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## **Grant Proposal**

The mere mention of the word snake usually invokes a passionate response. The team of individuals at the Naja Project have devoted the past seven years to human-wildlife conflict management and our main efforts have been directed towards one of the most feared and misunderstood animals - snakes. The Naja Project set up by Bartosz Nadolski at the Sakaerat Environmental Research Station (SERS) has been ongoing since November 2014. Now armed with the experience gained over seven years and vast amounts of data collected we have decided to end the research at SERS to expand our work on Ko Pha-ngan in the South of Thailand. The new established site is a multidisciplinary reptile research and rescue center, building upon the strong foundation started at the Sakaerat Biosphere. This site will allow us to conduct interesting comparisons between mainland and island populations. Habitat fragmentation is at an all-time high due to deforestation and tourist construction projects. This makes it important to study the movements and variables which affect snake spatial ecology and as a result human-snake conflict. Using the success of the Naja Project at SERS as a model, we will work to implement on site science based education programs not only for Ko Pha-ngan but also the surrounding Islands and the wider Surat Thani Province. Though there is a good depth of research focused on venom composition, hospitalization and treatment of envenomation, there is little effort aimed towards snake bite prevention or the mitigation of snake/human conflict. Unlike many other areas such as India, Thailand does not have as high occurrences of envenomation. The majority of the conflict is unwarranted vilification of the cobra often resulting in its death. The goal of our project is to better understand snake ecology and use the information we gain in the field to better help mitigate this ongoing conflict.

We all know snakebites have moved up in the charts of public health risks. Physical as well as mental repercussions are significant. The challenge requires an understanding of snake ecology together with the environmental and ecological driving factors which influence the behaviors of snakes in the wild.

A great number of tourists visit the island continually encroaching on snake habitat, possibly causing behavior changes. This increases the opportunity for conflict and encounters between humans and snakes. In addition, insular populations can often be affected by habitat destruction differently than mainland populations and monitoring movement patterns will allow us to monitor the behavior and health of the population. While spending a short amount of time at the study site and assisting with snake rescues, I have observed some interesting dermatological inconsistencies that need further investigation. All this sounds great on paper, or maybe it doesn't, but the bottom line is that I want to save not just this species (*N. kaouthia*), but all snakes. Education has a huge impact. Bridging the gap between science and education is critical and happens to be a passion of mine. Currently snakes are being severely injured due to improper handling by rescue crews. I can regurgitate the same facts written in all my, and everyone else's papers but you know them. Snakes are not sexy to the world the same way other animals are and therefore we have to fight harder for them. This project is needed because we need ALL projects involving snakes.

The primary study species for the project is *Naja kaouthia*, the Monocled Cobra. It is a medically important snake due to its venom composition and amount of envenomation's throughout the large region it inhabits. We have established a collaboration with The Bangkok Red Cross Snake Farm, which is the biggest producer of antivenom in this part of the world. The venom research institute has obtained venom samples from SERS and also the island population of *N. kaouthia* in order to better understand an isolated population as well as develop a region-specific anti-venom due to the differences in venom composition from region to region.

The Ko Pha-ngan project has begun its scientific efforts with snake rescue services to gather a better understanding of the study site and its dynamics. Currently we have implanted seven Monocled Cobras with radio transmitters and have begun generating maps showing the emerging movement patterns and home ranges of each of the snakes. All snakes being radio tracked have been rescued from homes on the island. There are currently three females and four males which offer an exciting opportunity to gain breeding data. Until our research efforts there have been no terrestrial research projects on Ko Pha-ngan and it is relatively unexplored with the majority of known species inhabiting the island coming from old species checklists and various tourist blogs. The opportunities to document and discover are exciting as research and education are the two key components that drive us at the Naja Project.

