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REVIEW ARTICLE

LITERATURE REVIEW ON INSECT FAUNA (ODONATA: DRAGONFLIES AND DAMSELFLIES) OF PACHMARHI BIOSPHERE RESERVE (PBR), MADHYA PRADESH, INDIA

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ABSTRACT

A review is given on documentation of insects of Order Odonata. Data indicates that very less no. of insect faunal diversity have been documented of order Odonata from Pachmarhi Biosphere Reserve Madhya Pradesh, India. Current status, of documented species of Order- Odonata are 17 in nos. including Dragonfly and Damselfly from PBR.

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INTRODUCTION

Pachmarhi Biosphere Reserve (PBR)

PBR is scattered in 4926 sq km area, including Bori Sanctuary, Satpura National Park and Pachmarhi Sanctuary in Madhya Pradesh, India (Fig-1) (Anonymous, 1996). The PBR lies in between latitude 22° 11' to 22° 56' N and 77° 47' to 78° 52' E and altitude varies from 320 to 1352 m above MSL at different locations (Anonymous, 2001). Monsoon climate occurs in three season cycles, summer, rainy, and winter (Anonymous, 2001). It has seven kinds of forest viz. South Indian moist, Indian Slightly moist Teak Forest, South Indian moist Mixed Forest, Southern Tropical Dry Teak Forest, Southern Tropical Dry Mixed Deciduous Forest, Northern Dry Peninsular Sal Forest, Central Indian Sub Tropical Hill Forest. It also has five types of floral community organizations due to differences in topographical situation, soil and micro-climatic set-up the Sal forest dominated by *Shorea robusta* at the top of the hills, the mixed evergreen forest in the middle zones of the hills, dominated by *Mangifera indica*, *Terminalia tomentosa*,

Terminalia bellerica, *Syzygium cumini* and *Anogeissus latifolia*, the mixed dry deciduous forest dominated by good quality of *Tectona grandis* at low region and associated with *Albizia lebeck*, *Chloroxylon swietenia*, *Pterocarpus marsupium*, *Terminalia tomentosa* etc, the grassland and meadow vegetations on the flat plateau dominated by perennial grasses like, *Andropogon pumatus*, *Heteropogon contortus*, *Themeda triandra*, *Cymbopogon martinii*, *Pseudosorghum helepense* etc. (Pathak, 2001). Hence it is a rich habitat for wild lives.

Odonata

Odonata is an order of most primitive winged carnivore insects. This order was earlier kept in the order Paleodictyoptera, which are precursors of modern Odonata. Odonata is divided into three suborders Zygoptera, Anisoptera, and Anisozygoptera (Tolfilski, 2004). It includes both the dragonflies and damselflies, (Williams & Feltmate, 1992). Dragonflies are such insect present in the world, which have not modified or evolved yet, with any gradual change in environment, they are still as their ancestors were.

Ecological role of odonata

Odonata is an indicator of rich biodiversity of an area. Presence of odonata indicates existence of other kinds of flora and fauna

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biodiversity. They habitat near clean water ecosystem and is also indicator of water pollution.

Documentation of Odonata in India

Documentation of Indian insect fauna was earlier started during British rule, Amateurs who made faunal surveys at various locations and studied the materials or passed them to experts in Europe. The identified insects have been documented in the book 'Fauna of British India' series. Entomologist of Central India's has studied different order of the class insecta. Kailash Chandra, alone has been contributed enormous work in the field of insect identification and published a brief account in a book "Fauna of Pachmari Biosphere Reserve".

Documentation of Odonata by Indian Workers

Fraser, (1927, 1942) published detailed description dragonflies species of Siam and Federated Malay States. Fraser (1933, 1934, 1936, 1927, 1942) published three volumes on Odonata named "Fauna of British India" including 536 species and subspecies. Species from M.P., Bangladesh, Bhutan, Nepal, Pakistan Myanmar, Shri Lanka and regions of India. Singh, (1963); Kumar and Juneja, (1976); Kumar, (1978; 1982); Kumar and Prasad, (1981) made addition in Fraser's work, to M.P. and Himanchal Pradesh. Mitra, (1988) reported 39 Odonata species of India. Kumar (1988) published a descriptive account on endomorphic nature *Neurothemis tullia tullia*. Lahiri (1977, 1979, 1987) made collection of Odonata sample and made one new record from Manipur.

Laidlaw, (1902, 1920 and 1931) recorded dragonflies of the Skeat expedition in the Malay Peninsula ,also studied genus *Lestes* and its allies.Laidlaw, (1902, 1920, and 1931) also made taxonomical studies on museum specimens of Dragonfly species, made by members of the Skeat expedition in the Malay Peninsula and Indian museum. Ashina, (1955, 1956, 1961, 1962, 1965, 1967, 1968, 1970, 1974, 1981, 1988, and 1996) worked on recording and describing identifying characters of Odonata species ,collected from regions Thailand Vietnam and Burma of Asia .Prasad (1966,1975,1996,1998) studied Odonata from regions Bastar (M.P), Kangra (Himachal Pradesh) and Maharashtra of India. Tyagi and Miller (1991) published descriptive account Odonata species of Rajasthan, India. Miller, (1992) studied role oxygen gas concentration on egg hatching of *Potamarcha congener*. Miller, (1992) studies dragonflies of the campus at Madurai Kamaraj University, Tamil Nadu, India. Mitra, (1992 and 2002) studied distribution of Odonates in Mangrove tidal forest of West Bengal and Eastern India. Mitra, (1995) added nine species in entomofauna record and brought species to 48 of Odonata of Indrāvati Tiger Reserve M.P. Kumar and Prasad, (1981) and Kumar, (1995) generated a catalogued of dragon flies of Western Himalaya.

