

Conservation Guidelines for the Paha Frogs from Unchecked Harvest in the Northern Regions of Bhojpur district, Nepal



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Background Information

The need to prepare a conservation guideline document for paha frogs emerge from the unchecked harvesting in the absence of a regulatory mechanism in Nepal. ‘Paha’ is a generic term given for stream-dwelling frogs (represented by the genus *Amolops*, *Nanorana*, and *Ombrana*) in the mountains and has been used as a source of protein and therapeutic purpose by the ethnic communities since long [1–9]. But also seen as a mode of recreation in villages during the collection and its chicken-like taste, paha hunting is a commonplace activity in the hilly regions of Nepal, beyond the neediest resource users. The limitless harvest is a matter of grave concern when amphibians around the world are already hard hit by a multitude of threats (habitat loss, invasive species, disease, pollution, climate change, collection for food, the pet trade and scientific purpose), either individually or acting synergistically [10]. Recent estimates show about half of the amphibian species are on the declining trend, and 40% of them threatened with high risks of extinction [11].

The resource users from the elder segments in almost any mountain communities of Nepal assert that paha populations have declined than the past because of its excessive hunting and puts concern for its survival owing to the high value these frogs have. Such is the case of Bhojpur district, where the northern villages of Sadanandh Municipality and Salpasilicho Rural Municipality communities have long-held utilitarian beliefs about paha frogs. Here we attempt to draft the best conservation guidelines for three paha frogs from unchecked harvest in northern Bhojpur district. The guideline preparation is an important step to lay the groundwork for a co-managed paha conservation and sustainable resource use. The implementation of the action-call will help to understand the strength and weaknesses of the strategy developed to achieve the overarching goal of paha conservation.

Based upon descriptions provided by national and international authors [4, 6, 12–16].

***Amolops marmoratus* (Blyth, 1855)**

English Name: Marbled cascade frog

Nepali Name: Dalle pani (chhange) bhyaguto; Sikre paha

Vernacular Name: *Kirukwa* for male; *Baksalima* for female (Bhojpur, Bantawa Rai)

Distribution (Global): Myanmar, Thailand, India, China, Butan, Nepal, and Bangladesh

Distribution (National): Eastern, Central and Western Nepal between 1,000-1,900 masl (meters above sea level)

Status (IUCN): Least Concern

Population Trend: Decreasing

Identification Features An average-sized frog with maximum body length (SVL) 90 mm (male) and 100 mm (female). Snout acutely rounded; body texture granular and interspersed with olive-green to brown color in adults; the juveniles vary in color with the dorsal side dark brown having sparse yellow tubercles. The tip of the finger and toes exhibit truncated discs; toes with full webbing and legs have distinct dark brown crossbars.

Life History The breeding season is between late spring to summer (May-August) with no available information on egg deposition, clutch size, and tadpole development.

Foraging Insects in general.

Habitat In rapid mountain streams, cascades, and shallow brooks, especially around the rocky surfaces (in crevices) and surrounding vegetation. They are also found near human settlements close to water sources and in agricultural fields (juveniles) during monsoon.



Fig 1. *Amolops marmoratus* (lateral view)

***Nanorana liebigii* (Günther, 1860)**

English Name: Liebig's paa frog

Nepali Name: Man paha

Vernacular Name: *Lakwa* (Bhojpur, Bantawa Rai)

Distribution (Global): India, Nepal, China, and Bhutan

Distribution (National): From East to West of Nepal between 1,500-3,360 masl

Status (IUCN): Least Concern

Population Trend: Decreasing

Identification Features A robust frog with larger body size (largest paha from the mountains) having body length (SVL) between 53.5-123 mm of males and 61.5-117.0 mm of females. Snout obtuse; well-developed supratympanic folds (from the posterior end of the eye to rear arm) but interrupted dorsolateral folds (parallel lines) with rounded tubercles spread across the body, flank, and limbs. Males have hypertrophied arms during the breeding season and appearance of black horny spines in I, II, and III fingers, chest, and underside of arms. The body color is highly variable, but usually all greyish brown, reddish-brown to blackish brown.

