Conservation of birds of the Andaman & Nicobar Islands

Lalitha Vijayan

Vijayan, L. 2009. Conservation of birds of the Andaman & Nicobar Islands. *Indian Birds* 5 (4): 103–107.
Lalitha Vijayan, Salim Ali Centre for Ornithology and Natural History, Coimbatore 641108, Tamil Nadu, India.
Email: *vijayanlalitha@gmail.com*

Abstract

The Andaman and Nicobar Islands have a rich variety of flora and fauna with many rare and endemic species. Realising the importance of the need for conservation of the biodiversity of this fragile island ecosystem, the Salim Ali Centre for Ornithology and Natural History undertook several studies with a focus on birds and their habitats. An overview of these studies, a summary of the results, and conservation perspectives are presented here. A total of 288 avian spp., including subspecies, are recorded from these islands. Five species were studied in detail, namely Nicobar Megapode *Megapodius nicobariensis*, Narcondam Hornbill *Aceros narcondami*, Andaman Teal *Anas albogularis*, Andaman Crake *Rallina canningi*, and Edible-nest Swiftlet *Collocalia fuciphaga*, and species-specific measures for the conservation of these birds, and their habitats, were recommended.

Introduction

Andaman and Nicobar Islands, one of the major island archipelagos of India, are well known for their rich biodiversity (Saldanha 1989; Vijayan *et al.* 2000; Jayaraj & Andrews 2005). However, island communities are a most vulnerable biota, and island ecosystems are not only very fragile, but also harbour a higher proportion of endemics with greater chances of extinction (Castellata *et al.* 2000)—because of rarity, inbreeding, natural calamities, introduced species, and so on (Brooks *et al.* 1997). Forest birds, especially those on islands, are more threatened (Stattersfield *et al.* 1998; BirdLife International 2001). Saldanha (1988) has reviewed the studies conducted in the Andaman and Nicobar Islands. The Zoological Survey of India and the Bombay Natural History society have been conducting faunal surveys on these islands. However, detailed ecological studies were few and hence the Salim Ali Centre for Ornithology and Natural History (SACON) undertook several studies with a focus on the conservation of birds and their habitats. Ravi Sankaran and I initiated these studies. An overview of the studies on the birds of these islands, especially by SACON and the conservation issues are presented here.

Study area and methods

The Andaman and Nicobar Islands (6°45′N—13°41′N 92°12′E—93°57′E), in the Bay of Bengal, are spread over 8,249 km^2, comprising the Andaman Islands (6,408 km^2), and Nicobar Islands (1841 km^2). Jayaraj & Andrews (2005), and Andrews *et al.* (2006) have presented the latest details regarding biodiversity, and the state of the environment, respectively, of these islands.

SACON started preliminary surveys of the birds of these islands in 1992, as a priority area for research and conservation. Status surveys were conducted, following strip transects and stratified sample counts, for the birds in general and especially for a few target species namely, Nicobar Megapode *Megapodius nicobariensis*, Andaman Teal *Anas (gibberifrons) albogularis*, Narcondam Hornbill *Aceros narcondami*, Edible-nest Swiftlet *Collocalia fuciphaga*, and Andaman Crake *Rallina canningi*. Status and distribution of some of the species, especially the endemics, and also ecology of the target species were studied following standard methods (Pettingill 1985; Bibby *et al.* 1992). Studies of target species covered different seasons, except for the Narcondam Hornbill. Habitat characterisation of the Andaman Islands, and identification of high bird diversity areas were done by bird counts and using remote sensing and GIS techniques following Roy *et al.* (1986), Prasad *et al.* (1998), and IIRS (2003). The consequences of the tsunami of December 2004 on the Nicobar Megapodes was assessed in 2005, and a study is under way on the restoration of the affected areas. The impact of nest collection of Edible-nest Swiftlets was studied by monitoring the nesting colonies in caves and was followed up by developing a programme for in-situ and ex-situ conservation of this species (Sankaran1998a; Anon. 2008), which is being continued in collaboration with the Forest Department of Andaman and Nicobar Islands.