Srivastava and Prasad, (1998) introduced 6,000 Odonata species under 630 genera and 28 families of three sub orders Anisoptera, Zygoptera and Anisozygoptera of the world .Prasad and Varshney, (1995) studied larval stages of Odonata species, and also recorded 499 donates belonging to 17 family from various regions of India .Prasad and Varshney, (1995) also Andrew and Tembhare, (1997) made survey based study on collection of Odonata insect species from Nagpur, Maharashtra India. Bedjanic, (1996) recorded insect fauna

belonging to Odonata in Tamil Nadu and Kerala, India. Srivastava and Suri, (1997) published description on Drgonflies species of Sagar, India. Tyagi and Miller, (1991) published description of insects species of Odonates, collected from south-western Rajasthan, India. Kulkarni *et al.*, (1999) studied predation dragonflies *Ictinogomphus rapax* (Rambur) and *Pantala flavescence* (Fabr.) the Giant wood spider *Nephila maculata* (Fabr.). Uniyal *et al.*, ., (2000) recorded dragonfly from great Himalaya National Park, India.

Sharma and Talmale, (2000) studied occurrence of rare *Mantispa* sp. from Tadoba-Andhari Tiger Reserve, Maharashtra. Prasad and Kulkarni, (2001): Prasad and Kulkarni, (2002); Kulkarni and Prasad, (2002) reported 71 species from Nilgiri Biosphere reserve and 34 from Kerla and Ujjain (M.P.), India. Suri and Shrivastava, (2001) published remarkable annotation on the Dragonflies species from Sagar, India. Prasad and Kulkarni,(2002) studied Odonata of Eravikulam national park. Talmale and Kulkarni,(2003) reported Odonata from paddy field of Bhandara district. Rehan, (2003) analyzed phylogenic relationship of Odonata. Kumar, (2005) revealed the presence of 88 species under 52 genera belonging to Zygoptera (31 species) and Anisoptera (57 species) from Himachal Pradesh Khajjiar lake area Himachal Pradesh. Kulkarni and Prasad, (2005) studied entomofauna of Odonata in Fauna of Melghat Tiger Reserve.

Kulkarni and Prasad (2005) studied Odonates of Melghat Tiger Reserve. Subramanian (2009) worked anaromously on Drogenflies and Dameflies of India. Shinde and Sathe, (2006) recorded 36 new record of Dragonflies from Konya Western Ghats. Kulkarni *et al.*, (2004) reported 38 new species of Odonata from Pench National Park Nagpur. Mishra, (2007) studied insects faunal species of Odonata of Madhya. Mishra, (2007) studied 70 species of Odonates under 9 families from Pench National Park and Satpura National Park. Raju and Narayan, (2008) studied Odonates of Khanha National Park, India. Andrew *et al.*, (2008) described identification characteristics and geographical distribution of Dragonflies and Damselflies in a colored" Handbook of Common Odonates of Central India".Kulkarni and Talmale, (2008) reported Odonates occurs in, Lonar Wildlife Sanctuary.

Tiple *et al.*, (2008) published a colored catalogue on" Species Diversity of Odonata" of Nagpur, India. Mishra, (2009), reported six new records and existence 70 species from Achanakmark Amarkantak Biosphere Reserve, Chattishgrh. Subramanian, (2009) studied 463 species of odonates occurring in India, recorded 101 species of Odonata from Maharashtra ;Prasad and Mishra, (2009)reported Odonates from Pachmarhi Biosphere Reserve M.P.Chandra, (2009) edited description of faunal species including Odonata species in Fauna of PBR, (Madhya Pradesh). Kulkarni and Talmale, (2009) reported some Odonates from Bhimashankar Wildlife Sanctuary, Maharashtra. Suhling and Clausnitzer, (2009) *Pantala flavescen*; Mitra, (2010 and 2013), *Potamarcha congener* and *Orthetrum sabina*; Sharma, (2010) *Orthetrum pruinosum*;Mitra (2010 and 2013,) listed *Potamarcha congener* and *Orthetrum Sabina*; Sharma, (2010) listed *Orthetrum pruinosum* in IUCN Red List of Threatened species. Talmale, (2011) published a not on Odonata species from Signori Wildlife, India.

Tiple et al., (2012) published an introduction about Odonates and described 49 species from M.P. Kulkarni *et al.*, (2012) studied Odonata from Maharashtra. Kulkarni and Talmale, (2008) studied Odonata from Lonar Wildlife Sanctuary. Kulkarni and Talmale, (2009) studied Odonata from Bhimashankar Wildlife Sanctuary. Husain and Sharma, (2012) studies Odonates insect species of Arabian and Indian. Subramanian, (2005) edited information of Dragonflies and Damselflies of Peninsular India. Tiple, (2012) reported dragonflies and damselflies of the Achanakmar-Amarkantak Biosphere Reserve, in Chhattisgarh and Madhya Pradesh. Singh and Banyal, (2013) revealed existence of ten species under 8 genera and five family of Odonata from Khajjar Lake.

Documentation of Odonates by Worlds Famous Workers

McLachlan, (1894 and 1896) studied Odonates of Ta-chien-la, Western China. Morton, (1907, 1919, 1920 and 1924) reported Odonata from Mesopotamia, north-western Persia and Mesopotamia. Campion (1925) made collection on Odonata species in Korinchi, West Sumatra. Andres, (1928) studied insect species of dragonflies of Egypt. Needham (1930 and 1931) published a manual of the dragonflies of China and Hainan. Nielsen (1936) of Africa Orientale Italiana. Lieftinck, (1934, 1935, 1953 and 1954) published an annotated list of insects species belonging to the Odonata with geographical distribution habitat of Java, Lesser Sudan Island, Sumatra. Pinhey, (1961 and 1972) studied genus *Aciagrion* Sélys (Odonata) of the National Museum of Southern Rhodesia and Eastern Africa. Blom, (1982) listed some species of Odonata, were collected from various locations in Iran. Roberson, (1985) studied behavior of female damselfly *Ischura rambari*.

