



# Ela Journal of Forestry and Wildlife

ISSN 2319-4361  
(Indexed in Google Scholar)  
Volume 13 | Issue 1  
January - March 2024



A quarterly scientific refereed e-Journal of Ela Foundation and Forest Department, Maharashtra for Nature Conservation through Education and Research

**Listed in UGC- CARE**



## Fish Diversity of Bhima River at Machnur, Solapur (M.S.) India

Amruta S. Sutrave, Vidhya V. Shagalolu, Laxmikant B. Dama and Laxmi C. Mushan

(Email: [amruta.sutrave@gmail.com](mailto:amruta.sutrave@gmail.com); [southvidhya@gmail.com](mailto:southvidhya@gmail.com); [southraj@gmail.com](mailto:southraj@gmail.com); [lcmushandbf@gmail.com](mailto:lcmushandbf@gmail.com))

Department of Zoology and Research Center, D.B.F. Dayanand College of Arts and Science, Solapur (M.S.)  
India

**Citation:** Sutrave Amruta S., Shagalolu Vidhya V., Dama Laxmikant B. and Mushan Laxmi C. (2024). Fish Diversity of Bhima River at Machnur, Solapur (M.S.) India. *Ela Journal of Forestry and Wildlife*. 13(1): 1536-1540

**Date of Publication:** 31 March 2024

ISSN 2319-4361



### Abstract:

Bhima River runs in the semi-arid landscape of Solapur region and is often considered as a life line for Solapur district. The economy of rural regions of Solapur district is directly or indirectly dependent on Bhima River for agricultural, industrial, domestic as well as fishing purposes. Fish diversity is an indicator of the quality of the aquatic ecosystem. The present study was conducted in the monsoon season from July 2022 to November 2022. During our study, 12 species of fishes belonging to 05 orders were reported from Bhima River, Machnur. The order Cichliformes was dominant in abundance, with only one representative species *Oreochromis mosambicus*. followed by Cypriniformes with 05 species, Siluriformes with 03 species, Anabantiformes with 02 species and Synbranchiformes with 01 species. The study site is a centre of pilgrimage and anthropogenic activity during festive season which may influence the water quality, fish diversity and abundance.

**Keywords:** Fish diversity; Bhima River; Water parameter; Anthropogenic activity; Machnur; Solapur.

### Introduction:

The Bhima River runs in semi-arid landscape of Solapur district and plays a vital role in the economy of the rural area around the river. Also, citizens are directly or indirectly dependent on Bhima River for their agricultural, industrial, domestic as well as fishing practices. (Pardeshi *et al.*, 2019). The flow of Bhima River near Machnur is an oxbow curvature, and plays a significant role in enriching the local biodiversity. Bhima River is also a sacred river in India, pilgrims visit in high numbers during the Hindu month of Shravan (August). Thereafter, the high human activity leads

to some significant changes in the water parameters (Basavaraja, *et al.*, 2014). These changes in the water parameter ultimately affects the lotic community.

Freshwater fishes serve an important ecologically and economical role. Ecological studies of the freshwater fishes are very crucial for the conservation of the rivers (Kumbhar *et al.*, 2018). Studying the community of the freshwater fishes indicates the status and health of the river (Dede., 2016). Habitat modification, fragmentation and destruction, invasive species, overfishing, environmental pollution, forestry practices and climate change are the major threats to freshwater fishes and other freshwater biodiversity (Kumbhar *et al.*, 2018). The ever-growing human population puts pressure on fish fauna through over extraction from the river as fish is consumed as one of the major high protein rich foods for local and regional market (Gohil *et al.*, 2013).

The objectives of the current study were to understand the community structure of lotic freshwater fishes and analyse the current status of physiochemical parameters of the Bhima River, Machnur, Solapur district, Maharashtra.

## Material and Methodology:

### Study Site:

Bhima River which exhibits an oxbow curvature at multiple locations is an important tributary of the Krishna River well known for its religious values. The study site of Machnur village is located on the bank of Bhima River in Solapur district and is 44 km west of Solapur (Lat 17.565664° Long 75.566571°). The village is well known for the Siddheshwar temple on the banks of Bhima River where pilgrims visit in large numbers during the month of Shravan during the Monsoon.



Figure-1: Study Site: Bhima River, Machnur

## Sample Collection and analysis:

The study was conducted from July 2022 to November 2022. Weekly one visit was undertaken at Machnur for the collection of data. The data of the actual fishes caught by the fishermen was recorded. All the fishes caught by the fishermen were counted. Netting was not performed by me. A single specimen from all the species recorded were preserved in the lab for proper identification. Collection of water samples for the physio-chemical analysis was done. Water Temperature, Ambient Temperature, pH, EC, Turbidity, CO<sub>2</sub>, DO, Total Hardness, Total Dissolved Solids, Nitrate, Fluoride, Chloride, Sulphate, Total Alkalinity were documented.

Collected fishes were preserved in 5% formalin and identified with help of available literature (Day's volume 1 and 2, 2007, Talwar & Jhingran, 1991). Water analysis was done by using standard methods APHA (2005). Statistical analysis was performed using software PAST 4.12b.exe© and Graphical analysis by MS Excel©.



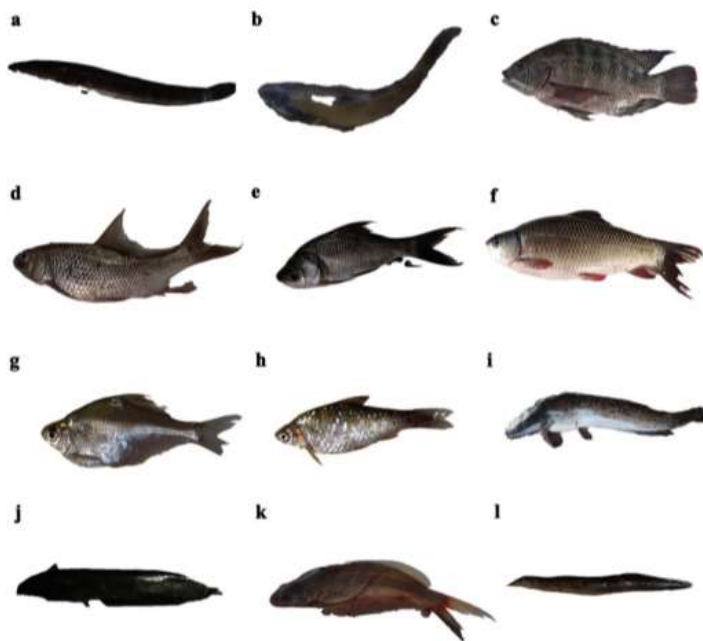
Figure-2: Bhima River, Machnur showing collection sites shown as yellow dots

## Result:

### a) Species Richness:

During the present study, 12 fish species belonging to 05 orders were recorded from Bhima River, Machnur. The order Cichliformes was dominant in abundance, with only one representative species Mozambique tilapia *Oreochromis mosambicus*, followed by Cypriniformes with 05 species *Kolus Hypselobarbus kolus*, *Katla Labeo catla*, *Rohu Labeo rohita*, *Bheema Osteobrama Osteobrama penisularis*, and *Pool barb Puntius sophore*; Siluriformes with 03 species *Sharptooth catfish Clarias gariepinus*, *Stinging catfish Heteropneustes fossilis* and *Bagarid catfish*

*Mystus cavasius*. Anabantiformes with 02 species Great shankheaded *Channa marulius* and Spotted shankheaded *Channa punctata*, Synbranchiformes with 01 species Zig-zag eel *Mastacembelus armatus*. The IUCN status are given below: Mozambique tilapia *Oreochromis mosambicus* (NT), Kolus *Hypselobarbus kolus* (VU), Katla *Labeo catla* (LC), Rohu *Labeo rohita* (LC), Bheema *Osteobrama Osteobrama penisularis* (NT), and Pool barb *Puntius sophore* (LC), Sharptooth catfish *Clarias gariepinus*, Stinging catfish *Heteropneustes fossilis*(LC), Bagarid catfish *Mystus cavasius*(LC), Great shankheaded *Channa marulius* (LC) and Spotted shankheaded *Channa punctata* (LC), Zig-zag eel *Mastacembelus armatus* (LC) (Kharat.,2016)



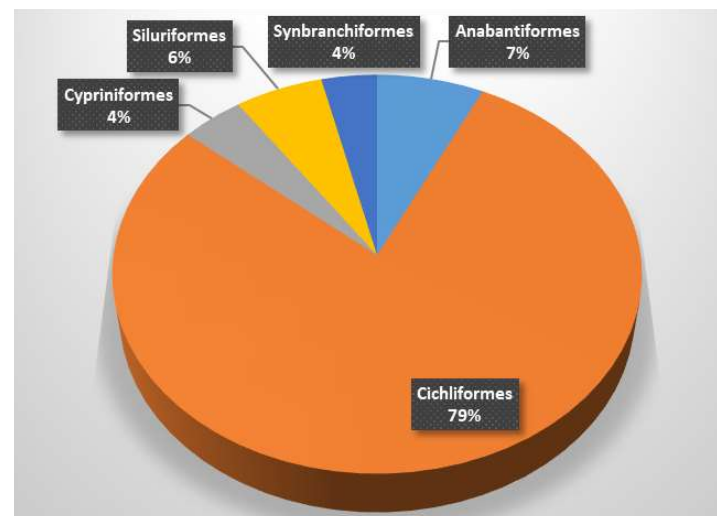
**Figure- 3 Fishes Recorded from Study Sites: a: *Channa marulius*, b: *Channa punctata*, c: *Oreochromis mosambicus*, d: *Hypselobarbus kolus*, e: *Labeo catla*, f: *Labeo rohita*, g: *Osteobrama penisularis*, h: *Puntius sophore*, i: *Clarias gariepinus*, j: *Heteropneustes fossilis*, k: *Mystus cavasius*, l: *Mastacembelus armatus***

### b) Species Abundance:

We found that the order Cichliformes was the most abundant comprising 79% (870 out of 1101) of the total fish collected followed by Anabantiformes with 02 species forming 7% (79 out of 1101) of the total Abundance. The order Cypriniformes shows the highest species richness with 05 species and with an abundance of 4% (46 out of 1101). Order Siluriformes comprise with 03 species and order Synbranchiformes

with 01 species showing the abundance of 6% (65 out of 1101) and 4% respectively (41 out of 1101).

The maximum range of electroconductivity was recorded in the month of November i.e. EC 905  $\mu\text{s}/\text{cm}$  while minimum range in the month of September i.e. 296  $\mu\text{s}/\text{cm}$ . The Total Dissolved Solid with maximum range was noted in the month of November i.e. TDS 740 mg/lit and the minimum range in September month i.e. 362 mg/lit. Similarly the November month shows the highest values for parameters including Nitrate as  $\text{NO}_3$  17 mg/lit; Chloride 140 mg/lit; Sulphate 165 mg/lit ; and Total alkalinity range 128 mg/lit. However, the July month shows the minimum range of Nitrate i.e. 4.8 mg/lit and Alkalinity 92 mg/lit. The minimum range of Chloride 50mg/lit and Sulphate 67.8mg/lit was observed in the month of September. However, the Dissolved oxygen was found to be more during August 6.00mg/lit and it showed constant range 5.6mg/lit in other months. The  $\text{CO}_2$  estimated maximum range of 6 ppm in all experimental month except 4ppm in the month of August.



