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(RESEARCH ARTICLE)

Survey of vertebrate diversity in Narthamalai reserve forest, Pudukkottai district, Tamil Nadu, India

Vassou Miriam Cecilia [1,*] and Tennyson Samuel [2]

[1] *Department of Zoology, Periyar EVR College, Tiruchirappalli 620 023, Tamil Nadu, India.*
[2] *Department of Zoology, Madras Christian College, Chennai 600 059, Tamil Nadu, India.*

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Abstract

The present survey documented the vertebrate diversity of Narthamalai, a reserve forest located in the Kulathur taluk of Pudukkottai district of Tamil Nadu, an area with suitable habitat availability for faunal species. The herpeto, avian and mammalian fauna were surveyed by direct observation at nine sampling stations. The present survey recorded a total of 43 different species of which 11 were amphibians/reptiles, 22 avian and 10 mammals. Amongst the total number of individuals (1136) recorded in the present survey, 301 were herpeto, 674 were avian and 161 were mammals. With respect to the herpeto fauna, the relative dominance, relative density, relative frequency, Simpson's index of dominance, community dominance index and species diversity index were 25.58%, 26.50%, 0.26%, 0.26, 1.18% and 0.009 respectively. In the case of avian fauna, it was 51.16%, 59.33%, 0.31%, 0.59, 1.48% and 0.019 respectively. For mammalian fauna, it was 23.26%, 14.17%, 0.42%, 0.14, 1.20% and 0.008 respectively. Evaluating and recording biological diversity intent to develop a strategic framework for predicting the behavior of key variables in order to improve controlling, increase management options and provide an early warning of system modification. Accomplishment of monitoring for biodiversity depends on various factors such as using an appropriate taxon. Therefore, it is essential that biodiversity rich regions and reserve forests managed in ways that allow protection and conservation of biodiversity as much as possible.

Keywords: Narthamalai; Reserve Forest; Vertebrates; Survey; Diversity Indices

1. Introduction

Conservation of biodiversity is a vital part of ecologically sustainable faunal management, and fundamental to ecosystem functioning and consequently forest health. Forests play an important role in the conservation of natural resources. Forests contribute significantly towards environmental upkeep, climatic balance, and are mainly instrumental for the rainfall patterns. They are the source of rivers ensuring livelihood security for innumerable people who are dependent on them and also perform other vital functions such as providing protection from natural disasters, in the form of shelter belt plantations. They are the treasure chests of biodiversity and home to most of world's vast array of life forms offering needed habitat for wildlife and wide diversity of medicinal plants, while also ensuring livelihood support to the tribes living within the forests areas [1, 2]. India owns a distinctive identity in biodiversity not only because of its geography, history and culture but also because of the pronounced diversity of its natural ecosystem. India is one of the mega biodiversity country of the world represented by a wide array of faunal species. Tamil Nadu's faunal biodiversity is equally impressive. It is very important to document the identity and geographical distribution of species it supports. This information is vital in attempts to preserve and use its biodiversity. The major source of such information for protected areas and ownership species distribution and natural vegetation helps to determine gaps in protected area coverage and to propose new area for protection. Deforestation and habitat destruction is one of the major threats for decline in majority of faunal populations. In spite of extremely high species diversity and high degree of endemism in tropical forests, many hectares of forest are lost annually. The

* Corresponding author
E-mail address: miriamceciliavassou@gmail.com

speed of tropical deforestation is unparalleled in evolutionary history. The transformative effects and role of various faunal species play an important role in grassland and there is need to understand the ecological impacts on the surrounding and biota. Narthamalai, a reserve forest area of Pudukkottai district, Tamil Nadu India is one of the largest reserve forests in Pudukkottai district whose floral diversity have been recorded and documented [3, 4]. Rapid increase in land development, extensive agricultural and quarrying operations in and around Narthamalai poses significant challenges to the survivability and sustainability of Narthamalai native ecosystem [4]. Therefore, the present survey attempted to document the vertebrate diversity of Narthamalai reserve forest by direct observation.

2. Material and methods

Pudukkottai (10°38'N latitude and 78°82'E longitude and 100 m altitude) is a district of Tamil Nadu state (Figure 1). The district encompasses a geographical area of 4,644sq km. bounded by Thanjavur district on the North East and East, Ramanathapuram district and Sivagangai district on the South West and Tiruchirapalli district on the West and North West. The study area Narthamalai is located in the Kulathur taluk of Pudukkottai district, covering an area of about 700.44 hectares (18.47sq.km.). It is one of the reserve forests having maximum area among all the reserve forests of Pudukkottai district. The entire Narthamalai region comprises of nine hillocks, viz., Melamalai, Kottaimalai, Kadambarmalai, Paraiyanmalai, Uvachchanmalai, Aluruttimalai, Bombadimalai, Manmalai and Ponmalai.

