



Final Report

The disappearing striped rabbits of Southeast Asia: Creating a conservation action plan for the Sumatran striped rabbit (*Nesolagus netscheri*) and the Annamite striped rabbit (*Nesolagus timminsi*)

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Background:

The genus *Nesolagus* contains two extant species that are endemic to Southeast Asia: the Sumatran striped rabbit (*Nesolagus netscheri*) and the Annamite striped rabbit (*Nesolagus timminsi*). The species are similarly striking in appearance, with large, dark stripes along their flanks, resulting in uncharacteristically bold markings for a lagomorph. Despite their unique appearance, both species remained largely unknown to researchers until relatively recently. The Sumatran striped rabbit (SSR) was described by early naturalists, yet was not photographed until 1997 (FFI 1998). The Annamite striped rabbit (ASR) was formally described in 2000 (Averianov et al. 2000). Owing in part to the late emergence of the *Nesolagus* species into the conservation spotlight, the ecology of these species is largely unknown, and there have been no comprehensive conservation actions developed for either species to date. However, Southeast Asia is currently experiencing significant rates of habitat alteration, and poaching is rapidly increasing throughout the area (Gray et al. 2018, Miettinen et al. 2011). Along with the intensification of these general risks in the region, the IUCN Lagomorph Specialist Group has become aware of targeted threats to both *Nesolagus* species which will likely precipitate drastic and rapid population declines if we cannot develop a cohesive and comprehensive conservation action plan for the striped rabbits of Southeast Asia.

To date, there has been a near complete lack of targeted ecological studies on either *Nesolagus* species, with most information on the species coming from diffuse anecdotal data (Dang et al. 2001, McCarthy et al. 2012, McCarthy et al. 2018). The ASR became known to the scientific world from a specimen collected in a local market (SurrIDGE et al. 1999). It is thought to range throughout the central and northern Annamite Mountains along the border between Vietnam and Lao PDR (Dang et al. 2001, Tilker et al. 2020a). There have been a small number of studies in the region that report anecdotal information on the species (Dang et al. 2001, Johnson and Johnson 2007),



with one recent study providing robust data on the species (Tilker et al. 2020a). Overall, the general distribution, ecology, and status of the ASR remains poorly understood. The SSR was first described in 1880 from a specimen collected in the Padang Highlands. There were several other specimens that were collected from that region in the early 1900's (Flux 1990, Jacobsen and Kloss 1919, Jacobsen 1921), but after that the species was not recorded again until a camera trap photograph was taken in Kerinci Seblat NP in 1997 (FFI 1998). The species has subsequently been recorded along the Bukit Barisan range through anecdotal camera trap images and chance observations (BBC 2007, Dinets 2010, McCarthy et al. 2012, WWF 2009). However, there has been no ecological research focused on the SSR, and even basic knowledge of the species is lacking.

The overall paucity of information on the *Nesolagus* species is perpetuated by the lack of any comprehensive conservation action plan for the two species. To date, there has been no formal identification of ecological knowledge gaps for the species, no prioritization of research objectives, no characterization of threats, and no strategic plan of how to effectively conserve the species in the future. The lack of a cohesive action plan for the *Nesolagus* species has become particularly alarming as the IUCN Lagomorph Specialist Group has recently identified specific threats towards the two species that have the potential to significantly affect their populations. The entire distribution of the ASR lies in the forests along the border of Vietnam and Lao PDR, all of which are in the midst of a snaring epidemic that has precipitated a defaunation crisis that is likely unparalleled in any other tropical region (Gray et al. 2017, 2018, Harrison et al. 2016). Research by Tilker et al. (2020a,b) indicated that the distribution of the ASR is heavily affected by past hunting pressure, with low occurrence in areas where hunting pressure has been particularly intense. Without urgent and effective conservation measures to address the current snaring crisis, the ASR is at risk of extinction in the near future.