Al-Houty, (1985) studied Odonata of Kuwait. Mahato, (1986) published information on altitudinal distribution pattern of Odonata between Dumre and Khansar in central Nepal. Schneider (1985, 1986 and 1988) made systematic studies on Zygoptera (Odonata) in Syria, Nahen Osten and Johannes Gutenberg. Mahato, (1986) published a note the altitudinal distribution of Odonata between Dumre and Khansar in central Nepal. Hinnekint, (1987) studied population dynamics of Odonates with special reference to morphological colour change, female polymorphism, multiannual cycles and their influence on behavior. Tsuda and Kitagawa, (1987 and 1988) worked on collection of worker Iwaki from Indonesia and Singapore. Dumont, (1988 and 1991) studied palaeoecological significance of the Odonates fauna of Darfur, western Sudan. Dumont, (1991) surveyed Odonates of the Levant. Dumont and Al-Safadi, (1991) made some additions to the dragonfly fauna of Yemen. Dumont and Heidari, (1996) worked on spring collection of Odonata from Iran.

Kemp and Kemp, (1989) recorded some Dragonfly from the states of Pahang and Perak, West Malaysia. Huisman and van Tol, (1989) reported dragonflies and caddisflies (Odonata and Trichoptera) from waters around the Danum Valley. Al-Safadi, (1990 and 1995) worked on a pilot study of Lake Mirib to explore dragonflies species. Waterson, (1980, 1984); Waterson and Pittway (1991 and 1989) surveyed on fauna of Odonata, of southern Arabia and Oman. Schneider, (1981, 1985 and 1995);

Schneider, and Krupp, (1993) made survey on Odonata species reading from Syria, Nahen Osten, of Saudi Arabia. Sage, (1960) published notes on Odonates of Iraq. Shalaby, (1961) made preliminary survey on the insects fauna of Saudi Arabia. Kimmins, (1961) published information of Odonata and Neuroptera entomofauna of the Island of Socotra. Israel and Yemen, (1992), published identifying key to aquatic larva of dragonflies (Anisoptera). Khalq, (1994) made entomofaunal survey in Gilgit and Baltistan, Kashmir, and also recorded new species for Pakistan. Geene, (1994) published shortly describe dragonflies of Egypt. De Marmels, (1995) recorded some dragonflies from central and northern Israel.

Lohmann, (1996) studied phylogenetic relationship of insect species of sub order Anisoptera. Dumont and Heidari, (1996) published a detail description of *Coenagrion australocaspicum* species during spring season collection from Iran. Cordero and Andres, (1996) studied mimicry behavior and colour polymorphism in female. Kotarac, (1996) worked on the existence of androchrome females in *Crocothemis erythraea* Brulle. Westfall and May, (1996.) studied Damselflies of North America. Sutton, (1996) described geographical distribution and migration status of certain insect species of Northern Persia. Schneider and Dumont, (1997 and 1998) updated annotated check list of Odonata of Saudi Arabia and Soqatra Island. Wilson, (1997, 1999, 2004, 2005, and 2008) worked enormously on Odonata species from various regions of Hong Kong, China, West Fall. Cordero and Egidio, (1998) studied on mating frequency, population density and female polychromatism in the damselfly. Hämäläinen and Pinratana, (1997 and 1999) shown geographical distribution of the dragonflies of Thailand. Samaroui and meai (1999) made study on some Odonata insect of Algeria. Corbet, (1999) studied behavior and ecology of Odonata.

Ross, (2000) published details list of Odonata fauna of America. Wang, (2000) studied dragonflies of Taiwan. Deserts. Jödicke, (2000) studies Odonata insect species of Tunisia. Heidari and Dumont. Katbeh *et al.*, (2002) studied Odonata of Jordan. Heidari, and Dumont (2002) published a check-list of the Odonata of Iran. Jödicke, (2000) studied Odonata of Tunisia. Orr, (2003 and 2005) published a guide line for identification dragonflies of Borneo, Peninsular Malaysia and Singapore. Dumont and Verschuren, (2005) surveyed on Odonata species and given checklist of species including. Dumont and Verschuren, (2005) published a note on status of *Orthetrum kollmannspergeri* Buchholz Odonata from the Ennedi and Ounianga regions of northern Chad. Theischinger and Howking, (2006) published field guide of dragon flies of Australia. Kalkman, (2006) published identification key to the Dragonflies of Turkey, including species known from Greece, Bulgaria, Lebanon, Syria, the Trans-Caucasus and Iran.

Do Manh and Dang, (2007) given checklist of Dragonfly from Vietnam. Michael, (2008) reported dragonflies and damselflies of South Africa. Amways, (2008); Samways, (2008) studied dragonflies and damselflies of South Africa. Van and Kalkman, (2008) created new recorders of dragonflies from Oman. Ebrahimi *et al.*, (2009) worked on dragonflies (Odonata) from South-Eastern Iran. Corbet, (1999) studied behavior and Ecology of Odonata. Ebrahimi, (2009) studied dragonflies (Odonata) from South-Eastern Iran. Ghahari *et al.*, (2009)

reported Odonata (Insecta) in rice crop field from Northern Iran. Suhling and Clausnitzer, (2009) *Pantala flavescens*; Subramaniam (2010) *Diplocides trivialis*; Subramanian and Daw, (2010) *Trithemis auroalis*; Dow, (2013) listed *Crocothemis servilia* listed in IUCN Red List of Threatened species. Sodhegi and Mohammadalizadeh, (2009) mode additional account in to Odonata species in Iran. Grunwell, (2010) reported dragonflies and damselflies in Qatar. Tariq, (2010) and worked on systemic of dragonflies of Pakistan. Tang *et al.*, (2010) generated photographic guide of dragonflies species. Tang *et al.*, (2010) created photographic guide to the Dragonflies of Singapore. Dijkstra and Boudot, (2010) updated information regarding geographical distribution of Odonata of the Mediterranean and North Africa. Sivaperuman and Shah, (2012) studied population dynamics species diversity and abundance of Odonata in Andaman and Nicobar islands.