Results & Discussion

Initially, a review of the status and distribution of avian taxa was prepared by Sankaran & Vijayan (1993), which listed a total of about 274 including 106 endemics. However, all did not accept status of a few taxa. During our surveys from 1992 to 1998, only a few species were observed due to the following reasons: 1) more emphasis was given to resident and endemic species, and 2) many sub-species could not be differentiated without catching them and taking various morphometric measurements During these surveys we found that seven endemic taxa were very common in Andamans—Green Imperial Pigeon *Ducula aenea andamanica*, Red-breasted Parakeet *Psittacula alexandri abbotti*, Black-naped Oriole *Oriolus chinensis andamanensis*, Racket-tailed Drongo *Dicrurus paradiseus otiosus*, Asian Fairy-Bluebird *Irena puella andamanica*, Asian Glossy Starling *Aplonis panayensis tytleri*, and Red-whiskered Bulbul *Pycnonotus jocosus whistleri*, of which the last two occur also on Nicobar (Vijayan 1999). The Andaman Dark Serpent Eagle *Spilornis elgini*, a near-threatened species, but also cited as one of the rare birds of the world (Mountfort 1988), was rather common during this survey. Ten species were added

(Vijayan *et al.* 2000) to the existing list for these islands (Sankaran & Vijayan 1993) and during 2003–2004 we added three more (Vijayan *et al.* 2005; Mamannan & Vijayan 2009), while Yahya & Zarri (2002a) added another, taking the list to 288. Studies in the Nicobar Islands have revealed the status of several endemic birds and suggestions for developing a protected area network have been proposed (Sankaran 1995, 1997, 1998b). Many endemics were rare and we could not gather enough data to determine their status. Three species on the islands were found assessed to be of immediate conservation concern and were chosen for detailed studies—Nicobar Megapode, Narcondam Hornbill, and Andaman Teal (Vijayan 1993).

The avifauna of the Andaman Islands shows greater affinity to that of south-east Asia and mainland India, than with that of Nicobar Islands (Vijayan *et al.* 2005). Endemic species preferred moist forests and Andaman Cuckoo-Dove *Macropygia rufipennis*, Andaman Hawk-Owl *Ninox a. affinis* and Andaman Crake were rare; the last species being recorded for the first time from North and Little Andaman (Vijayan *et al.* 2005). SACON's landscape ecology study has generated biological richness maps, with areas of different grades, for each major island group; Little Andaman showed a third of its area as having very high priority, followed by South Andaman (Vijayan *et al.* 2005).

Nicobar Megapode

The Nicobar Megapode has two sub-species: *M. n. nicobariensis* inhabits the Nancowry group of islands north of Sombrero Channel, mainly Nancowry, Teressa and Bomboka, and *M .n. abbotti*, the Great Nicobar group of islands, mainly Great Nicobar**. The** population of the former was estimated at 1,200–2,100 and of the latter between 3400 and 6000 (Sankaran 1995). Sankaran & Sivakumar (1999), Sivakumar (2000), and Vijayan *et al.* (2000) studied its ecology. This species is a primitive mound-nester of the littoral forest (Ali & Ripley 1987), mainly restricting itself to within 100 m of the beach. The populations showed declines in many islands where the coastal forests were destroyed or disturbed and the species is threatened (vulnerable) under IUCN criteria (BirdLife International 2001, 2008). The present status, after tsunami, reveals a decline of about 70%, as the littoral forest has been heavily destroyed (Sankaran 2005; Sivakumar 2007).

Narcondam Hornbill

This species has a highly restricted range (6.82 km^2) on Narcondam Island in North Andaman. Its population was estimated at 330–360 in 1998 (Sankaran 1998c), showing a decline from the 1972 record of 400 (Hussain 1984). It is threatened (vulnerable) under IUCN category (BirdLife International 2008). Sankaran (1998c), and Vijayan *et al.* (2000) documented its altitudinal distribution, nests, and population structure . Breeding birds were over four years old and constituted around 46–53% of the population. A majority (88%) of the nests was below 200 m altitude while the younger non-breeding birds occupied elevations >300 m. The nests were located in holes on the trunk or broken branches of large trees. Birds fed on a wide variety of fruits and invertebrates and occasionally small reptiles.

