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DENSITY AND DIVERSITY OF AQUATIC MITES IN A SPRING FED STREAM OF GARHWAL HIMALAYA, INDIA

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Abstract: Hydrachnidia, commonly called water mites are an important and diverse group of benthic insects which is usually neglected by the aquatic biologists in their routine biodiversity duties. Present study is an attempt to investigate the dynamics and diversity of water mites from a freshwater stream Randi Gad from Pauri Garhwal which is a lower order stream of river Alaknanda. Mites were collected using a square framed Surber Sampler of $1m^2$ of the stream bed. Samples were preserved and brought to laboratory for further study. A total of fourteen species from five families were observed with a maximum density of 138 mites.m^{-2} in the month of January. Coefficient of similarity and Shannon wiener diversity index was calculated for diversity and cluster analytical study.

Keywords: Water mites, Randi Gad, Spring-fed Stream, Pauri Garhwal

Introduction

The water mites represent an important group of aquatic invertebrates which is almost neglected by the aquatic biologists. However, it is an important structural and functional unit of river systems. Mites of freshwater streams are often examined for seasonal cyclicity studies (Dutta and Malhotra, 1986), as biological indicators (Gerecke, and Schwoerbel, 1991; Smith and Vander, 1992), for molecular characterization (Otto and Wilson, 2001) and also for biodiversity assessment purposes (Cook, 1967,1974; Prashad, 1974). The knowledge regarding distribution of aquatic mites in river ecosystems of India is limited and highly fragmentary (Kumar and Dobriyal, 1992, 93; Kumar et.al., 2007; Pesic et.al., 2007, 2019a, 2019b). Aquatic mite fauna of India includes 275 species in 70 genera and 25 families (Pesic et. al., 2010). Kumar and Dobriyal (1992) undertook some preliminary studies on the water mites of Garhwal Himalayas and described certain genera of lotic water species. After a long gap the research on aquatic mites restarted in the first decade of 21th century (Kumar *et al*. 2006, 2007, Pesic *et al*. 2007a, b and Pesic et.al, 2019 a, b).The present study is an another significant attempt on density and diversity of water mites in a spring fed stream from Garhwal Himalaya.

Material and Methods

Study Area

Randi is an important third order spring fed stream (Latitude -30°07'06"N and 78°35'21"E). It is an important tributary of Alaknanda River (Fig.1), which originates from the Ransi and Jhandidhar Peak in the Pauri Garhwal region. The flow regime is characterised by wide seasonal fluctuations, with peak flow during monsoon and the least during summer season. A 20km-long stretch of the stream just upstream from

Alaknanda River was chosen as the study area. It has a stony substratum consisting of gravel, cobbles and a few boulders. The mean channel width is 7.0m and the mean depth is 0.70m during the study period (October 2017 to September 2018).

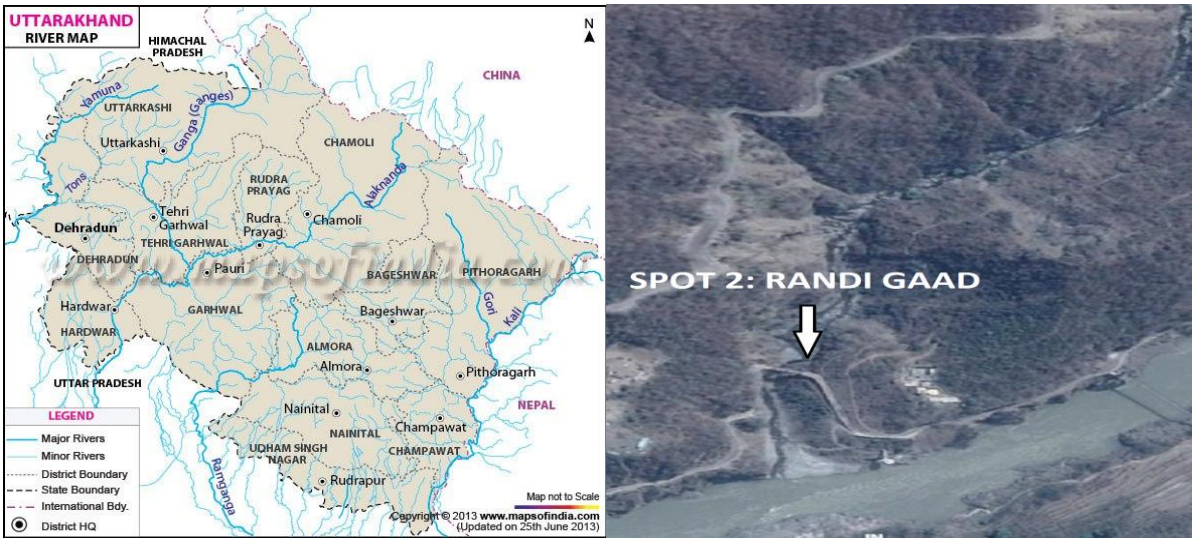

Fig 1: Location map of Pauri in Uttarakhand and view of Randi Gad stream

Sampling Design and Analysis

For density and diversity study of aquatic mites a square framed Surber Sampler was used that enabled the sampling of $1m^2$ of the stream bed. The mite samples were collected from the stones very carefully. Species identification was done with the help of various keys provided by Cook (1967, 1974), Prasad (1974), Gerecke (2003), Kumar et.al. (2007), Pesic and Panesar (2008).

