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Factors affecting habitat selection by three sympatric otter species in the southern Western Ghats, India

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ABSTRACT

Understanding habitat preference of a species of conservation significance is essential for planning effective conservation measures. The habitat structure of three sympatric otter species, viz. the smooth-coated otter (*Lutrogale perspicillata*), the Eurasian otter (*Lutra lutra*) and the Asian small-clawed otter (*Aonyx cinereus*) was examined in five Protected Areas (PA) of the southern Western Ghats, India. Data on habitat structure and otter signs were collected in each one-km section of 28 different streams and rivers. Mean values of eight habitat variables were used to define habitat characteristics. Components extracted in PCA from these eight variables were used for preparing a three dimensional ordination plot overlaid with otter occurrence. The results indicated that the otters differed in their habitat use. The Asian small-clawed otter used narrow streams at higher-elevation regions (>950 m) of southern Western Ghats, whereas the Eurasian otter mostly used small rivers in a wider elevation range between 450 and 950 m. The smooth-coated otter was mostly confined to large rivers, lakes and reservoirs at a lower elevation between 200 and 700 m. The Asian small-clawed otter preferred habitats characterized by high-elevation, narrow streams with tall and dense shoreline herb cover. In contrast, the other two species used markedly different habitat types including middle and low elevation, slow-flowing rivers which were comparatively wider than the ones preferred by the Asian small-clawed otter and with tall trees and dense canopy. The persistence of otters in India is threatened due to anthropogenic pressures. This study has identified priority habitats in southern Western Ghats that need concerted efforts to conserve the dwindling otter populations.

1. Introduction

Global extinction of species, driven by anthropogenic factors, is occurring at an unprecedented rate [1–3]. Around 52% of all the threatened mammalian species included in the IUCN Red List of Threatened Species, have shown declining population trends [4] and all the Asian otter species are listed in this group. These trends indicate that the overall conservation status of mammals is likely to deteriorate further in the near future, unless appropriate conservation actions are devised. The situation is particularly serious for land mammals in South Asia as a result of the combined effects of poaching and habitat loss [5]. Conservation success will depend on identifying vulnerable species and understanding environmental factors that support their persistence, particularly in human-dominated landscapes [6]. Besides, understanding how carnivores use the human matrix relative to the remaining contiguous natural habitat is essential for predicting their long-term survival across landscapes that are increasingly dominated by human presence [7].

The Western Ghats complex forms one of the three biological hotspots in the Indian subcontinent. The three otter species found in India viz. the smooth-coated otter (*Lutrogale perspicillata*), the Eurasian otter (*Lutra lutra*), and the Asian small-clawed otter (*Aonyx cinereus*) occur sympatrically in southern Western Ghats [8–11]. However, information on the resource partitioning among these sympatric species is lacking. The total length and weight of the smooth-coated otter range between 1.07–1.3 m and 7.0–11.4 kg, respectively [12–13]. The Eurasian otter is similar to the smooth-coated otter in body size, with total body length ranging from 0.92–1.2 m [14,12] and the weight ranging between 4 and 12 kg [15]. The Asian small-clawed otter is the smallest of all otter species found worldwide. Its total body length ranges between 0.7–0.93 m, and the body weight ranges between 2.7–5.4 kg [16,11].

A study on the niche separation among sympatric otters in Huai Kha Khaeng River, Thailand, describes that variations in microhabitat and food preference have led these three species to coexist in the same riverine habitat [17]. Studies on habitat use by otters have helped in identifying the factors that influence its presence ([18,19]. for smooth-coated otter; [20,21,22] for Eurasian otter) in a landscape as it is important not only to assess the distribution pattern of a population, but also for guiding conservation actions [23,24].

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The present study examines the distribution pattern and factors affecting habitat selection by three sympatric otter species in southern Western Ghats. In this paper, habitat was visualized as a multidimensional space with essential variables grouped according to their co-relatedness and placed in different dimensions. Our approach identifies the distribution pattern and occurrence of the three species in this multidimensional space. By corollary, we also identify priority habitats for immediate conservation action.

1.1. Study area

The Western Ghats are one of the major tropical evergreen forested regions of India (Fig. 1), which harbor rich biodiversity, especially endemic species. The landscape has lost a significant part of its forest cover and the remaining forests are threatened by increasing anthropogenic pressures. During the present study, five different PAs of southern Western Ghats, viz. Eravikulam National Park (ENP), Periyar Tiger Reserve (PTR), Anamalai Tiger Reserve (ATR), Parambikulam Wildlife Sanctuary (PWS) and Kalakkad-Mundanthurai Tiger Reserve (KMTR), were surveyed to examine the factors affecting occurrence of otters.

