



NEWSLETTER

QUARTERLY ENVIS NEWSLETTER

XIITH EDITION VOL 6 (1)- APRIL-JUNE, 2021



NEWLY DISCOVERED FLORA FAUNA AND OTHERS IN ARUNACHAL PRADESH 2019-21

ARUNACHAL PRADESH STATE ENVIS HUB
STATUS OF ENVIRONMENT & ITS RELATED ISSUES

Supported by
Ministry of Environment, Forest & Climate Change
Government of India

Hosted by
Department of Environment & Forests
Government of Arunachal Pradesh

NEWLY DISCOVERED FLORA, FAUNA AND OTHERS IN ARUNACHAL PRADESH (2019-21)

Introduction:-

Arunchal Pradesh is situated on the northeastern most part of the country (India); the state is located between 26° 28' to 29°30' N latitudes and 91° 30' to 97°30' E longitudes. It occupies the largest area (83.743 Sq. Km) among all northeastern states of India, and consists of mountainous ranges sloping to the plains of Assam. The diversity of topographical and climatic condition has favoured the growth of luxuriant forests, which are home to myriad plant and animal forms, adding beauty to the landscape. Living in this incredible cradle of nature are the colorful and vibrant tribes of Arunachal Pradesh for whom the forests and wildlife are of special significance. The total human population of 13, 83,727 (2011 census) lives in 5589 villages and small towns. Livelihoods of local people have been closely linked and heavily dependent on forest resources since time immemorial. However, with increasing population, development activities, large number of wood-based industries and etc, the pressure on forest resources is consistently increasing leading to their degradation affecting regeneration and productivity.

Vast climatic variations of Arunachal Pradesh have resulted in the existence of almost all types of timber wealth ranging from the tropical teak like species of the foothills jungles, to the conifers of the high mountains. Arunachal Pradesh is famous for rare species of orchids, which are found in all types of forests, altitudinal ranges, and rainfall conditions. The many unspoilt tree-clad slopes contain tigers, leopards, elephants, deers, bears and apes. The Mithun, or 'bos frontalis' exists both in wild and semi-domesticated form.

Forest Types: Arunachal is the land of green gold. Due to the variation in altitudes and climatic conditions, different places of Arunachal Pradesh have different types of forests.

Tropical:

1. Northern Tropical Semi-evergreen Forests.
2. Northern Tropical Evergreen Forests.
3. Northern Tropical Moist Deciduous Forests.
4. Secondary Bamboo Breaks

Sub-tropical:

1. East Himalayan Sub-tropical broad leafed Forests.
2. Sub-tropical Pint Forests.

Temperate Forests:

1. Temperate broad leafed Forests.
2. Temperate Conifer Forests.
3. Sub-alpine Woody shrub.
4. Alpine Meadow (Montane tundra)

In this newsletter the main content is to highlight about newly discovered Flora, Fauna, Minerals, etc in the last three years in Arunachal Pradesh. The following are the lists which have been discovered/found in the state.

A. New alpine plant species in Tawang district

A new species of alpine plant has been discovered in Tawang District of Arunachal Pradesh named as *Cremanthodium indicum*.

Facts about *Cremanthodium indicum*:

1. Its discovery has been published in *Biodiversitas: Journal of Biological Diversity*.
2. It is a species of Himalayan Sunflower
3. Something surprising is that the species newly found is critically endangered as per the IUCN guidelines
4. The plant species generally flowers from July to August
5. It is endemic to Penga-Teng Tso Lake of Tawang district and was discovered at place.
6. *Cremanthodium indica* is a perennial herb and stands 16–24 cm tall.
7. The flowering plant grows in boggy soil among mosses along the banks of alpine lake





Knows-What are Alpine Plants?

Alpine plants are those that grow at a high elevation and above the tree line.

- These plant species generally grow in alpine tundra.
- The species include perennial grasses, forbs, cushion plants, mosses and lichens.
- The plants grow in harsh conditions, low temperatures, dryness and UV radiation, wind, drought, poor nutritional soil etc.
- They also grow in a short growing season.

