Chapter 7

Summary and conclusions

The Nilgiri Wood Pigeon is a Globally Threatened species and endemic to the Western Ghats in India. In Asia 323 bird species (about 12 %) face extinction; and an additional 317 are Near Threatened. In the Indian subcontinent, of the 1295 species of birds, 75 are Globally Threatened, two Data Deficient, one Conservation Dependent and 52 Near Threatened (BirdLife International 2001). 16 species are endemic to the Western Ghats, of which four each are Threatened and Near Threatened. Species, which have restricted range of distribution, have more chances of getting endangered or extinct. A study on the impacts of disturbances on the bird communities conducted by Vijayan *et al.* (1999) shows that the status of many endemics cannot be assessed without conducting detailed studies on individual species.

In the case of the Nilgiri Wood Pigeon, except some occasional sightings, no detailed information was available on the ecology and biology which are very vital for the conservation of endemics, particularly the endangered species. Hence, a detailed ecological study was carried out on this species with the following specific objectives:

a) Determine the current status of the endemic, endangered Nilgiri Wood Pigeon.
b) Study the ecology of the Nilgiri Wood Pigeon, and
c) Identify the key factors affecting the survival of the species

The field work was conducted during 2002 to 2004 with surveys of important locations of previous sightings of this species from Goa to the southern tip of the Western Ghats and, intensive ecological studies were undertaken at Kukkal (10°1- 26' N; 77°14 - 52' E), one of the Important Bird Areas in India, in the Upper Palni Hills elevation of which ranges between 1500 and 2450 m. The area had a moderate climate with mean temperatures ranging from 12 to 23° C in summer while the winter temperatures ranged from 8.3 to 17.3° C. The annual rainfall averages 165 cm. The vegetation at Kukkal is predominantly montane

wet temperate forest, popularly known as shola forest and a variety of plantations. Totally 1734 trees of 63 species, 402 individuals of 19 species of shrubs, and 143 lianas of 15 species were recorded in 1.08 ha of shola forest sampled. Tree species richness and diversity (H') were more than those of the shrub species. The dominant trees are *Phoebe paniculata, Symplocos foliosa, Neolitsea zeylanica,* and *Maesa indica* and the dominant shrub species are *Psychotria nilgiriensis var. astephana,* and *Lasianthus acuminatus.* 23 species of trees were with fruits during the study period with a peak fruiting in June-July.

There are 72 locations with sighting records of the Nilgiri Wood Pigeon in its distribution range. Surveys were conducted in 20 probable locations in the Nilgiris and Anamalai Hills in the Kerala and Tamil Nadu and a few sites in Karnataka and Goa. Nilgiri Wood Pigeon was recorded in the Silent Valley National Park, Siruvani, Castle rock, Mathikettan shola, Eravikulam National Park, Mannavan shola, Mukurthi National Park, Thai shola and most of the sholas in the Upper Palni Hills. The species was not recorded in Goa during our survey.

Preferred habitat of the Nilgiri Wood Pigeon was montane wet temperate forest followed by tropical wet evergreen forest. In the 158.5 ha of evergreen forest and 166 ha of shola forest surveyed in four states, 17 and 41 Nilgiri Wood Pigeon were found in the respective habitats. Sighting frequency increased with size of the forest patch, encounter rates being 0.24 birds/ ha in shola and 0.10 bird/ ha in the evergreen forest. The Nilgiri Wood Pigeon was recorded in evergreen forests > 650m in elevation with maximum numbers > 1800m. In the intensive study area, the maximum number of birds (51) was recorded in May 2004 and minimum (8) in September 2002. During the breeding season, 32 breeding pairs were observed in 40 ha of the intensive study area. The Nilgiri Wood Pigeon was very rarely recorded in the plantations, that too only on their edges near the shola.

