

This is a new section in *Wetland Science & Practice* that offers distinguished scientists an opportunity to reflect on their career and involvement/contribution to wetland science, management, or conservation. It will appear intermittently as interviews are conducted by SWS members. Students may want to consider interviewing their professors or other mentors – wetlanders who have served as an inspiration for seeking wetlands as a career. If interested in doing an interview please contact Ralph Tiner, editor at [ralphtiner83@gmail.com](mailto:ralphtiner83@gmail.com).

This one offers an interview of Dr. Nepal Chandra Nandi (retired Senior Scientist from Zoological Survey of India) by Priyanka Sarkar, 2019 SWS Wetland Ambassador<sup>1</sup>. The interview was conducted on November 10, 2020.

## Reflections from Indian Scientist Dr. Nepal Chandra Nandi

*Interview by Priyanka Sarkar*

### INTRODUCTION

Dr. Nepal Chandra Nandi served as the Additional Director (Retd.) of the Zoological Survey of India (ZSI), Kolkata, one of the premier Indian organizations under the Ministry of Environment, Forest and Climate Change in zoological research and studies to promote the survey, exploration, and research of fauna in the country. Dr. Nandi earned his M.Sc. (1971) and Ph.D. (1978) under the Supervision of Prof. Amalesh Choudhury (Retd.) from Calcutta University, India.

Dr. Nandi has experience working on the ecology and faunal resources of India's wetlands in different wetland ecosystems including freshwater wetlands, brackish water wetlands, and mangroves for more than 35 years while being involved with ZSI and SEBA (the Social Environmental and Biological Association) Kolkata, India. In addition, he is specialized in Protozoology / Parasitology (Avian Haematozoa). Dr. Nandi has a special interest in fishery and marine sciences and has published some books on crab fisheries as well as fisheries sociology aspects. He is also an honorary consultant of Queensland Museum, Australia. He is a Fellow of the International Biographical Research Foundation. He received training in wetland management from Wetland Advisory and Training Centre (WATC), the Netherlands.

Dr. Nandi has acted as an examiner in Zoology, Environmental Science, Fishery Science, and Marine Science for M.Sc. and M. F. Sc. degrees in nine different Indian Universities. He has supervised five Ph.D. students from Calcutta University and Kalyani University, India. He represented the ZSI, India at the Mangrove Committee of Sundarban Biosphere Reserve of the Forest Department and as the Member of the Wetland Committee, Department of Environment, Government of West Bengal, India. He has published 7 books, 18 monographic accounts, and more than 250 research papers in national and international journals including wetland research. Some of his noted published books and articles on wetland science include Nandi and Misra

1987, Mandal and Nandi 1989, Nandi and Pramanik 1994, Mukherji and Nandi 2004, Pramanik and Nandi 2004, 2011, Pal and Nandi 2006, Mandal and Nandi 2009, and Nandi et al. 2013. Dr. Nandi is a life member of several scientific societies, and presently acting as the Managing Editor (formerly Executive Editor, for 14 years) for the *Journal of Environment and Sociobiology* (ISSN 0973-0834).

### THE INTERVIEW

**Priyanka:** How did you start your career in wetland science?

**Dr. Nandi:** Actually, I was introduced to wetland science in ZSI by former Director, Dr. A. K. Ghosh in 1988 while I was in-charge of Ecology Division, ZSI after my transfer from Sundarban Field Research Station (SFRS), ZSI, Canning Town, West Bengal. However, mangrove and estuarine research were initiated in the early 1980s with an emphasis on fishery sciences, even though I did my Ph.D. from Calcutta University on "Blood Parasites of Indian Avifauna" in 1978, while in service as Sr. Zool. Asst., ZSI, Kolkata.

**Priyanka:** What led you to your current position and industry?

**Dr. Nandi:** I retired from ZSI in January 2009 as Additional Director, ZSI; introduced formally to wetland research



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as Zoologist in 1988. Currently, I am serving as the Vice President SEBA (Social Environmental and Biological Association) Kolkata, since 2004; and also, as the Managing Editor (earlier acted as Executive Editor for 14 years from 2004-2017), for the *Journal of Environment and Sociobiology* published by SEBA since 2004.

**Priyanka:** During your career, what types of wetlands and projects did you work on? Who have you worked with on it?

**Dr. Nandi:** I worked on freshwater wetlands, brackish water wetlands, and mangroves, especially on wetland ecology and faunal resources of wetlands in Indian states namely, West Bengal, Goa, and Kerala as well as India as a whole. The projects I worked on include: 1) wetland faunal resources of West Bengal, 2) wetland faunal resources of Goa, 3) faunal diversity of Vembanad Lake, Kerala, 4) fauna of Indian Museum Tank, Kolkata, 5) faunal diversity of Indian Wetlands, 6) wetland ecosystems in India, 7) limnology, biodiversity and management issues of Mirik Lake, West Bengal, 8) ecological studies of Rabindra Sarovar, 9) fauna of Sundarban mangrove ecosystem, 10) bibliography of Indian Sundarban, 11) crabs and crab fisheries of Sundarban, and 12) fisheries sociology of Indian Sundarban.