- Alpine plants occur in a type of natural region or biome that does not contain trees. It transitions to subalpine forests below the tree line
- Various stunted forests occurring at the forest-tundra ecotone are known as Krummholz
- As the elevation increases, the vegetation ends at the snow line. It is also known as the Nival Zone.

What is IUCN and Red List of threatened Species:

International Union for the Conservation of Nature, IUCN is a membership Union composed of both government and civil society organisations. It harnesses the experience, resources and reach of its more than 1,400 Member organisations and the input of more than 17,000 experts.

IUCN follows the following strategy to categorize the plant and animal species:

Assess- Plan- Act- Communicate

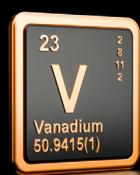
The main aim of IUCN is to influence, encourage and assist societies to conserve the integrity and diversity of nature and ensure that any use of natural resources is equitable and ecologically sustainable.

The IUCN Red List of threatened Species is also known as IUCN Red Data List and was founded in 1964. It is the world's most comprehensive inventory informing about the global conservation status of various species. There are 7 categories in the IUCN list namely Data Deficient (DD), Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), Critically Endangered (CR), Extinct In The Wild (EW), Extinct (EX)

B. Vanadium found in Arunachal Pradesh: How is this significant for India

Recently in mid January 2021, vanadium has been discovered in Arunachal Pradesh.

Geological Survey of India (GSI) has found reserves of Vanadium in Arunachal Pradesh. It is a very rare, hard, silvery grey element with ductile and malleable properties and good structural strength.



Few facts About Vanadium:

- It is found in more than 60 different minerals/ores that include vanadinite, carnotite, roscoelite and patronite.
- It was discovered by Spanish mineralogist Andreas Manuel del Rio.
- He named it Erythronium but thought that it was just an impure version of chromium.
- In the periodic table, it is symbolised as V
- The colour of the element is silver and it has great structural strength.
- It is listed as a transition metal which means it is a very good conductor of heat and electricity.

Uses of Vanadium:

- Vanadium finds its uses in many of the following areas:
- Vanadium can be used to make steel alloys for use in space vehicles, nuclear reactors etc
- It can be used to make tools, axels, piston rods, girders etc.
- Vanadium Redox Batteries are used to create a reliable renewable energy source
- It is used in ceramics as a pigment
- Vanadium Gallium tapes are used in superconducting magnets
- Vanadium is used in the treatment of heart diseases, diabetes, high cholesterol etc.
- It is useful in creating nuclear reactors. Vanadium is the first choice for mixing with steel alloy used for a nuclear reactor.

About Vanadium in Arunanchal Pradesh

This by far is the first time any primary deposit of vanadium has been reported in India. Listed below are the finding sites of Vanadium in Arunachal Pradesh:

- The paleo-proterozoic (era) carbonaceous phyllite rocks of Arunachal Pardesh consist of Vanadium concentrates. It is found in Depo and Tamang regions of Papum Pare district there.
- Phyllite happens to be a fine-grained metamorphic rock that forms through re-crystallization of homogeneously grained, sedimentary rocks like mudstone or shale.

- Sedimentary rocks that contain a certain amount of enriched organic matter are called carbonaceous sedimentary rocks.
- There are many other potential sites spread across various districts in Arunachal Pradesh that need proper research.

How was it found in AP?

- It was during the exploration when the team of geologists discovered two bands of 7-meter thick carbonaceous phyllite rocks of length exceeding 6 km in Depo area. Geologists then decided to start finding more and stretch their research to other areas in Arunachal as well.
- They found a promising quantity of the metal in a rock 15.5 km long and 7 meters thick in Saiya, Deed, and Phop areas of the Lower Subansiri district.
- Some quantities were also found in Palin-Sangram- Kra Daadi, Pakke-Kesang district, Kalamati- West Siang, Kaying in Siang district, and Kalaktang in West Kameng.

