



## Diversity and Economic Importance of Mayflies (Ephemeroptera) From Kolhapur Region, India.

### KEYWORDS

Mayflies, diversity, economic importance, Kolhapur, India.

**Kamble Rohini P.**

**\*Professor(Dr). T.V.Sathe**

Dept. of Zoology, Shivaji University, Kolhapur, India.

Dept. of Zoology, Shivaji University, Kolhapur, India.  
\*corresponding author

**ABSTRACT** *May flies and their nymphs (naids)(Ephemeroptera) constitute an important food source for many fishes, amphibians, reptiles, birds, large insects and many aquatic invertebrates and are good indicators of water quality. Therefore, biodiversity and economic importance of may flies from Kolhapur region, India have been studied. A total of 33 species of mayflies belonging to 25 genera and 11 families have been reported predated by amphibians, reptiles and many fishes from Kolhapur region.*

### INTRODUCTION

May flies (Ephemeroptera) are the most primitive and ancient of the extant insect groups (Edmunds and Mc Cafferty, 1988) dating back to the late carboniferous or early Permian periods, some 290 mya. Globally, there are about 3000 species of mayflies belonging to 400 genera and 42 families. Out of which 390 species belonging to 84 genera and 20 families occur in the oriental region. From India, 124 species of mayflies have been recorded under 46 genera and 12 families (Sivaramkrishnan et al., 2010). Adult mayflies are terrestrial and immature forms are aquatic and called naids (nymphs).

May fly nymphs colonise a variety of locations including lakes, wetlands, streams and rivers. Generally, may fly adults live from a few hours to a few weeks depending on species since they don't have mouth parts. May flies are very important source of food for fishes and act as an indicator of good water quality since they are relatively intolerant to pollution. Review of literature indicates that Linnaeus (1758), Leach (1815), Pictet (1843-1845), Eton (1871, 1883-1888), Edmunds (1962), Mc Cafferty (1991), Mc Cafferty and Wang (2000), Kluge (2004), Barber- James et al., (2008), Sivaramkrishnan et al., (2010), Subramanian and Sivaramkrishnan (2010), etc contributed on Mayflies.

### MATERIALS AND METHODS

Adult may flies were collected with the help of insect hand net at morning hours from 7.00 am to 8.00 am and preserved in 70% alcohol time being before preparations of slides. After dehydration with different alcoholic grades, the specimens were cleaned with xylene and mounted on slides. Many times spot observations have been taken and May flies were released in the environment from which they were collected. The naids (nymphs) of mayflies were collected with the help of a simple triangular hand net with a side length of approximately 20 cm attached to a long handle for use in deeper water. A short, shallow net bag of 20 cm length and made of stiff plastic or wire was found useful for collection of naids. With the help of taxonomical and key characters the species have been identified consulting appropriate literature cited in references. Observations were also taken on the May fly (imago + naids) predation by fish fauna from various aquatic ecosystem of Kolhapur region including Ghats, India. Kolhapur is situated between 15° to 17° North latitude and 73°-74° East longitude with an average rain fall 1100mm covered mainly

by monsoon.

### RESULTS

Results are recorded in table and figs 1 to 4. The results indicate that a total of 33 species of Ephemeroptera (Mayflies) were prevalent in Kolhapur region of India. The important genera refers to Prosopistoma, Choroterpes, Edmundsula, Isca, Nathanelia, Notophlebia, Petersula, Thraululus, Eatonigenia, Ephemera, Epheron, Euthyposia, Potamanthus, Rhoenanthus, Potamanthellus, Caenis, Clypeocaenis, Ephemerella, Baetis, Cloeon, Teloganodes, Ecdyonurus, Epeorus and Proclon. The May flies nymphs and imagoes were predated by amphibians, reptiles and many fishes (table-1). It has been noted that mayfly naids were very good source of food for many freshwater fishes (table-1).

**Table-1 Diversity and economic importance of May flies from Kolhapur region, India**

Sr.No	Mayfly species	Locality/habitat	Economic importance: naids predated by fishes
1.	Prosopistoma indicum Peters (Prosopistomidae)	Running fresh water	Cyprini
2.	Choroterpes (Euthraululus) alagarensis B. & A. (Leptophlebiidae)	Running fresh water	Cyprini
3.	Edmundsula lotica Sivaramkrishnan (Leptophlebiidae)	Running/ Stagnant fresh water inhibiting in submerged vegetation and leaf litter	Labeo rohita Ham.
4.	Indialis badia Peters & Edmunds (Leptophlebiidae)	Running/ Stagnant fresh water inhibiting in submerged vegetation and leaf litter	Labeo rohita

