NATIONAL MISSION FOR SUSTAINING THE HIMALAYAN ECOSYSTEM (NMSHE)

WILDLIFE WATCH

IN THE INDIAN HIMALAYAN REGION

2017-2018

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Wildlife Institute of India

SERIES IV

WILDLIFE WATCH

IN THE INDIAN HIMALAYAN REGION

Shashank Arya

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SPECIES WISE CITATIONS

Mammals

Pal, R., Bhattacharya, T., Sathyakumar, S., 2018. Himalayan Brown bear, *Ursus arctos isabellinus*. pp.1 In: Sathyakumar, S., Mathur, V. B. (eds)2018. Wildlife Watch Series IV, A user guide for monitoring wildlife species in the Indian Himalayan region. Wildlife Institute of India, Dehradun, 62 p.

Pal, R., Bhattacharya, T., Sathyakumar, S., 2018. Himalayan mouse hare (Royle's Pika),*Ochotona roylei*. pp.5 In: Sathyakumar, S., Mathur, V. B. (eds) 2018. Wildlife Watch Series IV, A user guide for monitoring wildlife species in the Indian Himalayan region. Wildlife Institute of India, Dehradun, 62 p.

Birds

Bhattacharya, T., Ramesh, K., Singh, P., 2018. Grandala. *Grandala* spp. pp.9 In: Sathyakumar, S., Mathur, V. B. (eds) 2018. Wildlife Watch Series IV, A user guide for monitoring wildlife species in the Indian Himalayan region. Wildlife Institute of India, Dehradun, 62 p.

Bhattacharya, T., Ramesh, K. Singh, P., 2018. Ibisbill. *Ibiborhyncha struthersii*..pp.13 In: Sathyakumar, S., Mathur, V. B. (eds) 2018. Wildlife Watch Series IV, A user guide for monitoring wildlife species in the Indian Himalayan region. Wildlife Institute of India, Dehradun, 62 p.

Herpetofauna

Patel, N., Das, A., 2018. Himalayan blotched pit viper. *Protobothrops himalayanus*. pp.17 In: Sathyakumar, S., Mathur, V. B. (eds) 2018. Wildlife Watch Series IV, A user guide for monitoring wildlife species in the Indian Himalayan region. Wildlife Institute of India, Dehradun, 62 p.

Patel, N., Das, A., 2018. *Amolops himalayanus*. pp.21 In: Sathyakumar, S., Mathur, V. B. (eds) 2018. Wildlife Watch Series IV, A user guide for monitoring wildlife species in the Indian Himalayan region. Wildlife Institute of India, Dehradun,62 p.

Fish

Sharma, A., Dubey, V. K., Johnson, J. A., Sivakumar, K., 2018. Stone Loach. *Schistura rupecula*. pp.25 In: Sathyakumar, S., Mathur, V. B. (eds) 2018. Wildlife Watch Series IV, A user guide for monitoring wildlife species in the Indian Himalayan region. Wildlife Institute of India, Dehradun, 62 p.

WILDLIFE WATCH
IN THE INDIAN HIMALAYAN REGION

Series IV

S. Sathyakumar
& V.B. Mathur
Editors

Sharma, A., Dubey, V. K., Johnson, J. A., Sivakumar, K., 2018. Gangetic Mystus. *Mystus cavasius*. pp.29 In: Sathyakumar, S., Mathur, V. B. (eds) 2018. Wildlife Watch Series IV, A user guide for monitoring wildlife species in the Indian Himalayan region. Wildlife Institute of India, Dehradun, 62 p.

Entomofauna

Das, S., Uniyal, V. P., 2018. Red Veined Darter. *Sympetrum fonscolombii*. pp.33 In: Sathyakumar, S., Mathur, V. B. (eds) 2018. Wildlife Watch Series IV, A user guide for monitoring wildlife species in the Indian Himalayan region. Wildlife Institute of India, Dehradun, 62 p.

Singh, A. P., Uniyal, V. P., 2018. Tiger Beetle. *Calomerachloris*.pp.37 In: Sathyakumar, S., Mathur, V. B. (eds) 2018. Wildlife Watch Series IV, A user guide for monitoring wildlife species in the Indian Himalayan region. Wildlife Institute of India, Dehradun, 62 p.

Flora

Rai, I.D., Rawat, G. S., 2018. Himalayan Fir. *Abiesspectabilis*. pp.41 In: Sathyakumar, S., Mathur, V. B. (eds) 2018. Wildlife Watch Series IV, A user guide for monitoring wildlife species in the Indian Himalayan region. Wildlife Institute of India, Dehradun,62 p.

Rai, I.D., Rawat, G. S., 2018. Himalayan Yew. *Taxus wallichiana*. pp.45 In: Sathyakumar, S., Mathur, V. B. (eds) 2018. Wildlife Watch Series IV, A user guide for monitoring wildlife species in the Indian Himalayan region. Wildlife Institute of India, Dehradun,62 p.

Rai, I.D., Rawat, G. S., 2018. Sikkim Rhubarb. *Rheum nobile* pp.49 In: Sathyakumar, S., Mathur, V. B. (eds) 2018. Wildlife Watch Series IV, A user guide for monitoring wildlife species in the Indian Himalayan region. Wildlife Institute of India, Dehradun, 62 p.

Ms. Ankita Sinha is thanked for her contribution on Ibisbill. Mr. Nilanjan Chatterjee, Dr. Tawqir Bashir, and Dr. Kamal Poudyal are thanked for providing species and habitat photographs of Ibisbill, Grandala, and Sikkim Rhubarb respectively.

Naitik G. Patal

Preface

The Indian Himalayan Region (IHR) is one of the rich biodiversity regions of the world with over 10,000 plants, 420 mammals, 900 birds, 250 herpetofauna, 250 fishes, several species of invertebrates and micro-organisms, many of which have global conservation significance. Despite its significant ecological, hydrological and biological values, the fragile mountain ecosystems in the IHR are seriously threatened due to increasing anthropogenic pressures mainly development. In the IHR, wildlife species are threatened due to poaching for meat, illegal wildlife trade, human-wildlife conflicts, habitat loss, habitat fragmentation and degradation due to developmental activities and natural resource use by humans. These have led to decline in wildlife populations, reduction in distribution range and in some cases, local extinction of species.

Climate change/climate variability is the recent threat to wildlife and their habitats in the IHR. The effects of climate change are pronounced in places such as the Himalaya where the network of snow-clad mountains, ice-peaks, high intensity drainage and precipitation characterises the bio-social landscape. Evidence suggests that responses of species to impacts of climate change are inter-alia manifested in changes in phenology, earlier onset of spring, migration, changes in behaviour or activity patterns, and lengthening of growing seasons. Therefore, it is very appropriate that scientific investigations are carried out to assess impacts of climate change/climate variability on wildlife species and their habitats in order to formulate and apply directed management strategies for long-term conservation in the IHR.

Under the Government of India's 'National Mission for Sustaining the Himalayan Ecosystem (NMSHE)', the Department of Science and Technology (DST) has identified the Wildlife Institute of India (WII) for coordination of the Task Force on Micro Flora & Fauna, and Wildlife and Animal Populations. The thematic areas identified under the research project are (A) Terrestrial Ecosystem, (B) Aquatic Ecoystem, (C) Human Ecology, and (D) Spatial Ecology; and include assessments of (a) animal species/communities diversity, distribution, abundance; (b) wildlife habitats, ecosystems, and ecosystem services; (c) anthropogenic and climate change impacts

on wildlife and ecosystems through scenario building and visualization; (d) vulnerability of species/habitats to climate change; and (e) prioritization of species/taxa and sites for monitoring.

In order to sensitize all stakeholders on the importance of monitoring selected endangered or indicator wildlife species in the IHR, this publication 'Wildlife Watch in the Indian Himalayan Region' - A User Guide for Monitoring Wildlife Species in IHR has been conceptualized and developed. This is the forth publication in this series. The selection of species for 'Wildlife Watch' is based on evaluation and scoring of criteria such as (a) the status (endangered/threatened) based on IUCN and Indian Wildlife (Protection) Act, 1972 (b) functional role (apex predator/ key stone species), (c) values (charismatic, cultural, umbrella/flagship species), (d) detectability in the wild, (e) sensitivity to climate change or climate variability, and (f) invasive species as negative indicators.

Using the above criteria, we have selected 13 species for Series IV; two species each representing mammals, birds, herpetofauna, fishes, invertebrates and three species for flora. We have plan to bring out the Wildlife Watch for the next year with another Series dealing with 12 to 15 species representing the various faunal/floral groups.

For every species, we have presented information on their taxonomic status, local/vernacular names, their physical attributes, elevation range, habitats they occur, some key field identification features, the probable distribution map of the species in the IHR, species photographs, and illustrations of tracks/signs which will come handy for the user, all at one glance. The key references used for compiling the information for the species are presented at the end of the user guide. This user guide can be used by all stakeholders, both amateur as well as trained. For an amateur, creating awareness and reporting of presence only based on visual encounters and signs as part of wildlife monitoring are envisaged. Most of the local community members, pilgrims, tourists, and school/university students would fall in this category. For trained biologists, managers, frontline staff of Forest/Wildlife Departments, field staff of the defence and para-military forces, trained Nature Club members, would fall in the second category from which we envisage reporting more information as per data format provided at the end of this user guide. In order to facilitate easy reporting back to WII, we have provided a mobile number for SMS/Whatsapp or phone call and an email ID as well. Any additional information could be provided in remarks and sent to WII. All the information with source will be stored in a database at WII for future monitoring. This publication will eventually be translated in all major vernacular languages spoken in the IHR and also hosted in our website.