Documentation of Odonata by Zoological Survey of India in account of Pachmarhi Biosphere Reserve

The taxonomic profile generated by ZSI, in a book published named "Fauna of Pachmarhi Biosphere Reserve" (2009) on the faunal species of group viz , Annelida, Mollusca, Solifugae, Araneae, Scopinida, Scolopendromorpha, Plant mites, Dictyoptera, Mantoda, Odonata, Demeptera, Orthoptera, Hemiptera, Thysanoptera, Lepidoptera, Coleoptera, Hymenoptera, Fishes, Amphibia, Reptilia Aves, Mammalia . Among these studied groups, 217 species are belonging to class insecta. Total 825 nos. species of various faunal groups have been documented, which includes 415 species of invertebrate belonging to insect groups present in this area (Anonymous, 2009). The entomofaunal diversity in group and number of species are (Chandra 2009): Odonata 14; Orthoptera 54; Dermaptera 01; Hemiptera 31; Thysanoptera 01; Lepidoptera-Rhopalocera 79; Heterocera 37; Coleoptera and 95 Hymenoptera 15.

Conclusion

Literature is reviewed on documentation of odonata in different region of the world. Review is analyzed critically in reference the on Pachmarhi Biosphere Reserve, Madhya Pradesh, India. Kailash Chandra provided a taxonomic platform of class insect an in Central India. Chandra edited a book named "Fauna of Pachmarhi Biosphere Reserve" (2009) which includes documentation of 14 insect species of Dragonfly and Damselfly under order Odonata, which indicates very less diversity survey and field entomological survey work on PBR.

DISCUSSION

As review provide information about documentation of Odonata from India and other country of the world. Documented data is very less in point of view diversity of Odonata from Pachmarhi Biosphere Reserve .So there is needed documentation of insect biodiversity for conservation planning, protected area justification and design, and development of management plans, the rich biodiversity of the Odonata species in PBR. Documentation would be use full to conserve protect and maintain the biological health PBR. Data study on the taxonomy and systematic of Odonata insects will be very useful to field entomologists for quick and accurate field recognition of the beneficial insect.

REFERENCES

- Andres, 1928 studied insect species of dragonflies of Egypt. Mémoires de la Societé Royale Entomologique d'Égypte 3(1): 1-43
- Andrew, R.J. et al, 2008. A Handbook of Common Odonates of Central India. Pub. South Asian Council of Odonatology, India for 18th International Symposium on Odonatology, Nagpur, India, 54pp.
- Andrew, R.J., and D.B., Tembhare, 1997. Collection of Odonata from Nagpur City. Maharashtra State, India. Fraseria (N.S.) 4: 1-4.
- Andrews, H.E., 1929. The fauna of India including Ceylon & Burma, Coleoptera, Carabidae, Vol. I. Carabinae, pp. xviii + 431, Taylor & Francis, London.
- Anonymous, 1992. The Wildlife (Protection) Act, 1972 (as amended up to 1991). Natraj
- Bedjanič, M. 1996. On a small odonate collection made in February 1995 in Tamil Nadu and Kerala, southern India. *Notulae odonatologicae* 4: 114-116.
- Blanchard, E. 1850. Catalogue des collections Entomologiques du Muséum d'Histoire naturelle de Paris. Classe des Insectes, Ordre des Coléoptères I. Milne-Edwards H, Blanchard E. et Lucas H. (Editors) Gide et Baudry. Paris (1850)1-128 (1851)129-240
- Blom, W.L. 1982. List of Odonata collected during various lepidopterological trips in Iran (1971-1974). *Notulae odonatologicae* 1: 150-151.
- Campion, H. 1925. Odonata collected in Korinchi, West Sumatra, by Messrs. H.C. Robinson and C. Boden Kloss. *Journal of the Federated Malay States Museums* 8: 161-165.
- Chandra, K. 2009. (Edited). In. Fauna of Pachmarhi Biosphere Reserve, (Madhya Pradesh) Conservation Area Series, by Director, Zoological survey of India, Kolkata, 39, pp.247-257
- Corbet, P.S. 1999. Dragonflies: Behavior and Ecology of Odonata. Comstock Publishing Associates, Cornell University Press. Ithaca, New York.
- Corbet, P.S. 1999. Dragonfly Behaviour and Ecology of Odonata. Harley Books, Colchester, England, 829pp.
- Cordero, A.R. and F.J.P. Egidio 1998. Mating frequency, population density and female polychromatism in the damselfly, *Ischnura graellsii*: an analysis of four natural population. *Etologia* 6: 61-67.
- Cordero, A.R. and J.A. Andres 1996. Colour polymorphism in Odonates: Females that mimic males? *Journal of the British Dragonfly Society* 12: 50-60
- Daigle J.J. 1992. Florida Dragonflies (Anisoptera): A Species Key to the Aquatic Larval Stages. State of Florida Department of Environmental Regulation. Technical Series. Vol. 12, Num. 1.
- De Marmels, J. 1995. Some dragonfly records from central and northern Israel. *Opuscula zoologica fluminensia* 128: 1-9.
- Dijkstra, K. D. B. and Boudot, J. P. 2010. First update of the Atlas of the Odonata of the Mediterranean and North Africa: *Orthetrum machadoi* Longfield, 1955 new to the Palearctic and *Agriocnemis sania* Nielsen, 1959 new to the Egyptian Nile Valley. *Libellula*, 29(1/2): 107-125.