The ENP is situated between 77°0′–77°10′ E and 10°05′–10°20′ N in the Kannan Devan Hills of the southern Western Ghats in the Idukki district, Kerala. The Park has an area of 97 km^2 consisting mostly of high elevation montane grasslands interspersed with evergreen shola forests and streams. The PTR lies in between 76°55′–77°25′ E and 9°15′–9°40′ N in the Idukki district, Kerala. It covers an area of 777 km^2, out of which the Periyar Lake occupies an area of 26 km^2. The major vegetation types in PTR are: tropical evergreen and semi-evergreen forests (74.6%), moist deciduous forests (12.7%), grasslands (1.5%) and eucalyptus plantations (7.1%). The ATR occupies a vast stretch of forested area of 958 km^2 between the longitudes 76°49′–77°20′ E and latitudes 10°13′–10°35′ N in Coimbatore district, Tamil Nadu. The vegetation of the Reserve consists of tropical evergreen rainforests, tropical montane forests, grasslands and moist and dry deciduous forests. The PWS lies between the longitudes 76°35′–76°50′ E and latitudes 10°20′–10°26′ N in the Palakkad district, Kerala, with an area covering over 285 km^2. The evergreen and moist deciduous forests are the most dominant natural vegetation type that also includes moist bamboo brakes, reed brakes and sholas. Microclimatic fluctuations coupled with edaphic, topographic and biotic factors have endowed this sanctuary with rich floral diversity. The KMTR, covering a total area of 895 km^2, lies between the longitudes 77°10′ E and 77°35′ E and latitudes 8°25′–8°53′ N in Tirunelveli district, Tamil Nadu. The Reserve forms the catchment area of 14 rivers and streams and has seven major dams. The forest types of this Reserve include tropical evergreen forest, semi-evergreen forest, dry deciduous forest and moist deciduous forest. Other forest types observed in this Reserve include tropical riparian fringe forest, Euphorbiaceous scrub, high/low elevation grassland and dry teak forest.

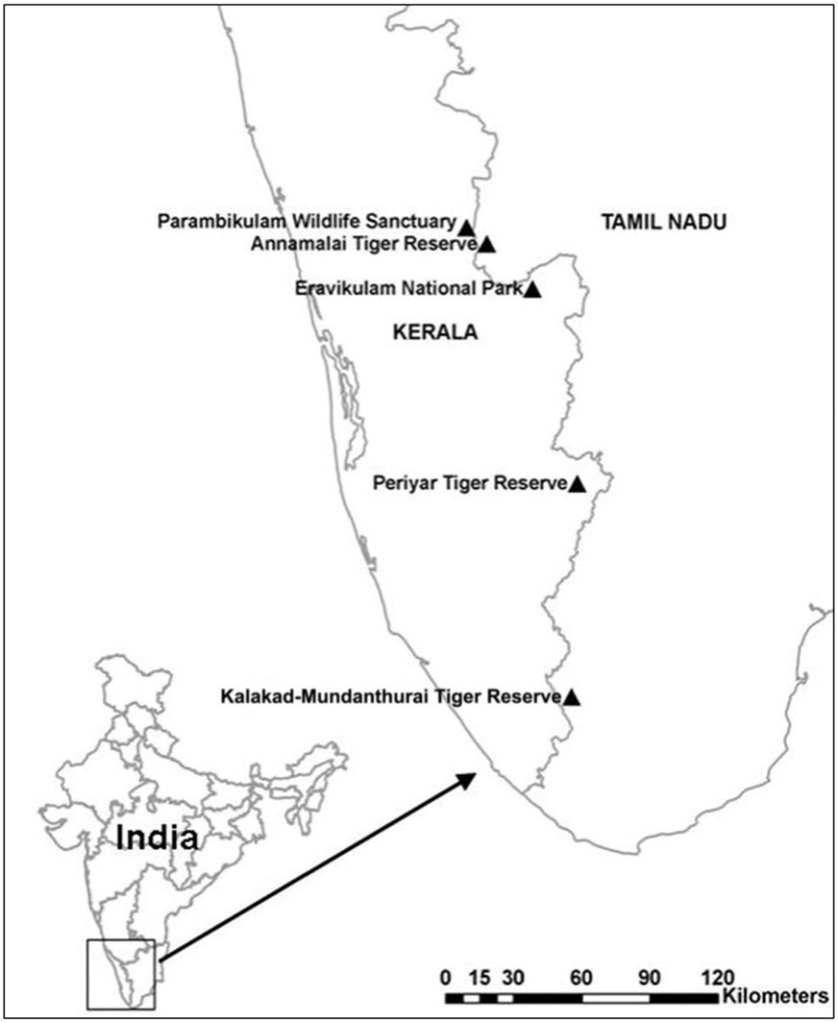

Fig. 1. Map showing different Protected Areas studied for the presence of otter in the southern Western Ghats, India.