**Figure-4: Fish abundance as per order from Bhima River, Machnur**

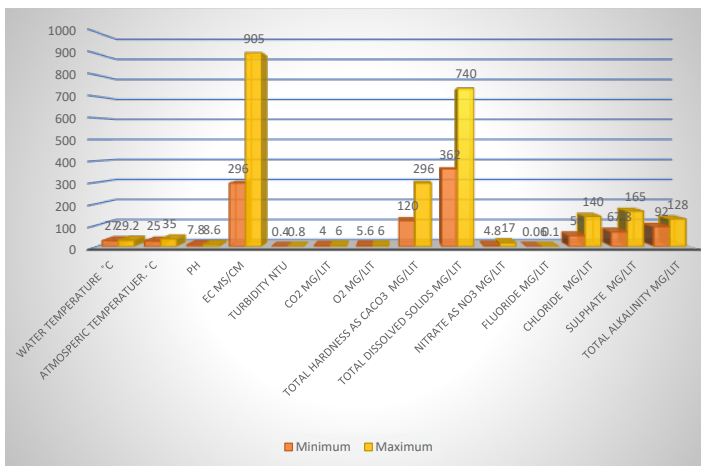
### c) Water Parameters:

The range of variation in various water parameter between July 2022 and November 2022 is shown in the Table 1.

Abbreviations: (pH: potential of Hydrogen, EC: Electro conductivity,  $\text{CO}_2$ : Carbon Dioxide,  $\text{O}_2$ : Dissolved Oxygen,  $\text{CaCO}_3$ : Calcium Carbonate; DO dissolved oxygen).

Water Parameters	Range	
	Minimum	Maximum
Water Temperature °C	27	29.2
Ambient Temperature °C	25	35
pH	7.8	8.6
EC µs/cm	296	905
Turbidity NTU	0.4	0.8
CO2 mg/lit	4	6
O2 mg/lit (DO)	5.6	6
Total Hardness as CaCO3 mg/lit	120	296
Total Dissolved Solids mg/lit	362	740
Nitrate as NO3 mg/lit	4.8	17
Fluoride mg/lit	0.06	0.1
Chloride mg/lit	50	140
Sulphate mg/lit	67.8	165
<b>Total Alkalinity mg/lit</b>	<b>92</b>	<b>128</b>

**Table:1** Water parameters with their range from Bhima River during study period



**Figure-5:** Water Parameter ranges collected from Bhima River, Machnur

## Discussion:

This variation in water parameters is probably due to the influx of water released from Ujani dam into the main river in September 2022 and also due to unseasonal rainfall in the post monsoon season in November 2022.

In the present study, order Cichliformes was dominant followed by orders Anabantiformes, Cypriniformes, Siluriformes and Synbranchiformes. Similar dominance pattern of fish species belonging to the order Cichliformes was also reported in previous studies (Dede., 2016; Kadam *et al.*, 2020). The species *Oreochromis mosambicus* is an invasive fish (Wani *et al.*, 2014) which was found in highest abundance in our study. Exotic fishes like *Oreochromis* are known to impact fish diversity of fresh water ecosystem (Kadam *et al.*, 2020).

Koli *et al.*, 2021 determined that, physicochemical parameters fluctuate seasonally as well as due to anthropogenic activity. Water parameter play an important role as buffering indicators (Najafpour *et al.*, 2008). During our study, the minimum and maximum values of physicochemical water parameters were basically within the permissible range. This may be due to upstream flow of water. Though large number of pilgrims visit during the study period, the quality of the water remained within the standard permissible range during the study. However, in recent years, the anthropogenic and infrastructural development are growing which may impact the water quality and fish diversity in the future. We recommend sustainable and scientific eco-tourism activity and yearly monitoring of water quality and fish diversity at the pilgrimage site.

## Acknowledgment:

Authors express special thanks to the Principal, D.B.F. Dayanand College of Arts and Science for providing library and laboratory facilities; and to Prof. K.R. Rao and colleagues from Department of Zoology, Walchand College of Arts and Science (Autonomous), Solapur. We extend our thanks to local fishermen Mr. Ganesh Bhoi and Mr. Dashrath Bhoi from Machnur for their support during field studies.

## References:

- **A. N. Dede.,** (2016). Study on Fish Diversity Indices in Bhima River from Gursale Village, Dist. Solapur (India) *International Journal for Scientific Research & Development* Vol. 4(5): 1675-1678
- **A. Shahnawaz, M. Venkatachalam, D. S. Somashekar and K. Santosh.,** (2010) Fish diversity with relation to water quality of Bhadra River of Western Ghats (INDIA) *Environ Monit Assess* 161:83-91

- **APHA:** (2005). Standard method for the examination of water, American Public Health Association, Washington DC, USA
- **Basuraj L. Koli and Rahul P. Patil.,** (2021) STUDY OF WATER QUALITY OF BHIMA RIVER WATER AT DAUND. DIST. PUNE. MAHARASHTRA (INDIA) *JETIR*, Vol 8 (10):440-442
- **D.Basavaraja , J.Narayana , B.R.Kiran and E.T.Puttaia.,** (2014) Fish diversity and abundance in relation to water quality of Anjanapura reservoir, Karnataka, India *Int.J.Curr.Microbiol.App.Sci* (3): 747-75
- **D.S. Kumbhar, S.A. Shaikh, D.K. Mhaske.,** (2018). FISH FAUNAL DIVERSITY OF BHIMA RIVER AT PEDGAON, SHRIGONDA (AHMEDNAGAR DISTRICT) *International Journal of Creative Research Thoughts Vol.6(2):* 298 -305
- **D.S. Nikam, A.L. Shaikh, A.B. Kamble and K.R. Rao.,** (2014). Ichthyofaunal Diversity of Ashti Lake, Tal. Mohol, Dist. Solapur (M.S.) *GLOBAL JOURNAL FOR RESEARCH ANALYSIS* Vol. 3: ISSN No 2277 - 816
- **Devashish Kar, A.V. Nagarathna, T.V. Ramachandra and S.C. Dey.,** (2006). FISH DIVERSITY AND CONSERVATION ASPECTS IN ANAQUATIC ECOSYSTEM IN NORTHEASTERN INDIA *ZOOS' PRINT JOURNAL* 21(7): 2308-2315
- **Dr. Malti** (2017) *Freshwater Fishes* (In Special Reference of Uttar Pradesh) Sarup Book Pvt.Ltd., New Delhi-110002
- **Dr. Sanjay Karat** (2016) *Maharashtratil Panchim Gattatil Mase* (Savarakshan -Savardhan) Shri. J. Printers Book Pvt.Ltd., Pune-411030
- **Francis Day** (2007) *The Fishes of India* Jagminder Book Agency., New Delhi-110005
- **G Srinivas Reddy, D Balakrishna, T Ravinder Reddy.,** (2015). A Study of Physico-Chemical Parameters and Fish Diversity of Nizam Sagar Dam, Nizamabad, Telangana *International Journal of Fisheries and Aquatic Studies* 3(2): 248-254
- **Gohil Mahendrasinh N. and Mankodi Pradeep C.,** (2013) Diversity of Fish Fauna from Downstream Zone of River Mahisagar, Gujarat State, India *Research Journal of Animal, Veterinary and Fishery Sciences* ISSN 2320 – 6535 Vol. 1(3), 14-15
- **Kadam V. Y., Patil S. S. and Patil S.B.,** (2020) Study of fish faunal diversity of Ujani Reservoir, Near Bhigwan, Dist. Pune *International Journal for Environmental Rehabilitation and Conservation* ISSN: 0975 -272 XI (SP2): 519 -52
- **Najafpour Sh., Alkarkhi A. F. M., Kadir M. O. A. and Najafpour Gh. D.,** (2008) Evaluation of Spatial and Temporal Variation in River Water Quality *Int. J. Environ. Res.*, 2(4): 349-358
- **Owais Ahmad Wani and Uma Shankar Gupta,** (2015). A study on Ichthyofaunal diversity of Sagar Lake, Madhya Pradesh, India *International Journal of Biodiversity and Conservation* Vol. 7(3): 126-129
- **Pardeshi B. M., Bhor G.L., Salve A. N and Sardesai M. M.,** (2019) Study on seasonal variations in the water quality of Bhima river flowing through Khed Tehsil *IJS DR* ISSN: 2455-2631 Vol 4(5):405-408
- **Pawara Ravindra H., Patel Nisar G. and Patel Yusuf E.,** (2014). Review on fresh water fish diversity of Maharashtra (India) *Journal of Entomology and Zoology Studies* Vol.2 (5): 358-364
- **Rani S. Dharan, Dr. Sherly Williams.E.,** (2017). CLUSTER ANALYSIS OF SEASONAL FISH FAUNAL DIVERSITY AND WATER PHYSICO-CHEMICAL ATTRIBUTES AT PALLATHURUTHY, KERALA SOUTH INDIA. *International Journal of Scientific and Research Publications*, Vol. 7(6): 72-80
- **S. Gilles, L. Fargier, X. Lazzaro, E. Baras4, N. De Wilde5, C. Drakide's, C. Amiel, B. Rispal & J-P. Blancheton.,** (2013). An integrated fish-plankton aquaculture system in brackish water Vol.7(2): 322–329
- **Sanjay S. Kharat, Mandar Paingankar & Neelesh Dahanukar.,** (2012). Freshwater fish fauna of Krishna River at Wai, northern Western Ghats, India *Journal of Threatened Taxa* Vol. 4(6): 2644–2652
- **Talwar, P.K. & A.G. Jhingran** (1991). *Inland Fishes of India and Adjacent Countries*. Oxford-IBH Publishing Co. Pvt. Ltd., New Delhi

## *Crotalaria clarkei* Gamble (Fabaceae), a new record for the Satpuda range of Jalgaon district, Maharashtra

Tanveer A. Khan

Department of Botany, H. J. Thim College of Arts and Science,  
Mehrun, Jalgaon, Maharashtra, India.  
(Email: [tanveerkhan04@gmail.com](mailto:tanveerkhan04@gmail.com))

**Citation:** Khan Tanveer A. (2024). *Crotalaria clarkei* Gamble (Fabaceae), a new record for the Satpuda range of Jalgaon district, Maharashtra. *Ela Journal of Forestry and Wildlife*. 13(1): 1541-1544

**Date of Publication:** 31 March 2024

ISSN 2319-4361



### Abstract

I report *Crotalaria clarkei* Gamble (Fabaceae) for the first time from the Satpuda ranges of Jalgaon district, Maharashtra. Detailed taxonomic description, photographs and relevant information are provided.

**Keywords:** Satpuda range, *Crotalaria clarkei* Gamble, Jalgaon, Maharashtra.

### Introduction

The vegetation of Satpuda range of Jalgaon district is quite varied and interesting (Patil, 2003, Kshirsagar 2008, Khan, 2017 and Khan, 2019). Jalgaon district lies between 20° and 21° North latitude and 74° 55' and 76° 28' East longitudes with a total area of about 272 sq. km. The total forest area in the district is 72685.27 hectares. In the upper Tapi basin, it forms a distinct topographical unit separated from neighboring Madhya Pradesh state by Satpura ranges and from the south by Satmala hilly ranges. The physiography of the district is made up of high hill ranges on the north, alluvium in the centre and low hill ranges to the south of river Tapi. On the north, the hill ranges stretch east-west and form part of the Satpuras, the highest peak being about 1175 meters.

The economically important genus *Crotalaria* L.



(Fabaceae) is represented by *ca.* 700 species in the world (Polhill, 1982; Mabberly, 2008; Abdull Jabbar *et al.* 2010) mostly distributed in tropical and subtropical regions. *Crotalaria clarkei* Gamble with strong branches is used in preparation of ropes and cordages. The leaves and branches are used in the preparation of indigenous medicine that have a cooling effect. The plant is also valued as a fodder for animals. In India, *Crotalaria* is the largest genus of the family Fabaceae with 93 species, 1 subspecies 17 varieties and 2 formae (Ansari, 2008). Sibichen and Nampy (2007) have reported 67 species and 4 infra-specific taxa for south India. Theodore Cooke (1967) has reported occurrence of 32 species and 3 infra specific taxa for the Presidency of Bombay. Almeida (1998) reported 43 species and 5 infra-specific taxa for the state of Maharashtra. Afterwards Kothari (2000) recorded 42 species and 3 infra-specific taxa as account on flowering plants of Maharashtra. Later on Lakshminarasimhan (2002) added 7 species and 2 infra-specific taxa to the Kothari's contribution. Thus in the flowering plants of Maharashtra, the genus *Crotalaria* accounts for 49 species and 5 infra-specific taxa.

