

Distribution Update

Rediscovering dholes in the Deccan Plateau, southern India

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Abstract

Intensive camera trapping to understand leopard *Panthera pardus* abundance in Chincholi Wildlife Sanctuary and Bidar Forest Division in southern India revealed the presence of dhole *Cuon alpinus* in the Kalyana-Karnataka region. Here, we report a new record for the species, which is perhaps the first such record of dhole presence from this region since 1966. Twenty independent photos of dholes were recorded from a camera trapping effort of 1,650 trap days. All images were of individual dholes; we did not obtain any pictures of dhole packs. Dhole was found to be sympatric with golden jackal *Canis aureus*, and Bengal fox *Vulpes bengalensis*. However, the Relative Abundance Index indicated the golden jackal had higher distribution in the study area compared to the other two canids. The presence of dholes in isolated patches like this emphasises the significance of studying and safeguarding lesser-known areas, shedding light on the ecological dynamics and biodiversity of the region. We recommend infusing additional captive bred dhole individuals into Chincholi Wildlife Sanctuary along with other conservation measures.

Introduction

The Asiatic wild dog or the dhole *Cuon alpinus* is a social canid found across South and East Asia. Primarily found in forested areas, dholes are habitat generalists and can persist in a wide array of habitats. The species is classified as Endangered (EN) by the IUCN (Kamler *et al.* 2015) and, in India, it is given the highest degree of protection under Schedule-I of the Wildlife Protection Act 1972. Wide-ranging carnivores have suffered sizeable losses in their ranges due to loss of habitat, depletion of prey, as well as a suite of anthropogenic threats (Wolf and Ripple 2017). In line with this trend, dholes have also undergone a major contraction in range and currently occur in <25% of their historic range. The species has been declared extinct in several Asian countries, including Afghanistan, the Republic of Korea, and Singapore, and its presence is uncertain in the Democratic People's Republic of Korea and Pakistan (Jo and Baccus 2015). In the absence of reliable population estimation methods, expert opinions suggest a global population ranging from 949 – 2,215 mature individuals, with India emerging as a stronghold for this canid (Kamler *et al.* 2015). However, the population in India is highly fragmented, sensitive to anthropogenic pressures (Srivathsa *et al.* 2019), and the distribution of this wild canid has shrunk by 60% of its historic extent.

Dholes, and sympatric carnivores like tigers *Panthera tigris* and leopards *Panthera pardus*, collectively constitute mid-to-high level carnivore guilds in India. They hold ecological significance as apex predators in the areas they inhabit (Srivathsa *et al.* 2023). However, compared to extensively studied large carnivores, the dhole remains relatively understudied. In India, dholes are estimated to occupy an area of 249,606 km² (Srivathsa *et al.* 2020) however, data on dhole abundance and distribution, derived from ground

surveys, is still nascent. A significant portion of available data is derived from literature focused on dholes in three stronghold landscapes: the Western Ghats, and central and northeast India (Srivathsa *et al.* 2020). Consequently, most distribution accounts are limited to these stronghold landscapes. The absence of comprehensive assessments for dhole populations as well as reports on distribution, particularly from dry and arid habitats, skews conservation strategies and hinders an accurate understanding of the species' status.

Incorporating data from previously undocumented regions is vital for a more accurate and effective approach to conserving dholes on a larger, nationwide scale. Hence, updates of distribution, especially from previously undocumented regions, contribute significant insights and help in understanding drivers of their current occurrence. Here, we report a previously undocumented dhole population from the Kalyana-Karnataka region in the southern Indian state of Karnataka. Prior studies conducted in this region have not documented the presence of dholes. We also report the comparative distribution and Relative Abundance Index (RAI) of the three canid species – dhole, Bengal fox *Vulpes bengalensis*, and golden jackal *Canis aureus* – to provide an overview of the relative abundance of these species.

