

FIRST REPORT ON THE OCCURRENCE OF SOME BENTHIC MACROINVERTEBRATES IN THE SPRING FED STREAMS OF GARHWAL HIMALAYA, INDIA.

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ABSTRACT

The paper deals with the first report on the occurrence of three macrozoobenthic species from the spring-fed streams of Garhwal, Uttarakhand. Genus *Cheumatopsyche* (Hydropsychidae) of the order trichoptera, *Isonychia* (Isonychidae) of the order ephemeroptera and the species i.e. *Corydalus cornutus* (Corydalidae) of the order megaloptera are described as new to Garhwal Himalayan region. Date and site of collection, substratum quality and some detrimental ecological parameters are discussed

Keywords: First Report, *Cheumatopsyche*, *Isonychia*, *Corydalus cornutus*, Garhwal, Uttarakhand

Introduction

Benthic animals are a group of organisms that dwell at the bottom of water bodies. Based on body size they are classified into several groups of micro and macrozoobenthos. The existence of macrozoobenthos is very important in the streams ecosystem as they form an important trophic level being eaten by fish. Several ecological factors influence their population dynamics being detrimental. Water temperature, velocity of water current and amount of dissolved oxygen are principal ones.

Some important contributors toward ecology and population study of benthic biota from the Indian sub continents are Bisht and Das (1980), Dutta and Malhotra (1986), Kumar and Dobriyal (1992, 1996, 1999), Dobriyal et.al. (1999, 2002, 2009, 2011) and Kumar et.al, (2006) but taxonomic work on macrozoobenthos is limited (Subramanian and Sivaramakrishnan, 2007). Present communication is an attempt to contribute towards macro-zoobenthic diversity of Garhwal region by reporting some new species which were earlier not reported by any of the worker

Material and Methods

During the routine survey of macrozoobenthos conducted under the SERB project, three new species were identified. Samples were collected from the spring fed stream Randi gad (Fig 1) and Kyunja gad (Fig 2) and were fixed in ethanol 70 %. Holotypes of the new Genera / species were deposited in Government Post Graduate College Agustyamuni (GPGCA). Specimens were identified to genus or species level mainly

according to the standard keys (Bouchard and Paul, 2012; Contreras-Ramos, 1998; Elliott, et.al., 1988 and Flint, et.al., 2008).



Fig 1: Sampling site (Near Bijju) of of 3rd order stream Randi Gad.
Results and Discussion

The present study was undertaken with the objective to analyze the density and diversity of macroinvertebrate communities of the spring-fed tributaries, the Randi gad of the river Alaknanda and the Kyunja gad of river Mandakani. Two new Genera and one new species of macrozoobenthos are reported for the first time from Garhwal Himalaya. In Randi Gad stream, 35 genera belonging to 9 orders of benthic fauna were obtained from its 3rd order stream. From this



Fig 2: Sampling site (Near Chandrapuri) of 3rd order stream Kyunja Gad.

stream a new genus *Cheumatopsyche* (Hydropsychidae) is reported in Order- Trichoptera and a new species *Corydalis cornutus* (Corydalidae) is reported in the order-Megaloptera. Similarly from 3rd order of Kyunja Gad stream 47 genera belonging to 10 orders of benthic fauna were noted. From this stream a new genus *Isonychia* (Isonychidae) in the order Megaloptera is reported. Date and site of collection, substratum quality and some detrimental ecological parameters are presented in the Table 1.

Table1: Date and site of collection, substratum quality and some detrimental ecological parameters of new species

Name of Genus/species	<i>Cheumatopsyche</i>	<i>Corydalis cornutus</i>	<i>Isonychia</i>
Date of collection	19/11/2017	19/11/2017	10/12/2017
Name of stream	Randi Gad stream	Randi Gad stream	Kyunja Gad stream
Name of collection Site	Near Biju Place	Near Biju Place	Near Chandrapuri
Substratum Quality	Medium size Rocky substratum	Rocky bottom and Big Bolder	Semi rocky, Cobble and Pebbles bottom
D.O. (ppm)	8.3	8.3	8.6
Velocity (m/sec)	0.340	0.340	0.312
Temp (°C)	17.9	17.9	16.9
pH	7.6	7.6	7.4

SYSTEMATICS OF THE NEW SPECIES

Phylum - Arthropoda

Class - Insecta

Order - Trichoptera

Family - Hydropsychidae

Genus - *Cheumatopsyche*

1. *Cheumatopsyche* (larva form)

Type material-

Holotype- (GPGCA) specimen prepared, India, Uttarakhand State, Randi Gad stream, 30°6'28"N, 78°37'30"E, (2017). P. Bahuguna

Paratypes- (GPGCA)- same site and data as holotype.

