

SPIDER DIVERSITY FROM RELOCATED AREA OF MELGHAT TIGER RESERVE

Kishor Rithe

“Pratishtha”, Bharat Nagar, Akoli Road, Near Sainagar, Amravati,
Maharashtra state, India. Pin-444607.
Email- rithekishore@gmail.com

ABSTRACT

Tigers (*Panthera tigris*) are facing a concrete threat of extinction. India has protected its last viable tiger populations and hence potentially holds the key to save the tigers from extinction. Many efforts at international and local level have been initiated to save tigers. Threats have been identified and strategies have been evolved to tackle them. The tiger conservation units (TCU) are identified as priority areas for action. Melghat tiger reserve (MTR) in the Satpuda landscape of central India is listed as a TCU. The voluntary relocation of human settlements from critical tiger source population areas is recommended as one of the key actions in these landscapes for saving tigers. Such village relocation efforts are ongoing in MTR, where three villages were relocated in 2001-02. It is essential to study whether voluntary relocation efforts really help in habitat recovery. Here, the study conducted to document the fauna specially spiders to understand the habitat recovery process. We observed predominance of spider species in the resettled area of Melghat Tiger Reserve. A total of 254 species belonging to 113 genera and 27 families were recorded from Koha, Kund and Bori meadows. We conclude that the relocation of three villages has had a positive biological impact on habitat recovery.

Keywords: Village resettlement; Spiders, Melghat Tiger Reserve; India

INTRODUCTION

Village relocation and rehabilitation are considered as an accepted action for ecological requirements of some endangered species (Rangarajan & Shahabuddin, 2006; Baya & Storch, 2010). However for saving Tigers (*Panthera tigris*), it has been recommended as an essential action as a global strategy in tiger source areas (Karanth *et al.*, 2009). However looking at the huge economic cost and social factors involved, it is essential to prove whether these efforts are really serving to address the issue of tiger and its prey species decline (Lasgorceix & Kothari, 2009).

From the studies, mostly it seems that Village relocation initiatives have been proved very effective for the species like tigers, primates and some other endangered ungulates like Swamp deer. Relocation of villages has been done in

Spider diversity in relocated area.....Kishor Rithe

many Tiger reserves of India like Kanha, Melghat, Satpuda, Saraiska, Panna (Lasgorceix & Kothari, 2009), Tadoba-Andhari (Ghate, 2005), Bhadra (Karanth, 2007) consisting around 28 protected area.

The three villages of Melghat sanctuary situated on the boundary of Gugamal National Park were relocated during 2001-02 (Table-1).

Table-1.Details of families and livestock resettled and area vacated from tiger reserve

Village	Families (Population)	Cattles	Residential Area (m ²)	Cattle Shed (m ²)	Total house built up Area	Agriculture area (Ha)
Koha	39 (223)	348	1459.06	727.75	2196.81	58.02
Kund	34 (141)	141	1343.29	909.53	2252.82	30.28
Bori	19 (135)	273	745.91	159.84	903.75	35.08

Approximate 166 ha of human habitation has been given back to the wildlife by shifting three villages from Melghat. Non government organisations like Nature Conservation Society and later Satpuda Foundation worked with the Government to provide better facilities to relocated families.

This biodiversity assessment study around the resettled Bori, Koha and Kund villages was done by Satpuda Foundation at relocated sites with the support from experts from Bombay Natural History Society, SGB Amravati University Amravati and Melghat Tiger Reserve. The study granted research permission from the wildlife department of Government of Maharashtra. ABN AMRO Foundation (AAF) extended its financial and volunteer support to Satpuda Foundation (SF) for this work. Spiders and insects also are the indicators of health of the eco-system. Additionally, spiders are an important food source for birds, lizards, wasps and other animals. In a study of trunk arthropods, spiders provided a relatively constant food source throughout the year for bark-gleaning birds (Peterson *et al.* 1989). Hence it was decided to cover this aspect of biodiversity in detail during the study.

The study site:

Melghat tiger reserve (MTR) is located in the Satpuda hill ranges of central India's Maharashtra state between 21° 15' and 21° 45' N, and 76° 57' and 77° 30' E (Fig. 1). It covers an area of 2027 km² with 312 m to 1178 m altitude (Chaudhary *et al.*, 2003).

The MTR is included in the bio-geographic zone '6 E-Deccan Peninsula' – central highlands (Rodgers *et al.*, 2002). It records annual rainfall between 950 to 1400 mm and average mean temperature varies from 4° (minimum) to 46° c (maximum). It connects to other reserves and protected areas in the Satpuda landscape (Rithe & Fernandes, 2004). MTR harbours carnivore species including

tiger, leopard (*Panthera pardus*), Asian wild dog (*Cuon alpinus*), Indian jackal (*Vulpes bengalensis*) and sloth bear (*Melurus ursinus*). It supports prey species like gaur , sambar, chital (*Axis axis*), muntjack (*Muntiacus muntjak*), nilgai and four horned antelope (*Tetracerus quadricornis*) as well as many reptiles and insects (Chaudhary *et al.*, 2003).