Significance

- India has been an active consumer of vanadium but this is for the first time vanadium would be produced in the country. China which has been a source full of vanadium consisting of the highest reserves of the element till now will face not be the source now India has to rely on for its demand of vanadium.
- In India currently, it is recovered as a by-product of slag from processed vanadiferous magnetite ores. As per GSI, India's consumption of vanadium is 4% of the global demand which can now be fulfilled through its indigenous source.
- The highest production of vanadium is in China, followed by Russia and South Africa

India's Efforts for Vanadium extraction:

- Reliance Industries Limited has designed a low-cost temperature hybrid green process that can be used to extract vanadium from gasifier slag. The project is now being scaled up from laboratory to pilot level.
- NALCO has also completed lab-scale studies to

- recover vanadium sludge using Bayers process from Bayers liquors.
- Also, Lanjigarh Alumina has discovered in house process of extraction of vanadium pentaoxide from bauxite with a little consumption of energy.
 - Vanadium is a rare earth metal that finds many properties suitable for generating tensile strength and finds usage in various high-end projects. Now that India has found some of the metal extracts in one of its states, it must focus on bringing technology to extract it in its purest form. This discovery could bring huge benefits to the Indian economy as well.

C. 3 (Three) new species of tiny frogs discovered in Arunachal Pradesh

In mid January 2021, three new species of tiny frogs have been discovered in Talle Valley Wildlife Sanctuary (WLS) of Lower Subansiri district, Arunachal Pradesh by the Scientists at the Zoological Survey of India (ZSI).

- A study, co-authored by Saikia and Sinha, has been published in a science journal, the Records of the Zoological Survey of India, which confirmed that the species are new discoveries.
- Earlier, Saikia and Sinha had also found a rare frog species, *Megophrys pachyproctus*, from Tale Valley Wildlife Sanctuary.
- The new species discovered have been named as 'Liurana himalayana', 'Liurana indica' and 'Liurana minuta'.
- The frogs are so small in size that one can sit on a coin, as per ZSI scientist Bhaskar Saikia.
- The specimens of the new frog species were collected by Bikramjit Sinha, another scientist of ZSI in Itanagar during 2015-16 as part of the documentation of faunal diversity in the protected area.



D. Five new fish species discovered in Arunachal Pradesh:



Mystus prabini



Exostoma kottelati



Creteuchiloglanis tawangensis



Garra ranganensis



Physoschistura harkishorei

In the month of August 2019, Five new species of fish have been discovered from different districts of Arunachal Pradesh. The discovery was made by a fisheries and aquatic ecology research team from the zoology department of Rajiv Gandhi University (RGU). The research team was headed by Professor DN Das.

The RGU research team published the details of the discovery in various International journals. According to Prof DN Das, the head of the research team, the majority of remote water bodies in the state are still not easily accessible to researchers due to dense rainforests, steep terrains and communication problem. He, however, said that the research team was confident that systematic exploration may result in more discoveries of new Ichthyo species from the state in the future.

Following are the five newly discovered fish species:

- i. *Mystus Prabini*: The fish species was discovered in Sinkin and the Dibang rivers in Lower Dibang Valley district.
- ii. *Exostoma Kottelati*: The species was discovered in the Ranga River in Lower Subansiri district.
- iii. *Creteuchiloglanis Tawangensis*: The species was discovered in the Tawangchu river in Tawang district of the Arunachal Pradesh.
- iv. *Garra Ranganensis*: The species was discovered in the Ranga River.
- v. *Physoschistura Harkishorei*: The species was discovered in the Dibang and the Lohit rivers in Lower Dibang Valley district.



E. New bird species discovered in Arunachal Pradesh:

A new species of bird, scientifically named *Zoothera salimalii*, has been discovered by biologists in Arunachal Pradesh. It has been named 'Himalayan Forest Thrush' as it was found in the snow-capped mountains of the Himalayas. As per reports, it is the fourth such discovery in India since independence and first in the past decade.