Date of collection- 19.11.2017

Substrate type- Mostly collected from cobble or bedrock substrate

Habitat ecology: (Table 1)

General Characteristics of *Cheumatopsyche*:

The nota (tops) of all thoracic segments with sclerotized plates.

Most abdominal segments with tufts of finely branched gills;

Dorsal abdominal segments with only plain setae

Prosternum with small scerite or absent

Anal prolegs each terminating in a brush of long setae (Fig.3).



Fig.3: *Cheumatopsyche* (larva)

These caddis flies build tubular retreats and spin silk nets nearby which are used to collect detritus from the water.

Size: Maximum 35mm

Habitat: Small spring fed streams Randi gad

Common Name: Net-Spinner Caddis flies

Size: 25mm

Status: Rare

2. *Corydalus cornutus* (larva form)

Phylum - Arthropoda

Class - Insecta

Order - Megaloptera

Family - Corydalidae

Genus - *Corydalus*

species - *cornutus*

Type material-

Holotype- (GPGCA) specimen prepared, India, Uttarakhand State,

Randi Gad stream, 30°6'28"N, 78°37'30"E, (2017). P. Bahuguna.

Paratypes- (GPGCA)- same site and data as holotype.

Date of collection- 19.11.2017

Habitat type- *Corydalus cornutus* collected from riffles areas in spring fed streams Randigad.

Habitat ecology: (Table 1)

General Characteristics of *Corydalus cornutus*:

Elongate, dorsally flattened body; large jaws projecting forward;

All three thoracic segments with notum sclerotized;

First eight abdominal with 2 segmented lateral filaments and abdominal segment 9 with 2 anal prolegs, each with pair of apical claws (Fig 4).

Fleshy appendages each are bearing a pair of hooks extending from apex of abdominal segment.

Corydalus leave their hiding places at night to hunt for prey. The larvae, which are sometimes used as bait, are usually called hellgrammites.

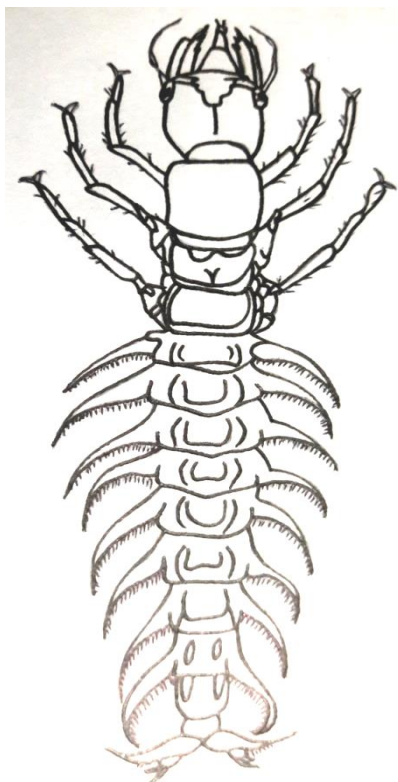


Fig.4: *Corydalus cornutus* (larva) Dorsal View.

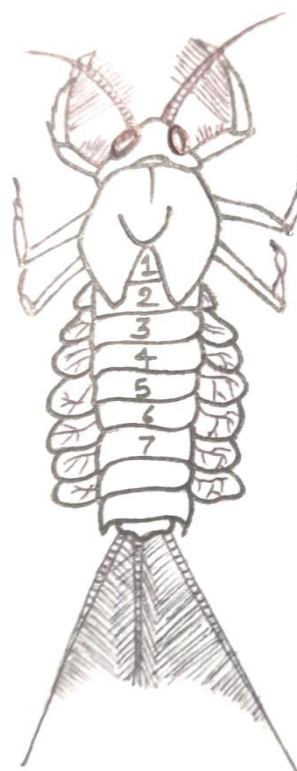


Fig.5: *Isonychia* (larva) Dorsal View.

Common Name: Dobson flies, Fish flies

Size: Maximum 75mm

Status: common

3. *Isonychia*

Phylum - Arthropoda

Class - Insecta

Order - Ephemeroptera

Family - Isonychidae

Genus - *Isonychia*

Type material-

Holotype- (GPGCA) specimen prepared, India, Uttarakhand State,

Kyunja Gad stream, 30°25'37"N, 79°4'20"E, (2017). P. Bahuguna.

Paratypes- (GPGCA)- same site and data as holotype

Date of collection- 10.12.2017

Habitat: Genus occurs in streams and swift or moderate current. Species associated with sticks leaves and roots.

Habitat ecology: (Table 1)

General Characteristics of *Isonychia*:

Forelegs with a double row of long setae.

Gill plates oval and present on abdominal segments 1-7.

Gills on segment 1 similar to other gills.

Gill fibrils shorter than plates.

Long hairs along the margins of caudal filaments. (Fig.5)

Species spend most of the time clinging to the substrate.