Significant threats to the SSR have also emerged in recent years. The species has likely been affected by extensive deforestation throughout its range, as this has been a known conservation issue in the region (Margono et al. 2012). However, of perhaps even more concern is an apparently recent trend of SSR being trafficked in the illegal wildlife trade (Setiawan et al. 2018). The emergence of the SSR in the illegal wildlife trade raises substantial concerns as to the viability of the species in the face of sustained commercial demand. Already, intensive demand within illegal pet markets has driven some Indonesian species to the brink of extinction (Nijman et al. 2018, Shepherd et al. 2016), portending potentially dire consequences for the SSR.

The recently identified threats to both the ASR and the SSR are grave, and have the potential to significantly affect their status if there are not immediate steps taken to develop strong and comprehensive conservation action plans for both *Nesolagus* species.

Meeting Objectives:

Owing to the serious threats facing the SSR and the ASR, the IUCN Lagomorph Specialist Group proposed the formation of a Striped Rabbit Working Group to guide the development and implementation of comprehensive conservation action plans for both *Nesolagus* species. An SSC



Internal Grant supported the first planning session of the group from December 11 – 14, 2019 in Bogor, Indonesia.

The objectives of the meeting were threefold: (1) identify additional stakeholders that should be invited as members of the working group, (2) collect and review ecological data for the *Nesolagus* species, and (3) develop a draft conservation action plan that will serve as the foundation for subsequent planning and action undertaken by the Striped Rabbit Working Group.

Meeting Attendees and Invitees:

From the outset, the scope of this meeting was relatively small, with the general goal being to bring together key researchers on each species. This meeting was planned as a foundational meeting, from which the working group would gradually increase in scope. As such, we prioritized limited funds towards covering travel costs for in-country researchers that we (Co-Chairs Dr. Jennifer McCarthy and Andrew Tilker) identified as key stakeholders for each *Nesolagus* species. Additional researchers were invited, but asked to cover their own travel costs. None of these researchers attended, but all expressed interest in the results of the meeting.

Below is a comprehensive list of all attendees and their affiliation.

Attendees:

Dr. Jennifer McCarthy, IUCN Lagomorph Specialist Group and Lincoln University

Jennifer is an Assistant Professor in the Biology Department at Lincoln University. She completed her dissertation work on small cats in Sumatra, in Bukit Barisan Selatan National Park, and recorded photographs of SSR during the course of her research. She has since authored several notes on the SSR and lead the recent IUCN re-assessment of the species. She is a member of the IUCN Lagomorph Specialist Group, and was charged with co-chairing the Striped Rabbit Working Group with Andrew Tilker.

Andrew Tilker, IUCN Lagomorph Specialist Group and Global Wildlife Conservation

Andrew is Asian Species Officer with Global Wildlife Conservation. He conducted his dissertation work in the Annamite mountains of Vietnam and Lao, which formed the background for one of the first in-depth studies of the ASR. He has authored several papers on the ASR, and led the IUCN reassessment of the species. He is a member of the IUCN Lagomorph Specialist Group, and was charged with co-organizing the event with Jennifer McCarthy.

Dr. Arum Setiawan, Sriwijaya University

Arum is a professor at Sriwijaya University. He has conducted research in Sumatra to assess local knowledge of the SSR, and has also been involved in recording the species in trade for the first time in Java. He has co-authored some of the first papers on the SSR and their ecology, and continues to conduct field work in South Sumatra.



Dr. Muhammad Iqbal, Sriwijaya University

Muhammad is a post-doctoral researcher at Sriwijaya University. He has conducted research in South Sumatra (Gunung Raya) and near South Kerinci in Sumatra. He has assessed local knowledge of the SSR, and has also recorded the species in trade for the first time in Java. He has co-authored some of the first manuscripts on the SSR and their ecology and continues to conduct field work in South Sumatra.

Tuan Anh Nguyen, University of Ho Chi Min

Tuan Anh is a researcher affiliated with both the Hanoi University of Science and Central Institute for Natural Resources and Environmental Studies, University of Ho Chi Min. He has conducted fieldwork throughout Vietnam. He has a special interest in ASR ecology and conservation, and has documented the species in trade.

