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Research Paper

DISTRIBUTION LOCALITIES OF ROYAL BENGAL TIGER– *Panthera tigris* IN MANAS NATONAL PARK, ASSAM, INDIA

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Abstract

The Tiger (Panthera tigris) the IUCN most endangered species and schedule I species under Indian Wildlife (Protection) Act 1972, is facing serious conservation threats from anthropogenic disturbance, prey depletion and habitat destruction. In Manas National Park (MNP), the species has received severe threats during two decades of political unrest for reasons. Though there was regular census of the Tiger was done till 2000-2001 with the pug mark census technique. But the present population distribution of the tiger is not in Manas National Park. Hence the present study was designed to evaluate the distribution pockets of tiger in Manas National Park. The methods followed were transect survey for gathering data sign of tiger pug marks, trails, scats and scratch mark on nearby trees with its GPS location. The relative occurrence was calculated from the occurrence data tiger on each transects. The results of the study showed that the distribution of tiger in Manas National Park is not even and high tiger occurrence were found on the transects which are on the northern boundary of the park. The results of present study suggest that tiger is distributed relatively high in seven pockets of MNP. The study results suggests the management of the MNP must concentrate on the site specific management strategy to free the southern boundary of the park from the anthropogenic disturbances, livestock grazing pressure to allow the growth of prey population. This will also help the tigers in the existing tiger pockets to disperse into new areas facilitating growth of tiger population in Manas National Park.

Key words: Manas National park, Tiger pockets, Distribution, Project tiger, relative occurrence, riverine.

INTRODUCTION

In India, the charismatic species of Tiger (*Panthera tigris*) served as an effective flagship species in India. For saving this majestic carnivore in India, the 'Project Tiger' was started in the year 1973. The Manas Tiger Reserve, Assam was formed with the starting of the Project tiger in India.

Though the Tiger *Panthera tigris* is a specialist, inhabits a wide range of forest types, climatic regimes, sustaining on a wide prey bases (Schaller, 1967; Sunquist *et al.*, 1999). The resilience power of tiger, a product of adaptability and high fecundity, has allowed tigers to

survive the massive onslaught and habitat loss of the past century (Kawanishi, 2002). However, many of the remaining tiger populations are confined to small, isolated less productive forests due to fragmentation. In its distribution areas an expanding human population has increased pressure on the tiger's habitat, its prey and on the tiger itself with different types of anthropogenic activities and livestock grazing pressure. Even tiger populations in large forest tracts may not be secure (Kenney *et al.*, 1995), especially those in tropical rainforest habitats where prey densities are naturally low (Eisenberg and Seidensticker, 1976). With the larger forest area in Manas Tiger Reserve have a very unimpressive population of tiger as compared to some other protected area in Assam.

The Manas National Park the core area of the Manas Tiger reserve one of such area whose tiger received severe threat from organised poaching, habitat destruction, declining prey base, domestic cattle grazing, flood etc. The regular department census was done till the 2000-2001 with the pug mark census technique. After that the centralised census was done at the same time with on all India level. However after the two decade unrest in the region the population of the Tiger and its prey base received severe damage in the level of their population and distribution. Their present distribution and abundance in the Manas National Park is least known as in the case of the tiger of other areas in the North east India. The ecology and conservation status of tigers are least known from the state of Assam also. Hence, with the objective to know the spatial distribution of tiger in Manas National Park the present study was carried out. The issue we address in this paper is how the tiger is spatially distributed in MNP in different distribution pockets and place them in GIS environment by collecting their occurrence with help of GPS. The above objective was set to answer the following research questions-

1. Do the Tiger still have distribution in Manas National Park.
2. Do the spatial distribution of tiger is even throughout the study area?