In ZSI, I had worked with two Directors - Dr. A. K. Ghosh and Dr. J. R. B. Alfred, three Senior Scientists - Dr. K. Venkataraman, Dr. A. K. Mandal, and Dr. R. A. Khan, four Assistants - Mr. S. Bhuinya, Mr. S. R. Das, Mr. S. K. Das, Mr. J. M. Das Gupta, and four Research Scholars - Manika Mukherji, Sobhana Palit, Sujit Pal, and Mousumi Roy.

**Priyanka:** Regarding these projects, what are their implications to biodiversity conservation and the society & community?

**Dr. Nandi:** My research projects (in ZSI and SEBA) contributed mainly in terms of enriching the scientific records of wetland biodiversity, development of database, and societal and community-level management implication concerns in India through the publication of scientific articles and technical reports on behalf of the ZSI and other governmental organizations. These studies have been useful for administrative actions towards livelihood issues at the community level. Some of the project outputs are mentioned below:

1. A faunal diversity inventory made for West Bengal wetlands as an invited project from West Bengal Biodiversity Board, Govt. of West Bengal, India.
2. Faunal assessments made for freshwater wetlands as well as brackish water wetlands in India as two book chapters in the book - "*Ecosystems of India.*"
3. Wetlands and wetland biodiversity conservation and management scenarios in India.
4. Fauna, fishery, conservation and management aspects of Vembanad Lake, one of India's wetlands of international importance (Ramsar site).

5. In books and journals, I addressed various aspects of the Sundarban mangrove wetland including fauna, fishery, socio-economic aspects, and indigenous management.

**Priyanka:** Since you served at ZSI for almost three decades, what changes have you noticed in India in terms of wetland degradation?

**Dr. Nandi:** I served the ZSI from March 1973 to January 2009 and studied faunal resources of wetlands and wetland-related aspects from the 1980s up to my retirement from ZSI in 2009. Changes that I noticed in terms of wetland degradation in India include: 1) encroachment, 2) indiscriminate waste disposal, 3) reclamation and conversion of wetlands, 4) siltation, 5) pesticide/herbicide problems, 6) oil spillage, 7) shrinkage in the wetland area, 8) weed infestation, 9) management crisis-related degradation, and 10) livelihood and economic activity impairment.

**Priyanka:** What is the status of wetlands in your country and what is the outlook for their future?

**Dr. Nandi:** All Ramsar sites (41 as of November 2020), national wetlands, national lakes are reasonably protected. However, there are various other large, medium, small wetlands of local and regional importance which need to be protected and sustainably used so that they can provide for biodiversity protection and livelihood generated activities for the present and future generations with local administrative support towards the sustenance of such wetlands. Overall, there is a lack of stringent legislation defeating the prospects and preservation of wetlands in India, especially for the smaller ones and open access categories of wetlands.

**Priyanka:** In your view, what are the few top native wetland species of flora and fauna at risk in India?

**Dr. Nandi:** Some flora of Indian wetlands facing risks include, *Bacopa monnieri* (water hyssop), *Centella asiatica* (Asiatic pennywort), *Sonneratia griffithii*, and *Heritiera fomes* among others. And, some Indian wetland fauna found to be at risks include *Platanista gangetica* (South Asian river dolphin), *Batagur baska* (northern river terrapin), *Gavialis gangeticus* (gharial), *Tylosurus gangeticus* (Himalayan newt), *Wallago attu* (helicopter catfish), *Tor putitora* (Himalayan mahseer), and *Glyptothorax gangeticus* (Ganges shark), among others.

**Priyanka:** What are the top invasive species that threaten India's wetlands?

**Dr. Nandi:** Top invasive plant species threatening Indian wetlands include *Eichhornia crassipes* (water hyacinth), *Pistia stratiotes* (water lettuce), *Salvinia molesta* (giant Salvinia), *Alternanthera philoxeroides* (alligator weed),

and *Ipomoea carnea* (pink morning glory). Some major invasive animal species threatening Indian wetlands include *Oreochromis nilotica* (Nile tilapia), *Clarias gariepinus* (African sharp-tooth catfish), *Pygocentrus nattereri* (red-bellied piranha), *Pterygoplichthys pardalis* (Amazon sailfin catfish), and *Aristichthys nobilis* (bighead carp).

**Priyanka:** In your view, what might be the key reason for wetland degradation in your country? What can be done to support or protect the existing wetlands in India?

**Dr. Nandi:** The key factors for wetland degradation in India include: 1) sewage pollution and waste disposal, 2) encroachment and reclamation, and 3) lack of wetland specific as well as appropriate administrative-level integrated management plans.

