle. There are currently three known populations left on the Island:

- The sub-population of **Mts. Iglit-Baco Natural Park (MIBNP)** is considered the largest one and benefits from stronger protection efforts since the creation of the protected area in 1970. Yet recent studies suggest that the number of animals has been overestimated for a decade and could have begun a decline due to density-dependence effect.
- The sub-population of the **Aruyan-Malati region**, in the Municipality of Sablayan, Occidental Mindoro, is a historical site of presence of the species but recent studies highlight that both the area of presence and the number of animals have declined drastically in the past few decades to a critical state.
- The sub-population of the **Upper Amnay-Mt. Gimparay region**, across the border of the two Provinces in the Municipalities of Sablayan and Naujan, was rediscovered in 2018 through a collaboration between the Department of Natural Resources Tamaraw Conservation Program (DENR TCP), D'ABOVILLE Foundation and Demo Farm Inc (DAF) and Mindoro Biodiversity Conservation Foundation Inc. (MBCFI). This sub-population may shelter a substantial number of animals of several dozens.

In addition, there is a serious risk that the tamaraw has disappeared from **Mt. Calavite Wildlife Sanctuary (MCWS)**, another historical site of presence of the species.

While the sub-population of MIBNP and Aruyan-Malati are quite well monitored and assessed, the exact range and possible abundance of tamaraw in the inner Mindoro Island remains barely precise and relies on the initial surveys conducted in 2018-19 which were limited to the upper Amnay / Mt. Gimparay region.

In the frame of the **Tamaraw Conservation and Management Action Plan (TCMAP 2021-30)**, DENR TCP has been tasked to address this gap by conducting a meta-population research aiming at identifying all remaining potential areas of presence of the species outside known sites. DAF is providing its technical support and expertise in this mission. This report outlines the methodology undertaken and the results of the verification surveys carried out in the past two years.

DAF - DENR TCP COLLABORATION TO CONDUCT THE METAPOPOPULATION RESEARCH ACROSS MINDORO

DAF and DENR TCP conducted a series of workshops and meetings aiming to elaborate on the biological concept of “meta-population” and to coach/train TCP technical staff and rangers on mapping and remote sensing techniques; the goal being to help defining survey areas based on qualitative and quantitative data as well as exploring best manners to integrate IP knowledge and IP communities in the research. Technical assistance was also provided to help organize and analyse data collected during the verification surveys conducted by the TCP in the targeted Municipalities of Mindoro.

In addition, several workshops and meetings were conducted with our partner from UST – Icolabb, Dr Nikki H. Dagamac and several of his students in order to provide expertise and supervision towards the creation of habitat suitability and quality models for tamaraws. Several articles are already in progress for publication.

Finally and in agreement with the TCP, DAF took the lead in coordinating the survey of some specific areas of the inner Mindoro in the Municipality of Sablayan. The aim was to fully implement the methodology that was built from past experience in conducting field verification surveys. The following section elaborates on the approach undertaken.

PROPOSED METHODOLOGY FOR VERIFICATION SURVEYS

The areas to be still surveyed in Mindoro are generally remote and difficult to access, and the preparation and implementation are costly in terms of time and resources. Therefore, such endeavour should be planned and coordinated thoroughly in order to optimize logistics and increase the probability of success. The proposed methodology is consisting of four different steps:

1. Collating historical data:

This step aims at identifying and organizing the most relevant data on the historical and current tamaraw distribution available in the literature or scattered throughout different sources (such as NGOs, LGUs, IPOs, POs...). Although generally vague, this information helps to identify potential areas for further refining through micro-scale level approaches.

2. Conducting remote sensing analysis:

Recent surveys and findings suggest that the tamaraw is a rather generalist species, being able to thrive in a wide range of habitat types from lowland dry seasonal tropical forest (Aruyan-Malati region) to tropical and mountain forest habitats (Upper Amnay-Mt. Gimparay region), as well as grassland dominated landscapes in climate type 1 such as in MIBNP.

These ecological characteristics make habitat suitability mapping not very relevant to predict the presence/absence of the species as it returns a potential survey area far too large to be exhaustively surveyed. However, it appears consistent that human pressure and disturbance are crucial factors driving the occurrence of the species in suitable landscapes. As a matter of fact, most potential areas of presence are restricted within ancestral domains of the Mangyan Indigenous communities living in the interior of Mindoro where most of what remains from Mindoros’ nature can be found. Therefore, we attempted to identify the possible areas of presence at a more reasonable scale focusing on the upland territories of the Mangyans.

