

The Larger Mammals and Their Endangered Habitats in the Silent Valley Forests of South India

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ABSTRACT

A study has been made of the population ecology of large mammals of Silent Valley and contiguous forests of South India. The vegetation of Silent Valley and Attapadi forests are mostly west coast tropical evergreen and semi-evergreen types. In the adjoining forests of Nilambur and Nilgiris, the vegetation is southern secondary moist mixed deciduous and southern montane wet temperate, respectively. Silent Valley and its contiguous forests harbour 25 species of large and medium-sized mammals, including two endangered endemic species and many others that are endangered and protected. The lion-tailed macaque, Nilgiri tahr and tiger were sighted in and around the submergence area of the proposed Silent Valley hydroelectric project. If constructed, the impact of this dam on the populations of larger mammals in the area would be severe.

INTRODUCTION

The controversy concerning the Silent Valley—whether it should remain silent for the benefit of future generations as a virgin forest with its immensely rich fauna and flora, or whether its silence should be ended for

more immediate and short-term benefit—has been receiving considerable attention. It is true that hydroelectric projects are needed for irrigation and power production, which would augment the diverse development activities of the country. However, recent progress in the field of environmental biology and wildlife conservation has stressed the need to maintain areas of undisturbed natural habitat (Gadgil, 1979, 1982; Sharma, 1981; Balakrishnan & Easa, 1982; Balakrishnan, in press). In recent years, human encroachment has become a threat to a large number of species of animals and plants. Further, the continuing exploitation of our living resources without detailed ecological impact studies in advance continues to damage the environment with the subsequent loss of undisturbed biota (Ananthakrishnan, 1980).

Although the impact of hydroelectric projects on animal life and the habitat has been studied elsewhere in the world (Patterson, 1961; Sterling, 1971), no scientific work of this nature has been undertaken in India (Vijayan & Balakrishnan, 1977). Consequently it was decided to conduct a preliminary survey of the habitat and populations of large mammals of this area and to evaluate the likely impact of the proposed dam on the endangered mammalian fauna.

METHOD OF STUDY

To ascertain the status of wildlife, the linear transect method was employed (Vijayan & Balakrishnan, 1977; Vijayan *et al.*, 1979). The observer walked through the forest along a path or animal track and the following items were recorded on a check sheet: (1) time of observation; (2) species of animal seen; (3) total number in a herd, troop or pack; (4) activities of animals during the period of observation; (5) the habitat where the species was seen; (6) indirect evidence such as droppings, hoof or pug marks, diggings, burrows and scratchings; and (7) time spent in each vegetation type.

As the Silent Valley forests are continuous with the forests of Attapadi, Nilambur and the Nilgiris, the survey was extended to include them. Camping arrangements were made in various parts of the forests with the help of tribal trackers. The whole of the area within walking distance from a given camp was surveyed before the next camp was set up. The camp sites were selected mostly on river beds so as to minimise disturbance to the forest habitat.

STUDY AREA

Location

Silent Valley (11°5' to 11°25' latitude and 76°21' to 76°33' longitude), in the Palghat District of Kerala, is about 45 km north of Mannarghat, the nearest town. The reserve is about 8952 ha and forms part of the westerly sloping Silent Valley–New Amarambalam basin. The altitude varies between 658 and 2383 m. The area is bordered in the north by a sub-parallel Nilambur Valley and northeasterly sloping Nilgiri Valley. The eastern border is demarcated by a watershed dividing it from the southerly sloping Attapadi Valley. The southern sector is bordered by the roughly east-west Walayar ridges. The total area of continuous forests is about 40 000 ha.

Climate

The average annual rainfall, based on the data available from 1965 to 1973, is 3180 mm (2800–3450 mm) and temperature varies from 7 to 23.5°C.

Vegetation

The vegetation is mostly the west-coast tropical evergreen type (Champion & Seth, 1968). In the Attapadi reserve three types of forests exist; west coast tropical evergreen, west coast semi-evergreen and southern secondary moist mixed deciduous forests. Table 1 lists the dominant tree species that make up these forests.