The MTR includes the Gugamal national park of 368.28 km², the core zone without any human settlement, surrounded by Melghat sanctuary of 788 km², which in turn is partially surrounded by the buffer area of 526.90 km² including 39 villages. The National Park area is managed by the Gugamal division along with some sanctuary area. The sanctuary area is managed by the Sipna wildlife division along with the buffer area.

There were 22 villages situated in the sanctuary area having approximately 5216 human population and 15,486 livestock (Fig-2) whereas the buffer area sustain 23,347 human population and 17,286 cattle population (Rithe, 2006) in its 39 villages. The villages in sanctuary and buffer has total 27620 human population as well as 28968 cattle heads (Thosare, 2003). Figure 2 below shows the human and cattle population in 22 villages of sanctuary. Recently the core and buffer area of MTR have been expanded, adding the Melghat and adjoining Wan, Ambabarawa, Narnala sanctuaries in the core and more tiger bearing forests around these areas in to the buffer of MTR, including few more villages.

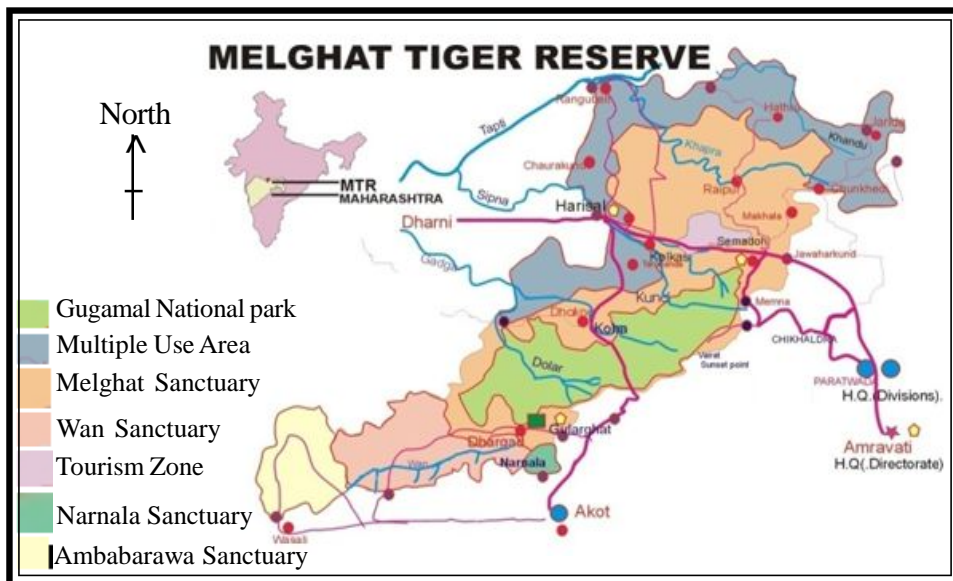


Figure-1, Melghat Tiger Reserve (MTR) in India with Gugamal National Park, Sanctuary and Buffer. Source: MTR

The majority of the human population in MTR consist of tribal communities like Korku, Gond and Balai. The grazing community Gawali with huge livestock is also present (Chaudhary *et al.*, 2003). The Korkus were brought to the area by British rulers as labours (Forsyth, 1889). They use to carry out timber logging operations for British rulers and cultivate the agriculture lands close to rivers given

Spider diversity in relocated area.....Kishor Rithe

to them by British after clearing the forest (Forsyth, 1889). The limited flat lands in this undulating landscape and the nearby forest for forest products have been the major source for sustenance of local tribal communities in MTR (Rithe, 2003). The Gawalis have been dependent on their livestock to make a living (Pardeshi, 2003).

The logging has not been taken place in national park area of MTR since last 60 years. The sanctuary area is systematically logged during the same time and has been a source of employment for the local communities (Chaudhary *et al.*, 2003).

However the villages with increasing human and livestock population are complaining about less fodder availability for their livestock due to invasion of *Raimunia* weed. The crop depredation and livestock losses in predator attacks also have been recorded substantially around the villages (Thosare, 2003). The villages have been located deep inside the forest and away from the big market places.

The three villages out of 22 of Melghat sanctuary officially recorded their request to the MTR to relocate them and provide the better resettlement package. The relocation and resettlement was done in 2001-02. The relocated area was handed over to the MTR administration to develop the habitat to restore the prey population and recover the tiger population.

The description of the village locations and our study area is shown in following tables (Table 2, Table 3, Table 4, Table 5).Field Procedure

Table 2. Study area of relocated villages

Name of village	MTR Range	Range ID	Beat name	Beat ID
Koha	Dhakana	2	Koha	10
Bori	Dhargad	3	Bori	3
Kund	Harisal	4	Kund	12

Table 3. Study Area of national park (For spiders)

Name of Range	Range ID	Beat name	Beat ID
Chikhaldara	1	Dhondriam	8
Dhakana	2	Dolar	6
Dhargad	3	Gurgipati	9

Table 4. Study Area of Melghat sanctuary (For spiders)

Name of Range	Range ID	Beat name	Beat ID
Harisal	4	Malur	12
Raipur	6	E.Raipur	6
Semadoh	5	N.Pili	13

Table 5. Co-ordinates of study Area (Forest ranges)

Name of Range	Min Longitude	Min Latitude	Max Longitude	Max Latitude
Chikhaldara	77.05833	21.3083	77.325	21.4583
Dhakana	76.92222	21.3111	77.12778	21.5167
Dhargad	76.89444	21.2333	77.13333	21.4083

Table 6. Number of genera and species recorded from Koha, Kund and Bori meadows during 2009.

