

## Marine faunal diversity\*

Peninsular India has a long coastline of about 7516.6 km with an exclusive economic zone (EEZ) of 2.02 million km<sup>2</sup>, a continental shelf area of 372,424 km<sup>2</sup> and territorial water of 193,834 km<sup>2</sup>. The continental shelf, oceanic islands and coastal ecosystem of India represent a wide variety of ecosystems such as estuaries, mangroves, backwaters, lagoons, coral reefs, salt marshes, as well as rocky and sandy shores. Studies on marine faunal communities of India were initiated in 1784, but most of the inventories were restricted to a depth of 200 m, while our seas extend to a maximum of 4600 m. On completion of 100 years of services to the nation, the Zoological Survey of India (ZSI) made a self-assessment of its achievement on faunal diversity studies in the Indian seas. This revealed that a total of 20,444 species have been reported from the marine environment which contribute to about 20% of the Indian faunal diversity. In order to disseminate the knowledge acquired by ZSI, a workshop on marine faunal diversity was conducted to sensitize students, researchers, scientists and conservationists of the country. A total of 50 participants, including research scholars, scientists and academicians from all over the country attended the workshop. The workshop comprised of 4 sessions with 15 lectures by experts from ZSI, as well as those from other leading institutions in India. It covered most of the faunal groups from Protozoa to Mammalia in two days of deliberations.

The workshop was inaugurated by Rajendra Prasad Das (Vice-Chancellor, Berhampur University) and the felicitation address was delivered by Kailash Chandra (Director, ZSI). He articulated the need for marine faunal exploration and its conservational approaches for a blue economy and sustainable development. Other speakers briefly mentioned the value of marine biodiversity and the necessity of taxonomical studies.

\*A report on the National Workshop on 'Current Status of Marine Faunal Diversity in India' the workshop was held during 26–27 October 2017, at Zoological Survey of India, Gopalpur-on-Sea.

Chandra also delivered a plenary talk on the history of ZSI and its contribution to the nation. He especially recalled the role of the Research Vessel *Royal Indian Marine Ship (R.I.M.S.)* in marine research between 1884 and 1926. He narrated ZSI's faunal exploration from the time of British India by the founder Director, Thomas Nelson Annandale till date. He also mentioned about the national database and its updating through the discovery of new faunal species as well as their geographical distribution by scientists of ZSI.

The technical session of the workshop commenced with a lecture by K. C. Gopi (ZSI, Kolkata) on 'Ichthyofaunal diversity in coastal and marine ecosystem in India'. He described the evolution of marine fishes in the Malaysia–Philippines–Indonesia triangle, their dispersal and present global status. He also mentioned about fishes of brackish water ecosystem, marine commercial fishes and their correlation for sustainable livelihood of coastal population. P. Jasmine (ZSI, Kolkata) spoke on 'Zooplankton diversity in India'. She discussed a wide variety of zooplankton along with depth gradient and their biological as well as physiological role in the management of marine food web and biological carbon pump. K. Valarmathi (ZSI, Kolkata) presented a thorough overview on the 'Diversity of crustaceans in Indian seas'. She emphasized on the crustacean taxonomy along with several groups of least-explored crustaceans in marine as well as brackish water ecosystems of India. P. Dandapani (formerly with ZSI) elaborated on the status on 'Marine mammals of India'. He gave a detailed account on different marine mammals as well as the difference between Cetacea and Sirenia with morphological taxonomy. He also mentioned the present threats on marine mammals and the methods of study to document stranded mammals along the coastal areas, if spotted. D. V. Rao (ZSI, Hyderabad) presented an overview on 'Diversity of fishes in the Andaman and Nicobar Islands'. He categorized commercially important fishes, ornamental fishes, venomous and poisonous fishes of Andaman and Nicobar Islands among the

reported 1583 species and mentioned their importance in the development of socio-economic structure along with the livelihood of fishing community. C. Stella (Alagappa University, Karaikudi) talked on 'Diversity of molluscs in India with special reference to Gulf of Mannar and Palk Bay'. She made noteworthy comments on the significance of molluscs in community development as a source of food.

On the second day of workshop, Swetapadma Dash (ZSI, Gopalpur-on-Sea, Ganjam) made a presentation on 'Diversity of estuarine aquatic insects'. She compared the aquatic insects of the western and eastern coasts of India and described their adaptation to physiological conditions. C. Raghunathan (ZSI, Port Blair) highlighted the need for studies on 'Lesser known marine animals in India', where he mentioned the gap areas in faunal exploration in Indian seascape. He has documented a wide variety of faunal groups in Indian waters with good photographs, which was a real visual treat. C. Venkatraman (ZSI, Kolkata) dwelt on the 'Diversity of bryozoans in Indian seas'. He presented the basic structure of bryozoans with their classification and role in the ecosystem. Rajkumar Rajan (ZSI, Chennai) showcased the 'Coral reefs of India with special reference to Lakshadweep'. He mentioned the basic structure organization, as well as role and importance of coral reefs in conserving marine ecosystem. Anil Mohapatra (ZSI, Digha) spoke on 'Diversity of marine aquarium animals in India'. He mentioned different types of fauna which can be used in aquarium trade. Oswin D. Stanley (Eco-Balance Consultancy, Vadodara) presented the scope and initiatives on 'Diversity and restoration of mangroves in Indian subcontinent'. Her talk gave basic idea about mangroves and why this ecosystem is of so much importance. She also provided information on various components of mangroves and the ways to restore them. Basudev Tripathy (ZSI, Kolkata) made a presentation on the 'Marine turtles and their conservations in India'. The significance of turtle conservation and practices for safeguarding turtle nests were emphasized in his

lecture with special reference to the nesting site of the Olive Ridley turtles in Rushikulya Estuary, Ganjam district, Odisha. Ch. Satyanarayana (ZSI, Kolkata) discussed the issue of 'Restoration of corals in Gulf of Kachchh'. He mentioned about the pioneering work of ZSI in this field. The session concluded with a lecture by S. S. Mishra (ZSI, Kolkata) on 'Faunal diversity of Chilika Lake'. He

provided base-line data on the diversity and distribution pattern of faunal communities in Chilika Lake.

