Ezhilarasi, N. 2009. Status and ecology of the Andaman Crake. Ph.D. thesis, Bharathiar University,

Coimbatore.

**Chapter 6**

**SUMMARY AND CONCLUSION**

**6.1 Summary**

Andaman Crake is a rare and endemic bird of Andaman Islands. There was no detailed information available on this species and was listed as data deficient till recently. Hence, a study was undertaken during 2004-2007 to collect baseline data on the population, ecology and biology of the Andaman Crake. A variety of factors is responsible for Andaman Crake’s habitat degradation and loss. In this chapter I briefly highlight key findings of this study, major threats to this species and suggestions for conservation and future research. While these threats and recommendations are given for the conservation of the Andaman Crake, they pertain to several other species ecologically dependent on the wet forests.

Status and distribution of the Andaman Crake were assessed in different islands of different size classes and in different habitats. A total of 253 birds were recorded in 8% of points surveyed from 2001 points with the encounter rate of 0.18 birds/km. The encounter rate of this Crake was significantly higher in the five major islands of above 100 km2 (0.81 bird/km) compared to outer islands (0.18 bird/km). Andaman Crake Habitat-wise survey showed presence of the Andaman Crake only in wet forests, namely semi-evergreen (1.00 bird/km), evergreen (0.74 bird/km) and moist deciduous forest (0.61 bird/km). Although these forests were recorded in most of the islands, encounter rates increased with the increasing island size. The lowest elevation of sighting of the Crake was 0 m and the highest 558 m. The number of Crakes observed decreased with increasing elevation. Andaman Crake had clumped distribution with the encounter rate being positively associated with the presence of stream. The habitat was characterized with high canopy height, moderate canopy cover, high number of saplings and low ground vegetation with dense leaf litter.

To study the activities of the Andaman Crake about 5000 hours were spent in the field; as a result, a total of 2714 observations were made in 382 contact hours. The activity pattern of the Andaman Crake showed trimodal pattern in foraging, peak recorded in the morning 04.00 to 05.00 h, 09.00 to 10.00 h and evening 16.00 to 17.00 h. The overall pattern showed that most of the time the foraging and calling activities were inversely proportional. Resting and maintenance activities, especially bathing were recorded mainly in the afternoon.

The total activity budget showed that the Andaman Crake spent the maximum time (49%) for foraging followed by calling (38%) and breeding (9%) and minimum time was spent for maintenance and resting. During the non-breeding season maximum time was spent for foraging (65%) followed by calling (27%) while during breeding calling was more (47%) than foraging (35%). Significant difference in activities was observed between breeding and non-breeding seasons and also among the seasons.

A total of 1113 foraging observations were made. Andaman Crakes were noted to feed on invertebrates. The feeding observations indicated the intake of earthworms (Neooligochaeta), caterpillars (Lepidoptera), termites (Isoptera) and ants (Hymenoptera). In total, 60 faecal samples of the Andaman Crake were collected and analyzed. Faecal materials comprised mainly five different prey items including mouthparts of ants and termites, cuticle of beetles and broken pieces of shells. When the food items were compared between breeding and non-breeding seasons and among different seasons significant difference was recorded in Isoptera, Hymenopter, and Stylommatophora, whereas no significant difference was recorded in Coleoptera. Invertebrate diversity was high during summer and south-west monsoon. Pecking was the major method used by the Crake for feeding (61%). Apart from pecking, it used the flake method (35%) while other methods such as stabbing and gleaning were negligible (1% each). Although there was slight difference in foraging methods in different seasons it was not significant. Foraging rhythm showed alternative ups and downs but peaks were more in early morning and late evening. The feeding rate had negative correlation with temperature (r = -0.514; *p* = 0.06).