Nevertheless, the absence of prominent and referenced infrastructure in these regions and the lack of proper statistical data on the demography of the Mangyans make it difficult to assess the anthropogenic pressure from IPs in this wide-scale suitable landscape. Indeed, many Mangyan communities maintain elusive lifestyle and voluntary seclusion in the uplands, keeping them *de facto* “out of the map”.

To overcome these challenges, we tested indirect approaches using two different parameters:

- a. *Presence of human habitation*: We attempted to map human infrastructures such as isolated huts and villages (group of huts) visible through close screening of aerial images from Google Earth. Although a tedious process, it demonstrated to be a successful approach, highlighting the network of settlements in the uplands out of accessible roads (Map appendix 1). Nevertheless, this approach presents several limits: first, the data source is not reflecting the exact current situation, as we are depending on the regular updates from Google Earth, a constraint considering that many communities maintain nomadic lifestyle; second, those infrastructures can only be detected in open areas free from close canopy. Thus most settlements located in forested areas are missed. This is particularly the case in Oriental Mindoro.



Left: IP settlement visible by screening through aerial images from Google Earth Pro; left: Isolated IP village composed of several huts (@ DAF)

- b. *IP land-use and crops*: Mangyans are extensively using fire for their farming system (slash-and-burn agriculture) and for hunting purposes (burning of grassland). Thus, the analysing of data from the NASA on burning regime becomes a good indicator of human activity in our context and a proxy for assessing disturbance (Map appendix 2). However, this approach doesn't detect other types of activity that are not using fire, such as traditional hunting with traps or harvesting of natural resources.

Remote sensing data proves very valuable to highlight anthropogenic sources of disturbance; however, some threats remain discreet such as disturbance from illegal activities perpetrated by lowlander outsiders (wood poaching and wildlife poaching).



Left: mosaic landscape of IPs from Google Earth Pro aerial images showing fresh burning on slopes of hill and opening in forest for crops, right: use of fire by IPs

3. Involving IPs in the survey and integrating IP knowledge:

The Mangyan Indigenous communities of Mindoro can be roughly divided into two categories: lowland and upland communities. The lowland communities are more assimilated to mainstream Filipino society due to their proximity to the road network, making them easier to approach. These communities are the “gate-keeper” of the mountains, giving the initial permission to enter the tribe's land and/or conduct any activity. They also facilitate the access to the upland communities by pointing out specific focal persons or settlements to be contacted. On the other hand, the upland communities continue their traditional lifestyle due to their greater distance to mainstream society infrastructures or through voluntary seclusion in remote areas. We also need to gain their consent to conduct fieldwork in their territory. They have *de facto* a better knowledge of the area and natural resources, including the past and current presence of tamaraw, terrain and physical accessibility. Thence, it is important to identify IP members that can become focal liaisons and to select guides and porters from communities residing the closest as possible from suspected tamaraw areas.



Left and right: consultation with IPs prior to survey (@TCP)

Establishing a trusting relationship with these IP communities is therefore key in collecting relevant information and preparing the actual verification survey, as well as undertaking any future conservation efforts. IPs are generally secretive and suspicious in delivering information, especially in the case of tamaraw as they fear that the presence of the species, if revealed, will create complications with the state and restrictions of rights. Thence it requires some sensitive social approach and several consecutive meetings and consultations. Overlooking or rushing this step has proven to be prone to failure in conducting a successful survey.

4. Site verification survey:

Collating information from the previous steps enables building maps of the most probable areas of presence of tamaraw at a lower geographic scale. This will define the number of areas and potential surveys required to exhaust the sampling area. The itinerary and plans are prepared with DENR TCP and validated with IPs. The number of days to reach the target area is estimated so as to define the total number of days required to assess it. We favour a small size team of rangers already acquainted with such mission in order to increase efficiency by reducing the amount of supply needed and consequently the number of porters required. Yet, the tamaraw is the primary target, such fieldwork is also the opportunity to continue gathering information from IP communities along the way, difficult to contact on a general basis, as well as collecting *ad-libitum* information on their lifestyle, land-use pattern and on the overall biodiversity of the area visited, including data on other endangered species.

