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A preliminary survey of Dung beetles in Jnana Bharathi Campus of Bangalore University

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Dung beetles play an important role in the nutrient cycle and the soil structure by feeding on dung and returning the nutrients in dung to the soil. These usually coprophagous and rarely necrophagous beetles belong to the family Scarabaeidae and Sub- family Scarabaeinae of order Coleoptera and are categorized into tunnelers (paracoprids), dwellers (endocoprids), or rollers (telecoprids) (Figure 1) (Halffter and Matthews 1966; Hanski and Cambefort 1991). Tunnelers consume the dung pat and burrow into the soil beneath the pat; dwellers consume the manure pat and deposit eggs in the manure, or in the soil near the surface; Rollers tend to break the pat into brood balls that are rolled to a suitable site and buried. Dung beetles are considered as economically important insects as they are widely used in pasture ecosystem to improve the soil quality (Bertone *et al.*, 2006) and are also considered to be active biological control agents of gastrointestinal parasites of grazing livestock (Thomas, 2001).

A pilot survey was undertaken to assess the species richness of dung beetles in the forest ecosystem of Jnana Bharathi campus of Bangalore University (JBBU) and to update the existing scientific data on dung beetles of Bangalore region (Veena Kumari 1984, Vennila and Rajagopal 1999, Seena and Priyadarsanan 2010).

Surveys were carried out during September to November 2012 during the early hours of the day. A randomized walk through the study area was undertaken and on spotting a fresh dung pat, it was inspected for existence of any type of beetles. Adult beetles on the ground, in and around dung/ animal excrement were handpicked and transferred into vials containing 70% alcohol. Collected individuals were transferred to Insect taxonomy lab, ATREE for taxonomic evaluation and the specimens are pinned for future references.

Total of twenty four specimens belonging to Scarabaeidae, three of Histeridae and one belonging to Carabidae were collected during this pilot survey (Table 1). Nine species of dung beetles belonging to sub-family Scarabaeinae, viz., *Gymnopleurus gemmatus, Tibiodrepanus setosus, Catharsius pithecius, Onitisphilemon, Onthophagusuni fasciatus, O. pygmaeus*, *Tiniocellus spinipes, Caccobius torticornis* and *Gymnopleurus miliaris*, out of which two were dwellers, two were rollers and rest were tunnelers. Additionally other beetles associated with animal excrement collected belong to family Histeridae (3 unidentified species) and family Scaritinae (1 *Clivina* sp.) were recorded.

The present work is a head start to record the diversity of dung beetles in the Jnana Bharathi campus carried as a rapid diversity survey, serving as an impetus for further detailed studies.

References

Bertone, M., W. Stringham., M. Green., J. Washburn, S. Poore, M. & Hucks, M. (2006). Dung Beetles of Central and Eastern North Carolina Cattle Pastures. NC State University. http://www.cals.ncsu.edu/entomology/guidetoncdungbeetles.pdf accessed on 17/11/2013.

Halffter, G. and E.G. Matthews (1966). The natural history of dung beetles of the sub family Scarabaeinae (Coleoptera: Scarabaeidae). *Folia Entomologica Mexicana* 12-14: 312.

Hanski, I. and Y. Cambefort (1991). *Dung Beetle Ecology*. Princeton, Princeton University Press, 481p.

Seena, N. K. and D.R. Priyadarsanan (2010). Dung beetles of Karnataka (Coleoptera: Scarabaeidae: Scarabaeinae), Occasional Paper, Zoological Survey of India (In Press).

Thomas, M.L. (2001). Dung beetle benefits in the pasture ecosystem. www.attra.org/attra-pub/PDF/dungbeetle.pdf accessed on 17/11/2013.

Vennila, S. and D. Rajagopal (1999). Optimum sampling effort for study of tropical ground beetles (Carabidae: Coleoptera) using pitfall traps. *Current Science,* 77: 281-283.

Veena Kumari, K. (1984). Studies on dung beetle communities with special reference to the biology and ethology of some coprise dung beetles (Coleoptera: Scarabaeidae). Ph.D. thesis, UAS, Bangalore, India pp. 235.

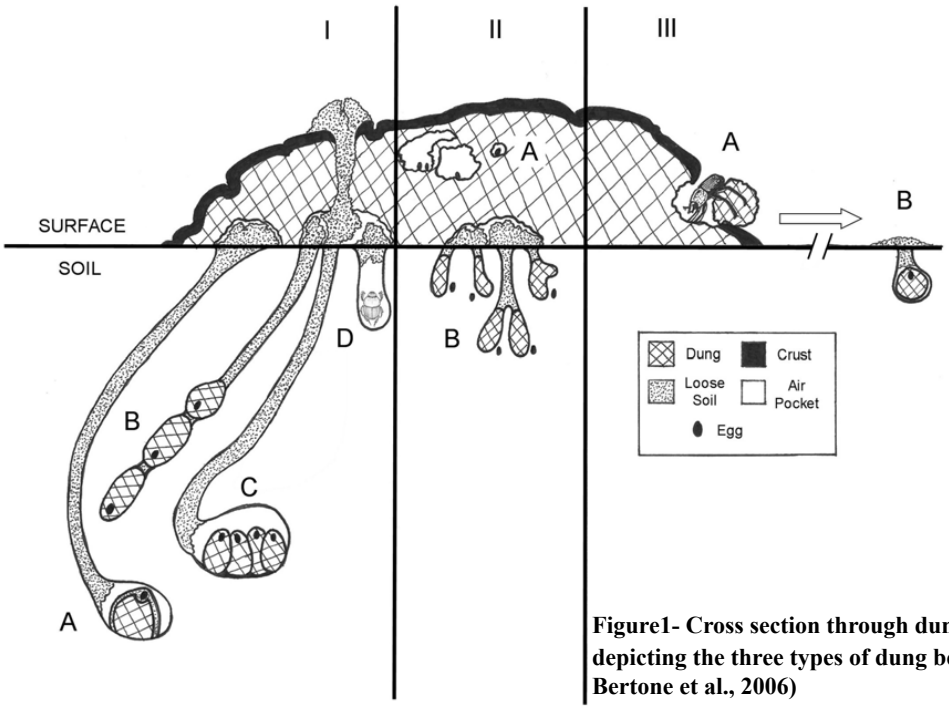

Figure1- Cross section through dung pat depicting the three types of dung beetles (From Bertone et al., 2006)

Cross section through dung pat depicting three nesting types:

Tunnelers I-A. *Phanaeus vindex* tunnel with single, soil-coated brood ball in single chamber; B. *Onthophagus* species tunnel with multiple brood masses; C. *Copris minutus* multiple brood balls; D. beetle excavating new tunnel (note subsurface soil is pushed through the dung pat crust)

Dwellers II-A. *Aphodius pseudolividus* eggs are laid singly or in groups inside dung pat; B. Aphodius erraticus bury dung under pat with eggs laid beside brood masses.

Rollers III-A. *Canthon pilularius* adult carving out dung into a ball; B. ball rolled a distance

Table 1. List of beetles collected from the survey area

Sl. No.	Type of Dung	Species	No. of individuals	Guild
Coleoptera: Scarabaeidae				
1	Human faeces	*Gymnopleurus gemmatus*		Roller
2	Human faeces	*Tibiodrepanus setosus*	1	Dweller
3	Cattle dung	*Catharsius pithecius*	1	Tunneler
4	Cattle dung	*Onitis philemon*	1	Tunneler
5	Cattle dung	*Onitis philemon*	1	Tunneler
6	Dog faeces & Goat droppings	*Onthophagus unifasciatus*	1	Tunneler
7	Dog faeces & Goat droppings	*Onthophagus pygmaeus*	2	Tunneler
8	Cattle dung	*Tiniocellus spinipes*	2	Dweller
9	Cattle dung	*Caccobius torticornis*	2	Tunneler
10	Cattle dung	*Gymnopleurus miliaris*	7	Roller
11	Cattle dung	*Onthophagus pygmaeus*	2	Tunneler
Coleoptera:Histeridae				
12	Cattle dung	Unidentified.1	2	
13	Cattle dung	Unidentified.2	3	
14	Cattle dung	Unidentified.3	2	
Coleoptera:Scaritinae				
15	Cattle dung	*Clivina* sp.	4	

New Record of *Catapiestus subrufescenus* Pic, 1911 (Coleoptera: Tenebrionidae: Cnodalonini) from India

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The genus *Catapiestus* Perty, 1831 belongs to the tribe Cnodalonini (Tenebrionidae: Stenochinae), having 12 species in the Oriental and Palearctic regions. The species of the genus *Catapiestus* are mainly distributed in the subtropical forests in Southeast Asia. In India, *Catapiestus bourgoini* Pic, 1912 and *Catapiestus piceiventris* Fairmaire, 1893 have been reported from Malabar-Mahe and Andaman Islands respectively and *Catapiestus indicus* Fairmaire, 1896 from Kanara and Sikkim. The collection of two examples of *Catapiestus subrufescenus* Pic, 1911 during our recent survey (from 26.02.2013 to 02.03.2013) in Dudhwa National Park, (DNP) constitutes not only the first record to Uttar Pradesh but also new addition to the fauna of India.

Systematic Position

Order: **Coleoptera**
Family: **Tenebrionidae**
Subfamily: Stenochinae
Tribe: Cnodalonini
Catapiestus subrufescenus Pic, 1911

Diagnostic characters

Body elongate, parallel-sided, strongly depressed and with dense punctures. Head broad, space between eyes broad, neck slender and nearly cylindrical. Distal six segments of the antenna dialated. The lateral margins of pronotum with serrations, and the middle and lateral with depressions. Elytra with distinct punctures and striae. Legs slender and pro femur with one small tooth like structure. Lateral margins of the pronotum curved with small radius, with more acute serrations than upper, front corner acute, hinder corner rounded (Lang and Ren, 2009).

Material examined

Uttar Pradesh: Gauriphanta, Dudhwa National Park, Lakhimpur - Kheri district, 2 ex. (under litter), 26.ii.2013, collector: V.D. Hegde and party. Deposited in Zoological Survey of India, Kolkata and Reg. No. 19755/H4A.

Distribution

INDIA: Uttar Pradesh (Gauriphanta: Dudhwa National Park). Elsewhere: China: Taiwan (Lang and Ren, 2009).

Discussion

The report of *Catapiestus subrufescenus* Pic, 1911 constitutes the first record from Uttar Pradesh as well as the new record from India. All the species of genus *Catapiestus* have been reported from subtropical forests in Southeast Asia. The present record of the species *C. subrufescenus* from Dudhwa National Park, Uttar Pradesh, India extends its distribution to Terai Ecosystem of Uttar Pradesh as well as Indian Subcontinent.