Breeding biology of the Andaman Crake was studied during June to September in 2005 and 2006 at Pathilevel in North Andaman. A total of 155 nests was recorded, 35 and 120 nests during 2005 and 2006 respectively. The Andaman Crake breeds during south-west monsoon, June-August as reported in other forest rails. Totally eight pairs of the Andaman Crake were recorded during the breeding season inside the 10 ha intensive study area which made 36 nests with a density of 4.9 nests/pair. The proximity of nests was confirmed by the observations, and those without eggs were used for roosting which is reported as a common character of rails. The nest was typically platform-shaped with a shallow cup, made up of dryed leaves and twigs above the leaf litter, mostly placed on the ground between buttresses. Totally 151 trees belonging to 21 species in 12 families were used for nesting. The five species *Tetrameles nudiflora*, *Pterocarpus dalbergioides*, *Terminalia bialata*, *Pterygota alata* and *Celtis timorensis* together contributed 72 % while 17 other species together contributed for 28% of nest trees. They showed preference for the above five species of trees. The most important variable influencing nest-site selection and nesting success of the Andaman Crake was concealment; other factors such as nearness to stream, density of saplings, climbers, large trees and buttresses were also important.

Nest was built by both the members of the pair. The period required for construction was three days. Eggs were laid early in the morning between 06.00 and 08.00 h on successive days. The laying interval was usually 24 hours. Eggs of the Andaman Crake were glossy white in colour, ovoid and without any spots; the mean weight, length and width were 24g, 4.2 cm and 2.2 cm respectively. Clutch size varied from 4-8 and maximum nests were with 5 eggs. The mean clutch size was 5.75 ± 1.71. Incubation was shared by both the sexes of the pair and the incubation period was 21 days (N = 4). Andaman Crake chicks are precocial and leave the nest within 0-1 day of hatching; brooding was done only by female for 30-31 days (N=2). Nesting success of the Andaman Crake for the two years was 22%, with no success in 2005 and 32% in 2006 which is comparatively lower than that of several threatened species. Out of 155 nests, 17 (14%) with eggs, whereas 133 were (86%) without eggs. In 2005 productivity was nil, while in 2006, out of the 17 nests, 41% was successful with a mean of one chick per pair, the fate of which was also not sure. The major causes of nest failure were predation, abandonment and damage. The early season nests had better survival rates than the late season nests. Maximum losses were during the 1st and 3rd stages; abandoning was more in the former while predation was more in the later stages of incubation. Nesting success was high in those nests which were placed away from the forest edge (r = 0.674; *p* > 0.05).

**6.2 Key threats to the Andaman Crake**

There have been direct and indirect ecological consequences of human disturbances with both planned and unplanned development activities on the Crake and other birds in the Andaman Islands.

**6.2.1. Habitat destruction / alteration**

Although the Andaman Crakes were recorded near settlements inside the forest, no Crake was recorded in any cultivation and plantation during this survey. Absence of the species in these altered habitats and its presence only in moist forests shows that the Andaman Crake is a strict habitat specialist and hence susceptible to habitat loss and modification. In the major islands many areas were converted for agriculture and human inhabitation which caused the habitat patchiness. Such small habitat patches were less likely to be occupied than large ones. Development activity in Portblair has destroyed whole forest habitat in Abardeen Bazaar, where Butler (1900) once trapped 80 Andaman Crake per Sq. km. Large forest areas were converted for cultivation of coconut, paddy and teak. This shows that availability of suitable habitats could be one of the limiting factors influencing the population of the Andaman Crake. Neil and Havelock Islands are almost fully under cultivation and also most of the forest areas are occupied by settlers from mainland. Habitat alteration in the forest area creates edge effect which provides snakes the thermal properties of both adjoining habitats, allowing greater flexibility for thermoregulation (Blouin-Demers and Weatherhead 2002). Snake was noted to prey on the eggs and affect the nesting success of the Andaman Crake. The prevailing fragmentation hypothesis suggests that predation rates are higher in fragmented landscapes than in contiguous forest (Robinson et al. 1995). Slow encroachment of the forest habitat by the settlers through firewood collection and thinning the edges is a common practice near settlements. As the Andaman Crake prefers to nest near the forest edges biotic pressure would lead to the degradation of nesting habitat and increase in predation.