Another short-term study was carried out between January and March 2003 on roosting and nesting by Vivek & Vijayan (2003). Their population estimate was 320–340 birds, which was similar to that of the earlier study but differed from the 432 of Yahya & Zarri (2002b), . These birds used mature undisturbed forests with large trees for nesting and roosting. Additional information was obtained on roosting and pre-nesting activities.

Photo: *Pankaj Sekhsaria*

A megapode on the banks of the Galathea River at South Bay, Great Nicobar Island (2002).

Adult birds roosted in pairs on large trees at elevations of <255 m, and juveniles, in small flocks of three to seven, on a branch of a tree located at higher elevations.

Andaman Teal

The Andaman Teal is restricted to the Andaman Islands and it has long been considered globally endangered at the sub-species level (Green 1992). Green (1992) designated the Andaman Teal as 'vulnerable' or 'doubtfully vulnerable', and Vijayan (1996), Green (1996), and Anon. (2001) categorized it 'endangered', at sub-species level. This taxon has been raised to full species status as *Anas albogularis* by Rasmussen & Anderton (2005). However, BirdLife International (2001, 2008) has not recognised this, and continues to list it as sub-species. This species is the only threatened endemic duck in India, with the exception of the Pink-headed Duck *Rhodonessa caryophyllacea*, which is believed to be extinct. The Andaman Teal inhabits freshwater streams, ponds, swamps and brackish water swamps, tidal creeks and estuaries (Ali & Ripley 1987). A detailed study on this species during 1995–1998 estimated its population at 500–600 (Vijayan *et al.* 2000), and later studies, during 2003–2004 also found these estimates valid (Vijayan *et al.* 2006). However, fluctuation in numbers was very high because of local movements, and the counts were not simultaneous, hence it was difficult to get a realistic population estimate. Ecology of this species showed differential use of habitats at different times. Nesting pools were 20–50 cm deep, mainly brackish, and located in coastal areas, 50–100 m from the hightide line. The nest was a platform of grass or reed mat, 20–35 cm above water, among the reeds, and 20–50 cm from open water (Vijayan *et al.* 2000, 2006; Vijayan 2006).

Edible-nest Swiftlet

The Edible-nest Swiftlet, a cave dwelling species, ranges from the Andaman and Nicobar Islands through Indonesia to the Philippines—the endemic race on the islands being *C. f. inexpectata*. Its population showed declines due to indiscriminate and unrestricted nest collections as the nests are made of its saliva, and the main ingredient of 'bird-nest soup' (Sankaran1998a; Sankaran 2001). Subsequently, a programme was developed in 2002 for in-situ and ex-situ conservation, the latter using the White-bellied Swiftlet *C. esculenta* as a foster parent. It has been progressing well; the chicks of the Edible-nest Swiftlet foster-reared by the White-bellied Swiftlet have come back for nesting; artificial houses are also found to be used by them for nesting, showing the suitability of this programme for farming this species for its sustainable use and conservation (Sankaran & Manchi 2008; Anon. 2008). They also found that in-situ conservation has paid dividends, as protection provided to the caves has helped in substantially increasing the population of the Edible-nest Swiftlet at the selected sites.