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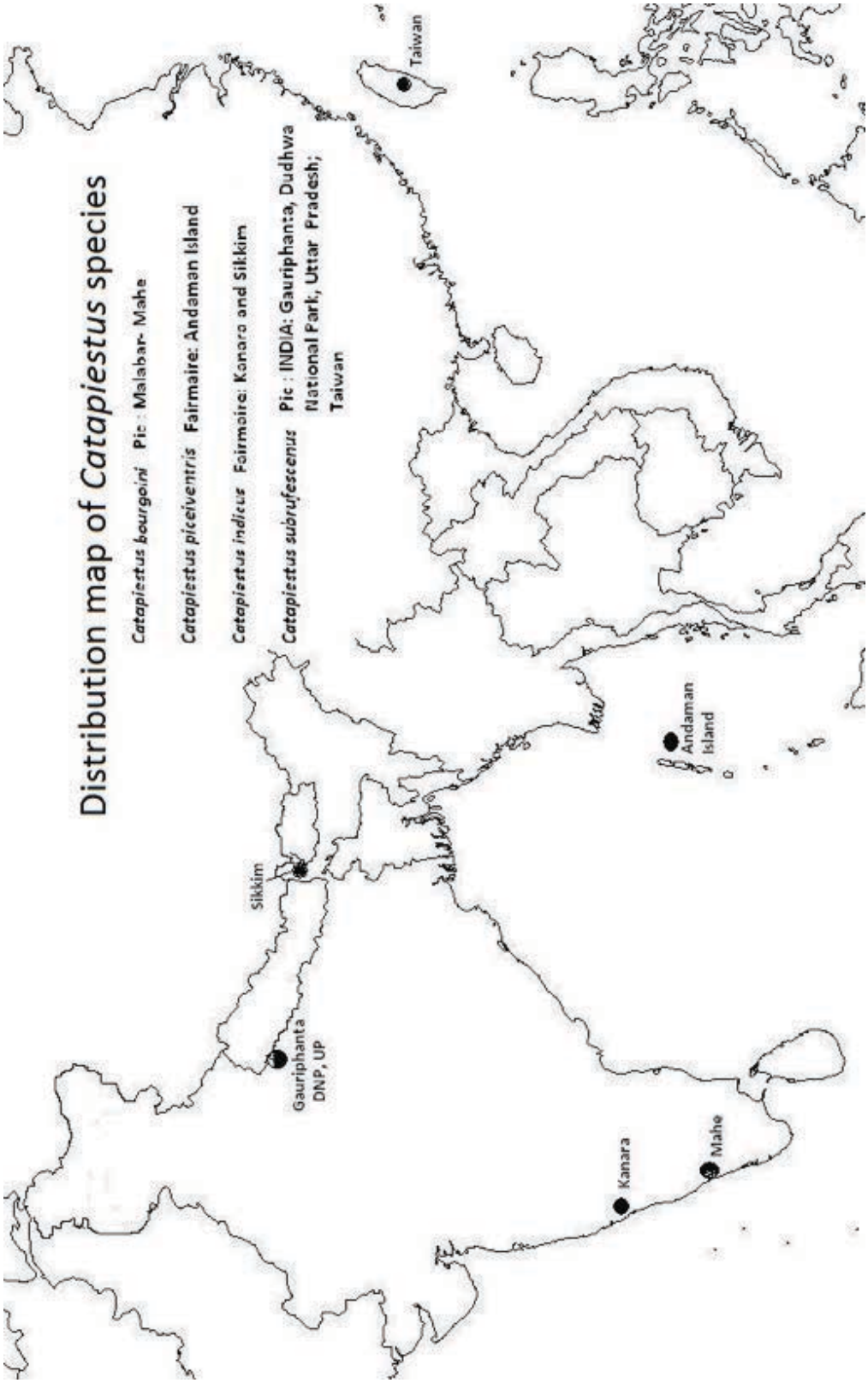
References

Lang, J. T. and G.D. Ren (2009). A review of the genus *Catapiestus* Perty, 1831 (Coleoptera: Tenebrionidae: Cnodalonini) with descriptions of two new species from China, *Caucasian Entomological Bull*.**5** (2) : 195-199.

Pic, M. (1911). *Coleopteres exotiques* nouveaux ou peu connus (Suite). LÉchange // *Revue Linneenne* **27**: 132-134, 138.

***Catapiestus subrufescenus* Pic, 1911**


Distribution map of *Catapiestus* species
Catapiestus bourgoini Pic : Malabar- Mahe
Catapiestus piceiventris Fairmaire: Andaman Island
Catapiestus indicus Fairmaire: Kanara and Sikkim
Catapiestus subrufescenus Pic : INDIA: Gauriphanta, Dudhva National Park, Uttar Pradesh; Taiwan
Taiwan
Andaman Island
Sikkim
Gauriphanta DNP, UP
Kanara
Mahe

Odonata (Insecta) fauna of Varadoor, Kannur, Kerala, Southern India

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Odonata are economically very significant as they are predators of mosquitoes and other insects including agricultural pests and vectors of diseases that cause serious agricultural loss and health problems to man. About 5937 species / subspecies of odonates belonging to 654 genera in 33 families are documented worldwide (Schorr *et. al.,* 2013). Kerala has a rich and diverse odonate fauna with a known diversity of 154 species as per literature (Fraser 1933, 1934, 1936; Rao and Lahiri 1982; Radhakrishnan 1997; Prasad and Varshney 1995; Emiliyamma and Radhakrishnan 2000, 2002; Jafer and Radhakrishnan 2002; Mitra 2002; Jafer and Soniya 2004; Emiliyamma *et. al.*, 2005, 2007, 2012; Emiliyamma, 2005; Raju 2007; Kiran and Raju 2013).

Studies on odonata of Kerala are available only from certain specific habitats. Rao and Lahiri (1987) reported 23 species from the Silent Valley and New Amarambalam reserve forests. Emiliyamma and Radhakrishnan (2000, 2002) reported 25 species from Parambikulam Wildlife Sanctuary and 43 species from Thiruvananthapuram district. Jafer and Radhakrishnan (2005) reported 42 species from Madayipara, Kannur. Emiliyamma (2005) reported 31 species from Kottayam district. Further Jafer and Soniya reported 21 species from Chempallikkundu, a backwater swamp in Kannur, North Kerala. David Raju (2007) reports 45 species from the wetlands of Kuttanad, South Kerala. The present study reports 44 species from Varadoor of Kannur district, North Kerala.

Study area

Varadoor is a small village about 24 km east from Kannur city, near Sir Syed College Taliparamba, belonging to Kurumathur gramapanchayath of Kannur district (latitude $12^0.2^!$ N and longitude $75^0.24^!$ E). The village has an area of 50 acres and has agricultural fields, rubber plantations, scrub jungles, home gardens, marshy areas, ponds etc.

Methodology

Studies were conducted during 2011 – 2012 in all three seasons *viz*., summer (March to May), monsoons (June to October) and winter (November to February) for a period of one year. Mostly direct searching method was used in the study and photographs were taken using digital camera for identification. Most of the odonates were collected using insect net and released after identification. Only photographs were obtained in the case of some odonates which resisted capture. Collected odonates were identified with the help of Fraser (1933, 1934, 1936), Bedjanic *et.al.*, (2007), Emiliyamma *et. al.,* (2005, 2007), Subramanian (2009) and Kiran and Raju (2013). Nomenclature and classification followed is after Schorr *et. al.*, (2013). Common name followed is after Kiran and Raju (2013). Odonates were categorized into four groups depending upon their occurrence during the study period. Accordingly species observed 75-100% of survey days were categorized as very common (VC), 50-75% as common (CO), 25-50% as occasional (OC) and below 25% as rare (RA).

Result and discussion

The study reveals the presence of 44 species of odonates belonging to 31 genera and 7 families. A detailed systematic list is given in Table 1. Maximum number of species is from Family Libellulidae (26) followed by Coenagrionidae (8), Aeshnidae (3), Caloptrygidae (3), Gomphidae (2) and least is represented by family Lestidae (1) and Platycnemididae (1).

Merogomphus longistigma (Fraser) is a rare species found in Western Ghats and the females are not common. It has been recorded from Chinnar, Vythiri Ghat (Wyanad), Travancore and Malabar (Emiliyamma *et al.,* 2007). The present record is the first record from Kannur. *Pseudagrion malabaricum* (Fraser) and *Gynacantha bayadera* (Selys) is recorded for the first time from Kannur. *Gynacantha bayadera* Selys in this study is the second record from Kerala. *Ceriagrion olivaceum* Laidlaw, *Anax guttatus* (Burmeister), *Brachydiplax chalybea* Brauer, and *Hydrobasileus croceus* (Brauer) has not been recorded from Kannur as per Emiliyamma *et al.,* (2007). So they are new records from Kannur. According to Sathe and Bhusnar (2010) the species of the genera *Anax, Orthetrum, Potamarcha, Pantala, Davidioides, Bradinopyga,* and *Crocothemis* are very good predators of mosquitoes, *Culex, Anopheles and Aedes*. The presence of these genera at Varadoor plays a good role in biological control.

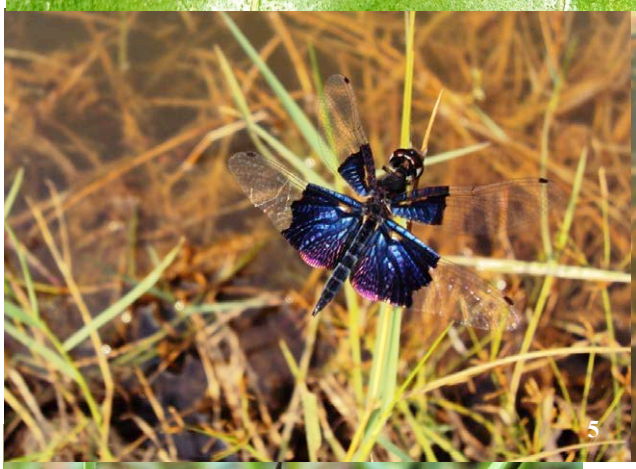

Photo 1. ***Merogomphus longistigma***
Photo 2. Brachydiplax sobrina
Photo 3. ***Orthetrum pruinosum***
Photo 4. ***Trithemis aurora***
Photo 5. ***Rhyothemis triangularis***
Photo 6. ***Ictinogomphus rapax***
Photo 7. ***Acisoma panorpoides***

Table 1. Systematic list - Order: Odonata
Very Common (VC), Common (CO), Occasional (OC), Rare (RA).

Scientific name	Common Name	Occurrence
Suborder: Zygoptera		
Family: Coenagrionidae		
1. *Ceriagrion cerinorubellum* (Brauer, 1865)	Orange Tailed Marsh Dart	VC
2. *Ceriagrion coromandelianum* (Fabricius, 1798)	Coromandel Marsh Dart	VC
3. *Ceriagrion olivaceum* Laidlaw, 1914	Rusty Marsh Dart	CO
4. *Ceriagrion rubiae* Laidlaw, 1916	Orange Marsh Dart	CO
5. *Pseudagrion malabaricum* Fraser, 1924	Jungle Grass Dart	VC
6. *Ischnura aurora* (Brauer, 1865)	Golden Dartlet	CO
7. *Agriocnemis pygmaea* (Rambur, 1842)	Pigmy Dartlet	VC
8. *Agriocnemis splendidissima* Laidlaw, 1919	Splendid Dartlet	CO
Family: Platycnemididae		
9. *Copera marginipes* Rambur, 1842	Yellow Bush Dart	OC
Family: Lestidae		
10. *Lestes praemorsus* (Selys, 1862)	Sapphire Eyed Spreadwing	RA
Family: Calopterygidae		
11. *Neurobasis chinensis* (Linnaeus,1758)	Stream Glory	RA
12. *Vestalis apicalis* Selys, 1873	Black Tipped Forest Glory	CO
13. *Vestalis gracilis* (Rambur, 1842)	Clear Winged Forest Glory	RA
Sub order: Anisoptera		
Family: Gomphidae		
14. *Merogomphus longistigma* (Fraser, 1922)	Long Legged Clubtail	VR
15. *Ictinogomphus rapax* (Rambur, 1842)	Common Clubtail	CO
Family: Aeshnidae		
16. *Anax guttatus* (Burmeister, 1839)	Blue Tailed Green Darner	OC
17. *Gynacantha dravida* Leiftinck, 1960	Brown Darner	OC
18. *Gynacantha bayadera* Selys, 1854	Parakeet Darner	VR
Family: Libellulidae		
19. *Brachydiplax chalybea* Brauer, 1868	Rufous Backed Marsh Hawk	OC
20. *Brachydiplax sobrina* (Rambur, 1842)	Little Blue Marsh Hawk	CO
21. *Cratilla lineata* Foerster, 1903	Emerald Banded Skimmer	CO
22. *Lathrecista asiatica* (Fabricius, 1798)	Asiatic Blood Tail	VC
23. *Orthetrum chrysis* (Selys, 1891)	Brown Backed Red Marsh Hawk	VC
24. *Orthetrum glaucum* (Brauer, 1865)	Blue Marsh Hawk	OC
25. *Orthetrum pruinosum* (Rambur, 1842)	Crimson Tailed Marsh Hawk	VC
26. *Orthetrum sabina* (Drury, 1770)	Green Marsh Hawk	VC
27. *Potamarcha congener* (Rambur, 1842)	Yellow Tailed Ashy Skimmer	OC
28. *Acisoma panorpoides* (Rambur, 1842)	Trumpet Tail	CO
29. *Brachythemis contaminata* (Fabricius, 1793)	Ditch Jewel	OC
30. *Bradinopyga geminata* (Rambur, 1842)	Granite Ghost	OC
31. *Crocothemis servilia* (Drury, 1770)	Ruddy Marsh Skimmer	CO
32. *Diplacodes trivialis* (Rambur, 1842)	Ground Skimmer	VC
33. *Neurothemis fulvia* (Drury, 1773)	Fulvous Forest Skimmer	VC
34. *Neurothemis tullia* (Drury, 1773)	Pied Paddy Skimmer	VC
35. *Rhodothemis rufa* (Rambur, 1842)	Rufous Marsh Glider	CO
36. *Trithemis aurora* (Burmeister, 1839)	Crimson Marsh Glider	VC
37. *Trithemis pallidinervis* (Kirby, 1889)	Long Legged Marsh Glider	CO
38. *Rhyothemis variegata* (Linnaeus, 1763)	Common Picturewing	VC
39. *Rhyothemis triangularis* Kirby, 1889	Lesser Blue Wing	CO
40. *Hydrobasileus croceus* (Brauer, 1867)	Amberwinged Marsh Glider	RA
41. *Pantala flavescens* (Fabricius, 1798)	Wandering Glider	VC
42. *Tramea limbata* (Rambur, 1842)	Black Marsh Trotter	CO
43. *Tholymis tillarga* (Fabricius, 1798)	Coral Tailed Cloud Wing	OC
44. *Urothemis signata* (Rambur, 1842)	Greater Crimson Glider	CO