The participants raised several questions on conservation practices and exploration of faunal communities in the marine ecosystems of India. They also took an active part during the brainstorming for developing new ideas to bridge the gap in our knowledge on

marine faunal communities of the Indian seas.

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## MEETING REPORT

### Pteridological researches in India\*

The symposium on 'Pteridological research in India' was inaugurated by Brig. (retired) B. D. Mishra, the Governor of Arunachal Pradesh. Mishra highlighted the urgent need to explore innovative ways of conservation of nature's bounty for the welfare of the present and future generations, and called upon researchers to come up with effective and sustainable models of development to mitigate continuous pressure on plants and natural habitats. He also released the book of abstracts of the symposium and *Flora of Kurung Kumey District of Arunachal Pradesh* by S. S. Dash and P. Singh (Botanical Survey of India (BSI)). He expressed hope that BSI will continue quality research in the field of floristic studies. The other speakers during the session were T. N. Thongdok (Speaker of the Arunachal Pradesh State Legislative Assembly), P. M. Padhye (BSI, Kolkata), P. K. Rajgopal and S. P. Khullar (Indian Fern Society). Vineet Rawat welcomed the dignitaries and delegates, while Krishna Chowlu presented the vote of thanks.

In his presidential address, Rajgopal emphasized on the unique pteridophytic flora of the Western Ghats, an UNESCO World Heritage Site with high endemism

and rich diversity; he also urged for its *in situ* and *ex situ* conservation. In his keynote address on 'Fern taxonomy in genomic age', Khullar discussed briefly about various trends and challenges on pteridophyte taxonomy, classification and nomenclature starting from pre-Linnaean period to the modern age. B. D. Sharma, A. K. Srivastava and S. C. Srivastava presented lectures on Mesozoic pteridophytic flora of Rajmahal Hills, Late Paleozoic pteridophytic assemblage of India, and vanished pteridophytes respectively. These speakers were requested to document this scattered information on Indian fossil fern in the form of an illustrated fossil flora of Indian pteridophytes for the future generations.

H. K. Goswami (Bionature, Bhopal) urged for the establishment of 'Fernatums' (ferneries) in various regional centres of BSI for conservation, recreation, demonstration and supply of authenticate material for applied research. He and many other delegates from outside BSI were not aware of the various ferneries and experimental gardens at different centres of BSI where ferns are already in cultivation. There are about 140 species of ferns in cultivation at BSI Gangtok (c.f. Kholia 2017 in *Indian Botanic Gardens: Role in Conservation*, BSI). BSI Dehradun also has a good fernery with many species of ferns. Further, several cultivated or naturally growing ferns can be found in BSI gardens at Barapani in the Shillong campus; Dhanikhari Garden at Port Blair, BSI Itanagar and Acharya J. C. Bose Indian Botanic Garden in Howrah. Many rare tree ferns of India are cultivated by BSI scientists at Sikkim, Shillong, Barapani, Itanagar, Dhanikhari

and Yercaud gardens. Other prominent lead lectures were delivered by A. S. Ahluwalia (Biology and possible role of *Azolla* in mitigation of climate change), N. Punetha (Ecology of scrambling fern family Gleicheniaceae), Ashwani Kumar (Understanding plant development with *in vitro* studies) and H. S. Kirn (*Adiantum*).

B. S. Kholia (BSI, Dehradun) spoke about our historical and natural heritage of botanical research in general and pteridophytes in particular in North East India and Eastern Himalaya. He also focused on the diversity and current status of pteridophyte taxonomy of NE India and Eastern Himalaya. V. Irudiyaraj (St Xavier's College, Palayamkottai) gave a presentation on climate change in relation to ferns and lycophytes and cytology; R. Somvanshi (Indian Veterinary Research Institute, Izatnagar, Bareilly), on bracken and bovine cancer; A. Benjamin on interesting ferns of NE India; K. S. Rajput on pteridophytes of Gujarat. There were several presentations, posters and lectures on pteridophyte diversity, taxonomy, nomenclature, ethnobotany, cytology, molecular biology, ecology, floristics, micropropagation, regional floras and taxonomic studies on several fern families (Adiantaceae, Lycopodiaceae, Thelypteridaceae, Pteridaceae, Dryopteridaceae) and genera like *Cheilanthes*, *Ophioglossum*, *Lepisorus*, *Marsilea*, *Athyrium*, *Isoetes*, *Tectaria*, *Pyrrosia*, *Pteris* and *Polystichum*, etc. The valedictory session was chaired by P. Habung (Additional Secretary, Arunachal Pradesh Legislative Assembly).

Overall, the symposium served as a perfect platform, where expert pteridolo-

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\*A report on two-day National symposium on 'Pteridological researches in India: Perspective of modern approaches in relation to Environment and climate change' organized by Botanical Survey of India (BSI), Ministry of Environment, Forests and Climate Change, Government of India in collaboration with Indian Fern Society (IFS), Chandigarh on 22 and 23 February 2018 at Arunachal Pradesh, Regional Centre at Itanagar.