F. Researchers from 5 institutes throughout India discover new gecko species from Arunachal Pradesh.



- A staff of researchers from 5 institutes throughout India has found a brand new gecko species in Arunachal Pradesh. Their discovery was revealed within the worldwide peer-reviewed journal Evolutionary Systematics in Mid January 2021.
- The brand new species, which belongs to the genus *Cyrtodactylus* generally known as bent-toed geckos, was found by Zeeshan Mirza of the Nationwide Centre for Organic Sciences in Bengaluru, Harshal Bhosale and Mandar Sawant of the Bombay Pure Historical past Society in Mumbai, Faizan Ansari of the Madras Crocodile Financial institution in Chennai, Gaurang Gowande of Ferguson Faculty in Pune, Pushkar Phansalkar from Pune, and Harshil Patel of the Veer Narmad South Gujarat College in Surat.
- The researchers have named the species *Cyrtodactylus arunachalensis* after the state during which it was found. "The discovering of this lizard species is vital of it proves that the State of Arunachal Pradesh is wealthy in biodiversity which is but to be documented."
- The staff discovered the gecko on a month-and-a-half-long expedition throughout Arunachal Pradesh throughout late June to early August 2019 in a try to check undocumented biodiversity within the state with the assistance of DNA information.

- The gecko is the fourth new reptile species to be found by the staff through the journey. The opposite three species which were found have been snakes, considered one of which was a pit viper species — *Trimeresurus Salazar* which was named after the character Salazar Slytherin from the Harry Potter collection.
- “These geckos are strictly nocturnal and are discovered normally round rocky areas or below culverts. Most members of this group look fairly related and therefore a detailed look is important to separate the species



G. Assam keelback snake registers presence after more than a century:

June 29, 2020

129 years ago, the centre of the Ahom dynasty, Si-vasagar district of Upper Assam, would have had impenetrable evergreen forest teeming with wildlife. It's the massive tea plantation that took its toll first, and perhaps during that time, Samuel Edward Peal, a British tea planter based in upper Assam, collected two specimens of a small 50 cm long brown-coloured snake and deposited in the museum.

In the year 1891, William Lutley Sclater, a British zoologist, formally described the snake as a new species in a half-page description and named it after the collector (Edward Peal) and commonly after the place where it was found.

Of the two original specimens, one was kept in the Zoological Survey of India, Kolkata, and the other in the Natural History Museum, London. This species has never been reported since then; nobody knew where it lived and how it looked, and everyone considered it a lost species.

In September 2018, a team from the Wildlife Institute of India (WII), Dehradun, retraced the steps of the century-old iconic Abor Expedition to Arunachal



Pradesh. They initiated their survey from the Poba reserved forest, located at the interstate boundary between Assam and Arunachal Pradesh, from 30 September, 2018. This relict patch of lowland Brahmaputra Valley tropical wet forest is characterized by a three storied appearance with >30 m canopy with numerous, small, slow-moving perennial streams and rivulets in the forest interior.

While following one of these muddy-bottomed streams in the forest interior, at around 10:30 h, they recorded this harmless snake coiling under the submerged leaflitter of a stream. The snake was difficult to spot among leaflitter due to its dark-brown colour, but its belly contrasted it with brown spots on a yellow background – and that's what caught their attention.

To confirm the identity and evolutionary relationships of this rare find, collaboration came from the Natural History Museum, London, where original the specimen was kept intact, unlike the one in the Zoological Survey of India, Kolkata. Subsequently, they identified this species as the Assam keelback (*Herpetoreas pealii*), based on morphological and molecular comparisons.

The discovery of the Assam keelback from a slow-flowing stream inside a forest indicates the need to prioritize conservation of ‘special habitats’ to safeguard microhabitat specialized species.

The Assam keelback is the real ‘Khilongia of Upper Assam region’ as this species is found nowhere else in the world. Poba, at the interstate boundary between Assam and Arunachal Pradesh, is a reserved forest with a ‘least protection’ status. The structure and composition of this forest have been highly modified as a result of past logging events and fragmentation by a highway and a village road.

They feel that this discovery is significant for the fact that they have discovered a first female individual of the species, and a natural habitat where this rare snake exists. The Assam keelback is endemic to lowland evergreen forests of upper Assam that were already fragmented into small patches, mainly from the expansion of tea plantations, habitation and agriculture.

Emerging threats of coal mining and oil exploration in these regions will only deteriorate the biodiversity values of these fragmented patches. In addition to new fieldwork, looking for the Assam keelback in other forest patches close to the Poba reserve forest is warranted, such as in the Pani Dihing Wildlife Sanctuary and the Dibru Saikhowa National Park in Assam, and the Daying Ering Wildlife Sanctuary in Arunachal Pradesh.