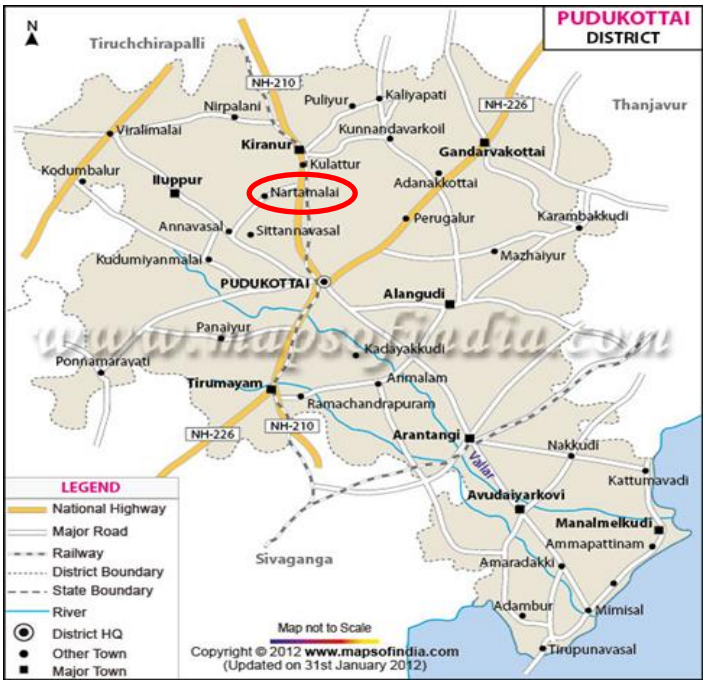

Figure 1 Map of the study area

Survey of herpeto, avian and mammalian fauna were determined by direct observation using field binoculars, high resolution camera and a mobile GPS. A total of nine sampling stations were established randomly to cover different habitat types. The survey was conducted from July 2018 to December 2018 in morning (between 6.30 and 7.00am depending on weather) and was completed before 12:00 noon. The methodology followed was developed by Yu-Seong *et al*. [5]. In Narthamalai, the location of each site were at intervals of 250m apart, sufficient enough to avoid double counting of the same species at more than one station. Each point was surveyed for 10 to 15 minutes. This was based on the recommendation by Gregory *et al*. [6] who stated this approach was suitable: (i) for dense habitats (forest and shrubs); (ii) to survey cryptic, shy, and skulking species; (iii) for the populations that are of higher density and are more rich species; (iv) for situations where access is restricted; and (v) particularly for bird-habitat studies. Further, the relative dominance, relative density, relative frequency, Simpson's index of dominance, community dominance index and species diversity index were calculated.

3. Results

The present survey recorded a total of 43 different species of which 11 were amphibians/reptiles, 22 avian and 10 mammals (Table 1). Amongst the total number of individuals (1136) recorded in the present survey, 301 were herpeto (Figure 2), 674 were avian (Figure 3) and 161 were mammals (Figure 4). With respect to the herpeto fauna, the relative dominance, relative density, relative frequency, Simpson's index of dominance, community dominance index and species diversity index were 25.58%, 26.50%, 0.26%, 0.26, 1.18% and 0.009 respectively. In the case of avian fauna, it was 51.16%, 59.33%, 0.31%, 0.59, 1.48% and 0.019 respectively. For mammalian fauna, it was 23.26%, 14.17%, 0.42%, 0.14, 1.20% and 0.008 respectively (Figure 5).