During floristic exploration of Satpuda range of Jalgaon district of Maharashtra, 11.10.2020 and 23.10.2020 specimens of *Crotalaria clarkei* Gamble were collected from the Langdha Aamba and Vaki forest area. These forest area is protected area due to permission and consistent support of forest department of Jalgaon district exploration was done. After critical examination and consultation of relevant literature, these were identified as *Crotalaria clarkei* Gamble, hitherto unrecorded from Satpuda range of Jalgaon district, Maharashtra. The species was first time collected by Paithane (2012) from Kas Plateau and Sinhgad Fort from Maharashtra state. So far this taxon is known only from few collections and seems to be rare and hence it needs immediate steps towards conservations in Maharashtra. In India this taxon is known to be endemic to Andhra Pradesh, Kerala and Tamil Nadu.

Literature search (Singh *et al.* 2000, Patil 2003, Kshirsagar 2008 and Khan 2019.) and consultation with BSI Herbarium Pune revealed that this species was not reported from Satpuda range of Maharashtra. The voucher specimens are deposited in the herbarium of Department of Botany, H. J. Thim College of Arts and Science Mehrun, Jalgaon.

## Taxonomic Treatment

*Crotalaria clarkei* Gamble in Kew Bull. 1917 (1): 27-28. 1917 et Fl. Pres. Madras 1:296. 1918; Sanjappa, Leg. India 118. 1992; Matthew, III. Fl. Palni hills t.160. 1996 et Fl. Palni hills. 1: 299.1999; Ansari. *Crotalaria* L. in India. 88. 2008; Paithane *et al.*, in Zoo's Print, 27 (1) 26. 2012; Tiwari and Ansari, in Indian Journal of Forestry, 36 (2): 249-252, 2013. Plate-I.

Erect herbs with quadrangular stems and branches, up to 50 cm high. Leaves simple, chartaceous, subsessile, ovate or ovate-oblong, 2.0-4.5 x 0.7-1.5 cm, obtuse or subcordate at base, obtuse or acute and mucronate at apex, margins involute, strigose on both surfaces with bulbous based hairs; stipules present on both sides in pairs, lanceolate, 3-4 mm long. Racemes terminal or axillary, up to 18 cm long; peduncles *ca* 3 cm long, rusty. Flowers large, 2-8, distantly arranged; bracts ovate; bracteoles linear, smaller. Calyx-tube short; lobes lanceolate, divided to more than half of their length, spreading, ferruginous-villous, *ca* 1 cm long. Corolla yellow, distinctly exserted; vexillum obovate, 0.9-1.5 cm long, obtuse at apex, sericeous-villous on the dorsal side; wing petals obovate or oblong; keel petal rostrate, apex twisted, partially villous on dorsal side, with ciliate margins. Staminal sheath *ca* 4 mm long. Ovary sessile, oblong, densely villous; style *ca* 6 mm long, geniculate; stigma lobed. Pods oblong. 2.5-3.0 cm long, cylindrical, with spreading, silky hairs, much exserted. Seeds 15-20, reniform, *ca* 0.5 mm long.

**Flowering and Fruiting:** October-December

**GPS Reading:** N 21° 21' 46.52" E 75° 35' 27.20" (Elevation 640.6m)

**Habitat:** Rare. On hill slopes, amidst grasses at higher elevation.

**Distribution:** In Maharashtra only reported from Satara District, Kas Plateau, Paithane & Sonje 7819, 14 November 2010; Pune District, Sinhgad Fort, Paithane, 5730, 26 January 2011.

**Specimens examined:** India, Maharashtra, Jalgaon District Langdha Aamba: TAK 8015 (CAL), 11.10.2020; Vaki, on hill slopes. TAK 8063 (CAL), 23.10.2020.

**Note:** It can be identified by erect herbs with quadrangular stems and branches. Leaves simple, strigosely hairy on both the surfaces with bulbous based hairs; stipules present. Flowers 2-8 on elongated terminal racemes. Pods pubescent, 2.5-3.0 cm long, much exserted. Seeds 15-20, reniform.





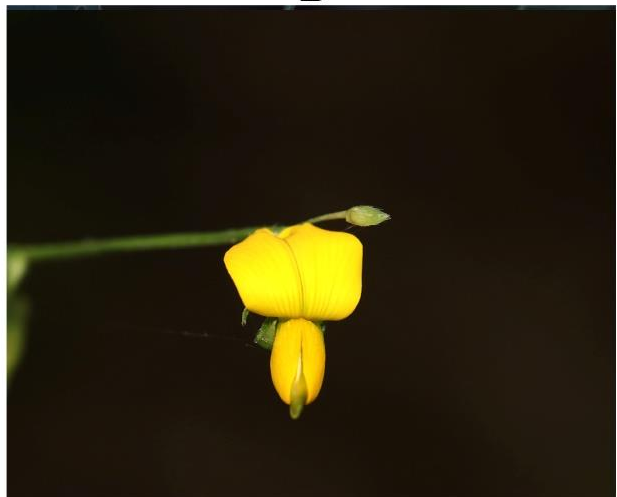
**A**



**B**



**C**



**D**



**E**



**F**

**Figure:1. *Crotalaria clarkei* Gamble A. Habit B. Leaf C. Bud D. Flower E. Fruit F. Seeds**

**Plate-I**

## Acknowledgement

We are thankful to Dr. Tiwari A.P. (BSI, Central Regional Centre), Allahabad and Paithane V.A., A.R.ACS College, Vaibhavwadi, for confirming the identity of the species. Dr. Mujaffar Shaikh for their support. Thanks are also due to the Principal, H. J. Thim College of Arts and Science Mehrun Jalgaon, for providing laboratory and library facilities.

## References

- Abdull Jabbar, V. M.V. Krishnaraj and N. Mohana (2010). *Crotalaria incana* subsp. *Purpurascens* (Fabaceae)- a new record for India. *Rheedea*. 20 (2): 131-132.
- Almeida, M.R. (1998). *Flora of Maharashtra II* Fabaceae to Apiaceae. Orient Press, Mumbai, 457.
- Ansari, A.A. (2008). *Crotalaria L. in India*. Bishen Singh Mahendra Pal Singh, Dehra Dun. 245-249.
- Cooke, T. (1967). (repr.ed.). *Flora of the Presidency of Bombay*. Vol.-I Botanical Survey of India, Calcutta. 632.
- Khan T.A. (2017). *Flowers of Jalgaon District*. Prashant Publication Jalgaon in Association with Jalgaon Forest Division Jalgaon, 45-50.
- Khan T.A. (2019). *Wild Flowers of Jalgaon District A succinct field guide*. Prashant Publication Jalgaon, 35-75.
- Kothari, M.J. (2000). Family Fabaceae in *Flora of Maharashtra State Dicotyledones* Vol.-I in N.P. Singh and S. Karthikeyan (eds.). *Botanical Survey of India*, Calcutta. 898.
- Kshirsagar S.R. and Patil D.A. (2008). *Flora of Jalgaon District, Maharashtra*. Bishen Singh Mahendra Pal Singh, Dehradun, India, 101-104.
- Lakshminarasimhan, P. (2002). Addenda & Corrigenda in *Flora of Maharashtra State Dicotyledones* Vol. II in N.P. Singh, P. Lakshminarasimhan, S. Karthikeyan and P.V. Prasanna. (eds.). Botanical Survey of India, Calcutta. 1080.
- Mabberley, D.J. (2008). *Mabberley's Plant Book, a portable dictionary of plants, their classification and uses*. 3<sup>rd</sup> ed. Cambridge University Press, Cambridge. 5-32.
- Paithane V.A., Sonje S.B. and Bhuktar A.S. (2012). *Crotalaria clarkei* Gamble (Fabaceae), a new record for the State of Maharashtra *Zoo's Print*, 27 (1) 26-27.
- Patil D.A. (2003). *Flora of Dhule and Nadurbar District, Maharashtra*, Bishan Singh Mahendra Pal Singh Deharadun, 174-181.
- Polhill, R.M. (1982). *Crotalaria in Africa and Madagascar*. A.A. Blakema Rotterdam. 13-39.
- Sibichen, M.T. and S. Nampy. (2007). *Crotalaria kurisumalayana* Sibichen & Nampy (Fabaceae), a new species from India. *Candolleana*. 62 (1): 105-108.
- Singh N.P., Karthikeyan S., Lakshminarasimhan P. and Prasanna P.V. (2000). *Flora of Maharashtra State Dicotyledon* (Botanical Survey of India, Kolkata, India). 1. 619-652.
- Tiwari A.P. and Ansari A.A. (2013). *Crotalaria clarkei* Gamble (Fabaceae) A new record for Madhya Pradesh Indian, *Journal of Forestry*, 36 (2): 249-252.

# Review On Butterfly Diversity Of Karnataka State, India

## Introduction

**Kavya K Saraf**

(Guest Faculty, Department of Post Graduate Studies and research in Zoology, Government (Autonomous) College Sedam Road Gulbarga, Kalaburagi, 585106, Karnataka, India.

Complete Postal Address – 4-601/44/B/2-C, : Kavya Sadan”, Near Raghavendra Temple, M.B. Nagar, Gulbarga-585105, Kalaburagi, Karnataka; Email - [kkavyaksaraf@gmail.com](mailto:kkavyaksaraf@gmail.com); ORCID – 0000-0002-3197-1796)

**Somanath Reddy C Patil**

(Assosiate Professor, Department of Post Graduate Studies and research in Zoology, Government (Autonomous) College Sedam Road Gulbarga, Kalaburagi, 585106, Karnataka, India. Email- [somanath.sairam@gmail.com](mailto:somanath.sairam@gmail.com))

**Citation:** Saraf Kavya K and Patil Somanath Reddy C. (2024). Review On Butterfly Diversity Of Karnataka State, India. *Ela Journal of Forestry and Wildlife*. 13(1): 1545-1556

**Date of Publication:** 31 March 2024

ISSN 2319-4361



### Abstract

A total of 40 research papers published on butterfly diversity of Karnataka from different districts, namely- Bagalkot (1), Bangalore Urban(6), Bellary(1), Chamrajanagar(1), Chikkamagalur(1), Dakshina Kannada(5), Davanagere(3), Dharwad(2), Gulbarga(3), Uttara Kannada(2), Kodagu(2), Mysore(2), Shimoga(5), Udupi(1), Yadgir(2), Nagarahole National Park(1), Karnataka coastal line(1), Central Western Ghats in Karnataka (1). Still there are no published paper from following districts of Karnataka- Bangalore Rural, Belgaum, Bidar, Bijapur, Chitradurga, Gadag, Hassan, Haveri, Kolar, Koppal, Mandya, Raichur, Ramanagara, and Tumkur. This paper surely help the researcher to get butterfly diversity data on single stretch, and it will save their data searching time and they can make their new research plan in the specific region where there were no studies at all.

### Introduction:

India is described as a “Butterfly paradise” by Venkataramani (1986). Butterflies have been studied systematically since early 18<sup>th</sup> century (Siva and Swamy). *Following Lepidopterists contributed extensively on butterfly diversity documentation, their seasonal variation, morphology, butterflies and their host plants, effect of abiotic factors on butterfly community, effect of deforestation and anthropogenic disturbances on butterfly population.* Few of them include Marshall and De Niceville (1883), De Niceville (1886, 1890), Bingham (1905, 1907), Evans (1932, 1949), Piele (1937), Talbot (1939, 1947), Wynter – Blyth (1957), Cantlie (1962), Paul Van Gasses (2013),



Gupta and Mridula (2012), Varshney and Peter (2015), Isaac Kehimkar (2016). *Following Lepidopterists worked on regional butterfly diversity* : Goankar (1996), Gunathilagaraj *et al.*, (1998, 2015), Kunte (2000) from south India, Varshney and Chanda (1971), Radhakrishana *et al.*, (1989), Haribal (1992), Gupta and Shukla (1988), Gupta (1997a, 1997b, 2002, 2004) from Northeast India; Pajni *et al.*, (2006) from North-West India Parmod Kumar (2008) from Uttarakhand, Arora *et al.*, (2009) from Himachal Pradesh, Raju K (2016) from Western Ghats.