Andaman Crake

The Andaman Crake is rare and endemic to the Andaman Islands. So little is known about its ecology and biology that BirdLife International (2001) listed it as 'data deficient'. Hence, a detailed study was carried out during 2004–2007 with status surveys on various islands and ecological studies at two locations, but mainly at Pathilevel, North Andaman (Vijayan & Ezhilarasi 2007; Ezhilarasi 2009). Its population could not be estimated as we had problems in sighting the bird and assessing the distance of calls. The mean encounter rate of this bird was low, 0.29 bird/ point. Smaller islands had lower abundance, but it was higher on larger islands, especially in South, Middle and North Andaman. The study shows that the bird is a habitat specialist of moist forests with clumped distribution showing preference for semi-evergreen and evergreen forests. Its nest is cup-shaped, made up of leaves and twigs, located mostly on the ground, between the buttresses of trees, within 200 m of the forest's edge and near water. Although the population could not be estimated, taking into consideration its low encounter rate, the IUCN criteria such as the restricted range of distribution and a fragmented population with declining locations, area of occurrence estimated to be <5,000 km2 (around 4,000 km2), area of occupancy of around 700 km2, this species is recommended to be considered 'Vulnerable' under 'threatened' category (Vijayan & Ezhilarasi 2007). At present BirdLife International (2008) has listed it as 'near threatened'.

Conservation issues and suggestions

Habitat loss or degradation, hunting, and introduced species are the major threats to birds on these islands, as they are to all the threatened birds of Asia, mainly because 80% are forest species, especially of lowland tropical forests) 30% have a restricted range of distribution as on the islands (BirdLife International 2001; Riley 2002) where habitat changes affect the species much more than on the mainland (Brooks *et al.* 1997). Habitat loss, in many parts of the world, is mainly due to human interferences (Castellatta *et al.*2000). The population problem (mainly because of the settlers from mainland India) has been identified as one of the root causes for habitat changes and other related problems with the development of the area (Davidar *et al.* 1995, 1996; Vijayan 1996,; Sankaran 1997; Vijayan *et al.* 2005). The Forest Survey of India reports of 1999 and 2005 have shown a decrease of 1.5% and 8.6% of forests during 1994–1998 and 1999–2003 respectively, in the Andaman Islands, which are attributed to encroachment by settlers (FSI 1999, 2005). However, there is hope in the future—with the stopping of commercial forestry (logging) operations, removal of encroachments, and habitat restoration (Vijayan *et al.*2006).

The most immediate threat in the Nicobars is the proposal to make Great Nicobar a free port and to create a dry dock and refueling base for international shipping at the mouth of the Galathea River (Vijayan *et al.* 2000). Sankaran (1997) had suggested developing a protected area network for the Nicobar Islands. The 2004 tsunami created havoc, much more in the Nicobars, but natural regeneration along with habitat restoration could improve the situation (Sivakumar 2007).

Data deficient, threatened, and near threatened species, especially endemic, should be given higher priority for research and conservation. Andaman and Nicobar Islands form two of the 218 Endemic Bird Areas of the world with 18 endemic species (Stattersfield *et al.* 1998) and with the addition of the new species, Nicobar Scops-owl *Otus alius* (Rasmussen 1999), now there are 19. Four species are common to both the Andaman and Nicobar groups of islands. Rasmussen & Anderton (2005) have given full species status to the Andaman Teal and their list shows 20 endemics in Andaman and eight in Nicobar. According to BirdLife International (2008), of the 19 endemics, four are threatened, one data deficient, and 11 near-threatened. Nicobar Scops-owl is data deficient, and Nicobar Sparrowhawk *Accipiter butleri* and Nicobar Bulbul *Hypsipetes nicobariensis* are the two threatened taxa on Nicobar Island, which are not studied. Many other species also require detailed surveys during different seasons, concentrating on their specific habitats, in order to assess their status. BirdLife International (2001) has documented that more than 80% of the threatened birds in Asia require population status for monitoring. Meaningful conservation measures can be suggested only after understanding the ecological requirements of these species (Vijayan 1996).