- Do Manh Cuong and Dang Thi Thanh Hoa. 2007. Checklist of dragonfly from Vietnam. Vietnam National University Publisher, Hanoi.
- Dow, R.A. 2013. *Crocothemis servilia*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org>.
- Dumont, H. J. 1988. On the composition and palaeoecological significance of the Odonate fauna of Darfur, western Sudan. *Odonatologica* 17: 385-392.
- Dumont, H. J. 1991. Odonata of the Levant. The Israel Academy of Sciences and Humanities, Jerusalem.
- Dumont, H. J. and Al-Safadi, M. M. 1991. Additions to the dragonfly fauna of Yemen. *Notulae Odonatologicae* 3: 114-117.
- Dumont, H. J. and Heidari, H. 1996. On a collection of spring Odonata from Iran, with the description of *Coenagrion australocaspicum* n.
- Dumont, H. J. and Verschuren, D. 2005. Odonata from the Ennedi and Ounianga regions of northern Chad, with a note of the status of *Orthetrum kollmannspergeri* Buchholz, and a checklist of the species currently known from the Republic of Chad. *Odonatologica* 34: 291-297.
- Ebrahimi, A. et al., 2009. Dragonflies (Odonata) from South-Eastern Iran. *Caspian Journal of Environmental Science* 7: 107-112.
- Geene, R. 1994. Notes on dragonflies in Egypt, spring 1990. In: P.L. Meininger and G.A.M. Atta (eds), Ornithological studies in Egyptian wetlands 1989/1990, pp. 391-395 (Appendix III). *Foundation for Ornithological Research in Egypt, Vlissingen*.
- Ghahari, H. et al. 2009. Odonata (Insecta) from Northern Iran, with comments on their presence in rice fields. *Munis Entomology & Zoology* 4: 148-154.
- Grunwell, M. 2010. Dragonflies and damselflies in Qatar. *Journal of the Qatar Natural History Group*.
- Hämäläinen, M. and Müller, R.A. 1997. Synopsis of the Philippine Odonata, with lists of species recorded from fortyislands. *Odonatologica* 26: 249-315.
- Hämäläinen, M. and Pinratana, A. 1999. Atlas of the dragonflies of Thailand. Distribution maps by provinces. Brothers of St. Gabriel in Thailand, Bangkok.
- Heidari, H. and Dumont, H.J. 2002. An annotated check-list of the Odonata of Iran. *Zoology in the Middle East* 26: 133-150.
- Hinneking, B.O.N. 1987. Population dynamics of *Ichnura e. elegans* (Vander Linden) (Insecta: Odonata) with special reference to morphological colour change, female polymorphism, multiannual cycles and their influence on behavior. *Hydrobiologia* 146: 3-31.
- Huisman, J. and van Tol, J. 1989. Dragonflies and caddisflies (Odonata and Trichoptera) from waters around the Danum Valley Field Centre. *Sabah Society Journal* 9: 90-109.
- Husain, A. and Sharma, G. 2012. Odonates of Arabian and Indian Deserts and their conservation
- Jödicke, R. 2000. The Odonata of Tunisia. *International Journal of Odonatology* 3: 41-71.
- Kalkman, V. J. 2006. Key to the Dragonflies of Turkey, including species known from Greece, Bulgaria, Lebanon, Syria, the Trans-Caucasus and Iran. *Brachytron* 10: 3-82.
- Kalkman, V. J. and van Pelt, G. J. 2006. The distribution and flight period of the dragonflies of Turkey. *Brachytron* 10: 83-153.
- Katbeh-Bader, A. et al. 2002. Odonata of Jordan. *Fragmenta Entomologica* 34: 147-170
- Kemp, R. G. and Kemp, G.S. 1989. Some dragonfly records from the states of Pahang and Perak, West Malaysia. *Notulae Odonatologicae*: 37-40.
- Khaliq, A. et al. 1994. A collection of Odonata from Gilgit and Baltistan, Kashmir, with three new species for Pakistan. *Notulae Odonatologicae* 4: 68-69.
- Kimmins, D. E. 1961. The Odonata and Neuroptera of the Island of Socotra. *Annals and Magazine of Natural History* 13th series. 3: 385-392.
- Kirby, W. F. 1900. On a small collection of Odonata (Dragonflies) from Hainan, collected by the late John Whitehead. *Annals and Magazine of Natural History* 5: 530-539, plate XII.
- Kotarac, M. 1996. A note on the existence of androchrome females in *Crocothemis erythraea* (Brulle) (Anisoptera: Libellulidae). *Notule Odonatologicae* 4: 123-124.
- Kulkarni, P. P. and Prasad, M. 2002. Insecta: Odonata. In: Fauna of Ujani. *Zoological Survey of India*: pp. 91-104
- Kulkarni, P. P. and Prasad, M. 2002. Insecta: Odonata. In: Fauna of Ujani. *Zoological Survey of India*: pp. 91-104
- Kulkarni, P. P. and Talmale, S. S. 2008. Insecta : Odonata, In Fauna of Lonar Wildlife Sanctuary, Conservation Area Series 37 : 159-167 (Published: Director, Zool. Surv.India, Kolkata).
- Kulkarni, P. P. and Talmale, S. S. 2009. Insecta : Odonata. In Fauna of Bhimashankar Wildlife Sanctuary, Dist. Pune (Maharashtra). Conservation Area Series, 42: 231-250. Zool. Surv. India, Publication.
- Kulkarni, P.P. and Prasad, M. 2005. Insecta: Odonata in Fauna of Melghat Tiger Reserve. Conservation Area Series (Zoological Survey of India, Kolkata) 24: 297-316.
- Kumar, A. 1982. An annotated list of Odonata of Himachal Pradesh. *Indian J. Physical and Natural Sciences*. 2: 55-59.
- Kumar, A. 1988. On the andromorphic female of *Neurothemis t. tullia* (Dru.) (Anisoptera: Libellulidae) *Notule Odonatologicae* 3: 12-16.
- Kumar, A. 1995. Odonata. In: Fauna of Western Himalaya-I. *Zoological Survey of India, Kolkata*: pp. 25-33.
- Kumar, A. 2005. Odonata. In: Fauna of Western Himalaya (Part 2). *Zoological Survey of India, Kolkata*: pp. 75-98.
- Lahiri, A.R. 1977. On a collection of Odonata from Manipur with new records. *Records of the Zoological Survey of India* 72: 409-418.
- Lahiri, A.R. 1979. Odonata (Insecta) from different states of north east India. *Oriental Insects* 13: 119-132.
- Lahiri, A.R. 1979. Odonata (Insecta) from different states of north east India. *Oriental Insects* 13: 119
- Lahiri, A.R. 1987. Studies on the Odonate fauna of Meghalaya. *Records of the Zoological Survey of India, Occasional Paper* 99: 1-402.
- Laidlaw, F.F. 1902. On a collection of dragonflies made by members of the Skeat expedition in the Malay Peninsula in 1899-1900. *Proceedings of the Zoological Society of London* 1902: 63-92.
- Laidlaw, F.F. 1920. A list of the Dragonflies recorded from the Indian Empire with special reference to the collection of the