Table 1 Vertebrate fauna of Narthamalai

S. No.	Common Name	Scientific Name
Herpeto fauna		
1	Bark gecko	*Hemidactylus leschenaultii*
2	Brook's house gecko	*Hemidactylus brooki*
3	Common cat snake	*Boiga trigonata*
4	Common sand boa	*Gongylophis conicus*
5	Garden lizard	*Calotes versicolor*
6	House gecko	*Hemidactylus frenatus*
7	Indian bull frog	*Hoplobatrachus tigerinus*
8	Indian monitor lizard	*Varanus bengalensis*
9	Indian skipper frog	*Euphlyctis cyanophlyctis*
10	Marbled toad	*Bufo stomaticus*
11	Spectacled cobra	*Naja naja*
Avian fauna		
12	Asian koel	*Eudynamys scolopaceus*
13	Barn owl	*Tyto alba*
14	Black drongo	*Dicrurus macrocercus*
15	Black kite	*Milvus migrans*
16	Black-shouldered kite	*Elanus axillaris*
17	Cattle egret	*Bubulcus ibis*
18	Comb duck	*Sarkidiornis melanotos*
19	Common myna	*Acridotheres tristis*
20	Common starling	*Sturnus vulgaris*
21	Common tailorbird	*Orthotomus sutorius*
22	Grey heron	*Ardea cinerea*
23	House crow	*Corvus splendens*
24	House sparrow	*Passer domesticus*
25	Indian peafowl	*Pavo cristatus*
26	Indian silverbill	*Euodice malabarica*

27	Large/Great egret	*Ardea salbus*
28	Little egret	*Egretta garzetta*
29	Little grebe	*Tachybaptus ruficollis*
30	Rock pigeon	*Columba livia*
31	Rose-ringed parakeet	*Psittacula krameri*
32	Spotted owlet	*Athene brama*
33	White breasted kingfisher	*Halcyon smyrnensis*
Mammalian fauna		
34	Cow	*Bos taurus*
35	Five striped squirrel	*Funambulus pennantii*
36	Mole rat	*Heterocephalus glaber*
37	Goat	*Capra aegagrus hircus*
38	Bat	*Chiroptera* species
39	Cat	*Felis catus*
40	Dog	*Canis lupus familiaris*
41	Sheep	*Ovis aries*
42	Buffalo	*Bubalus bubalis*
43	Monkey	*Macaca fascicularis*