The foraging ecology of the Nilgiri Wood Pigeon was studied by direct method using focal animal or scan sampling and, food by direct observation and fecal analysis. In total, 1520 foraging observations were made. The Pigeon fed on the fruits of 34 species of 26 families of plants, four species of flower and leaf buds and three taxa of ground invertebrates. Nine

species of plants were used more often, 47%; while 12 species were used very rarely. Fruits of the family Lauraceae were the most preferred. In the 134 faecal samples, 13 species of seeds were identified; 70% the diet was fruits, ranging from 0.04 to 70mm, mainly 10 - 20mm. The Nilgiri Wood Pigeon fed on ground invertebrates during monsoon, which had significant correlation with their abundance ($r = 0.65$, $p < 0.01$). The fruit abundance and the frequency of sightings of the Nilgiri Wood Pigeon correlated significantly ($r = 0.49$, $p < 0.01$). The principal feeding technique was gleaning (76.25 %) followed by leaping (20.75 %). There was no significant difference in the method within the season and between seasons. Mostly, the species foraged in small flocks of its own and only rarely did they share with other species on the same tree.

Phonological events of 10 individuals each of the 23 species of trees used by the Nilgiri Wood Pigeon were studied in a six hectare plot encompassing the bird census area. Values ranging from 0-100 % for each phase (such as flowers, fruits and young leaves) were recorded for each individual every fortnight. Ripe fruits were available round the year. The number of species in fruit and the fruit abundance generally kept increasing from February and attain a peak in June – July. The number of species appears to have no correlation with rainfall ($r = 0.26$, $p = 0.2$) while the fruit abundance did show a correlation ($r = 0.40$, $p < 0.05$). In the drier months, the fruit abundance was mainly due to *Olea glandulifera* and *Daphniphyllum neilgherrense* which serve as keystone species of the Nilgiri Wood Pigeon.

Activity pattern was studied by direct observation. The Nilgiri Wood Pigeon spent maximum time for foraging (47 %) followed by maintenance (30 %). Resting (16%) and breeding behaviour were low (6.8 %); the latter was seen during summer, south-west monsoon and winter. During late winter, the pre-nesting activities such as pair-formation, calling and display were noted.

The Nilgiri Wood Pigeon has three distinct calls, namely breeding, non-breeding and feeding calls. Breeding call was heard from February onwards and the frequency was more in the early breeding season. It made both non-breeding and breeding calls during the late breeding season.

Peak breeding of the Nilgiri Wood Pigeon was during March to April, although the breeding season extended from February to September. The emergence of large number of chicks coincides with the high abundance of ripe fruits in June – July. It completes its breeding before the onset of heavy monsoon which is October at Kukkal.

The Nilgiri Wood Pigeon nested inside the forest, mainly in shola forest, on trees located close to any stream or openings but away from human settlement. During the two years of study, 108 nests were observed; 103 at Kukkal, three at Thai Shola (Nilgiris), one each in the Silent Valley National Park and Siruvani (Muthikulam Reserve Forest). Of the 108 nests, 106 were in the shola forest, and two in evergreen forest. No nests were observed in wattle, pine, eucalyptus and coffee plantations. Nests were observed in loose colonies.

Nest was a platform of twigs placed between four and eight meter in medium sized trees near the streams or any other small openings. *Turpinia nepalensis* had the maximum number of nests (22.55 %) followed by *Viburnum cylindricum* (11.76 %), *Phoebe paniculata* (9.80 %) and *Neolitsea zeylanica* (8.82 %). Canopy cover at the nest-site was 81% and nest concealment was high in 35% nests. Distance to water, distance to trek path, tree canopy cover, tree height, nest concealment and ground cover were the important factors in nest-site selection as these differed significantly between the nesting and random sites. The principal component analysis of the nest-site characteristics showed that the first component was closely associated with nest tree height and nest height.

The clutch size was only one. Both the parents took part in nest-building and feeding chicks. Incubation period was 14-18 days (15.89 $\pm$ 2.3; N= 23) and nestling period 15-19 days (16.89 $\pm$ 4.4; N =12). Nesting success was 14.43 %; productivity was very low (one chick for 7 pairs), mainly because of predation, natural and human (mainly egg collection by local people). Nests nearer to the forest edge had more chances of human predation. Thickness of nesting branch and climber cover on the nest tree and, distance to trek path significantly influenced the nesting success.

The study shows the restricted distribution of the Nilgiri Wood Pigeon; its low population density, movement pattern between the evergreen and shola forests, altitudinal and habitat restrictions, specific nesting and breeding requirements, low fecundity and productivity; along with the loss of its critical habitats, the shola forests. It is only prudent to protect its habitat in its entire range of movement and take site-based conservation management strategies for the long- term conservation of this Globally Threatened endemic bird from extinction.