Sr.No.	Family	Genus	Species
1.	FAMILY ARANEIDAE Clerck, 1757	14	37
2.	FAMILY CLUBIONIDAE Wagner, 1887	1	8
3.	FAMILY CORINNIDAE Karsch, 1880	1	3
4.	FAMILY ERESIDAE C. L. Koch, 1850	1	2
5.	FAMILY FILISTATIDAE Ausserer, 1867	1	1
6.	FAMILY GNAPHOSIDAE Pocock, 1898	10	31
7.	FAMILY HERSILIIDAE Thorell, 1870	1	3
8.	FAMILY LYCOSIDAE Sundevall, 1833	7	30
9.	FAMILY MIMETIDAE Simon, 1881	1	1
10.	FAMILY MITURGIDAE Simon, 1886	1	2
11.	FAMILY NEPHILIDAE Simon, 1894	1	1
12.	FAMILY OECOBIIDAE Blackwall, 1862	2	3
13.	FAMILY OONOPIDAE Simon, 1890	2	4
14.	FAMILY OXYOPIDAE Thorell, 1870	3	16
15.	FAMILY PALPIMANIDAE Thorell, 1870	1	1
16.	FAMILY PHILODROMIDAE Thorell, 1870	3	15
17.	FAMILY PHOLCIDAE C. L. Koch, 1850	3	3
18.	FAMILY PISAURIDAE Simon, 1890	5	6
19.	FAMILY SALTICIDAE Blackwall, 1841	23	38
20.	FAMILY SCYTODIDAE Blackwall, 1864	1	3
21.	FAMILY SICARIIDAE Keyserling, 1880	1	1
22.	FAMILY SPARASSIDAE Bertkau, 1872	2	2
23.	FAMILY STENOCHILIDAE Thorell, 1873	1	1
24.	FAMILY TETRAGNATHIDAE Menge, 1866	4	5
25.	FAMILY THERIDIIDAE Sundevall, 1833	9	13
26.	FAMILY THOMISIDAE Sundevall, 1833	11	17
27.	FAMILY ULOBORIDAE Thorell, 1869	3	7
Total		113	254

Field procedures:

The biodiversity documentation exercise was conducted in Melghat tiger reserve at three relocated sites Bori, Koha and Kund. The study teams were lead by experts to monitored the systematic documentation of the data.

The members were divided in two separate groups to study spiders (Araneae). The teams visited Kund, Koha and Bori meadows from 26 to 29 April 2009 and documented available spiders on ground, among grasses, shrubs and on trees by the standardised methods which included visual search, hand capturing, sweeping, gentle beating/shaking of tree and shrub branches, pitfall trapping and litter sampling. The team conducted second seasonal data collection from 2 to 5 October 2009.

Spider identification:

The collected specimens were sorted, preserved and identified in the Arachnology laboratory of SGB Amravati University on the basis of morphological characteristics, including eye arrangement, cephalothorax, legs, abdominal pattern and external and internal epigyne and palp structure. Epigyne in case of females and palps in case of males were dissected out and were made transparant with 10% KOH. Different taxonomic keys (Tikader, 1980; Tikader and Malhotra, 1980; Tikader, 1982a; 1982b) as well as on-line literature (Proszynski, 2012) were used for identification.

RESULTS AND DISCUSSION

A total of 254 species (Table 6) belonging to 113 genera and 27 families were recorded from Koha, Kund and Bori meadows. These are the results of two surveys during 2009. Among all these 27 families, high diversity was observed in families Salticidae (38 species), Araneidae (37 species), Gnaphosidae (31 species) and Lycosidae (30 species). The family, genera and species wise list is given in table-7.

The list indicates that the meadows are rich in ground dwelling spiders like salticids, gnaphosids and lycosids. This is a positive sign as these spiders being on the top of foodweb of small invertebrates. After feeding on these available invertebrates, the final excreta falls on the ground which might have made the soil quality better that might have helped in developing a good meadow in turn herbivores , population will increase which will help in conservation of primary carnivores and ultimately secondary carnivopres. Thus resettlement of forest villages have resulted into spider conservation. This indirect approach of spider conservation indicates that the spider fauna is to be considered broadly in general conservation planning and habitat protection efforts as an important component of terrestrial ecosystems. More information in this regard will largely determine the viability of this approach. Increased communication between conservation professionals and spider researchers may yield new co-operative approaches for assessing the usefulness of spiders in conservation tools. Thus spider can be used as indicators of healthy ecosystems.

Table-7, Diversity of spiders collected from Koha, Kund and Bori meadows during 2009.