The main goal of the project is to facilitate a peaceful coexistence with local wildlife by better communicating science in the hope of mitigating snake-human conflict. In addition to the education and outreach aspect (including rescues), species checklists will be created for future researchers to use for better habitat and species management protocols. Though the focus is the Monocled Cobra, there is significant work conducted with the King Cobra as well due to the prey/predator relationship. Understanding the environment and all its components is essential for an amicable coexistence with nature and even more important creating a fun and easy way to disseminate the scientific information to the community for ease of understanding.



Removing a tracked Cobra from a villager's vegetation pile. He had been working and removing bits from the pile. The snake was moved approximately 25 meters to a more forested patch.

Training rescue crews, creating and distributing region specific snake identification posters and demonstrating the latest handling and first aid techniques is key to mitigating the ever-growing problem of snake-human conflict. We often fear what we do not know. Social media is a powerful tool; however, it is just as powerful in a negative way as it is a positive way, maybe more so. Showing the dramatic and isolated, possibly staged, or provoked encounters with snakes perpetuates the myths surrounding them and re-enforces the innate fear one might have. Often to counteract the negative assumptions believed instantly, we must prove the positive

which is sometimes received with skepticism. Providing positive guided encounters with snakes during a rescue or a scheduled education talk allows humans to see snakes in a much different way than they are used to. This is especially important when rescuing a King Cobra, as the villainized view of the snake is often very different from reality. The goal of this project is to use scientific data collected in the field by way of physical surveys, radio telemetry of the Monocled Cobra, and camera trap surveys to help dispel myths and facilitate a peaceful coexistence with snakes.



**Left:** Releasing a King Cobra after rescued from a home near Khao Sok National Park. We were conducting a survey in the area and thankful the local rescue service included us. We did not process this snake; however, we were able to estimate size and get a good look at the body to ensure it was healthy which is when the photo was taken. **Right Top:** King Cobra immediately after eating a Reticulated Python neonate. A crowd was gathered while I explained the behavior and food preferences of the King Cobra. We persuaded the crowd to let the snake digest its food and go off into the forest on its own. **Right bottom:** training proper handling techniques using a bag and pipe rather than a plastic bottle. These gentlemen are from Nicks Wildlife: Southern Education Division in Thailand. The local rescue crew was in attendance to learn as well.



We will accomplish our goals as follows:

- 1) Determine factors bringing cobras into conflict with humans (anthropogenic factors, weather, etc.) by collecting data in the field via radio telemetry of the medically important Monocled Cobra, *Naja kaouthia*.
- 2) Determine differences in breeding season from island to mainland. Investigate observed nest attendance more closely.
- 3) Continue the education program developed at (SERS) adapted with an emphasis on reptiles and amphibians for Ko Pha-ngan and the surrounding islands. Continued on-the-spot education opportunities present at each rescue. Information about the ecology of the King and Monocled Cobra in addition to safety tips if another encounter should arise.
- 4) Provide snake handling training for the rescue teams of the Surat Thani Province and Southern Thailand.
- 5) Conduct a wide range of species surveys in order to better understand the island fauna and ecology. This includes survey's for King Cobras and Monocled Cobras in areas they have been seen.
- 6) Conduct a capture, mark, recapture study with the Black Marsh Turtle.

Our project has produced region specific posters (fig. 1) to aid in accurate snake identification as well as flyers for villagers to have current contact numbers for snake removal and also accurate photos of common snakes in the region. Snakes are highly variable and often have different coloration patterns not only from region to region, but also within a region. This can make it difficult to make an accurate identification and often in the case of envenomation, identification for anti-venom purposes can mean life or death. The project's aim is to decrease snake-human conflict events and education is an instrumental component for obtaining our goal. It is not only vital for the safety of the human, but also for the safety of the snake, as harmless snakes are often killed out of fear and misidentification. Currently the project has had 5 negative encounters where a tracked cobra has been killed by humans. In addition, 3 tracked cobras have been food items for King Cobras. This is an indication that the Monocled Cobra is a vital part of the island's ecosystem. With limited food sources for specialized species, each additional species

plays a vital role in maintaining species diversity. There are approximately 4 species of snake large enough to be consistent food items for *Ophiophagus hannah* (the King Cobra) and this includes the Monocled Cobra. Localized extinction of even one of them could have drastic effects on the population of *O. hannah*. It might not be likely; however, islands are more susceptible to localized extinction rates than other land areas.