Wido Albert, Fauna and Flora International

Wido is a researcher with Fauna and Flora International in Sumatra, Indonesia. He is in charge of their camera trapping program in Kerinci Seblat National Park, thought to be a stronghold of the SSR. He has recorded several photographs of the species in that region.

Dr. Hoa Nguyen, University of Minnesota and University of Hanoi

Hoa Nguyen is a postdoctoral researcher at the University of Minnesota, and is also a lecturer at the University of Hanoi. He focuses on the quantitative modeling and molecular biology of rare species, and has a specific focus on the ASR in Vietnam.

Report of Meeting Activity:

General Meeting Schedule:

The meeting took place from December 11 – 14, 2019 at the 101 Bogor Hotel Suryakencana in Bogor, Indonesia. Attendees arrived on the evening of the 11th for a group dinner, and then the official meeting ran all day on the 12th and 13th, with attendees leaving on the morning of the 14th.

The first day of meetings, December 12, 2019, started with introductions of all attendees and a charge from the Co-Chairs on the purpose and goals of the meeting. The Co-Chairs then each gave synopsis presentations of the current knowledge of each *Nesolagus* species, with Dr. McCarthy presenting on the SSR and Andrew Tilker presenting on the ASR. After each presentation, there was an open discussion among the members to add any additional anecdotal knowledge on the species which was not represented in the presentations. The attendees then broke into species-specific groups to further discuss specific current information for both species (range, habitat use, recent reports), as well as to characterize and prioritize threats for each species. The group then reconvened and the information from each sub-group was presented. The activities conducted on the first day of meetings were designed to inform the entire working group on the current status of both species and create a general foundational knowledge for the group.



The second day of meetings, December 13, 2019, began with a recap of the previous day and the statement of the objectives for the current day. As a group, the attendees developed a vision and goal for the Striped Rabbit Working Group, and then once again broke into species-specific groups to discuss conservation priorities and implementation plans for both *Nesolagus* species. These plans were presented to the overall group as they reconvened, and discussion centered around developing an overall implementation plan and the next steps in the conservation planning for each species. The final act of the attendees was to identify additional candidates for invitation to the IUCN Striped Rabbit Working Group.

IUCN Striped Rabbit Working Group Vision:

The IUCN Striped Rabbit Working Group works to prevent the extinction of the SSR (*Nesolagus netscheri*) and the ASR (*Nesolagus timminsi*); to maintain thriving populations of both *Nesolagus* species in the wild; to support *ex-situ* efforts; to increase awareness of the species; and to aid in the conservation of critical habitat for each *Nesolagus* species.

Information Reassessment for the Sumatran Striped Rabbit (Nesolagus netscheri):

Distribution:

The actual distribution of the SSR on Sumatra remains uncertain. The species is thought to be endemic to the Barisan mountain range, with most of the sightings and camera trap photographs recorded between Kerinci Seblat National Park (KSNP) and Bukit Barisan Seletan National Park (BBSNP). There was one report of a sighting of the species in Gunung Leuser National Park (GLNP), and that protected area has historically been included in the hypothesized distribution of the species. However, no working group members could document the species in GLNP, despite extensive camera trapping in the area. There had also been historical records of the species in the Padang Highlands in West Sumatra, but we are unaware of any confirmed reports of the species there since the early 1900's. The members identified the necessity of drafting an official letter to all individuals and organizations that had conducted camera trapping in GLNP, or the Padang Highlands, with a request to report any records of the species. As there have been no photographic records (to our knowledge) of the species north of KSNP, it is important to assess whether there are extant populations in those regions as the outcome of those findings would drastically alter distribution calculations for the species.

According to Mr. Albert, within KSNP there has been extensive and long term camera trapping in several core areas of the park. At two of the long-term camera trapping sites, there are consistent records of the SSR. Jeremy Holden also has several records of the species from Gunung Kerinci. There has been some limited camera trapping conducted in the north of the park, and those efforts have not generated photographs of the species. This is true in south KSNP as well, where there have been no photographs despite camera trapping efforts, and local people do not report seeing the species. This area is lower elevation, and the group members hypothesized that this may be a determining factor in the species distribution. In BBSNP, the species has been recorded from higher elevations in the more core regions of the protected area. Dr. McCarthy reports additional



photographs within BBSNP from a recent camera trapping effort by WCS-IP, but is unaware of the exact locations. The members identified the need to solicit that information from WCS-IP.

