

# Survey and monitoring of salamander populations in the Darjeeling Himalaya of northern West Bengal

## Abstract

The Himalayan Salamander is the only species of salamander found in the Darjeeling Himalayas of northern West Bengal and is protected under Schedule II of the Indian Wildlife (Protection) Act, 1972. Even the distribution of the species is not clearly known due to lack of proper surveys. We conducted a status survey of this species during the monsoon seasons of 2005-2007 and located it in 21 small and medium-sized wetlands in the Darjeeling hills and tried to estimate its breeding population in them. We also tried to determine the possible causes of its rapid decline to help in formulating a conservation action plan for the species in future.

## Introduction

The Himalayan Salamander *Tylotriton himalayanus* (Khatiwada et al. 2015) is the only species of salamander (Amphibia: Urodela: Pleurodelidae) that is found in the Darjeeling Himalayas of northern West Bengal. It is a unique and rare tailed amphibian that is protected under Schedule II part II of the Indian Wildlife (Protection) Act, 1972. It is a bioindicator species of the lentic habitats in the eastern Himalayas. It occurs between the altitudes of 1330-2220 meters in the Shiwalik, Mahabharat and Chulachuli hills of eastern Nepal, Darjeeling district of northern West Bengal and in Bhutan. It inhabits the cloud forests and cool mountain lakes and temporary as well as permanent pools in the eastern Himalayas. However, wherever it is found, it is threatened and its future is uncertain.

The genus *Tylotriton* is presently known by 21 species but the distribution of the Himalayan Salamander is poorly known. Thomas Nelson Annandale (1907-1908), J.C. Daniel (1962) and S.K. Chaudhuri (1966)

were among the first to report the presence of the Himalayan Salamander in the Darjeeling hills of northern West Bengal. P.W. Soman (1966) and Shrestha (1984) noted its distribution in eastern Nepal. Palden (2003) confirmed its presence in Bhutan. The first survey on the species in the Darjeeling hills was conducted by Ritwik Dasgupta during 1983-1988 and he reported the species from 10 sites (Dasgupta, 1990). The second survey was conducted by Daniele Seglie and he reported the species from 16 sites in the Darjeeling hills (Seglie et al. 2003).

## Key words:

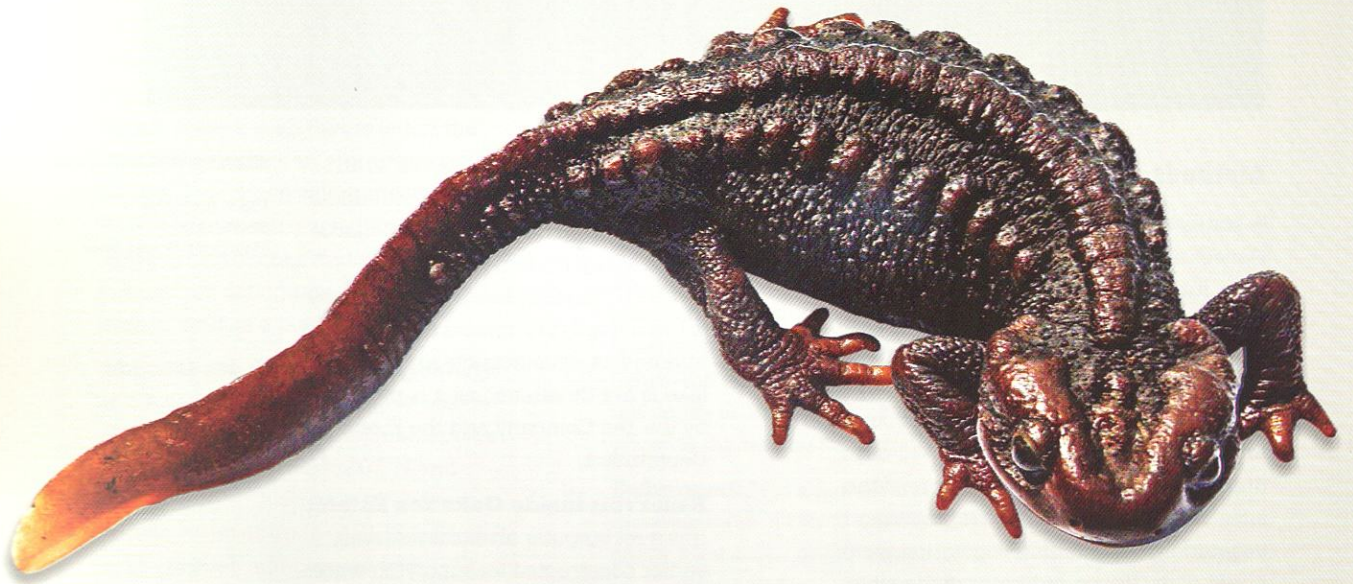
*Amphibia*,  
*bioindicator*,  
*Himalayan Salamander*,  
*sites*, *status survey*, *Urodela*.