Photo 8. ***Vestalis apicalis***
Photo 9. ***Ischnura aurora***
Photo 10. ***Pseudagrion malabaricum***
Photo 11. ***Copera marginipes***
Photo 12. ***Ceriagrion cerinorubellum***
Photo 13. ***Lestes praemorsus***

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References

Bedjanič, M., K. Conniff., G. de Silva Wijeyeratne (2007). *Gehan's Photo Guide. A photographic Guide to the Dragonflies of Sri Lank*a. Jetwing Eco Holidays: Colombo. 248 pp.

Emiliyamma, K.G. & C. Radhakrishnan (2000). Odonata (Insecta) of Parambikulam Wildlife Sanctuary, Kerala, India. *Records of Zoological Survey of India*, Kolkatta. 98(1): 157 -167.

Emiliyamma, K.G. & C. Radhakrishnan (2002). Additions to the Odonata (Insecta) of Thiruvananthapuram district, Kerala. *Zoos' Print Journa*l, 17 (10): 914 – 917.

Emiliyamma, K.G. (2005). On the Odonata (Insecta) fauna of Kottayam district, Kerala, India. *Zoos' Print Journa*l, 20 (12): 2108-2110.

Emiliyamma, K.G., C. Radhakrishnan and M.J. Palot (2005). *Pictorial Handbook on Common Dragonflies and Damselflies of Kerala*. Zoological Survey of India. 67pp.

Emiliyamma, K.G., C. Radhakrishnan & M.J. Palot (2007). Odonata (Insecta) of Kerala. *Records of Zoological Survey of India, Kolkatta.* Occ. Paper No., 269: 195 pp + 8 plates.

Emiliyamma, K.G., M.J. Palot & C. Radhakrishnan (2012). Microgomphus souteri Fraser, a new addition to the Odonata (Insecta) fauna of Kerala, Southern India. *Journal of Threatened Taxa* 4(6): 2667 – 2669.

Fraser, F.C. (1933). *Fauna of British India including Ceylon and Burma: Odonata: Vol. 1.* Taylor & Francis, London. 436 pp.

Fraser, F.C. (1934). *Fauna of British India including Ceylon and Burma: Odonata: Vol. 2*. Taylor & Francis, London. 442 pp.

Fraser, F.C. (1936). *Fauna of British India including Ceylon and Burma: Odonata: Vol. 3*. Taylor & Francis, London. 488 pp.

Kiran, C.G & D.V. Raju (2013). *Dragonflies and Damselflies of Kerala. A bilingual photographic field guide*. Tropical Institute of Ecological Sciences, Kottayam, Kerala. 156pp.

Mitra, T.R. (2006). Handbook on – Common Indian Dragonflies (Insecta: Odonata). Zoological Survey of India, Kolkata. 124 pp.

Palot, M.J., & C. Radhakrishnan (2005). Faunal diversity of a laterite hill system at Madayipara, Kannur District, Kerala, India. *Records of Zoological Survey of India, Kolkatta.* Occ. Paper No., 242: 98 pp + 7 plates.

Palot, M.J. & V.P. Soniya (2004). Studies on the Odonata (Insecta) from a backwater swamp on Northern Kerala. J*ournal of the Bombay Natural History Society,* 101 (1): 177 – 179.

Prasad, M & R.K. Varshney, (1995). A checklist of the Odonata of India including data on larval studies. *Oriental Insects*, 29 : 385 – 428.

Radhakrishnan, C. (1997). Ecology and conservation status of Entomofauna of Malabar. *Zoos' Print Journal*,11: 2-5.

Raju, D.V. (2007). Odonates of the Kuttanad wetland ecosystem. *Malabar Trogon* 5(1): 12-13.

Rao, K.R, & A.R.Lahiri (1982). First records of Odonates (Arthropoda: Insecta) from the Silent Valley and New Amarambalam Reserve Forests. *Journal of the Bombay Natural History Society,* 79 (3): 557 – 562.

Sathe, T.V., & A.R. Bhusnar (2010). Biodiversity of Mosquitovorus dragonflies (Order: Odonata) from Kolhapur district including Western Ghats. *Biological Forum*, 2(2): 38 – 41.

Schorr. M., M. Lindeboom & D. Paulson (2013). World Odonata List. http://www.pugetsound.edu/x6140.xml. Accessed on 28/06/2013.

Subramanian, K.A. (2009). *India – A Lifescape. Dragonflies of India – A Field Guide*. Vigyan Prasar, New Delhi, India. 180 pp.

Record of long-horned grasshopper, *Trigonocorypha unicolor* Stoll, 1787 (Orthoptera: Tettigoniidae) from Maharashtra, India, with additional diagnostic characters

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Tettigoniids are large insects belong to the order Orthoptera of the class insecta known as Katydids or bush crickets. They are known to occur in a wide variety of habitats, ranging from the littoral zone of the sea shore to grasslands, forests and mountaintops, well above the tree line. Family Tettigoniidae includes 6000 species in 1070 genera (Srinivasan 2012). Of which, 159 species have been reported so far in India (Shishodia, *et al.,* 2010, Srinivasan 2012). However, this number is probably an underestimate since there is paucity of information on Indian tettigoniids in different parts and we know very little about distribution of these species.

Shishodia (2010) reported that the genus *Trigonocorypha* is still known. Ingrisch (2003) recorded *Trigonocorypha unicolor* Stoll, 1787 from Tamil Nadu.

Trigonocorypha unicolor was recorded and described by Barman (1993) based on one male and one female from Purulia district, Ajodhya Hills, West Bengal. And again he recorded this species in 1995 from East Khasi Hills dist, Cherrapunji, Meghalaya. The diagnostic characters cited by him, include fastigium conically produced with semicircular apex, pronotum concave at anterior margin almost straight; elytron highly undulating at anterior margin, posterior margin almost straight, anal vein very short; hind wing wholly transparent except a little brown area dorsally at apex; fore femur only with 2 or 3 spines and maximum in the hind pair, male sub-genital plate with deep concavity and style conically developed; ovipositor curved with a pair of horny projection at base.

Ingrisch (2000) has given additional diagnostic characters to *T. unicolor* deposited in Zoological Survey of India, Kolkata. He found the stridulatory file on the underside of the left tegmen larger in size and bears about 125 teeth.

Shishodia (2010) mentioned its distribution in Andaman and Nicobar Islands, Karnataka, Meghalaya, Orissa, Rajasthan, Tamil Nadu and West Bengal, Indonesia (Java) and Sri Lanka. Chandra (2012) compiled the list of Tettigoniidae from Maharashtra based on the deposited material in Zoological Survey of India, Pune and Kolkata, which contains 18 species belonging to 14 genera. However, there was no report of *T. unicolor* from Maharashtra.

The present report is the record of *T. unicolor*, an additions to the Tettigoniidae of Maharashtra with detailed diagnostic characters with due illustrations. Fig.1 (A- N).

Family: **Tettigoniidae**
Subfamily: Phaneropterinae
Genus: Trigonocorypha

***Trigonocorypha unicolor* Stoll, 1787**
Synonym: *T. crenulata* (Thunberg, 1815)
T. prasinus (Serville, 1831)
T. subproductum (Walker, 1869)

Material examined: 3 male, 2 female, 2009-10, Deposited material in Department of Zoology, Shivaji University, Kolhapur (Coll. Y. J. Koli); 1 male, 06.02.2013, Tamgaon, Kolhapur dist., Coll. S. M. Gaikwad (15^0 43' to $17^0$17' N & 73^0 40' to 74^0 42' E at 500 msl. (deposited in Z.S.I W.R.C., Pune, Registration No. Ent-5/1324, Female & Ent- 5/1325, Male).

Measurements (mm): Body ♂25, ♀26.5; pronotum ♂8, ♀10.5; tegmen ♂66, ♀51; tegmen width ♂15.5, ♀16; anterior femur ♂7.5, ♀7; posterior femur ♂28.2, ♀28; post tibia ♂29.5, ♀30.

Description: Fastigium vertices of about equal width with scapus, fastigium conically produced with semicircular (triangular), apex separated by a narrow furrow from fastigium frontis, and with a shallow groove in middle and two more longitudinal narrow furrows in fastigium (fastigium of vertex triangular, medially sulcated); pronotum concave at anterior margin, posterior margin almost straight; transverse sulcus U-shaped, crossing midline of pronotum in anterior half of pronotum, pronotum with crenulate margin; fore femur with 2 spines; anterior margin of tegmina undulating and posterior margin straight, anal vein short. Anterior tibiae perforated on both sides; hind wings a little longer than tegmina (forewing). Ovipositor short and curved upwards.

Male: Tegmen with stridulatory area roughly triangular large. Stridulatory file on underside of left tegmen concave and little curved towards apex with 133 teeth; teeth in basal and apex area closely arranged; epiproct tongue shaped; cerci slightly curved shorter than subgenital plate; subgenital plate in basal area moderately wide, middle narrowing and apically divided in to two narrow diverging projection with 1 compound lobe each; styli small, conical.

Female: cerci, narrow conical; subgenital plate roughly triangular with central area strongly raised; ovipositor curved with a pair of horny projections at base.

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References

Barman, R. S. (1993). Insecta: Orthoptera: Tettigoniidae. Fauna of West Bengal, *Zoological Survey of India* State Fauna Series, 3 (4): 355-367.

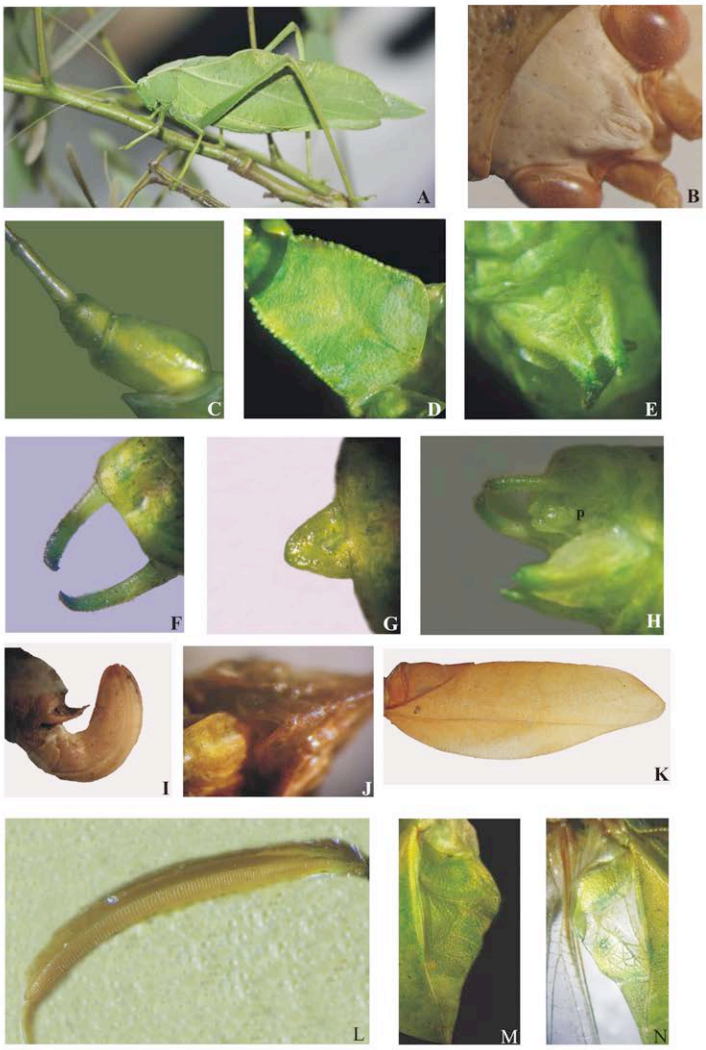
Chandra, K. & S. K. Gupta (2012). Insecta: Orthoptera. In: Director, Zoological Survey of India (Ed.), *Fauna of Maharashtra, state fauna series,* 20 (Part- 2): 429-436.