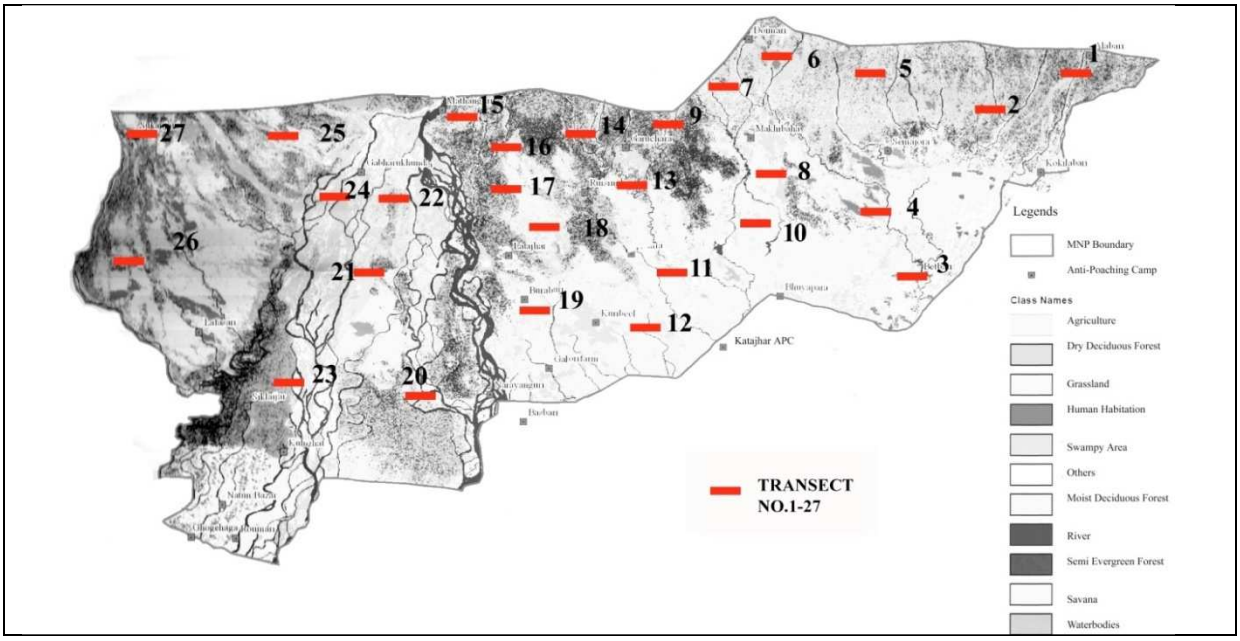
STUDY AREA

The Manas National Park is situated in the latitude of 26°28'12.73- 26°49'04.37″ N and longitude of 090°15'41.38″- 090° 49'5″7.11″ E longitude(Ref.). This was declared as national park during the year 1990. It is the Core area of the Manas Tiger Reserve declared on 1st April, 1973 as "Project Tiger" with core area of 391 km^2 at that time. The National Park is bounded by international boundary between Bhutan and India in the south and is an agricultural land. The area is networked by a numbers of streams, tributaries of the river Brahmaputra from north & south. The Manas NP was inscribed as the first world heritage site of Assam, during 1985 (under UNESCO), as a site of outstanding natural value. Manas National Park was also designated as the first Biosphere Reserve of Assam on 14 March, 1989, with more area extended over from the river Sankosh in the west and Dhansiri in the east along with the national park area.

METHODS

Data collection of tiger distribution in Manas national parks were done from March, 2008 to April 2009. Altogether 27 permanent transects were established, nine in each of Panbari, Bansbari and Bhuyapara Range (Table-2). The transects were established with a fixed length of 2 km within 1km apart from each transact. All the transects were laid in stratified manner, so that all types of habitat could be covered in an equal manner. Data collections were performed between 05:30hrs–08:30hrs and 15:30hrs-14:30hrs of the day. Occupational survey methods such as pug marks, trails, scats and scratch mark on trees were used and GPS points were taken in each sighting locations. The relative abundance (occurrence) of tiger was calculated based on indirect evidences as mentioned earlier. Area wise relative abundance was calculated to mark as tiger pockets.

The habitat coverage of study area has been digitised using 1:50,000 topo sheets maps and the GPS points of tiger sighting locations were plotted on the map. The GPS used during the survey was the Garmin GPS72 and GIS software is the Arc info 9.0. The locations of tiger distribution data were later plotted into the satellite image of Manas National Park to identify the distribution pockets of Tiger. The method of Hooge (1999) was also cited for spatial distribution pattern.



Map 1: Showing the location of all 27 transects on the map of Manas National Park.