Drs. Iqbal and Setiawan conducted surveys in Gunung Raya and Gunung Dempo, two isolated protected areas between KSNP and BBSNP, to assess local knowledge of the SSR. Gunung Raya is an official wildlife reserve, but there is extensive encroachment into the protected area. During the surveys, local people indicated that they saw the rabbit and that they hunted it as well. In one village in particular, there were numerous people that reported having seen SSR, always in the forest and never in the vicinity of local villages. After the surveys were conducted, one SSR individual was found to be offered for sale near Dempo. It died within two days, but Drs. Iqbal and Setiawan were able to collect samples from the individual from which they have successfully extracted DNA. Their surveys indicated that local people said the rabbit almost always dies in captivity and is rarely kept as a pet. In subsequent surveys, the research team saw a SSR in the remaining forest on Gunung Raya.

Illegal Trade:

Drs. Iqbal and Setiawan have reported the first incident of a SSR being offered for sale online and have published a manuscript documenting this incident (Setiawan et al. 2018). They reported that there is a rising increase of social media use to illegally sell wildlife and wildlife products. This is becoming even more difficult to monitor as the social media sites become more encrypted and individuals must be invited to join certain groups. In the case of the SSRs that were offered for sale, they were found in a WhatsApp group for those interested in civets. The SSRs were likely caught through indiscriminate snaring, which impacts a number of non-target species. The members discussed the fact that many more SSRs than we are seeing offered for sale are likely dying if caught in snares. To date, the species has been sold in Java and Sumatra, and there are no records of the species being offered outside of Indonesia. It appears that the species may be being moved on the buses which frequently travel between Sumatra and Java, as this is a known trafficking route and there remains little regulation.

Population:

There is no information on population density of the SSR, and the group members found it impossible to even hazard a population estimate. There is too much uncertainty around relatively basic ecological information, including the actual distribution of the species. All members agreed that with the amount of camera trapping occurring in Sumatra, and the low numbers of reported photographs of the species, it is likely that the SSR is uncommon. It could be particularly rare, and the population is not abundant anywhere in its range. There was some discussion of using DNA isolated from leeches to assess the presence of SSR, but members identified the high cost of these analyses as a major setback to their use in this instance.

Priorities for Additional Information on the Sumatran Striped Rabbit (*Nesolagus netscheri*):

1. Official letter from the IUCN Lagomorph Specialist Group/Striped Rabbit Working Group to all researchers in Sumatra who may have conducted any camera trapping efforts asking them to



document any records of the species. Most camera trapping efforts conducted on Sumatra to date have focused on large, charismatic mammals such as the Sumatran tiger (*Panthera tigris sondaica*) or Sumatran rhino (*Dicerorhinus sumatrensis*), thus the necessity of targeted camera trapping efforts that focus specifically on the SSR. However, the SSR is still captured by cameras in these studies, and we feel meta-analysis of these data may allow for a better baseline delineation of the species distribution in Sumatra.

2. Intensive and targeted camera trapping between KSNP and BBSNP to assess the actual distribution of the species in these areas. We also feel that this work may lend itself to generating the first density estimate for the species (see Tilker et al. 2020a).

3. Genetic analysis of the SSR sample has been conducted, and the members were interested in comparing the sample to those collected from ASR to further assess the relationship between the two *Nesolagus* species.

Identified Threats for the Sumatran striped rabbit (Nesolagus netscheri):

These are threats that the members felt were the most significant for the species, but are not in order of perceived severity of the threat.