(Source: Abhijit Das is Scientist D, Wildlife Institute of India, Dehradun <https://arunachaltimes.in/index.php/2020/06/29/assam-keelback-snake-registers-presence-after-more-than-a-century/>)

H. New orchid species discovered; habitat disturbed by highway work:

ITANAGAR, Feb 16:

- A new species of orchid, *Spathoglottis arunachalensis* (Orchidaceae), has been discovered from West Kameng district.
- The new species has been officially named and published in the current issue of the international journal of plant taxonomy, *Phytotaxa*, coauthored by Dr Jambe Tsering of the Orchid Research Centre (ORC), Tipi, and Dr Kothareddy Prasad of the Botanical Survey of India, Hyderabad.
- Genus *Spathoglottis* consists of about 50 species, of which only four, including the new discovery,

are found in India as informed by the authors.

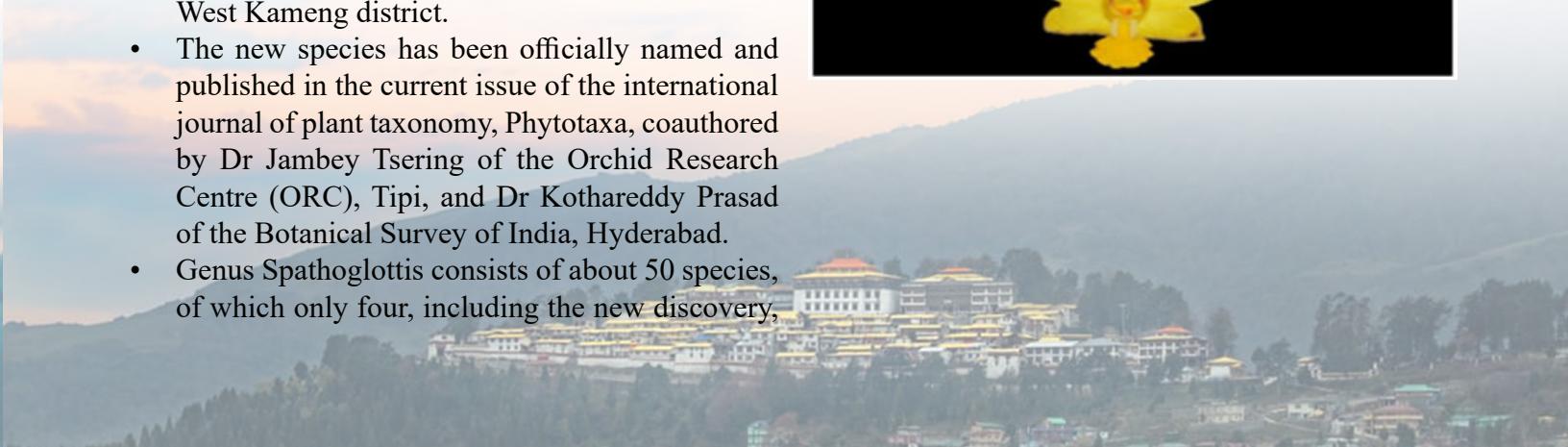
- It was first notice in October 2016 that a team of the ORC noticed a unique, yellow-flowered *Spathoglottis* population during a field trip to the Sessa orchid sanctuary in West Kameng said by Drs Tsering and Prasad.
- “The species is now confirmed as new and named after the state Arunachal Pradesh, where this novelty occurs.”
- The type specimens of the new species are stored in the orchid herbarium in Tipi.

The new species is provisionally assessed as ‘critically endangered’ as per the IUCN criteria (2014). The original habitat of the species “is totally disturbed due to ongoing highway construction.”

- Designating the newly reported species as ‘the lost *Spathoglottis*’, the ORC has announced a cash reward of Rs 10,000 for those who spot the species in its type locality.

“Besides, three more orchid species were recorded by the ORC during the past year, which are new for the state and communicated to various journals for publication,” Dr Tsering added.