Life History Their breeding season starts in early spring to summer (March-July) with an average of 80-140 eggs in a single clutch. The eggs are white, covered in a jelly ball congregating in the shape of a honeycomb but underneath stones immersed in water. Tadpoles share their habitat with the larvae of *Duttaphrynus himalayanus* and, in some cases, found foraging on them.

Foraging Mostly insects (earthworm, beetles, caterpillars, spiders, dragonflies, etc.) and sometimes small rodents.

Habitat Usually mountain streams with covering of moss and ferns on the banks and nestled within oak and coniferous forest. They are found hiding underneath of rocks in deep and shallow pools in the mountain brooks and also seen in agricultural canals.



Fig 2. *Nanorana liebighii* (dorsal view)

***Ombrana sikimensis* (Jerdon, 1870)**

English Name: Sikkim Asian frog

Nepali Name: Rato paha; Khui paha; Sikkme asiali bhyaguto

Vernacular Name: *Kangmak* (Bhojpur, Bantawa Rai)

Distribution (Global): India, Nepal and Bhutan

Distribution (National): Eastern, Central and Western Nepal between 1,200-2,500 masl

Status (IUCN): Least Concern

Population Trend: Decreasing

Identification Features Middle to a large-sized frog with females (60.5-88 mm) generally more massive than their male counterpart (63 mm). Snout rounded; supratympanic folds quite apparent, so as the dorsolateral folds running back to the lower vertebral column, tympanum not visible. The dorsal surface of the body is smooth with periodic tubercles spread across the body, flank, and limbs. Males lack nuptial spines in forearms, fingers, and pectoral regions during the breeding season but have numerous spines above the cloaca. The body color varies from reddish-

brown to dark brown over the dorsal surface, while the ventral section is white to yellowish-white in thigh and legs.

Life History No information.

Foraging Insects in general.

Habitat Normally found in slow-moving shallow mountain streams with rocky substrates. They live in clusters underneath rocks of moderate size. Usually, they prefer high precipitation and moist areas (forest) and also seen in agricultural landscapes.



Fig 3. *Ombrana sikimensis* (dorsal view)

Project Location

The hilly district Bhojpur lies in province 1 of Nepal and situated on the lap of the eastern Himalayas. The upper northern fringe shares its boundary with Makalu Barun National Park (MBNP), which is also a part of The Sacred Himalayan Landscape. Bhojpur extends from the lowest of 153 masl to 4153 masl, having an area of 1522 sq km with geographical coordinates as 26⁰53'N to 27⁰27'N and 86⁰53'E to 87⁰17'E. Bhojpur is a biologically rich district due to the presence of five out of eight climatic zones in Nepal, i.e., lower tropical < 300 masl; upper tropical 300-1000 masl; subtropical 1000-2000 masl; temperate 2000-3000 masl and subalpine 3000-4000 masl. The major rivers in the region include Arun, Sunkoshi, Sikhuwa, Ikhuwa, Pikhuwa, Chirkhuwa, Chhintalung, etc. and the significant ponds/lakes are Salpa Pokhari, Kal Pokhari, Panchakanya Pokhari, and Hans Pokhari. Such a varied geographical and climatic setting has favored optimum habitats for amphibians, specially paha frogs that are adapted to hilly riverine forests and associated riparian habitats. Past records suggest the presence of 15 amphibians from the district.

Our project location is on the northern segments of Bhojpur district, mainly the rural villages of Kulunga, Dobhane, Khatamma, and Chaukidada from Salpasilicho Rural Municipality and Nepaledada, Keurepani, Mulpani and Tungechha of Sadanandh Municipality (Fig 4). The major ethnic groups in Bhojpur district are Kirats (37.45%), Chhetri (20.39%), Tamang (8.67%), Newar (7.66%), Brahmin (5.73%), Gurung, etc. The natural resources here are protected under the legislation of District Forest Office, Bhojpur.