It is hoped that substantial interest would be generated on Wildlife Watch in the IHR through this publication and it would be of great use for Wildlife monitoring by different stakeholders. This user guide has been published with the funds received from DST under the NMSHE project.

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HIMALAYAN BROWN BEAR
Ursus arctos isabellinus

camera trap/WII

Vernacular/other names

Lal bhalu, bhura bhalu (Hindi)

Haput (Kashmiri)

Denmo (Ladakhi)

Taxonomy

Order: Carnivora

Family: Ursidae

Subfamily: Ursinae

***Genus**: Ursus*

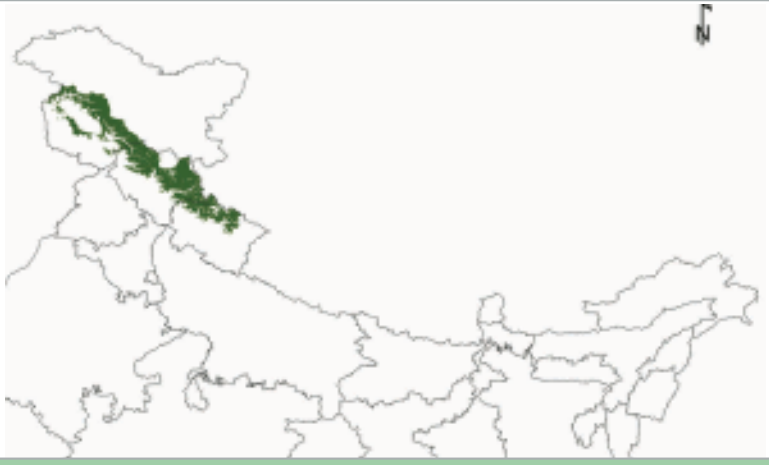
***Species**: arctos*

Sub-species: *isabellinus*

Conservation status

IUCN: *Ursus arctos is listed as least concern but subspecies Ursus arctos isabellinus is listed as endangered in India due to isolated population and declining population status (McLellan et al. 2017)*

Size ▸ *Head to body length:* ***210-245 cm***



Distribution:

Himalayan Brown bear occurs in very low densities in alpine and subalpine habitats (3000 to 5200m) of the greater Himalaya and some parts of the Trans-Himalaya inthe Indian Himalayan Region. It is distributed in the states of Jammu and Kashmir, Himachal Pradesh, and Uttarakhandand is reported from 23 Protected Areas and 18 other localities. In the trans-Himalayan region of Jammu and Kashmir (Zanskar, Suru, Dras, Kargil) and Himachal Pradesh (Spiti), the brown bear is present. In Sikkim, the Tibetan brown bear *U.a.pruinosus* is reported to occur but there are no confirmed reports in the recent past.

Description

The Himalayan brown bear is a large sized bear with thick, reddish or pale brown coat, large head and upstanding small rounded ears. There is a hump of long hairs over the shoulder, and not so prominent paler creamy white hair on either side of the neck. It is an omnivore and largely feed on alpine vegetation but they also kill livestock, weak and young wild ungulates, small mammals or scavenge dead animals. They are known to go into hibernation during peak winter seasons (December to February). Although their rate of metabolism is much reduced during this time, they are not entirely unconscious and can be aroused, and frequently emerge above ground in warmer weather. The females which give birth in winter, stay awake and nurse their young throughout this period.

Shoulder height: ***122 cm*** | *Weight:* ***130-400 kg (male); 80-230 kg (female)*** | *Tail Length:* ***7 cm***

Vulnerability to climate change

Brown bear can act as model species for climate change research as its ecology and physiology are highly dependent on climatic conditions. It is a large omnivore species and goes into hibernation. With the exception of a study from Nepal, there is virtually no investigation on how climate change would affect Himalayan brown bear but research on the other subspecies in Europe have revealed shorter hibernation periodin recent few years. Shortening of the bear denning period or increased bear activity during winter may result into a trophic mismatch. Untimely food resources during hyperphagia, when bears have to gain weight for winter denning and successful reproduction, may also have important consequences.Tree-line shift and change in climatic condition may bring it into conflict with other species such as Asiatic black bear (*Ursus thibetanus*) which has also shown reduced hibernation periods in the recent years. Climate-induced changes in bear denning, foraging patterns or potential range shifts into new areas may also affect the occurrence of human-bear conflicts.

Monitoring protocol

Monitoring of Himalayan brown bear status and numbers can be carried out based on direct and indirect evidence. Apart from direct sightings during trail walk or scanning, photo-captures in camera traps can also be used to generate relative abundance estimates for a particular site. Detections of indirect evidence such as scats, tracks and stone turnings can also be used as presence information for occupancy analysis and relative abundance estimation. Population estimation through genetic analysis using hair samples and scat are cost-effective non-invasive monitoring options that can be used. Research on other ecological aspects such as information on food and feeding habits, habitat utilization, and ranging patterns are crucial for long-term conservation and management of this species.

camera trap/WII

Key threats

- *Habitat degradation,*
- *Poaching and illegal trades in bear parts,*
- *retaliatory killing to reduce conflict.,*
- *climate change*

Reproduction and life cycle

Gestation period:
120 days

Breeding:
May to the middle of July

Young per birth:
1- 4, but 2 is most common

Weaning: ***30 months***

Sexual maturity:
3.5- 7 months

Life span:
12- 14 years

S. Sathyakumar

Key field identification features

- The Largest animal of the Himalaya. Reddish or pale brown thick coat. Large head with upright small rounded ears. Hind footprints of brown bear are very similar to human foot in appearance but larger. Himalayan brown bearfootprints on snow have led to several myths of the Yeti.

Albrecht, J., Barto, K. A., Selva, N., Sommer, R. S., Swenson, J. E., & Bischof, R. 2017. Humans and climate change drove the Holocene decline of the brown bear. Scientific reports, 7(1), 10399.

Sathyakumar, S. 2001. Status and management of Asiatic black bear and Himalayan brown bear in India. Ursus 12:21-30.

Sathyakumar, S. 2006. The status of brown bears in India. 7-11. In: Understanding Asian bears to secure their future. Japan Bear Network. Ibaraki, Japan.

camera trap/WII

Important web links

http://wildpro.twycrosszoo.org/000ADOBES/Bears/Bears_IUCN_ActionPlan/bearsAP_chapter7.pdf

HIMALAYAN MOUSE HARE
Royle's Pika, *Ochotona roylei*

Nikhil S Kahera

Vernacular/other names

Runda(Garhwali),
Wuse-gagun(Kashmiri)

Taxonomy

Order: *Lagomorpha*

Family: Ochotonidae

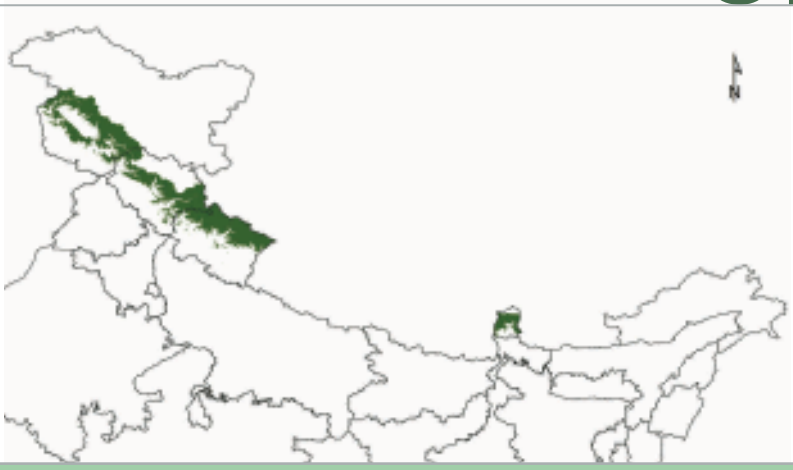
Genus: *Ochotona*

Species: *roylei*

Conservation status

IUCN: *Least Concern (ver 3.1)*

Size ▸



Distribution

It is distributed in the Indian Himalaya region at an altitude of 2400 to 5200m. They prefer rocky areas and often nests in stone heaps. They are found in rocky, broken ground, pine, deodar or rhododendron forests and also found in the rocky wall near human habilitations.

It has a rufous-grey coloured body (without tail) with a chestnut buffed head. Ventral body colour varies from white to greyish- white to dark grey. The reddish colouration fades in winter. It has moderately sized ears with sparse hair. Young ones can be distinguished from adult based on the absence of blackish marks on the back where the new fur grows.

Description

Pikas are small lagomorphs without any tail. Their head is short and blunt, with rounded ears. Unlike other pikas, Royle's pika does not hibernate in winter and construct hay-piles for winter food.

Body length: ***150-200 mm*** | *Weight:* ***100-150 g*** | *Ear length:* ***17 to 21 mm***

Vulnerability to climate change

In high altitude areas, a thick layer of snow helps insulation in winters and decreasing winter precipitation might cause more cold stress, increase energy demand in a food-scarce environment, and negatively influence the abundance. Unpredictable climate and low availability of food resources and high energy demands due to thermoregulatory mechanisms for surviving in extremely variable climate may affect the reproduction in Royle's pika. Warming may also make low altitude areas inhospitable for Pika hence might cause range shift for the species but may reduce the connectivity between different subpopulations.