Ingrisch, S. & M.C. Muralirangan (2003). A new species of *Himertula* (Orthoptera, Tettigoniidae) and additional records of Tettiogoniidae from Tamil Nadu (India). *Bonner zoologische Beiträge.* 51(4): 305-312.

Ingrisch, S. & M. S. Shishodia (2000). New taxa and distribution records of Tettigoniidae from India. *Mitt. Műnch. Ent. Ges.* 90: 5-37.

Shishodia, M.S., Kailash, C. & S.K. Gupta (2010). An annotated checklist of Orthoptera (Insecta) from India. In: Director, Zoological Survey of India (Ed.), *Zoological Survey of India, Occ. Paper No.*314: 1-366.

Srinivasan, G. & D. Prabakar (2012). Additional records of Tettigoniidae from Arunachal Pradesh, *India. Journal of Threatened Taxa.* 4(14): 3255-3268.



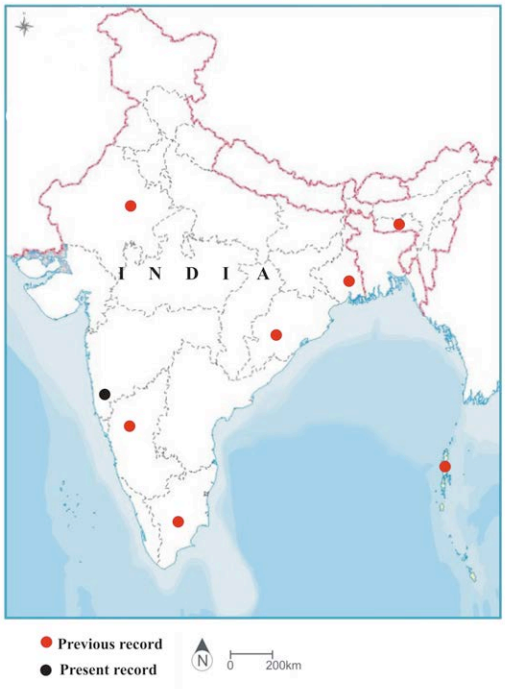


Fig 1: A- *Trigonocorypha unicolor* (Male), B- head in dorsal view, C- scapus, D- Pronotum (dorsal view), E- subgenital plate (male), F- cerci (dorsal view), G- epiproct, H- apex of abdomen (lateral view) (p= apex of phallus), I- Ovipositor, J-subgenital plate (female)), K- tegmina (male), L- stridulatory files on underside of left tegmen,M — Stridulatory area of left tegmen, N-right male tegmen

Note on the first sighting of Jerdon's Jumping Ant, *Harpegnathos saltator*, Jerdon 1815 (Hymenoptera, Formicidae, Ponerinae) in Karnala Bird Sanctuary, Raigad District, Maharashtra, India

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Abstract
Harpegnathos saltator, Jerdon 1815 (Hymenoptera, Formicidae, Ponerinae) an ant whose known distribution is considered to be restricted in India to Southern Indian states, was first sighted in Karnala Bird Sanctuary, Raigad District, Maharashtra, India. The ant is known to prefer undisturbed forest ecosystems of moist deciduous, scrubland, semi-evergreen and evergreen forests. The presence of this ant so far north from its published range signifies an extension of the range of its distribution.

Introduction
Harpegnathos saltator is a species of ant in the subfamily Ponerinae. It was first described in 1815 by Thomas C. Jerdon in Thalassery, Kerala, and was subsequently recorded along the Malabar Coast (Jerdon 1851). *H. saltator* exhibits a long head and large compound eyes, with finely serrated mandibles. The total body length is 3/4th of an inch (Jerdon 1851). In India, *H. saltator* was considered to be restricted to Southern India (Narendra & Kumar 2006), in the states of Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu. There exist no published records for its presence further up the northern Western Ghats in Maharashtra.

In the early morning hours on June 24, 2012, during the monsoon season, a single specimen of a worker ant (Image 1) was observed foraging on the forest floor in Karnala Bird Sanctuary in Raigad District in the state of Maharashtra. The coordinates for the sanctuary are 18°54'31" N and 73°6'9" E. The highest point of the Bird Sanctuary is over 1400 feet above sea level. The Bird Sanctuary is located in the Konkan region along the western side of the northern Western Ghats. It is 12.11 sq. km. in area, located 60 km from the main city of Mumbai and about 13 km from the nearest town of Panvel in Navi Mumbai. The ant was observed approximately halfway through the Karnala Fort trail, at an altitude of 700 feet above sea level. The habitat in which the ant was observed was moist deciduous forests dominated by trees such as Teak (*Tectona grandis*), Crocodile-bark tree (*Terminalia tomentosa*), Black Catechu (*Acacia catechu*), Decussate-leaved Lagerstroemia (*Lagerstroemia parviflora*), Ben Teak (*Largerstroemia microcarpa*), Black Rosewood (*Dalbergia latifolia*), Yellow Teak (*Hadina cordifolia*), Kalam (*Mitragyna parvifolia*), and Indian Cottonwood (*Bombax ceiba*). During the sighting, the forest floor was littered with fallen dry leaves, damp from the rain. The ant exhibited the typical behaviour of jumping in succession, and occasionally hid under fallen leaves on sensing disturbance.

Materials and Methods
The ant was sighted on a trek in Karnala Bird Sanctuary on June 24, 2012. The photographic record was obtained with a Sony DSC H7 digital camera. The ant was identified using key provided by Narendra and Kumar (2006). An area of approximately 50 sq. m with a gentle slope was surveyed to identify the tree species of the area. Map showing location of Karnala Bird Sanctuary (Image 2) highlights the western part of the Indian peninsula, with the arrow locating the Bird Sanctuary.

Discussion and Conclusion
H. saltator has been recorded in Southern India, with its overall range extending to Sri Lanka and Southeast Asia (Munoz-Torres *et al.* 2010). This species is known to prefer undisturbed forest ecosystems, more specifically moist deciduous, scrubland, semi-evergreen and evergreen forests (Ramachandra, Subash Chandran, Joshi, Narendra & Ali 2012). Worker ants of *H. saltator* are solitary foragers (Shivashankar et al. 1989), which might explain the sighting of only one individual. The current record of one worker ant may signify the presence of an active colony within the boundary of Karnala Bird Sanctuary. This Bird Sanctuary is visited by a number of trekkers and bird watchers in all the seasons; however it is rather undisturbed owing to the absence of residential and agricultural areas. Furthermore, the Forest Department has launched a programme to minimize pollution within the Bird Sanctuary by keeping a strict check on the number of disposable items, such as plastics, carried inside the Bird Sanctuary. We firmly believe that Karnala Bird Sanctuary is a place to harbouring unique species such as *H. saltator*, which may be regarded as an indicator of an undisturbed ecosystem. No specimen was collected at the time of the sighting as it is illegal to collect specimens in Protected Areas without prior permission from the respective authorities.

However, subsequent sightings and further search for the colony will help ascertain the status and occurrence of this species so far north from its previously known distribution.

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References

Jerdon (1851). A catalogue of the species of ants found in southern India. *Madras Journal of Literature and Science*, 17. 117pp Retrieved from: http://hol.osu.edu/literature-viewer.html?id=4764

Munoz-Torres., C. Monica., J.T. Reese., C.P. Childers., A.K. Bennet., J.P. Sundaram., K.L. Childs., J.M. Anzola., N. Milshina., C.G. Elisk (2010). Hymenoptera Genome Database: integrated community resources for insect species of the order Hymenoptera. Nucleic Acid Research. Volume 39. D658-D662pp. Retrieved from: http://nar.oxfordjournals.org/content/39/suppl_1/D658.full-text-lowres.pdf

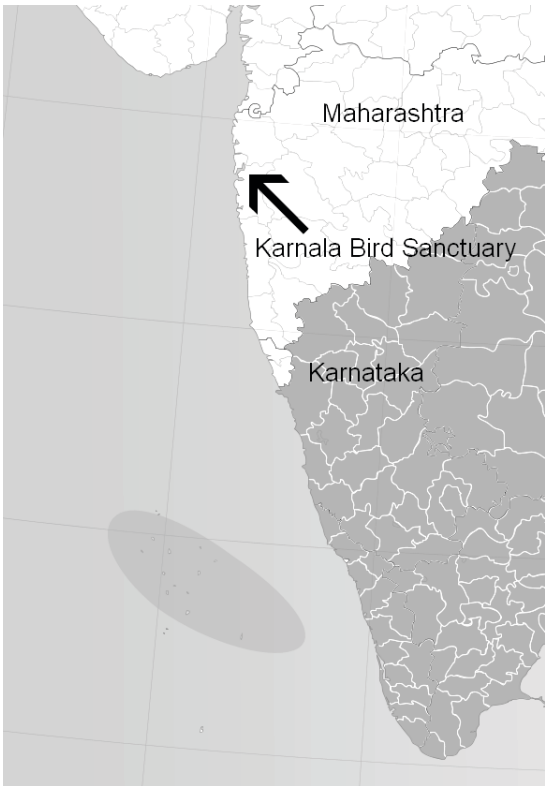
Narendra A, and M.S. Kumar 2006. *On a trail with ants: a handbook of the ants of peninsular India*. 81pp.

Ramachandra, T. V, M.D. Subash Chandran., N. V. Joshi., A. Narendra and T. M. Ali (2012). Ant Species Composition and Diversity in the Sharavathi River Basin, Central Western Ghats. Sahyadri Conservation Series 3. Environment Information System Technical Report 30. 51pp. Retrieved from: http://wgbis.ces.iisc.ernet.in/biodiversity/pubs/ETR/ETR20/ETR20.pdf

Shivashankar, T., H.C. Sharathchandra and G.K. Veeresh (1989). Foraging activity and temperature relations in the ponerine ant *Harpegnathos saltator* Jerdon (Formicidae). *Proceedings of Indian Academy of Sciences.* Volume 98 (5). 367-372pp. Retrieved from: http://link.springer.com/article/10.1007%2FBF03179963?Ll=true

Image 1: *Harpegnathos saltator* worker ant at Karnala Bird Sanctuary, Raigad District, Maharashtra

Image 2: Map showing location of Karnala Bird Sanctuary in the state of Maharashtra, the southern Indian states are highlighted in gray



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First record of phototaxis in the Miletinae, Lycaenidae

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Many species of moths are known to be attracted to artificial light, being perhaps the most conspicuous of insect visitors. However, not all moths and very few butterflies are thus attracted. No butterfly is a regular visitor to artificial light, but individuals have been recorded from time to time. In India, reports in literature are far and few between, and were reviewed by Chowdhury & Soren (2011).

The present note documents the observations in Chennai, India. Three species of butterflies, belonging to three families, were attracted to artificial light. Table 1 shows the list of the species, along with the type of artificial light source to which they were attracted. The observations were made from July 2008-2012. The Common Gull (Figure.1) was quite sedentary for the two hours that it rested on a letter box, about 1 meter away from the light source. On the other hand, the Apefly (Figure.2) was very restless and circled the tube light many times, settling sometimes on the tube light or at its base for no more than 10-20 seconds at a time. This continued for about an hour. The Common Evening Brown, which is known to be crepuscular, was observed on several occasions. This butterfly too would not rest very near the source of the light, but settle a little distance away on a wall or other convenient perches. There is no previous record of the Miletinae (Lycaenidae) attending light, so this may be the first recorded instance. At the time the Apefly visited the tube light, a few moths were also observed, such as *Somena scintillans* (Walker, 1856) and *Eurrhyparodes bracteolalis* (Zeller, 1852).