There is an intimate association between butterflies and plants and their lives are exceptionally *interlinked* (Feltwell, 1986). The relationship between plants and butterflies leads to different patterns in their distribution depending on the availability of their food plants (Nimbalkar *et al.*, 2011). Butterflies and their caterpillars are dependent on specific host plants for foliage, nectar and pollen as their food. Thus, butterfly diversity reflects overall plant diversity, especially that of herbs and shrubs in the given area (Nimbalkar *et al.*, 2011). Among insects, butterflies occupy a vital position in ecosystems and their occurrence and diversity are considered as good indicators of the health of terrestrial biota (Kunte, 2000b). Butterflies are valuable pollinators in the local environment and help in pollinating more than 50 economically important crops (Borges *et al.*, 2003). Butterflies are an excellent choice for monitoring the habitat quality (Kunte *et al.*, 1999). Butterflies are one of the best studied groups and are highly sensitive to habitat disturbances; they are commonly used as indicator of environmental quality (Varshney, 1993; Kremen, 1994; Kocher and Williams, 2000; Koh and Sodhi, 2004).

Karnataka ranks second next only to Rajasthan in India, in terms of total geographical area prone to drought (Jayasree and Venkatesh, 2015; Nagaraja *et al.*, 2011). In Karnataka 18 districts are droughts prone. Bagalkot, Bidar, Bijapur, Kalaburagi, Koppal, Raichur and Yadgir are the most drought prone districts of North Karnataka. *On an average Bagalkot, Bidar, Bijapur, Kalaburagi, Koppal, Raichur and Yadgir regions receive about 650 mm of rainfall in about 50 days. Monsoon rainfall contribution is almost 75-80 % which generally breaks by mid-June and lasts till end of October (Jayasree and Venkatesh, 2015). December is the coldest month, March and May are hot and dry, mean monthly temperatures hover around 32 °C*

(Rupali, 2015).

Being good indicators of climatic conditions as well as seasonal and ecological changes, butterflies can serve in formulating strategies for conservation. However, they have largely been ignored by conservation biologist and policy makers as well. It is hence encouraging that butterflies are now being included in biodiversity studies and biodiversity conservation prioritization programme (Gadgil, 1996).

## Result and Discussion

Lepidopterists on the diversity of butterflies from Karnataka state were recorded since from 1887 (Aitken, 1887; Davidson and Aitken, 1890; Davidson *et al.*, 1896; Bell, 1909-1927). According to the recent literature review a total of 40 research articles were published from the different districts of Karnataka. There are different views regarding the total number of butterflies of Karnataka state. The views are given below:

The below list gives information about total number of butterflies species of Karnataka state.

1. Kunte (2006) reported 318 species of butterflies under 166 genera belongs to 5 families of Karnataka State. Lycaenidae family was dominant with 98 species, followed by Nymphalidae with 92 species, 80 species in Hesperidae, 29 in Pieridae and 19 from Papilionidae.
2. Kishan Das (2009), documented 317 butterfly species from Karnataka.
3. Dr.A.K.Chakravarthy (2009), documented 112 butterfly species in different locations of costal Karnataka, reported in Government of Karnataka - monitoring Butterfly fauna of Coastal Karnataka. In his report he quotes that, “the butterfly diversity increases markedly from South India were Karnataka tops the list with over 330 species including several endemic species”.
4. According to Government of Karnataka, “Biodiversity of Karnataka” At a Glance by Dr.R.C.Prajapati (2010), there are over 300 species of butterflies in Karnataka.
5. Muhamed Jafer and Radhakrishnan review the diversity of butterflies of Karnataka state and documented a total of 318 species, in state Fauna series of India, and they reported 19 species in Papilionidae, 80 species in Hesperidae, 29 species in Pieridae, 98 in Lycaenidae and 92 in Nymphalidae

- in the year of 2013.
6. Wikipedia listed a total of 318 butterfly species, 19 species in Papilionidae, 80 species in Hesperidae, 29 species in Pieridae, 98 in Lycaenidae and 92 in Nymphalidae till date.
  7. Karnataka state of environment and related issues also listed a total of 318 butterfly species, 19 species in Papilionidae, 80 species in Hesperidae, 29 species in Pieridae, 98 in Lycaenidae and 92 in Nymphalidae till ate.
- Mysore nature (<https://www.mysorenature.org/mysorenature/butterflies-of-mysore-area>), documented a total of 324 butterfly species from the state in the year 2018. in the year 1996 reported 313 from Karnataka State.
8. Ramakrishna and Alfred, J.R.B reported 330 butterfly species during the year 2007 from Karnataka state.
  9. Dr. A.K.Chakravarthy in the year 2009 reported 350 butterfly species from Costal Karnataka
  10. Dr.R.C.Prajapati in the year 2010 reported 300 butterfly species from Karnataka state.
  11. Ilango K. in the year 2013 reported 318 butterfly species from Karnataka state.
  12. ifoundbutterflies.org website by Krushnmehgha Kunte reported 286 butterfly species in 2019; 19 species in Papilionidae, 66 species in Hesperidae, 30 species in Pieridae, 2 species in Riodinidae, 86 species in Lycaenidae, 83 species in Nymphalidae.
  13. ifoundbutterflies.org website by Krushnmehgha Kunte reported 297 butterfly species in 2020; 19 species in Papilionidae, 71 species in Hesperidae, 30 species in Pieridae, 2 species in Riodinidae, 89 species in Lycaenidae, 86 species in Nymphalidae.
  14. Dr. Kavya K. Saraf, A review on Karnataka Butterflies, a report submitted to EMPRI during the year 2019, documented a total of 291 butterfly species, 19 species in Papilionidae, 72 species in Hesperidae, 29 species in Pieridae, 2 species in Riodinidae, 84 species in Lycaenidae, 85 species in Nymphalidae.
  15. Karnataka Butterflies – A field guide by O.K. Rema devi, K.H. Vinaya Kumar, Ritu Kakkar, R. K. Singh. Centre for climate change Environmental Management and Policy Research Institute Department of Forest, Ecology and Environment of Karnataka. June 2020. (ISBN – 978-93-89947-16-8. Excel India Publishers) documented a total of 323

butterfly species from Karnataka State, 19 species in Papilionidae, 81 species in Hesperidae, 30 species in Pieridae, 2 species in Riodinidae, 98 species in Lycaenidae, 93 species in Nymphalidae.

The website [\\_https://www.ifoundbutterflies.org](https://www.ifoundbutterflies.org) gives the complete details of each species of India butterflies including Karnataka State along with egg, caterpillar and adult butterflies with dorsal and ventral side images of butterflies; hence please visit the website for images for all the butterflies of Karnataka state.

## Overview Of Butterfly Diversity Documented From Different Districts Of Karnataka State:

### BAGALKOT

1. Menasagi and Kotikala carried out a survey at Bagalkot District in the campus of Horticultural College, Haveri, Bagalkot. A total of 56 butterfly species were recorded. 10 species in Papilionidae, 3 species in Hesperidae, 18 species in Pieridae, 4 in Lycaenidae and 21 in Nymphalidae in the year of 2011.

### BANGALORE URBAN

1. L. Shashikumar and M.G. Venkatesha during the year 2010 at Bio-Park, Jnana Bharathi, reported a total of 64 butterfly species. 7 species in Papilionidae, 1 species in Hesperidae, 14 species in Pieridae, 18 species in Lycaenidae, 24 species in Nymphalidae.
2. Chaturved Shet R during the year 2016 studied butterfly diversity at Lalbagh and Cubbon Park and a few water bodies - Ulsoor, Sankey, Lalbagh, Yediyur and Madiwala and reported a total of 116 butterfly species. 10 species in Papilionidae, 17 species in Hesperidae, 19 species in Pieridae, 1 species in Riodinidae, 35 species in Lycaenidae, and 34 species in Nymphalidae.
3. Dr. O. K Remadevi, during the year 2016 studied butterfly diversity at Gandhi Krishi Vikas Kendra, Indian Institute of Science Campus (IISc), Cubbon Park, Lal Bagh, Doresanipalya Forest Campus and Bannerghatta National and Biological Park and reported a total of 108 butterfly species. 10 in Papilionidae, 14 species in Hesperidae, 20 species in Pieridae, 1 species in Riodinidae, 34 species in Lycaenidae, and 29 in Nymphalidae.
4. Sathya C, Sagar Hand Antoney during the year 2015



at Christ university campus carried butterfly diversity survey and reported a total of 41 butterfly species. 6 species in Papilionidae, 3 species in Hesperidae, 6 species in Pieridae, 8 species in Lycaenidae, and 18 species in Nymphalidae.

5. Radhakrishna and Muhamed reported a total of 12 butterfly species at Bannerghatta National Park during the year 2007, and they documented 3 species in Papilionidae, 3 species in Pieridae, and 6 species in Nymphalidae.
6. Deepanjali during the year 2010 reported the diversity of butterflies at Bannerghatta Biological Park, Bangalore, Karnataka, state, India. She reported 42 species of butterflies.

## BELLARY

1. Harisha and Hosetti during the year 2013 at Daroji Sloth Bear Sanctuary studied butterfly diversity and reported a total of 41 butterfly species; 6 species in Papilionidae, 1 species in Hesperidae, 12 species in Pieridae, 7 species in Lycaenidae, and 15 species in Nymphalidae.

## CHAMRAJANAGAR

1. Santhosh, S. during the year 2016 at Agriculture ecosystems of Chamarajanagar District studied butterfly diversity and reported a total of 115 butterfly species; 11 species in Papilionidae, 13 species in Hesperidae, 21 species in Pieridae, 33 species in Lycaenidae, and 35 species in Nymphalidae.

## CHIKKAMAGALUR

1. Raghavendra *et al.*, (2011) studied the seasonality, status and diversity of butterflies in Bhadra Wildlife Sanctuary, Lakavalli range, Karnataka, covers an area of 2243.17 km. Field observations were made from November 2009 to October 2010. The checklist of their study shows that 54 species of butterflies spread over 42 genera and 8 families. Out of 54 species reported – Crimson rose and Danaide eggfly are in Schedule – I; Common Baron and Gray Count are in Schedule – II as per Indian Wildlife (Protection) act, 1972. 49 species of butterflies were reported during Winter, 26 were in Summer, 44 were in Monsoon and 20 species of butterflies observed throughout the year.

## DAKSHINA KANNADA

1. Naik, D. and M.S. Mustak during the year 2016 studied the butterfly diversity at Dakshina Kannada District and reported a total of 172 butterfly species; 17 species in Papilionidae, 37 species in Hesperidae, 15 species in Pieridae, 1 species in Riodionidae, 45 species in Lycaenidae, and 57 species in Nymphalidae.
2. Jane Maria D'Souza, Besii Mayikho, Precilla D Silva during the year 2016 carried out butterfly diversity survey at Dakshina Kannada District Permude village in Mangaluru Taluk and reported a total of 45 butterfly species; 4 species in Papilionidae, 12 species in Hesperidae, 4 species in Pieridae, 4 species in Lycaenidae, and 21 species in Nymphalidae.
3. Nagarathna Balakrishna, Hemachandra during the year 2016 carried out butterfly diversity survey at Dakshina Kannada District Permude village in Mangaluru Taluk and reported a total of 51 butterfly species; 7 species in Papilionidae, 4 species in Hesperidae, 6 species in Pieridae, 7 species in Lycaenidae, and 27 species in Nymphalidae.
4. Prashantha Naik *et al.*, during the year 2018 at Mangalore university campus, Mangalagangothri carried out butterfly diversity survey and reported a total of 37 butterfly species; 3 species in Papilionidae, 3 species in Hesperidae, 3 species in Pieridae, 4 species in Lycaenidae, and 24 species in Nymphalidae.
5. Since 2011 to 2017 November, a total of 147 butterfly species representing 6 families of order Lepidoptera and Class Insecta have been recorded by Sammilan Shetty and other volunteers at Sammilan Shetty's Butterfly Park, Belvai, Mangalore, Karnataka, India.