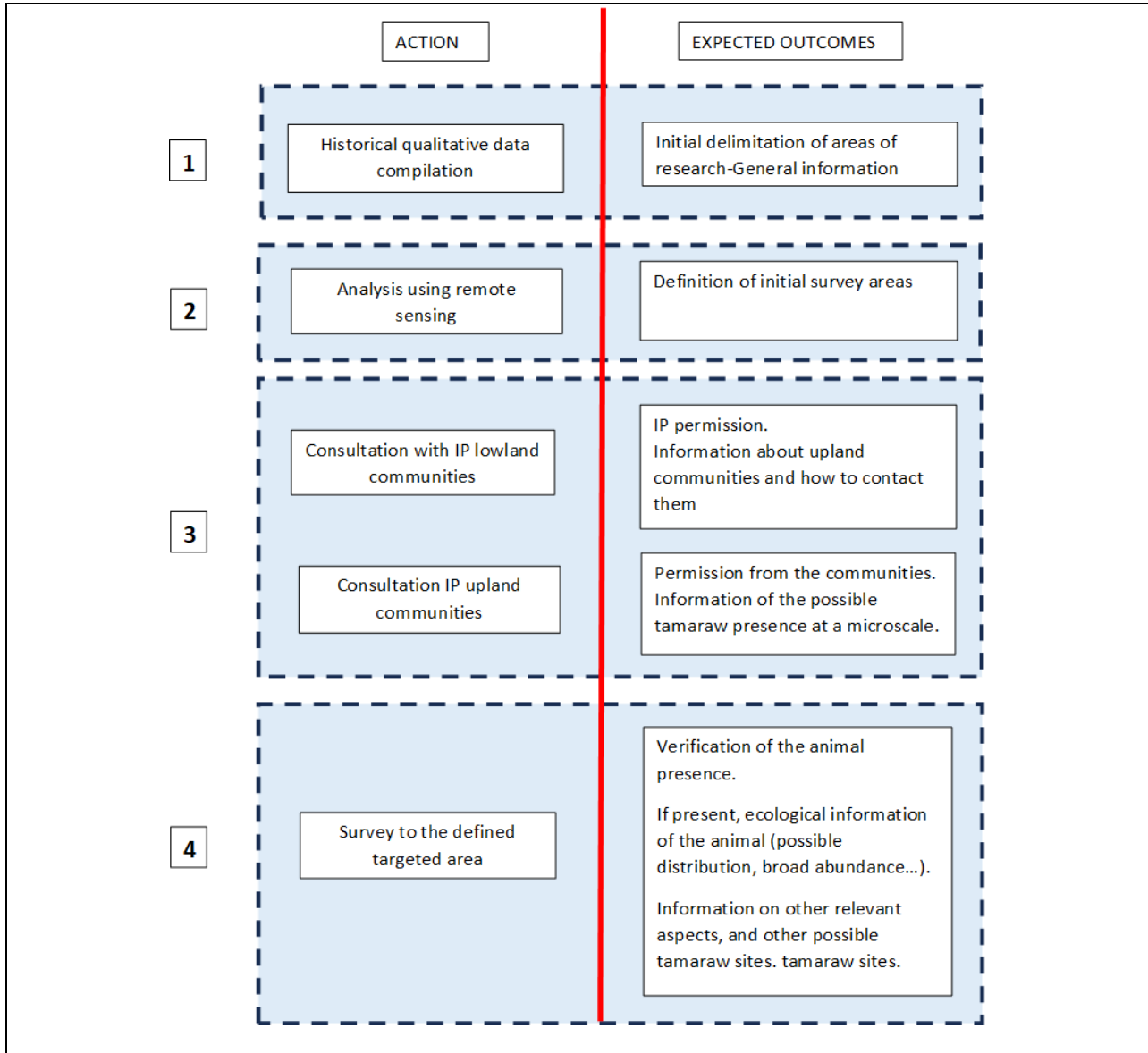


Left: line of local IP porters during the survey, right: random meeting with upland IP (@DAF)



Left: spear trap, right: sign indicating presence and location of spear trap (@ DAF)

The following diagram depicts the four steps methodology undertaken:



IMPLEMENTATION OF THE METHODOLOGY – LOCATING A NEW TAMARAW SITE IN THE INNER SABLAYAN REGION.

The Municipality of Sablayan is the largest of Mindoro and harbours large tracks of forest and mountains that deserve thorough assessment to uncover Mindoro’s hidden biodiversity. All known tamaraw sites are actually located within its border or at the vicinity. Therefore this Municipality presents the highest potential to host unseen tamaraws.