**6.2.2 Introduced species**

The introduced animals such as dogs and cats have become predators for adults and chicks of the Andaman Crake. The larger herbivores introduced here include three species of deer and Asian Elephant. The number of saplings seen were also a few in some areas, an effect that would be expected if seedlings were not allowed to grow, which obviously affect the habitat of the Andaman Crake. Ali (2004) in his study found the absence of saplings of *Terminalia manii* and very few *Dipterocapus* saplings which are the nesting trees for the Andaman Crake. This indicates that browsing might be selectively removing some species. Missing of understory in most of the places reported by Ali (2004) is a major challenge for survival of the Andaman Crake, an understory species. Sivaganesan and Kumar (1993) reported heavy damage of vegetation by Elephants on Interview Island with bamboo and *Pandanus* having shown a major decline. They also found damage to a number of trees that were uprooted or debarked. Debarking also results in the death of trees; but Elephant was not an issue in the other areas. The sapling proportion test of trees of Interview Island by Ali (2004) showed a negative trend in about 80% of the commoner species; analysis of the vegetation indicated that as trees die, they are unlikely to regenerate due to browsing by another introduced species, the chital, wide spread in the Andaman Islands.

**6.2.3 Hunting**

Hunting by the settlers is another serious problem facing the Andaman Crake. The Crake is hunted for meat; they were trapped by nooses, especially during breeding season when calls were frequent. Illegal selling of the Andaman Crake was reported in Dugapur (North Andaman).

**6.3 Recommendation**

Andaman Crakes were not recorded in the island having area below 1 sq km. Population of the Andaman Crake increased with the increasing island size. However, 58 of the reserves in the protected area network are smaller than 1 km­2 and of these, 13 are less than 0.1 km2 in area (Pande *et al*. 1991; Andrews *et al*. 2006). Only four of the reserves are larger than 30 km2. As forests on large islands are not adequately represented in the current protected area network, it is important that remaining patches of primary forests on large islands are protected on a priority basis. These patches should be large enough to include habitat diversity which would support many rare species. Though Andaman Crake was recorded in the edges it preferred huge trees in the moist forest for nesting. The primary wet evergreen forests of the Andaman Islands are being destroyed and degraded at an alarming rate by forestry operations and encroachments (Davidar 1996). Protecting large areas of forests on the large islands will be essential to conserve the vegetational mosaic and species diversity (Davidar 1996). This study shows that wet forests, especially evergreen and semi-evergreen forests on large islands are very important in the conservation of the Andaman Crake. This non-random distribution of the Andaman Crake suggests that small islands, however numerous, are not equivalent to large islands for the conservation. A protected area network has been established in the Andaman Islands with seven National Parks and 93 Sanctuaries encompassing a total area of about 818 km2 (Andrews *et al*. 2006). This, however, constitutes a mere 14 % of the total land area of the archipelago (Vijayan *et al.* 2005). Thus there is a need for developing programmes to protect/restore the forests which are in the major islands encompassing localities of greater abundance of this Crake. Conservation of an endemic species requires the maintenance of sufficient area of suitable habitat to harbor a viable population for long-term survival. Establishment of larger conservation complexes rather than smaller protected areas is crucial for the long-term survival of the Andaman Crake and many other endemic species. Apart from this, hunting of Andaman Crake should be stopped. Environmental education and public awareness programmes also should be taken up intensively and regularly. Removal of introduced animals has to be permitted in order to protect the ecosystem to which they cause damage.

**6.4. Research implications.**

Although the habitat preservation approaches are of prime importance, the long-term conservation of the Andaman Crake requires further understanding of such life history and other parameters as age of first breeding, lifespan, adult survival rates, annual fecundity; nest survival in protected and unprotected / fragmented areas; movements and demographic trends. Therefore, some of the immediate research needs for the conservation of the Andaman Crake are: 1) breeding status of the species in selected islands and habitats that could not be surveyed during this study and 2) Monitoring the populations including marking of individuals to identify population changes in relation to environmental and anthropogenic factors.

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