Monitoring protocol

As the individuals are territorial, conspicuous and easily detectable, they are ideal candidates for presence-absence surveys. Occupancy models can be used to identify important habitat covariates making this approach cost-effective given the vast area of potential habitats.The mark-recapture framework can be used to estimate abundance where individuals with unique identifying features such as scars and clipped ears can be found. DNA based population estimation can also be carried out if genetic samples can be collected. Monitoring of other ecological aspects such as feeding behaviour and activity patterns are also very important for long-term conservation and management.

Nikhil S Kahera

Key threats

The population status of Royle'sPika is largely unknown but is considered widespread and stable. Its presence in some areas is believed to be affected by logging and livestock grazing, but these are not considered serious threats to the distribution or abundance of the species.

Reproduction and life cycle

Gestation period:
30 Days

litter size
varies from 2-6 although it is generally 3 or 4.

Sexual maturity:
7-10 Months

Life span:
1 to 3 Years

Key field identification features

- Rufous-grey coloured body (without tail).
- Ventral body colour varies from white to greyish- white to dark grey.
- Moderately sized ears with sparse hair.

Important web links

http://www.iucnredlist.org/details/41268/0

S. Sathyakumar

Nikhil S Kahera

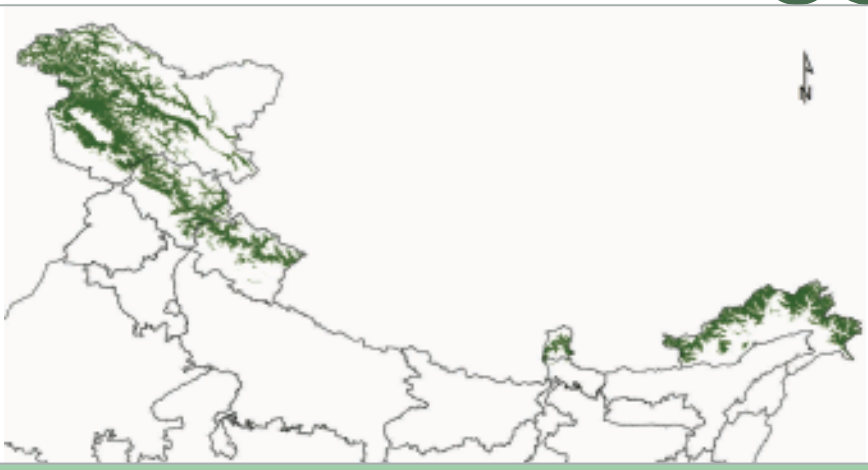
GRANDALA
Grandala coelicolor

Tawqir Bashir

Taxonomy
Kingdom: Animalia
Phylum: Chordata
Class: Aves
Order: Passeriformes
Family: Turdidae
Genus: *Grandala*
Species: *coelicolor*

Conservation status
IUCN: *Least Concern*

Size *Wing: 146-152 mm (male), 140-147 (female)*



Distribution & Habitat

This altitudinal migrant species is distributed in the Himalaya from Kashmir east to northern parts of Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh at 3900-5500m in summers and 3000- 4300m in winters. They are resident of very high altitudes and hardly descending in winter unless forced down temporarily by heavy snowfalls and severe weather in the high alpine areas just below snow-line. They prefer rocky slopes, ridges and stony meadows in the alpine zone during summer and similar habitats with *Hippophae* bushes below tree-line at its lowest winter limits.

Description

Grandala is a slim, long-winged, starling-like chat. The adult male is almost entirely purple-blue with glistening sheen, but with black lores, wings and tail. Iris hazel, bill black, yellow at gape, inside mouth bright lemon yellow, legs and feet black. Adult female and immature male are dark brown, with a blue wash to rump and upper tail coverts, and with whitish streaking on head, mantle and underparts, white tips to tertials and coverts, and white patches on the wing (prominent in flight). The juvenile is similar to the female, but is darker brown and more boldly streaked with streaking on throat and breast becoming broad triangular spots; lacks blue on the rump and upper tail coverts.

Bill: ***19.5-21 mm (male), 19.5-20 mm***	*Tarsus:* ***28.5-31 mm (male), 19.5-20 mm (female)***	*Tail:* ***84-91 mm (male), 77.5-87 mm (female)***

Behaviour

Found chiefly in flocks, consisting of several hundred birds in the non-breeding season, even in summer, 50 or more congregate to feed. Flocks circle buoyantly for long periods high over valleys and ridges, catching insects on the wing; also seeks insects on the ground, hopping about on alpine meadows and stony slopes. Often perches on rocks with an upright posture. Flight call is a *tew-wee*, the song is a repeated *galeb-che-chew-de-dew*. In winter an occasional short twit is uttered by individuals, but on the whole, they are very silent. Usually feeds on insects (particularly moths) and berries (such as *Hippophae, Vaccinium*).

Vulnerability to climate change

Climate change may compel many species to shift their distribution range in the future. One general pattern is that the birds at high elevations may face higher range shifts. Another general pattern is that the northward range shift is more than that for other direction. As grandala is more northerly distributed and more specialized to alpine habitats, they may experience a greater decline in future due to habitat loss.

Monitoring protocol

As grandala inhabit steep rocky areas in high altitude environment, regular monitoring of this species may require substantial efforts through intensive field expeditions in high altitude alpine areas. Trail (if possible transects of 300-500m) sampling or point counts for distance based abundance estimation can be used. Information on flock size and breeding behaviour can be noted for long-term monitoring.

Tawqir Bashir

Key threats

- *Habitat degradation*

Reproduction and life cycle

Breeding:
Mid June-July

Clutch size:
2 is most common

greenish-white with reddish-brown blotches over purplish undermarkings.

Key field identification features

- Shiny purple blue starling like chat of very high altitude areas. Found chiefly in flocks.
- Flight call is a *tew-wee*, the song is a repeated *galeb-che-chew-de-dew*.

Tawqir Bashir

Tawqir Bashir

Important web links

https://www.xeno-canto.org/species/Grandala-coelicolor

https://www.hbw.com/ibc/species/grandala-grandala-coelicolor

IBISBILL
Ibidorhtncha struthersii

Nilanjan Chatterjee

Vernacular/other names

Sanskrit/Hindi:
Krikasha, Miri hills: Puggah

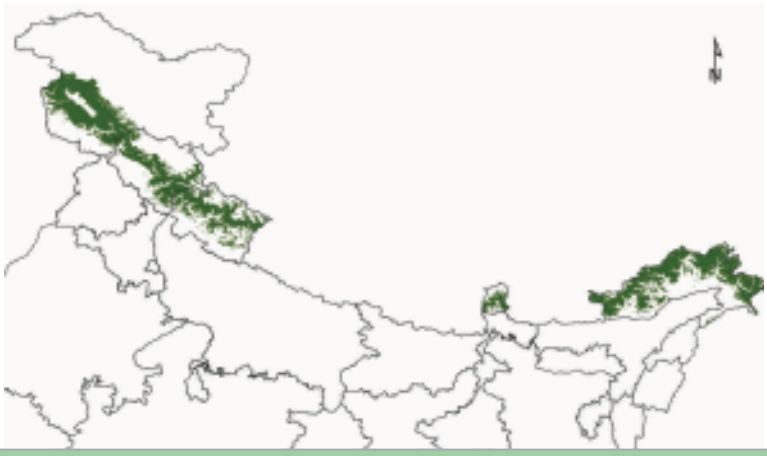
Taxonomy

Kingdom: Animalia
Phylum: Chordata
Class: Aves
Order: Charadriiformes
Family: Ibidorhynchidae
Genus: *Ibidorhyncha*
Species: *struthersii*

Conservation status

IUCN: *Least concern*

Size



Distribution & Habitat

The ibisbill occur in shingle-bed mountain river valleys, high rocky plateaus, montane wetlands, rivers, streams of Himalaya from 1700m to 4500m. In the Indian Himalayan Region, the ibisbill is distributed in the states of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Northern districts of West Bengal and Arunachal Pradesh. This species is also found in Punjab, Haryana and Uttar Pradesh.

Description

The ibisbill is a medium-sized distinctive wader with an apparent resemblance to an ibis, but it is closely related to oystercatchers, stilts and avocets. The wing-coverts and dorsal parts are lightbrown to grey. The black face and crown have a fine white border. The remaining portion of the head and the neck are pale bluish grey. The ventral portion is whitish and the short tail has a dark terminal band, fragmented at centre. In flight, shows a white patch at base of inner primaries and blackish tail-band. Both the sexes look similar. In breeding males the bill is slightly shorter than the females. Adult breeding has a black face, bordered with white and black breast bands, and bright red bill and legs. Adult non-breeding is similar, but black on the face is molted with white, and has white lores and chin. The long and decurved bill is coloured deep red in breeders and pale brown in juveniles. Juveniles have whitish or brown face, dark cap, diffuse brown breast band, buff to brown ventral portions and dull coloured bill and legs.