(Source: <https://arunachaltimes.in/index.php/2020/02/17/new-orchid-species-discovered-habitat-disturbed-by-highway-work/>)



I. New tortoise species found in India for the first time

The first-ever sighting of the rare Impressed Tortoise or *Manouria impressa* will help to focus on turtle conservation in Northeast India.



*Pic:- Impressed Tortoise (*Manouria impressa*) found near Yazali of Lower Subansari district in Arunachal Pradesh*

Wildlife experts have discovered the Impressed Tortoise also known as the Manouria impressa – a new species of tortoise that are elusive and have never been previously sighted in India – near Yazali of Lower Subansari district in Arunachal Pradesh, the Wildlife Conservation Society-India said in a press statement on 25th June 2019.

A male and a female species of the Impressed Tortoise were discovered in June 2019. This discovery has increased the total number to 29 species of non-marine chelonians and five tortoises in the country.

J. New moth species spotted in Arunachal Pradesh

- A team of researchers have spotted a new moth species and rediscovered another not seen in India in over a century at the Tale Wildlife Sanctuary (TWS) in Arunachal Pradesh.
- The researchers, two from Dehradun-based Titli Trust, two from Bengaluru-based National Centre for Biological Sciences and one from Pune discovered the two species in August last year, Hindustan Times reported.
- The findings were published recently in Zootaxa, a peer-reviewed scientific journal, appeared from Auckland in New Zealand.
- “The new moth species that we discovered belongs to the rare genus ‘Metallolophia’, of which

only 16 species are known globally and three in India. We have named it ‘Metallolophia taleensis’ after the Tale wildlife sanctuary where it was discovered,” said Sanjay Sondhi of Titli Trust.

- According to the researchers, ‘Metallolophia taleensis’ can be distinguished from other species in the same genus by the presence of prominent oval black-edged oval green spot on upperside forewing and smaller spot on hindwing.
- The new species has been recorded at the Tale wildlife sanctuary only in the month of August so far.
- It has not been seen at any other location in any other month and nothing is known about its life history yet.

(Source: <https://nenow.in/north-east-news/arunachal-pradesh/new-moth-species-spotted-in-arunachal-pradesh.html>)

Conclusion :-

The Arunachal Pradesh is an important part of the Himalaya Biodiversity Hotspot, one of the globally recognised regions known for high species diversity and endemism, as well as a high number of globally threatened species. However, the state remains relatively overlooked and unexplored. The discovery highlights the need for further herpetological investigations into the region. Arunachal Pradesh is among the least explored states in northeast India, there are many unexplored regions still exist where varieties of species still need to be discovered that we never seen before.

“The aroid flora of Arunachal Pradesh, which has immense ecological and economic value, has been largely ignored by botanists and conservationists, and therefore the particular group of species still largely remains unexplored,” which need to be in categorically prioritized with government intervention is an utmost necessary.

The demand for alternative remedies has given rise to a poaching industry that, along with other factors, has decimated animal populations

A combination of rich biodiversity and low human population densities makes Arunachal Pradesh a conducive habitat for wildlife, but widespread hunting is

a serious threat to the biodiversity of the region (Velho & Laurance, 2013; Mazumdar, Samal & Gupta, 2014) and threatens numerous charismatic species, including goral *Naemorhedus* spp., takin *Budorcas taxicolor*, black bear *Ursus thibetanus*, common leopard *Panthera pardus*, clouded leopard *Neofelis nebulosa*, bearcat *Arctictis binturong* and hornbill species. The region forms a large part of global biodiversity hotspots and has the highest per capita forest area in India (Chaudhuri & Sarkar, 2003). Besides being rich in biodiversity, the state is home to 26 tribal groups, with 110 sub-tribes, each with its own specific cultural identity (Datta, Naniwadekar & Anand, 2008; Pandit, 2017). The tribes of Arunachal Pradesh have been granted rights and privileges by Indian laws, which have a knock-on effect on natural resources; these include the practice of slash and burn (shifting cultivation) agriculture and hunting. The tribal communities of the Arunachal Pradesh are governed, partially, by the local customary and ritual laws, which have huge impacts on their lifestyles (Velho & Laurance, 2013). Due to the rugged mountain topography and inaccessible terrain, these tribal communities have, for decades, remained socially, culturally and economically isolated from contemporary India.