Results and Discussion

The monthly variations in the density and diversity of different aquatic mites (units.m^{-2}) in the stream Randi gad during the year 2017-18 is presented in Table 1. A total of fourteen species from five families were observed. A maximum number of 138 mites.m^{-2} was recorded in the month of January and minimum density of 03 mites.m^{-2} was observed in the month of July 2018. The dominant species obtained in the river Randi gad were *Torrenticola turkestanica, Monatractides oxystomus, Sperchon indicus, Sperchon garhwaliensis, Atractides indicus, Atractides garhwali, Kongsbergia indica, Kongsbergia rucira and Feltria gereckei.*

The Shannon-Wiener Index ($H^{/}$) for the aquatic mites communities of the stream Randi Gad during the year 2017-18 are shown in the Table 2. The value of $H^{/}$ was maximum 3.1450 in January and a minimum value of 2.7743 was observed in May. The similarity Index (S) between taxa of different months during are presented in the Table 3. The Index showed relatively higher values during favourable months (winter season) and lower during unfavorable months (monsoon season.

Table 1: Density and diversity of aquatic mites in stream Randi Gad at 3rd order stream**.**

	Name of species	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
A	**Family – Torrenticolidae Piersig, 1902**												
	Genus - *Torrenticola* Piersig, 1902												
01	*Torrenticola uttarakhandensis*	02	04	06	07	03	01	00	01	04	00	01	00
02	*Torrenticola chatterjeei*	00	02	04	05	00	02	00	01	00	00	00	01
03	*Torrenticola turkestanica*	16	12	08	13	17	05	05	07	00	01	02	00
04	*Torrenticola wonchoeli*	00	00	02	05	00	00	02	00	02	00	00	00
	Genus - Monatractides K.Viets, 1926												
05	*Monatractides oxystomus*	12	17	16	10	12	07	05	05	00	00	00	02
	Total	**30**	**35**	**36**	**40**	**32**	**15**	**12**	**14**	**06**	**01**	**02**	**03**
B	**Family – Sperchontidae Thor, 1900**												
	***Genus - Sperchon* Kramer, 1877**												
06	*Sperchon indicus*	15	18	19	28	18	11	09	08	07	01	00	06
07	*Sperchon garhwaliensis*	14	09	09	19	14	05	05	00	04	00	01	02
	Total	**29**	**27**	**28**	**47**	**32**	**16**	**14**	**08**	**11**	**01**	**01**	**08**
C	**Family - Hygrobatidae Koch, 1842**												
	***Genus - Atractides* Koch, 1837**												
08	*Atractides indicus*	09	10	08	14	15	05	05	07	00	00	02	00
09	*Atractides garhwali*	07	05	10	05	00	01	00	05	03	00	01	03
10	*Atractides yukii*	00	05	04	01	03	00	02	00	00	00	00	00
11	*Atractides incertus*	01	00	10	05	04	02	03	00	01	00	00	01
	Total	**17**	**20**	**32**	**25**	**22**	**08**	**10**	**12**	**04**	**00**	**03**	**04**
D	**Family - Aturidae Thor, 1900**												
	***Genus - Kongsbergia* Thor, 1899**												
12	*Kongsbergia indica*	04	00	18	16	00	06	06	05	04	00	00	05
13	*Kongsbergia rucira*	00	09	10	10	04	00	04	08	05	00	03	00
	Total	**04**	**09**	**28**	**26**	**04**	**06**	**10**	**13**	**09**	**00**	**03**	**05**
E	**Family - Feltriidae K.Viets, 1926**												
	***Genus - Feltria* Koenike, 1892**												
14	*Feltria gereckei*	00	11	12	00	08	08	05	00	04	01	00	03
	Total	**00**	**11**	**12**	**00**	**08**	**08**	**05**	**00**	**04**	**01**	**00**	**03**

Table 2: Shannon-Wiener diversity Index for aquatic mites at Randi Gad stream during 2017-18.

Month	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
H/	1.981	1.573	1.829	1.883	1675	1.782	1.635	1.666	1.399	0.732	1.401	1.509

Table 3: Similarity index (S) between aquatic mites taxa of different months during the year 2017 - 2018 at the Randi gad stream.

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Oct	-	0.800	0.869	0.818	0.736	0.900	0.700	0.777	0.667	0.333	0.667	0.706
Nov	-	-	0.880	0.833	0.857	0.818	0.727	0.700	0.600	0.428	0.706	0.631
Dec	-	-	-	0.963	0.833	0.880	0.880	0.956	0.696	0.353	0.600	0.727
Jan	-	-	-	-	0.782	0.833	0.833	0.818	0.727	0.250	0.631	0.667
Feb	-	-	-	-	-	0.761	0.857	0.631	0.631	0.461	0.555	0.625
Mar	-	-	-	-	-	-	0.727	0.900	0.700	0.428	0.588	0.842
Apr	-	-	-	-	-	-	-	0.600	0.700	0.428	0.470	0.421
May	-	-	-	-	-	-	-	-	0.555	0.333	0.533	0.706
Jun	-	-	-	-	-	-	-	-	-	0.333	0.533	0.706
Jul	-	-	-	-	-	-	-	-	-	-	0.222	0.363
Aug	-	-	-	-	-	-	-	-	-	-	-	0.286
Sep	-	-	-	-	-	-	-	-	-	-	-	-

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