West coast tropical evergreen forests occur in adjacent areas of the Silent Valley reserve. In the Nilgiris, the vegetation is southern montane wet temperate. A transitional zone of vegetation from west coast tropical evergreen to southern montane wet temperate occurs at the higher levels of Silent Valley reserve (reserve forests are those forests managed by the State Forest authority over a long period), where the forest merges with that of Nilgiris. At Sispara, the vegetation is similar to that of Nilgiris, with large areas of grassland over rolling hills, interspersed with small pockets of forests in the valleys. In the area of vested forests (forest areas recently nationalised by the State Forest authority) in Nilambur, the vegetation is mostly southern secondary moist mixed deciduous. West coast semi-evergreen forest also occurs in some places.

TABLE I
List of Major Species of Trees of Silent Valley and Adjacent Forests

<i>Name of species</i>	<i>Habitat</i>
<i>Artocarpus heterophyllus</i> Lamk.	West coast tropical evergreen and southern hill-top tropical evergreen forests.
<i>Bischofia javanica</i> Bl.	West coast tropical evergreen and west coast semi-evergreen forests.
<i>Bridelia squamosa</i> (Lamk.) Gehrm.	West coast semi-evergreen and southern moist mixed deciduous forests.
<i>Calophyllum elatum</i> Bedd.	West coast tropical evergreen, west coast semi-evergreen and southern hill-top tropical evergreen forests.
<i>Canarium strictum</i> Roxb.	West coast tropical evergreen, southern hill-top evergreen and southern secondary moist deciduous forests.
<i>Cinnamomum verum</i> J. S. Presl.	West coast tropical evergreen and west coast semi-evergreen forests.
<i>Cullenia exarillata</i> Robyns	West coast tropical evergreen and southern hill-top tropical evergreen forests.
<i>Dysoxylum malabaricum</i> Bedd.	West coast tropical evergreen and southern hill-top tropical evergreen forests.
<i>Elaeocarpus tuberculatus</i> Roxb.	West coast tropical evergreen and west coast semi-evergreen forests.
<i>Euodia Luna-Ankenda</i> (Gaertn.) Merr.	West coast tropical evergreen and west coast semi-evergreen forests.
<i>Haldina cordifolia</i> (Roxb.) Ridsd.	West coast semi-evergreen and southern moist mixed deciduous forests.
<i>Hopea parviflora</i> Bedd.	West coast tropical evergreen, southern hill-top tropical evergreen, and west coast semi-evergreen forests.
<i>Knema attenuata</i> (Hook. f. & Thomas) Warb.	West coast tropical evergreen forests.
<i>Mesua nagassarium</i> (Burm. f.) Kosterm.	West coast tropical evergreen, southern hill-top tropical evergreen and west coast semi-evergreen forests.
<i>Palaquium ellipticum</i> (Dalz.) Engl.	West coast tropical evergreen and southern hill-top tropical evergreen forests.
<i>Persea macrantha</i> (Ness) Kosterm.	West coast tropical evergreen and west coast semi-evergreen forests.
<i>Poeciloneuron indicum</i> Bedd.	West coast tropical evergreen forests.
<i>Rhododendron arboreum</i> Sm.	Southern subtropical hill forests.

(continued)

TABLE 1—*contd.*

<i>Name of species</i>	<i>Habitat</i>
<i>Schleichera oleosa</i> (Loar.) Oken	West coast semi-evergreen and southern secondary moist mixed deciduous forests.
<i>Spondias pinnata</i> (Linn. f.) Kurz	West coast semi-evergreen forests.
<i>Syzygium cumini</i> (Linn.) Skeels	West coast tropical evergreen and west coast semi-evergreen forests.
<i>Vateria indica</i> Linn.	West coast tropical evergreen and west coast semi-evergreen forests.

The peaks of all the hills in this area are grass-covered while their upper slopes have scattered short trees and tall grass. There are two main types of grasslands in the study area—one which is close floristically to the west coast tropical evergreen forest, and the other similar in appearance to the southern montane wet temperate forests. The former is common in the comparatively low lands of the Silent Valley whereas the latter is common in its upper reaches. At lower levels, these grasslands diminish and give way to forest. Though rainfall is very heavy in these areas, the run off is also very fast due to the nature of the terrain. Signs of abandoned coffee plantations were also noticed in the Walakad area, probably planted between 1843 and 1873.