The process undertaken to find new tamaraw areas of presence proved challenging, requiring several months of coordination, data gathering and a tedious consultations process with local IPs in order to better understand the terrain and the bio-cultural landscape in this poorly visited region.

In addition, severe weather conditions, with unusually low pressure for the season, hampered the fieldwork, forcing the team to conduct three successive surveys. Despite creating complications, it helped us to establish a better relationship with local IP communities, to understand the context, habitat and requirements, as well as to gather more consistent information, not only about the targeted region but also about other relevant areas in Mindoro.

The primary goal was to verify if the distribution of the Upper Amnay-Mt Gimparay subpopulation is larger than what we know and especially to validate if tamaraws are still present or not between this area and the northern border of MIBNP (indeed, park 'rangers reported a hoofmark near the corner 4 of the protected area in 2022 while setting the park's demarcation markers). Additionally, the main objective of the DENR TCP was to evaluate the possible impact of the on-going construction of the inter-Mindoro road, if tamaraws were to be found on both sides of its delineation. If/when completed, this road will cut Mindoro into two blocks, north and south, right through the central spine of the island, raising much concern on the capacity of the central spine to play its role of biodiversity corridor in the future.

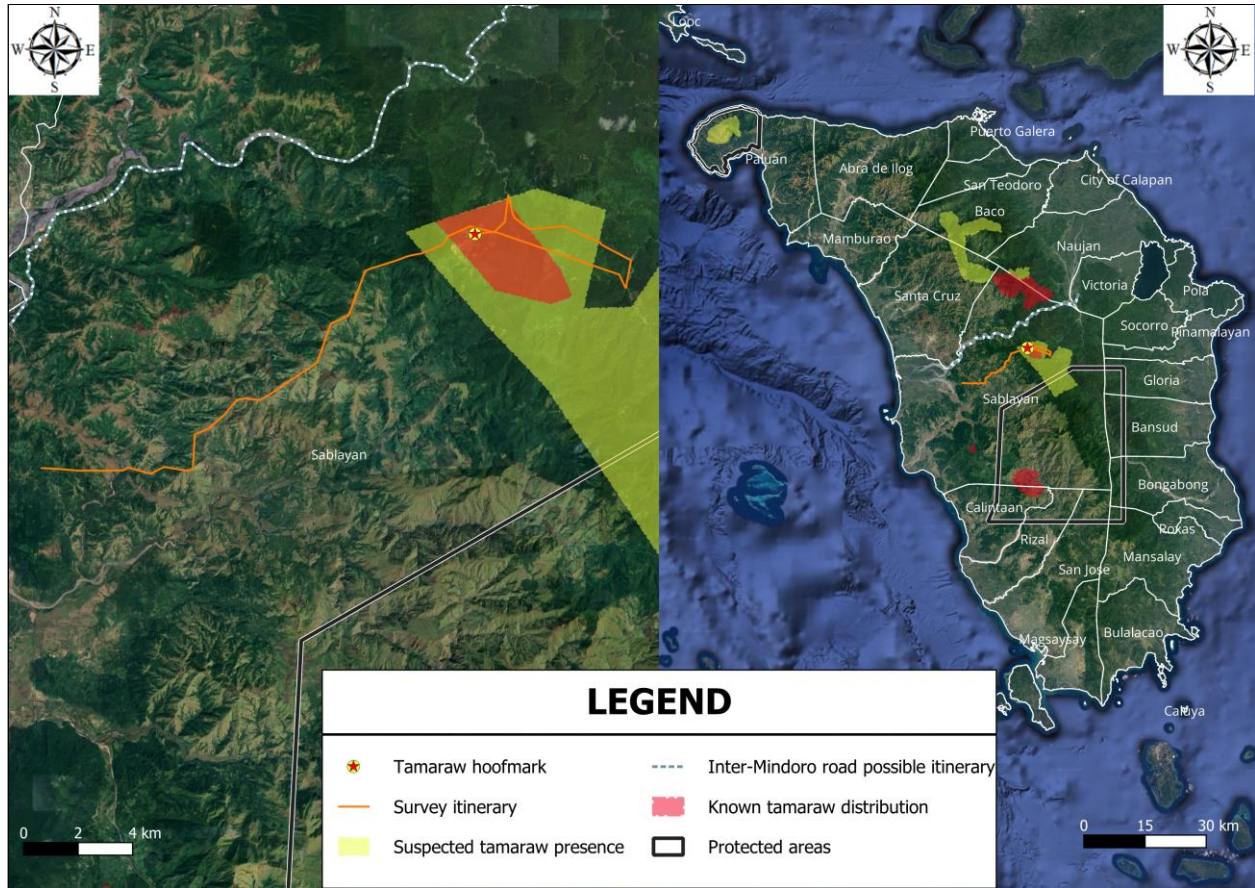
Thanks to the information already available, DAF was able to build a preliminary map, through GIS technology, of the possible areas to be further explored. Consequently, the DENR TCP launched a field survey in January 2023. Unfortunately, the field team was not able to reach the planned targeted area and no tamaraw signs were found. Some issues in the coordination with local communities proved the importance of completing the four-step process. Nevertheless, the local indigenous guide corroborated the hypothesis that the species could be observed in the southern tip of the proposed survey area. This information validated the approach undertaken and the need to complete the survey process.

