



Grant reference number:
RAF20-009

Final report

Organisation name: Zoological Society of London

ASAP species: Botsford's Leaf-litter Frog *Leptobrachella botsfordi* and Sterling's Toothed Toad *Oreolalax sterlingae* Please note that Sterling's Toothed Toad was considered an ASAP species at the time the award was granted; as it has now been reassessed as Endangered and is no longer an ASAP species.

Project title: Gathering the evidence needed to conserve critical habitat for Vietnam's most threatened amphibians

Period of project implementation: 4/2021-8/2022

1. Brief Executive Summary (max. 300 words)

Mount Fansipan is home to Botsford's Leaf-litter Frog and Sterling's Toothed Toad. Both are range restricted and threatened by habitat degradation associated with tourism. During recent surveys, we documented substantial gravel mining on Mount Fansipan. This will remove oviposition sites and impact tadpole survival. To prevent future mining, evidence is needed to demonstrate that mining is detrimental to the two species.

We monitored both species at two sites on Mount Fansipan. One site is heavily impacted by mining (tourism site), the other site is relatively intact forest (non-tourism site). We estimated population sizes using photographic IDs. This assessment is important as population size could show that mining at the tourism site is detrimental to the target species.

Both species were encountered at both sites. The pattern matching software to identify individual frogs underperformed. However, recaptures were identified by reviewing photos by eye. We gathered an important baseline dataset that can be used to estimate population size and population trends going forward. We estimated the population size of two target species in the non-tourism site and we were unable to estimate the population size of one of the two species at the tourism site due to insufficient data (non-detection during several surveys).

We gained new information on the reproductive biology of Botsford's Leaf-litter Frog, recorded their oviposition sites, eggs and nest attendance. We have a greater understanding of the reproductive biology of Sterling's Toothed Toads and breeding seasonality. This information will inform the timings of future monitoring activities and priorities for microhabitat protection.

We strengthened local amphibian conservation and research capacity in Hoang Lien National Park; rangers assisted the team throughout. Results were reported to local stakeholders at a workshop in August 2022. The National Park has committed to improving the management to benefit the two species at the tourism site.

2. Objectives. Please list your project's objectives and report progress against each.

- Objective 1. Photographic library developed for each individual encountered during surveys

Sterling's Toothed Toad: At the tourism site we identified 24 different individual Sterling's Toothed Toads and had 1 recapture over the study period. At the non-tourism site, we identified 94 different individual Sterling's Toothed Toads and had 15 recaptures over the study period.

Botsford's Leaf-litter Frog: At the tourism site we identified 36 different individuals and had two recaptures over the study period. At the non-tourism site, we identified 20 different individual Sterling's Toothed Toads and had no recaptures over the study period.



Figure illustrating the ventral surfaces of Sterling's Toothed Toad (left) and Botsford's Leaf-litter Frog (right)

Summary of survey results below.

In the second survey period we did not observe a single Botsford's Leaf-litter Frog at either of the two sites, this may be due to the fact that it was unseasonably cold. We observed the tadpole of this species at the non-tourism site, this was the first time we have seen the tadpole of this species in April. However, these cool conditions favoured the Sterling's Toothed Toad and we observed 87 individuals of this species at the non-tourism site. The presence of keratinised spines on the chest of many male individuals and that many couples were in amplexus indicate that they were in breeding condition. This is the largest aggregation observed of this species our team has ever observed and this will be really informative when planning future monitoring surveys and for the team to stand the best chance of observing the oviposition sites and reproductive biology of the species.

For the first time, the nests of one target species, *Leptobranchella botsfordi*, has been found. The frogs nest in seepages. Six egg clutches were observed in the first nest, and at least one clutch was observed in the second nest. We also discovered that both male and female frogs attended the nest site and were emitting calls. One of these calls is already described (the male advertisement call). The other call has not been described and the purpose of this call is currently unknown. This finding is extremely significant as the oviposition site seems to be quite specific, and this will need to be considered by protected area managers if there is to be any future infrastructural development within the National Park. These findings have been written up and the manuscript was accepted by the open access journal Herpetology Notes.

Objective 2. Population size of breeding BLLF and STT estimated (Program Mark)

The final analyses of all photos of the two target species from field survey has been completed. The pattern matching software we used to identify individuals was unable to distinguish between individual conspecific frogs and toads despite its use being validated on many other amphibian species (e.g. Caorsi et al. 2012; Bendik et al. 2013). Fortunately, we were able to identify individuals by eye when reviewing the photos.

We estimated the population size following mark-recapture method according to Hoang et al (2008) and modified by Gewiss et al. (2020). However, there was a very large variation in the number of individuals encountered in each field visit and further work should be undertaken to collect additional longitudinal data in order to more robustly estimate adult population size at breeding sites.