*Tylotriton verrucosus*, Manipur.  
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## Kaushik Deuti

Herpetology Division,  
Zoological Survey of India,  
27 JL Nehru Road, Kolkata: 700016

Corresponding Author e-mail: [kaushikdeuti@gmail.com](mailto:kaushikdeuti@gmail.com)





## Methods

A status survey was conducted by us in the Darjeeling hills of northern West Bengal from June 2005 – July 2007 during the monsoons. The specific small and medium-sized ponds (locally called “pokhries”) which serve as breeding sites for the Himalayan Salamander were visited during six surveys to the area each consisting of 10-15 days duration. The physical parameters of the sites like area, depth, altitude, covering vegetation, surrounding vegetation were noted. The GPS co-ordinates of the sites were also taken. The number of salamanders breeding at each site was also counted.

## Results

Our survey revealed the presence of the Himalayan Salamander in 21 wetland sites in the Darjeeling hills of northern West Bengal. All of these sites are located in the Darjeeling and Kurseong sub-divisions of Darjeeling district. Although we visited the Kalimpong sub-division also several times, we did not locate any Salamander populations there. The sites where we located the Himalayan Salamander are described below:

1. **Lake inside Margaret Hope Tea Estate:** It is an oval-shaped mountain lake ( $26^{\circ}56'58''\text{N}$  and  $88^{\circ}16'58''\text{E}$ ) with

an area of 3200 square meters at an altitude of 1600 meters. It is situated 2 km down from Gorabari (near Sonada) inside Margaret Hope Tea Estate owned by the Goodricke Tea Company. It has a depth of 2 meters and a few hundred salamanders breed here. The lake is not threatened as it is protected by the Tea Company and the Forest Department.

2. **Reservoir inside Oaks Tea Estate:** It is a rectangular artificial reservoir, earlier constructed for supplying water to the tea estate ( $26^{\circ}56'89''\text{N}$  and  $88^{\circ}15'19''\text{E}$ ) with an area of 760 square meters at an altitude of 1560 meters. It is situated 5 km down from Sonada, near Pacheng town, inside Oaks Tea Estate. It has a depth of 1 meter and a few dozen salamanders breed here. However, it is highly threatened by pollution from agricultural pesticides used by the Tea Estate.
3. **Pacheng:** It is a natural marsh but now drying up ( $26^{\circ}57'08''\text{N}$  and  $88^{\circ}15'87''\text{E}$ ) with an area of 1540 square meters, at an altitude of 1640 meters. It is situated 4 km down from Sonada beside Pacheng town, the area locally called Pokhri lane. A few scores of salamanders breed in the drains of local houses and maize fields as the

Eggs of *Tylotriton himalayanus*.  
Photo Credit: M. Firoz Ahmed

site is threatened by drainage for agriculture and housing.

4. **Reservoir beside Shanti Rani High School (Pacheng):** It is a rectangular artificial reservoir made for storing water (26°59'91"N and 88°15'62"E) with an area of 352 square meters, at an altitude of 1690 meters. It is situated 4 km down from Sonada, beside Shanti Rani High School at Pacheng. A few scores of salamanders breed here but the reservoir is threatened by drainage.
5. **Pool at Maneybhanjang:** This was once a huge marshland which was reclaimed for making the football ground of the High School at Maneybhanjang town (26°59'29"N and 88°07'34"E). The small pool with an area of 10 square meters and the adjoining remnant marshland of 450 square meters is all that is left of the original habitat at an altitude of 1934 meters. Few dozen salamanders breed in this pool which is used for washing utensils and clothes and so gets polluted by detergents. The marshy area is used as a public urinal.
6. **Majhidhura (Near Sukhiapokhri):** It is a natural marshy meadow beside the football ground of the Sukhiapokhri Boys High School (26°52'07"N and 88°15'72"E) with an area of 750 square meters, at an altitude of 2148 meters. It is 25 cm deep and covered with Polygonum herbs. A couple of dozen salamanders breed here but the marshland is threatened by drying (in Gorkha language, Sukhia means drying and pokhri means pond).
7. **Dungdungia (near Sukhiapokhri):** It is a natural marshy place at the top of a hill, 2 km from Sukhiapokhri town near the petrol pump (26°52'12"N and 88°15'73"E) with an area of 600 square meters, at an altitude of 2227 meters. It is 20 cm deep and surrounded by Cryptomeria trees. About a dozen salamanders breed here.
8. **Jorepokhri:** Once two large natural ponds on the top of the Jorepokhri hill (in Gorkha language, Jorepokhri means joined pokhrisor ponds) surrounded by Cryptomeria trees (27°02'40"N and



