

STONEFLY-FAUNA (INSECTA: PLECOPTERA) OF J&K STATE (INDIA): CHECKLIST AND BIODIVERSITY

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ABSTRACT

More than 15 species of stoneflies, covering 11 genera, belonging to 6 families, viz. Capniidae, Chloroperlidae, Leuctridae, Nemouridae, Perlidae and Perlodidae, are known to occur in cold fresh water bodies such as torrential streams, river (Jhelum) and lakes, in vast areas of Jammu, Kashmir and Ladakh himalayan regions of J&K State. The dominating family is Nemouridae, having 6 species, pertaining to 5 genera, and the dominating genus as *Xanthoperla*, including 3 species. The most dominating and widely distributed species is *Nemoura* sp., followed by *Neoperla* sp., and *Chloroperla* sp. The stonefly species are not only as biological indicator of watershed health but also serve as an important food for fishes, especially trout of this region. An up-to-date checklist of the stonefly species has been provided.

Key Words: *Stoneflies, Checklist, Biodiversity, J & K State (India)*

INTRODUCTION

The stoneflies belong to order Plecoptera, are small or medium-sized amphibiotic insects. The nymphs or naiads of stoneflies are aquatic and need cold and well aerated fresh water for their life activities and development, existing in torrential streams of melts water or still water bodies. The adults of stoneflies resemble nymphs in having long cerci- “tail”, arising from the tip of the abdomen. The adults possess a long pair of wings, folded down the length of the body. In J & K State, the stonefly- fauna have been found to be inhabiting the benthic zones of well oxygenate streams, river and Lakes, in diverse areas of Jammu, Kashmir and Ladakh Himalayan regions of paramount zoogeographical importance. The stoneflies are indicator of good or cleaner water quality, besides serving as important food for cold water fishes of the region such as trout fishes. For nomenclatural changes in the stonefly- fauna of this region, De Walt *et al.*, (2012) has been followed. The present communication not only include the updated checklist of stonefly species, occurring in various water-bodies of this region of Indian sub-continent but also throws light on the earlier bio ecological surveys conducted on these beneficial aquatic insects. In addition to this, diversity and species richness of these insects belonging to this State have been studied.

RESULTSAND DISCUSSION

Systematic and Bio Ecological Survey

The earliest surveys on the stone-fauna of Jammu & Kashmir State have been conducted by: Hora (1930), reported stonefly, *Nemoura* sp. as one of the dominating species, Kimmins (1947) described *Capniapedestris* and Kawai (1963), studied *Capnia* sp. from Kashmir himalyan region (Table 1).

Aubert (1959), for the first time gave descriptions of four new species of stoneflies, inhabiting streams in Daksum, Gulmarg and Pahalgamlocalities of Kashmir region. These new species included *Chloroperla kishanganga*, *Nemouralilami*, *Nemoura polystigma* and *Nemoura (Amphinemura) skardui*, now synonymized as *Xanthoperla kishanganga*, *Illiesonemoura lilami*, *I. polystigma* and *Mesonemouraskardui* respectively (Table 1).

In the recent years, Zwick (1973) recorded stonefly (Perlodid), *Filchneria kuenluensis* from Karakorum Mt. of J & K State and Zwick and Sivec (1980) described a new Chloroperlid, viz. *Xanthoperlaacuta* from Daksum locality of Kashmir (see Table 1).

Table 1: Checklist of Stoneflies (Plecoptera) of Jammu & Kashmir State.

| S No. | Name of The Family/Genus/Species | Distribution | Author(s) Reporting |
|---------------------------------|---|---|---------------------|
| Family 1: Capniidae | | | |
| (1) | <i>Capniapedestris</i> Kimmins | Talis , Kashmir | 08, 10 |
| (2) | <i>Capnia</i> sp. | Kashmir | 07 |
| Family 2: Chloroperlidae | | | |
| (3) | <i>Chloroperla</i> sp. | Sind and Lidder stream (Kashmir), Bishleri stream(Banihal,Jammu) | 05, 02 |
| (4) | <i>Xanthoperlaacuta</i> Zwick | Daksum | 11 |
| (5) | <i>Xanthoperla kishanganga</i> (Aubert) (Syn. <i>Chloroperla kishanganga</i> Aubert) | Daksum | 01 |
| (6) | <i>Xanthoperla</i> sp. | River Jhelum (Uri) | 04 |
| Family 3: Leuctridae | | | |
| (7) | <i>Megaleuctra</i> sp. | Lakes and streams of J&K State | 03 |
| Family 4: Nemouridae | | | |
| (8) | <i>Amphinemurasp.</i> | Bishleri stream, Jhelum (Uri) | 04, 05 |
| (9) | <i>Illiesonemoura lilami</i> (Aubert) (Syn. <i>Nemoura lilami</i> , Aubert) | Gulmarg | 01 |
| (10) | <i>Illiesonemoura polystigma</i> (Aubert) (Syn. <i>Nemoura polystigma</i> , Aubert) | Pahalgam | 01 |
| (11) | <i>Mesonemouraskardui</i> (Aubert) (Syn. <i>Nemoura</i> (<i>Amphinemura</i>)- <i>skardui</i> Aubert) | Daksum | 01 |
| (12) | <i>Nemoura</i> sp. | Bishleri Stream, River Jhelum, Sind and Lidder stream and water bodies in Kupwara | 02,04,05,06,09 |
| (13) | <i>Nemurella</i> sp. | Bishleri Stream | 05 |
| Family 5: Perlidae | | | |
| (14) | <i>Neoperlasp</i> | Lakes, streams and other water bodies of the J&K State | 02,03,04,06 |
| Family 6: Perlodidae | | | |
| (15) | <i>Filchneria kuenluensis</i> (Sa'mal) | KarakorumMt (J&K) | 10 |