The rows of hairs on the tails help these may fly larvae swim by functioning as a paddle.

Common Name: Brush-Legged Mayflies

Size: 20 mm

Status: Rare.

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References

- Bisht, R.S. and Daa, S.M. (1980). Certain aspects of habitat ecology of aquatic entomofauna in two cold water Kumoun lakes. *Indian J.Ecol.* 7: 237-245.
- Bouchard, R.W. and Paul, Jr. S. (2012). Guide to Aquatic Invertebrate Families of Mongolia Identification Manual for Students, Citizen Monitors and Aquatic Resource Professionals. Minnesota, USA: 1-274:
- Contreras-Ramos, A. (1998). Systematics of the dobsonfly genus *Corydalus* (*Megaloptera: Corydalidae*). Monographs, Thomas Say Publications in Entomology, Entomological Society of America. 360 pp.
- Dobriyal, A.K., Balodhi, V P, Joshi, H.K., Thapliyal, A., Bahuguna, P., Uniyal, S.P. and Kotnala, C B. (2009). Substratum heterogeneity and indicator macro-zoobenthos of the Eastern Nayar, Garhwal, Central Himalaya. *J. Mountain Res.* 4: 130-135
- Dobriyal, A.K., Balodi, V.P., Joshi, H.K., Bahuguna, P. and Kumar, N. (2011). Seasonal cyclicity of Macrozoobenthos correlated with detrimental abiotic factors in the Eastern Nayar of Garhwal Himalaya, Uttarakhand. In: Himalayan Aquatic Biodiversity Conservation and new tools in Biotechnology (Eds.J P Bhatt, M. Thapliyal and A. Thapliyal). Transmedia Publication, Srinagar Garhwal. pp. 94-103.
- Dobriyal, A.K., Kumar, N., Kotnala, C.B., Bahuguna, A. K. and Singh, H. R. (1992). Preliminary observation on seasonal trends in macro-zoobenthic diversity in the river Nayar of Garhwal Himalaya. In: Recent researches in cold water fisheries(Editor- K.L.Seahal). Today and Tomorrow Primers and Publishers, New Delhi, India: 119-127.
- Dobriyal, A.K. Balodi, V.P., Uniyal, S.P., Thapliyal, A., Bisht M.S., Joshi, H. and Bisht, K.L. (2002). Species composition and diversity of macro-zoobenthos in the river Western Nayar from Uttaranchal.

Bull. Env. Sci., (2002): 49-57.

Dutta, S.P.S. and Malhotra, Y.R.(1986). Seasonal variations in the macrozoobenthic fauna of Gadigarh stream (Misan Sahib) Jammu. *Indian J. Ecol.* 13(1): 136-145.

Elliott, J., Humpesch, U.H. and Macan, T.T.((1988). Larve of the British ephemeroptera: A key with ecology notes. Freshwater biological association scientific publication No.49:1-142.

Flint, O. S. Jr., Evans, E. D. and Neunzig, H. H. (2008). Megaloptera and aquatic Neuroptera Pp. 425–437. In: R.W. Merritt, K.W. Cummins, and M. B. Berg (editors). An Introduction to the Aquatic Insects of North America. 4th Edition. Kendall / Hunt Publishing Company. Dubuque, Iowa, U.S.A. 1158 pp.

Kumar, K., Rautela, K.K., Bisht, K.L., Joshi, V.D., Rautela, A.S. and Dobriyal, A.K. (2006) Ecological studies on the Biodiversity of river Khoh in the foothills of Garhwal Himalaya: Part II: Macro-zoobenthic analysis. *Aquacult* , 7(2): pp 277- 283.

Kumar, N. and Dobriyal, A.K. (1992). Some observations on water mites of a hillstream Khandagad in Garhwal Himalaya. *J. Freshwater Biol.* 4: 193-197.

Kumar, N. and Dobriyal, A.K. (1996). Benthic diversity of Garhwal Himalayan hill streams in relation to their fishery potential. In: Joseph, M.M. (Ed.) *The Third Indian Fisheries Forum Proceedings*.159-162.

Kumar, N and Dobriyal, A.K. (1999). Correlation of some environmental variables with adaptive net spinning strategies in stream larval hydropsychids (Trichoptera) in Garhwal Himalaya. *Tropical Freshwater Biology, Nigeria*. 8 : 27-30

Subramanian, K. A. and Sivaramakrishnan, K.G. (2007). Aquatic Insects of India-A field guide. Ashok Trust for research in ecology and Environment (ATREE). Small Grants Programme: 1-63.

Wallace, I. D., Wallace, B., Philipson, G. N. (2003). Keys to the case-bearing caddis larvae of Britain and Ireland. *Freshwater Biological Association, Scientific Publication* 61: 1-259.