1.FAMILY ARANEIDAE Clerck, 1757	
Genus	Species
<i>Arachnura</i>	<i>angura</i> Tikader, 1970
<i>Araneus</i>	<i>anantnagensis</i> Tikader & Bal, 1981 <i>bastarensis</i> Gajbe, 2005 <i>ellipticus</i> (Tikader & Bal, 1981) <i>mitificus</i> (Simon, 1886) <i>pahalgaonensis</i> Tikader & Bal, 1981
<i>Argiope</i>	<i>aemula</i> Walckenaer, 1841 <i>anasuja</i> Thorell, 1887 <i>pulchella</i> Thorell, 1881
<i>Chorizopes</i>	<i>bengalensis</i> Tikader, 1975 <i>kastoni</i> Gajbe & Gajbe, 2004 <i>khandaricus</i> Gajbe, 2005
<i>Cyclosa</i>	<i>bifida</i> (Doleschall, 1859) <i>confraga</i> (Thorell, 1892) <i>hexatuberculata</i> Tikader, 1982 <i>insulana</i> (Costa, 1834) <i>moonduensis</i> Tikader, 1963 <i>spirifera</i> Simon, 1889
<i>Cyrtarachne</i>	<i>bengalensis</i> Tikader, 1961
<i>Cyrtophora</i>	<i>bidenta</i> Tikader, 1970 <i>citricola</i> (Forsskål, 1775) <i>moluccensis</i> (Doleschall, 1857)
<i>Eriovixia</i>	<i>excelsa</i> (Simon, 1889) <i>laglaizei</i> (Simon, 1877)
<i>Larinia</i>	<i>emertoni</i> Gajbe & Gajbe, 2004 <i>chloris</i> (Audouin, 1826)
<i>Neoscona</i>	<i>bengalensis</i> Tikader & Bal, 1981 <i>bihumpi</i> Patel, 1988 <i>mukerjei</i> Tikader, 1980 <i>nautica</i> (L. Koch, 1875) <i>sanghi</i> Gajbe, 2004 <i>sinhagadensis</i> (Tikader, 1975) <i>subfusca</i> (C. L. Koch, 1837) <i>theisi</i> (Walckenaer, 1841)
<i>Ordgarius</i>	<i>hobsoni</i> (O. P.-Cambridge, 1877)
<i>Parawixia</i>	<i>dehaani</i> (Doleschall, 1859)
<i>Poltys</i>	<i>nagpurensis</i> Tikader, 1982
<i>Thelacantha</i>	<i>brevispina</i> (Doleschall, 1857)
2.FAMILY CLUBIONIDAE Wagner, 1887	
<i>Clubiona</i>	<i>bengalensis</i> Biswas, 1984 <i>acanthocnemis</i> Simon, 1906 <i>analis</i> Thorell, 1895 <i>drassodes</i> O. P.-Cambridge, 1874 <i>filicata</i> O. P.-Cambridge, 1874 <i>nilgherina</i> Simon, 1906 <i>pashabhaiti</i> Patel & Patel, 1973 <i>tikaderi</i> Majumder & Tikader, 1991

Spider diversity in relocated area.....Kishor Rithe

3.FAMILY CORINNIDAE Karsch, 1880

Castianeira albopicta Gravely, 1931 (Female)
indica Tikader, 1981 (Male and Female)
zetes Simon, 1897 (Male and Female)

4.FAMILY ERESIDAE C. L. Koch, 1850

Stegodyphus hisarensis Arora & Monga, 1992 (Female)
sarasinorum Karsch, 1891 (Male and Female)

5. FAMILY FILISTATIDAE Ausserer, 1867

Pritha poonaensis (Tikader, 1963) (Female)

6. FAMILY GNAPHOSIDAE Pocock, 1898

Callilepis ketani Gajbe, 1984 (Female)
lambai Tikader & Gajbe, 1977 (Female)
pawani Gajbe, 1984 (Female)
rajani Gajbe, 1984 (Female)
rukminiae Tikader & Gajbe, 1977 (Male and Female)

Drassodes narayanpurensis Gajbe, 2005 (Female)
pashanensis Tikader & Gajbe, 1977 (Female)
sitae Tikader & Gajbe, 1975 (Male and Female)
tikaderi (Gajbe, 1987) (Male and Female)
viveki (Gajbe, 1992) (Male and Female)

Gnaphosa jodhpurensis Tikader & Gajbe, 1977 (Male and Female)
pauriensis Tikader & Gajbe, 1977 (Female)
poonaensis Tikader, 1973 (Male and Female)
sataransis Tikader & Gajbe, 1977 (Male and Female)

Haplodrassus sataransis Tikader & Gajbe, 1977 (Male and Female)

Megamyrmaekion ashae Tikader & Gajbe, 1977 (Male and Female)

Poecilochroa barmani Tikader, 1982 (Female)

Scopoides maitraiae Tikader & Gajbe, 1977 (Male and Female)

Sergiulus lamhetaghatensis Gajbe & Gajbe, 1999 (Female)
poonaensis Tikader & Gajbe, 1976 (Male and Female)