## DAVANAGERE

1. lavandi, Shwetha in the year 2019 carried out butterfly diversity study at Shivagangothri campus, Davanagere University and reported a total of 26 butterfly species; 4 species in Papilionidae, 1 species in Hesperidae, 9 species in Pieridae, 1 species in Lycaenidae, and 11 species in Nymphalidae.
2. Harisha and Hosetti (2016) reported butterfly diversity from Kondajji Forest, Harihar Taluk, District Davanagere, Karnataka State located between 14° 34' 25.8'' N Latitude and 75° 53' 07.8'' E Longitude. They reported a total of 53 species of butterflies belonging to five families. They have reported 56 species of butterflies belonging to five

families. Nymphalidae was the dominant family with 21 species, followed by Pieridae with 18 species, Papilionidae with 10 species, Lycaenidae with 4 species, and Hesperidae with 3 species.

3. Harisha (2015) carried out butterfly survey along the road on the edge of the Kundavada Lake for a period of one year from October 2010 to September 2011. Kundavada Lake spread across 243.27 acres located between 14° 27' 30'' N latitude and 75° 53' 39'' E longitude. He was reported 51 species of butterflies. The most dominant family was Nymphalidae with 17 species, followed by the Pieridae with 14 species, Lycaenidae with 11 species, Papilionidae with 6 species and Hesperidae by 3 species.

### DHARWAD

1. Umapati Y *et al* in the year 2016 reported a total of 36 butterfly species Karnataka University Dharwad campus, 6 species in Papilionidae, 2 species in Hesperidae, 8 species in Pieridae, 4 species in Lycaenidae, and 16 species in Nymphalidae.
2. Katti *et al.*, (2017) systematic survey reported that a total 69 butterfly species in seven different spots in Dharwad, Karnataka state, India. Out of 69, 53 were identified and classified, out of 53; 6 species are enlisted under Indian Wildlife (Protection) Act, 1972.

### GULBARGA

1. Nandini and Murali (2014) carried out studies on abundance and diversity of Insect fauna in agricultural field at Hadgil Harutti village, Gulbarga district, Karnataka. They have collected 11,318 insect samples from June 2013 to September 2013. They recorded total of 26 families, under 6 orders. In Lepidoptera order (Butterfly and Moths) 13 species of butterflies reported belonging to four families.
2. Sulochana and Murali (2014) carried out study on butterfly diversity in Ankalga village near Kurikotta Bridge of Gulbarga district, Karnataka. The study was conducted from 2012 to 2013. They have recorded 31 species representing 23 genera of 5 families of butterflies. The family Nymphalidae was dominant with 11 species, followed by Pieridae with 10, Lycaenidae with 5 and 4 species belonging to the family Papilionidae and one species in Hesperidae family.
3. Kavya. K Saraf and K Vijayakumar worked on butterfly ecology of Kalaburagi district. The result

was -Butterfly diversity was studied from April 2015 to November 2016 a total of 52 species of butterflies belonging to 29 genera and 5 families were recorded from Uplaon Nature Camp, Kalaburagi district, Karnataka and published. Nymphalidae and Pieridae dominated the list with 18 species followed by, Lycaenidae with 8 species, Papilionidae with 6 species and Hesperidae with 2 species. Further field study was continued till December 2017. A total of 83 butterfly species belonging to 5 families: Papilionidae, Hesperidae, Pieridae, Lycaenidae and Nymphalidae had been recorded from April 2015 to December 2017. All the 83 species of butterflies distributed under one Superfamily Papilionoidea, and 5 families, 16 subfamilies, 19 tribes and 48 genera. 6 species recorded in the family Papilionidae, 7 species recorded in Hesperidae, 21 species recorded in the family Pieridae, 25 species recorded in Lycaenidae and 24 species recorded in Nymphalidae family.

### UTTARA KANNADA

1. Udaya Kumar K *et al.*, at in 2019 at college of forestry campus, Sirsi reported 84 butterfly species, 9 species in Papilionidae, 13 species in Hesperidae, 9 species in Pieridae, 1 species in Riodinidae, 19 species in Lycaenidae, and 33 species in Nymphalidae.
2. Udaya Kumar K, Bharath S, Nagaraj Shastri in 2019 reported a total of 176 butterfly species belonging to six families were recorded in and around college of forestry campus, Sirsi, reported 176 butterfly species, 16 species in Papilionidae, 36 species in Hesperidae, 15 species in Pieridae, 1 species in Riodinidae, 52 species in Lycaenidae, and 56 species in Nymphalidae.

### KODAGU

1. Mone *et al.*, (2011) studied biodiversity of insect study for comparing the diversity of insects in 29 plots of Kodagu districts of Karnataka state. 12 plots contain completely organic plantations that apply no pesticides or chemical fertilizers, five plots using only chemical fertilizers but not pesticides and remaining 12 plots of plantations uses (NATIONAL PARKK) chemical fertilizer as well as chemical pesticides. They have collected 1,259 butterflies comprising 25 species from the family Nymphalidae. Shanno's butterfly species diversity index (H') is highest in organic plantations and lower in pesticide



(P) plantations. The intension of the study was to show the effects of pesticide on insect fauna. Their record clearly indicates that the butterfly community will shows negative correlation with the pesticide treatment to the plantation in which they live.

2. Hannington and Winchworth worked on butterfly diversity from 1916, 1918 and 1928 at Coorg area of Western Ghats and reported 250 butterfly species.

## MYSORE

1. The Mysore nature website - <https://www.mysorenature.org/mysorenature/butterflies-of-mysore-area>, (Accessed on ,17/5/2020, at 10.42 am.) reported 163 butterfly species from Mysore during the year 2018.
2. Sarjan *et al.*, reported 86 butterfly species from Manasagangothri Campus of Mysore University during 2014, 7 species in Papilionidae, 13 species in Hesperidae, 17 species in Pieridae, 23 species in Lycaenidae, and 26 species in Nymphalidae.

## SHIMOGA

1. Sayeswara, reported a total of 36 butterfly species from H.A Gandhi Park of Shivamogga in the year of 2018; 8 species in Papilionidae, 1 species in Hesperidae, 8 species in Pieridae, 3 species in Lycaenidae, and 16 species in Nymphalidae
2. M.N. Harisha *et al.*, reported a total of 151 butterfly species from Shettihalli Wildlife Sanctuary in the year of 2019; 15 species in Papilionidae, 27 species in Hesperidae, 24 species in Pieridae, 33 species in Lycaenidae, and 52 species in Nymphalidae.
3. Dayanada studied diversity of butterfly in and around Gudavi Bird Sanctuary (GBS), Karnataka during the year 2019. The systematic survey revealed that 115 species of butterflies belonging to 78 genera and 5 families. Nymphalidae was the dominant family with 40 species followed by Lycaenidae (25 species), Hesperidae (18 species) and Papilionidae and Pieridae (16 species) each.
4. Jeevan *et al.*, (2013) carried out diversity study of butterflies in Mandagadde situated about 21 km away from Shivamogga district, Karnataka, India. They have reported 52 species of butterflies representing to 44 genera and 5 families. Nymphalidae dominated the list with 23 species, Papilionidae with 9 species followed by Pieridae and Lycaenidae with 8 species each and Hesperidae with 4 families.

5. Sayeswara (2014) carried butterfly observation in Sahyadri College Parkus, Shivmogga, Karnataka, with an area of 85 acres. Field observations were made for a period of seven months from June to December 2013, once in 15 days. A total of 33 species of butterflies representing 5 families were identified and recorded.

## UDUPI

1. Vijaya Kumar K.M, Manasa Shetty reported a total of 39 butterfly species from Kundapura: Mullikatte Site, Hosadu, Movadi in the year 2019; 6 species in Papilionidae, 5 species in Hesperidae, 7 species in Pieridae, 5 species in Lycaenidae, and 16 species in Nymphalidae.

## YADGIR

1. Sunil *et al.*, (2013) carried out study in Yadgir and Gulbarga Districts in North Karnataka, a 30 km radius from the centre point Gogi. They have divided study area in 3 zones- 0 to 5 km Core Zone (CZ), 5 to 15 buffer Zone (BF I), 15 to 30 km radius Buffer Zone (BF-II). A total of 28 butterfly species representing 6 families have been recorded. In CZ – 7 species of butterflies, in BZI- 24 species of butterflies, In BZ II -28 species of butterflies were reported. In all the three regions the family Nymphalidae represented by 13 species, this was dominant one, followed by Papilionidae with 6 species, Pieridae with 5 species, Lycaenidae with 2 species, Satyridae and Hesperidae with one species each.
2. The butterfly diversity work from Dr. Shankara Murthy, M., (Assistant Professor of Agricultural Entomology at the College of Agriculture, Bheemarayanagudi, University of Agricultural Sciences, Raichur, Karnataka, India) documented a total of 47 butterfly species from Sleeping Buddha Hill located near Shahapur town Shahapur taluk of Yadgir district in Karnataka state, India. reported 7 species in Papilionidae family, 4 in Hesperidae, 11 in Pieridae, 8 in Lycaenidae, and 17 in Nymphalidae family. (Still this work is not communicated to any journals, he is in the process of communication, this information is gathered by the Personnel communication with Dr. Kavya K Saraf).

## NAGARAHOLE NATIONAL PARK

Basavarajappa S, Gopi Krishna V and S Santhosh



worked on butterfly diversity from Nagarahole National Park, Karnataka, India and reported 138 butterfly species in the year 2018; 12 species in Papilionidae, 29 species in Hesperidae, 20 species in Pieridae, 30 species in Lycaenidae, and 47 species in Nymphalidae.

## KARNATAKA COASTAL LINE

A.K.Chakravarthy reported 112 butterfly species from 320 Kms. Coastal line of Coastal Karnataka, in 2009.

## CENTRAL WESTERN GHATS IN KARNATAKA

Sumesh Dudani *et al.*, reported 44 butterfly species from Gundia river basin, Central Western Ghats in Karnataka, during 2013; 5 species in Papilionidae, 1 species in Hesperidae, 7 species in Pieridae, 8 species in Lycaenidae, and 23 species in Nymphalidae.

## CONCLUSIONS

Though the tropical region contains very rich and diverse butterfly fauna, the information on species found in different habitats is very poor particularly for the Indian region (Rajagopal *et al.*, 2011). From the numerical data it is evident that butterflies are the integral part of not only insect diversity but the entire biodiversity.

*There were no research articles on butterfly diversity studies from Bangalore Rural, Belgaum, Bidar, Bijapur, Chitradurga, Gadag, Hassan, Haveri, Kolar, Koppal, Mandya, Raichur, Ramanagara, and Tumkur districts till date.*

## Author Contributions:

Survey and Data collection, Manuscript Preparation, Data analysis, and Design of the study - Kavya. K Saraf<sup>1</sup>. Original Idea, Design of the study - Dr. Somanath Reddy C Patil<sup>2</sup>

## REFERENCES

● **A.K.Chakravarthy.(2009).**Monitoring butterfly fauna of coastal Karnataka. Karnataka biodiversity board, Government of Karnataka, by dr., University of agricultural sciences, department of agricultural Entomology, Bngalore-560065, *Karnataka published by Karnataka biodiversity board*, 'vanavikas' building, 18th cross,, mallehwaram, bangalore-560003, phone: 080- -23440535, e-mail:

kbb.kar@gmail.com, website: [www.kbb.kar.nic.in](http://www.kbb.kar.nic.in), 2009, 1-57.