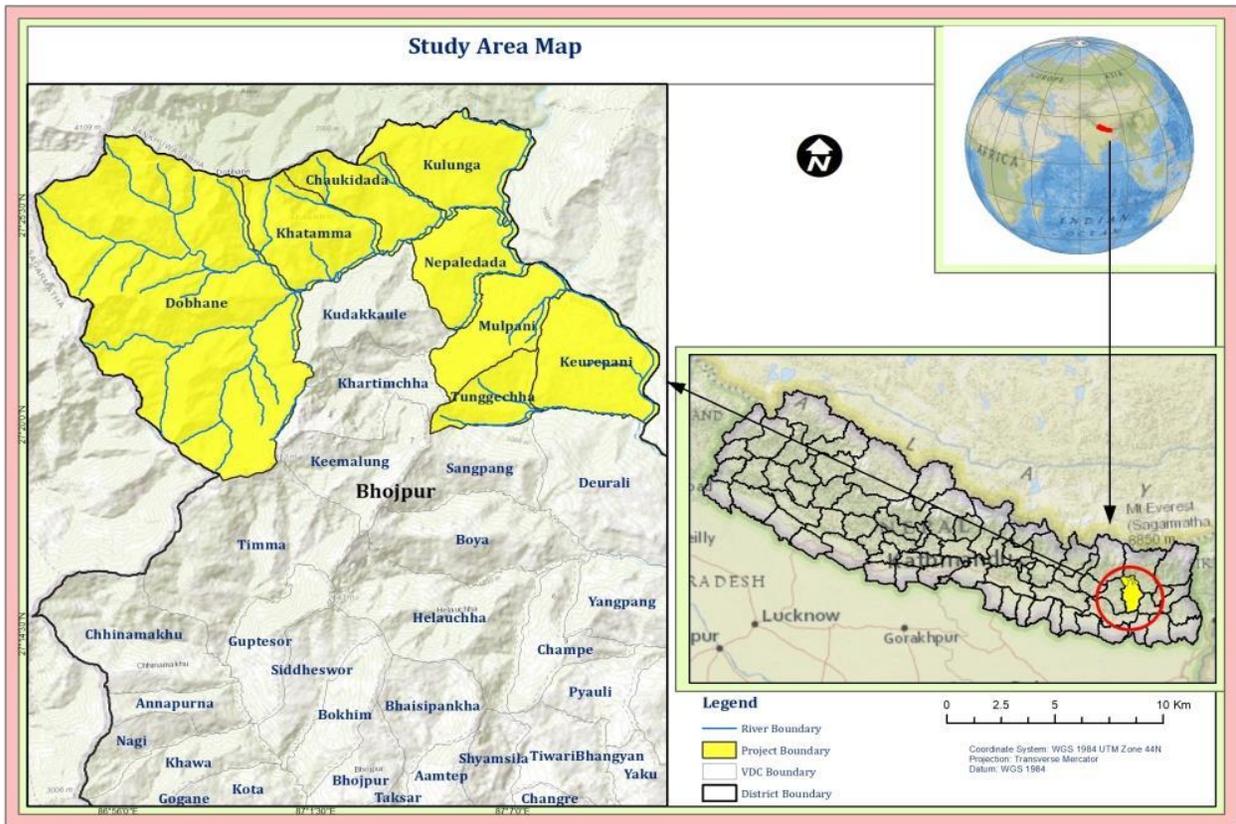


Fig 4. Bhojpur district with the project locations (highlighted in yellow)

Questionnaire Survey

We interviewed 240 people from eight villages (30 respondents per community) in northern Bhojpur district between mid-June and the first week of July in 2018 for paha harvest information in the region. The primary purpose of collection is for food and followed by medicinal use, specially *Amolops marmoratus*, *Nanorana liebigii*, and *Ombrana sikimensis* (Fig 5). Mainly school children and young-aged males constitute the hunters' group, and surprisingly we noticed female members participating in paha collection. During our survey, we came across six hunter groups in the area.