Table 1. Transact numbers and GPS location of the study transects in Manas. National park, Assam.

TRANSECTS NO.	START POINT		END POINT	
	Latitude	Longitude	Latitude	Longitude
1	N26°47'55.55"	E091°13'52.21"	N26°47'57.02"	E091°14'41.70"
2	N26°46'55.12"	E091°11'40.43"	N26°47'01.86"	E091°12'29.20"
3	N26°42'41.84"	E091°09'58.03"	N26°42'42.28"	E091°10'50.44"
4	N26°44'21.35"	E091°08'46.59"	N26°44'20.99"	E091°09'38.35"
5	N26°47'52.78"	E091°08'18.22"	N26°47'53.27"	E091°09'07.84"
6	N26°48'17.37"	E091°05'46.12"	N26°48'17.89"	E091°06'34.52"
7	N26°47'30.26"	E091°04'22.00"	N26°47'29.74"	E091°05'10.27"
8	N26°45'18.32"	E091°05'47.06"	N26°47'55.22"	E091°09'08.70"
9	N26°46'32.87"	E091°02'53.94"	N26°46'33.21"	E091°03'43.09"
10	N26°44'05.19"	E091°05'17.45"	N26°43'58.56"	E091°06'28.44"
11	N26°42'46.77"	E091°03'07.44"	N26°42'48.65"	E091°03'59.23"
12	N26°41'24.44"	E091°02'23.63"	N26°41'25.21"	E091°03'17.17"
13	N26°44'58.89"	E091°01'55.50"	N26°45'00.04"	E091°02'46.36"
14	N26°46'17.78"	E091°00'29.35"	N26°46'17.15"	E091°01'19.93"
15	N26°46'41.15"	E090°57'13.95"	N26°46'41.05"	E090°58'05.11"
16	N26°45'55.36"	E090°58'26.97"	N26°45'57.07"	E090°59'16.64"
17	N26°44'54.30"	E090°58'25.03"	N26°44'54.96"	E090°59'15.95"
18	N26°43'56.44"	E090°59'28.60"	N26°43'57.96"	E091°00'19.93"
19	N26°41'54.60"	E090°59'11.56"	N26°41'52.56"	E091°00'04.94"
20	N26°39'48.42"	E090°55'49.84"	N26°39'47.12"	E090°56'43.05"
21	N26°42'49.04"	E090°54'28.74"	N26°42'49.95"	E090°55'20.63"
22	N26°44'40.41"	E090°55'16.34"	N26°44'40.10"	E090°56'07.35"
23	N26°40'07.79"	E090°51'57.45"	N26°40'09.34"	E090°52'52.29"
24	N26°44'41.51"	E090°53'37.02"	N26°44'38.85"	E090°54'28.46"
25	N26°46'09.89"	E090°52'18.13"	N26°46'10.68"	E090°53'08.49"
26	N26°43'07.92"	E090°47'41.06"	N26°43'07.45"	E090°48'32.73"
27	N26°46'12.14"	E090°48'25.15"	N26°46'12.93"	E090°49'16.54"

RESULTS

Distribution of Tiger

Study found that the tiger was distributed in three range of Manas National Park, based on Pug marks and Tiger tracks (see Figure 1 for relative occurrences.). However, the occurrences were not found to equal in all the transects studied (see Table 2, 3&4). The occurrences of tiger in all the transects in Bansbari Range was highest (0.599), than the Bhuyapara range (0.214) and Panbari (0.188) transects (Figure 1).