- **Arun Singh, A. P and Sanjay Sondhi. (2016).** Butterflies of Garhwal, Uttarakhand, Western Himalaya, India. *Journal of Threatened Taxa*. 8(4): 8666-8697.
- **Cantlie, K. (1962).** The Lycaenidae Portion (except the Arhopala Group) of Brigadier Evan's. *The Identification of Indian Butterflies* 1932. (India, Pakistan, Ceylon, Burma). Vi+156 pp+ index+12pp. 5pls. Bombay Natural History Society, Bombay.
- **Talbot, G. (1939).** *The Fauna of British India including Ceylon and Burma*. Butterflies, xxix+600pp, 184 text figs., 2 pls., 1map. Taylor and Francis, London.
- **Talbot, G. (1947).** *The Fauna of British India including Ceylon and Burma*. Butterflies, xv+506pp, 104 text figs., 2 pls., 1map. Taylor and Francis, London.
- **Aitken, E. H. (1887).** A list of Butterflies of Bombay Presidency. *J. Bombay nat. hist. Soc.* 35-44.
- **Chaturved Shet R. (2016).** Date: 28-30th December, Environmental Management and Policy Research Institute. *Lake 2016: Conference on Conservation and Sustainable Management of Ecologically Sensitive Regions in Western Ghats*.
- **Davidson, J., Aitken, E.H. (1899).** Notes on Larvae and pupae of some butterflies of Bombay Presidency. *J. Bombay nat. Hist. Soc.* 5(4): 349-374.
- **Dayananda, G. Y. (2014).** Diversity of butterfly fauna in and around Gudavi bird Sanctuary, Sorab, Karnataka, *Journal of Entomology and Zoology Studies*. 2(5):376-380.
- **Deepanjali, T. (2010).** *Butterfly biodiversity at Bannerghatta National Park*. Lake 210: Wetlands, Biodiversity and Climate Change. 1-12.
- **Dr. O. K Remadevi. (2015).** *Butterflies as indicators of climate change – a baseline study in Bangalore city*. Centre for climate change (ccc) Environmental Management and Policy Research Institute Department of Forest, Ecology and Environment Government of Karnataka, Project team: Principal Investigator: 1-210.
- **Dr. Prashantha Naik, Prof. Raju Krishna**



- Chalannavar, Dr. M. S. Mustak, Dr. Shamaprasad V. R. (2018).** Biodiversity of Mangalore University campus, Mangalagangothri. 98-118. *Mangalore University Publication*.
- **Evans, W.H. (1932).** *The identification of Indian butterflies*. (Second Edition Revised). X+454 pp., 9 text figs., 32 pls. *The Bombay Natural History Society. Madras*.
  - **Evans, W.H. (1949).** *A catalogue of the HesperIIDae from Europe, Asia and Australia in the British Museum (Nat. Mus.)*, London. Xx+502pp., 53pls. By order of the Trustees of British Museum.
  - **Feltwell, J. (1986).** *The natural history of butterflies*. Groom Helm Ltd., Provident House, Bureel Row, Beckenham Kent BR3 IAT, 133.
  - **Gadgil, M. Documenting diversity: An experiment. (1996).** *Curr Sci.* 70: 36-44.
  - **Goankar, H. (1996).** *Butterflies of the Western Ghats, India including Srilanka: A biodiversity Assessment of a Threatened Mountain System*. Ii+86pp. 5 figs., 32 pls (Unpublished). Danida Visiting Scientist, centre for Ecological Sciences, Indian Institute of Science, Bangalore, India.
  - **Gunathilagaraj K, Perumal TNA, Jayaram K, Ganesh Kumar M, Field Guide, South Indian Butterflies, (2015).** PP: 359, published by Krab Media and marketing
  - **Gupta, I. J. and Mridula, M. (2012).** *Handbook on Diversity in some of the Indian Butterflies (Insecta – Lepidoptera)*. Published by the Director, *Zoological Survey of India, Kolkata*. 1:310.
  - **Gupta, I.J. (1997b).** Insecta: Amathusiidae, Acraeidae, Nymphalidae, Rionidae. *Zoological Survey of India. State Fauna Series 3, Fauna of West Bengal (Part- 7)*: 533-612.
  - **Gupta, I.J. And Shukla, J.P.N. (1988).** Butterflies of families Acraeidae, Satyridae, Nymphalidae, Riodinidae and Lycaenidae (Lepidoptera) from Arunachal Pradesh and adjoining areas, India. *Zoological Survey of India*. Occasional paper number, 109: 115pp. 23pls, 1 map.
  - **H.N. Sarjan, Jigmat Yangchan, S.K. Kripa, Saniya Fathima, A. Ameena Husna and Prakash R. Naik. (2014).** *Butterfly Diversity in Manasagangothri campus of Mysore University*. ZOO's PRINT, Volume XXIX, Number 8 August, 1-8.
  - **Haribal, M. (1992).** *The butterflies of Sikkim Himalaya and their Natural History*. *Sikkim Nature Conservation Foundation*, Gangtok. 217pp. 60 colour pls.
  - **Harish, M.N., Hosetti, B.B. (2013).** Butterfly fauna of Daroji Sloth bear Sanctuary, Hospet, Bellary District, Karnataka, India. *Journal of Research in Biology*. 3 (2): 840-846.
  - **Harisha, M.N. (2015).** A preliminary survey on diversity of butterflies around the Kundavada Lake, Davanagere District, Karnataka, India. *Life Sciences Leaflets*. 61: 1-7.
  - **Harisha, M.N. and Hosetti, B.B. (2016).** Community structure and diversity of butterfly of Kondajji Forest, Harihar Taluk, Davanagere District, Karnataka, India. *Journal of Entomology and Zoology studied*. 4(2): 30-33.
  - **Heppner, J.B. (1991).** Faunal regions and the diversity of Lepidoptera. *Tropical Lepidoptera* 2. Supplement 1, 1-85.
  - **ILANGO K. (2013).** *Fauna of Karnataka, State Fauna Series*. An overview. Zoological Survey of India, 21 (1) -6. *Karnataka Biodiversity Board, Government of Karnataka, monitoring butterfly fauna of coastal Karnataka*.
  - **Isaac Kehimkar. (2016).** *Butterflies of India*. Bombay Natural History Society, Mumbai. Pp xii+528.
  - **Jane Maria D'Souza, Besii Mayikho, Precilla D Silva. (2016).** Butterfly diversity and their host nectar plants of Permude village in Dakshina Kannada. Lake 2016: *Conference on Conservation and Sustainable Management of Ecologically Sensitive Regions in Western Ghats*. Date – 28<sup>30th</sup> December,, <http://ces.iisc.ernet.in/energy>
  - **Jayasree, V., Venkatesh, B. (2015).** *Analysis of rainfall in assessing the drought in semi-arid region of Karnataka State, India*. 29 (29); 5613-5630.
  - **Jeevan, E.N., Nail, K.L., Ashashree, H.M., Sayeswara, H.A. (2013).** Butterfly diversity and status in Mandagadde of Shivamogga, Karnataka, India. *International Journal of Applied Biology and Pharmaceutical Technology*. 4(4): 325- 332.

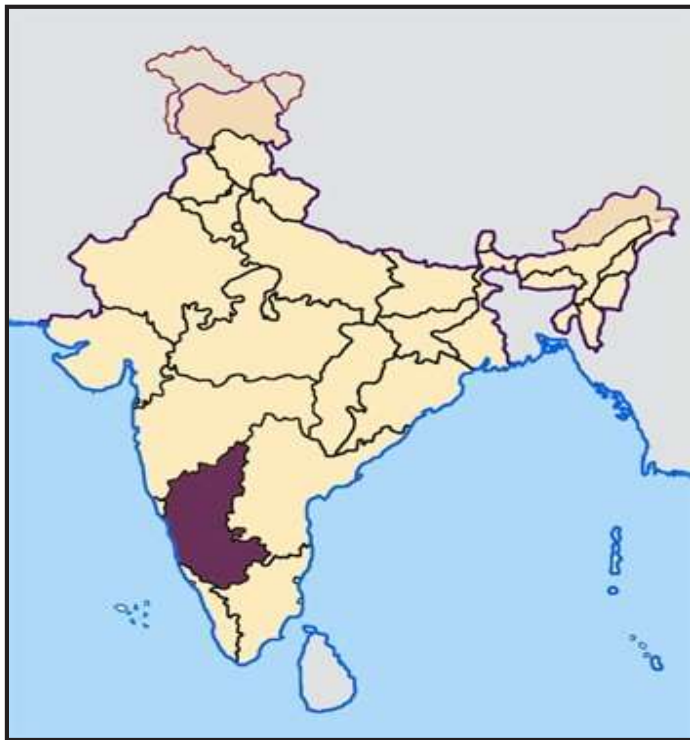
- **Jyoti, B.M., Kotikal, Y.K. (2011).** Studies on butterfly fauna of Bagalkot district (Karnataka – India). *Karnataka J. Agri. Sci.* 24(2): 538-539.
- **K.R. Kishen das. (2009).** Chittegalu – *A book on Butterflies* with special reference to those of Karnataka State, color plates. *Arivu Education and Cultural Trust, Ramakrishna Nagar, Mysore.* 104+32.
- **Katti P. et al., 2016, Jun 20.** Dharwad: A cradle for Butterflies. *Deccan Herald article.*
- **Koh, L.P. Sodhi, N.S. (2004).** Importance of reserves, fragments and parks for butterfly conservation in a tropical urban landscape, *Ecol., Appl.* 14: 1695-1708.
- **Kremen, C. (1994).** Biological Inventory using target taxa: a case study of butterflies of Madagascar. Value of the countryside for forest birds in central Sulawesi (Indonesia). *Bio. Conserv.* 122:547-558.
- **Kunte, K. (2000).** Butterflies of Peninsular India. Xvii+254. *Indian Academy of Sciences, University Press.* Hyderabad.
- **Kunte, K. (2000b).** *Project life Scape*, Resonance. 5:86-97.
- **Kunte, K., Joglekar, A., Utkarsh, G., Padmanabhan, P. (1999).** Patterns of butterfly, birds and tree diversity in the Western Ghats. *Curr. Sci.* 77:577-586.
- **Kocher, S.D. Williams, E.H. (2000).** The diversity and abundance of North American butterflies vary with habitat disturbances and geography. *J. Biogeogr.* 27:785-794
- **Lavandi, Shwetha. (2019).** A preliminary observation on diversity of butterflies of Shivagangotri campus, Davangere university Davangere, Karnataka. 9. 273-280.
- **Marshall, G.F., De Niceville, L. (1883).** Butterflies of India, Burma and Ceylon. 1: vii+ 327pp. 16pls. *A.J. Reprints Agency, New Delhi.*
- **Mone, S., Kusha, K.M., Devcharan, J., Musthak, A., Aurag, G. (2014).** Comparison of insect biodiversity between organic and conventional plantations in Kodagu, Karnataka, India. *Journal of Threatened Taxa.* 6(9): 6186-6194.
- **Muhamed Jafer. P., Radhakrishnan, C. (2013).** Insecta: Lepidoptera: Rhopalocera. Fauna of Karnataka State, Fauna Series. Published by the Director, *Zoological Survey of India, Kolkata.* 21: 197-206.
- **Nagaraja, B.C. Somasekhar, R.K., Kavitha, A. (2011).** Impact of drought on agriculture. Challenges facing poor farms of Karnataka, South India. Paper presented at conference on climate change and security. *Trondhiem. Norway.* 21-24.
- **Nagarathna Balakrishna, Hemachandra. (2016).** Butterfly diversity and its host specificity of Permude village in Dakshina Kannada District. Lake 2016: *Conference on Conservation and Sustainable Management of Ecologically Sensitive Regions in Western Ghats. Date – 28<sup>th</sup> December, 2016.* <http://ces.iisc.ernet.in/energy>
- **Naik, D. & M.S. Mustak. (2016).** A checklist of butterflies of Dakshina Kannada District, Karnataka, India. *Journal of Threatened Taxa.* 8(12): 9491–9504;
- **Nandini, V.B., Murali, J. (2014).** A preliminary study on abundance and diversity of Insect fauna in Gulbarga district, Karnataka, India. *International Journal of Science and Research.* 3(12):1670-1675.
- **Nimbalkar, R.K., Chandekar, S.K., Khunte, S.P. (2011).** Butterfly diversity in relation to nectar food plants from Bhor Tahsil, Pune District, Maharashtra, India. *Journal of Threatened Taxa.* 3(3):1601-1609.
- **Pajni, H.R., Rose, H.S., Walia, V.K. (2006).** *Butterflies of North – West India* (Part -1). Xi+115pp. Published by *Atma Ram and sons, Chandigarh.*
- **Parmod Kumar. (2008).** *Handbook on Common Butterflies of Uttarakhand:* Published by the Director, *Zoological Survey of India, Kolkata.* 1-136.
- **Peile, H.D. (1937).** *A guide to collecting butterflies of India.* Staples, London, 14+312pp+25pp.
- **Prajapati, R. C. (2010).** *Biodiversity of Karnataka, at a glance.* Forest, Environment and Ecology Department, Government of Karnataka, Bangalore. 25.
- **Raghavendra Gowda., Vijaya Kumar, H.T., Pramod, A.F., Hosetti, B.B. (2011).** Butterfly diversity, seasonality and status in Lakkavalli range of Bhadra Wildlife Sanctuary, Karnataka. *World Journal of Science and Technology.* 1(11): 67-72.