88°15'18"E). The site was declared as India's only Salamander Sanctuary in 1985 by the West Bengal Forest Department. However, the banks of the ponds were cemented and a recreational park build all around which encloses a Tourist Lodge built by the Darjeeling Gorkha Hill Council. Nowadays, salamanders are found in the hill-side forests but cannot breed in Jorepokhri as the breeding habitat has been totally destroyed by artificial construction, release of ornamental fishes and swans in the ponds. One of the ponds is also used for supply of water to the nearby Sukhiapokhri town.

9. **Debrapani:** It is a big natural marshland (26°57'65"N and 88°10'01"E) about 8 km down from Sukhiapokhri towards Pokhriabong. It is almost square-shaped with an area of 2500 square meters, with a depth of 50 cm and covered by grasses and bushes. Situated at an altitude of 1874 meters, a few scores of salamanders breed there. The marsh is not threatened as it is considered as a sacred place by the local people.
10. **Satdobate:** A big natural marshy land (26°57'21"N and 88°10'12"E) and a sacred place for local people on the road from Sukhiapokhri towards Pokhriabong. Area is about 1300 square meters, at an altitude of 1828 meters. A few scores of salamanders were found and they were breeding there too.
11. **Simana:** A small pool (26°55'21"N and 88°08'31"E) beside a permanent stream between Simana and Fatak, surrounded

*Tylotriton himalayanus*  
Photo credit: Shruti Sengupta

by bushes and grasses. This site is just beside the border road with Nepal and less than a dozen salamanders were seen here.

12. **Solimore:** A natural pool ( $26^{\circ}55'10''\text{N}$  and  $88^{\circ}08'21''\text{E}$ ) between Fatak and Seeyok surrounded by grasses and herbs. Less than 10 salamanders were found to breed in this pool near the Nepal border.
13. **Seeyok:** It is a circular temporary marsh ( $26^{\circ}55'59''\text{N}$  and  $88^{\circ}08'48''\text{E}$ ) with an area of 112 square meters, at an altitude of 2057 meters. Situated 1 km from Seeyok on the roadside between Sukhiapokhri and Mirik, just opposite to the DGHC view point, near to the border with Nepal. It is 15 cm deep and covered by *Polygonum* herbs. About half a dozen salamanders breed here but the site is threatened by drying.
14. **Nakhapani Lake (inside Gopal Dhara Tea Estate):** It is a natural lake ( $26^{\circ}55'06''\text{N}$  and  $88^{\circ}08'93''\text{E}$ ) about 2 km from Seeyok, beside the road between Seeyok and Mirik inside Gopal Dhara Tea Estate. Situated an altitude of 1728 meters, it has an area of 200 square meters, a depth of 60 cm and is partly covered by *Polygonum* herbs. A few scores of salamanders are found here but the lake is dirty. Local people do not drink the water (in Gorkha language, Na = No, kha = to drink, pani = water).
15. **Ninth Mile – Upper Pond:** It is a circular natural pond at Ninth Mile ( $26^{\circ}54'21''\text{N}$  and  $88^{\circ}09'34''\text{E}$ ) about 6 km from Mirik, between Seeyok and Mirik. Situated at an altitude of 1614 meters, it has an area of 88 square meters and a depth of 1 meter. About a dozen salamanders breed here but their eggs and larvae are threatened by release of exotic fishes (carps).
16. **Ninth Mile – Lower Ponds:** These are two natural ponds about 1 km from Ninth Mile ( $26^{\circ}54'32''\text{N}$  and  $88^{\circ}09'50''\text{E}$ ) and about 5 km from Mirik. Situated at an altitude of 1584 meters, they have areas of 78 and 134 square meters and a depth of about 50 cm. About a dozen salamanders breed here but their eggs and larvae are threatened by release of exotic fishes (carps) in these ponds.
17. **Mirik:** The Social Forestry Wing of the West Bengal Forest Department has dug about 20 small artificial pools (each about 2 square meters) at Mirik

A typical Himalayan Salamander habitat in Darjeeling, West Bengal  
Photo credit: Abhijit Das



(26°53'14"N and 88°11'23"E) for breeding salamanders at an altitude of 1608 meters. About a hundred salamanders are successfully breeding in them.