- Indian Museum. Part III—The genus *Lestes* and its allies. Record of Indian Museum 19(4): 145–164.
- Laidlaw, F.F. 1931. Dragonflies of the Malay Peninsula with descriptions of new species. *Journal of the Federated Malay Museums* 16: 175-233.
- Le Roi, O. 1915. Odonaten aus der Algerischen Sahara von der Reise von Freiherrn H. Geyr von Schweppenburg. Mit einer Übersicht der Nordafrikanischen Odonaten-Fauna. *Deutsche Entomologische Zeitschrift* 1915: 609-634.
- Lieftinck, M.A. 1934. An annotated list of the Odonata of Java, with notes on their distribution, habits and life-history. *Treubia* 14: 377-462.
- Lieftinck, M.A. 1935. A Synopsis of the Odonata (Dragonflies) of Sumatra. *Miscellanea Zoologica Sumatrana* 92-93: 1-23.
- Lieftinck, M.A. 1953. The Odonata of the island Sumba with a survey of the dragonfly fauna of the Lesser Sunda Islands. *Verhandlungen der Naturforschenden Gesellschaft, Basel* 64: 118-228.
- Lieftinck, M.A. 1954. Hand list of Malaysian Odonata. A catalogue of the dragonflies of the Malay Peninsula, Sumatra, Java and Borneo, including the adjacent small islands. *Treubia (Supplement)* 22: 1-202. *Magazine* 121: 62.
- Lohmann H. 1996. Das phylogenetische System der Anisoptera (Odonata). *Deutsche Entomologische Zeitschrift* 106: 209-266.
- Mahato, M. 1986. A note on the altitudinal distribution of Odonata between Dumre and Khansar in central Nepal. *Notulae Odonatologicae* 2: 121-123.
- Mc Lachlan, R. 1894. On two small collections of Odonata from Ta-chien-la, in the province of Szechuen, western China, on the frontier of Thibet. *Annals and Magazine of Natural History* 6: 421-436.
- Mc Lachlan, R. 1896. On Odonata from the province of Szechuen, in western China, and from Moupin, in eastern Thibet. *Annals and Magazine of Natural History* 6: 364-374.
- McLachlan, R. 1894. On two small collections of Odonata from Ta-chien-la, in the province of Szechuen, western China, on the frontier of Thibet. *Annals and Magazine of Natural History* 6: 421-436.
- McLachlan, R. 1896. On Odonata from the province of Szechuen, in western China, and from Moupin, in eastern Thibet. *Annals and Magazine of Natural History* 6: 364-374.
- Meurgey, F. (coord.) 2006. Les Odonates des Départements et Collectivités d'outre-mer français. Société française d'Odonatologie, Versailles.
- Michael, J. 2008. Dragonflies and Damselflies of South Africa. Pensoft. ISBN 954-642-330-0.
- Miller, P.L. 1992. Dragonflies of the campus at Madurai Kamaraj University, Tamil Nadu, India. *Notulae odonatologicae* 3: 160-165.
- Miller, P.L. 1992. The effects of oxygen lack on egg hatching in an Indian dragonfly, *Potamarcha congener*. *Physiological Entomology* 17: 68-72.
- Mishra, S.K. 2007. Fauna of Madhya Pradesh (including Chhatisgarh). Odonata: Insecta, State Fauna Series, 15 (Part-1), ZSI Publi.: 245-272.
- Mishra, S.K. 2007. Insecta: Odonata, pp. 245-272. In: Fauna of Madhya Pradesh (including Chhatisgarh). State Fauna Series. 15 (Part-1). (Zoological Survey of India, Kolkata).
- Mitra, A. 2010. *Potamarcha congener*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>.
- Mitra, A. 2013. *Orthetrum sabina*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org>.
- Mitra, T.R. 1992. Odonata of the Mangrove tidal forest of west Bengal, India. *Notulae odonatologicae* 3: 141-143.
- Mitra, T.R. 2002. Geographical distribution of Odonata (Insecta) of Eastern India. *Memoirs of Zoological Survey of India* 19(9): 1-208.
- Morton, K.J. 1907. Odonata collected by Lt.-Colonel Nurse, chiefly in North-Western India. *Transactions of the Royal Entomological Society of London* 1907.
- Morton, K.J. 1919. Odonata of Mesopotamia. *Entomologist's Monthly Magazine (ser. B)* 55: 143-151, 183-196.
- Morton, K.J. 1920. Odonata collected in north-western Persia and Mesopotamia by Captain P.A. Buxton, R.A.M.C. *Entomologist's Monthly Magazine* 56: 82-87.
- Morton, K.J. 1924. The dragonflies of Palestine, based primarily on collections made by Dr. P.A. Buxton, with notes on the species of the adjacent regions. *Transactions of the Royal entomological Society of London* 72: 25-44.
- Needham, J.G. 1930. A manual of the dragonflies of China. *Zoologia Sinica* 11: 1-344.
- Needham, J.G. 1931. Dragonflies (Odonata) of Hainan. *Lingnan Science Journal* 10: 223-232
- Nielsen C. 1936. Odonati dell' Africa Orientale Italiana. *Bolletino della Societa Entomologica Italiana* 68: 123-130.
- Orr, A.G. 2003. A guide to the Dragonflies of Borneo. Their identification and biology. Natural History Publications, Kota Kinabalu, Sabah, Malaysia.
- Orr, A.G. 2005. Dragonflies of Peninsular Malaysia and Singapore. Natural History Publications (Borneo).
- Pinhey, E. 1961. A survey of the dragonflies of Eastern Africa. British Museum (Natural History), London.
- Pinhey, E. 1972. The genus *Aciagrion* Sélys (Odonata). *Occasional Papers of the National Museum of Southern Rhodesia (B)* 5(1): 1–59.
- Prasad M. 1966. Studies on the odonata fauna of Bastar, Madhya Pradesh, India. *Rec. zool. Surv. India*, 95 (3-4): 165-213.
- Prasad, M. 1975. Odonata of District Kangra (Himachal Pradesh). *Records of the Zoological Survey of India* 71(95-119).
- Prasad, M. 1996. An account of Odonata of Maharashtra state, India. *Records of Zoological Survey of India*. 95: 305-327.
- Prasad, M. 1998. Odonata. In: Faunal Diversity in India. Zoological Survey of India, Kolkata: pp. 172-178.
- Prasad, M. and Ghosh, S.K. 1988. A contribution on the estuarine Odonata of east India. *Records of the Zoological Survey of India* 85: 197-216.
- Prasad, M. and Kulkarni, P. P. 2002. Insecta: Odonata. In: Fauna of Eravikulam national park. Zoological Survey of India. 13: 7-9.
- Prasad, M., and Varshney, R.K. 1995. A check list of the Odonata of India including data on larval studies. *Oriental Insects*, 29: 385-428.