Although an ecological study of the Andaman Teal was conducted for two years, evaluating its habitat requirements, an estimate of such available habitats and movement patterns need to be worked out immediately and site-specific action needed to save this species from extinction (Vijayan 2006; Vijayan *et al.* 2006). The ecology of the Narcondam Hornbill, although partly studied during one breeding season, has yet to be studied intensively (Sankaran 1998c; Vijayan *et al.* 2000; Vivek & Vijayan 2003). The Andaman Crake has a low nesting success, and its fledgling success could not be recorded. Its population is naturally fragmented and there has been a loss of the species from many localities due to habitat loss and degradation. Considering all these factors, management regimes should ensure that adequate protection is given to this species, especially during its breeding season, and full protection of the crucial areas from any kind of human and related disturbances, especially in the larger islands (Vijayan & Ezhilarasi 2007). Some of the above areas are partly or fully protected and many others are near human settlements. Vijayan & Sankaran (2001) have already proposed the southern part of Rutland Island be declared an Andaman Teal Sanctuary. The habitat of this Crake in the localities without full protection may be declared as Sanctuaries or Conservation Areas, delineating the boundaries depending on the status of the land and feasibility. Islam & Rahmani (2004) have listed 19 sites in the Andaman and Nicobar Islands as Important Bird Areas and conservation actions are needed for these and other species-specific sites.

Population of the Edible-nest Swiftlet was found to decline because of the unsustainable harvesting for trade (Sankaran 1998a). Recent studies have shown that nests could be utilised without much adverse effect on the population if protection is provided and collected in a planned manner and also through farming as in many south Asian countries.

Hunting or poaching occurs even in protected areas mostly because of the inadequate facilities with the Forest Department and lack of awareness in the local communities, which should be addressed with all seriousness (Vijayan & Sankaran 2001; Vijayan *et al.* 2005, 2006). Suggestions for the conservation of the avifauna and biodiversity of these islands, resulting from various studies, should be discussed and implemented to maintain these ecologically sensitive and still pristine areas of our country.

Acknowledgements

Ravi Sankaran and I undertook initial surveys with funding from SACON and the initiative of its former Director, V. S. Vijayan. The Edible-nest Swiftlet survey was carried out by Ravi Sankaran, supported by Traffic-India through WWF-India. The first major project was funded by the Man and Biosphere Reserve Programme of the Ministry of Environment & Forests, Government of India with the study of the Nicobar Megapode by Ravi Sankaran and Sivakumar; Narcondam Hornbill by Ravi Sankaran; and Andaman Teal by V Murugan and myself. Another major (long-term) project on the Edible-nest Swiftlet, executed by Ravi Sankaran and Shirish Manchi, has been supported by the Forest Department of Andaman and Nicobar Islands. The project on the Andaman avifauna and biodiversity characterisation was overseen by S. N. Prasad, M. A. Raja Mamannan, Priti Kaushik, A. Giriraj, and myself, and was funded by the NBDB, Department of Biotechnology, Ministry of Science & Technology, Government of India. N Ezhilarasi and I conducted the study on the Andaman Crake with financial assistance from the Ecosystem Research Programme of the Ministry of Environment & Forests, Government of India. The above studies could be done successfully because of the sincerity and hard work of the research students under the guidance of the scientists with the cooperation from the administrative staff and other students of SACON.

These studies would not have been possible without the whole-hearted co-operation and assistance from the Forest Department of Andaman and Nicobar Islands. Officials of various other departments such as District Administration, Forest Development Corporation, Public Works, Harbour Works, Tribal Welfare, Police, Navy, and Coast-guard were also helpful. Scientists from various institutions, namely Botanical Survey of India, Zoological Survey of India and Central Agricultural Research Institute, Andaman and Nicobar Islands Environmental Team, and many others helped us during the study. We have benefited from the discussions and communication with many other scientists within and outside the country. The support from many field assistants and the local communities throughout our studies is gratefully remembered. My heartfelt thanks go to Aasheesh Pittie for taking the initiative of publishing a memorial issue of *Indian Birds* for Ravi Sankaran and for inviting an article from me.

References

Ali, S. & Ripley, S. D., 1987. *Compact handbook of the birds of India and Pakistan together with those of Bangladesh, Nepal, Bhutan and Sri Lanka.* 2nd ed. Delhi: Oxford University Press.