For effective protection and sustaining the wetlands in India, integration and local administrative supports are important for promoting the wise use of existing wetlands. A SMART (Specific, Measurable, Achievable, Realistic, Time related) management plan is needed for Indian wetlands involving: i) long term/ ideal objectives (mission), and ii) short term / yearly operational objectives under Integrated Wetland Development Programme (IWDP) at the Administrative Block Level in the country so that there should be concerned attention to improving environmental awareness of future generations related to ecosystem services of different wetlands with emphasis on 1) Model Fish Ponds, 2) Model Habitat for Wetland Plants, 3) Model Bird Habitat, Turtle Habitats, Frog Habitats, etc., 4) Sewage fed Fishery Demonstration System, 5) Water Lily Marshes, Lotus ponds, Floating and Suspended Flora, etc., 6) Hydrobiological Demonstration Systems, 7) Vegetation Mat Habitat, 8) Game Fishing Lakes, 9) Waterfront Recreational wetlands, 10) Microclimate Stabilizing Wetland Systems, etc. In addition, community-based wetland livelihood and management approaches are also important to conserve wetlands especially in developing countries like India. The Brace Bridge Nature Park (BBNP), Kolkata, India is a good example. It is a sewage-fed fishery system with two large ponds and some smaller ones that was developed and managed by fishermen communities and has been used as settling ponds and sewage treatment channel; it uses aquatic plants as biofilters along the drainage channel with advice from Fishery Extension Officer, Govt. of West Bengal. (Please note: Draft Management Plan of BBNP as “Own Wetland” was presented in one of the Wetland Management Training Course in the Netherlands in 1996.)

**Priyanka:** How are wetlands viewed by the general population? How can young generation researchers contribute to wetland conservation?

**Dr. Nandi:** The general population is least concerned for both open access and privately owned wetlands. However, I

believe, the young generation including the researchers can be motivated by involving them as wetland workers/managers and giving them specific responsibilities for restoration and management.

**Priyanka:** What were your most memorable experiences? Looking back what are you most proud of in your profession?

**Dr. Nandi:** Some of my memorable experiences include a six-week wetland management training in the Netherlands in 1996 with exposure to Wadden Sea excursion, a visit to Delta area for field study, Weeriben Marshland Nature Reserve experience, and the three-course files with case studies. In fact, I was entrusted in ZSI to comment on files on wetland and mangrove related issues on behalf of the Director, ZSI, and also had the occasion to attend and inspect some of the wetlands of West Bengal as part of a team comprised of members from Botanical Survey of India (BSI), ZSI and the Indian Ministry of Environment and Forest (MoEF).

**Priyanka:** Any push back experiences you would like to share?

**Dr. Nandi:** Earlier in ZSI and presently in SEBA, I have been working on wetlands on academic interests, and as such, there is no push back experience. In fact, I find pleasure in working on wetlands.

## CONCLUDING THOUGHT

*“An Integrated Wetland Development Programme (IWDP) involving Wetland Extension Officers and Wetland Managers at the administrative Block Development Office (BDO) level all over the country (India) based on a SMART (Specific, Measurable, Achievable, Realistic, Time related) Management plan is needed for Indian wetlands” – Dr. N.C Nandi. ■*

## LITERATURE CITED

- Mandal, A. K. and Nandi, N. C. 1989. Fauna of Sundarban mangrove ecosystem, West Bengal, India. *Fauna of Conservation Areas* No. 3: 1-116, Z.S.I., Kolkata.
- Mandal, F. B. and Nandi, N. C. 2009. Biodiversity – Concept, Conservation and Biofuture. Asian Publication Pvt. Ltd., New Delhi, pp. 1-494.
- Mukherji, M. and Nandi, N. C. 2004. Studies on Macrozoobenthos of Rabindra Sarovar and Subhas Sarovar in Kolkata in Relation to Water and Sediment Characteristics. *Rec. zool. Surv. India. Occ Paper* No. 225: 1-119.
- Nandi, N. C. and Misra, A. 1987. Bibliography of the Indian Sundarbans with special reference to fauna. *Rec. zool. Surv. India Occ. Paper* No. 97: 1-135.
- Nandi, N. C. and Pramanik, S. K. 1994. *Crabs and Crab Fisheries of Sundarban* Hindustan Publishing Corporation (India), Delhi-110 007, pp. 1-192.
- Nandi, N. C., Das, A. K. and Dey, A. 2013. Wetland Faunal Diversity of West Bengal. WBBB & NBI, Kolkata, pp. 1- 256.
- Pal, Sujit and Nandi, N. C. 2006. Phytofaunal community of two freshwater lakes of West Bengal, India. *Rec. zool. Surv. India Occ. Paper* No. 248: 1-146.
- Pramanik, S. K. and Nandi, N. C. 2004. *Dry Fish Production Profile of Indian Sundarban*. Classical Publishing Company, Delhi – 110 015, pp. 1-292.
- Pramanik, S. K. and Nandi, N. C. 2011. *Fisheries Sociology of Indian Sundarban*. Narendra Publishing House, New Delhi –110 015, 300pp.