- Rehn, A.C. 2003. Phylogenetic analysis of higher-level relationships of Odonata. *Systematic Entomology* 28: 181-240.
- Sadhegi, S. and Mohammadalizadeh, J. 2009. Additions to the Odonata Fauna of Iran. *Iranian Journal of Science and Technology, Transaction A* 33: 355-359.
- Sage, B.L. 1960. Notes on the Odonata of Iraq. *Iraq Natural History Museum Publication*: 1-11.
- Samraoui, B. and Menai, R. 1999. A contribution to the study of Algerian Odonata. *International Journal of Odonatology* 2: 145-165.
- Samways, Michael J. 2008. Dragonflies and damselflies of South Africa. Pensoft. ISBN 954- 642-330-0.
- Saussure, 1859. Orthoptera Nova Americana (Diagnoses praeliminaires), *Revue et Magasin de Zoologie Pure et Appliquée (Revue et Magasin de Zoologie)* 2(11):201-212, 315-317, 390-394
- Schneider W. 1995. Ein Paarungskette between *Orthetrum sabina* (Drury 1770) und *Crocothemis erythraea* (Brullé 1832) (Odonata: Anisoptera: Libellulidae). *Entomologische Zeitschrift* 105: 462-463.
- Schneider, W. 1981. On a dragonfly collection from Syria. *Odonatologica* 10: 131-145.
- Schneider, W. 1985. Die Gattung *Crocothemis* Brauer, 1868 im Nahen Osten (Insecta: Odonata: Libellulidae). *Senckenbergiana Biologica* 66: 79-88.
- Schneider, W. 1986. Systematik und Zoogeographie der Odonata der Levante unter besonderer Berücksichtigung der Zygoptera. *Biologie, Institut für Zoologie, Johannes Gutenberg-Universität*.
- Schneider, W. 1988. Dragonflies (Odonata) of the Wahiba Sands and adjacent Areas, Eastern Oman. *Journal of Oman Studies Special Report* 3: 377-388.
- Schneider, W. and Dumont, H.J. 1997. The dragonflies and damselflies (Insecta: Odonata) of Oman. An updated and annotated checklist. *Fauna of Saudi Arabia* 16: 89-110.
- Schneider, W. and Dumont, H.J. 1998. Checklist of the Dragonflies and Damselflies of Socotra Island (Insecta: Odonata). *First International Scientific Symposium on Socotra Island: present and future* 1: 211-231. Aden, 1996.
- Schneider, W. and Krupp, F. 1993. Dragonfly records from Saudi Arabia, with an annotated checklist of the species from the Arabian Peninsula (Insecta: Odonata). *Fauna of Saudi Arabia* 13: 63-78.
- Sharma G. 2010. *Orthetrum pruinosum*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>.
- Sharma, R. M. and Talmale, S. S. 2000. Occurrence of rare *Mantispa* sp. (Neuroptera: Mantispidae) from Tadoba-Andhari Tiger Reserve, Maharashtra. *Zoo's Print Journal*, XV (3): 228.
- Shinde, K. and Sathe, T. V. 2006. Biodiversity of dragonflies (Odonata) from koyna dam and around area. In: *Biodiversity and Environment* (eds: Pandey B.N. and Kulkarni G. K.). A.P.H. Pub., New Delhi: pp.61-65
- Sivaperuman, C. and Shah, S. K. 2012. Species diversity and abundance of Odonata in Ritchie's Archipelago, Andaman and Nicobar islands. *Biological Forum-An International J.* 4: 65-69.
- Srivastava, V.K., Suri Babu, B. 1997. Annotations on the Dragonfly collection from Sagar, Central India. *Fraseria* (N. S.), 4 (1-2): 13-15.
- Subramanian, K.A. 2005. Dragonflies and Damselflies of peninsular India - A Field Guide: An e-book of Project Lifescape. Indian.
- Subramanian K, and Dow R. 2010. *Trithemis aurora*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>.
- Subramanian, K. 2010. *Diplacodes trivialis*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>.
- Subramanian, K.A. 2005. Dragonflies and Damselflies of Peninsular India; A Field Guide. Project Landscape, Indian Academy of Sciences, Bangalore, India, 118pp.
- Subramanian, K.A. 2009. A checklist of Odonata (Insecta) of India. *Zoological Survey of India*: 33.
- Subramanian, K.A. 2009. A Checklist of Odonata of India. *Zoological Survey of India*, 36pp.
- Subramanian, K.A. Editor: Madhav Gadgil, Dragonflies and Damselflies of Peninsular India: A Field Guide, Indian Institute of Science and Indian Academy of Sciences, Bangalore, India.
- Suhling F, Clausnitzer V. 2009. *Pantala flavescens*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>.
- Suri Babu B, and Srivastava V K. 2001. Annotations on the dragonfly fauna of Sagar, Madhya Pradesh, Central India (Odonata: Anisoptera). *Opusc. Zool. Flumin.*, 193: 1-7.
- Talmale, S. S. and Kulkarni, P. P. 2003. Odonata in paddy fields of Bhandara district, Maharashtra. *Bionotes* 5 (3) : 67-68.
- Tang, H. B., L. K. Wang and M. Hämäläinen, 2010. A Photographic Guide to the Dragonflies of Singapore. Raffles Museum of Biodiversity Research, National University of Singapore, Singapore. 222 p
- Tariq Chaudry, M. 2010. Systematics of Dragonflies (Anisoptera: Odonata) of Pakistan. Department of Entomology, Arid Agriculture University, Faculty of Crop and Food Sciences.
- Theischinger, G. and Hawking, J.H. 2006. The Complete Field Guide to Dragonflies of Australia. CSIRO, Collingwood, Australia.
- Tiple, A. D., Khurad, A. M., Andrew, R. J. 2008. Species Diversity of Odonata in and around Nagpur City, Central India. *Fraseria* (Proc. 18th International Symp. *Odontology, Nagpur*). 7: 41-45.
- Tiple, A.D. 2012. Dragonflies and Damselflies (Odonata: Insecta) of the Achanakmar-Amarkantak Biosphere Reserve, in Chhattisgarh and Madhya Pradesh, with their status in Central India. *International Journal of Biotechnology and Bio Sciences* 2(1): 97-102.
- Tiple, A.D., Paunikae, S., Talmale, S.S. 2012. Dragonflies and Damselflies (Odonata: Insecta) of Tropical Forest research Institute, Jabalpur, Madhya Pradesh, Central India. *Journal of Threatened Taxa*. 4(4): 2529-2533.
- Tofilski, Adam 2004. Draw Wing, a program for numerical description of insect wings. *Journal of Insect Science*. 4:17, 5 pp.