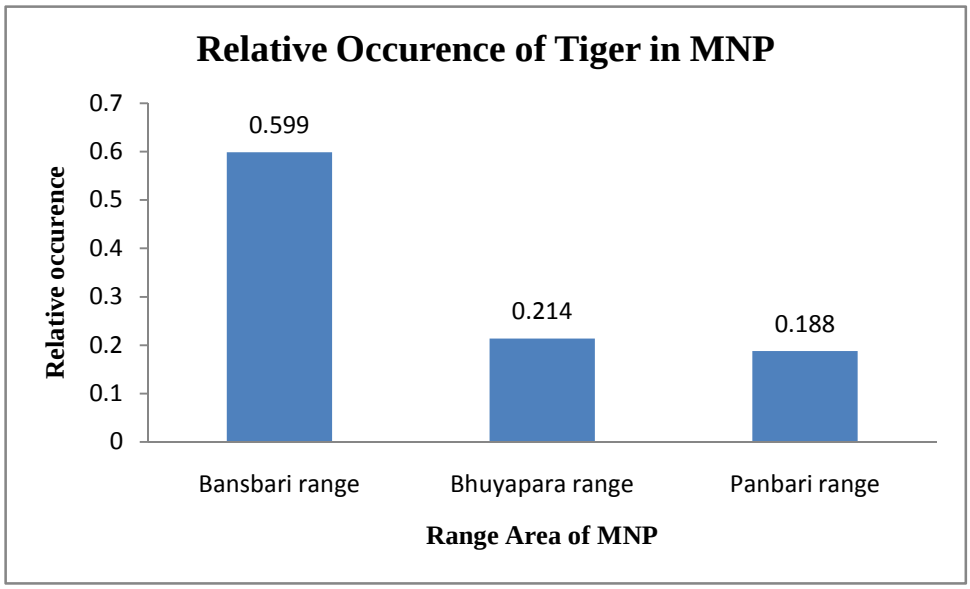


Figure 1. Relative Occurrence of Tiger in three forest ranges of manas National park.

Table 2: Relative Occurrence of Tiger in the Transects of Bhuyapara Range

Range	Bhuyapara Range							
Transects	T1	T2	T3	T4	T5	T6	T7	T8
Relative Occurrence of Tiger	0.035	0.038	0.01	0.008	0.003	0.06	0.045	0.015

Table 3: Relative Occurrence of Tiger in the Transects of Bansbari Range

Range	Bansbari Range										
Transects	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19
Relative Occurrence of Tiger	0.14	0.032	0.029	0.031	0.029	0.023	0.154	0.029	0.026	0.095	0.011

Table 4: Relative Occurrence of Tiger in the Transects of Panbari Range

Range	Panbari Range							
Transects	T20	T21	T22	T23	T24	T25	T26	T27
Relative Occurrence of Tiger	0.01	0.01	0.04	0.01	0.04	0.01	0.01	0.06

Distribution Pockets

The distribution pockets of tiger was found in seven pockets in different areas of Manas National Park from the data collected on transects, which are as follows-

Alabari-Thanganmara

The Alabari and Thanganmara are two areas adjacent in the eastern boundary of MNP. The vegetation of the area is dominantly semi-evergreen forest with the shorts grassland distributed in the gaps of woodland. That short grassland was the prime habitat for the abundant Barking deer in the area. One Tigress with two cubs was seen in the Alabari area during the period of the

study. It has relative occurrence of tiger of 0.073 among the seven pockets found during the study (Figure 2, Map 2)

Dwimari-Rabang

The Dwimari and Rabang areas are on the northern most edge of the MNP bordering Bhutan is covered with the Semi-evergreen and mixed deciduous forest. These two areas were covered with short grassland areas interspersed with the sudden tall grass especially near the river Dwimari and Ranang. The movement of the herbivores to the uphill salt lick area were seen trough these two rivers and the tiger mimic the herbivore movements in this pocket. It has relative occurrence of tiger of 0.105 among the seven pockets found during the study (Figure 2, Map 2)

Garuchara

The Garuchara area is at the middle of the MNP and connects the movement of the movement of the herbivores from the southern grassland to the uphill salt lick sites. The area is covered with semi evergreen forest, mixed deciduous forest and also with the riverine grassland on the sand bar and banks of the river Garuchara. The occurrence of the Sambar and Bison was found to be very high in this area. It has relative occurrence of tiger of 0.14 among the seven pockets found during the study (Figure 2, Map 2).

Mathanguri

The Mathanguri area is on the North of the MNP and is on the Bank of the river Beki. The vegetation of the area was semi-evergreen and mixed deciduous forest with mosaic occurrence of short grassland in the woodland gap and riverine areas. The occurrence of the Sambar, Bison, Barking deer were found to be high in this area. It has relative occurrence of tiger of 0.154 among the seven pockets found during the study (Figure 2; Map-2).