Deforestation:

Because the SSR seems to occur at higher elevations, deforestation may not affect the species as significantly as it is affecting lowland species where deforestation has been more rapid and expansive. This may be a particularly low threat in KSNP, as there is little encroachment at high elevations in the core area of the park. However, it could be a more severe issue in BBSNP and Gunung Raya, where coffee plantations are rapidly encroaching on protected areas and deforestation is extensive.

Illegal Trade and Hunting:

This is a new and emerging concern for the SSR, which the members believe may significantly affect the viability of the species if not addressed. There has been substantial illegal trade already indicated out of Gunung Raya and Dempo, and it is likely more widespread than we are aware of. This is exacerbated by the lack of education among law enforcement and forestry officials who may not always be aware of the difference between domestic rabbits and the SSR. There have also not been any targeted educational campaigns focused on the plight of the SSR. This is despite the fact the SSR is listed as one of the 10 Key Species for Protection in Indonesia with a maximum of five years in prison and a 1,000,000 IDR (\$62 USD). In addition, many local people also believe that the species is common and are not aware that it is a rare endemic.

Lack of Awareness and Education:

Many law enforcement and forestry officials are unaware of the rarity of the SSR, and are unable to distinguish it from domestic rabbits. This makes the species easier to traffic. In addition, even



if people with SSR in their possession are caught, the punishment may be less severe than if they were caught with a larger and more charismatic animal like a bear or a wild felid. There is evidence that some local people perceive the species to be common.

Population Fragmentation:

Remaining forests in Sumatra are highly fragmented and often completely isolated from other intact habitats. This means that there are few contiguous corridors for the species and populations may face genetic isolation, seriously threatening long-term population viability. Gunung Raya is completely isolated, with no connectivity to other forested habitat.

Lack of Ecological Information:

Lack of ecological knowledge hinders the development of effective conservation strategies targeted towards the species. Currently, there is a lack of even basic ecological information on the SSR. Researchers do not have information on habitat specificity or distribution, which hampers efforts to target conservation efforts.

Information Reassessment for the Annamite Striped Rabbit (*Nesolagus timminsi*):

Ecology and Distribution:

Research by Tilker et al. (2020a) indicates that, unlike the SSR, the ASR does not appear to have clear elevational preferences, although this information was generated from a study in a single contiguous forest landscape, and could change with additional data from other areas. The distribution of the species seems to be tied closely to wet evergreen forests where there is little to no dry season (Tilker et al. 2019). Research by Tilker et al. (2020a) and unpublished data from participants indicates that the species is nocturnal and primarily solitary. As a side note, there have been some attempt to assess breeding cycles of the species. Researchers have come across juveniles and attempted to backtrack the birth date. This has generated estimates of a breeding season that began in February (Abramov et al. 2016). However, there remains considerable uncertainty around the species' breeding cycle.

The ASR has been recorded from six provinces in Lao and six provinces in Vietnam, ranging from the northern to central Annamites. The members discussed that, based purely on ecological considerations (i.e. extent of wet evergreen forest), the species could occur further south or north, but there has been little work in these areas using appropriate survey methods (i.e. camera-trapping). With proper surveys in these areas the known species distribution may expand.

Illegal Trade:

Members of the team with experience working in the range of the ASR identified the snaring crisis in Vietnam and Lao PDR (Gray et al. 2017, 2018) as the single greatest threat facing species. Few protected areas in Vietnam and Laos have effective on-the-ground anti-poaching teams, and for those that do, the magnitude of the threat, coupled with insufficient resources, capacities, and



political will, means that snaring nonetheless continues at high levels. The ASR is listed in the Vietnam Red Book, meaning that it is theoretically illegal to hunt the species, yet there remains little active enforcement. It is important to note that, unlike the situation with the SSR, the teams were unaware of any targeted trade for the ASR. The species does not appear to be targeted, but is snared along with many other ground-dwelling species.

Identified Threats for the ASR (Nesolagus timminsi):

These are threats that the members felt were the most significant for the species, but are not necessarily in order of perceived severity of the threat.