Photos of Botsford's Leaf-litter Frog were not good enough to use with the pattern matching software because of the reflection from the flash due to the shagreened texture of the skin (please see Challenges). However, we were able to identify individuals from photos by eye and estimate the adult population of this species during the breeding season at the non- tourism site. The lack of detection of this species at the tourism site during some surveys meant we were unable to estimate population size for at this site.

Bendik, N.F., Morrison, T.A., Gluesenkamp, A.G., Sanders, M.S. & O'Donnell, L.J. (2013). Computer assisted photo identification outperforms visible implant elastomers in an endangered salamander, *Eurycea tonkawae*. PLoS ONE 8:e59424. <https://doi.org/10.1371/journal.pone.0059424>

Caorsi, V.Z., Santos, R.R. & Grant, T. (2012). Clip or snap? An evaluation of toe-clipping and photo-identification methods for identifying individual Southern Redbellied Toads, *Melanophryniscus cambaraensis*. South American Journal of Herpetology 7:79– 84.

Gewiss, L.R., Ngo, H.N., van Schingen-Khan, M., Bernardes, M., Rauhaus, A., Pham, C.T., Nguyen, T.Q. & Ziegler, T. (2020) Population assessment and impact of trade on the Asian Water Dragon (*Physignathus cocincinus* Cuvier, 1829) in Vietnam. Global Ecology and Conservation 23.

Huang, C.M., Yu, H., Wu, Z.J., Li, Y.B., Wei, F.W., Gong, M.H., 2008. Population and conservation strategies for the Chinese crocodile lizard (*Shinisaurus crocodilurus*) in China. Anim. Biodivers. Conserv. 31 (2), 63e70;

Objective 3. Examine population trends at sites and between sites over the study period

The non-detection of some species at some sites during survey periods meant that we were unable assess population trends over time. However, we were able to combine our historic transect data and combine it with the IUCN ASAP funded transect data. We were able to estimate catch per unit effort of both species at both sites over time. However, we urge caution with regard to how these data are interpreted as the IUCN ASAP funded surveys have revealed just how challenging it can be to monitor and detect the target species as their activity periods are dictated by prevailing environmental conditions. More intensive survey effort would be required to gather robust data with which to estimate population trends. Any apparent trends in population size from the data we collected could be spurious as there was a huge variation in the number of individual frogs and toads encountered during the different field expeditions.

Objective 4. Results presented to stakeholders and management of the type locality discussed at a stakeholder meeting

The workshop disseminating the results to stakeholders was successfully held on 30th August 2022. It was named Workshop on The Conservation of Amphibians in Hoang Lien National Park, Period 2021-2022: An update on activities funded by the IUCN SSC Asian Species Action Partnership and determining future actions 2022-2027. The stakeholders included 30 people from the Lao Cai Province Forest Protection Department (FPD) ; Department of Science and Technology in Lao Cai; Department of Agriculture and Rural Development; Hoang Lien NP; Sapa District FPD; Hoang Lien-Van Ban NP (Mr. Ngon-Director); Bat Xat NR (Mr Chung-Director); member from CRCO; Animals Asia; Lao Cai express; Sapa express; Lai Chau provincial and districts FPD.

During the workshop we reported not only on the ASAP -funded work but on the work undertaken from 2017-2022; highlighted the results from the ASAP funded component (2021-2022); we highlighted the differences in population size of the two target frog and toad species at the two different sites (presence and absence of tourist activities) advised that gravel mining should be halted at the tourism site and that at the non-tourism site it be strictly protected.

The Hoang Lien NP and Centre of Tourism agreed with our findings and made a verbal commitment to reduce the gravel mining and protect these important sites. Other attendees suggested more fieldwork



in the Hoang Lien Range focussed on Hoang Lien-Van Ban NR and Bat Xat NR to better understand the amphibian faunas in the rest of the range.

3. Outcomes and impacts.

- a. Please describe how your project contributed to the conservation outcome(s) you included in your application.

The target ASAP species are inherently threatened due to their limited range and available habitat. As result of three separate field expeditions to Mount Fansipan were undertaken between June 2021 and June 2022, all encountered individuals of the two target species were photographed. We successfully estimated the population size of one species (Sterling's Toothed Toad) at both sites (tourism site and non-tourism site) and highlighted the impact of tourist activity to the target species in the workshop with stakeholders at the end of the project. The Hoang Lien NP management board committed to take more action to protect habitat where these frog and toad species occur and the National Park will do more to prohibit littering in stream at the type locality of two target species.