Latajhar

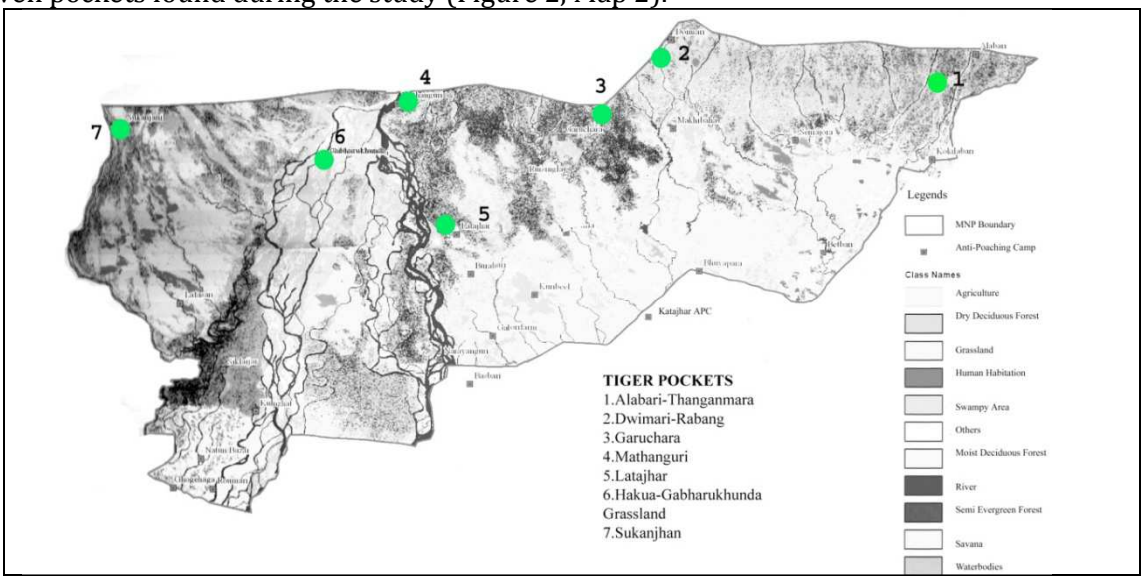
The Latajhar area is on the halfway between Bansbari Range office and Mathanguri. The vegetation of the area was found to be mixed deciduous forest and tall grassland. It has relative abundance of tiger of 0.095 among the seven pockets found during the study (Figure 2; Map-2).

Hakua-Gabharukhunda Grassland

The Hakua- Gabharukhnda grassland was on the western part of the MNP and is adjacent to the Bhutan boundary. The area was covered mostly with grassland. The tiger distribution in the area is results of mimic of herbivore occurrence specially the hog deer and bison. It has relative abundance of tiger of 0.128 among the seven pockets found during the study (Figure 2, Map 2).

Sukanjhan

The Sukanjhan area is on the North western part of the MNP. The area is covered with mixed deciduous forest and short-grassland. It has relative abundance of tiger of 0.061 among the seven pockets found during the study (Figure 2, Map 2).



Map 1: Showing the location of the tiger pockets in the Manas National Park.