Sr.No	Mayfly species	Locality/habitat	Economic importance:naids predated by fishes
5.	Isca (Isca) purpurea Gillies (Leptophlebiidae)	Running/ Stagnant fresh water  inhibiting in submerged vegetation and leaf litter	Catla catlaHam.
6.	Nathnella indica Demoulin (Leptophlebiidae)	Running/ Stagnant fresh water inhibiting in submerged vegetation and leaf litter	Cyprinus sp.
7..	Nathanelia sarawathia S.V.&B. (Leptophlebiidae)	Running/ Stagnant fresh water  inhibiting in submerged vegetation and leaf litter	Cyprinus sp,Catla sp.
8.	Notophelebia jobi Sivramkrishnan & Peters (Leptophlebiidae)	Running/ Stagnant fresh water  inhibiting in submerged vegetation and leaf litter	Cyprinus sp.
9	Petersula courtallensis Sivramkrishnan (Leptophlebiidae)	Running/ Stagnant fresh water  inhibiting in submerged vegetation and leaf litter	Cyprinus sp.
10	Petersula nathani Sivramkrishnan & Hubbard (Leptophlebiidae)	Running/ Stagnant fresh water  inhibiting in submerged vegetation & leaf litter	Rita rita (Ham).
11	Thraululus gopalani Grant & Sivramkrishnan (Leptophlebiidae)	Running/ Stagnant fresh water  inhibiting in submerged vegetation and leaf litter	Cyprinus sp.
12	Thraululus mudumalaiensis AS (Leptophlebiidae)	Running/ Stagnant fresh water  inhibiting in submerged vegetation and leaf litter	Cyprinus sp.
13	Eatonigenia indica (Chora) (Ephemeridae)	Running fresh water	R. rita
14	Ephemera sp. (Ephemeridae)	Stagnant, freshwater, bottom inhibiting and burrowing	Labeo rohita, Rita sp.
15	Euthyplosia punensis Dubey (Polymitarcyidae)	Running fresh water	Cyprinus sp.
16	Ephoron annandalei (Chopra) (Polymitarcyidae)	Running fresh water	Catla sp, Toads
17	Ephoron indicus (Pictet) (Polymitarcyidae)	Running fresh water	Catla sp, Rita sp

Sr.No	Mayfly species	Locality/habitat	Economic importance:naids predated by fishes
18	Potamanthus subcostalis Navas (Potamanthidae)	Running fresh water	Cyprinus, Catla, Rita
19	Rhoenanthus distafurcatus B.&M. (Polymitarcyidae)	Running fresh water	Rita sp, Toads
20	Potamanthellus ganges B.&M. (Neoephemeridae)	Running fresh water	Labeo, Rita
21	Caenis perpusilla Walker (Caenidae)	Running fresh water inhibits in silty bottom	Cyprinus sp.Catla sp.Rita sp.
22	Clypeocaenis multisetosa Soldan (Caenidae)	Running fresh water	Cyprinus
23	Ephemerella indica Kapur & Kripalani (Ephemerellidae)	Running fresh water	Ciprini
24	Telogramodes dentatus Navas (Taloganodidae)	Running fresh water	Ciprini
25	Ecdyonurus indicus Hubbard (Heptageniidae)	Running fresh water	Ciprini
26	Epheorus lahaulensis Kapur & Kripalani (Heptageniidae)	Running fresh water	Amphibians
27	Baetis chandraKapur & Kripalani (Baetidae)	Stagnant, freshwater, inhibited in submerged vegetation and leaf litter	Amphibians, reptiles
28	Baetis septemmensis Dubey (Baetidae)	Stagnant, freshwater, inhibited in submerged vegetation and leaf litter	Amphibians, reptiles
29	Baetis seragrui Dubey (Baetidae)	Stagnant, freshwater, inhibited in submerged vegetation and leaf litter	Amphibians, reptiles
30	Baetis solitarius Gillies (Baetidae)	Stagnant, freshwater	Amphibians, reptiles
31	Cloeon bicolor Kimmins (Baetidae)	Running fresh water	Ciprini
32	Cloeon taeniatum Navas (Baetidae)	Running fresh water	Ciprini
33	Procloeon bimaculatum Eaton (Baetidae)	Running fresh water	Ciprini