Sosticus jabalpurensis Bhandari & Gajbe, 2001 (Female)
poonaensis Tikader, 1982 (Female)

Zelotes ashae Tikader & Gajbe, 1976 (Female)
bharatae Gajbe, 2005 (Female)
jabalpurensis Tikader & Gajbe, 1976 (Female)
kusumae Tikader, 1982 (Female)
nalinae Tikader & Gajbe, 1979 (Female)
nasikensis Tikader & Gajbe, 1976 (Female)
poonaensis Tikader & Gajbe, 1976 (Female)
sataransis Tikader & Gajbe, 1979 (Female)
viveki Gajbe, 2005 (Female is known)
yogeshi Gajbe, 2005 (Female)

7. FAMILY HERSILIIDAE Thorell, 1870

Hersilia longivulva Sen *et al.*, 2010 (Female)
orvakalensis Javed *et al.*, 2010 (Male and Female)
savignyi Lucas, 1836 (Male and Female)

8. FAMILY LYCOSIDAE Sundevall, 1833

Arctosa indica Tikader & Malhotra, 1980 (Male and Female)
tappaensis Gajbe, 2004 (Male and Female)

Spider diversity in relocated area.....Kishor Rithe

<i>Evippa</i>	<i>banarensis</i> Tikader & Malhotra, 1980 (Male &Female) <i>jabalpurensis</i> Gajbe, 2004 (Female)
<i>Geolycosa</i>	<i>urbana</i> (O. P.-Cambridge, 1876) (Male and Female)
<i>Hippasa</i>	<i>charamaensis</i> Gajbe, 2004 (Male and Female) <i>hansae</i> Gajbe & Gajbe, 1999 (Female) <i>madhuae</i> Tikader & Malhotra, 1980 (Male and Female) <i>pisaurina</i> Pocock, 1900 (Male and Female)
<i>Lycosa</i>	<i>barnesi</i> Gravely, 1924 (Female) <i>bhatnagari</i> Sadana, 1969 (Female) <i>bistriata</i> Gravely, 1924 (Male and Female) <i>choudhuryi</i> Tikader & Malhotra, 1980 (Female) <i>jagadalpurenensis</i> Gajbe, 2004 (Female) <i>mahabaleshwarensis</i> Tikader & Malhotra, 1980 (Male and Female) <i>poonaensis</i> Tikader & Malhotra, 1980 (Female) <i>shahapuraensis</i> Gajbe, 2004 (Female) <i>shaktae</i> Bhandari & Gajbe, 2001 (Female)
<i>Pardosa</i>	<i>altitudis</i> Tikader & Malhotra, 1980 (Female) <i>balaghatensis</i> Gajbe, 2004 (Female) <i>bargaonensis</i> Gajbe, 2004 (Male and Female) <i>birmanica</i> Simon, 1884 (Male and Female) <i>duplicata</i> Saha <i>et al.</i> , 1994 (Female) <i>jabalpurensis</i> Gajbe & Gajbe, 1999 (Female) <i>mukundi</i> Tikader & Malhotra, 1980 (Female) <i>partita</i> Simon, 1885 (Female) <i>ranjani</i> Gajbe, 2004 (Female) <i>sumatrana</i> (Thorell, 1890) (Male and Female) <i>sutherlandi</i> (Gravely, 1924) (Male and Female)
<i>Trochosa</i>	<i>gunturensis</i> Patel & Reddy, 1993 (Female)

9. FAMILY MIMETIDAE Simon, 1881

<i>Mimetus</i>	<i>indicus</i> Simon, 1906 (Female)
----------------	-------------------------------------

10. FAMILY MITURGIDAE Simon, 1886

<i>Cheiracanthium</i>	<i>jabalpurensis</i> Majumder & Tikader, 1991 (Female) <i>poonaense</i> Majumder & Tikader, 1991 (Female)
-----------------------	--

11. FAMILY NEPHILIDAE Simon, 1894

<i>Nephila</i>	<i>pilipes</i> (Fabricius, 1793) (Male and Female)
----------------	--

12. FAMILY OECOBIIDAE Blackwall, 1862

<i>Oecobius</i>	<i>chiasma</i> Barman, 1978 (Male and Female)
<i>marathaus</i> Tikader, 1962 (Male and Female)	
<i>Uroctea</i>	<i>indica</i> Pocock, 1900 (Female)

13. FAMILY OONOPIDAE Simon, 1890

<i>Ischnothyreus</i>	<i>deccanensis</i> Tikader & Malhotra, 1974 (Male and Female)
<i>Triaeris</i>	<i>melghaticus</i> Bastawade, 2005 (Male and Female) <i>nagpurensis</i> Tikader & Malhotra, 1974 (Female) <i>poonaensis</i> Tikader & Malhotra, 1974 (Male and Female)