Given these challenging circumstances, urgent action is required in order to manage and conserve the wildlife in Arunachal Pradesh. Notably, the rights and privileges granted to the tribes, including their cultural and customary hunting practices, combined with lack of livelihood and economic opportunities, constitute the principal constraints that get in the way of strict enforcement of the State's conservation laws. The goal of effective conservation of wildlife in Arunachal Pradesh can only be achieved through education and awareness programs, active participation of tribal communities in conservation programs and putting sustainable livelihood conservation strategies in place (Masolene, 2017).

In recent years, the Government of India has ramped up development activities in the region. For instance, a number of major development schemes, such as hydropower projects, are expected to bring the region into India's mainstream development profile. Even though dams are generally regarded as significant drivers of the loss of biodiversity (Pandit & Grumbine, 2012; Bhatt, Tiwari & Pandit, 2017) (note that although we do not support unsustainable development activities), if these projects are unavoidable, in

our experience, they can be used as positive forces for wildlife conservation in Arunachal Pradesh. We have been part of many Environmental Impact Assessment studies of hydroelectric projects in Arunachal Pradesh, including interacting with the local tribes. We find that many local residents are well educated, engaged in government/private jobs in nearby towns and understand the importance of biodiversity conservation. Our interactions with these communities have focused on the alternative sources of livelihoods and measures to support biodiversity conservation.

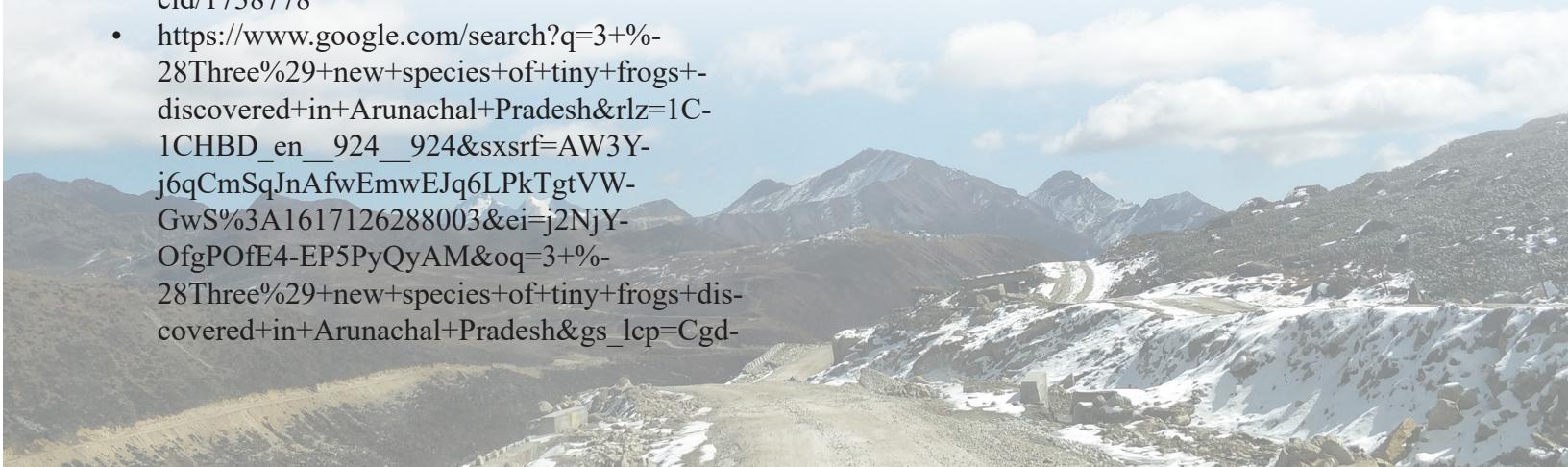
The conservation measures we have outlined in the various environment management plans are as follows:

1. A comprehensive awareness and education program run by local non-governmental organizations and civil society groups, with the assistance of the State Forest Department, addressing the significance of biodiversity conservation and the impacts of hunting. This can be achieved by involving the heads of the villages (Gram Budhas) and religious leaders. The teachings of religious and cultural leaders can effectively change the positions of hunters vis-a-vis wildlife (Velho & Laurance, 2013).
2. Provision for fulltime jobs for active hunters. Active hunters can easily be employed by the developers of major projects, at least under the unskilled jobs category in development projects.
3. Active hunters can be encouraged to surrender their guns in exchange for attractive incentives. This strategy can be implemented by district administration and project developers, with certain terms and conditions. Project developers can raise the funds for implementation of this scheme under provisions in their plans.
4. The cultural attachment of local population for wildlife trophies and hides is widespread in Arunachal Pradesh. They use different body parts, viz. hornbill beaks, leopard jaws and skulls of big cats, hides of cats, bears, deer, monkeys, etc., as caps, ornaments, jackets, knife enclosures, etc. Their demand for these animal parts can be satisfied by distributing replicas of trophies made of fabricated synthetic materials at low costs. Similar practices have been applied successfully in the Nyishi tribal area of Arunachal Pradesh, with the

- help of Wildlife Trust of India. This intervention has played a key role in conserving the hornbill population in the area (see Kumar & Riba, 2015).
5. It is heartening that the tribal populations are more than willing to implement the conservation measures and could prove to be crucial to the future of wildlife species in this unique region of India

References /Photo Source:-

- Department of Environment & Forests, Govt. of Arunachal Pradesh/ <http://arunachalforests.gov.in/>
- <https://theprint.in/environment/3-new-species-of-tiny-frogs-discovered-in-arunachal-pradesh/349779/>
- [https://www.business-standard.com/article/pti-stories/three-new-frog-species-discovered-in-arunachal-pradesh 120011500510_1.htm#:~:text=The%20new%20species%20discovered%20from,Liurana%20minuta%2C%20he%20said.](https://www.business-standard.com/article/pti-stories/three-new-frog-species-discovered-in-arunachal-pradesh-120011500510_1.htm#:~:text=The%20new%20species%20discovered%20from,Liurana%20minuta%2C%20he%20said.)
- https://www.google.com/search?q=3+-28Three%29+new+species+of+tiny+frogs+discovered+in+Arunachal+Pradesh&rlz=1C1CHBD_en_924_924&sxsrf=AW3Y-j6qCmSqJnAfwEmwEJq6LPkTgtVW-GwS%3A1617126288003&ei=j2NjY-OfgPOfE4-EP5PyQyAM&oq=3+-28Three%29+new+species+of+tiny+frogs+discovered+in+Arunachal+Pradesh&gs_lcp=Cgdnd3Mtd2l6EANQu0pYrU1gu1VoAHAeA-CAAQCIAQCSAQCYAQCgAQGqAQdnd3Mt-d2l6wAEB&sclient=gws-wiz&ved=0ahUKEw-in5M_vyNjvAhVn4jgGHWQ-BDkQ4dUD-CA0&uact=5#
- <https://www.telegraphindia.com/north-east/3-new-frog-species-found-in-arunachal-pradesh/cid/1738778>
- https://www.google.com/search?q=3+-28Three%29+new+species+of+tiny+frogs+discovered+in+Arunachal+Pradesh&rlz=1C1CHBD_en_924_924&sxsrf=AW3Y-j6qCmSqJnAfwEmwEJq6LPkTgtVW-GwS%3A1617126288003&ei=j2NjY-OfgPOfE4-EP5PyQyAM&oq=3+-28Three%29+new+species+of+tiny+frogs+discovered+in+Arunachal+Pradesh&gs_lcp=Cgdnd3Mtd2l6EANQu0pYrU1gu1VoAHAeA-CAAQCIAQCSAQCYAQCgAQGqAQdnd3Mt-d2l6wAEB&sclient=gws-wiz&ved=0ahUKEw-in5M_vyNjvAhVn4jgGHWQ-BDkQ4dUD-CA0&uact=5#





Source : <https://scroll.in/latest/928357>

Published by
State ENVIS Hub, Arunachal Pradesh
on Status of Environment & Related Issues
Dept. of Environment & Forests
Govt. of Arunachal Pradesh, Itanagar

