

Smooth-coated Otter as an ecological indicator of riparian habitat ecosystem

Technical Report No. PR234



Riddhika Ramesh
Ankit Moun
Giridharan Rajendran

February 2023

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File No: SRG/2019/000995

Technical report: PR234

Funding Agency

Science Engineering Research Board,
Department of Science and Technology,
Government of India

Principal Investigator

Riddhika Ramesh

Research Fellows

Ankit Moun

Giridharan Rajendran



**Sálim Ali Centre for Ornithology and Natural History
(Ministry of Environment, Forest, and Climate Change,
Government of India)
Coimbatore - 641108, Tamil Nadu, India
February 2023**



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Citation

Riddhika R., Ankit M., Giridharan R. (2023). Smooth-coated Otter as an ecological indicator of riparian habitat ecosystem. Sálím Ali Centre for Ornithology and Natural History, Coimbatore, Tamil Nadu, India. Technical Report (PR 234), submitted to SERB-DST, Government of India.

For Correspondence: Dr. Riddhika Ramesh, riddhikalle@gmail.com

Front and Back cover Design: Ankit M & Giridharan R

Photographs in the report: All images are captured by Research Fellows



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1. Acknowledgements

We sincerely thank the former Director and the present Director-in-charge of SACON for their enthusiastic support and critical comments at various stages of the project. We thank Dr. S. Balasubramanian, former Research Coordinator, SACON, and Dr. P.R. Arun, present Research Coordinator, for their immense support to the Ph.D. Scholar, Junior Research Fellows, and Interns during the project. We thank Dr. Goldin Quadros, Principal Scientist, Wetland Ecology Division, SACON and Mr. Khaja Maideen for their advice and much needed help with handling laboratory chemicals in water quality analysis, instrumentation and calibration of the hand-held multiparameter equipment. We are thankful to Dr. T. Thangaradjou, Scientist-E (then) and Dr. Pramod Kumar Prasad, Scientist-D (present) in charge of the Start-up Research Grant, Scientific and Engineering Research Board, Department of Science and Technology (DST), Government of India for sanctioning sufficient funds to bring out this important project on the ecology of a lesser known semi-aquatic mammal in the Bhavani-Noyyal River Basin. We thank all the forest officials who were with us in our field journeys. We specially thank the Principal Chief Conservator of Forest (PCCF), Chief Conservator of Forest (CCF), Deputy Conservator of Forests (DCF) and Assistant-Conservator of Forest (ACF) for providing necessary research permits. We thank the Ranger Forest Officers; Mr. Senthil Kumar (Sirumugai Forest Range), Mr. Saravanan (Boluvampatti Forest Range), Mr. Manoharan (Karamadai Forest Range), Mr. Shiva (Coimbatore Forest Range), Mr. Suresh, former Range Forest Officer (Periyanaickenpalayam Forest Range), Mr. Selvaraj (Periyanaickenpalayam Forest Range), and Mr. Palaniswamy (Mettupalayam Forest Range). We thank all other Foresters who helped us during the field survey, especially Forester Mr. Arun Singh and Mr. Naveen as well as all the Forest Watchers, especially Mr. Vadugan (Karamadai Forest Range) who provided enormous inputs in the field identification of tracks and signs of otters. We deeply thank all the Anti-Poaching Watchers (APW), especially Mr. Subramani (Kudapatti Forest Range), Mr. Murgesh (Thuvapathi Forest Range), and Mr. Ganesh (Sirumugai) who helped us in the fieldwork. We thank Anti-Poaching Watcher Mr. Laxmanan (Anaikatti Forest Range) who took a step forward to take us to the field when elephant-encounters were high, and he also brought us back safely. We sincerely thank Dr. Anita Varghese, Deputy Director of Keystone Foundation for showing immense interest in further collaboration to explore additional field sites on small mammal surveys in the Nilgiris and we also thank the researchers of Keystone Foundation, Ms. Natasha Rajpurohit & Ms. Habeeba Fatima for their support during the otter fieldwork at Pillur Dam. We thank Mr. Arjun Shivakumar for providing logistic support, Mr. Daniel & Mr. Ravi for taking us safely to the field and staying with us in the field camp. We thank all the interns and volunteers who extended necessary support during field data collection, camera-trapping and data entry. Mr. R. S. Tomar is thanked for kindly sharing his otter photographs, some of which are displayed on the cover page and back page.

- Authors



2. Executive Summary

Fine-scale resource availability and habitat suitability of riverine-edge habitats are vital for the survival of otter populations in India's river basins which are threatened by burgeoning anthropogenic threats. We conducted field surveys in the Bhavani-Noyyal River basin using a 2 km x 2 km grid system from 2019 to 2021. Each grid was surveyed for a maximum of 1 km to record smooth-coated otter evidence (tracks, spraints, mass latrines) and habitat variables at 250 m in two seasons (dry & wet). At the grid scale we applied forward stepwise ordinary least-square regression models to relate otter encounter rates with habitat covariates. We developed self-organizing maps (SOM) of the clusters using artificial neural networks and applied random forests to identify the most influential factor within each cluster. In the dry season, Smooth-coated otter (SCO) encounter rate decreased with the presence of dams/check dams, high proportion of dense vegetation and high salinity but increased with riparian habitat quality index (QBR), proportion of dry deciduous and degraded forest whereas in the wet season encounter rates decreased with the presence of construction, high proportion of scrub jungle, moist deciduous forest and high ammonia concentration while it increased with the presence of sandbanks, pools, smooth non-turbulent stream flow and fast turbulent stream flow near river confluences. In both the seasons, high proportion of barren land, emergent shoreline vegetation was significantly positive whereas grass cover influenced SCO encounter rate negatively. The SOM revealed six clusters in both seasons and only the highest stream order had high to moderate encounter rates of SCO while Asian Small-clawed otter (SCL) evidences were encountered prominently in the clusters with lower order streams flowing through the protected area (PA). Both otter species evidence was relatively low and even absent in stream segments where a higher concentration of total dissolved solids and salinity was present in non-forested areas outside PA. Clusters of dry seasons outside PAs had minimum or no otter evidence. Moderate to high SCO and SCL spraint encounter rates were associated with clusters having less water pollution, high QBR index, moderately dry and moist deciduous forest cover with high riparian tree density and minimum human disturbance. All active holts were recorded in stream segments with high QBR index (80-100%) characterized by minimum human disturbance, high tree density, and moderate riparian canopy cover (40-50%). Our study demonstrates the novel application of quantitative approaches to characterize otter habitat and study the niche contraction and expansion of otter species driven broadly by seasonal changes in fine-scale stream characteristics, thereby resulting in spatiotemporal shifts in otter habitat use and suitability. To our knowledge, this is the first study to have applied advanced machine learning and predictive modeling approaches to understand the spatiotemporal patterns of Smooth-coated otter and Asian Small-Clawed Otter habitat use. In addition, the 4th stream order of Bhavani River passing through the Sirumugai and Mettupalayam forest ranges is a crucial link that connects smooth-coated otter populations with the Moyar river of the Moyar River basin for movement and dispersal of otter groups. It is suggested that there needs to be further surveys on otter species in the Cauvery river basin in west and east-flowing rivers to assess the impact of riparian habitat fragmentation, rise in water levels on holt occupancy, and the scale of poaching/hunting and water pollution on otter dispersal and movements.





**Division of Environmental Impact Assessment
Sálim Ali Centre for Ornithology and Natural History
(Ministry of Environment, Forest and Climate Change, Govt. of India)
Anaikatty (Post), Coimbatore - 641108
Tamil Nadu, India**

