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ENDEMIC ODONATA OF INDIA

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INTRODUCTION

The Order Odonata, popularly known as dragonflies and damselflies, is a primitive group of insects and occurs in different ecosystems. In India about five hundred species and subspecies occur. India has a landmass with an area of approximately 32,67,500 sq. km. including the arcuate chain of Andaman and Nicobar Islands; the Laccadives (Lakshadweeps) and Minicoy islands in the Arabian sea. The main landmass is divided into the Himalayan mountain chain in the North, isolating the country from the rest of Asia; this is followed by the monotonous highly populated Indo-Gangetic plain which ends in the Bay of Bengal. The last is a triangular plateau of old peninsular upland.

ZOO-CENTRES AND ENDEMISM

Endemics occur only in a particular area. According to Roonwal and Verma (1977) endemic species have evolved locally; and Hutchinson (1957) has considered that endemics remain confined in their 'fundamental niche' where they can survive for indefinite period. According to Emerson (1955) endemic genera occur in a vast zoogeographic area. Indian odonate fauna although largely borrowed from Malaysian subregion but some forms *viz. Zygonyx* of Ethiopian region and *Hemicordulia* of Australian region have made their way to India. Kiauta (1984) has opined that members of the family Chlorocyphidae have reached India from their place of origin at Malaysian subregion. India has also zoo-centres of its own (Mitra 2000b). For example according to Lieftinck (1984) members of the genus *Calicnemia* Strand have originated and radiated from the Himalayan region.

Among the zoo-centres, the North-East India-East India—the meeting area of Tibeto-Chinese, Indo-Chinese and Old peninsular forms, is very important; the Western Ghats, which are separated from other zoo-centres are rich in endemics. The North-west India is a zone where forms get opportunities for a considerable admixture of mediterranean elements with Turkmenian and some Ethiopian derivatives including the fauna of old peninsular India. The South Indian forms bear affinities with the fauna of Sri Lanka (Ceylon). The group of Andaman and Nicobar Islands is an arcuate chain in the Bay of Bengal. These islands are formed by the summits of submerged ranges

connected with the Arakan yoma of Burma (Myanmar) to which the meridian 92°E forms a tangent between cape Negaris and Sumatra (Achin head).

List of endemics : (a) *Genera : Caconeura* Kirby, *Esme* Fraser, *Melaneura* Fraser, *Phylloneura* Fraser, *Calocypha* Fraser, *Davidioides* Fraser, *Dubitogomphus* Fraser.

(b) *Species and subspecies* (excluding some recently described controversial taxa), number of species in family are in parenthasis.

Suborder ZYGOPTERA

Family PLATYSTICTIDAE

1. *Drepanosticta anandalei* Fraser
2. *Platysticta decannensis* Laidlaw
3. *Protosticta antelopoides* Fraser
4. *Protosticta davenporti* Fraser
5. *Protosticta fraseri* Kennedy
6. *Protosticta gravelyi* Laidlaw
7. *Protosticta hearseyi* Fraser
8. *Protosticta mortoni* Fraser
9. *Protosticta rufostigma* Fraser
10. *Protosticta sanguinostigma* Fraser

Family PROTONEURIDAE

1. *Caconeura gomphoides* (Rambur)
2. *Caconeura obscura* (Fraser)
3. *Caconeura ramburii* (Fraser)
4. *Caconeura risi* (Fraser)
5. *Caconeura t-coerulea* (Fraser)
6. *Disparoneura quadrimaculata* (Rambur)
7. *Disparoneura apicalis* (Fraser)
8. *Disparoneura canningi* (Fraser)
9. *Elattoneura atkinsoni* (Selys)
10. *Elattoneura campioni cacharensis* (Fraser)

11. *Elattoneura nigerrima* Laidlaw
12. *Elattoneura souteri* (Fraser)
13. *Elattoneura tetrica* (Laidlaw)
14. *Elattoneura nihari* Mitra
15. *Esme cyaneovittata* Fraser
16. *Esme longistyla* Fraser
17. *Esma mudiensis* Fraser
18. *Melaneura billineata* Fraser
19. *Phylloneura westermani* (Selys)
20. *Prodasineura verticalis andamanensis* (Fraser)
21. *Prodasineura verticalis anandalei* (Fraser)