14. FAMILY OXYOPIDAE Thorell, 1870

<i>Hamataliwa</i>	<i>ovata</i> (Biswas <i>et al.</i> , 1996) (Female)
<i>Oxyopes</i>	<i>ashae</i> Gajbe, 1999 (Female)
	<i>bharatae</i> Gajbe, 1999 (Female)
	<i>birmanicus</i> Thorell, 1887 (Male and Female)
	<i>chittrae</i> Tikader, 1965 (Male and Female)
	<i>indicus</i> (Walckenaer, 1805) (Female)
	<i>jabalpurensis</i> Gajbe & Gajbe, 1999 (Female)
	<i>ketani</i> Gajbe & Gajbe, 1999 (Female)
	<i>nalinae</i> Gajbe, 1999 (Male and Female)
	<i>pankaji</i> Gajbe & Gajbe, 2000 (Female)
	<i>pawani</i> Gajbe, 1992 (Female is known)
	<i>boriensis</i> Bodakhe & Vankhede, 2012
	<i>kohaensis</i> Bodakhe & Vankhede, 2012
<i>Peucetia</i>	<i>elegans</i> (Blackwall, 1864) (Female)
	<i>jabalpurensis</i> Gajbe & Gajbe, 1999 (Female)
	<i>viridana</i> (Stoliczka, 1869) (Male and Female)

15. FAMILY PALPIMANIDAE Thorell, 1870

<i>Palpimanus</i>	<i>vultuosus</i> Simon, 1897 (Female)
-------------------	---------------------------------------

16. FAMILY PHILODROMIDAE Thorell, 1870

<i>Philodromus</i>	<i>ashae</i> Gajbe & Gajbe, 1999 (Female)
	<i>decoratus</i> Tikader, 1962 (Female)
	<i>jabalpurensis</i> Gajbe & Gajbe, 1999 (Female)
	<i>ketani</i> Gajbe, 2005 (Female)
	<i>pawani</i> Gajbe, 2005 (Female)
	<i>rajani</i> Gajbe, 2005 (Female)
<i>Thanatus</i>	<i>dhakuricus</i> Tikader, 1960 (Female)
	<i>indicus</i> Simon, 1885 (Female)
	<i>jabalpurensis</i> Gajbe & Gajbe, 1999 (Male and Female)
	<i>stripatus</i> Tikader, 1980 (Female)
<i>Tibellus</i>	<i>elongatus</i> Tikader, 1960 (Female)
	<i>jabalpurensis</i> Gajbe & Gajbe, 1999 (Female)
	<i>katrajghatus</i> Tikader, 1962 (Female)
	<i>pashanensis</i> Tikader, 1980 (Female)
	<i>poonaensis</i> Tikader, 1962 (Female)

17. FAMILY PHOLCIDAE C. L. Koch, 1850

<i>Artema</i>	<i>atlanta</i> Walckenaer, 1837 (Male and Female)
<i>Leptopholcus</i> sp. Nov.	
<i>Pholcus</i>	<i>kapuri</i> Tikader, 1977 (Male and Female)
	<i>phalangioides</i> (Fuesslin, 1775) (Male and Female)

18. FAMILY PISAURIDAE Simon, 1890

<i>Dendrolycosa</i>	<i>robusta</i> (Male and Female)
<i>Hygropoda</i> sp. nov.	
<i>Nilus</i>	<i>hipsoni</i> (F. O. P.-Cambridge, 1898) (Male and Female)

Spider diversity in relocated area.....Kishor Rithe

<i>Pisaura</i>	<i>podilensis</i> Patel & Reddy, 1990 (Male and Female) <i>swamii</i> Patel, 1987 (Male and Female)
<i>Tinus</i>	<i>arindamai</i> Biswas & Roy, 2005 (Female)

