

## Zoological Diversity

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*India is one of the mega-biodiversity countries in the world with unique biogeographical locations, diversified climatic conditions and wide array of ecosystems from deep sea to high mountain ranges at Himalayas. During the century, a variety of terrestrial and marine ecosystem areas, especially the diversity-rich areas in the forest ecosystems, grasslands, coastal plains (terrestrial ecosystem types), and varying coastal/marine ecosystems, including coral-reef ecosystems have been explored in India.*

**A**ccording to world biogeographic classification, India represents two of the major realms, the Palearctic and Indo-Malayan, and three biomes viz. Tropical Humid Forests, Tropical Dry Deciduous Forests, and Warm Deserts/Semi-Deserts. Indian landmass has been classified into 10 Biogeographic Zones and ZSI documented the faunal resources in all biogeographic zones to the extent of 30,377 species in the Himalayas, 3,324 species in Trans-Himalayas, 11,009 species in Islands, 18,527 species in Northeast, 3,346 species in Desert, 7,424 species in Semi-Arid, 11,883 species in Coasts, 17,099 species in the Western Ghats, 14,640 species in Gangetic Plains, and 15,539 species in Deccan Peninsula. In order to protect biodiversity, 990 Protected Areas sprawling over 5.27% of the country's geographical areas have been designated, of which faunal communities have been thoroughly listed among 120 Protected Areas by the Zoological Survey of India (ZSI).

The ZSI under the Ministry of Environment, Forest and Climate Change (MoEF&CC) is a more than a century-old organisation, established in 1916, for inventorying the faunal resources of the country right from Protozoa to Mammalia. It has contributed to the revision of the Wildlife (Protection) Act, 1972 by Govt of India and has advised on the matter related to faunal diversity and conservation in different international forums. Headquartered in Kolkata, with its 16 Regional Centres spread across the country, ZSI is studying the Indian fauna of all the States, UTs, and Protected Areas present in different ecosystems.



*Great-Indian Bustard at Desert National Park, Rajasthan*

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Golden Langur, found primarily in Assam

Altogether, 1,03,258 species have been documented in India. Among the animals reported from the country, 2,841 species are protected under different schedules of the Wildlife (Protection) Act, 1972 for better conservation.

### Coastal and Marine Biodiversity

India is endowed with a long coastline of 7,516.6 km on the mainland, Lakshadweep, and the Andaman & Nicobar Islands. The country has the 18<sup>th</sup> largest Exclusive Economic Zone (EEZ) with a total area of 2.37 million square kilometres. In the Indian Ocean region, India is one of the highest marine biodiversity countries for 20,444 species. Besides, 9,457 species from freshwater, 3,939 species from estuarine, and 5,747 species from mangrove ecosystems have been recorded in the country. Among the Indian fauna, 5,632 species have been included in various categories on 'IUCN Red List' which requires much attention for conservation.

### State Fauna

ZSI has made notable progress in its mandatory scientific function of faunistic survey/exploration of India towards documenting its faunal wealth. During the last 107 years, a variety of terrestrial and marine ecosystem areas, especially the diversity-rich areas in the forest ecosystems, grasslands, coastal plains (terrestrial ecosystem types), and varying coastal/marine ecosystems, including coral-reef ecosystems, were explored. The faunal diversity of 28 States and Union Territories has been published.

### New Discovery

Scientists of ZSI are describing new species at the rate of 125 to 175 per year. Till December 2021, a total of 5,300 species have been described as new to science. In 2021, ZSI discovered one new genus and 131 species and recorded 102 species.

### Status Survey

Significant progress made in the monitoring of the status of the

endangered/rare species of animals was undertaken. Arthropods: Horseshoe Crabs (*Carcinoscorpius rotundicauda* and *Tachypleus gigas*); Robber Crab (*Birgus latro*); Cnidaria: corals of Andaman and Nicobar Islands; and corals of Gulf of Kutch, and Lakshadweep waters; amphibians of Western Ghats; birds viz. Great-Indian Bustard (*Ardeotis nigriceps*, Vigors), Nicobar Megapode and Black-necked Crane (*Grus nigricollis*); Golden Langur (*Trachypithecus geei*, Khajuria), Hoolock Gibbon (*Bunopithecus hoolock*, Harlan); Himalayan Musk Deer (*Moschus chrysogaster*, Hodgson); Crab-eating Macaque (*Macaca fascicularis umbrosa*, Miller); Swamp-Deer (*Rucervus duvaucelii*, Cuvier); Wild Ass (*Equus hemionus khur*, Lesson), and Himalayan Blue Sheep (*Pseudois nayaur*). Moreover, long-term monitoring of sea turtles and other threatened fauna are also being undertaken by ZSI. Recently, ZSI has taken an initiative of a massive tagging programme of Olive Ridley sea turtles along the Odisha coast and Leatherback turtles in Great Nicobar Island for tracking their migration and movement between feeding and breeding areas in the Bay of Bengal and the Indian Ocean. ZSI has also initiated several innovative programmes from the molecular level to the monitoring of fauna. There are at least 37 species of mammals genetically identified from Himalayan regions through non-invasive genetic study techniques. Similarly, the population genetics of Arunachal Macaque (*Macaca munzala*) and population genetics of Barking Deer (*Muntiacus muntjak*), as well as Chinese Pangolin, have been carried out by scientists of ZSI. Studies viz. phytogeography patterns of Ibex and adaptive spatial planning of Protected Area network for conserving the Himalayan brown bear, as well as distribution of modeling and climate change risk assessment strategy for rare Himalayan Galliformes species using archetypal data abundant with cohorts for adaptation planning and other such research taken up by ZSI contributes substantially towards conservation and management of the threatened fauna of India. Adding to this, advanced research on soundscape (acoustics) through spectrogram of vocalisation of animals, and impact of forest fire on faunal diversity in the Northeastern Region of India are vital contributions by ZSI.