Andrews, H. V., Jayaraj, R. S. C., & Mundoli, S., 2006. *State of environment 2005, Andaman and Nicobar Islands.* Hyderabad, India: Universities Press (India) Pvt. Ltd.

Anon. 2001. Threatened waterfowl species and sub-species. *Threatened Waterfowl Specialist Group News Bulletin* 13: 2–4.

Anon. 2008. Conservation of the Edible-nest Swiftlet *Collocalia fuciphaga* in the Andaman and Nicobar Islands. Pp. 31. Project Report. Coimbatore, India: Salim Ali Centre for Ornithology & Natural History; Forest Department of Andaman and Nicobar Islands.

Bibby, C., Burgess, N. D., & Hill, D. A., 1992. *Bird census techniques.* London, U.K.: Academic Press.

BirdLife International 2001. *Threatened birds of the world.* Barcelona & Cambridge: Lynx Editions & BirdLife International.

BirdLife International 2008. The BirdLife checklist of the birds of the world, with conservation status and Taxonomic sources. Version 1. URL: http://www.birdlife.org/datazone/species /downloads/ BirdLife_Checklist_Version_1.zip [.xls zipped 1MB].

Brooks, T., Pimm, S. L., & Collar, N. J., 1997. Deforestation predicts the number of threatened birds in insular Southeast Asia. *Conservation Biology* 11: 382–394.

Castellatta, M., Sodhi, N. S., & Subraj, R. 2000. Heavy extinctions of forest avifauna in Singapore: lessons for biodiversity conservation in south-eastern Asia. *Conservation Biology* 14 (6): 1870–1880.

Davidar, P., Devi, S. M., Yoganand, T. R. K., & Ganesh, T., 1995. Reserve size and implications for the conservation of biodiversity in the Andaman Islands. **In:** Boyle, T. J. B., & Boontawee, B., (eds.) *Measuring and monitoring biodiversity in tropical and temperate forests.* Indonesia: CIFOR.

Davidar, P., Yoganand, T. R. K., Ganesh, T., & Joshi, N., 1996. An assessment of common and rare forest bird species of the Andaman Islands. *Forktail* 12: 135–142.

Ezhilarasi, N., 2009. *Status and ecology of the Andaman Crake*. PhD thesis. Coimbatore, India: Bharathiar University.

FSI. 1999. *Status report on the forests of India*. Dehradun, India: Forest Survey of India.

FSI. 2005. *Status report on the forests of India*. Dehradun, India: Forest Survey of India.

Green, A. J., 1992. Wildfowl at risk, 1992. *Wildfowl* 43: 160–184.

Green, A. J. 1996. Assessment of which *Anatidae* taxa qualify for globally threatened status. *Gibier Faune Sauvage, Game Wildl.* 13 (1): 777–798.

Hussain, S. A., 1984. Some aspects of the biology and ecology of Narcondam Hornbill *(Rhyticeros narcondami*). *J. Bombay Nat. Hist. Soc.* 81 (1): 1–17.

IIRS. 2003. *Biodiversity characterization at landscape level in Andaman & Nicobar Islands using satellite remote sensing and geographic information system.* Dehradun, India: Department of biotechnology, Government of India & Department of Space, Government of India.

Islam, M. Z., & Rahmani, A. R., 2004. *Important bird areas in India: priority sites for conservation.* Mumbai, India: IBCN & BNHS.

Jayaraj, R. S. C., & Andrews, H. V., (eds). 2005. *Andaman & Nicobar Islands Union Territory biodiversity strategy and action plan.* Pp. 142. India: Prepared under the National Biodiversity Strategy and Action Plan-India, ANET/ GOI-UNDP/A &N D E & F. Universities Press.