Methods

The study area (17°23'49.038"N – 17°38'11.544"N, 77°18'16.8372"E – 77°37'43.3992"E, Figure 1) falls within the Kalyana-Karnataka region in the north-eastern part of Karnataka state in southern India. It encompasses the Chincholi Wildlife Sanctuary (CWS, 134.88 km²), and the Devagiri-Changler (25.07 km²), Salebeeranahalli (12.20 km²), and Basipur (3.23 km²) Reserved Forests (RFs), which are contiguous to the wildlife sanctuary.

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CWS falls under the Kalaburagi administrative district, while the RFs fall under the Bidar administrative district (Figure 1). The region is distinct from other landscapes within the state and features characteristic Deccan plateau habitats. The area is undulating, with an average elevation of 620 masl, comprises dry, arid habitats with dry deciduous forests and laterite plateaus with grasslands. The predominant vegetation in the study area includes *Annona squamosa*, *Anogeissus latifolia*, *Butea monosperma*, *Chloroxylon swietenia*, *Diospyros melanoxylon*, *Grewia villosa*, *Holarrhena pubescens*, *Terminalia bellirica*, and *Ziziphus mauritiana*. The invasive *Lantana camara* is found in some patches of the study area. Plantations of exotic species such as *Acacia auriculiformis*, *Eucalyptus grandis*, *Gliricidia sepium*, and *Senna siamea* were carried out in the past. The annual temperature varies from 16 °C to 42 °C and the mean annual rainfall is ~700 – 750 mm.

Some of the prey species documented here include chital (*Axis axis*), four-horned antelope (*Teracerus quadricornis*), nilgai (*Boselaphus tragocamelus*), blackbuck (*Antelope cervicapra*), wild pig (*Sus scrofa*), Northern Malabar langur (*Semnopithecus hypoleucos achates*), rhesus macaque (*Macaca mulatta*), Indian crested porcupine (*Hystrix indica*), black-naped hare (*Lepus nigrocollis*), peafowl (*Pavo cristatus*), jungle fowl (*Gallus sonneratii*) and livestock (cattle, goat and sheep) (Gubbi et al. 2024).

Intensive camera trapping was conducted in CWS and adjacent RFs as part of our long-term studies on leopard populations. Panthera V4 and V6 and Spartan lumen SR3-CX motion detection cameras were set up at 104 locations for photo capturing leopards, with a mean inter-trap distance of 874.90 m. Camera trap locations were selected based on initial reconnaissance of trails and forest roads. We surveyed for signs, to ascertain higher probabilities of photo capture of the focal species (leopards).

CWS and its adjoining RFs were subdivided into two blocks for logistical convenience and the study was carried out during 16 October – 20 November 2023. The 1st block (16 October – 01 November 2023) consisted of 38 camera trap locations resulting in a total of 605 camera trapping days, and there were 66 camera trap locations in the 2nd block (03 November – 20 November 2023) resulting in a camera trapping effort of 1,045 days (Figure 2). At each location, two camera traps were set up ~40 cm above the ground level on both sides of animal trails or forest roads to capture both flanks of individual animals. The camera traps were checked every 2 – 3 days to download data, change batteries, and make any necessary adjustments. With cameras operating continuously for 24 hours, these surveys with 104 camera trap locations resulted in a cumulative effort of 1,650 camera-trap days, with each day (24 hrs) defined as one sampling occasion.

We used photographic capture rates to estimate Relative Abundance Index (RAI) of the three sympatric canid species found during our study. From camera trap data, the number of dhole, Bengal fox, and golden jackal images and the total number of camera trap days were used to calculate RAI per 100 trap days as a proxy of abundance.

Table 1. List of camera-trap locations where dholes have been photo-captured, and the number of independent dholes encountered.