Consequently and in agreement with the DERN TCP, DAF took the lead in coordinating the following surveys in order to verify the above suspicion. We undertook the four steps, initiating stronger communication with local IP communities with consultations and interviews being held over several months. A small team composed of a DAF field officer and few TCP rangers was created on this purpose.

The second survey mission was once again challenged by harsh weather conditions and difficult terrain. The team couldn't reach the new refined targeted area. However, this mission was useful to assess the exact areas where the species is currently reported by upland IPs and the way to reach it in a faster and less arduous way.

The third attempt, in May 2023, proved the one successful. Several tamaraw hoofmarks were collected in an area characterized by mossy forest, corroborating both the GIS mapping exercise and the information collected from the upland IP guide.

Despite the fact that the weather condition prevented the team from conducting a thorough investigation within the area of interest or to photo-document the tamaraw, the team was able to collect important information on the location and movement of tamaraw and the biodiversity of this remote region as well as to document the lifestyle and presence of these secretive upland communities.



Left: map showing the itinerary followed during the third survey, the targeted area and location of the tamaraw hoofmarks collected, right: map of Mindoro showing all the know and suspected areas of presence of tamaraw in 2023 and the planned trans-Mindoro road construction cutting through the central spine

DISCUSSION AND CONCLUSION

Locating this new area of presence of tamaraw demonstrated the relevance of conducting a thorough approach combining desk-based ecological work and a community-based approach, to make predictions and verify them empirically.

The work prior to the survey proves crucial. Most of the historical data are scattered and collating all the available information is making this step long and tedious. There is a need to increase the network of informants from the various local stakeholders, including IP members, and to set up a mechanism to record, inventory and manage the information being collected in the field over time. Furthermore, this finding attests that a few relevant reports from a handful of upland IPs prove worth an entire field survey if we want to avoid looking for a needle in a haystack. Therefore it is crucial to build solid trusting and lasting relationships with local IP communities living in suitable tamaraw areas so as to identify and contact these specific people. This will be even more essential in order to plan future conservation measures that do not alienate or scare upland communities.

This finding brings some light and hope for the long term conservation of the species. It validates the initial hypothesis suggesting that the range of the tamaraw in the inner Mindoro Island, along the central spine, is wider than originally assessed and goes far beyond the areas surveyed in 2018. It pushes to conduct further intensive research to define the exact distribution and status of the species in the whole island, using new baseline data in new possible tamaraw sites. The map in **Appendix 3** combines all layers of information collected from the different steps. It clearly highlights that the current areas of presence of tamaraws are located in areas of lower anthropogenic disturbance, which helps, in return, to define the possible areas that could still shelter undetected animals.

We are also starting to understand better the interaction between the species and IP communities sharing the same landscape. It appears that, similarly to the Aruyan-Malati region, the presence of tamaraw at a certain time is directly related to the pattern of movement of communities through their living space, both for external reasons or as an expression of their semi-nomadic lifestyle. The species seems constantly looking for less disturbed areas and moving along with communities. This means that locating animals at a certain place at a certain time shall not translate into delineating a final tamaraw site on the map. In other words, the overall potential tamaraw landscape in the inner Mindoro is larger than the sum of all the areas of presence already identified.

To understand this process, research on the historical and current IP lifestyle is needed so as to help us to define future possible scenarios and holistic management, including social and ecological aspects of the ecosystem.

Lastly, the last surveyed area needs further visits so as to establish a more complete picture of the socio-ecological situation and presence of the species. It is also important to maintain a constant channel of communication with the IP communities in tamaraw landscapes in order to formulate and implement consistent conservation strategies integrating the socio-ecosystem parameters.