Length: ***38-42 cm*** | *Weight:****270-320 g*** | *Wingspan :* ***75 cm***

Behaviour

Single individuals, pairs or small groups forage inconspicuously in mountain rivers and streams. The diet is mostly aquatic invertebrates. Generally quite cautious, if alarmed, anxiously nods its head and wags its tail. Fish, crustaceans and aquatic and terrestrial invertebrates are their primary food. They feed by walking slowly through the water, using its long decurved bill to probe around and under stones, picking the floating prey from the water surface as well as submerging head. They also quest in short vegetation to search insect and rake small stones on riverbed to dislodge prey. Their call is a repeated "*sisi-sisi-sip*" sound. They are altitudinal migrant and make local movements for feeding and breeding within their range.

Vulnerability to climate change

Little is known about the ecology and other aspects of the species, and the river systems are undergoing adverse climatic change andanthropogenic impacts in India, that may cause significant shifts in habitat suitability. This calls for concerted monitoring strategies to understand the vulnerability of the bird to climate change.

Monitoring protocol

Field surveys along the banks of the high altitude streams at regular intervals can be carried out.

Nilanjan Chatterjee

Key threats

- *Factors such as climate change, geographical and altitudinal shifts in habitat suitability, and pressures onriverine habitat from tourism, infrastructure developmentand waste disposal,*

Reproduction and life cycle

Breeding:
end of March to mid-May

They breed in the trans-Himalayan region and migrate to lower elevations during the non-breeding season.

Clutch size:
two to four oval eggs

Both the parents take turns to incubate the eggs.

Key field identification features

- long, curved, red bill and prominent black band at the neck.

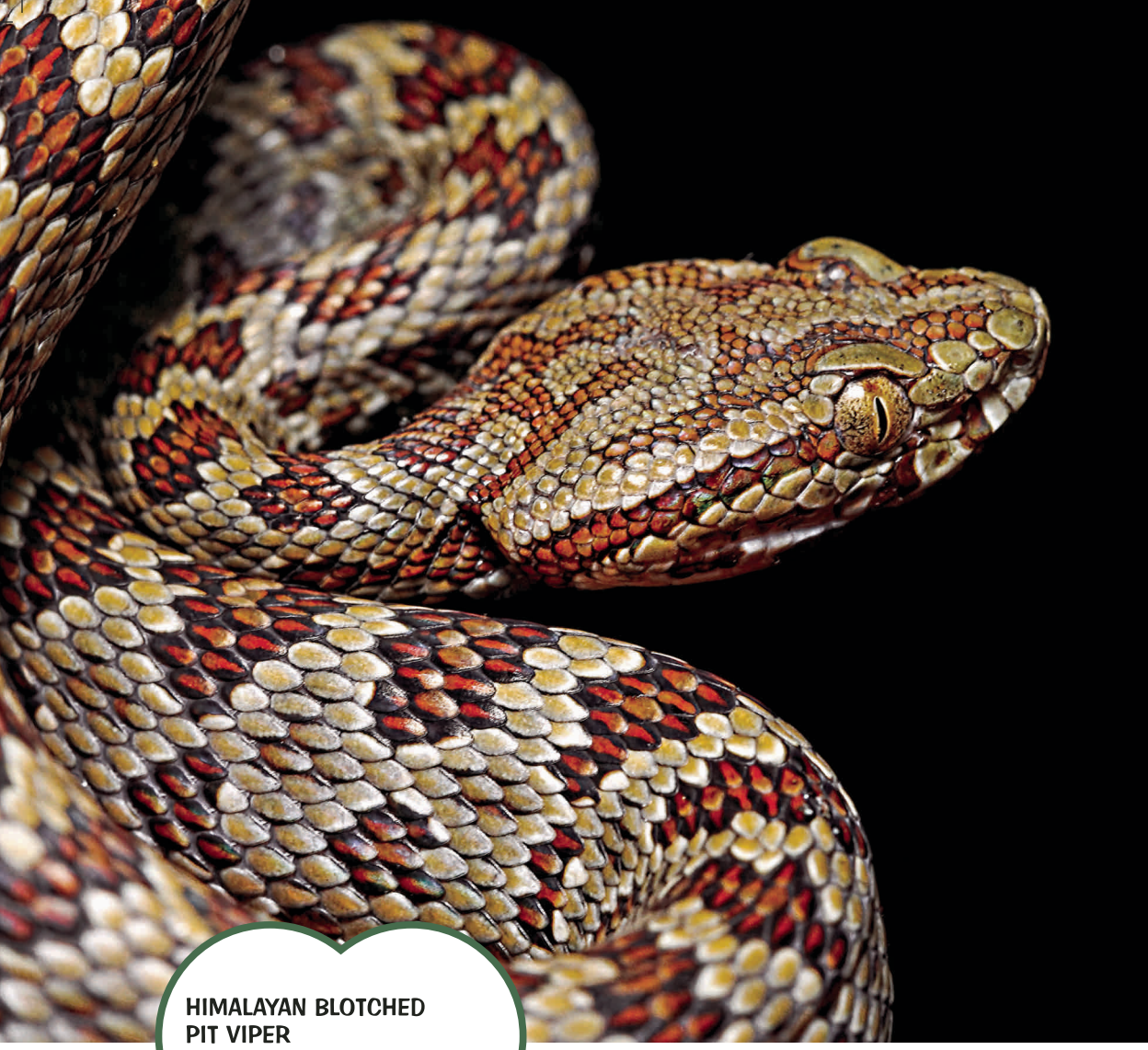
Important web links

https://indianbirds.thedynamicnature.com/2017/06/ibisbill-ibidorhyncha-struthersii.html

https://www.xeno-canto.org/species/Ibidorhyncha-struthersii

Shashanka Arya

Shashanka Arya



HIMALAYAN BLOTCHED PIT VIPER
Protobothrops himalayanus

Naitik G.Patel

Vernacular/other names

Himalayan blotched pit viper, Himalayan pit viper

Synonyms

Protobothrops himalayanus Pan, Chettri, Yang, Jiang, Wang, Zhang & Vogel 2013

Protobothrops jerdoni - Guo et al. 2009

Protobothrops sp. - Sharma 2013

Taxonomy

Class: Reptilia

Order: Squamata

Family: Viperidae

Genus: *Protobothrops*

Species: *himalayanus*

Conservation status

IUCN: *not yet assessed*

CAMP: *not yet assessed*

IWPA : *not yet assessed*

CITES: *not yet assessed*

Size

Distribution & Habitat

So far, the species is known from India, Bhutan and China. In China *P. himalayanus* is reported from Jilong valley in south Tibet, China which is the type locality of the species. In India, it was reported from Chungthang area of North Sikkim district. The species known to inhabit subtropical forest between elevation 1300m to 2100m. Species observed commonly on roads and in the moist litter of cardamom plantation. Stone walls and agricultural fields provide refuge for the snakes.

Description

This species is relatively large in body size (male- body 1035mm tail 185mm; female- body 935mm tail 166mm), with 198 to 216 ventral scales and 65-76 subcaudal scales; Dorsal head covered with a very small scales; 2 large solenoglyph teeth and loreal pit; Pupil is vertical; 7-8 supralabials and 11-13 infralabials; body and tail elongated tin and cylindrical with a distinct transverse band found across body and tail; Dorsal scales are keeled except outermost. Dorsal scale row 25-25-25;3.

Length: ***1035mm (male), 935mm (female)*** | *Tail:****185mm (male), 166mm (female)***

Color in life

Dorsal body and tail are olive with reddish and transverse bands across the body and tail, Head is uniformly dark brown from dorsal side and yellow. A red brown stripe laterally in adult. Eye coloration from bright brown to reddish brown. Ventral side of the head body and tail are grayish white. In juvenile, the body coloration is uniformly light brown with transverse bands across the body and tail. Dorsal head with dark brown markings; A red brown stripe on the lateral side of the head.

Behavior

This species is nocturnal in nature. Most sightings are on ground but individuals may affect low vegetation. Tail prehensile. During the day, the snakes hide themselves under boulders, among grasses or in the stone walls by agricultural fields and they come out to feed at dawn(Hujunet al. 2013). A gentle and inoffensive snake. This species is active from May to mid-September. Rodents are the main part of their diet.

Vulnerability to climate change

Climate change may influence elevational range shift in snakes. Climate related change in human land use pattern may lead to conflict situation and increase persecution of this species.

Monitoring protocol

Nocturnal Visual encounter survey and road survey in evening hours along with opportunistic observation, (rescue dead snakes, museum and published literature records) can help gather presence record and grid-based distribution of the species. Monitoring Snake hibernacula can provide data on demography, activity cycles and thermal characteristics of hibernating animals. Radio telemetry studies can help determine movement ecology of the species.

Naitik G.Patel

Key threats

- *Road kill*
- *Habitat destruction*

Key identifying features

Dorsal head uniform dark brown and laterally a reddish brown obscure postocular streak, Starting behind the eye in adult;

7-8 supralabials,

Large body size with 198 to 216 ventral scales

Naitik G.Patel

Important web links for more information

http://reptile-database.reptarium.cz/species?genus=Protobothrops&species=himalayanus

Key references

Pan, Hujun; Basundhara Chettri, Daode Yang, Ke Jiang, Kai Wang, Liang Zhangand Gernot Vogel 2013. A New Species of the Genus Protobothrops (Squamata: Viperidae) from Southern Tibet, China and Sikkim, India. Asian Herpetological Research 4 (2): 109-115

Guo, P., A. Malhotra, C. Li, S. Creer, C. E. Pook, and T. Wen 2009. Systematics of the Protobothropsjerdonii complex (Serpentes, Viperidae, Crotalinae) inferred from morphometric data and molecular phylogeny. The Herpetological Journal 19: 85-96

McDiarmid, R.W. ed., 2012. Reptile biodiversity: standard methods for inventory and monitoring. Univ of California Press.