Block	Camera trap	GPS coordinates	No. independent events
1	CC-016	17°35'53.42"N, 77°24'11.55"E	1
2	CC-039	17°29'43.76"N, 77°29'59.33"E	1
	CC-040	17°30'2.06"N, 77°30'26.50"E	2
	CC-041	17°30'32.55"N, 77°31'2.77"E	1
	CC-052	17°29'20.92"N, 77°32'40.64"E	2
	CC-064	17°27'37.41"N, 77°29'37.71"E	1
	CC-067	17°27'16.88"N, 77°30'4.65"E	1
	CC-073	17°26'50.60"N, 77°31'27.84"E	1
	CC-077	17°25'58.27"N, 77°30'3.08"E	2

Results

Adult dholes were recorded at nine camera trap locations in the study area, of these eight were within CWS and one record was from the Devagiri-Changler RF. A total of 20 photo captures of dholes were recorded that accounted for 12 independent events (Table 1, Figure 1, Figure 3). None of the photo captures contained more than one individual and no photos of pups were recorded. However, from their unique body characteristics (colouration, body size, and snout shape) we found that two different individuals were recorded. All the records were from daytime hours.

We believe that our observations indicate an extension in the range of dhole distribution. Presently, distribution records for this canid species are well-established within the Western Ghats (Srivathsa et al. 2020). Our recorded location signifies a northeastern extension, measured by a straight-line distance of approximately 400 km from Bhimgad Wildlife Sanctuary in the Western Ghats. Similarly, the study area is approximately 200 km west of Amrabad Tiger Reserve in the Eastern Ghats (Karanth et al. 2009). Both protected areas represent the closest geographical locations with documented dhole occurrence.

Two other wild canid species (golden jackal and Bengal fox) were recorded in the study area. The golden jackal was the most widespread canid within the study area, with 83 independent events, in contrast to the dhole and Bengal fox, each with 12 independent events (Figure 4). The RAI per 100 trap days for dhole and Bengal fox was 0.727, while it was 5.030 for golden jackal.

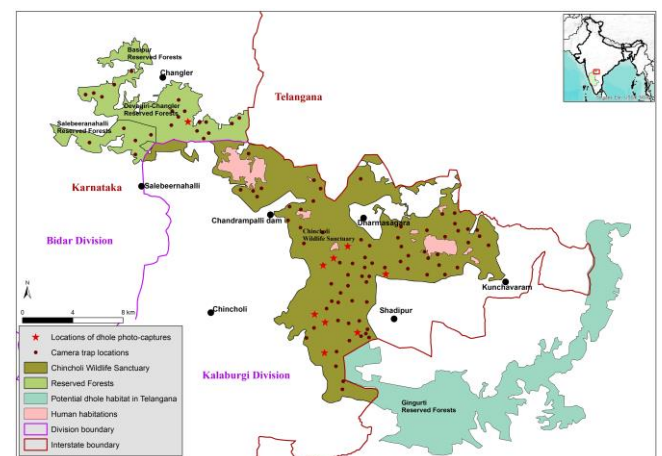


Figure 1. Study area with camera trap locations, locations where dholes were documented, and study area location within India as an inset.

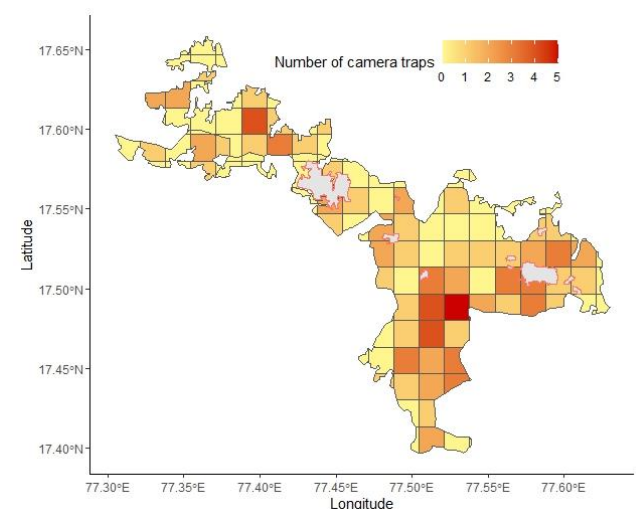


Figure 2. Intensity of camera trapping in the study area within a grid size of 1.85 x 1.85 km².