These activities were supported by:

Mandai Nature Singapore

The Mohamed Bin Zayed Species Conservation Fund

The Zoologischen *Gesellschaft* für Arten und Populationsschutz (ZGAP)

Tierpark Berlin / BERLIN WORLDWIDE

Association Française des Parcs Zoologiques

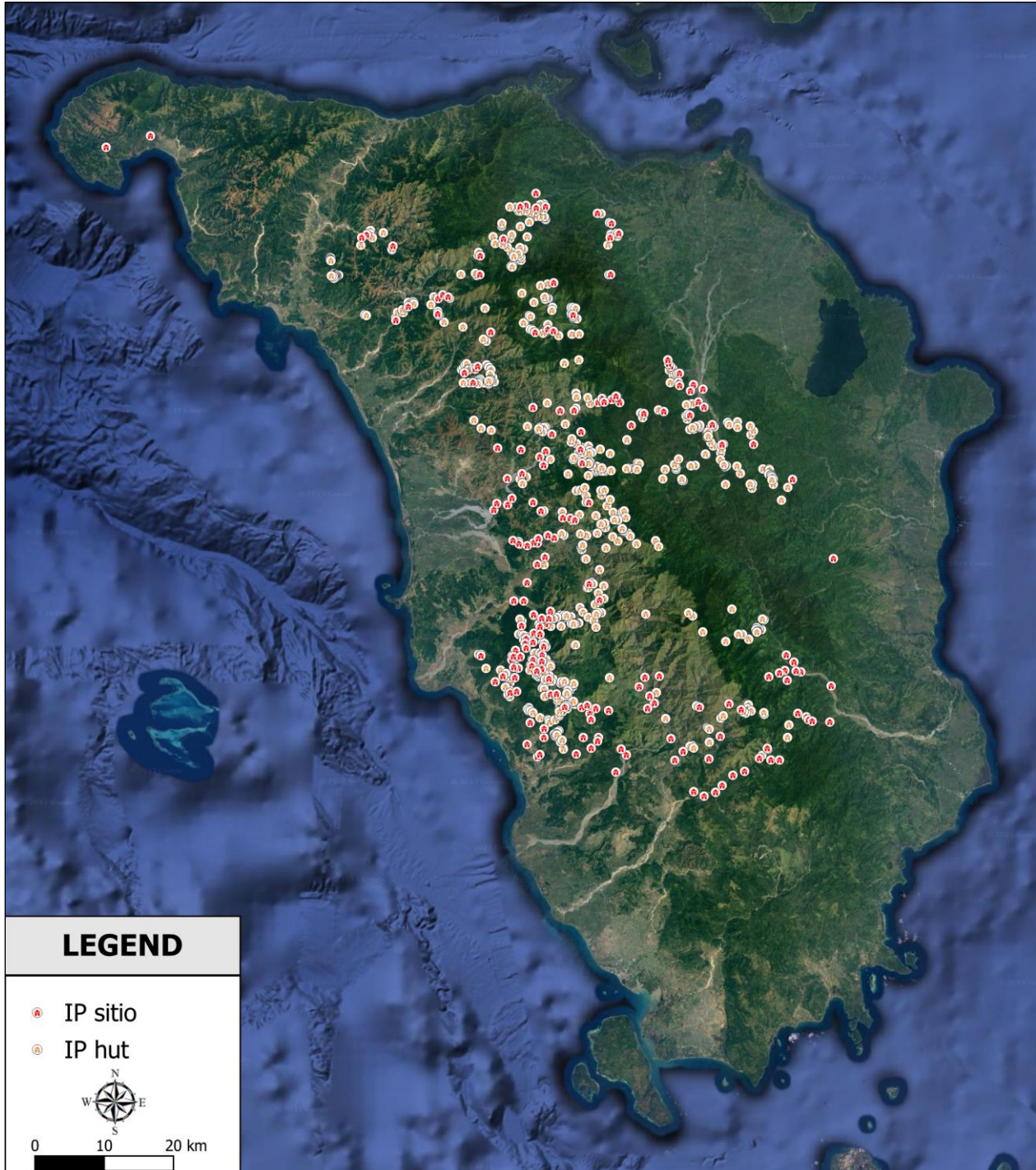
In collaboration with:

Re:Wild

LBBE CNRS France

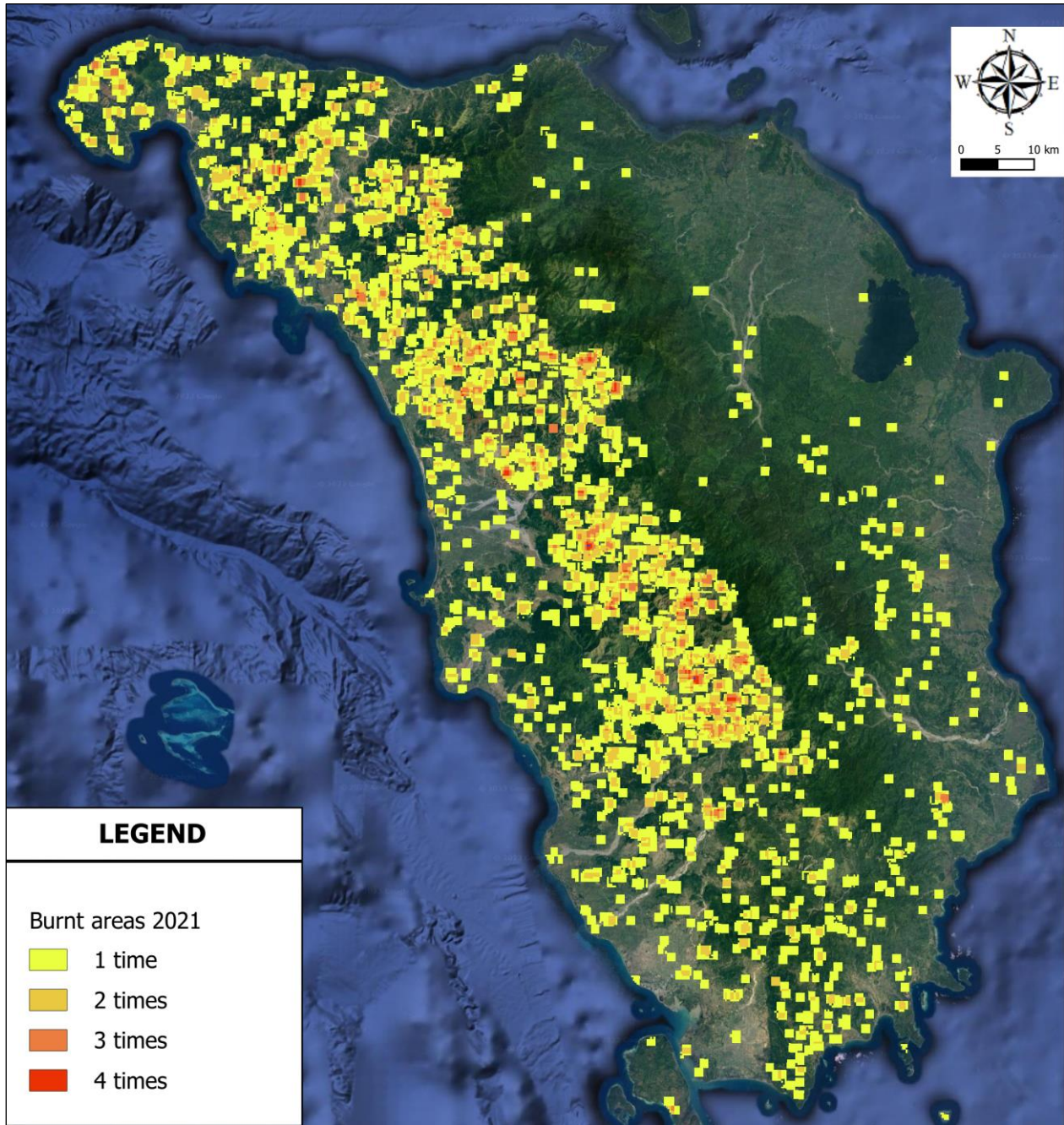
University Santo Tomas

APPENDIX 1: Map showing the huts and settlements of IPs from field data and detected through screening of Google Earth Pro images