**DISCUSSION**

According to Balachandran et al May flies are most primitive insects possessing soft body and two pairs of wings and nearly cosmopolitan in distribution. They have three stages of life cycle namely egg,nymph (naid) and adult (imago). Nymphs mostly feed on algae from under water

rocks and higher plants or by extracting food particles from mud. Streams, rivers, brooks, lakes, marshes and ponds were the aquatic habitats for breeding nymphs. Baetids and Leptophlebiids were with large gills and their nymphs inhabited in submerged vegetation and leaf litters while nymphs of *Caenis* species were found in silty bottoms and their gills were protected by an operculum. The nymphs of Tricorythids inhabited on sand bottoms, with long claws and brushes on the head. The nymphs of *Ephemera* sp. were bottom inhabiting and burrowing with tusk. The nymphs of Heptageniids were characterized by having clasping legs and flat body. The naids and imago of Odonates and Mayflies and larvae of mosquitoes were widely predated by several fishes from Kolhapur region of India. (Jayram, 2010; Sathe, 2014; Londhe & Sathe, 2015).

Mayflies were responsible for breakdown and recycling of organic matter that entered the stream/ water body from outside sources and played an important role in the food chains of aquatic environments. According to Balchandran et al., the mayflies and their nymphs constituted very important food resources for many fishes, amphibians, reptiles, birds, large insects and various aquatic invertebrates. The present work is the first report of May flies and their predation by various predator like fishes, amphibians and reptiles. The index of Mayflies and predatory fishes will help in future for investigating ideal food for fishes and further fulfillment of the nutritional need of humans. In the present study a total of 33 species belonging to 25 genera and 11 families have been reported as preys for several fishes, amphibians and reptiles. Although many workers reported may flies from various aquatic ecosystems such as lakes, wetlands, streams and river, however, they were more diversified in running water or lotic habitats than in lakes or ponds.

#### ACKNOWLEDGEMENT

Authors are thankful to Shivaji University, Kolhapur for providing facilities to this work.



Fig. 1- *Ephemera* sp.



Fig. 2- Ephemerid



Fig. 3- *Epeorus* sp.



Fig. 4- *Caenis* sp.

#### REFERENCE

- 1) Barber- James, Helen M., Gattoliat, Jean-luc., Sartori, Michel and Hubbard, Michael D(2008). Global diversity of mayflies (Ephemeroptera, Insecta). *Hydrobiologia*.595:339-350.
- 2) Eaton, A. E., (1883-1888). A revisional monograph of recent Ephemeridae or mayflies. Transactions of the Linnean society of London, 2nd series, Zoology 3:1-352.
- 3) Edmunds G.F., (1962). The principles applied in determining the hierarchic level of the higher categories of Ephemeroptera. *Systemic Zoology* 11:22-32.
- 4) Hubbard MD; peters WL(1978). A catalogue of Ephemeroptera of the Indian subregion. *Oriental Inst (supplement)*9:1-43.
- 5) Jayram, K.C. 2010. The freshwater fishes of Indian region. 2nd edition. Narendra publication house New Delhi 11006, India. 1-616
- 6) Kluge, N.J.(2014). The phylogenetic system of Ephemeroptera. Kluwer Academic publishers, Dordrecht 1-442.
- 7) Leach W.E.(1815). *Entomology*. Brewster's Edinburgh Encyclopaedia, 9:57-172.
- 8) Linnaeus (1758). *Systema Naturae*. Ed.XZ.vol.1 Holmiae.
- 9) Londhe Sheetal D and T.V.Sathe 2015. Fish faunal diversity and occurrence from lakes of Kolhapur district. *Biolife*, 3(2),437-441.
- 10) Mc Cafferty, W.P., (1991). Toward a phylogenetic classification of the Ephemeroptera (Insecta): a commentary on systematics. *Ann ent.Soc.Ami*.84:343-360.
- 11) Mc Cafferty, W.P and T. Q.Wang. 2000. Phylogenetic systematic of the major lineages of pannota mayflies (Ephemeroptera: panota). *Trans. Am. Ent. Soc*; 126,9-101.
- 12) Pictet F.J (1843-1845). *Histoire naturelle generatlet particuliere des Insects Neuropteres*. Famille des Ephemerines- Bailliere edit., paris (Kessmann et Cherbuliez edit.).300 pp.
- 13) Sathe T.V. 2014. Dragonflies production technology. *Astral Int. Nat. pvt ltd New Delhi* – pp 1-100.
- 14) Sivaramkrishnan,K.G., Venkataraman,K.,Moorthy,R.K., Subramanian,K.A. and Utkarsh,G(2000). Aquatic Insect Diversity and Ubiquity of the streams of the Westren Ghats, India. *J. Indian Inst.Sci*.80,537-552.
- 15) Subramanian and Sivaramkrishnan (2010). A new species of Symbiocloeon (Ephemeroptera:Baetidae) associated with a fresh water mussel from India. *Oriental Ins*.71-76.