19. FAMILY SALTICIDAE Blackwall, 1841

<i>Aelurillus</i>	<i>improvisus</i> Azarkina, 2002 (Male and Female)
<i>Asemonea</i>	<i>santinagarensis</i> (Biswas & Biswas, 1992) (Female)
<i>Bavia</i>	<i>kairali</i> Samson & Sebastian, 2002 (Male & Female)
<i>Bianor</i>	<i>narmadaensis</i> (Tikader, 1975) (Female)
<i>Brettus</i>	<i>albolimbatus</i> Simon, 1900 (Female)
<i>Burmattus</i>	<i>pococki</i> (Thorell, 1895) (Male and Female)
<i>Cosmophasis</i>	<i>umbratica</i> Simon, 1903 (Male and Female)
<i>Euophrys</i>	<i>minuta</i> (Prószyn'ski, 1992) (Female)
<i>Hasarius</i>	<i>adansoni</i> (Audouin, 1826) (Male and Female)
<i>Hyllus</i>	<i>semicupreus</i> (Simon, 1885) (Male and Female)
<i>Marengo</i>	<i>nigriminor</i> Samson & Sebastian, 2002 (Male & Female)
<i>Marpissa</i>	<i>anusuae</i> Tikader & Biswas, 1981 (Female) <i>decorata</i> Tikader, 1974 (Female) <i>kalighatensis</i> Biswas & Biswas, 1992 (Female) <i>singhi</i> Monga <i>et al.</i> , 1989 (Female)
<i>Menemerus</i>	<i>bivittatus</i> (Dufour, 1831) (Male and Female)
<i>Myrmarachne</i>	<i>bengalensis</i> Tikader, 1973 (Female) <i>incerta</i> Narayan, 1915 (Female) <i>laeta</i> (Thorell, 1887) (Male and Female) <i>maratha</i> Tikader, 1973 (Male and Female) <i>orientales</i> Tikader, 1973 (Male and Female) <i>plataleoides</i> (O. P.-Cambridge, 1869) (Male & Female)
<i>Phidippus</i>	<i>audax</i> (Hentz, 1845) (Male and Female) <i>bengalensis</i> Tikader, 1977 (Male and Female) <i>yashodharae</i> Tikader, 1977 (Female)
<i>Phintella</i>	<i>indica</i> (Simon, 1901) (Male) <i>macrops</i> (Simon, 1901) (Male) <i>vittata</i> (C. L. Koch, 1846) (Male and Female)
<i>Plexippus</i>	<i>paykulli</i> (Audouin, 1826) (Male and Female)
<i>Rhene</i>	<i>indica</i> Tikader, 1973 (Male and Female) <i>khandalaensis</i> Tikader, 1977 (Female) <i>sanghrakshiti</i> Gajbe, 2004 (Female)
<i>Siler</i>	<i>semiglaucus</i> (Simon, 1901) (Male and Female)
<i>Stenaelurillus</i>	<i>lesserti</i> Reimoser, 1934 (Male and Female)
<i>Telamonia</i>	<i>dimidiata</i> (Simon, 1899) (Male and Female) <i>peckhami</i> Thorell, 1891 (Male and Female)
<i>Thiania</i>	<i>bhamoensis</i> Thorell, 1887 (Male and Female)
<i>Thyene</i>	<i>imperialis</i> (Rossi, 1846) (Male and Female)

20. FAMILY SCYTODIDAE Blackwall, 1864

<i>Scytodes</i>	<i>alfredi</i> Gajbe, 2004 (Female) <i>fusca</i> Walckenaer, 1837 (Male and Female) <i>pallida</i> Doleschall, 1859 (Female)
-----------------	--

Spider diversity in relocated area.....Kishor Rithe

21. FAMILY SICARIIDAE Keyserling, 1880

Loxosceles rufescens (Dufour, 1820) (Male and Female)

22. FAMILY SPARASSIDAE Bertkau, 1872

Heteropoda venatoria (Linnaeus, 1767) (Male and Female)
Olios sp.

23. FAMILY STENOCHILIDAE Thorell, 1873

Stenochilus crocatus Simon, 1884 (Female)

24. FAMILY TETRAGNATHIDAE Menge, 1866

Guizygiella melanocrania (Thorell, 1887) (Male and Female)
Leucauge decorata (Blackwall, 1864) (Male and Female)
Opadometa fastigata (Simon, 1877) (Male and Female)
Tetragnatha bengalensis Walckenaer, 1841 (Female)
sutherlandi Gravely, 1921 (Male and Female)

25. FAMILY THERIDIIDAE Sundevall, 1833

Achaearanea triangularis Patel, 2005 (Male and Female)
Argyrodes argentatus O. P.-Cambridge, 1880 (Male and Female)
chiriatapuensis Tikader, 1977 (Female)
dipali Tikader, 1963 (Male and Female)
gouri Tikader, 1963 (Male and Female)
jamkhedes Tikader, 1963 (Male and Female)
Ariamnes flagellum (Doleschall, 1857) (Female)
Chryso angula (Tikader, 1970) (Male and Female)
Latrodectus hasselti Thorell, 1870 (Male and Female)
Parasteatoda mundula (L. Koch, 1872) (Male and Female)
Rhomphaea projiciens O. P.-Cambridge, 1896 (Male and Female)
Steatoda triangulosa (Walckenaer, 1802) (Male and Female)
Theridion indicum Tikader, 1977 (Female)

26. FAMILY THOMISIDAE Sundevall, 1833

Amyciaea forticeps (O.P.-Cambridge, 1873) (Male & Female)
Diaea bengalensis Biswas & Mazumder, 1981 (Female)
Misumena annapurna Tikader, 1963 (Female)
ritujae Gajbe, 2008 (Female is known)
Misumenoides gwarighatensis Gajbe, 2004 (Female)
Oxytate elongata (Tikader, 1980) (Female)
Ozyptila maratha Tikader, 1971 (Male and Female)
Runcinia khandari Gajbe, 2004 (Male)
Strigoplus moluri Patel, 2003 (Female)
Thomisus ashishi Gajbe, 2005 (Female)
rajani Bhandari & Gajbe, 2001 (Female)
viveki Gajbe, 2004 (Female)
Tmarus jabalpurensis Gajbe & Gajbe, 1999 (Female)
Xysticus bharatae Gajbe & Gajbe, 1999 (Male and Female)
breviceps O. P.-Cambridge, 1885 (Female)
jabalpurensis Gajbe & Gajbe, 1999 (Female)