Discussion

The dhole, one of the least studied large carnivores, requires a deeper understanding of its distribution and population, upon which future conservation efforts can be developed. The documentation of this canid in new areas has not only expanded its known distribution range but also presents opportunities for their conservation in arid regions.

Based on the documentation of dholes in these new locations we have proposed to the authorities to include Devagiri-Changler (25.07 km²), Sale-beeranahalli (12.2 km²), and Basipur (3.23 km²) RFs within CWS for better management and enhanced conservation initiatives for a wide-ranging species such as the dhole. This would expand the current area of CWS from 134.88 km² to 175.38 km². CWS is also connected to dhole habitats in the neighbouring state of Telangana (Sangareddy district) which could potentially harbour dhole populations. In this context, we propose that further camera trapping studies should be undertaken in the Sangareddy district to possibly provide further distribution information on dholes.

Our proposal to expand the protected area of CWS is in line with the conclusions of Srivathsa *et al.* (2019) who found that dhole occupancy is greater within protected areas, due to increased forest cover and prey availability, as opposed to outside.

The recent IUCN assessments also do not include our study areas as part of the dhole distribution range (Kamler *et al.* 2015). According to the Mysore State Gazetteer for the Gulbarga district (Sathyan 1966), dholes were last documented in the region in 1966. The current observation of these canids may mark the first record of dholes in the area after half a century. Srivathsa *et al.* (2020) carried out dhole distribution and potential recovery sites through literature review. This study area where dholes are now reported is not identified as part of the distribution or potential recovery habitat. Hence, it highlights the importance of field studies compared to mere predictive modelling at coarse spatial scales. Though such studies provide information on geographic range limits, they need to be complemented with field studies.

The low volume of independent dhole photo captures demonstrates that the species likely occurs in a very low density in the area. Dholes live in packs of up to 30 individuals but are frequently recorded in packs of 5 – 10 animals (Bhandari *et al.* 2021). The photo captures of single individuals possibly demonstrate the extremely low abundance of dholes in this landscape.

The documentation of dholes in CWS and Bidar division in nine different locations demonstrates the potential for dhole conservation in this area. However, given the wide-ranging behaviour of dholes, conservation of adjoining areas in both Karnataka and the neighbouring state of Telangana is critical. Provided that dhole presence is positively affected by availability of prey (Srivathsa *et al.* 2019), the presence of chital, four-horned antelope,



Figure 3. Photographs of dholes (*Cuon alpinus*) from camera traps in Chincholi Wildlife Sanctuary and its adjoining Reserved Forests in southern India.

wild pig and other large prey in CWS highlights the potential for dhole conservation in this area. However, dholes are negatively affected by human presence, loss of forest cover and other similar factors (Srivathsa *et al.* 2019; Pattekar *et al.* 2024), and CWS and its adjoining areas face these threats. It is key that these threats are addressed on a priority basis. Hunting can deplete dhole prey, hence needs effective management strategies to protect them as it could be a key factor to enhance dhole population in this area.