General biotic features

Tropical evergreen forests, to which most of the forests of Silent Valley area belong, are amongst the most complex and diverse vegetation communities on earth. They are considered to be a climax formation.

Among vertebrates, birds are the most successful in terms of numbers of species. Arboreal mammals are relatively more abundant than terrestrial forms, the food resources of the forest canopy being more abundant and productive than those on the forest floor. The lion-tailed macaque *Macaca silemus*, Nilgiri langur *Presbytis johni* and the Malabar giant squirrel *Ratufa indica* are the three commonest arboreal mammals in Silent Valley forests.

Herbivorous mammals are more common in the deciduous forests and in the grasslands than in the evergreen forests, due to the greater availability of food on the forest floor.

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The grassland is used by many types of grazers. Nilgiri tahr *Hemitragus hylocrius*, an endangered goat, mostly favours rocky grasslands. Predators such as tiger *Panthera tigris* and wild dog *Cuon alpinus* also occur in open grassland and forest margins when hunting.

Large and medium-sized mammals

Only the populations of the large and medium-sized mammals were studied during the present investigation. Table 2 shows their abundance

TABLE 2
Large and Medium-Sized Mammals in the Silent Valley and Adjoining Forests

Name of species	Number of groups	Approximate population
Bonnet macaque <i>Macaca radiata</i>	11	100
Lion-tailed macaque <i>Macaca silenus</i> ^a	20	200
Nilgiri langur <i>Presbytis johni</i> ^b	80-90	560-630
Tiger <i>Panthera tigris</i> ^a		20-40
Panther <i>Panthera pardus</i> ^b		25-35
Jungle cat <i>Felis chaus</i>		75-125
Small Indian civet <i>Viverricula indica</i> ^b		100-150
Toddy cat <i>Paradoxurus hermaphroditus</i>		60-80
Jackal <i>Canis aureus</i>		30-50
Wild dog <i>Cuon alpinus</i>	15-20	100-130
Sloth bear <i>Melursus ursinus</i> ^b		50
Malabar giant squirrel <i>Ratufa indica</i>		150
Porcupine <i>Hystrix indica</i>		250
Asiatic elephant <i>Elephas maximus</i> ^b		100-150
Gaur <i>Bos gaurus</i> ^b		60-75
Nilgiri tahr <i>Hemitragus hylocrius</i> ^a		75-125
Sambar <i>Cervus unicolor</i>		200-250
Barking deer <i>Muntiacus muntjak</i>		80-100
Mouse deer <i>Tragulus meminna</i>		50-60
Wild boar <i>Sus scrofa</i>		200-250
Indian pangolin <i>Manis crassicaudata</i> ^b		15
Otter <i>Lutra</i> sp.		— ^c
Nilgiri marten <i>Martes</i> sp.		— ^c
Common mongoose <i>Herpestes edwardsi</i>		— ^c
Ruddy mongoose <i>Herpestes smithi</i>		— ^c

^a Endangered.

^b Vulnerable.

^c Evidence insufficient for estimation.

in Silent Valley and the adjoining forests. This area has almost all the species of mammals found in Peninsular India, of which three are listed as endangered—tiger, lion-tailed macaque and Nilgiri tahr. Other species present include Nilgiri langur, elephant, wild boar, sambar, giant squirrel, sloth bear, leopard, jungle cat, toddy cat, gaur and wild dog. The black panther, a melanic form of *Panthera pardus*, is also found.

A total of 23 species of large and medium-sized mammals, excluding bats, rodents and insectivores, were observed in the Silent Valley area alone and a further two species were also recorded in the adjacent forests. Their status varies: some are endangered, some vulnerable while others are rare, according to population size and distribution (Table 2).

DISCUSSION

Factors causing disturbance to wildlife in the forests of Silent Valley

The forests of Kerala in general are subjected to a wide variety of human activities, particularly from the creation of plantations, agricultural activities, and collection of forest products. Extensive damage is done by poaching and the establishment of tribal settlements. However, at present such disturbances are slight in the Silent Valley forests, although a serious problem in adjoining forests.

Clear-felling of natural forest and conversion to plantations is especially damaging to wildlife, as the continuity of the forest habitat is destroyed. Forest products include cane, reed, cardamon, honey and wax, and the collection of these materials reduces the range of habitats. Poaching is widespread. The Nilgiri langur and the Sambar deer are the two species suffering most persecution in the Silent Valley and nearby regions because the reserve can be approached from Mannarghat through the Karuvarakundu near Nilambur.