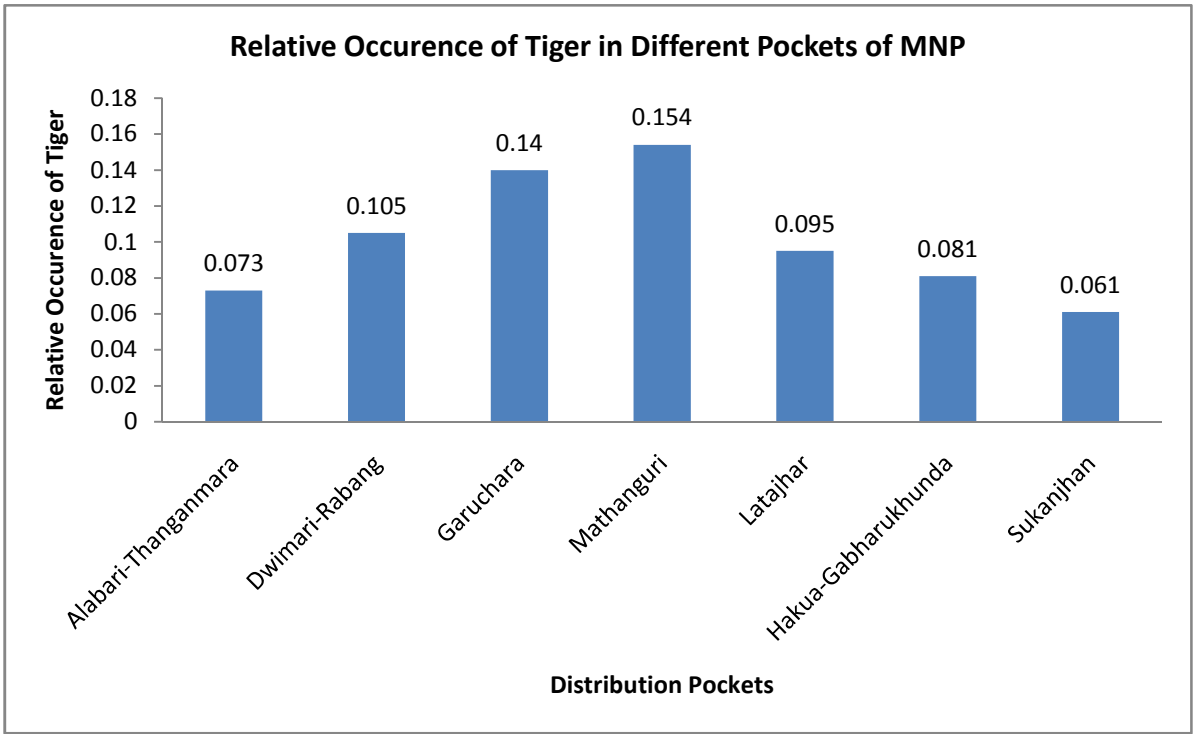


Figure 2: Relative occurence of Tiger in different pockets of Manas National Park.

DISCUSSION

Present study suggest that the distribution of tiger in Manas National Park is not even as the relative occurrence in all the transects were not found even. Interestingly the high tiger occurrence were found on the transects which are on the northern boundary of the MNP along the international boundary with Bhutan. This may be due to the fact that the southern part of the MNP is prone to anthropogenic disturbance and livestock grazing pressure. The livestock grazing pressure on the southern boundary pushes the tiger prey base towards the northern side where prey are relatively abundant than the southern boundary. Absolute abundance of prey is a factor of predator abundance, but of great importance for these similar but different sized predators is the availability of prey in both the larger and smaller size classes (MacArthur, 1972; Wilson, 1975). However high abundance of larger prey like Sambar and Bison in the northern area may be one of the causes for the high occurrence of tiger in that area. As the high availability of large prey in the study area would be expected to influence prey selection by tigers, as they are usually known to have a predilection for larger prey (McDougal, 1977; Sunquist, 1981; Johnsingh, 1983; Karanth and Sunquist, 1995; Stoen & Wegge, 1996; Biswas and Sankar, 2002). Again Brown *et al.* (1995) point out that in certain cases, the distribution patterns seen may not be best explained by environmental conditions, such as when time lags in responses to environmental changes decreases the correspondence between environmental conditions and abundance, or when territoriality/ aggregation for group benefits changes distribution in a way different from that expected by availability of resources. But in all the seven tiger pockets located inside the MNP the occurrence of the Leopard is very low. This is the classic response of a shift in niche breadth as a function of interspecific social dominance (Morse, 1974). But the recent census of tiger in the 2010 in the entire Manas Buxa Tiger Reserve was reported as nine (Jhala *et al.,*2011). But the results of present study suggest that tiger is distributed relatively high in seven pockets of MNP whose population may cross the census number of nine (Opcit.) only from the national park. Hence, as the conservation recommendation the management of the MNP must concentrate on the site specific management strategy to free the southern boundary of the park from the anthropogenic disturbances, livestock grazing pressure to allow the prey population growth. This will also help the tigers in the existing tiger pockets to disperse into new areas. Further studies should be

made to evaluate the population status of tiger in the MNP with the help of statistically and technically robust camera trapping technique.

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