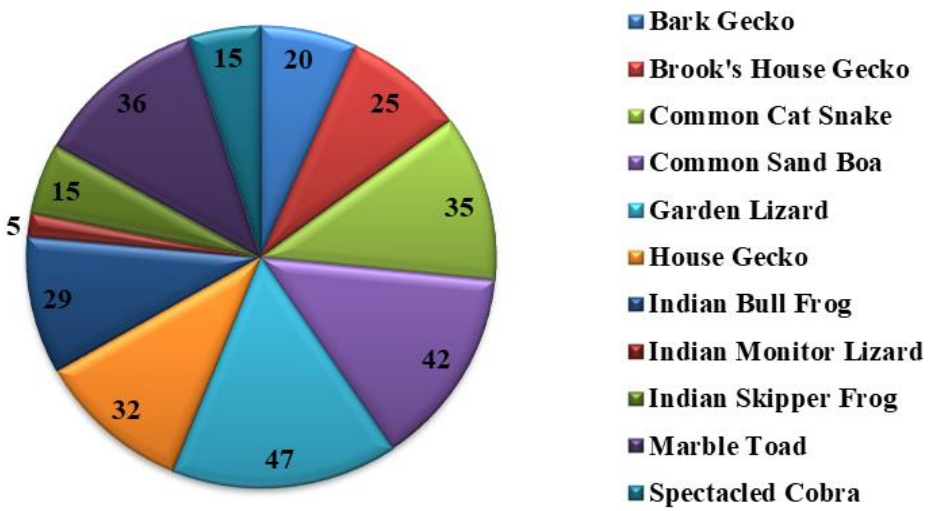

Figure 2 Herpeto fauna of Narthamalai

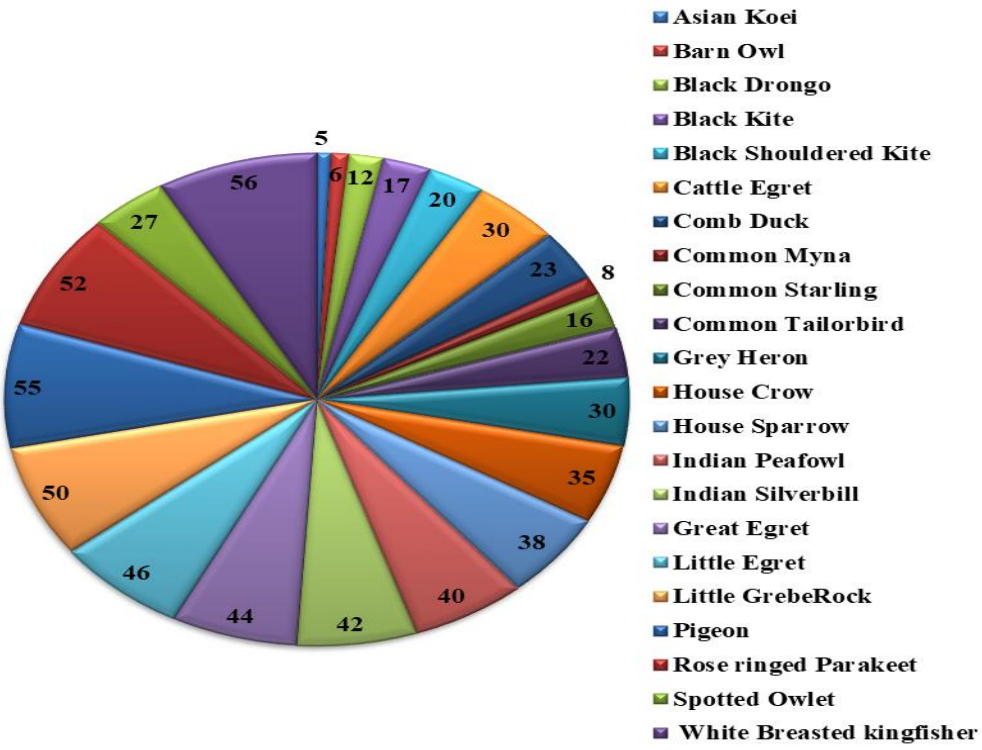

Figure 3 Avian fauna of Narthamalai

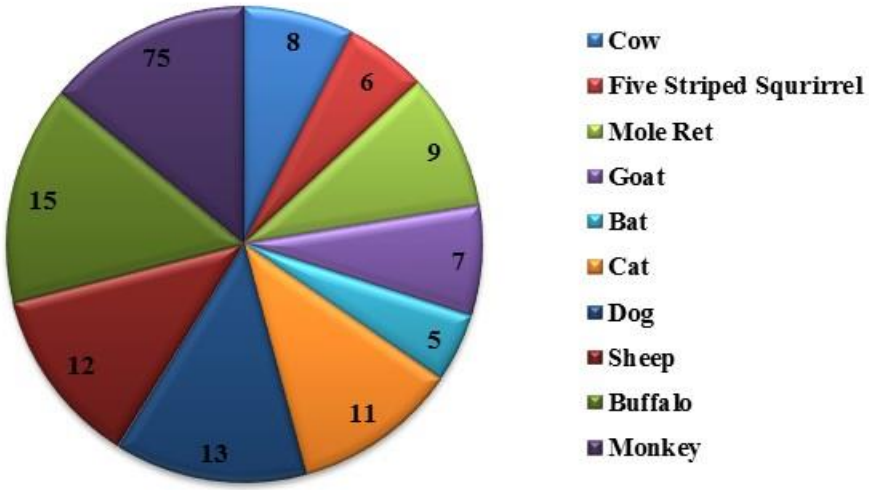

Figure 4 Mammalian fauna of Narthamalai

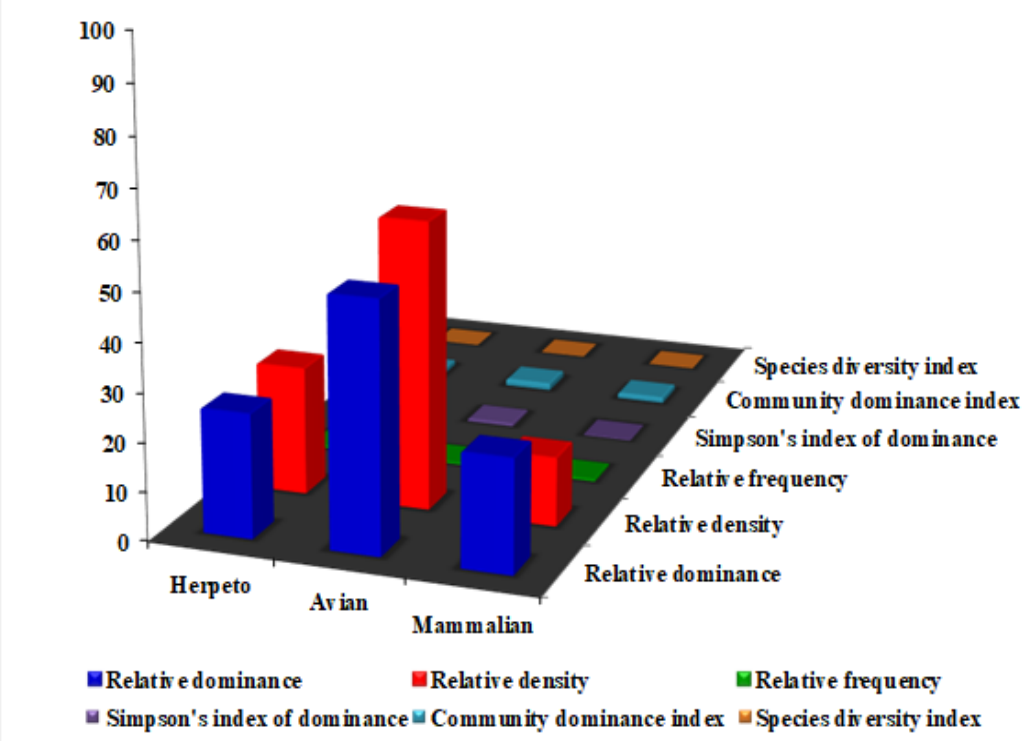

Figure 5 Diversity indices of vertebrates surveyed at Narthamalai

4. Discussion

Forest degradation is considered one of the most serious environmental and economic problems for many countries in the tropical and sub-tropical regions of the world [7, 8]. Reserve forests, a representative example of biodiversity indigenous to an area is a portion of state land where commercial harvesting of wood products is excluded in order to capture elements of biodiversity that can be missing from sustainably harvested sites and provide potential refuge for unique species assemblages and habitat for wildlife in order to conserve biodiversity of reserve forests. However, reserve forests are disappearing at alarming rates owing to deforestation for extraction of timber and other forests products especially in south India. In the present survey, the vertebrate diversity of the reserve forest at Narthamalai had been recorded. Herpeto fauna includes amphibians and reptiles as a group, especially those of a particular region or time period. Among amphibians, the order Anura constitute the vast majority of living species of amphibians and the bulk of their genetic, physiological, ecological, and morphological diversity. Reptiles are more dominant and important group of terrestrial organisms and play an important role in the human economy [9]. The variety of avian species in ecosystems reflects the well-being of its habitat as they are the indicators of environment and are being used for conservation and environmental impact assessment [6]. Population of bird species, especially in the areas of extreme change of land use pattern, through industrial setup, river valley projects, deforestation for various purpose and other anthropogenic activities, have subjected various habitats to the adversarial impact [10]. These have resulted in decline of population of various species resulting in their local extinctions [11]. Habitat degradation due to accelerating pollution, drainage, weed infestation, siltation and successive droughts has claimed the premature departure of many migratory birds. In the case of mammals, habitat loss is the greatest threat globally which is believed to affect many species and the second major threat is utilization/exploitation. Besides these, many species of mammals are difficult to monitor because of their small size, drab coloration, and secretive