Family COENAGRIONIDAE

1. *Aciagrion hisopla krishna* Fraser
2. *Aciagrion approximans* (Selys)
3. *Agriocnemis corbeti* Kumar and Prasad
4. *Agriocnemis keralensis* Peters
5. *Agriocnemis pieris* Laidlaw
6. *Agriocnemis splendidissima* Laidlaw
7. *Ceriagnion coeruleum* Laidlaw
8. *Enallagma immsi* Laidlaw [Tsuda (1991) separated it from *E. parvum* Selys]
9. *Enallagma insula* Fraser [Mitra (2000a) considered its doubtful status]
10. *Ischnura dorothea* Fraser
11. *Ischnura inarmata* Calvert
12. *Ischnura patricia* Fraser
13. *Ischnura rubiolio* Selys
14. *Ischnura rufostigma rufostigma* Selys
15. *Mortonagrion varalli* Fraser
16. *Pseudagrion andamanicum* Fraser
17. *Pseudagrion indicum* Fraser
18. *Pseudagrion hypermelas* Selys

Family PLATYCNEMIDIDAE

1. *Calicnemia carminia pyrrhosoma* Lieftinck
2. *Calicnemia mukherjeei* Lahiri
3. *Calicnemia sudhaae* Mitra
4. *Coeliccia dorothea* Fraser
5. *Coeliccia prakritiae* Lahiri
6. *Coeliccia sarbottama* Lahiri
7. *Coeliccia rossi* Asahina
8. *Coeliccia schmidti* Asahina
9. *Coeliccia fraseri* Laidlaw
10. *Copera vittata decanensis* (Laidlaw)
11. *Copera vittata serapica* (Selys)

Family SYNLESTIDAE

1. *Megalestes irma* Fraser
2. *Megalestes lieftincki* Lahiri
3. *Megalestes raychaudhuri* Lahiri

Family LESTIDAE

1. *Indolestes assamicus* Fraser
2. *Indolestes pulcherrimus* Fraser
3. *Indolestes davenporti* (Fraser)
4. *Orolestes durga* Lahiri
5. *Lestes garoensis* Lahiri
6. *Lestes malabaricus* Fraser
7. *Lestes nigriceps* Fraser
8. *Lestes praemorsus sikkima* (Fraser)
9. *Sympecma annulata kashmirensis* Ander

Family MEGAPODAGRIONIDAE

1. *Burmargiolestes laidlawi* Lieftinck

Family CHLOROCYPHIDAE

1. *Calocypha laidlawi* (Fraser)
2. *Libellago lineata andamanensis* (Fraser)
3. *Libellago lineata blanda* Selys
4. *Rhinocypha bisignata* Selys
5. *Rhinocypha perforata beatifica* Fraser
6. *Rhinocypha vitrinella* Fraser
7. *Rhinocypha hilaryae miaoa* Lahiri and Sinha

Family EUPHAEIDAE

1. *Anisopleura subplatystyla* Fraser
2. *Anisopleura lieftincki* Prasad and Ghosh
3. *Anisopleura vallei* St. Quentin
4. *Bayadera hyalina* Selys
5. *Bayadera kali* Cowley
6. *Dysphaea ethela* Fraser
7. *Euphaea cardinalis* (Fraser)
8. *Euphaea dispar* Rambur
9. *Euphaea fraseri* (Laidlawi)

Family CALOPTERYGIDAE

1. *Echo margarita tripartita* Selys
2. *Vestalis apicalis apicalis* Selys
3. *Vestalis apicalis submontana* Fraser
4. *Vestalis gracilis montana* Fraser

Suborder ANISOPTERA

Family GOMPHIDAE

1. *Acrogomphus fraseri* Laidlaw
2. *Anormogomphus heteropterus* Selys

3. *Asiagomphus nilgiricus* (Laidlaw)
4. *Asiagomphus odoneli* (Fraser)
5. *Burmagomphus cauvericus* Fraser
6. *Burmagomphus hasimaricus* Fraser
7. *Burmagomphus sivalikensis* Laidlaw
8. *Burmagomphus laidlawi* Fraser
9. *Cyclogomphus heterostylus* Selys
10. *Cyclogomphus vesiculosus* Selys
11. *Cyclogomphus wilkinsi* Fraser
12. *Cyclogomphus ypsilon* Selys
13. *Davidius aberrans senchalensis* Fraser
14. *Davidius davidi assamensis* Fraser
15. *Davidius kumaoensis* Fraser
16. *Davidius malloryi* Fraser
17. *Davidius zallorensis zallorensis* Selys [Type locality cited by Selys is untraceable]
18. *Davidioides martini* Fraser
19. *Dubitogamphus bidentatus* Fraser
20. *Gomphidia ganeshi* Chhotani, Lahiri and Mitra
21. *Gomphidia kodagunensis* Fraser
22. *Gomphidia leonorae* Mitra
23. *Gomphidia platyceps* Fraser
24. *Gomphidia t-nigram* Selys
25. *Heliogomphus promelas* (Selys)
26. *Heliogomphus spirilus* (Fraser)
27. *Ictinogomphs atrox* (Selys)
28. *Ictinogomphs kishori* Ram
29. *Macrogomphus abnormis* Selys
30. *Macrogomphus wynaadicus* Selys
31. *Macrogomphus annulatus annulatus* (Selys)
32. *Megalogomphus bicornuatus* (Fraser)
33. *Megalogomphus flavicolor* (Fraser)
34. *Megalogomphus hannyngtoni* (Fraser)