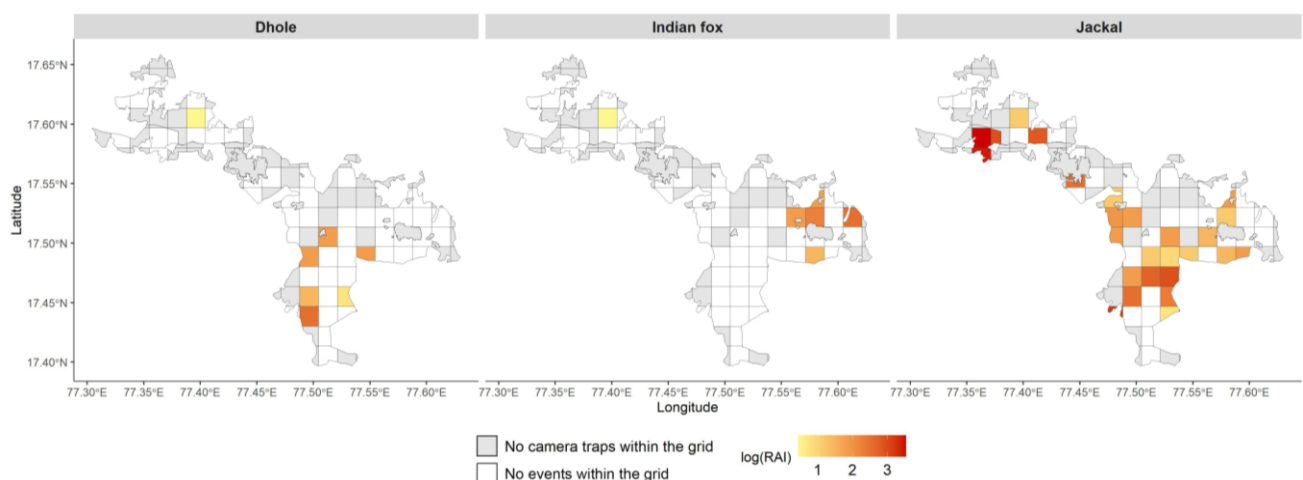


Figure 4. The distribution and Relative Abundance (grid size of 1.85 x 1.85 km²) of the three canid species found in Chincholi Wildlife Sanctuary and its adjoining Reserved Forests, India.

In addition to dholes, our camera traps also documented a single leopard image in CWS during the study period (Gubbi *et al.* 2024). Despite an effort of 1,650 camera trapping days only a single image of a leopard demonstrates that this felid is also present in very low numbers in CWS. The documentation of a single leopard and such a low number of dhole captures suggests that these large carnivores are facing a bottleneck in CWS and could soon see local extinction if suitable conservation measures are not undertaken. This is perhaps a naturally isolated population of large carnivores. However, radio collaring studies on dholes could provide further information about the use of habitats by dholes and their home ranges which could possibly spill into the neighbouring state of Telangana where an additional dhole habitat (~100 km²) is present and is connected to southern parts of CWS through a forested corridor. With fragmentation being one of the key threats to terrestrial large carnivores (Wolf and Ripple 2017), notifying the areas in Telangana as a protected area should bring in added benefits for dhole conservation in the landscape.

The Chamarajendra Zoological Gardens (Mysore Zoo) has been successfully breeding dholes (Ravi *et al.* 2015) and these individuals can be infused into CWS to boost the existing small population by following the appropriate guidelines.

Feral domestic dogs (*Canis familiaris*) pose a significant threat to dholes through interference competition, and as transmitters of disease pathogens (Belsare *et al.* 2014). The presence of many feral dogs in the study area, as observed during this study, could potentially threaten dholes. Hence suitable management interventions to reduce feral dog population will be crucial for recovery of dholes in the study area.

With dholes disappearing from >75% of their historic range and their population being severely fragmented (Kamler *et al.* 2015) the documentation of dholes in CWS and Bidar division, and in other isolated fragments of dhole habitats (Pardeshi *et al.* 2020) highlights the need for conservation of corridors to larger habitats and conservation emphasis to prevent local extinction of such small sub-populations. Provided that the Kalyana-Karnataka area has little forested cover, dholes can be used as an icon for this area for conservation and outreach of the habitat. We also propose periodic assessments in the study area so that future presence and changes in distribution can be documented.

The distribution and RAI (Figure 4) of golden jackal was higher in comparison to the other two canids reported in the study area. This could also be an indicator of higher absolute abundance of this species compared to dholes and the Bengal fox. Further support for research is required from conservation agencies to understand population size based on which further conservation plans could be implemented.

This finding and our other studies (Gubbi *et al.* 2014, Gubbi *et al.* 2020, Suthar *et al.* 2020, Gubbi *et al.* 2023a, Gubbi *et al.* 2023b) highlights the utility of by-catch data from camera-trap monitoring that could benefit non-target species and conservation planning.

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Biographical sketch

Sanjay Gubbi has a keen interest in understanding large carnivore populations, distribution and factors influencing their conservation.

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