References

Chowdhury, S. & R. Soren (2011). Light attracted butterflies: a review from the Indian sub-region with an inventory from West Bengal, India. *Journal of Threatened Taxa,* 3(6): 1868-1871.

Table 1. List of butterfly species attracted to light

Species	No. of occurrences	Year	Artificial Light
Common Gull (*Cepora nerissa* Fabricus)	Once	14th April 2012 8:34:00 PM	Neon light – 200V
Apefly (*Spalgis epius* Westwood)	Once	12th December of 2012 9:02:24 PM	Neon light – 200V
Common Evening Brown (*Melanitis leda* Linn.)	On several occasions, both during the monsoon months and during summer.	Been observing since 2008 till date	Neon light – 200V

FIGURE 1: Common Gull (*Cepora nerissa* Fabricus) on, April 14, 2012, 20:34hrs

FIGURE 2: Apefly (*Spalgis epeus*) on, December 12, 2012, 21:02hrs

Diversity and seasonal occurrence of butterflies at Jiwaji University Campus, Gwalior, Madhya Pradesh

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Butterflies are abundant in urban green patches, though, increased construction works including roads, buildings and mowed lawns, correspond with decreases in butterfly species richness, diversity and abundance (Blair & Launer 1997, Stefanescu et al. 2004, Clark et al. 2007, Pocewicz et al. 2009). Urban forested areas in the form of parks and green belts could be good habitats for sustenance of these species (Rajagopal et al. 2010, Raut and Pendharkar 2010, Kunte 2001). Urbanization also is associated with habitat degradation including decreased plant species diversity, reduced water quality, and increased air and soil pollutions (Bastin 1999, Hall et al. 1999, McKinney 2002, Singh et al. 2009, Garg et al. 2009), which in turn may reduce species abundance of butterflies.

University campus provide natural vegetation as well as planted seasonal flowering plants. Devoid of any developmental activities and pollution, these areas may be a reserve for butterflies. A total of 66 species of butterflies belonging to 47 genera and five families were observed by Tiple (2012) at the Tropical Forest Research Institute (TFRI), Jabalpur. Fifty two species of butterflies belonging to five families were reported from Amravati University Campus, Maharashtra (Tiple et al. 2006, 2007). Various workers like Kunte (1997) studied seasonal patterns in butterfly abundance and species diversity in four tropical habitats in the northern Western Ghats. Padhye et al. (2006) studied season and landscape wise distribution of butterflies in Tamhini, northern Western Ghats of India.

Several workers have studied butterfly diversity in Madhya Pradesh and Chhattisgarh (Gupta & Shukla 1987, Chaudhury 1995, Chandra et al. 2000a, b; 2002; Siddiqui & Singh 2004, Chandra 2006). Chandra et al. (2007) reported 147 species of butterflies from Madhya Pradesh and Chhattisgarh and sited only six species from Gwalior District. In this paper, an attempt was made to study diversity and seasonal occurrence of butterflies at Jiwaji University Campus in Gwalior, Madhya Pradesh.

Materials and Methods

Study area: Gwalior (26.22°N & 78.18°E, 197 msl), situated in the Semi-arid Zone of Central India and dominated by scrubland vegetation is a district in Madhya Pradesh, India. Geologically, the area is intruded by quartz veins and the oldest rocks exposed are referred to as Bundelkhand Granite (Singh and Singh, 2011). The area has a sub-tropical climate with hot summers from late March to early July, the humid monsoon season from late June to early October and a cool dry winter from early November to late February. The highest recorded temperature was 53°C and the lowest was -1°C. Gwalior gets 970 mm of rain every year, most of which is concentrated in the monsoon months from late June to early October.

Jiwaji University (N 26° 12' 11.34'', E 078° 11' 42.34'') (Fig.1) is located in Gwalior District of Madhya Pradesh. The campus is located at the southeastern part of Gwalior city. It is 1.86 km from Gwalior Railway Station and 3.37 km from Gwalior Fort. The Campus is surrounded by Madhav Rao Scindhia Marg in west, University Road in the east, NH 75 in south and south-west and Sachin Tendulkar Marg in the north. The University campus is surrounded by numerous tree and shrub species. *Ficus racemosa*, *Syzigium cumini*, *Anogeissus pendula*, *Terminalia arjuna*, *Tridax procumbens*, *Celosia argenta*, *Tamarindus indica*, *Acacia nilotica*, *Cassia fistula*, *Azadirachta indica*, *Lantana camara*, *Alstonia scholaris* and *Lagerstroemia* sp. are the dominant plant species in the area which provide for diverse habitat, food and breeding ground for butterflies.

Methods: The study was carried out during August 2011 to July 2012. The whole study period was divided into 48 sampling days. Butterflies were observed from 8:00 hrs to 12:00 hrs once in a week. Pollard walk method (Pollard 1979, Pollard and Yates 1993) was adopted for observing butterflies, i.e., walking along the fixed paths while recording and collecting the species. The observation width was limited to about 5 m. The species were identified in the field using field guides by Kehimkar (2008) and Kunte (2000) and followed classification given by Gaonkar (1996). Collection of the butterflies was made using insect collecting net. The collected butterflies were narcotized with crystals of methanol and after air-drying of the specimen. The seasonality was determined using presence- absence scoring method and then percentage of occurrence was calculated to determine the status. The status was categorized into five groups as Very Rare (VR), Rare (R), Not Rare (NR), Common (C) and Very Common (VC) (see, Nimbalkar et al. 2011).

Results

During the study period a total of 42 species of butterflies belonging to 5 families were identified (Table 1). The family Pieridae dominated the butterfly community with 15 species, followed by Nymphalidae (11 species), Lycaenidae (9 species), Hesperiidae (5 species) and Papilionidae (2 species) (Fig. 2). Among these species, 6 (14%) were rare, 7 (17%) were not rare, 19 (24%) were commonly occurring and 10 (45%) were very common (Fig. 3).

It was also noted that 16 species were present in all seasons. Highest numbers (36) of species were seen during post monsoon. A total of 34 species were observed during summer and 33 during winter. Least numbers of species (22) were observed during monsoon (Table 1). The sighting frequency was determined for each species according to their occurrence. The highest frequency was observed for *Catopsilia pomona* (93.8%) and lowest was observed for *Arhopala atrax* (12.5%). The sighting frequencies of all the species are presented in Fig. 4. Among the 42 species recorded during the study period, three species (*Castalius rosimon*, *Hypolimnas misippus* and *Acytolepis puspa*) belong to Schedule I and two species (*Lampides boeticus* and *Cepora nerissa*) belong to Schedule II of the Indian Wildlife (Protection) Act, 1972.

Discussion & Conclusions

The species belonging to the families Papilionidae and Hesperidae were very less compared to the proportion of the other families. Some authors (Kunte 2000; Subba Reddi et al. 2003) suggested that it may be due to the sampling bias, since Hesperids exhibits crepuscular habit; and availability of Papilionids vary according to suitable larval host plants and adult nectar resources, which differ season to season.

Butterflies are seasonal in their occurrence. They are common for only a few months and rare or absent in other parts of the year (Kunte 2000). Wynter-Blyth (1957) had identified two seasons as peaks, March-April and October for butterfly abundance in India. Bhusal & Khanal (2008) reported a considerable relation between species diversity and spring season also indicating that the abundances of diverse species was positively affected by approaching summer, high relative humidity and more rainfall. During the present study, the numbers of the butterflies were peaked during post-monsoon season (late August to October) which was similar to the findings of Tiple & Khurad 2009 and Tiple 2012. The species abundance decreased during late winter to mid-summer (January to May). Some authors also recorded similar phenomenon during January-February (Tiple et al. 2007; Tiple and Khurad 2009; Tiple 2012).

The present study underlines importance of institutional campuses as potential habitat, which provide for undisturbed and near-natural environment for butterflies. Butterflies play a major role as pollinator and ecological indicator and should be conserved by finding the intricate interactions of the species with plants. Jiwaji University campus with all its plant diversity in the form of grassland, scrubland and dense forested area could provide for advanced studies on the species as well as their conservation.

References

Bastin, L. (1999). The distribution of plant species in urban vegetation fragments. *Landscape Ecology* 14: 493-507.

Bhusal, D.R. & B. Khanal (2008). Seasonal and Altitudinal Diversity of Butterflies in Eastern Siwalik of Nepal. *Journal of the Natural History Museum* 23: 82-87.

Blair, R.B. & A.E. Launer (1997). Butterfly diversity and human land use: Species assemblages along an urban gradient. *Biological Conservation* 80: 113-125.

Chandra, K. (2006). The Butterflies (Lepidoptera: Rhopalocera) of Kangerghati National Park (Chhattisgarh). *Advancement in Indian Entomology: Productivity and Health* II: 83-88.

Chandra, K., L.K. Chaudhary, R.K. Singh & M.L. Koshta (2002). Butterflies of Pench Tiger Reserve, Madhya Pradesh. *Zoos' Print Journal* 17(10): 908-909.

Chandra, K., R.K. Singh & M.L. Koshta (2000a). On a collection of butterflies (Lepidoptera: Rhopalocera) from Sidhi District, Madhya Pradesh, India. *Records of Zoological Survey of India* 98(4): 11-23.

Chandra, K., R.K. Singh & M.L. Koshta (2000b). On a collection of Butterfly fauna from Pachmarhi Biosphere Reserve. Proceedings of National Seminar on Biodiversity Conservation 8 Management with Special Reference on Biosphere Reserve, EPCO, Bhopal, 72–77pp.

Chandra, K., R.M. Sharma, A. Singh & R.K. Singh (2007). A checklist of butterflies of Madhya Pradesh and Chhattisgarh States, India. *Zoos' Print Journal* 22(8): 2790-2798.

Chaudhury, M. (1995). Insecta: Lepidoptera, Fauna of Conservation Area: Fauna of Indravati Tiger Reserve. *Zoological Survey of India* 6: 45-52.

Clark, P.J., J.M. Reed & F.S. Chew (2007). Effect of urbanization on butterfly species richness, guild structure and rarity. *Urban Ecosystems* 10: 321-337.

Garg, R.K., R.J. Rao & D.N. Saksena (2009). Water quality and conservation management of Ramsagar reservoir, Datia, Madhya Pradesh. *Journal of Environmental Biology* 30: 909-916.

Gunathilagaraj, K., T.N.A. Perumal, K. Jayramm & M.G. Kumar (1998). *Some South Indian butterflies.* Resources communications Pvt. Ltd., Bangalore.

Gupta, I.J. & J.P.N. Shukla (1987). Butterflies from Bastar district (Madhya Pradesh, India). *Records of Zoological Survey of India, Occasional Paper* 106: 1-74.

Gutierrez, D. & R. Mendez (1995). Phenology of butterflies in a mountain area in northen Iberian Peninsual. *Ecography* 18: 209-2196.

Hall, R.I., P.R. Leavitt, R. Quinian, A.S. Dixit & J.P. Smol (1999). Effects of agriculture, urbanization and climate on water quality in the northern green plains. *Limnology and Oceanography* 44: 731-759.

Kehimkar, I. (2008). *The Book of Indian Butterflies.* Bombay Natural History Society / Oxford University Press, 497p.