Mamannan, M. A. R., & Vijayan, L., 2009. Three new bird records from

the Andaman Islands, India. *Forktail* 25: 154–155.
Mountfort, G. 1988. *Rare birds of the world*. London: Collins.
Pettingill, O. S. R., 1985. *Ornithology in laboratory and field*. University of Minnesota: Museum of Natural History.
Prasad, S. N., Vijayan, L., Balachandran, S., Ramachandran, V. S., & Verghese, C. P. A., 1998. Conservation planning for the Western Ghats of Kerala: I A GIS approach for location of biodiversity hotspots. *Current Science* 75 (3): 211–219.
Rasmussen, P. C., 1999. A new Scops-owl from Great Nicobar Islands. *Bull. B. O. C.* 118: 141–153.
Rasmussen, P. C., & Anderton, J. C., 2005. *Birds of South Asia*: *the Ripley guide*. Washington DC & Barcelona: Smithsonian Institution & Lynx Edicions.
Riley, J., 2002. Population sizes and status of endemic and restricted range species on Sangihe Island, Indonesia. *Bird Conservation International* 12: 53–78.
Roy, P. S., Saxena, K. G., Pant, D. N., & Kotwal, P. C., 1986. Analysis of vegetation types using remote sensing techniques for wildlife habitat evaluation in Kanha National Park. Pp. 6–12. **In:** *Proceedings of the seminar-cum-workshop on wildlife habitat evaluation using remote sensing techniques*. Dehra Dun, India. 22–23 October 1986. Dehra Dun, India: IIRS & WII.
Saldanha, C. J., 1988. *A select bibliography on the Andaman and Nicobar Islands for an environmental impact assessment*. Bangalore, India: Centre for taxonomic studies, St. Joseph's College.
Saldanha, C. J., 1989. *Andaman, Nicobar & Lakshadweep: an environmental impact assessment*. New Delhi: Oxford University Press & IBH Publ. Co.
Sankaran, R., 1995. *The Nicobar Megapode and other endemic Avifauna of the Nicobar Islands: status and conservation*. Coimbatore, India: SACON technical report 2.
Sankaran, R., 1997. Developing a protected area network in the Nicobar Islands: the perspective of endemic Avifauna. *Biodiversity & Conservation* 6 (3): 797–815.
Sankaran, R., 1998a. *The impact of nest collection on the Edible-nest Swiftlet* Collocalia fuciphaga *in the Andaman & Nicobar Islands*. Coimbatore, India: SACON.
Sankaran, R., 1998b. An annotated list of the endemic avifauna of the Nicobar Islands. *Forktail* 13: 17–22.
Sankaran, R., 1998c. Status and conservation of the Narcondam Hornbill (abstract). National seminar on wildlife conservation, research and Management. Dehra Dun: Wildlife Institute of India.
Sankaran, R., 2001. The status and conservation of the Edible-nest Swiftlet (*Collocalia fuciphaga)* in the Andaman and Nicobar Islands. *Biological Conservation* 97: 283–294.
Sankaran, R., 2005. Impact of the earthquake and the tsunami on the Nicobar Islands. Pp. 10–77. **In:** Kaul, R., & Menon, V., (Eds). *The ground beneath the waves: post-tsunami impact assessment of wildlife and their habitats in India*. Vol 2. New Delhi: Wildlife Trust of India.
Sankaran, R., & Manchi, S., 2008. In-situ and ex-situ conservation of the Edible–nest Swiftlet *Collocalia fuciphaga* in the Andaman & Nicobar Islands. Pp. 18–19. *Annual Report 2007–08*. Coimbatore: SACON.
Sankaran, R., & Vijayan, L., 1993. The avifauna of the Andaman and Nicobar Islands: a review and the current scenario. **In:** Verghese, A., Sridhar, S., & Chakravarthy, A. K., (Eds.) *Bird conservation: strategies for the nineties and beyond*. Pp. 255–271. Bangalore, India: Ornithological Society of India.