- **Raju, K. (2016).** *Butterflies of Western Ghats*. An e-book. Self Published Pp. 327+Vii.
- **Kavya K.S. and Murali, J.V. (2016).** Butterfly diversity of Upland nature Park, Kalaburagi district, Karnataka. *International Journal of Entomology Research*. 1(7):49-53.
- **Sammilan Shetty's Butterfly park, Belvai, Mangalore, Karnataka, India.** All the information collected from Sammilan Shetty, the butterfly Conservator, from 2015-2019
- **Santhosh, S. (2016).** Butterfly species distribution, migration, protected and endemic butterfly species Chamarajanagar District, 1-136. <http://hdl.handle.net/10603/153019>, <http://shodhganga.inflibnet.ac.in:8080/jspui/handle/10603/11016>, <http://shodhganga.inflibnet.ac.in:8080/jspui/handle/10603/153019>, On 17/05/2020, at 10.47 AM.
- **Sathya Chandra Sagar H.S. and Antoney. (2015).** Diversity of Butterflies in Christ University Campus, Bangalore. India Zool. Surv. India, *Zoology for Future Education and Research* : 111-118,
- **Sayeswara, H.A. (2011).** A preliminary observation on butterflies of Sahyadri College Parkus, Shivamogga, Karnataka, India. *International Journal of Pharma Medicine and Biological Sciences*. 3 (4):34-39.
- **Sayeswara, H.A. (2018).** Butterfly Species Diversity, Occurrence and Abundance In Gandhi Park of Shivamogga, Karnataka, India. *International Journal of Engineering Science Invention* .7 (9 )Ver : PP 67-75.
- **Sulochana, A., and Murali, J. (2014).** Diversity of butterflies from Ankalg diversity of butterflies from Ankalg Village (Gulbarga District) Karnataka, India. *International Journal of Recent Scientific Research*. 5(6): 1166-1169.
- **Sumesh Dudani, M D Subhash Chandran, G R Rao, Vishnu Mukri, Harish Bhat and T V Ramachandra. (2013).** Biodiversity, Ecology and Socio-economic aspects of Gundia river Basin. Energy and Wetland Research Group, Centre for Ecological Sciences Indian Institute of Science, Bangalore – 560 012, 1-28. *Sahyadri Conservation Series*: 24 ENVIS Technical Report: 54, April. 2013.
- **Sunil, N., Bhaskar, K., Imran Khan, Y.D., Venkateshalu. (2013).** Biodiversity monitoring and its distribution in and around Uranium Mining area of Gogi Gulbarga (Yadgir), Karnataka: a case study. *J. Biodiversity*. 4(2):69-77.
- **Tiple, A.D., Khurad, A.M. (2009).** Butterfly species diversity, habitat and seasonal distribution in and around Nagpur City, Central India. *World Journal of Zoology*. 4(3) ; 153-162.
- **Udaya Kumar K, Bharath S, Nagaraj Shastri S. (2019).** *WINGED JEWELS*, Let's Unfold their Graceful wings. Youth Forum for Nature (YOFONA) , College of Forestry, Sirsi , University of Agricultural Sciences, Dharwad , 2019, First edition: , Publisher : YOFONA (Youth Forum for Nature), 1-78,
- **Udaya Kumar K, Ramesh Rathod, Vinayak Pai, Karthik NJ and Nagaraj Shastri. (2019).** Study of butterfly diversity in college of forestry campus, Sirsi, Uttara Kannada. *Journal of Entomology and Zoology Studies*; 7(4): 01-11
- **Umapati Y, Usha D.N, Vedavati G.N, Girimalleshwar B, Veeranagoudar D.K and Pulikeshi M.B. (2016).** Butterfly Diversity of Karnatak University Campus, Dharwad. *Journal of Environmental Science, Toxicology and Food Technology*. 10(12).77-83
- **Varshney, R. K. and Smetacek, P., (eds.) (2015).** *A Synoptic Catalogue of the Butterflies of India*. Butterfly Research Centre, Bhimtal and Indinov Publishing, New Delhi, ii +261pp, 8Pl.
- **Varshney, R.K. (1993).** Index Rhopalocera indica Part II. Common names of butterflies from India and neighboring countries. *Orient. Insects*. 27:347-372.
- **Varshney, R.K. and Chandra, S.K. (1971).** Butterflies of the North – Eastern India. *Indian Mus. Bull.* 6(1): 28-53.
- **Varshney, R.K. and Peter Smetacek. (2015).** *A Synoptic catalogue of the butterflies of India*, Butterfly Research Centre, Bhimtal and Indinov Publishing New Delhi, pp: 1-262.
- **Venkataramani, G. (1986).** In the shadow of extinction, In, *Frontline, India's National Magazine*, July 26- August 8, 3, 58.
- **Venkatesha, L. Shashikumar and M.G. (2010).** Analysis of butterfly communities in relation to the tree

- density and canopy cover in bio-park of Bangalore University, Bangalore, Karnataka, India. *Lake 2010, 22nd-24th December: Wetlands, Biodiversity and Climate Change. Department of Zoology, Bangalore University, Jnana Bharathi, Bangalore – 560056.1-9.*
- **Vijaya Kumar K.M, Manasa Shetty. (2019).** Insects Diversity of Kundapura Taluk, Udupi, Karnataka, India. *Journal of Entomology and Zoology Studies.* 2017; 5(1): 758-765.
  - **Winter Blyth, M.A. (1956).** *Butterflies of the Indian region* (Bombay; oxford – BNHS), p-43.
  - <http://www.ifounbutterflies.org/location/1152/Karnataka>, Accessed on 17/5/2020 at 12.56 pm
  - [https://en.wikipedia.org/wiki/List\\_of\\_butterflies\\_of\\_Karnataka](https://en.wikipedia.org/wiki/List_of_butterflies_of_Karnataka), Accessed on 19/5/2020 at 1: 50 pm.
  - <https://www.mysorenature.org/mysorenature/butterflies-of-mysore-area>, Accessed on 17/5/2020, at 10.42 am.
  - <https://www.karnataka.com/profile/location/>, Accessed on 31/5/2020 at 8.42PM
  - <http://karnataka.gov.in/empri>, Accessed on 31/5/2020 at 8.45PM
  - <http://karenvis.nic.in/WriteReadData/UserFiles/image/2017/Coastal%20Karnataka/coastal%20kar.png> coastal Karnataka map, Accessed on 13/05/2020, at 8.57 PM.
  - Coastal Master Plan – Karnataka Tourism, [http://karenvis.nic.in/Database/Coastal\\_Karnataka\\_7956.aspx](http://karenvis.nic.in/Database/Coastal_Karnataka_7956.aspx), 8.59 PM, 13/5/2020
  - <http://karnataka.gov.in/empri>, Accessed on 13/5/2020, at 8.39PM
  - <https://www.karnataka.com/profile/physiography/>, Accessed on 13/5/2020, at 8.45PM
  - <https://www.karnataka.com/profile/physiography/>, Accessed on 13/5/2020, at 8.38PM
  - [http://karenvis.nic.in/Database/Biodiversity\\_7954.aspx](http://karenvis.nic.in/Database/Biodiversity_7954.aspx), 13/5/2020,
  - <https://www.karnataka.com/profile/forest/>. Accessed on 14/5/2020, at 8.31PM
  - <http://karnataka.gov.in/empri>, Accessed on 14/5/2020, at 8.46PM
  - [http://karenvis.nic.in/Database/KarnatakaForest\\_8197.aspx](http://karenvis.nic.in/Database/KarnatakaForest_8197.aspx), Accessed on 13/5/2020, at 8.38PM
  - [http://karenvis.nic.in/Database/KarnatakaForest\\_8197.aspx](http://karenvis.nic.in/Database/KarnatakaForest_8197.aspx), 13/5/2020, 9PM
  - <https://www.karnataka.com/profile/forest/> on, 13/03.2020, at 8.52 PM.
  - [http://karenvis.nic.in/Database/KarnatakaForest\\_8197.aspx](http://karenvis.nic.in/Database/KarnatakaForest_8197.aspx), Accessed on 13/5/2020, at 9PM
  - [WWW.FAIRFAXCOUNTY.GOV/PARKS/GREENSPRING](http://www.fairfaxcounty.gov/parks/greenspring). GREEN SPRING GARDENS. Using native plants to attract butterflies, moths, bees and other pollinators in the Washington, D.C.Area
  - Website: [www.wiienvis.nic.in/Database/ScheduleSpeciesDarabase-7969.aspx](http://www.wiienvis.nic.in/Database/ScheduleSpeciesDarabase-7969.aspx), ENVIS Centre of Wildlife and Protected Areas, Hosted by Wildlife Institute of India, Dehradun.
  - Website. <http://www.bioutexas.edu/grad/krushnamegh/mooringslnaturalhistory.htm> Kunte, K. 2006. Kunte 's Website <http://www.bioutexas.edu/grad/krushnamegh/moorings/naturalhistory.htm>.
  - [https://en.wikipedia.org/wiki/List\\_of\\_butterflies\\_of\\_Karnataka](https://en.wikipedia.org/wiki/List_of_butterflies_of_Karnataka), Accessed on 19/5/2020, at 1: 50 pm.
  - <https://www.mysorenature.org/mysorenature/butterflies-of-mysore-area>, Accessed on ,17/5/2020, at 10.42 am.
  - <https://www.karnataka.com/profile/physiography/> Accessed on 13/5/2020, at 8.38PM.
  - <http://www.ifounbutterflies.org/location/1152/Karnataka>, Accessed on 17/5/2020 at 12.56