habits [12]. Additionally, many are nocturnal, some are fossorial, and many occur at low densities [13-15]. For large mammals, several survey methods have been developed and used to estimate population size, both by using indices and direct counts [16]. However, the methods vary with respect to their accuracy [17-19]. Aerial surveys are frequently used for estimating population densities and trends for large mammals [17, 20]. Field work may be required in rugged, remote areas, and areas of dense vegetation [21].

A large number of methods have been used to monitor terrestrial vertebrates [22], although many methods have not been compared or validated with a more rigorous method of density estimation or a known population size [14, 23].

The methods include, for example, direct observation (day or night) of individuals, mark-recapture/resight, removal, and transects and variable plot surveys [24]. A large number of 'indirect' methods, often referred to as population or abundance indices [24, 25] or activity indices [14], have also been used. These methods do not rely on directly seeing or hearing the animals, but merely noting some form of 'sign' that tracks the animals presence in the area: track stations, faecal counts, food removal, open or closed burrow-opening counts, burrow counts, runway counts, knockdown cards, snow tracks, or responses to audio calls [12]. These indices are based on the concept that a fixed amount of searching effort will locate a fixed proportion of the population. Furthermore, it is assumed that the index is proportional to the density and that the rate of proportionality is relatively constant. Technological developments have provided additional methods for monitoring populations such as the use of remote cameras [13, 26], infrared thermal imaging [27], DNA analysis [28], and radio-isotope detection [29]. However, inspite of all these methods, the use of direct observation methodology holds successful with regard to the present survey.

5. Conclusion

Evaluating and recording biological diversity intent to develop a strategic framework for predicting the behavior of key variables in order to improve controlling, increase management options and provide an early warning of system modification. Accomplishment of monitoring for biodiversity depends on various factors such as using an appropriate taxon. Therefore, it is essential that biodiversity rich regions and reserve forests be managed in ways that allow protection and conservation of biodiversity as much as possible.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there is no conflict of interest.

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