Snaring:

Indiscriminate, industrial snaring is the single largest threat to the ASR, as it is rapidly emptying the forests of Vietnam and Lao PDR of all ground-dwelling wildlife. The magnitude of snaring in Annamites forests is difficult to comprehend. In some protected areas, tens of thousands of snares are removed on an annual basis, but these likely represent a small fraction of the snares in the forest (Gray et al. 2018). More worrying is the fact that most protected areas have no functioning snare-removal efforts, so that wildlife is extracted at industrial scales. There is little question that the snaring crisis has the potential to drive the ASR to extinction in the near future if not effectively addressed. Snaring pressure may be indirectly tied to infrastructure development and forest fragmentation, as these processes have increased human access to forested areas.

Deforestation and Habitat Degradation:

The forests of the Annamites ecoregion have undergone extensive deforestation and habitat degradation in previous decades. These threats have been particularly severe in Vietnam, where little primary forest cover remains (Meyfroidt and Lambin 2008). However, in terms of a direct threat to the ASR, it is likely that forest alteration is a distant threat when compared to industrial snaring.

Conservation Actions for the Sumatran striped rabbit (Nesolagus netscheri):

The Striped Rabbit Working Group members developed a conservation action plan for each of the identified threats for the SSR. They are listed below, and we have attempted to prioritize them in terms of the most immediate threat for the SSR.

Lack of Ecological Knowledge:

A. Local Knowledge

The members believe that we should specifically target the areas between KSNP and BBSNP (Isali Isali Pasemah, Gumah Pasemah, Bukit Jambul Nanti Patah, and Pasir Bintang). We know the species is present in KSNP and BBSNP, so we do not need to prioritize local knowledge on the species from these areas, but if we target local knowledge in other areas where the presence



of the species is unknown to researchers, this may allow us to more appropriately identify where to deploy camera traps, or initiate further research. If possible, we should target gathering local knowledge in GLNP as well as we are still unsure as to the validity of the single report of the species from there. Finally, we should also conduct work North of Kerinci to confirm that the northern extent of the species range ends in Kerinci.

One way to gather a great deal of information is to encourage student involvement. This is possible by collaborating with universities. Drs. Setiawan and Iqbal used students to help conduct research on SSR and recommend replicating this approach. In addition, it is important to involve local forestry officials in any surveys to assess local knowledge.

B. Camera Trapping

A top priority is to send an official letter from the Lagomorph Specialist Group Striped Rabbit Working Group to all scientists that have conducted camera trapping work in Sumatra, asking for all records of the SSR to identify where the species has been recorded. It is especially important to target Leuser, Rimbabaling where we know that there have been camera trap studies, but we are unsure of the results. It would also be beneficial to contact WCS IP and get additional details on their recent records from BBSNP.

In terms of conducting additional camera trapping studies, we suggest targeting Rimba Chandi near Dempo, Gunung Raya. We know that there have been reports of the species from these regions, and there are indications that some of the individuals being illegally traded are coming from that area, yet there has not yet been targeted camera trapping there. It is also easy to access.

In Kerinci in the North, there are some high elevation areas that have not been camera trapped and might be good to target. In Kerinci it would be best to collaborate with a university on this aspect of the project so that students could be involved.

Finally, it would be useful to get an official protocol for camera trapping striped rabbits from Vietnamese counterparts. They have conducted effective camera trapping studies, and have developed a detailed protocol. We would like to produce an official camera trapping protocol from the Striped Rabbit Working Group, and possibly collaborate with colleagues working on the Annamite striped to conduct a camera trapping workshop in Sumatra.

C. Genetic Information

Two of the specimens that were confiscated from online sellers are currently in the possession of Dr. Setiawan. They were individuals that were collected in South Sumatra, and being able to conduct advanced genetic analyses on these specimens might allow for comparison to ASR and allow for the identification of interspecific genetic differences. In addition, creating a library of SSR DNA samples will allow us to document all information on the species. The members identified the importance of developing a proper protocol for long-term DNA sample storage.



D. Model Habitat Suitability

By creating a meta-analysis of SSR records, we may be able to start to model the species' probability of occurrence and habitat suitability, providing a more robust overview of potential suitable habitat for the species, which could in turn guide fieldwork or conservation efforts.