Spider diversity in relocated area.....Kishor Rithe

27. FAMILY ULOBORIDAE Thorell, 1869

<i>Miagrammopes</i>	<i>albomaculatus</i> Thorell, 1891 (Female) <i>poonaensis</i> Tikader, 1971 (Female)
<i>Uloborus</i>	<i>jabalpurensis</i> Bhandari & Gajbe, 2001 (Female) <i>khasiensis</i> Tikader, 1969 (Female) <i>modestus</i> Thorell, 1891 (Female) <i>plumipes</i> Lucas, 1846 (Male and Female)
<i>Zosis</i>	<i>geniculata</i> (Olivier, 1789) (Male and Female)

Recommendations

1) It appears that the post-monsoon and winter (July to December) seasons are the months of spider activities which mostly coincide with the life cycle of most of the insects. Thus during monsoon and winter months a comparative survey in the above mentioned meadows and the village nearer to these meadows is essential for better assessment.

2) It is essential to repeat the spider survey in different seasons of the year to draw conclusion regarding their activity patterns and diversity.

3) The observations on spider fauna are based on preliminary and short duration surveys conducted during monsoon and winter, detailed and long term monitoring is essential for further confirmation.

ACKNOWLEDGEMENTS

B. Majumdar, Principal chief conservator of forest (wildlife), Maharashtra and A.K. Mishra, Field director of Melghat Tiger Reserve for providing the permission and field assistant. S. Reddy, H. Bedge, R. Wankhade for providing the support from the field staff, management plans and supplementary documents. G.N. Vankhede for expert guidance. Volunteers from Royal Bank of Scotland, Nature Conservation Society, Amravati, SGB Amravati University forest staff from Melghat Tiger Reserve and Bombay Natural History Society, Mumbai, N. Sunil Kumar, RBS Foundation, Mumbai for financial support to conduct the study. N. Kale of Nature Conservation Society, Amravati for field support.

REFERENCES

- Baya, L. & Storch, I. (2010)** Status of diurnal primate populations at the former settlement of a displaced village in Cameroon. *American Journal of Primatology*, **72**, 645-652.
- Chaudhary, R., Dhamge, K., Taqiuddin, S. & Gogte, M. 2003.** Management Plan of Melghat Tiger Reserve, 2004-05 to 2013-14. (ed M.F.D. (India)), pp. 1-212. Government of Maharashtra (India), Nagpur (India).
- Forsyth, J. 1989.** The Highlands of Central India, London: Chapman and Hall Limited.
- Ghate, R. (2005)** Relocation versus Wildlife Preservation. *Economic and Political Weekly*, **40**, 4807-4809.

Spider diversity in relocated area.....Kishor Rithe

- Karant, K.K. 2007.** Making resettlement work: The case of India's Bhadra Wildlife Sanctuary. *Biological Conservation*, **139**, 315-324.
- Karant, K.U., Goodrich, J.M., Vaidyanathan, S. & Reddy, G.V. (2009)** Landscape-scale, Ecology based management of wild tiger populations. In *Kathmandu GTI workshop* pp. 1-24. Kathmandu (Nepal).
- Lasgorceix, A. & Kothari, A. 2009.** Displacement and Relocation of Protected Areas: A Synthesis and Analysis of Case Studies. In *Economic & Political weekly* pp. 37-47.
- Pardeshi, P. 2003.** *Economic Development Model In Melghat*, Maharashtra Forest Department, Nagpur, India.
- Prószyn'ski, J. 2012.** Monograph of Salticidae (Araneae) of the World 1995-2012, Version October 4th 2012
- Rangarajan, M. & Shahabuddin, G. 2006.** Displacement and Relocation from Protected Areas: Towards Biological and Historical Synthesis. *Conservation and Society*, **4**, 359-378.
- Rithe, K. 2003.** Resettlement from Melghat Wildlife Sanctuary. Nature Conservation Society, Amravati, Amravati (India).
- Rithe, K. 2006.** Conservation directory of Melghat Tiger Reserve. Nature Conservation Society, Amravati, Amravati (India).
- Rithe, K. & Fernandes, A. 2004.** The Satpuras central india's tiger belt. In *Sanctuary Asia* pp. 58-63. Mumbai, India.
- Rodgers, W.A., Panwar, H.S., Mathur, V.B. & Wildlife Institute of, I. 2002.** *Wildlife protected area network in India : a review, executive summary*, Wildlife Institute of India, Dehradun.
- Thosare, P.J. 2003.** Two Decades of Melghat Tiger Reserve. (ed M.F.D. India), pp. 249. Melghat Tiger Reserve Directorate, Amravati (India), Nagpur.
- Tikader, B. K. 1980.** Thomisidae (crab-spiders), *Fauna of India (Araneae)*. I: 247.
- Tikader, B. K. 1982a.** Araneidae(=Argiopidae), typical orb weavers, *Fauna of India (Araneae)*. 2(1): 293.
- Tikader, B. K. 1982b.** Gnaphosidae, *Fauna of India (Araneae)*. 2: 295-536.
- Tikader, B. K. and M. S. Malhotra. 1980.** Lycosidae (wolf-spiders), *Fauna of India (Araneae)*. I: 248-447.