Amolops himalayanus

Naitik G.Patel

Vernacular/other names

PeerePaa (Nepali)

Taxonomy

Class: Amphibia

Order: Anura

Family: Ranidae

Genus: *Amolops*

Conservation status

IUCN: *Least concern*

CAMP: *not listed*

IWPA : *not listed*

CITES: *not listed*

U.S. ESA: *not listed*

Distribution & Habitat

Amolops himalayanus is known from Himachal Pradesh to Sikkim with an altitudinal range of 1000m to 3000m. The species is known to inhabit fast flowing streams. This species is known to occur on to the rocky boulders and twigs in the torrent stream. The larvae of the species are unique, in having a gastrozymous sucker and are known to occur in rheophilous habitat clinging on to the rocks.

Description

A large frog male up to 76 mm, and female up to 88 mm, body depressed and slender: width of head equal to length, snout rounded and projecting beyond lowerjaw. Dorsal skin smooth with small granules on the side of head and base of forelimbs; Fingers slender, First finger shorter than second. Tips of the finger expanded into large disks with circummarginal grooves except on the first finger. Dorsolateral fold is absent; temporal fold very thick and straight.

Size ▸ *Body Length (Snout to vent length):* ***76 mm (male), 88mm (female)***

Color in life

Dorsally light green to brown in color with dark brown blotches. Limbs are light green in colour with brownish thick bands on it. Ventral side of the frog is off white to pale yellow in color, sometimes with irregular markings.

Behavior

Inhabit torrent streams at mid elevation. Nocturnal in nature. Individuals of this species go into winter sleep during winters (November to February). The species is known to be sympatric with *Nanorana leibigii*. Nocturnal and affect large rocks in fast flowing streams.

Reproduction and life cycle:

Breeding takes place during the monsoon from March to September where the eggs are laid in clutches under the boulders near fast flowing torrent streams. The upper section of the clutch was above the waterline while the lower section of the clutch was either resting on the water's surface or partially submerged.

Vulnerability to climate change

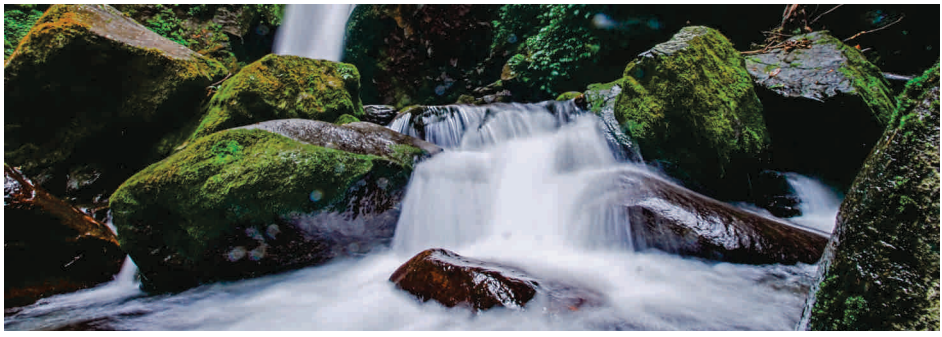
Climate change known to affect body size, breeding cycle, gaseous exchange and geographical ranges of amphibian species. However, such information is grossly lacking from Indian context. Obligate stream frogs may be more vulnerable to climate change scenario.

Monitoring protocol

Nocturnal visual encounter search, mark recapture may provide hitherto unknown population trend.

Visual Implant elastomer tags can be used for population studies on tadpoles and froglet.

Naitik G.Patel



Key threats

- *Collection for human consumption*
- *Introduction of exotic fish species*

Key identifying features

- Dorso-lateral fold is absent
- Dorsally light green in color with dark brown blotches
- Tadpoles with ventral sucker.

Naitik G.Patel

Important web links for more information

https://amphibiaweb.org/species/4646

http://research.amnh.org/vz/herpetology/amphibia/Amphibia/Anura/Ranidae/Amolops/Amolops-himalayanus

Key references

Yang, D.t. 1991. Phylogenetic systematics of the Amolops group of ranid frogs of southeastern Asia and the Greater Sunda Islands. Fieldiana. Zoology. New Series 63: 1-42.

Subba, B., Aravind, N.A. and Ravikanth, G., 2017. Amphibians of the Sikkim Himalaya, India: an annotated checklist. Check List, 13(1), pp.1-14.

Nidup, T., Gyeltshen, D. and Penjor, S.D., 2016. The first record of Amolopshimalayanus (Anura: Ranidae) from Bhutan. Herpetological Bulletin, 136, p.13.

Heyer, R., Donnelly, M.A., Foster, M. and Mcdiarmid, R. eds., 2014. Measuring and monitoring biological diversity: standard methods for amphibians. Smithsonian Institution.

STONE LOACH
Schistura rupecula

Vineet k Dubey

Vernacular/other names

Stone Loach (English Names)

Puinya (Common Name)

Taxonomy

Class: Actinopterygii

Order: Cypriniformes

Family: Balitoridae

Genus: *Schistura*

Species: *rupecula*

Conservation status

IUCN: *Least concern*

CITES: *Not Evaluated*

CMS: *Not Evaluated*

Habitat/Distribution

This is a benthopelagic fish, found in hill streams with pebbles as a major substrate. It mostly sustains in shallow riffles and also in pools, when adult. The importance of the rocky and pebbly substrate for this species is evident by its etymology, where 'rupecula' stands for 'rock dweller'. It inhabits hill streams throughout its life and is specially adapted morphologically to dwell in high altitude areas (200m to 1200m). It generally doesn't migrate to lower streams for feeding and breeding, instead migrate further upwards during breeding. It shows summer migrations to potential perennial hill streams. It is reported from Sutlej and Beas drainages of Himachal Pradesh, Kumaon and Garhwal Himalaya in Uttarakhand and Northern part of West Bengal.

Description

It has an elongate body, attaining up to 6.7cm in standard length. Eyes are relatively small and not visible when seen from the underside of the head. Nostrils are close to each other and mouth semicircular, with moderately fleshy lips. The lower lip is interrupted in middle. Barbels are well developed. It can be easily identified in streams due to 9-12 distinct vertical bands all over the body, which are broader than the width of interspaces between them. A dark spot can be seen at the base of the anterior dorsal fin rays. Dark streaks are present on the outer rays of dorsal and caudal fins.

Size ▸ *Maximum Length:* ***67mm***

Vulnerability to climate change

Unpredictable dry and wet seasons along with unpredicted floods/droughts would, in turn, affect the microhabitat of *S. rupecula*. Climate change would result in altered flow and habitat conditions which would result in decreased suitable habitat available for this species. Due to a narrow range, these species might not be able to migrate long distances in search of suitable habitat leading to their local extinctions. A rise in the temperature might also affect its distribution range and alter the competition matrix with other benthopelagic fishes. Also, the temperature fluctuations might affect the viability of this fish in the wild with respect to its critically maximum thermal tolerance level. Multiple environmental variables govern the viability of this species which modulates the thermal tolerance, oxygen consumption and respiratory burst activity along with its anti-oxidative potential in its native environment. Slightest modulations in these environmental factors afflicted by climate change can affect the species metabolism and distribution.

Ecological and Socio-Economic Benefits of Monitoring

This species of loach is of less fishery importance and it is rather more of an ornamental fish due to its banded body and attractive morphology. Such fishes are of higher commercial significance due to its demand in the aquarium fish sector, thus, any effect of the climate change on this fish would, in turn, affect the locals. As this species prefers a low flow and depth with an exposed river bed, monitoring of this species is of great ecological value as it would help to monitor the changes in the water flow and turbidity. Also monitoring this species is easy by local people due to its distinct morphology and unique characters.

Aashna Sharma

Key threats

- *Destructive fishing methods*
- *Habitat destruction through dredging and sand-mining*
- *Point and non-point sources of pollution*
- *Climate change*

Key field identification feature

1. Vertical bands all over the body, 9-12 in number
2. Dark streaks on outer rays of dorsal and caudal fin
3. Light-brown to yellowish in colour with greyish-green bands.

Important web link

http://www.fishbase.org/summary/24694

http://indiabiodiversity.org/species/show/233469

References

Vishwanath, W., 2010. "*Schistura rupecula*". The IUCN Red List of Threatened Species. 2010: e.T166463A6214561. doi:10.2305/IUCN.UK.2010-4.RLTS.T166463A6214561.en. Downloaded on 03 February 2018.

McClelland, J., 1838. Observations on six new species of Cyprinidae, with an outline of a new classification of the family. Journal and Proceedings of the Asiatic Society of Bengal.: 55-56.

Menon, A.G.K., 1987. The fauna of India and the adjacent countries. Pisces. Vol. IV. Teleostei - Cobitoidea. Part 1. Homalopteridae. Zoological Survey of India.