35. *Megalogomphus superbus* Fraser
36. *Merogomphus longistigma longistigma* (Fraser)
37. *Merogomphus longistigma tamaracherriensis* Laidlaw
38. *Merogomphus martini* (Fraser)
39. *Microgomphus souteri* (Fraser)
40. *Microgomphus torquatus* (Selys)
41. *Microgomphus verticalis* (Selys)
42. *Nihonogomphus indicus* Lahiri
43. *Onychogomphus acinaces* Laidlaw
44. *Onychogomphus cacharicus* (Fraser)
45. *Onychogomphus grammicus* (Rambur)
46. *Onychogomphus malabarensis* Fraser
47. *Onychogomphus meghalayanus* Lahiri
48. *Onychogomphus nilgiriensis anaimalaicus* (Fraser)
49. *Onychogomphus nilgiriensis nilgiriensis* Fraser
50. *Onychogomphus thienemanni* Schmidt
51. *Paragomphus echinoocipitalis* (Fraser)
52. *Phaenandrogomphus aureus* (Laidlaw)

Family AESHNIDAE

1. *Aeshna flavifrons* Lichtenstein
2. *Gynacantha apicalis* Fraser
3. *Gynacantha arnaudi* Asahina
4. *Gynacantha bainbriggei* Fraser
5. *Gynacantha biharica* Fraser
6. *Gynacantha odoneli* Fraser
7. *Gynacantha rammohani* Mitra & Lahiri
   (Appears to be abnormal variety of *G. dravida* Lieftinck)
8. *Gynacantha rotundata* Asahina
9. *Oligoaeschna speciosa* Karube
10. *Oligoaeschna andamani* Chhotani, Lahiri and Mitra

11. *Oligoaeschna khasiana* Lieftinck
12. *Periaeschna flinti assamensis* Asahina
13. *Periaeschna lebasii* Navas
14. *Petaliaeschna fletcheri* Fraser

Family CORDULEGASTERIDAE

1. *Chlorogomphus brittoi* Navas
2. *Chlorogomphus campioni* (Fraser)
3. *Chlorogomphus fraseri* St. Quentin
4. *Chlorogomphus preciosus fernandi* Asahina
5. *Chlorogomphus schmidti* Asahina
6. *Chlorogomphus xanthoptera* (Fraser)
7. *Chlorogomphus parvistigma* (Selys)

Family CORDULIIDAE

1. *Epophthalmia frontalis binocellata* (Fraser)
2. *Epophthalmia vittata vittata* Burmeister
3. *Idionyx corona burliyarensis* Fraser
4. *Idionyx corona corona* Fraser
5. *Idionyx galeata* Fraser
6. *Idionyx imbricata* Fraser
7. *Idionyx intricata* Fraser
8. *Iidonyx minima* Fraser
9. *Idionyx nadaganensis* Fraser
10. *Idionyx nilgiriensis* (Fraser)
11. *Idionyx periyashola* Fraser
12. *Idionyx rhinoceroides* Fraser
13. *Idionyx saffronata* Fraser
14. *Idionyx travancorensis* Fraser
15. *Macromia anaimalaiensis* Fraser
16. *Macromia bellicosa* Fraser
17. *Macromia ellisoni* Fraser
18. *Macromia flavotittata* Fraser

19. *Macromia ida* Fraser
20. *Macromia indica* Fraser
21. *Macromia irata* Fraser
22. *Macromia miniata* Fraser
23. *Macromia whitei* Selys
24. *Macromidia donaldi* Fraser
25. *Somatochlora daviesi* Lieftinck

Family LIBELLULIDAE

1. *Hylaeothemis fruhstorferi apicalis* Fraser
2. *Hylaeothemis gardeneri* Fraseri
3. *Orthetrum martensi* Asahina
4. *Zygonyx iris davina* Fraser
5. *Zygonyx iris intermedia* Lahiri
6. *Zygonyx iris metallica* Fraser
7. *Zygonyx torrida isis* Fraser
8. *Zygonyx iris malabarica* Fraser
9. *Epithemis mariae* Laidlaw

DISCUSSION

About five hundred species and subspecies of odonates occur in India* Of these two hundred one (or 40%) are endemics and 5% genera are endemics. This high rate of endemism is due to diversified ecosystems in the main landmass. Certain areas in North-East India, Himalays, Western Ghats are politically sympatric but divided into ecologically allopatric areas. Hence population of Odonata have been divided into subpopulations and finally new taxa (Mitra 1999). Distribution of species and subspecies as per genus has been cited by Mitra (2000b); and as per family has been indicated in the present list of endemics. Following will demonstrate the causes of high rate of endemism.