- Tsuda, S. and Kitagawa, K. 1987. Odonata of southeast Asia collected by the late Mr. M. Iwasaki. Part 1. Odonata of Malay peninsula (West Malaysia) and Singapore. *Gracile* 38: 1-7.
- Tyagi, B.K. and Miller, P.L. 1991. A note on the Odonata collected in southwestern Rajasthan, India. *Notulae odonatologicae* 3: 134-135.
- Ugemuge, N.R. 1986. The Flora of Nagpur District. Shree Prakashan, Nagpur, India, 497pp.
- Uniyal, V. P. *et al.*, 2000. Dragonfly fauna (Insecta: Odonata) in Great Himalayan National Park, western Himalaya. *Annals of Forestry*. 8: 116-119
- Uniyal, V. P., Mitra, A. and Mathur, P. K. 2000. Dragonfly fauna (Insecta: Odonata) in Great Himalayan National Park, western Himalaya. *Annals of Forestry*. 8: 116-119
- Van der Weide, M.J.T. and Kalkman, V.J. 2008. Some new records of dragonflies from Oman. *Agrion*, Newsletter of the Worldwide Dragonfly Association 12 : 52-54.
- Wang, Liang-Jong. 2000. Dragonflies of Taiwan. Wild Bird Society of Taipei.
- Waterston, A.R. 1980. Insects of Saudi Arabia. Odonata. *Fauna of Saudi Arabia* 2: 57-70
- Waterston, A.R. 1984. Insects of Southern Arabia. Odonata from the Yemens and Saudi Arabia. *Fauna of Saudi Arabia* 6: 451-472
- Waterston, A.R. and Pittaway, A.R. 1991. (1989). The Odonata or Dragonflies of Oman and neighbouring territories. *Journal of Oman Studies* 10: 131-168.
- Westfall MJ, and May ML. 1996. Damselflies of North America. Scientific Publishers, Gainesville, Florida. 649 pp.
- Williams, D.D. and Feltmate, B. 1992. Aquatic insects. CAB International. Wallingford, UK.
- Wilson, K.D.P. 1999. Dragonflies (Odonata) of Dinghu Shan Biosphere Reserve, Guandong Province, China. *International Journal of Odonatology* 2: 23-53.
- Wilson, K.D.P. 2004. Field Guide to the Dragonflies of Hong Kong. Agriculture, Fisheries and Conservation Department, Friends of the Country Parks and Cosmos Books Ltd., Hong Kong.
- Wilson, K.D.P. 2005. Odonata of Guangxi Zhuang Autonomous Region, China, part II: Anisoptera. *International Journal of Odonatology* 8: 107-168.
- Wilson, K.D.P. 2008. A brief trip to United Arab Emirates and northern Oman. *Agrion*, newsletter of the Worldwide Dragonfly Association 12: 56-57.