Banarescu, P.M. and Nalbant, T.T., 1995. A generical classification of Nemacheilinae with description of two new genera (Teleostei: Cypriniformes: Cobitidae). Trav. Mus. Hist. Nat. 35:429-496. (Ref. 33690)

Ali, M.Y., 1999. Fish resources vulnerability and adaptation to climate change in Bangladesh. In Vulnerability and Adaptation to Climate Change for Bangladesh (pp. 113-124). Springer Netherlands.

Hare JA, Morrison WE, Nelson MW, Stachura MM, Teeters EJ, Griffis RB, et al. (2016) A Vulnerability Assessment of Fish and Invertebrates to Climate Change on the Northeast U.S. Continental Shelf. PLoS ONE 11(2): e0146756.

Talwar, P.K. and Jhingran, A.G., 1991. Inland fishes of India and adjacent countries (Vol. 2). CRC Press.

Jayaram, K.C., 2010. Freshwater fishes of the Indian region. Narendra Pub. House.

GANGETIC MYSTUS
Mystus cavasius

Arvind Dwivedi

Vernacular/other names

Gangetic mystus (English Name)

Barsinghra, Singhara, Palwa, Kala-tenguah, Kavasi, Khirkirya, Katirna, Kinger, Singti, Tengra, Kabasi Tengra

Taxonomy

Class: Actinopterygii

Order: Siluriformes

Family: Bagridae

Genus: *Mystus*

Species: *cavasius*

Conservation status

IUCN: *Least concern*

CITES: *Not Evaluated*

Habitat/Distribution

This is a freshwater catfish, found mostly in rivers of a diverse range of flow including habitats like canals, beels, flooded farms and also from tidal lakes. It prefers a sandy or muddy substrate, although it has been found to inhabit a wide variety of freshwater habitats. It feeds on phytoplanktons, zooplanktons, roundworms, molluscs, insects and crustaceans, thus exhibiting an omnivorous diet. It is a bottom feeding carnivore and is reported to feed in the littoral zone (near to the bottom of the water body it inhabits). It is reported from Ganges and Brahmaputra drainages in Himachal Pradesh, Uttarakhand and Hill regions of West Bengal, Assam and Arunachal Pradesh.

Description

Being a catfish, this is a smooth fish with no scales. It is grey in colour, becoming yellowish along the abdomen. There is a distinct black spot found at the basal bone of the dorsal fin which is emphasized by a white or pale area along its ventral margin. This fish has a total of four pairs of barbels, of which the maxillary barbel pairs reach the cross base of caudal fin in adults but do not extend to the anal fin in young samples. The adipose fin is considerably large and originates just behind the dorsal fin. Dorsal, caudal and adipose fin are all shaded with melanophores. Body is elongate and compressed with a conical head. This fish has been reported to attain a maximum length of 400 mm. A blue band runs along the lateral line, occasionally. The mouth is terminal and the upper lip is fleshy extending beyond the upper jaw. The snout is slightly obtuse with longer the upper jaw. Its pectoral spine can cause painful wounds.

Size ▸ *Maximum Length:* ***400mm***

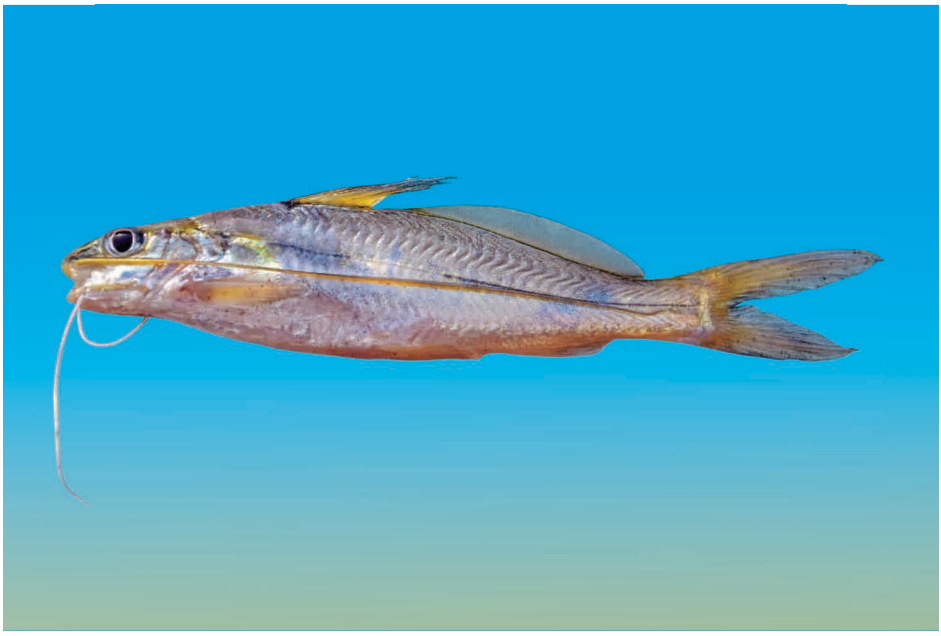
Vulnerability to climate change

Owing to its vast distribution ranging from plains to foothills the species has a wide tolerance of temperature. However,hailstorms and drought conditions in the foothills may cause adverse conditions as a consequence of climate change. Multiple environmental variables together modulate the thermal tolerance, oxygen consumption, respiratory burst activity and status of the anti-oxidative potential of this species in its native environment. The species spawns in August and September depending on the monsoons and temperature variations and further required low and optimum flow conditions for the survival of their juveniles and fingerlings. As such, any modulation in their optimum environmental condition due to climate change can negatively affect the species abundance and distribution.

Ecological and Socio-Economic Benefits of Monitoring

As ecological information on this species is inadequate to formulate a suitable conservation strategy, regular monitoring would aid in gathering information on its habitat, biology and range. It is both an ornamental as well as popular food fish for the locals, thus its monitoring can help in deducing sustainable strategies of its harvest without lending a pressure on its population in wild. As it is a fish of high economic significance, any effect of the climate change on this fish would, in turn, affect the locals. Monitoring this species is easy by locals including children due to its distinct morphology and unique characters.

Vineet k Dubey



Key threats

- *Indiscriminate fishing*
- *Fishing using electricity and dynamite*
- *Habitat destruction*
- *Point and non-point sources of pollution*
- *Climate change*

Key field identification features

1. Four pairs of barbels
2. Long maxillary barbel extending to the base of caudal fin
3. Black spot on the basal bone of dorsal fin

Important web link

http://www.fishbase.org/summary/5140

https://indiabiodiversity.org/observation/show/1510014

References

Bhatt V. S., 1971; Studies on the biology of some freshwater fishes. Part VI. *Mystus cavasius* (Ham.). Hydrobiologia, 38(2):289-302.

Gupta, S., 2014. A review on *Mystus cavasius*, a popular food fish of Indian subcontinent. International Journal of Fauna and Biological Studies, 1(6), pp.27-31.

Ng, H.H. 2010. *Mystus cavasius*. The IUCN Red List of Threatened Species 2010: e.T166409A6202832. http://dx.doi.org/10.2305/IUCN.UK.2010-4.RLTS.T166409A6202832.en. Downloaded on 05 April 2018.

Chaturvedi J., Saksena D.N. Diet composition, feeding intensity, gastrosomatic index and hepatosomatic index of a catfish, *Mystus cavasius* from Chambal river (near Rajghat) Morena, Madhya Pradesh. International Journal of Recent Scientific Research 2013a; 4(9):1350-1356.

Talwar, P.K. and Jhingran, A.G., 1991. Inland fishes of India and adjacent countries (Vol. 2). CRC Press.

Jayaram, K.C., 2010. Freshwater fishes of the Indian region. Narendra Pub. House.

RED-VEINED DARTER
Sympetrum fonscolombii

Shuvendu Das

Vernacular/other names

Red-veined Darter, Nomad.

Taxonomy

Class: Insecta

Order: Odonata

Family: Libellulidae

***Genus**: Sympetrum*

***Species**: fonscolombii*

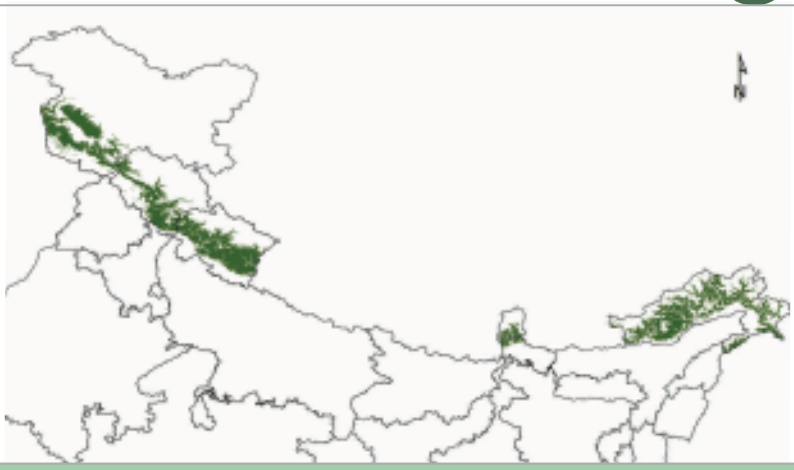
Conservation status

***IUCN:** Least Concern*

***IWPA:** Not Listed*

***CITES:** Not Listed*

Size



Habitat/Distribution

This species of dragonfly breeds in stagnant water such as swamps with bushes, often open, bare and shallow quarry lakes, sand pits, weedy marshes and well-vegetated ponds. This species is foundin several parts of the Indian Himalayan Region including Jammu & Kashmir, Himachal Pradesh, Uttarakhand, West Bengal, Sikkim and Arunachal Pradesh within the altitudinal range from 500 to 3500 m.