Kunte, K. (1997). Seasonal patterns in butterfly abundance and species diversity in four tropical habitats in northern Western ghats. *Journal of Biosciences* 22: 593-603.
Kunte, K. (2000). Butterflies of Peninsular India. Universities Press (Hyderabad) and Indian Academy of Sciences (Bangalore), 254pp.
Kunte, K. (2001). Butterfly diversity of Pune City along the human impact gradient. *Journal of Ecological Society* 13-14: 40-45.
McKinney, M.L. (2002). Urbanization, biodiversity and conservation. *Bioscience* 52: 883-890.
Nimbalkar, R.K., S.K. Chandekar & S.P. Khunte (2011). Butterfly diversity in relation to nectar food plants from Bhor Tahsil, Pune District, Maharashtra, India. *Journal of Threatened Taxa* 3(3): 1601-1609.
Padhye, A.D., N. Dahanukar, M. Paingankar, M. Deshpande & D. Deshpande (2006). Season and landscape wise distribution of butterflies in Tamhini, north-western Ghats, India. *Zoos' Print Journal* 21(3): 2175-2181.
Pocewicz, A., P. Morgan & S.D. Eigenbrode (2009). Local and landscape effects on butterfly density in northern Idaho grasslands and forests. *Journal of Insect Conservation* 13: 593-601.
Pollarad, E. (1979). A national scheme for monitoring the abundance of butterflies. The first three years British Entomological and Natural History Society, Proceedings and Transactions, 12: 77-99.
Pollard, E., & T.J. Yates (1993). *Monitoring butterflies for ecology and conservation: the British butterfly monitoring scheme*. Chapmen & Hall, London, United Kingdom.
Prajapati, B., U. Shrestha & A.S. Tamrakar (2000). Diversity of butterfly in Daman area of Makawanpur District, Central Nepal. *Nepal Journal of Science & Technology* 2: 71-76.
Rajagopal, T., M. Sekar, A. Manimozhi, N. Baskar & G. Archunan (2011). Diversity and community structure of butterfly of Arignar Anna Zoological Park, Chennai, Tamil Nadu. *Journal of Environmental Biology* 32(2): 201-207.
Raut, N.B. & A. Pendharkar (2010). Butterfly (Rhopalocera) fauna of Maharashtra Nature Park, Mumbai, Maharashtra, India. *Journal of species lists and distribution* 6(1): 22-25.
Siddiqui, A. & S.P. Singh (2004). A checklist of the butterfly diversity of Panna Forest (M.P). *National Journal of Life Sciences* 1(2): 403-406.
Singh, S.K., S.P. Srivastava, P. Tandon & B.S. Azad (2009). Faunal diversity during rainy season in reclaimed sodic land of Uttar Pradesh, India. *Journal of Environmental Biology* 30: 551-556.
Singh, V. & U.C. Singh (2011). Sedimentary structures in the part of Gwalior District (Madhya Pradesh). *International Journal of Geology, Earth and Environmental Sciences* 1 (1): 1-8.
Stefanescu, C., S. Herrando & F. Paramo (2004). Butterfly species richness in the north-west Mediterranean Basin: The role of natural and human induced factors. *Journal of Biogeography* 31: 905-915.
Tiple, A.D. & A.M. Khurad (2009). Butterfly Species Diversity, Habitats and Seasonal Distribution in and Around Nagpur City, Central India. *World Journal of Zoology* 4(3): 153-162.
Tiple, A.D. (2012). Butterfly species diversity, relative abundance and status in Tropical Forest Research Institute, Jabalpur, Madhya Pradesh, central India. *Journal of Threatened Taxa* 4(7): 2713-2717.
Tiple, A.D., A.M. Khurad & R.L.H. Dennis (2007). Butterfly diversity in relation to a human-impact gradient on an Indian university campus. *Nota Lepidopteralogica* 30(1): 179-188.
Tiple, A.D., V.P. Deshmukh & R.L.H. Dennis (2006). Factors influencing nectar plant resource visits by butterflies on a university campus: implications for conservation. *Nota Lepidopteralogica* 28: 213-224.
Wynter-Blyth, M.A. (1957). *Butterflies of the Indian Region*, Bombay Naturalist History Society, Bombay.

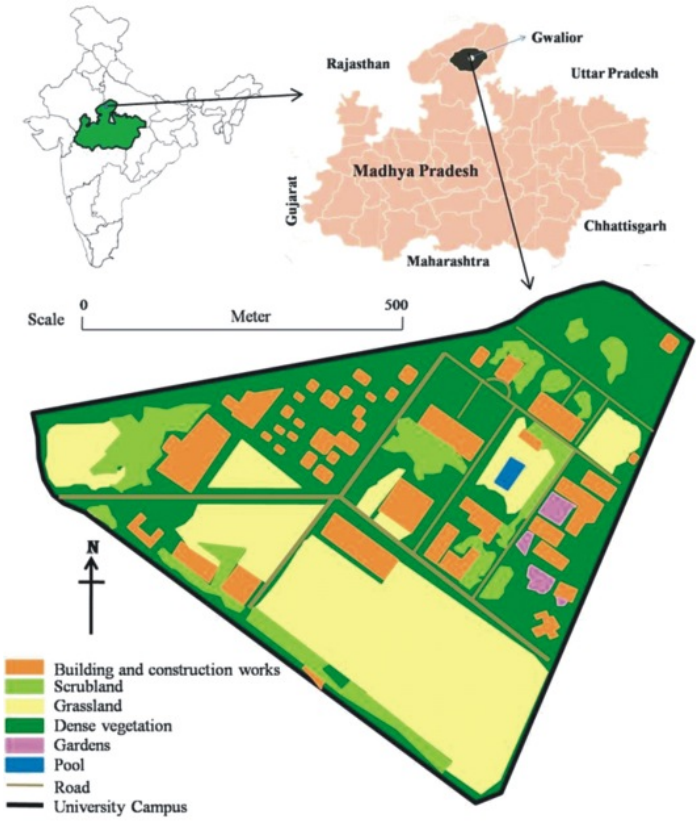

Fig. 1: Map of Jiwaji University campus and various habitat features

Table 1: Abundance, seasonal pattern and status of butterfly species observed at Jiwaji University campus, Gwalior

Family	Common Name	Scientific Name	Season	Status
Hesperiidae	Common Banded Awl	*Hasora chromus* Cramer	S, M, PM	NR
	Indian Skipper	*Spialia galba* Fabricius	All	NR
	Bevan's Swift	*Pseudoborbo bevani* Moore	S, M, PM	R
	Common Grass Dart	*Taractrocera maevius* Fabricius	S, PM	NR
	Indian Palm Bob	*Suastus gremius* Fabricius	All	NR
Lycaenidae	Forget-me-not	*Catochrysops strabo* Fabricius	PM, W	C
	Pea Blue	*Lampides boeticus* Linnaeus	All	C
	Common Pierrot	*Castalius rosimon* Fabricius	PM, W	C
	Dark Grass Blue	*Zizeeria karsandra* Moore	All	VC
	Scarce Shot Silverline	*Spindasis elima* Moore	M, PM, W	C
	Rounded Pierrot	*Tarucus nara* Kollar	All	VC
	Tiny Grass Blue	*Zizula hylax* Fabricius	M, PM, W	C
	Common Hedge Blue	*Acytolepis puspa* Horsfield	All	VC
	Indian Oak Blue	*Arhopala atrax* Hewitson	S, M	R
Nymphalidae	Blue Pansy	*Junonia orithiya* Linnaeus	S, PM, W	C
	Blue Tiger	*Tirumala limniace* Cramer	S, PM, W	R
	Common Castor	*Ariadne merione* Cramer	S, M, W	R
	Common Crow	*Euploea core* Cramer	All	C
	Common Evening Brown	*Melanitis leda* Linnaeus	All	NR
	Common Leopard	*Phalanta phalantha* Drury	All	C
	Danaid Eggfly	*Hypolimnas misippus* Linnaeus	All	C
	Lemon Pansy	*Junonia lemonias* Linnaeus	S, W	C
	Peacock Pansy	*Junonia almanac* Linnaeus	PM, W	C
	Plain Tiger	*Danaus chrysippus* Linnaeus	All	VC
	Stripped Tiger	*Danaus genutia* Cramer	S, PM, W	VC
Papilionidae	Common Mormon	*Papilio polytes* Linnaeus	S, PM, W	VC
	Common Rose	*Atrophaneura aristolochiae* Fabricius	S, W	C
Pieridae	Common Emigrant	*Catopsilia pomona* Fabricius	All	VC
	Common Grass Yellow	*Eurema hecabe* Linnaeus	All	C
	Common Jezebel	*Delias eucharis* Drury	PM, W	NR
	Spotless Grass Yellow	*Eurema laeta* Boisduval	M, PM	R
	Common Gull	*Cepora nerissa* Fabricius	S, M, PM	C
	Pioneer	*Belenois aurota* Fabricius	All	C
	Psyche	*Leptosia nina* Fabricius	S, M, W	C
	Mottled Emigrant	*Catopsilia pyranthe* Linnaeus	All	VC
	Small Orange Tip	*Colotis etrida* Boisduval	S, M, PM	C
	White Orange Tip	*Ixius marianne* Cramer	S, M, PM	VC
	Small Grass Yellow	*Eurema brigitta* Cramer	All	VC
	Small Salmon Arab	*Colotis amata* Fabricius	S, W	NR
	Plain Orange Tip	*Colotis eucharis* Fabricius	S, M, PM	R
	Large Salmon Arab	*Colotis fausta* Oliver	S, W	C
	Yellow Orange Tip	*Ixias pyrene* Linnaeus	M, PM, W	C

VR-Very Rare, R-Rare, NR- Not Rare, C-Common, VC-Very Common (VC); S-Summber, W-Winter, M-Monsoon, PM-Post Monsoon

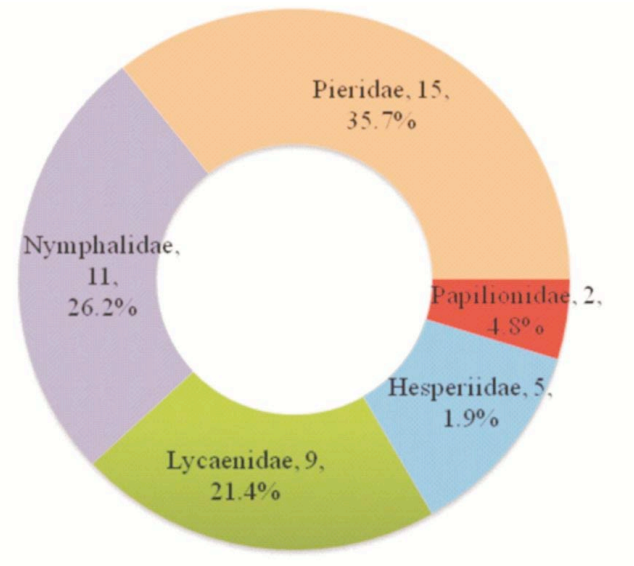

Fig. 2: Community structure, number of species and percent contribution of each family of butterflies at Jiwaji University campus, Gwalior