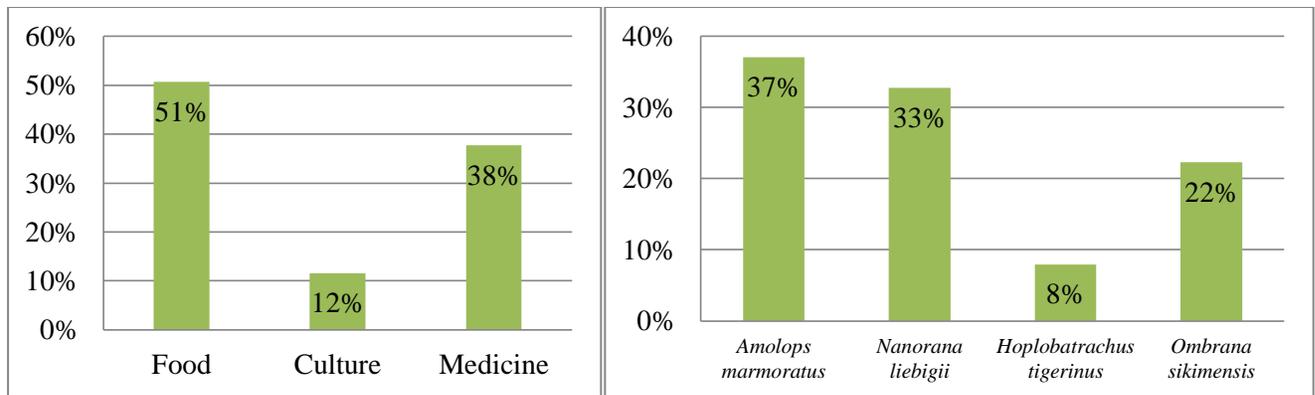


Fig. 5 Percentage share of response about paha use and species involved

Amolops marmoratus is mostly hunted in Nepaledada, Kulunga and Chaukidada villages whereas, *Nanorana liebigii* and *Ombrana sikimensis* are preferred for collection in Tungechha and Dobhane villages. There is a strong belief among the local people regarding paha use on specific days, as they said *Nanorana liebigii* killed on Tuesday bears magical medicinal value, and the paste prepared from the body can cure cuts and wounds (Fig 6). While the same species captured on other days serve as food (delicacy).



Fig. 6 Scar left (circled black) after treating with paste prepared from dried *Nanorana liebigii* (right)

We learned that local people start to look for paha frogs in the stream from mid-February until September every year. Generally, people collect between the categories of 1-50 to 51-100 frogs in each take. The collection is mainly for subsistence as people hardly make a living out of it. In an attempt to gather threats information, the majority of the people ranked excessive collection being the primary threat to the frogs. Other overarching threats people included were flood, landslide, and climate change (Fig 7).