Description

Red-veined Darter is a medium sized red dragonfly with prominant red veins in the wings and yellow base of the hind wings. In males, the pterostigma or wing spots are pale with a border of black veins and the underside of the eye is blue/grey.

The female is similar with yellow abdomen and the wings have yellow veins. The legs of both sexes are mostly black with some yellow. Even immature males are like females but often with red colouration.

Abdomen: ***22-28 mm (male), 23-28 mm (female)***

Wing: ***24-29mm (male), 27-30 mm (female)***

Habit

Perches at low to medium height tree near stagnant pools or ditches, weakly flutters away to nearby perch when disturbed.

Vulnerability to climate change

Larval stages are ectothermic, so different instar periods may respond to temperature change that may cause early emergence or inappropriate emergence which leads to the death of an individual which may affect their population trends.

Monitoring protocol

Species can be monitored through transect counts and opportunistic sampling near agricultural fields up to 3500m elevation range in IHR.

Shuvendu Das

Key threats

In the Himalaya, drainage and destruction of swampy habitats by agriculture is a serious threat for the survival of this species.

Key field identification features

A medium sized red dragonfly with prominant red veins in wings, yellow wing spots outlined in black and brown eyes with red at sides and pale olive to yellow below. Can easily be located near low perches near wetlands.

Shuvendu Das

Important web links

http://www.meadowhawks.info/index.html

http://www.iucn.org/

References

Fraser, F.C. (1933, 1934, 1936).The Fauna of British India including Ceylon and Burma: Odonata, Volumes 1, 2 & 3. Taylor and Francis Ltd., London, 423pp, 398pp, 461pp.

Nair, M.V. (2011).Dragonflies & Damselflies of Orissa and Eastern India. Wildlife Organization, Forest & Environment Department, Government of Orissa, 252pp.

Subramanian, K.A. (2009).Dragonflies and Damselflies of Peninsular India - A Field Guide. Vigyan Prasar, Noida, India, 168pp.

Subramanian, K.A. (2009). A Checklist of Odonata of India. Zoological Survey of India, 36pp.

Subramanian, K.A. (2014). A Checklist of Odonata of India. Zoological Survey of India, Kolkata, 31pp.

TIGER BEETLE
Calomera chloris

Amar Paul Singh

Taxonomy

Phylum: Arthropoda

Class: Insecta

Family: Carabidae

Subfamily: Cicindelinae

Genus: *Calomera* Motschulsky, 1862

Species: *chloris* Hope, 1831

Conservation status

IUCN: Not Concerned

IWPA: Not Listed

CITES: Not Listed

Size ▸

Description

Beetles form a very interesting order which can be easily distinguished from other insects by their first pair of wings called elytra. Globally 2328 species of tiger beetles are described, of which India ranks second (after Indonesia) in terms of tiger beetle diversity with 208 described species of which 108 species are endemic (Cassola and Pearson, 2000). Tiger beetles so named because not only they are predatory by nature which feeds voraciously on other insects, but their coloration patterns (specially of elytra) merges with the background for a perfect camouflage.These beetles are slim and very active predators with long powerful legs which are adapted for rapid movement. The very interesting adaptation in the tiger beetles is to hold their antennae rigidly and directly in front of them to avoid the obstacles by mechanical sense of environment while running.Tiger beetle species differ greatly in habitat preference. They are found usually in damp localities and along the banks of the rivers and streams. Some like moist environments while others like it dry.

Amar Paul Singh

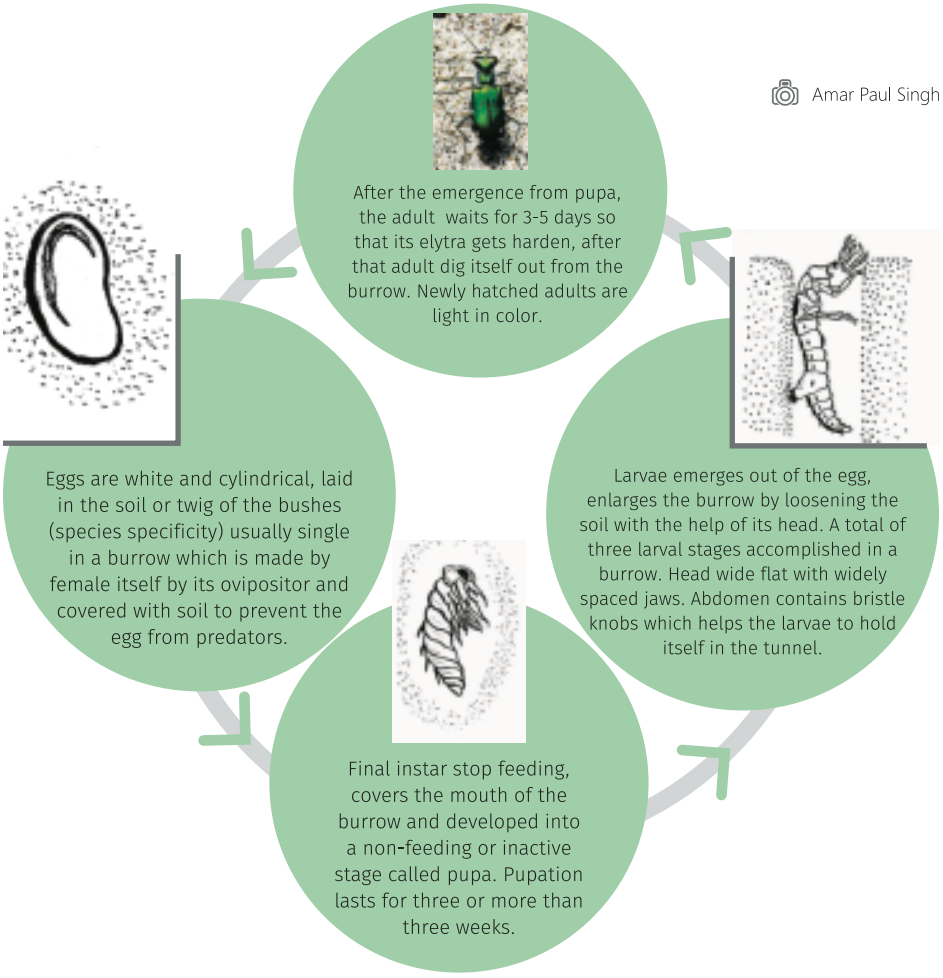
Wingspan: ***50-65 mm*** | *Altitude range:* ***1,800-5,200 m***

Vulnerability to climate change

Calomera chloris adapted to specific thermal and hydrological conditions; therefore changes in these conditions are likely to impact basic tiger beetle ecology. Climate change alters the seasonality and range of moisture and temperature experienced by this species, but more research is needed to determine whether the effects would be generally positive, negative or neutral.

Monitoring protocol

Monitoring of this species done by transect count and point count methods as well as record them opportunistically. The record should include their GPS location, which helps in understanding their habitat and distribution.



Key threats

In the Himalaya, drainage and destruction of swampy habitats by agriculture is a serious threat for the survival of this species.

Key field identification features

- Key field Identification features
- Long legged fast running beetles (5-25mm).
- Eyes large and bulging, with sharp forwarded directed mandibles.
- Elytra bright green in colour with white spots on the border.

Amar Paul Singh

Important web links

https://www.treknature.com/themes.php?thid=1086

http://www.bioone.org/doi/abs/10.1649/739

https://www.sciencedirect.com/science/article/pii/S0006320700000343

http://www.cornellpress.cornell.edu/book/?GCOI=80140100109350

HIMALAYAN FIR, WEBB'S FIR
Abies spectabilis

Ishwari Datt Rai

Vernacular/other names

Raga, Morinda (Uttarakhand), Badul (Jammu and Kashmir), Tosh (Himachal Pradesh)

Synonyms

Abies webbiana (Wall. ex D.Don) Lindl.

Abies brevifolia (A.Henry) Dallim.

The species epithet' spectabilis' refers to the spectacular or elegant growth habit when in cones.

Taxonomy

Class: Pinopsida

Order: Pinales

Family: Pinaceae

Genus: *Abies*

Species: *spectabilis*

Conservation status

IUCN: *Near Threatened*

WPA (1972): *not listed*

CITES: *Not Listed*

Distribution & Habitat

Abies spectabilis is distributed in the states of Jammu and Kashmir, Himachal Pradesh and Uttarakhand in the Indian Himalayan region whereas its close relative *Abies densa* is found in the eastern Himalayan region. The eastern distribution limit of the species exists in eastern Nepal region. It is a dominant tree in the subalpine zone of western Himalaya between 3000 to 4000 m elevation zones. It occasionally forms gregarious patches in the moist slopes generally on northern aspects and often a major associate species of *Betula utilis* in the subalpine-treeline zone.

Description

A graceful tree, up to 15m tall. Old branches horizontal or upright. Needles short, flattened, up to 4.5cm long, notched at tip, spirally arranged in the young braches; lower surface silvery-white, upper surface bright green. Female cones cylindrical, dark purple, maturing to dark brown or blue-brown, up to 15cm long. Male cones numerous on terminal shoots, red-brown, cylindrical, up to 4 cm long.