**Figure 1.** Poster example (all 4 pages both English and Thai are not depicted).

The process is ongoing and continuous; however, outreach and education talks have begun, with posters and flyers expanding as new species are photographed. An integral part of our project is combining research and community outreach. Establishing our positive and friendly presence in the community is key for building trustful relationships which is essential when sharing research-based information. When a villager is fearful of a snake and one has entered his or her home, it is imperative that they feel comfortable calling or messaging knowing that we, or a



trained professional will remove the snake and help provide an accurate identification in an effort to ensure the safety of both the snake and human. There have been multiple occasions where a villager volunteers' information about killing the green snakes they see here because they are venomous; however, there are no venomous Pit Vipers known to reside on the island save for the one I use for education presentations. Developing a trusting relationship, and creating engaging, interactive presentations utilizing real time data from the field is proving to be a very effective way to communicate our message.



Tracking NAKA011 through a rubber plantation to a patch of tropical forest within 200 meters of a human settlement (left). One of three camera traps monitoring NAKA014 a possibly gravid female (right).

Unfortunately, due to restructuring within the Thai government and scientific funding agencies in addition to the COVID-19 pandemic, funding proposals are on hold and new ones are not currently being accepted partially due to the funding changes. The traditional sources of funding normally sought for this project have been cut and are currently unavailable for the foreseeable future. This has been a considerable limiting factor and we humbly request \$3,000.00 to cover education material expenses such as posters, flyers, training materials, safe items for rescue crews and operating expenditures such as petrol, safe tires for the steep rocky terrain, transmitters and batteries.

Budget scope:

Item	Units	Price per Unit	Total Cost THB/USD	Justification
Petrol	1	1500/wk	6000/200/mo	Transportation to field and rescue sites, schools and other education engagements
Flyers	1	1000	1000/30	Tangible item for identification purposes. To be handed out to community members.
Stickers	1	500	500/15	Tangible item for schools and community members with phone numbers for rescue calls
PVC	1	1500	1500/50	Used to make a safe retreat for snakes during rescue. Tangible educational equipment to distribute to local rescue crews
Cloth Bags	2	400	800/25	Used for rescue teams and transporting snakes to and from the rescue sites.
Translator	3	500	1500/50	Used in the Thai schools and rescue training sessions
Website/Data Platform	6	500	3000/100	Website and database maintenance
Utilities	1mo	1500	1500/200	Monthly allotment for storing samples and husbandry food items
Transmitters	5	9600/320	48,000/1,600	Replacement transmitters after battery life expires
Miscellaneous	1	3,000	3,000/100	<p>We have been lucky enough to gather much of the scientific equipment such as transmitters, receivers, antennas, GPS, camera traps, and Kestrel weather logger.</p> <p>This money will serve to provide miscellaneous supplies for the equipment such as batteries, chargers, and SD cards as needed.</p> <p>Trap building materials.</p>
Living Expenses	1mo	13,500	13,500/	Housing expenses



TOTAL		13,200	80,300THB/ 2,676 USD	
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In gratitude toward your generosity, we will happily promote the King Cobra Conservancy through sharing your logo on our website, social media and all our promotional and educational materials. Additionally, we will put your logo on all presentations we conduct at international scientific conferences. We would also be happy to provide you any material you might need for your own use such as photographs or short video clips of the work we provide the community.

We appreciate your time and allowing us this opportunity. Please feel free to reach out if you have any further questions. We look forward to hearing from you.

#### Reference

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