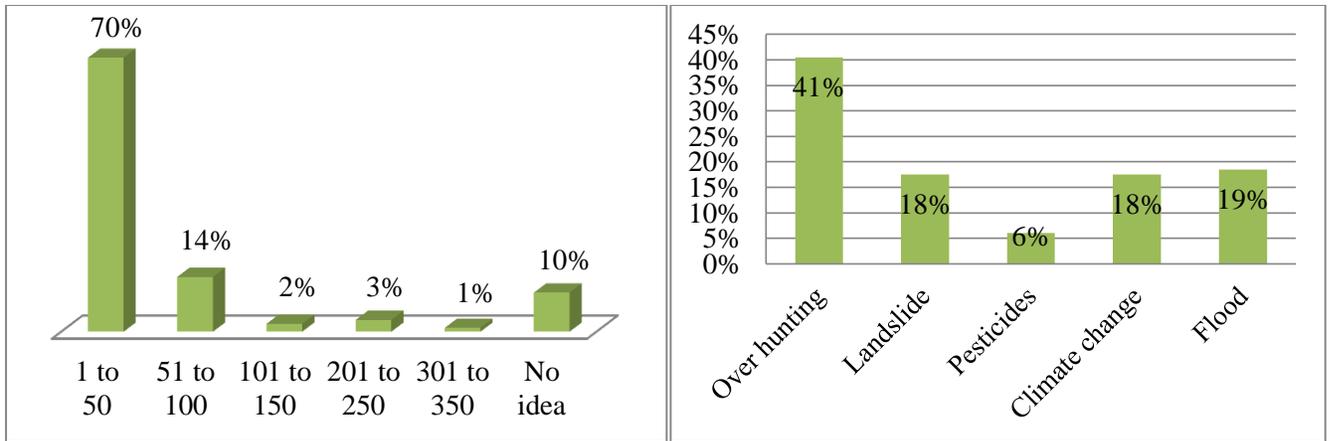


Fig. 7 Percentage share of response about paha quantities collected and threats

About half of the respondents voted that paha population is declining in comparison to the previous decade and express their concern for protection. People assert about controlling the excess collection of paha from streams through awareness, introducing regulations, and preservation of the water bodies (Fig 8).

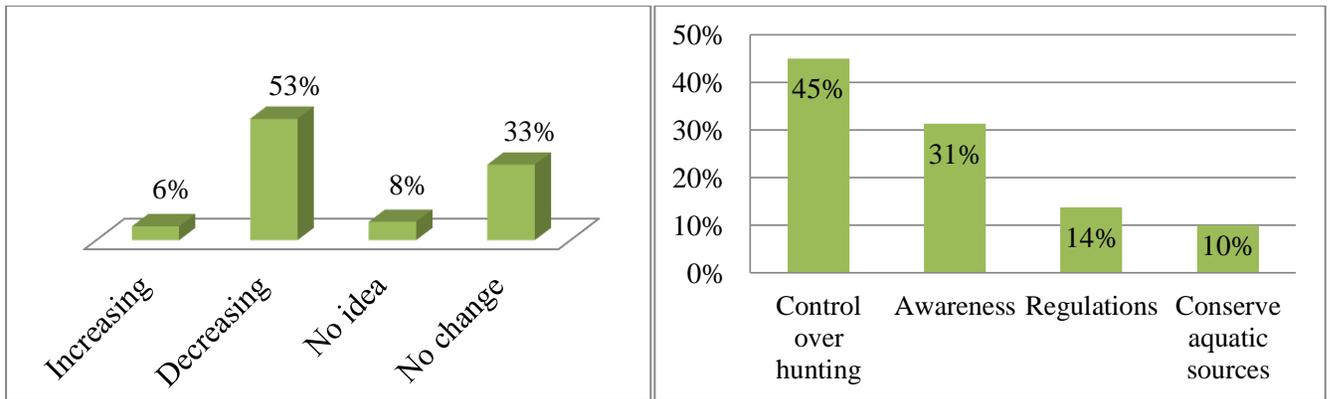


Fig. 8 Percentage share of response about the current paha population and measures of protection

Community Outreach Activities

Community-based conservation is the primary key in Nepal for resource use and management, which has been exemplary to the whole world. For example, conserving forests through community forestry and conservation of charismatic megafauna such as tiger, rhino etc. So why not take a similar approach even in the case of paha conservation when people are the resource users? We designed outreach programs and tools targeted to educate people about paha conservation from all segments of the community. The project team developed paha

conservation poster titled ‘Protect the Overly-harvested Paha from Extinction!’ and booklet ‘Amphibian Conservation: Brief Introduction in the context of Nepal’ to educate people from the project villages (Fig 9).