Use and trade

Abies spectabilis is considered a valuable timber species. Migratory pastoral communities camp near timberline invariably use this species for making temporary sheds. They use logs for making and annual repairing of their huts. Needle contains essential oil and reported to be used in the form of infusion or decoction to cure ailments like chronic bronchitis and other pulmonary diseases (Chauhan 1999).

Vulnerability to climate change

The high altitude areas in the western Himalaya are under intense anthropogenic pressure especially in the form of livestock grazing. Lack of regeneration in these degraded habitats posing severe threat to its population dynamics. The Himalayan fir grow in a narrow elevation belt and recent warming, which pushes species to adapt in higher elevations coupled with grazing pressure which does not allow seedlings to survive, may cause decline in the population of the species.

Monitoring protocol

Permanent plots (20m×20m) may be laid within the distribution areas (3000-4000 m) in the landscape. Regeneration status and population structure of the species along with other associated plants may be monitored.

Phenology

Cones appear in May-July. Seed mature and disperse during September-October

Ishwari Datt Rai

Key threats

Abies spectabilis has a wide distribution from East Nepal to eastern Afghanistan but with a narrow elevation zone in its habitat. The fir forests have suffered severe depletion, especially at the lower elevations, from logging and deforestation. A population decline of approximately 25% over the past three generation has occurred (IUCN 2018). This tree is therefore listed as Near Threatened. The species is reported to have been lost from the easternmost occurrence in East Nepal in the past 20 years. Deforestation and conversion of land to agriculture and grazing fields is the largest threat. Fire also caused patch mortality of the species in several locations in Western Himalaya.

Key field identification features

- Tall tree with upright old branches (drooping branches in *Abies pindrow*)
- Needle silvery beneath, appeared spirally (appears bilaterally in *A. pindrow*)

Important web links

http://www.iucnredlist.org/details/42300/0

https://www.flowersofindia.net/catalog/slides/Himalayan%20Silver%20Fir.html

Reference

Chauhan, N.S. 1999. Medicinal & aromatic plants of Himachal Pradesh. Indus Publishing Company, New Delhi

Ishwari Datt Rai

HIMALAYAN YEW
Taxus wallichiana

Ishwari Datt Rai

Vernacular/other names

Pastul (Kashmiri) Rukhal (Himachal Pradesh), Thuner (Uttarakhand), Dhengre Sala (Nepali), Chyongbu(Sikkim)

Synonyms

Taxus baccata L. subsp. *wallichiana*(Zucc.) Pilg.

Taxonomy

Class: Pinopsida

Order: Taxales

Family: Taxaceae

Genus: *Taxus*

Species: *wallichiana*

Conservation status

IUCN: *Endangered*

WPA (1972): *not listed*

CITES: *Appendix II*

Distribution & Habitat

Taxus wallichiana has a wide distribution range from Jammu and Kashmir to Arunachal Pradesh in Indian Himalayan region. The distribution ranges from 2000m to 3,700m asl. However, in cool-moist slopes it may grow in much lower elevations. It is a small to large understorey or lower canopy tree in montane to subalpine forests. In lower elevation regions it prefers cooler slopes whereas with increasing elevations it grows mainly in warmer slopes along bouldery/rocky areas. *Taxus wallichiana* rarely occurs in pure stands and mostly occurs as an understory species of *Quercus* and *Abies* forests.

Description

An evergreen tree, up to 20m tall. Dioecious (male and female cones on separate plants) with spreading branches. Needles 2-4cm long, linear, acute, rusty yellow beneath. Male cones globose, ca. 4mm in diameter, on the undersides of the shoots. Female cones berry-like, with a single scale developing into a soft, juicy red aril, ca. 1cm in diameter. Seeds brown. Seeds are mainly dispersed by birds.

Use and trade

Leaves and bark of *T. wallichiana* are in great demand for obtaining "Taxol" an anti-cancerous alkaloid. This has become a major reason for exploitation in recent years. Bark is also used as substitute of tea by many communities in the Himalayan region. The durable and strong wood is used for door frames, cabinet work and also handles for various implements. The leaves yield similar chemicals in low concentrations. The only non-toxic part of yews, the fleshy aril around the seed, is consumed by local inhabitants to prepare jam. In the Unani system of medicine, the extract from the bark and leaves is considered the source of a drug "Zarnab", used for the treatment of various disorders. Local communities in inner valleys of Himachal Pradesh use its leaves for thatching and wood carving, house construction and for the preparation of honey-bee shelter.

Vulnerability to climate change

Habitat degradation due to overgrazing and extraction of leaves and bark coupled with climate changes associated shifting in precipitation and temperature patterns may inhibit the species to regenerate in its natural environment.

Monitoring protocol

Permanent plots (20mx20m) may be laid and marked within the areas of occurrence. Regeneration status, population structure and habitat conditions may be monitored.

Phenology

Male cones appear during March-April; female cone take 9-10 months to mature during July-August.

Ishwari Datt Rai

Key threats

Across most of its range in the Himalaya *Taxus wallichiana* has been heavily exploited for its leaves and bark. This has led to declines of up to 90% population in India and Nepal (IUCN 2018). Studies suggest that the bark removal leads to significant impact on the survival of the species. Habitat degradation due to heavy grazing has resulted in failure of regeneration in many populations.

Key field identification features

- Bright red aril
- Bilaterally appeared Flattened needles with pointed tips
- Dioecious trees

Important web links for more information

http://www.iucnredlist.org/details/46171879/0

http://www.bsienvis.nic.in/CITES/Taxus%20wallichiana.pdf

Ishwari Datt Rai

SIKKIM RHUBARB, NOBLE RHUBARB
Rheum nobile

Kamal Poudyal

Vernacular/other names

Ekavira, Kenjo (Sikkim), Padamchal (Nepali)

.

Taxonomy

Class: Magnoliopsida

Order: Caryophyllales

Family: Polygonaceae

Genus: *Rheum*

Species: *nobile*

Conservation status

IUCN: *Not Assessed*

WPA (1972) : *not listed*

CITES: *Not Listed*

Distribution & Habitat:

Rheum nobile is distributed in alpine regions of Eastern Himalaya including Nepal, Bhutan and Tibet. In India it is found in Sikkim and Arunachal Pradesh. It grows in rock ledges, scree slopes, and glaciated valleys between 4000 to 5500m elevation zones.

Description

A perennial, large gregarious herb, 1-2 m tall. Basal leaves in a rosette and stem leaves dense bearing petiole shorter than blade. Leaf blade large, orbicular, cordate-ovate, 20-30 cm across, leathery, glabrous, base rounded or subcordate, apex obtuse; distal leaves smaller upward, orbicular. Bracts light yellow, membranous when dry. Flowers in the group of 5-9. Seeds black-brown. *Rheum nobile* is often called a glasshouse plant because its white bracts create a greenhouse like environment and protect the flowers inside.

Use and trade

The powder, decoction, or the infusion of roots and rhizomes are used in arthritis, heart complaints and as tonic after delivery. The rhizome is used to obtain yellow dye. Young and tender shoots are used to make pickles by local communities.

Vulnerability to climate change

The Sikkim rhubarb grows in the alpine regions which largely remain under snowpack during the winter season and the perenating parts of the plant remain protected from the frost. The changing snowfall patterns with reduced snowcover may cause frost damage during winter and adversely affect its seed production and regeneration.

Monitoring protocol

Permanent plots (20mx20m) may be laid and marked within the areas of occurrence above 4000m. Regeneration status and habitat conditions in terms of associated species composition and regeneration may be monitored.

Phenology

Flowering: June-July, Fruiting: September-October

Kamal Poudyal

Key threats

- *Excessive collection of the plant for the local use.*

Key field identification features

- Tall stout plant with large translucence white bracts

Threat

Habitat degradation due to over-grazing by domestic livestock

Collection by herders for making pickles

Kamal Poudyal

Kamal Poudyal

Important web links

https://en.wikipedia.org/wiki/Rheum_nobile

http://www.flowersofindia.net/catalog/slides/Sikkim%20Rhubarb.html

Wildlife watch survey (record sheet)

1. *Species Name* _____

2. *Scientific Name (if known)* _____

3. *Number of Individual/s* _____

4. *Sex* *Male* _____ *Female* _____ *Unknown* _____

5. *Observation type:* _____

   O- Observed; F - Tracks/pugmarks; H-Hair/feather/skin; R- road kill; K- Kill; B- Bone/teeth; S- scat/pellet; V- Vocalizatiion

6. *Location/ Nearest Landmark* _____

7. *Altitude (approx.)* _____

8. *GPS Coordinates (if possible)* _____

9. *Any other Information* _____

_____

_____

_____

9. *Your Name* _____

10. *Your contact Number* _____

11. *Your email ID* _____

Please send the details of your record to wlw.nmshe@wii.gov.in or message/Whatsapp in +91 9410915297

Department of Science & Technology
Ministry of Science & Technology
Government of India

NMSHE NATIONAL MISSION FOR SUSTAINING THE HIMALAYAN ECOSYSTEM

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

P.O. Box # 18, Chandrabani
Dehradun - 248 002 (Uttarakhand)
t. (0135) 2640111-115; **f.** 0135-2640117
w. www.wii.gov.in; **e.** wii@wii.gov.in

For more information, please contact: **m.** + 91 9410915297, **e:** wlw.nmshe@wii.gov.in

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