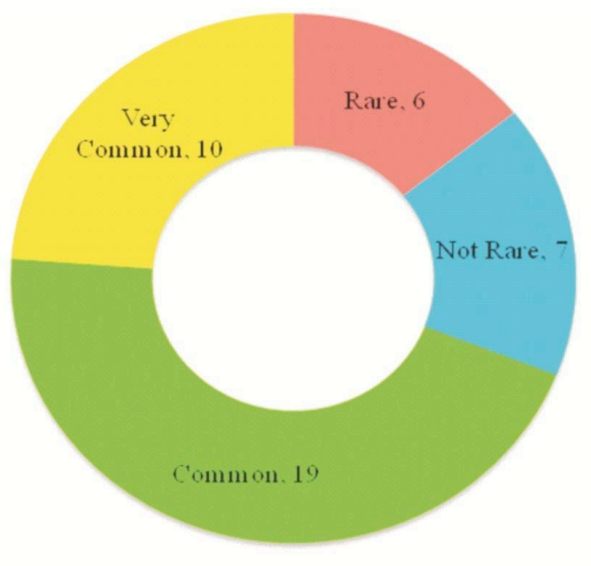

Fig.3: Status of butterfly species at Jiwaji University campus, Gwalior

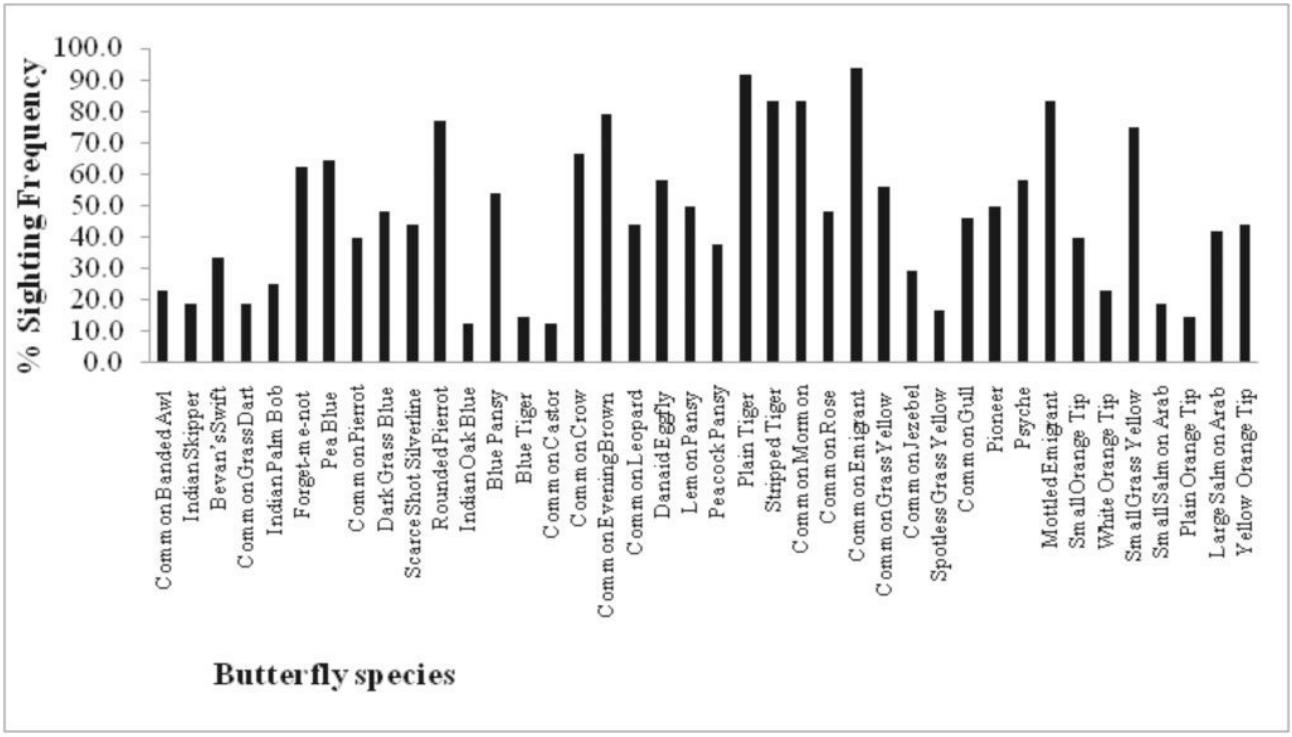

Fig. 4: Sighting frequencies of butterfly species during the study period at Jiwaji University campus, Gwalior

Biology of the moth *Metanastria hyrtaca* Cramer (Lepidoptera: Lasiocampidae) on Indian Badam Tree *Terminalia catappa* in Solapur, Maharashtra

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Abstract
The life history of *Metanastria hyrtaca* attacking sporadically on isolated trees is described from observations in the laboratory conditions. The present study was carried out in the months of December 2012 - February 2013. The eggs which were laid in clusters of 36 on a small twig of *Terminalia catappa* hatched in 15 days, the larval stages took 52 days. The pupal duration occupied 12 days. The average adult span was up to 9.5 days. Female moth laid 170 eggs in clusters of 25-30.

Introduction
The Indian Badam Tree, *Terminalia catappa* is a large tree in the leadwood tree family, Combretaceae that is native to the tropical regions of Asia, Africa and Australia. *T. Catappa* is widely grown in tropical regions of the world as an ornamental tree, grown for the deep shade its large leaves provide.

Limited information on the pests and diseases affecting *Terminalia* spp. exists. No widespread pest problems have been recorded in India. *Indarbela quadrinotata* is serious pest of *T. catappa* in Kerala (Mathew 1997). Nearly 20 different types of insect species were recorded on *Terminalia* spp. in Africa. These are divided in to fruit borers [1 species], Stem borers [2 species], Defoliators [12 species] and root feeder [1 species] (Browne, 1968; Lamb and Ntima, 1971; Lemmenes *et al*., 1995; Kapp *et al*., 1997). Very scant literature is available in relation with insects associated with *T. catappa* in India.

M. hyrtaca is a polyphagus species and is not a pest of economic importance, but occasionally it appears in very large numbers and cause considerable damage to the leaves, even of large trees. Subramanian and Anantanarayan (1938) and Beeson (1941) have reported 26 different host plants of *M. hyrtaca* including *T. catappa*. In the present communication, concentrated efforts were made to study detailed life history of *M. hyrtaca* in laboratory conditions on the host plant of *T. catappa*.

Materials and methods
One of the authors SRA by coincidence sighted a moth laying eggs (at 6.30 pm) on a small twig of a tree, *T. catappa* in Solapur City (Lat. $17^0 68'$ N Long. 75^0 92'E) on 15.12.2012. The twig along with freshly laid eggs was brought to the laboratory and kept in plastic container of ½ kg capacity for further observations. After hatching the early and late stages of larvae were fed with fresh and succulent and coarse and mature leaves of *T. catappa* respectively. Early and late stages of larvae were reared in plastic containers of 2 kg and 5 kg capacity respectively so as to provide sufficient space. Bed cleaning was done after every two days. Regular observations were recorded. During the study period temperature ranged from 16^0C to 35^0C. Recorded humidity was 45-70%. Identification and confirmation of species was done with available literature (Lefroy, 1909; Nair *et al*., 1974).

Results and discussion
The study revealed that eggs took 15 days for hatching. The recorded larval instars were 7 and they required 52 days for larval stage. Pre-pupal stage lasted for 2-2.5 days. The pupal stage was lasted for 12 days. The male and female moths lived for 3-4 and 5-7 days respectively. The average fecundity was 170 eggs.

Eggs (Fig. 1): The eggs were ashy grey to black in colour, spherical and more or less barrel shaped. The surface was smooth with three dark brown, circular spots surrounded by white halo and arranged in triangular pattern. After incubation period of 15 days, the first instar larvae were hatched out on 30.12.2012. Mathur (1950) and Nair *et al.*, (1974) have recorded incubation period of 7-12 and 9 days respectively.

First instar (Fig. 2): The first instar larvae after hatching started to eat egg shells. They measured 0.6 mm in length (n=10). After 4-6 hours fresh and succulent leaves of *T. Catappa* were provided. Head 0.15 mm in width. Larva jet black in colour with dirty white lines between the body segments. First instar lasted for 3 days. Very scant hairs were present. Nair *et al*., (1974) recorded 4.5 mm length. Moreover, they recorded first instar was lasted for 5.4 days. Thus, reports of present study are in agreement with Nair *et al.*, (1974).

Second instar (Fig. 3): Head 2 mm in width and black in colour, at the thoracic region very prominent red coloured band was observed. Larvae measured 13 mm in length. Body colour was reddish-brown bands were present in all the segments with numerous hairs. Second instar lasted for 5 days. According to Nair *et al.*, (1974) 4.2 days were required for second instar.

Third instar (Fig. 4): Head 3.6 mm in width. Mature larvae measured 19 mm in length. Very prominent white and black spot was seen in the middle and last segment respectively. Third instar lasted for 9 days. Nair *et al.*, (1974) recorded 4.8 days to complete third instar.

Fourth instar (Fig. 5): Head 5 mm in width with characteristic deep brown to black bands. Matured larvae attained a length of 26 mm. Fourth instar lasted for 10 days. Nair *et al.*, (1974) reported 4.6 days for complete development of fourth instar. During this instar, from each segment of the body brush like tufts of hairs were seen prominently.

Fifth instar (Fig. 6): Head 6.1 mm in width. Matured larvae measured 47 mm in length. Fifth instar lasted for 7 days. Nair *et al.*, (1974) observed and recorded 5.4 days. Sensory hairs in each segment were very distinct. No remarkable change has been seen as compared to previous instar.

Sixth instar (Fig. 7): Head 6.9 mm in width. Matured larvae measured 70 mm in length. Sixth instar lasted for 7 days. Nair *et al.*, (1974) recorded 11 days for the completion of sixth instar. In this stage, double row of blue coloured papillae like spots cum outgrowth were seen. Moreover, in the later segment of head a tuft of sensory hairs (90^0 to body axis) was noted remarkably.

Seventh instar (Fig.8): Head 7.5 mm in width. Matured larvae measured 100 mm in length. Nair *et al.*, (1974) recorded 70 mm length in mature larva. Seventh instar lasted for 11 days. During the study of Nair *et al.*, (1974) only six instars were reported. On the other hand Aherkar *et al*., (1997) reported seven instars. This might be due to sudden climatic fluctuations (temperature and humidity) during present investigation. The full grown seventh instar larva was dark brown with reddish lines dorsally and brown and yellow patches ventrally. It also showed lateral tufts of hairs on thoracic segments projecting anteriorly. All the segments showed a thin tuft of hairs on the mid-dorsal line. Moreover, short tufts of dirty hairs also sighted in small patches on the mesothoracic and abdominal segments.

Pre-pupa (Fig. 9): During pre-pupal stage the temperature and humidity were fluctuated. The average pre-pupal duration was 2-2.5 days (n=17). The last instar larvae of 100 mm in length got shrink up to the length of 30 mm (n=10). Almost all hairs were shed off and used to cover a silken gallery for pupation. In some cases (n=2), the soil kept in the container was used for pupation (Fig. 14). In addition, some larvae preferred to prepare cigar shaped cases of leaves of *T. catappa* for pupation (n=3) (Fig. 15) and very few prepared silken cocoons (n=2).

Pupa (Fig. 10 & 11): The male (Fig. 11) and female (Fig. 10) pupae measured 26 mm and 32 mm in length respectively. They were dark brown in colour. Tuft of hairs was noticed in both the sexes towards anterior tip of pupa. In addition, hairs were arranged in regular transverse rows on all segments. The pupal duration was lasted for 12 days. Nair *et al*., (1974) recorded same pupal duration (12 days) and 25 mm length, while Aherkar *et al.*, (1997) recorded 17.4 days as a pupal duration.

Adults - Male (Fig. 13): The male was smaller than female and measured 21 mm in length with wing expanse of 38 mm. Nair *et al*., (1974) reported body length of 25 mm and wing span of 42 mm. Forewing shows presence of prominent white spot encircled by black patch. The male forewings are narrower and more apically produced. Moreover, dark brown medial patch narrow, often broken anteriorly, submarginal dashes strong, irregular, with prominent paler zones towards the base. The antennae are bipectinate. The body colour was deep chocolate brown. Male lived for 3-4 days. Aherkar *et al.*, (1997) recorded life span of 2.6 days in males.

Female (Fig. 12): The female is larger than male and measured 31 mm in length. The wing expanse was 50 mm. Forewing never shows prominent white spot encircled by black patch as in male. The female forewings are not narrower and more apically produced as in male. The antennae are bipectinate and pectinations are narrower than male. Female lived for 5-7 days. Aherkar *et al.*, (1997) recorded life span of 4.2 days in female adult. During the present investigation, female laid 170 eggs (n=3). While Aherkar *et al.*, (1997) recorded average fecundity of 228 eggs/female. Whereas, Nair *et al.*, (1974) recorded average fecundity of 330 eggs.

References

Aherkar, S. K., S.V. Sarode & S.R. Katole (1997). Biology of *Metanastria hyrtaca* Cram. (Lepidoptera: Lasiocampidae) on jamun, *Syzygium cumini*. *Journal of Entomological Research*, 21 (1): 29-34.

Beeson, C. F. C. (1993) [1941]. *The Ecology and Control of the Forest Insects* of India and the neighboring Countries. Dehra Dun: Bishen Singh Mahendra Pal Singh, pp. 623.

Browne, F. G. (1968). *Pests and diseases of forest plantation trees*. Clarendon Press, Oxford.

Kapp, G. B., J. Bee & R. Lujan (1997). Species and site selection for timber production on farm boundaries in the humid Atlantic lowlands of Costa Rica and Panama. *Agroforestry Systems*, 35: 139-154.

Lamb, A. F. A. & O.O. Ntima (1971). *Terminalia ivorensis: Fast growing timber trees of the lowland tropics No. 5*. Commonwealth Forestry Institute, Oxford.