Possible effects of the proposed project on wildlife

As the proposed Silent Valley hydroelectric project requires extensive alteration or destruction of a little-disturbed ecosystem with an increase in the local human population, the effect of such a project on the ecosystem in general will be catastrophic because the Silent Valley is one of the very few remaining areas of isolated and undisturbed rain forest in India.

It is possible to foresee the probable effect of the proposed dam on certain important endangered species (Vijayan & Balakrishnan, 1977).

Lion-tailed macaque

Of the five troops of this species seen in the Silent Valley, three were located in the area which would be submerged and the other two were very close to it. *Cullenia excelsa*, the fruit of which comprises one of the main food items of this endangered primate, is abundant only in the area that will be submerged.

The lion-tailed macaque is an endemic species, and has a very restricted distribution in the evergreen forests of the Western Ghats. It is known that the Ashambu Hills and Silent Valley are the only two areas where this species still maintains a viable breeding population.

Nilgiri langur

Seven troops of Nilgiri langur were found in the area to be submerged and a further twelve troops nearby the dam site. The construction of the dam in this area would accelerate the decline in numbers of this species.

Nilgiri tahr

This is also an endemic species which is on the verge of extinction. Only a few herds are now living in the Western Ghats. Although many of the grassy hills in Kerala are known as 'Varayattumudi' or 'Tahr Hills', the tahrs no longer survive in any of these areas, due to indiscriminate poaching and encroachment into their habitat.

The distance from the proposed dam to the Nellikkal plot, where we have recorded the presence of Nilgiri tahr (about 30-40 animals) is less than 4 km. If the proposed dam is constructed, the interior of the forest would become accessible, resulting in a severe threat to the population of tahr in the area.

Asiatic elephant

Elephants require a large area for their extensive movements. The habitat destruction and loss of food items would reduce the population of this species.

Tiger

In the Silent Valley, five pug marks out of eight and six droppings out of eleven of this species were sighted within the area of the proposed

reservoir. Hence any disturbance to this area would lead to a reduction in numbers of this protected species.

The proposed dam would likewise affect the avifauna of this region. The great Indian hornbill *Buceros bicornis*, a protected species, was seen in substantial numbers in the Silent Valley. The hornbills require large areas of forest to maintain a breeding stock adequate to prevent extinction.

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REFERENCES

- Ananthkrishnan, T. N. (1980). The environmental crisis. *Zoologica*, 3, 5-10.
- Balakrishnan, M. (in press). Larger mammals and their endangered habitat in Kerala. *Acta Zoologica Fennica*.
- Balakrishnan, M. & Easa, P. S. (1982). Strategies for management of forests and wild life in Kerala. In *Recent trends in forest management*, 45-55. Trivandrum, Kerala Forest Department.
- Champion, H. G. & Seth, S. K. (1968). *A revised survey of the forest types of India*. Delhi, Manager of Publications.
- Gadgil, M. (1979). Hills, dams and forests. Some field observations from the Western Ghats. *Proc. Ind. Acad. Sci.*, C2, 291-303.
- Gadgil, M. (1982). Conservation of India's living resources through Biosphere Reserves. *Current Sci.*, 51, 547-50.
- Patterson, J. R. (1961). *Report on wild life studies in the Rocky Reach Hydro-electric Project area, FPC No. 2145, Columbia River, Washington*. Washington, DC, Department of Game.

- Sharma, A. K. (1981). Impact of the development of science and technology on environment. *Presidential address, 68th session of Indian Science Congress Association, Varanasi*, 1-43.
- Sterling, C. (1971). Aswan Dam looses a flood of problems. *Life*, 70, 46-7.
- Vijayan, V. S. & Balakrishnan, M. (1977). *Impact of hydroelectric project on wild life—report of the first phase of study*, 1-111. Peechi, Kerala Forest Research Institute.
- Vijayan, V. S., Balakrishnan, M. & Easa, P. S. (1979). *An ecological reconnaissance of the Periyar Tiger Reserve*, 1-171. Peechi, Kerala Forest Research Institute.