Sankaran, R., & Sivakumar, K., 1999. Preliminary results of ongoing study of the Nicobar Megapode *Megapodius nicobariensis* Blyth. *Zoologiszhe Verhandelingen, Leiden*. 327: 75–90.
Sivakumar, K., 2000. *Ecology of the Nicobar Megapode*. PhD Thesis. Coimbatore: Bharathiar University.
Sivakumar, K., 2007. *Impact of tsunami on the Nicobar Megapode*. Dehra Dun: Wildlife Institute of India.
Stattersfield, A. J., Crosby, M. J., Long, A. J., & Wege, D. C., 1998. *Endemic bird areas of the world*. Cambridge: BirdLife International.
Vijayan, L., 1993. *Status and conservation of some rare endemic avifauna of the Andaman Islands—a preliminary survey*. Coimbatore: Salim Ali Centre for Ornithology & Natural History. Unpublished report.
Vijayan, L., 1996. Status and conservation of the Andaman Teal *Anas gibberifrons albogularis*. *Gibier Faune Sauvage, Game Wildl*. 13 (1): 831–842.
Vijayan, L., 1999. Endemic birds of the Andaman Nicobar Islands and their conservation. Pp 20–30. **In:** Prabhakaran, J., (Ed.) *Environmental education needs of the Andaman & Nicobar Islands*. Proceedings of the conference held at Port Blair on March 5 & 6, 1997. Chennai: C P R Environmental Education Centre.
Vijayan, L., 2006. Ecology and conservation of the Andaman Teal. *J. Bombay Nat. Hist. Society* 103 (2–3): 231–238.
Vijayan, L., & Sankaran, R., 2001. *Action plan for the conservation and management of the rare endemic birds of the Andaman & Nicobar Islands*. Pp. 12. Coimbatore: SACON.
Vijayan, L., & Ezhilarasi, N., 2007. *Status and ecology of the Andaman Crake*. Pp. 100. Final report of the project. Coimbatore: SACON.
Vijayan, L., Sankaran, R., Sivakumar, K., & Murugan, V., 2000. *A study on the ecology, status and conservation perspectives of certain rare and endemic avifauna of the Andaman and Nicobar islands*. Pp. 184. Final report of the project. Coimbatore: SACON.
Vijayan, L., Prasad, S. N., Mamannan, M. A. R., Kaushik, P., & Giriraj, A., 2005. *Avifaunal diversity of the Andaman Islands and their conservation*. Pp. 84. Final report. Coimbatore: SACON.
Vijayan, L., Murugan, V., & Mamannan, M. A. R., 2006. Conservation of the Andaman Teal. *Threatened Waterfowl Specialist Group News bulletin* 15: 55–59.
Vivek, R., & Vijayan, V. S., 2003. *Ecology and conservation of the Narcondam Hornbill* Aceros narcondami *at Narcondam Island Sanctuary, India*. Reoprt. Coimbatore: SACON.
Yahya, H. S. A., & Zarri, A. A., 2002a. White Tern (*Gygis alba*) sighted at Narcondam Island, Bay of Bengal, India. *Forktail* 18: 148–149.
Yahya, H. S. A., & Zarri, A. A., 2002b. Status, ecology and behaviour of Narcondam Hornbill in Narcondam Island, Andaman & Nicobar Island, India. *J. Bombay Nat. Hist. Society* 99 (3): 434–445.

— *In memoriam* —

Chaman Lal Trisal 1948–2009

Trisal, C. L. 1993. Conservation of wetlands in India and international treaties. In: Wetland and Waterfowl Conservation in South and West Asia. Proc. Int. Symp., Karachi, Pakistan. 14-20 December 1991. 41–49. Moser, M. & van Vessem, J. (eds.). Slimbridge, UK: IWRB.
Trisal, C. L. 1998. Kashmir: Fast disappearing. In: Survey of the Environment '98. 95–99. Ravi, N. (ed.) Chennai: The Hindu.
Trisal, C. L. 1999. Kashmir wetlands: conservation strategies. Environ 7 (2): 46–48, 65–67.
Trisal, C. L., Ivan, R. & Kundangar, M. R. D. 1994. Wular Lake, Jammu and Kashmir. 1st ed. Delhi: WWF-India.