Lefroy, H. M. (1909). *Indian Insect Life*. A manual of the insects of the plains. Today and Tomorrows Printer and Publication, New Delhi, pp.1-786.

Life cycle of a moth, *Metanastria hyrtaca* (Cramer) reared in captivity in Solapur City of Maharashtra State

Lemmens, R. H. M. J., I. Soerianegara & W.C. Wong (1995). *Plant resources of South-East Asia. No. 5 (2). Timber trees: Minor commercial timbers.* Backhuys Publishers, Leiden.

Mathew, G. (1997). Management of the bark caterpillar, *Indarbela quadrinotata* in forest plantations of *Paraserianthes falcataria*. KFRI Research Report 122, p. 24.

Mathur, R. N. (1950). Biological notes on *Metanastria hyrtaca* Cram. (Lepidoptera: Lasiocampidae). *Indian Forester*, 76 (12): 539.

Nair, C. P. R., V.A. Abraham. & G.B. Pillai (1974). Biology of *Metanastria hyrtaca* Cram., a defoliator of cashew. *Journal of Plantation Crops*, 2 (2): 32-33.

Subramanian, T. V. & K.P. Anantnarayan (1938). A note on *Metanastria hyrtaca* Cram. *Journal of Bombay Natural History Society*, 40 (2): 257-263.

Studies on the Giant Wood Spider, *Nephila pilipes* (Fabricius, 1793) (Arachnidae: Nephilidae)

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The Giant Wood Spider *Nephila pilipes* (Fabricius, 1793) (Arachnidae: Nephilidae) are commonly found in deep forest and build very large webs on large bushes and trees. They are renowned for being the largest web-spinning spiders and are suitable model organisms for the study of extreme sexual size dimorphism (SSD) and sexual biology (Kuntner and Coddington 2009). They have been reported to simultaneously alter some structural and material properties of silk, as well as the physical characteristics of webs, in response to different types of prey (I-Min Tso, 2007). The web has more than one very minute male that lead kleptoparasitic life (Sebastian and Peter, 2009).

During the present study eco-morphometric studies on population of *N. pilipes* were undertaken in the horticultural garden of the Asirvanam Monastery, Anchepalya, Bangalore South taluk. The monastery is spread across 140 acres with a thicket of diverse tropical deciduous vegetation and horticulture garden of banana, mango, fig, tamarind etc. The study was undertaken during October to December 2010. An on foot walk through the study area was undertaken to identify the spots with more concentration of *Nephilia* webs. In this study banana plantation adjacent to mango orchards showed numerous webs of *N. pilipes,* ideal for morphometric studies. Morphometric measurements were done using centimeter scale and the individuals (N=10) were released unharmed after recording the measurements. Only female individuals were considered during the present study. The parameters recorded were prosomal length, prosomal width, ophisthosomal length, ophisthosomal width, total length, total length (legs extended), first appendage, second appendage, third appendage, fourth appendage. The females of *N. pilipes* are known to attain a size upto 20 cm, in this study the mean length was found to be 13.56 ± 1.08 (Table 1) and most parameters indicated a positive correlation except with the fourth appendage (Table 2). The statistical analysis was performed using SPSS 11.5 version. The reddish brown kleptoparasitic theridiid spiders (Fig 2) were found in the webs feeding on the prey swathed by *N. pilipes*. In the vicinity of *N. pilipes* webs very few black wood spider, *N. kuhlii* (Doleschall, 1859) webs were found.

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References
I-Min Tso, **Shu-Ya Chiang**, and **Todd A Blackledge** (2007). Does the Giant Wood Spider Nephila pilipes Respond to Prey Variation by Altering Web or Silk Properties? *Ethology* 113(4): 324- 333.
Kuntner, M and J.A. Coddington (2009). Discovery of the Largest Orb weaving Spider Species: The Evolution of Gigantism in *Nephila*. PLoS ONE 4(10): e7516. doi:10.1371/journal.pone.0007516.
Sebastian, P.A. and K.V. Peter (2009). Spiders of India. Orient Blackswan Publication. 734 pp.

Table 1: Descriptive statistics of morphometric parameters (N=10)

	Minimum	Maximum	Mean± SD
PL	.90	1.50	1.17 ±.20
PW	.90	1.50	1.17±.23
OL	1.70	3.60	2.83±.59
OW	.40	2.00	1.24±.43
TL	2.30	4.80	3.89±.73
TL (E)	11.80	15.30	13.56±1.08
FA	6.60	9.20	7.75±.71
SA	5.30	7.20	6.30±.59
TA	2.90	5.00	3.59±.59
FOA	5.20	7.10	6.22±.65

Table 2: Correlation between the morphometric parameters.

	PL	PW	OL	OW	TL	TL(E)	FA	SA	TA	FOA
PL	1	.93**	.60	.67*	.75*	.18	.46	.59	.52	-.19
PW		1	.57	.59	.74*	.05	.38	.67*	.54	-.17
OL			1	.93**	.89**	.40	.14	.29	.11	.26
OW				1	.88**	.41	.21	.37	.21	.17
TL					1	.25	.21	.37	.31	.01
TL (E)						1	.72*	.52	.52	.81**
FA							1	.82**	.92**	.38
SA								1	.88**	.35
TA									1	.24
FOA										1

PL=Prosomal length, PW=Prosomal width, OL=Ophisthosomal length, OW=Ophisthosomal width, TL=Total length, TL (E) =Total length (legs extended), FA=First appendage, SA=Second appendage, TA=Third appendage, FOA=Fourth appendage. * Correlation is significant at the 0.05 level (2-tailed) ** Correlation is significant at the 0.01 level (2-tailed).

Sighting records of Whip scorpion *Thelyphonus indicus* (Stoliczka, 1873) in Tirupattur forest division, Tamil Nadu, India

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Whip scorpions are tropical predators that possess enlarged pedipalps and multi segmented post-pygidium (Harvey, 2002). The special feature of these species having chemical anal spray to deter predators (Eisner *et al.*1961). They belong to the order Uropygi that includes Family Thelyphonidae (Pocock,1900). Pocock (1900) reported 19 species from the Indian sub-continent. Recently Javed et al (2009) reported *Thelyphonus sepiaris* (Butler, 1873) from the central Eastern Ghats of Andhra Pradesh, and *Thelyphonus indicus* (Stolickza,1873) from a few localities in Tamil Nadu and Karnataka (Rajasekhar & Bali, 1981).

The sighting of whip scorpion *Thelyphonus indicus* was recorded during May 2010 and September 2011, during the night survey taken after 2100 to 2400hrs on forest roads, in Tirupattur Forest division, Vellore District, Tamil Nadu. Morphological characters such as structure of the pedipalp, colour of body and legs were observed for identification (Pocock, 1900; Rajasekhar & Bali 1981).

The study was conducted in Tirupattur forest division which has popular Javvadhu Hill ranges. This hill range has various forest types. As per the classification by Champion & Seth (1968) the hill range has the following forest types: Southern Dry Mixed Deciduous Forests, Southern Dry Deciduous Scrub Forests, Southern Dry Savannah Forests, Dry Bamboo Brakes, Dry Tropical Riverain Forests, Southern Tropical Thorn Forests and Southern Thorn Scrub Forests. The hill range is home for several endemics and threatened plants. About 800 taxa of plants are reported to be present in the entire range of Javvadhu hills.

The whip scorpion *Thelyphonus indicus* was observed in two locations of Tirupattur forest division. In these location six individuals were recorded (3 adults and 3 young ones – comparing the size) and one species is identified Female (Fig:2) is not having Pedipalp, Tarsus tip spine (Rajasekhar & Bali 1981) (Fig:3). This species is different from *Thelyphonus sepiaris* having the following characters, body color is black (*vs* Pedipalp only having Black color, Body is pale brown colour), legs black (*vs* legs are totally red in Colour-Pocock,1900) (Fig:4) and this species found in the forest road sides near with River channels.

The species *Thelyphonus sepiaris,* is reported as Lower Rish - Near Threatened by Daniel et.al. (1998). The status of other species are not known.

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References

Daniel, B.A., S. Molur & S. Walker (Eds). (1998). Report of the workshop''conservation assessment and management plan for selected soil invertebrates of south india'' (BCCP-Endangered species project), Zoo Outreach Organization, Conservation Breeding Specialists Group, India, Coimbatore, 70p.

Eisner, T., I. Meinwald, A. Monro & R. Ghent (1961). Defense mechanisms of arthropods I. The composition and function of the spray of the whip scorpion *Mastigoproctus gigantecus* (Lucas) (Arachidna: Pedipalpida). *Journal of Insect Physiology* 6:272-298.

Harvey, M.S. (2002). The neglected cousins: What we know about the Smaller Arachnid orders?. *The Journal of Arachnonlogy* 30:357-372.

Javed, S.M.M., K.T.Rao, F. Tampal & C. Srinivasalu (2009). First record of *Thelyphonus sepiaris* (Butler 1873 (Uropygi: Thelyphonidae) from Andhra Pradesh, India. J*ournal of Threatned taxa* 1(7):395-397.

Pocock, R.I. (1900). *Fauna of British India*, Arachidna. Taylor and Francis, London,279Pp.

Rajasekhar, K.P. & Bali.G.(1981). Sexual dimorphism in a whip scorpion *Thelyphonus indicus* Stoliczka (Arachidna. Uropygi). *Bull. Br. arachnol. Soc.* 5(7): 330-333.

Photo: Kalaimani

Fig: 1. The Indian whip scorpion *Thelyphonus indicus* (Female).
Fig: 2. The Indian whip scorpion *Thelyphonus indicus* (Female) with pedipalps and tarsus (Red circled part showing absence of spine in the tip of tarsus of Pedipalp)
Fig: 3. The Indian whip scorpion *Thelyphonus indicus* with colouration on leg
Fig: 4 Map shows the previous records are given by numbers 1to 5 and Numbers 6 to 7 is forest areas under Tirupattur forest division, Vellore district.

Sighting of Whip spider *Phrynichus phipsoni* (Pocock, 1900) in Peechi Wildlife Sanctuary, Western Ghats, Kerala

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Some key characteristic features of whip spider, belonging to order Amblypygi are flattened body and modified front legs that act as tactile organs (Harvey, 2002). Some species are typical cave dwellers with no pigmentation and eyes (Harvey, 2002).

Recently Amblypygid species of Asia and Africa are placed under the family Phrynichidae (Weygoldt, 1998). India is represented by a few species of this family, of which Western Ghats whip spider *Phrynichus phipsoni* (Pocock 1900) was re-described by Bastawade in 1995 and Central Eastern Ghats whip spider *Phrynichus andhraensis* is a new species described by Bastawade *et al.* (2005) from the Kurnool district of Andhra Pradesh.

On 13th November, 2011 at 18.45 hrs. during the nature trek on Peechi Wildlife Sanctuary we found Western Ghats whip spider *Phrynichus phipsoni* on rocky slope area and another and another individual with in 5m distance on the same area. Records of Western Ghats whip spider *Phrynichus phipsoni* has been reported from Kerala, Maharastra and Goa (Bastawade, 1995; Bastawade *et al.* 2005).

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References

Bastawade, D.B. (1995). Redescription of *Phrynichus phipsoni* (Pocock) (Phrynichidae: Arachnida) collected after 100 years from new locations in Maharastra, Western India. *Journal of Bombay Natural History society* 92:132-136.

Bastawade, D.B., K. Thulasi Rao, S.M. Maqsood Javed and I. Siva Rama Krishna (2005). A new species of whip spider (Phrynchidae: Amblypygi) from Andhra Pradesh, India. *Zoo's print journal*, 20(12): 2091-2093.

Harvey, M.S. (2002). The neglected cousins: What we know about the smaller arachnid orders?. *The Journal of Arachnology* 30:357-372.

Pocock, R.I. (1900). *Fauna of British India, Arachnida*, Taylor and Francis, London, 279 Pp.

Weygoldt, P. (1998). Revision of the species of *Phrynichus* Karsch, 1879 and *Euphrynichus* Weygoldt,1995 (Chelicerata, Amblypygi). *Zoologica Stuttgart* 147:1-65.

4th CONGRESS ON INSECT SCIENCE (CIS-4)

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