18. **Raidhap area above Mirik:** A few dozen salamanders are also found in two small rock pools beside a hill-stream and some rain puddles in the football ground in the Raidhap area above Mirik at an altitude of 1644 meters.
19. **Pokhritar (at Bagora hill):** An oval-shaped natural pond at Pokhritar village (26°58'28"N and 88°07'42"E) with an area of 1750 square meters and a depth of 1.4 meters. Situated 3 km from Bagora at an altitude of 1854 meters, a few scores of salamanders are found here although the lake is threatened by dumping of organic wastes by the villagers.
20. **Chemeli:** A marshy area (26°57'16"N and 88°07'94"E) beside Chemeli village about 7 km from Bagora between Bagora and Dow Hill of Kurseong. It has an area of about 900 square meters at an altitude of 1789 meters. A few dozen salamanders breed at this site.
21. **Namthing Pokhri (near Latpancher):** It is a big oval-shaped natural lake (26°55'81"N and 88°23'98"E) at an altitude of 1437 meters, situated about 5 km from Latpancher. It has an area of 5250 square meters and a depth of 2 meters with a few emergent reeds. A few hundred salamanders breed here as the lake is fenced and hence protected.

## Discussion

The Status Survey conducted over three monsoon seasons from 2005-2007 including six visits of 10-15 days duration each, revealed breeding populations of the Himalayan Salamander in a total of 21 breeding sites (small or medium-sized pools, ponds and lakes) in the Darjeeling and Kurseong sub-divisions of Darjeeling district of northern West Bengal State, India. Even small waterbodies with only 15-20 cm of standing water can allow the adults to breed and deposit their eggs preferably on

submerged or emergent vegetation like *Polygonum* spp. Today, due to ever increasing human population, accelerated by the burgeoning tea and tourism industry, all flatlands in the Darjeeling hills are being used for housing and building tourism complexes. The slopes are being converted to huge tea estates. As a result many of the breeding pools have dried up and eggs and tadpoles are stranded during the dry season. It is appalling to see the rapid environmental degradation of hilly areas which were once lush green. Salamanders appear to be sensitive to such human disturbance of their habitat. They do not survive in areas where there has been considerable alteration of habitat due to deforestation and implementation of various developmental projects such as construction of motorable roads. Detergents and agricultural pesticides washed down into the water bodies from the tea gardens by rain causes considerable mortality of developing eggs and larvae. All stages of the life cycle are vulnerable to water pollution because most spend at least part of their lives in water. Many of the smaller water bodies are being used as garbage dumps and public urinals thus totally destroying them as breeding sites for salamanders. Many salamanders also breed in small rock pools that result from spring rains and melting snow. Such pools tend to be especially acidic because humic acid accumulates over winter with each snowfall. A serious threat is the introduction of carps and other exotic freshwater fishes in some ponds which are potential predators of salamander eggs and larvae. Although insignificant when compared to habitat destruction and pollution, exploitation for folk medicine is another threat. The dried and smoked salamander is used as an alleged cure for gastric ailments.

The Himalayan Salamander is rapidly declining in the Darjeeling hills and the future of the species is uncertain as there is no ecological stability. Water bodies which are vital breeding sites for the salamanders should not be drained or filled up. Strong legislation in support of this should be developed. Smaller water bodies should not be used as garbage dumps or public urinals! At certain places, small pools (5 m X 5 m X 1 m) should be dug which can act as

breeding pools for the salamanders. These should have sloping sides, not steep walls. Deforestation of the watershed areas of natural ponds and lakes should be actively prevented. The use of agricultural pesticides in the tea gardens and detergents in households in the hills should be reduced. Carps and other exotic freshwater fishes should not be released into any lakes and ponds between the altitudes of 1300-2200 meters as they destroy salamander eggs and larvae. Developmental projects in the vicinity of such natural wetlands should be stopped immediately. Certain forested areas and wetlands known to support salamander populations need to be specified as sanctuaries. Such wetlands in forested areas and the other important breeding sites mentioned above in this paper, should be fenced and protected as these are the last breeding sites for salamanders in those areas in the Darjeeling Himalaya.

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Sub-tropical forest beyond  
1000m elevation are habitats for  
Himalayan Salamander



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