Fig. 9 Conservation materials developed during the project

In the first field visit (June-July 2018), we carried out amphibian conservation workshops at six schools in Kulunga, Keurepani, Mulpani, Tungechha, and Nepaledada. Besides amphibians’ importance and their conservation, we also discussed the distribution of amphibians in their locality. Similarly, four community workshops/discussions were held in Nepaledada, Mulpani, Kulunga and Dobhane to know the people’s perception of amphibians and paha hunting scenario. Based on our first fieldwork, we understood that the paha hunting pressure was mostly in Dobhane and at Chaukidada villages, then we strategized paha awareness activities via community and school workshops in those villages (Fig 10).



Fig. 10 Community outreach activities

Call to Action

Priority	Goal	Activities	Indicators
Urgent	Gain legal measure to regulate the unsustainable hunting of <i>A. formosus</i> , <i>N. liebigii</i> and <i>O. sikimensis</i> in northern villages of Bhojpur district	<p>Work with local authorities such as district forest office and sub-division offices, municipality office (urban/rural) and local communities in a co-managed approach to draft paha conservation regulation in Salpasilicho Rural Municipality and Sadanandh Municipality that provides;</p> <ul style="list-style-type: none"> i. controlled harvest ii. restriction on destructive collection practice such as <ul style="list-style-type: none"> a. pre-breeding season collection b. flipping big rocks in the stream that increases the instability of rocks 	<p>Paha harvest regulation established (drafted, revised, agreed by local communities and approved by the local authorities) and publicized</p> <p>Catch limits established per effort/people/season</p> <p>Enacted closed (pre-breeding) and open season (post-breeding) of collection</p> <p>Fines imposed to violators</p>
Short-term	Improve the existing information of <i>A. formosus</i> , <i>N. liebigii</i> , and <i>O. sikimensis</i> by encouraging research that aid in effective conservation interventions	<p>Fill data gaps on the biology of species, for example, egg deposition, clutch size, breeding season, metamorphosis duration, tadpoles information, success rate, etc.</p> <p>Survey all the potential sites of <i>A. formosus</i>, <i>N. liebigii</i>, and <i>O. sikimensis</i> to identify priority habitats for conservation</p> <p>Document habitat characteristics; such as water parameters (pH, DO, conductivity, temperature, etc.), altitudinal range and surrounding vegetation</p> <p>Determine population size of <i>A. formosus</i>, <i>N. liebigii</i>, and <i>O. sikimensis</i> (capture-mark-recapture surveys)</p>	<p>Life history data of <i>A. formosus</i>, <i>N. liebigii</i>, and <i>O. sikimensis</i> available</p> <p>Potential sites for paha conservation located</p> <p>Habitat conditions, surrounding vegetation, and altitudinal distribution known</p> <p>Population size and trend estimated</p>

		Determine the status of population trend from people's perception and experience	
Short-term	Develop and implement community outreach programs that influence normative changes	<p>Identify key audiences to design activities, tools and launch educational campaigns</p> <p>Design and distribute educational materials to the public such as booklet, brochure, and posters in the Nepali language for paha conservation</p> <p>Organize amphibian educational campaigns/open forums that focus on the impacts of over-harvest to the environment. For example, celebrating the annual Save The Frogs Day</p> <p>Involve and empower local communities through training/workshop and help to set up clear environmental goals</p>	<p>Resources utilized (educational materials)</p> <p>Increased understanding of the local community about paha conservation</p> <p>Adopting eco-actions such as embracing 3Rs practice, clean up in streams, etc.</p>
Long-term	Review the existing regulations to identify emerging challenges and incorporate lessons learned to meet the overarching goal of paha conservation	<p>Define parameters to monitor and evaluate management efforts within the community</p> <p>Do follow ups through consultation with the local authorities</p> <p>Identify new challenges or problems in the management efforts or resource use</p> <p>Incorporate new changes or lessons learned from the past in the existing regulations and get it approved</p>	<p>Increased participation of the stakeholders in management decisions</p> <p>Sense of ownership toward paha conservation</p> <p>Better coordination between local communities and local authorities</p> <p>Proper enforcement of the paha conservation regulation</p>

'Urgent' refers to 6-12 months, 'Short-term' refers to 1-3 years, and 'Long-term' refers to above 3 years

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