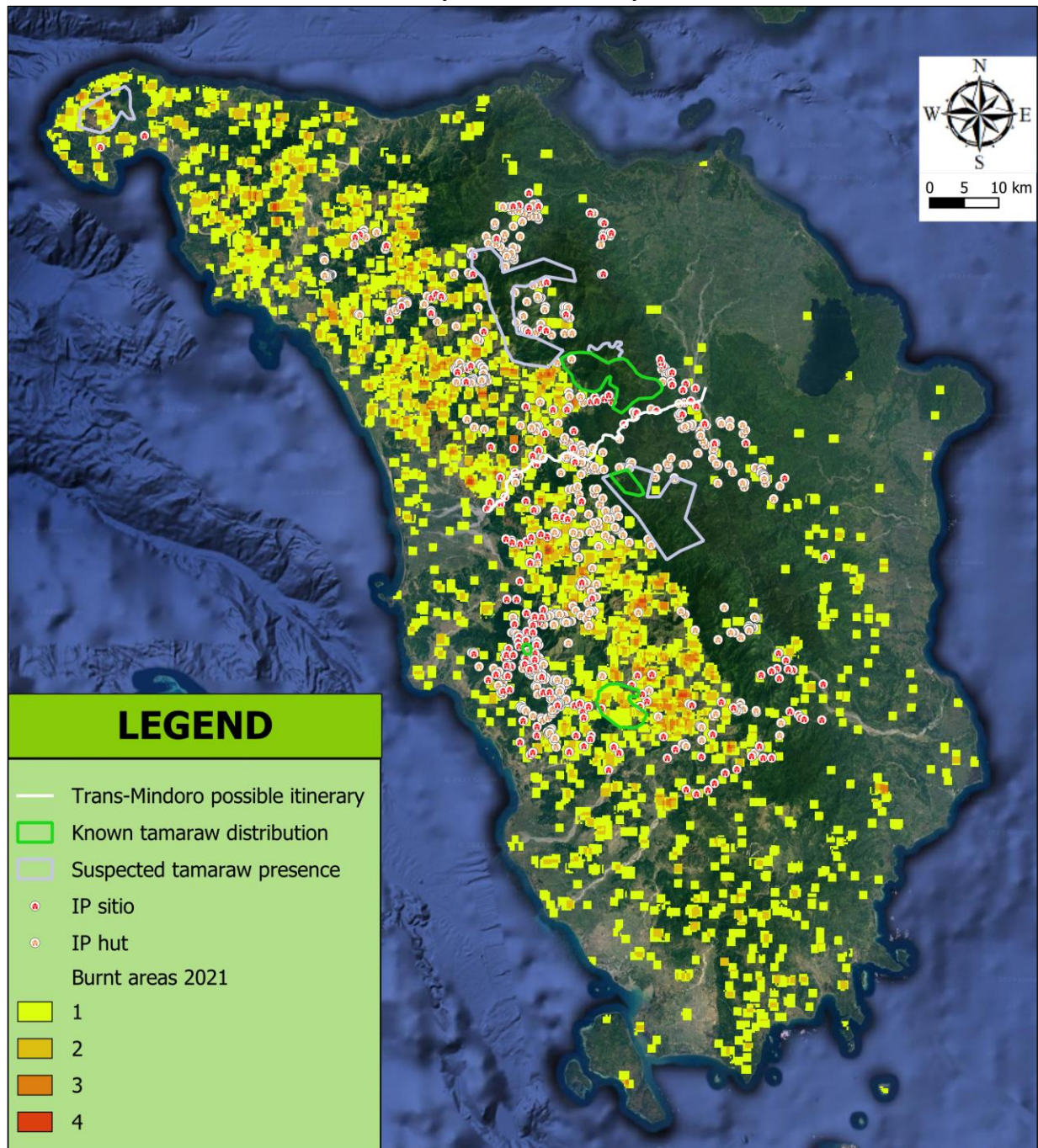


The information displayed is not exhaustive of the entire Island but only focus on areas of on-going research and surveys.

APPENDIX 2: Map showing the number of fire events cumulated for the year 2021 (source: NASA FIRMS LFTA)



APPENDIX 3: Map overlying the IP settlement and huts (Appendix 1), fire events (Appendix 2) and the known and suspected tamaraw presence as of 2023.



This map shows that current areas of tamaraw presence are located in areas of lower anthropogenic disturbance (green zones). By extrapolation, it enables to identify most suitable areas of potential presence at present time which could be subject to further verification surveys (white zones). Note that the area of presence in Aruyan-Malati follows the pattern but at a micro-scale while the fire events in the tamaraw range in MIBNP is due to the grassland burning prior to the annual tamaraw population count from local authorities. Detection of fire event and settlement in the oriental side is lower due to the climate that sustains constant rain over the year and faster forest regeneration. Also, the orography and especially the slopes are not taken into account here, but could be another explaining factor of presence/absence.