### Long Term Monitoring of Fauna

Long Term Ecological Observatories (LTEO)– Monitoring Arthropods in LTEO sites funded by MoEF&CC, is also being implemented through ZSI. A pilot project on Biodiversity Corridor-Baseline Survey and Feasibility assessment under Project for Improvement of Himachal Pradesh Forest Ecosystems Management & Livelihoods has been

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initiated by ZSI. Moreover, in order to understand the impact of climate change, long-term monitoring plots have been established in Andaman and Nicobar Islands and Lakshadweep.

### Forensic Study

ZSI is designated as a Forensic Laboratory by the Ministry of Home Affairs, Government of India, for solving wildlife case materials and supporting the MoEF&CC. Studies dealing with chromosomal mapping, PCR, and DNA Barcoding of animals including threatened species have been taken up by ZSI and more than 8,000 DNA sequences have been barcoded and registered in the NCBI database.

### Mapping of Fauna

ZSI has implemented a number of geospatial modelling studies including the mapping of biological corridors, landscape change analysis, and climate change risk modelling for several studies of Himalayan as well as other areas in collaboration with the State Forest Department. Out of 5.7 million specimens, 3.8 million specimens are identified and geo-tagged to 4.2 unique localities, pertaining to about 40,000 animal species. Mobile Application and Web GIS have been developed in collaboration with National Remote Sensing Centre, ISRO, to provide specific information on different animals in Protected Areas of India. A geospatial database has been created for the threatened vertebrates of the Indian Himalayan Region. The database will be useful in understanding the diversity and richness of wildlife



*Himalayan Blue Sheep*

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species in the Himalayan region. ZSI is currently working on developing the geospatial repository of the fauna of India based on the National Zoological Collections. It has undertaken a range-wide study on Red pandas to establish a fine-scale spatial pattern of genetic variation and contemporary gene flow with respect to landscape connectivity to cover the entire distribution range of Red pandas in India.

### Reef Restoration

Approximately, 1050 sq metre area of degraded reefs has been restored with branching coral species belonging to the family Acroporidae, which are the dominant reef contributors in all world reefs, in collaboration with the Government of Gujarat through World Bank-ICZM. Presently, the translocation of corals in the Gulf of Kutch is being carried out for Indian Oil Corporation.

Studies on pollinators, invasive and alien species, and climate change with reference to faunal diversity and conservation have been envisaged. An attempt has also been made to understand the impact of forest fire in Northeast India and also to predict the fire-prone area.

The results of the research finding of ZSI were brought out in the form of scientific publications/documents contributing a considerable quantum of taxonomic knowledge on Indian fauna. Scientific documents related to State fauna, Conservation Areas, records, monographs, pictorial handbooks, occasional papers, and scientific papers have been published in national/international journals by scientists of ZSI. Altogether, 1,704 documents (books and monographs) and 13,192 scientific papers have been published by ZSI till 2021. Over 181 documents and 2,405 scientific papers have been published during the last five years. During the period of the last two years, more than 770 publications have been completed.

ZSI has contributed towards the revision of the Wildlife (Protection) Act, 1972, of Govt of India, has advised on the matter related to faunal diversity and conservation at the national level viz. for MoEF&CC, ESZ, wetlands conservation, curbing wildlife crime, MoES on ocean science and technology, marine biodiversity, alien and invasive species for Ministry of Agriculture and Ministry of Commerce and Department of Science & Technology, Govt of India. ZSI is also contributing services for various Ministries of Government of India viz. Ministry of Jal Shakti on freshwater and wetland data to Central Water Conservation, to the Ministry of Fisheries, Animal Husbandry & Dairying on information pertaining to exotic fishes, for Project Dolphin of MoEF&CC. □