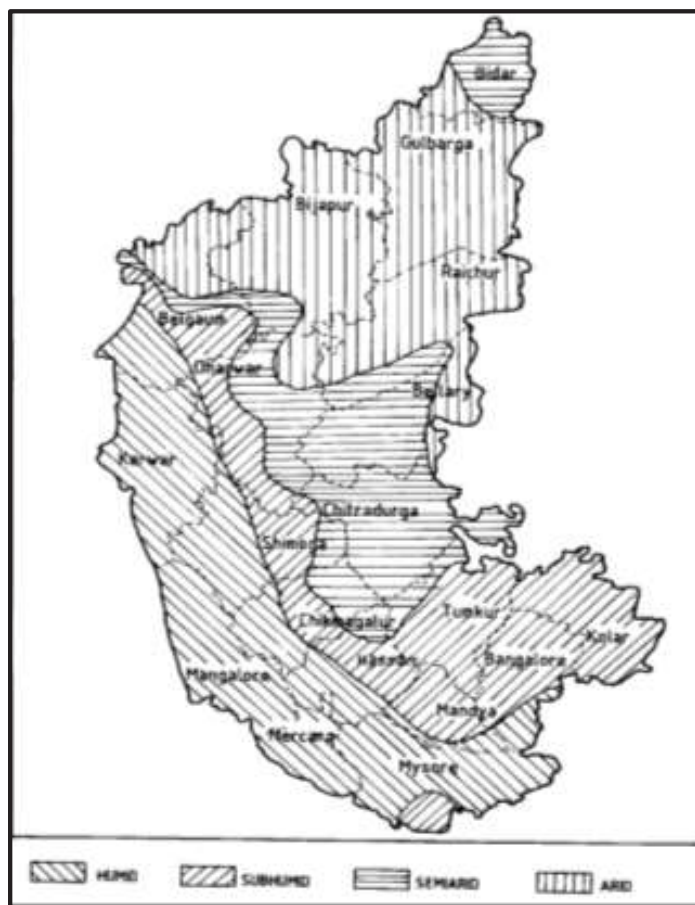
## STUDY AREA MAPS



India map showing Karnataka state



Karnataka state map with its districts



Climatic zones of Karnataka state



Forest map of Karnataka state

# First record of site fidelity of Blyth's Reed Warbler *Acrocephalus dumetorum* in Ela Habitat, Pingori, Pune, Maharashtra, India

Pande, Satish \*, Rahul Lonkar\*, Vikas Khare\* and Rajkumar Pawar\*  
(\*Ela Foundation, Pune, Email: pande.satish@gmail.com)

**Citation:** Pande Satish, Lonkar Rahul, Khare Vikas and Pawar Rajkumar. (2024). First record of site fidelity of Blyth's Reed Warbler *Acrocephalus dumetorum* in Ela Habitat, Pingori, Pune, Maharashtra, India. *Ela Journal of Forestry and Wildlife*. 13(1): 1557-1558

**Date of Publication:** 31 March 2024

ISSN 2319-4361



## Introduction:

The Blyth's Reed Warbler *Acrocephalus dumetorum* is an Old World Warbler in the genus *Acrocephalus*. It breeds in the Palearctic and far-eastern Europe. It is migratory, wintering in Bangladesh, India and Sri Lanka. And is rare migrant to western Europe. The habitat of the Blyth's reed warbler *Acrocephalus dumetorum* is trees or bushes from where it gives its calls. It eats insects and berries.

## Material and Methods:

A solitary Blyth's reed warbler *Acrocephalus dumetorum* was observed in Ela Habitat, the field research station of Ela Foundation for several years. It was wary and flew after human approach. On 14<sup>th</sup> February, 2018 at 6.10pm this individual was first time trapped in mist net under the Constant Effort Site (CES) project run by Ela Foundation and Maharashtra Forest Department in Ela Habitat, Pingori. Although the Blyth's Reed Warbler is known to return to the same locality in winter year after year there has been no confirmation based on ringing records from India of the same individual coming to the same traditional wintering ground. Hence, in order to evaluate site fidelity for this individual it was mist netted. We performed biometry with Vernier calipers with least count of 0.1 mm, metal scale with stopper with a least count of 1 mm and pesola scale with a least count of 1 g. Temperature was measured with a digital laser thermometer. A white plastic ring bearing the number R-G was placed on the right tarsus of the Blyth's Reed Warbler. The female could be identified by examining cloacal protuberance because there is no other distinct sexual dimorphism in this species (Ali and Ripley 1968).

**Table: Biometric parameters taken during ringing and re-trapping at Ela Habitat, Pingori, Purandar taluka, Pune district, Maharashtra and other relevant information about the Blyth's Reed Warbler *Acrocephalus dumetorum* is given below:**

Species	Blyth's Reed Warbler <i>Acrocephalus dumetorum</i>	Blyth's Reed Warbler <i>Acrocephalus dumetorum</i>	Blyth's Reed Warbler <i>Acrocephalus dumetorum</i>
Gender	Female, Adult	Female, Adult	Female, Adult
Biomass	11 g	10 g	9 g
Wing chord	58 mm	58 mm	60 mm
Tail	50 mm	52 mm	53 mm
Beak	13.2 mm	13.2 mm	13.8 mm
Tarsus	24.4 mm	28.1 mm	28.1 mm
Middle toe	11 mm	24.4 mm	24.4 mm
Middle talon	6.9 mm	6.9 mm	6.9 mm
Body temperature	33.6°C	34.2°C	34.4°C
Plumage	Fresh, no molting	Frayed feathers	Fresh, no molt
Date of ringing	14 <sup>th</sup> February 2018, 0610 PM		
Date of re-sighting/re-trapping	October 2018	7 <sup>th</sup> March 2018, 1215 PM	18 <sup>th</sup> March, 2020, 0200PM

### Results:

The ringed Blyth's Reed Warbler was re-tapped on 7<sup>th</sup> March 2018 at 12.15pm seen in the same locality in Ela Habitat till April 2018. After ringing it was seen in bushes and near roadside in Ela Habitat. It undertook return migration after April and was not seen again. It was seen again after 6 months on October 2018. Careful observation and examination of photographs (taken by author SP) confirmed that it was the same ringed individual with a green plastic ring on the right tarsus. It was subsequently mist netted and re-trapped after two year in same place and in same mist net on 18<sup>th</sup> March 2020 at 02.00pm the same ring in right tarsus. The Blyth's Reed Warbler had returned to the same locality for three consecutive years.

### Conclusion:

The present report is thus the first confirmed evidence of site fidelity of the same ringed individual female Blyth's Reed Warbler *Acrocephalus dumetorum* returning to the same locality where it was ringed. It returned to the same locality after five months in subsequent winter after migrating to its breeding site and was re-sighted in March 2020. The finding of site fidelity importantly highlights the need of protecting

and conserving all wintering sites of migratory birds.

### References:

- **Ali, S. & S.D. Ripley (1969).** *Handbook of The Birds of India and Pakistan Together With Those of Bangladesh, Nepal, Bhutan and Sri Lanka—Volume 3.* Oxford University Press, New Delhi.
- **Pande, S., S. Tambe, C.F. Francis & N. Sant (2003).** *Birds of Western Ghats, Kokan and Malabar (Including birds of Goa)* Oxford University Press and Bombay Natural History Society, India



## Recent sighting of a *Common Sandpiper* with a mass on the occiput at Bhigwan - Kumbhargaoon , Maharashtra, India

Vikas Khare

(Email: vikas.khare@kanjcs.com)

**Citation:** Khare Vikas. (2024). Recent sighting of a Common Sandpiper with a mass on the occiput at Bhigwan - Kumbhargaoon, Maharashtra, India. *Ela Journal of Forestry and Wildlife*. 13(1): 1559

**Date of Publication:** 31 March 2024

ISSN 2319-4361



- **Name of species-** Common Sandpiper
- **Scientific Name-** *Actitis hypoleucos*
- **Status-** Least Concern. (IUCN Red List,).
- **Date of sighting-** 6<sup>th</sup> January 2022.
- **Time of sighting-** 12.25 p.m.
- **Weather parameters-** Sunny.
- **Number of times sighted-** Twice.
- **Number of birds-** Single.
- **Gender of bird-** Unidentified
- **Locality-** Kumbhargaoon village situated on the backwaters of Ujjani Dam, about 10 km from Bhigwan and 110 Km from Pune in Taluka Indapur, district Pune of Maharashtra.
- **Habitat description-** On Cow dung mound.
- **Distance from human habitation-** Within human habitat
- **Any other bird/animal associates-** Two Common Sandpipers and four Little Ringed Plovers *Charadrius dubius*.
- **Bird behaviour-** Saw single bird feeding on insects and worms in cow dung. Frequently, flying if it sensed human and dog movement. Though it had mass on the head little below the crown, it was as active as other two sand pipers.
- **Threats to the habitat-** Advancing human habitation.
- **Photographs-** Attached.
- **Previous records-** Common Sand Piper is common in India but Common Sand Piper with mass is a rare sighting

## Ela Journal of Forestry and Wildlife: Editorial Board

### Editor in Chief

- Prof. Dr. Satish Pande, MD, DNB, PhD, FLS, FMASci., Director, Ela Foundation, India

### Associate Editors

- Nitin Kakodkar, IFS, PCCF, CWLW
- Pramod Deshpande

### Assistant Editor

- Dr. Nivedita Pande, MDS

### Editorial Board

- Dr. Arvind Kumar Jha, IFS, PhD, PCCF & DG (Ret.)
- Dr. Suruchi Pande, PhD (Phil.); PhD (Ornithology)
- Prof. Hemant Ghatge, PhD

### Subject Editors

- Prof. Reuven Yosef, PhD
- Prof. Gombobataar S., PhD (Univ. of Mongolia)
- Sunil Limaye, IFS, CCF (WL), Pune, Maharashtra and as listed on the previous pages. Technical Assistance & Web Publishing:
- Raghvendra Manavi, DIE, BCA, Ela Foundation

### Designing:

- Kiran Velhankar, Rahul Phuge and Pandurang Khutwad MediaNext Infoprocessors, Pvt. Ltd.



## Copyright

The Ela Journal is officially published by Ela Foundation and Forest Department Maharashtra in public interest keeping with the objective of Nature Conservation through Education and Research. All articles published in Ela J are registered under Creative Commons Attribution 3.0 Unported License unless otherwise mentioned. Ela J allows unrestricted use of articles in any medium for non-profit purposes, reproduction and distribution by providing adequate credit to the authors and the source of publication. For enquiries: Ela Foundation, C-9, Bhosale Park, Sahakarnagar-2, Pune 411009, India.

**E Mail:** [info@elafoundation.org](mailto:info@elafoundation.org)

**Disclaimer:** Views expressed in the Journal may not be those of the editorial committee.

ISSN 2319 - 2461   
Journal for Private Circulation only

### Become a Member of Ela Foundation

**Benefits:** Ela Files, Quarterly Journal, Tree Plantation, Workshops, Discounts on our books and more.

For membership of Ela Foundation:

Visit us on : [www.elafoundation.org](http://www.elafoundation.org)

## Table of Contents

- Sutrave Amruta S., Shagalolu Vidhya V., Dama Laxmikant B. and Mushan Laxmi C. (2024). Fish Diversity of Bhima River at Machnur, Solapur (M.S.) India. .... 1536-1540
- Khan Tanveer A. (2024). *Crotalaria clarkei* Gamble (Fabaceae), a new record for the Satpuda range of Jalgaon district, Maharashtra. .... 1541-1544
- Saraf Kavya K and Patil Somanath Reddy C. (2024). Review On Butterfly Diversity Of Karnataka State, India. .... 1545-1556
- Pande Satish, Lonkar Rahul, Khare Vikas and Pawar Rajkumar. (2024). First record of site fidelity of Blyth's Reed Warbler *Acrocephalus dumetorum* in Ela Habitat, Pingori, Pune, Maharashtra, India. .... 1557-1558
- Khare Vikas. (2024). Recent sighting of a Common Sandpiper with a mass on the occiput at Bhigwan - Kumbhargaoon, Maharashtra, India. .... 1559



Cover and Back cover : Dr. Omkar Sumant  
Montague's Harrier and Indian Grey Wolf

**You can contribute to conservation : Please send your reports and research papers to the Editor EJFW ([ejfwmanuscript@gmail.com](mailto:ejfwmanuscript@gmail.com))**

**Ela Foundation**

**Nature Conservation through Education, Research and 'One Health'**