01 = Aubert (1959); 02 = Chowdhary (1984); 03 = Chowdhary and Das (1970); 04 = Engblom and Lingdell (1999); 05 = Fayaz et al., (2005); 06 = Hora (1930); 07 = Kawai (1963); 08 = Kimmins (1947); 9 = Pandit et al., (2007); 10 = Zwick (1973); 11 = Zwick and Sivec (1980) ; J & K = Jammu and Kashmir State; Syn= Synonym..

Chowdhary and Das (1970) conducted a detailed survey of different lakes and streams of J& K State, for aquatic entomo-fauna and reported two species of stoneflies as Leuctrid, *Megaleuctra* and Perlid, *Neoperla*, these served as fish food in Kashmir region.

The thorough bioecological studies by Chowdahary (1984) on Plecopterans of two streams, viz. Sind and Lidder (torrential eutrophic), have shown the common to fairly common abundance of stoneflies like *Chloroperlasp.*, *Neoperlasp.* And *Nemoura* sp. in these streams. The population of stoneflies was observed to be higher in Lidder than Sind.

Stoneflies inhabiting river Jhelum in and around Uri region of Kashmir were found to be as *Xanthoperlasp.*, *Nemoura* sp. and *Amphinemurasp.* In addition to these, some Plecopterans have been identified up to the family level such as Perlodids, Perlids, Capiniids and Leuctrids, have been reported (Engblom and Lingdell, 1999).

Research Article

Recently, four stoneflies, belonging to genera such as *Amphinemura*, *Chloroperla*, *Nemoura* and *Nemurella*, from Bishleria stream, Doda (Jammu), have been reported by Fayaz *et al.*, (2005), and from different fresh water bodies of Kupwara region of Kashmir, Pandit *et al.*, (2007), recorded two Plecopterans as *Nemoura* and a Perlodid.

Diversity and Species Richness

More than fifteen species of stoneflies, belonging to eleven different genera, under six different families, viz. Capniidae (small winter stoneflies), Chloroperlidae (green stoneflies), Leuctridae (rolled-winged stoneflies), Nemouridae (spring stoneflies), Perlidae (common stoneflies) and Perlodidae, are known to occur in diverse fresh water bodies (streams, lakes and river), in vast areas and localities of Jammu, Kashmit State (Table 1).

Family Nemouridae is found to be the dominating family of order Plecoptera of the region, incorporating six species, belonging to 5 genera- *Amphinemura*, *Illiesonemoura*, *Mesonemoura*, *Nemoura* and *Nemurella*. In species richness, next to the family Nemouridae is the family Chloroperlidae, having four species, belonging to two genera (*Chloroperla* and *Xanthoperla*), followed by family Capniidae, having 2 species, pertaining to genus *Capnia*. Rest of three families: Leuctridae, Perlidae and Perlodidae, having one species each genera- *Megaleuctra*, *Neoperla* and *Filchneria* respectively (Table 1).

The most dominating and widely occurring species found to be *Nemoura* sp., followed by *Neoperla* sp. and *Chloroperla* sp., in different fresh water bodies of J & K State. Genus *Xanthoperla* is represented by 2 species, whereas genera *Capnia* and *Illiesonemoura*, are having 2 species each. The rest of the eight genera, viz. *Amphinemura*, *Chloroperla*, *Filchneria*, *Megaleuctra*, *Mesonemoura*, *Neoperla*, *Nemoura*, and *Nemurella*, are showing one species each genus (Table 1).

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