Peculiarities in the distribution of endemics : It is well known that dragonflies have great powers of flight. Inspite of this, several species have got peculiar local distribution. In the Himalayas,

* Tsuda (1991) reported 494 species and subspecies from India; Tsuda (2000) reported 497 species and subspecies from the country but he omitted four species, of them one endemic *Elattoneura nihari* Mitra) has been cited here. Hence the total number of odonate species occur comes to 501.

hills of North-East India, Western Ghats, and Andaman and Nicobar islands, several species which are usually rare are confined to a small stretch of river-bed or in a patch of marshy land. In addition to their localized distribution, there are several species which are very seasonal and are usually single-brooded and live for a few weeks only. Among the endemics *Echo margarita margarita* is confined in the North-East India; *Megalestes irma* in Eastern Himalayas; *Gomphidia leonorae* in the Susunia hill of West Bengal; *Epithemis mariae* in the Western Ghats; *Libellago lineata andamanensis* in the Andamans; *Libellago lineata blanda* in the Nicobars. Some taxa occur in several parts of India. For instance, *Onychogomphus duaricus* occurs in West Bengal, Meghalaya and Uttar Pradesh; *Epophthalmia vittata vittata* occurs in the peninsular India, West Bengal and Uttar Pradesh.

Barriers in the distribution of Indian Odonata : India is practically isolated from the whole of the world. It has been made possible after the break of Panagea, due to which India has become surrounded by seas and oceans. After the rise of the Himalayas and extension of the Thar desert the isolation has been completed. It has great influence on native culture as well as fauna and flora. Therefore the high rate of endemism in the biological world is due to barriers—Thar desert, Himalayas, oceans and seas. Moreover within the country hills, streams as well as forest provide different ecosystems for different taxa and isolate them from others in the same political or administrative area. The high rate of endemismm in a small state, Meghalaya, (33 out of 148 species and subspecies) indicate that political or administrative areas apparently appear sympatric but are ecologically divided into several allopatric zones. Occurrence of three subspecies—*Neurothemis intermedia intermedia, N.I. degener* and *N. I. atalanta* in Sikkim, proves the above facts. Lack of perennial water source is the cause for less number of species in Andamans than that of Arunachal Pradesh, although both are areas of rain forests. Occurrences of *Libellago lineata andamanensis* in South Andaman and *Libellago lineata blanda* in Great Nicobar clearly shows that they are unable to cross 135 kms. wide sea. A few species can cross the high altitudes of the Himalayas and the Thar desert but not all.

SUMMARY

The paper deals with a list of endemic genera (7) and endemic species and subspecies (201), zoo-centres and faunal affinities of Indian Odonata as well as peculiarities in the distribution of endemics and barriers in the distribution.

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REFERENCES

Emerson, A. E. 1955. Geographical origins and dispersons of termite genera. *Eieldiana (Zool).* **37** : 465-521.

Hutchinson, G. E. 1957. Concluding remarks. *Cold Spring Harb, Symp. Quant. Biol.* **22** : 415-427.

Kiauta, B, 1984. Aktuelle Probleme der Zytotaxonomie, erläutert an Beispielen bei sudasiatischen Prachtlibellen (Odonata : Chlorocyphidae) und schweizerischen Köcherfliegen (Trichoptera : Limnephilidae) mit Bemerkungen über die Bedeutung der Zytotaxonomie für die Umwelt forschung. *Opusc. zool. flumin.* **1** : 1-20.

Lineftinck, M. A. 1984. Further notes on the specific characters of *Calicnemia* Strand, with a key to the males and remarks on Some larval forms (Zygoptera : Platycnemididae). *Odonatologica* **13**(3) : 351-375.

Mitra, T R. 1999. Geographical distribution and zoogeography of Odonata (Insecta) of Meghalaya, India. *Rec. zool. Surv. India. Occ. pap.* **170** : 1-63.

Mitra, T. R. 2000 (a). A note on an Odonata collection from Orissa, India. *Notul. Odonatol.* **5**(5) : 60-61.

Mitra, T. R. 2000 (b). Diversity and Zoo-centres of Indian Odonata. *Fraseria* (N.S.) **6** : 21-28 (1999).

Roonwal, M. L. and S. C. Verma 1977. Resurvery of the termite fauna of Rajasthan, India and its Zoo-geography. *Rec. zool. Survey. India* **72** : 425-480.

Tsuda, S. 1991. A distributional list of World Odonata, 1991. Osaka Pref. pp. 1-362.

——, 2000. Ibid, 2000. Osaka Pref. pp. vi+1-430.