Illegal Trade and Hunting:

A. Increase Awareness of Protection

Many people are unaware that the species is protected, or are apathetic. Increasing awareness is therefore a priority, though the apparent rapid increase in price for live individuals may continue to drive hunting of the SSR. Ways to increase awareness include flyers, social media, direct communication with local people, and direct communication with officials. Trying to stop trade at the source is integral. It is also possible to target buyers, thus addressing the issue at both ends of the supply chain. Many buyers may not be aware that the species is protected and endemic to Sumatra. The members recommend targeting the Lagomorph Lovers Groups on WhatsApp.

B. Monitor Trade

Members identified the necessity of communicating with organizations like TRAFFIC and MONITOR to ensure that their organizations are aware of the SSR being trafficked, and that there is communication among all stakeholders.

C. Involve Law Enforcement

The members agree that it would be beneficial to meet directly with law enforcement officials to address issues in illegal trade of the SSR. Bus routes from Lampung to North Java are known pathways of illegal trade, so it would be a location to specifically target the involvement of law enforcement. In addition, Dui runs the WCS Wildlife Crime Unit in Lampung, and direct conversations with them would also be beneficial.

D. Confiscated SSRs

Currently, it is likely that any confiscated SSRs are kept in an office and then released soon thereafter, even if these areas are not ideal for release. If injured, the SSRs will be kept and given veterinary care, but usually the priority is to get the species back into the wild as quickly as possible.

We would like to ensure that there is a widely-known protocol for what to do with confiscated individuals. The members suggest creating a confiscation protocol, which details what should happen with individuals that have been confiscated, and who to inform. It would also be good to have some sample collection protocol that is implemented as well, as that would contribute to much-needed ecological information on the species.



E. Captive Breeding

The group feels that captive breeding for the SSR with individuals captured solely for this purpose is not a viable priority at this point. There are complex politics involved, and to designate an official captive breeding effort would be difficult. We suggest that instead any captive breeding efforts might flow best from confiscated individuals that cannot be released and require long-term care.

Lack of Awareness and Education:

A. Communicate with Local Officials

The members believe that we need to communicate directly with local officials, informing them of the threats of illegal trade on the SSR. In addition, it would be beneficial to work with KSDA to set up a protocol for confiscated species, with information on who to contact in the case of a SSR being seized.

It would also be beneficial to make a flyer that can go out to local officials that provides information about the SSR as a means to increase awareness. There is already an existing flyer distributed on other mammals and rare birds, so the SSR could even be included on that. It is especially important to highlight the difference between the SSR and domestic rabbits, to aid enforcement from government officials.

B. Communicate with KSDA

It is important to communicate directly to KSDA (Department of Natural Resources) about the threat of the species with a formal letter of concern from LSG Chair and Co-Chairs of the Striped Rabbit Working Group to document and draw concern to SSR trade.

C. Build Media Awareness

Using social media to broadly highlight the plight of the SSR will be useful. It might be beneficial to make a social media page and website for the Striped Rabbit Working Group.

We should also consider sending a paper to Mongabay and the Guardian to get information on trafficking of the species out into the general media. (Note: This was done at the meeting and an article in Mongabay did result. <https://news.mongabay.com/2020/02/scientists-find-never-before-seen-baby-of-rare-rabbit-on-whatsapp/>).

Deforestation:

Habitat loss, degradation and fragmentation is a massive issue in Sumatra and is closely tied to complex political issues. Although this threat is likely to be significant for SSR, we recognize that our ability to directly address it at this point may be limited.



A. Umbrella Species

We should consider looking for an action plan for other species that might utilize the same habitat. This might be the most effective strategy for including the SSR in deforestation actions that are already in place, and likely to increase in the near future. Perhaps the Sumatran tiger: Save a tiger, save a SSR?