All our research to date has had the support of the National Park and involvement of the National Park staff. Previously the National Park managers have supported our team to address some of the other threats posed to amphibians at this site. The National Park management facilitated litter clearing events at the tourism site and hosted a workshop for local guides and porters where our team highlighted the importance of ensuring that all litter generated by trekking activities is removed from the mountain.



b. How were your project's results or successes measured? Please refer back to section B7 in application.

Objective 1: Photographic library developed for each individual encountered during surveys by end of August 2021.

We successfully conducted three surveys and photographed the ventral surfaces of two target species. During the survey, we also observed for the first-time, the breeding behaviour of one target species, Botsford's Leaf-litter Frog and confirmed the breeding season of Sterling's Toothed Toad the first time.

Objective 2: Population sizes of breeding *Leptobrachella botsfordi* and *Oreolalax sterlingae* estimated by the end of September 2022.

We successfully estimated the population size of one species (Sterling's Toothed Toad).

Objective 3: Examine population trends at sites and between sites over the study period.

We were able to estimate population sizes of breeding adult frogs of both target species at the non-tourism site but we were only able to estimate the population size of breeding adults at the tourism site for one of the target species (Sterling's Toothed Toad). The IUCN ASAP funded surveys have revealed just how challenging it can be to monitor and detect the target species as their activity periods are

dictated by prevailing environmental conditions. Any apparent trends in population size or encounter rates could therefore be spurious and we are therefore unable to assess population trends at either of the two sites.

Objective 4: Results were presented to stakeholders and the appropriate management of the two sites were discussed at a stakeholder meeting.

We have an agreement for the National Park and at a higher level (Lao Cai Province) via the workshop that our results show that the impact of tourism threaten the viability of the target species on the summit area of Mount Fansipan.

4. Please describe any barriers or challenges you had when implementing this project, and if you were able to overcome these, what you did.

All projects experience barriers and challenges during implementation. Sharing these, and how you managed them, can be extremely helpful for others facing similar situations and can allow future conservation interventions for the species in question to be more effective and efficient. Therefore, please be open and transparent and provide as much detail as you can.

The greatest challenge is that photos of one species (Botsford's Leaf-litter Frog) were not suitable for analysis with Wild-ID. We used established methods that were already trialled at ZSL, using a petri dish to restrain the frog for photography. This species is very small in size (around 3 cm in length). In addition, the individuals moved a lot whilst restrained, so we had to use paper towel to prevent them from turning over but the images we obtained were lower in quality than anticipated.

The photos of Sterling's Toothed Toad were also affected by reflection of flashlight. However, thanks to the non-shagreened surface of the skin, the photo quality was less affected by flashlight. Therefore, we were able to use these photos.

We did not have ethical approval to remove frogs from their habitat during nocturnal surveys to photograph them during the day. Doing so would have been detrimental to individuals in this population, especially during the breeding season and was not something we felt would be appropriate to do.

5. Were any components of your project not achieved or not completed? If so, how has this affected the overall impact of the project?

We completed all aspects of this project following the initial four objectives in the project proposal.

We were unable to estimate the population size of Botsford's Leaf-litter Frog at both sites. However, the National Park Management Board are satisfied that the results are compelling enough for them to make a commitment to improving the management of the sites where these frogs are found.

6. What are your next steps or future plans for the ASAP species this project targeted? *For example, include details if the project will be continuing, long-term needs (funding, resources etc.), and whether the right threats were addressed or additional ones have been identified.*

The next important step will be to submit a full report to Hoang Lien National Park and the Lao Cai People's committee. We shall work with the National Park to implement the findings of this report and where needed, attempt to secure funding for them.

In the short term, we will try to estimate the population size of one species, Botsford's Leaf-litter Frog using other methods and we will continue collecting data on this and Sterling's Toothed Toad in June 2023.

In the long-term we will continue to monitor these populations and other threatened amphibians found at these sites.

We are currently completing Green Status assessments for both Botsford's Leaf-litter Frog and Sterling's Toothed Toad to assess the potential for future population recovery.

7. Based on the results of your project, what are your recommendations for conserving your project's focal ASAP species? These may be general or specific, reflecting the insight you gained since submitting your proposal to ASAP: anything which might help others working to conserve the species, or yourself in future, be more effective.

We recommend that gravel mining is prohibited within the protected area. We also recommend that the site not currently impacted by tourism is offered strict protection (no infrastructural development permitted) as it not only important for the two target species but for many other endemic and threatened species on Hoang Lien Range (e.g. the Hoang Lien Horned Frog *Boulenophrys hoanglienensis*, the Fansipan Horned frog *Boulenophrys fansipanensis*, the Giant Spadefoot Toad *Atympanophrys gigantea*).