B. Community-Based Conservation

One of the largest drivers of deforestation in Sumatra is the clearing for coffee plantations. The supply chain is vast, and the possibility of getting more money directly to the farmers for their coffee may influence their need to encroach into forested areas. We could also use this idea to encourage maintaining forested patches on the coffee landscape, though without robust ecological information on the SSR, we do not know if the species could utilize these patches.

Population Fragmentation:

A. Collect Genetic Samples

Forests will likely become increasingly fragmented in the future. To assess the impacts of reduced genetic flow between isolated populations, we suggest the development of a protocol to collect and store DNA samples for the SSR.

Conservation Actions for the Annamite Striped Rabbit (*Nesolagus timminsi*):

There are two broad conservation actions for the ASR and they both fit under the IUCN One Plan Approach.

Establish Ex-Situ Population:

An insurance population is urgently needed for the species as populations are likely declining across its range and will continue to do so with the high levels of snaring present across the species range. We recommend that a conservation breeding program is established in Vietnam and if possible this should be integrated into an existing or planned multi-species program rather than establishing a stand alone program. Protocols should also be developed so that ASR confiscated from the wildlife trade can be directed to this program. The long-term goal of the *ex-situ* program should be to secure a healthy population that can eventually be used to re-wild or reinforce support *in-situ* population, providing that the major threats (primarily snaring) have been brought under control.

Protect In-Situ Populations:

The goal in Vietnam and Lao PDR is to eventually identify at least two separate field sites that are effectively protected from snaring and would be adequate sites for future reintroductions. A timeline for this is not predictable, as there is a need for intensive and active law enforcement with



routine and robust threat monitoring, meaning that snaring is recorded at low-levels with scientifically robust methods.

Two sites that members mentioned as priority areas for strengthening *in-situ* protection efforts are Pu Mat NP and contiguous Hue and Quang Nam Saola Nature Reserves. Both of these sites have active law enforcement and long-term commitments from NGOs working there. Furthermore, both have confirmed populations of ASR.

Research to Support Ex-Situ and In-Situ Efforts:

It is important to continue expanding our understanding of the basic ecology of the ASR. The members would particularly like to expand knowledge of the movement ecology and home range of the species. Identifying food habits is also integral, as it may help inform the care of any captive populations, and conversely, the behavior of captive individuals can help to inform knowledge about their wild counterparts.

Population-level genetic studies may have direct implications for the management of an *ex-situ* population. It is possible that there exists considerable genetic differentiation between northern and southern populations. More information is urgently needed.

Action Plan Assignments:

Sumatran Striped Rabbit (Nesolagus netscheri):

Ecological Knowledge:

Grant Writing – Andrew Tilker and Jennifer McCarthy

Camera Trapping – Andrew Tilker, Jennifer McCarthy, Wido Albert, Muhamad Iqbal, and Arum Setiawan

Local Knowledge – Muhammad Iqbal and Arum Setiawan

Researcher Knowledge – Wido Albert and Jennifer McCarthy

Genetic Sampling Protocol – Hoa Nguyen

Camera Trapping Protocol – Andrew Tilker

Awareness and Education:

Social Media – Wido Albert, Muhammad Iqbal and Arum Setiawan

Government Officials – Arum Setiawan

Official Letter of Concern – Jennifer McCarthy and Andrew Tilker

Illegal Trade:

Group Monitoring – Muhammad Iqbal

Protocol for Confiscated Individuals – Jennifer McCarthy, Andrew Tilker, Arum Setiawan

Reach out to WCS WCU – Wido Albert



Annamite Striped Rabbit (Nesolagus timminsi):

Ex-Situ Program:

Establish Network in Vietnam – Andrew Tilker, Hoa Nguyen, Tuan Anh Nguyen

Establish Protocol for Confiscated Individuals - Andrew Tilker, Hoa Nguyen, Tuan Anh Nguyen

In-Situ Program:

Monitor in Potential Sites – Andrew Tilker

Research:

Food Habits Protocol – Hoa Nguyen

Movement Ecology – Hoa Nguyen

Population Genetics – Hoa Nguyen

Meta-Analysis of Data - Andrew Tilker, Hoa Nguyen, Tuan Anh Nguyen

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