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Short Communication

Crustacean communities of freshwaters of Kashmir

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Abstract

The paper discusses the crustacean communities of seventeen water bodies of four different categories (lakes, springs, wetlands and ponds) of Kashmir. Twenty-six species of crustacea (Twenty cladocerans and six copepods) formed seventy-six associations in fourteen water bodies. Three water bodies revealed complete absence of cladocerans and copepods in them. Comparing the different categories, ponds contained the highest population density and the springs the least.

Key words: Lakes, springs, ponds, wetlands, cladocera, copepoda.

1. Introduction

The valley of Kahsmir (33°, 01′–35°, 00′ N and 73°, 48′–75°, 30′ E) abounds in numerous freshwater bodies which are important for fishery, agriculture and recreation. There is enough evidence in literature[1-5] to show that the differences in the crustacean associations of the different aquatic habitats reflect difference in the nature as well as the trophic level of the water bodies. The present study was undertaken to investigate the variability in the crustacean communities of some typical aquatic habitats of the valley. In this connection seven lakes (i. Khush-hal Sar, ii. Anchar, iii. Wular. iv. Dal, v. Nagin, vi. Manasbal, vii. Malpur Sar), two wetlands (viii. Hokarsar and

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ix. Mirgund), one pond (x. Malla Bagh pond) and seven springs (xi. Achhabal, xii. Malakhnag, xiii. Beehama, xiv. Malla Bagh, xv. Andernag, xvi. Gajinag and xvii. Saidakadal), all situated at about the same altitude (c. 1600 m/ASL), were sampled for various physical, chemical and biological parameters in September 1980.

2. Methods

Water samples were collected by a Van-Dorn type sampler and analysed in the laboratory for various chemical factors as per the methods of Welch[6], Mackereth[7] and Taras[8]. For the zooplankton collection, horizontal and vertical hauls were taken at several places from each water body by a net having 60 meshes/cm. For quantitative study 10–20 litres of water were sieved through the same net. In both the cases plankton sample was fixed and preserved in 4% formalin and later studied in the laboratory.

3. Results and discussion

The data pertaining to the physical and chemical characteristics of the various water bodies are presented in Table I. A perusal of the data reveals that the water temperature in the lentic habitats (lakes, ponds and wetlands) follows closely that of the atmosphere but in case of lotic waters (springs) the underground source and continuous flow of water results in an appreciable difference between the air and water temperature. All the waters are alkaline (pH = 7·54 to 8·90), the pH being lowest in case of springs and highest in ponds. The alkalinity in all waters is mainly due to the bicarbonates of Ca^{++} and Mg^{++} especially in springs where large quantities of Ca^{++} and Mg^{++} bicarbonates were recorded. Very low oxygen content was recorded in springs. Such a phenomenon has also been reported by Qadri and Yousuf[9] and it seems to be related to the underground source of the water and low photosynthetic activity in such habitats due to scarce phytoplankton and macrovegetation[10]. All other water bodies, except for Malla Bagh pond and Khush-hal Sar lake, contain considerable quantities of oxygen mainly due to the photosynthetic activity of phytoplankton and macrophytes, especially the latter which are abundant in most of these waters. In Khush-hal Sar lake large quantities of raw sewage are daily added from the adjoining areas and the decomposition of this sewage results in decrease in oxygen. This is substantiated by the exceptionally high CO_2 (70 mg/l) and PO_4-P (0·729 mg/l) values in the lake as a result of liberation of PO_4 from the ferric complex in the absence of oxygen[11]. The presence of low O_2 values in Malla Bagh pond are also due to the decomposition of organic matter which releases large quantities of CO_2 (44 mg/l).

The amount of nutrients is generally low in all the water bodies except Saida Kadal spring. Kaul[12] has regarded the low nutrient values to be due to their locking

Table I

Physico-chemical variables of different water bodies

Factor	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII
Atm. Temperature °C	22·0	23·7	26·0	24·5	24·5	22·5	23·0	26·3	24·5	24·3	26·0	25·5	26·4	23·5	23·5	23·8	25·5
Water Temperature °C	20·5	22·5	20·0	23·5	24·0	22·2	20·7	19·5	24·0	18·0	10·7	22·0	18·4	18·0	19·4	19·4	17·5
pH	7·71	8·08	8·00	8·47	8·54	8·50	8·30	7·55	8·40	8·90	7·57	7·78	7·72	8·10	7·80	7·63	7·69
Free CO_2 Mg/l	70	18	18	12	6	16	22	44	40	44	42	30	32	42	36	26	88
HCO_3 alkalinity mg/l	256	86	72	100	72	90	122	114	164	166	110	196	144	300	156	154	340
Ca + Mg Hardness Mg/l	316	136	88	144	92	104	148	124	180	240	224	184	224	300	212	204	444
Dis. O_2 mg/l	2·8	7·2	7·6	15·6	11·2	7·2	9·6	1·6	13·6	4·4	1·8	0·8	6·8	4·4	2·8	1·2	1·6
Sulphate mg/l	18·2	7·7	5·9	4·3	3·4	5·2	1·8	2·4	6·2	5·5	1·9	1·5	4·4	5·0	2·8	1·7	26·0
Silicate mg/l	12·8	3·0	10·5	6·0	3·6	5·8	3·0	10·7	10·0	8·3	9·2	13·7	10·0	10·7	13·0	15·5	18·0
NO_3 — N mg/l	0·35	0·09	0·39	0·14	0·11	0·65	0·28	0·19	0·73	0·74	0·61	0·19	0·89	0·70	0·21	0·12	12·8
NH_3 — N μg/l	360	×	6	2	×	2	×	6	2	48	×	122	3	×	×	39	1
NO_2 — N μg/l	1·5	0·4	4·3	0·5	0·7	0·4	0·4	1·5	0·3	0·8	1·3	4·0	8·8	1·2	3·3	15·7	25·6
PO_4 — P μg/l	729	12	39	3·5	16	5	12	×	12	10	23	104	2	4	80	86	84

I–XVII. Water bodies (list of the water bodies given in the text).

Table II
Species composition in different water bodies

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	No. of occurrences
CLADOCERA															
Latonopsis occidentalis	—	—	—	—	+	+	—	—	—	—	—	—	—	—	2
Diaphanosoma brachyurum	—	—	—	+	—	+++	—	—	—	—	—	—	—	—	2
Simocephalus vetulus	+++	—	—	—	—	—	—	+	—	—	—	—	—	—	2
S. serrulatus	—	—	—	—	—	—	—	—	—	++	—	—	—	—	1
S. elizabithae	+++	—	—	—	—	—	—	—	—	++	—	—	—	—	2
Scapholeberis kingi	+	—	—	—	—	—	+	—	—	++	—	—	—	—	3
Ceriodaphnia reticulata	++++	—	—	+	+	+	—	+	—	+	—	—	—	—	6
Bosmina longirostris	—	—	+	+	+	—	—	—	—	—	—	—	—	—	3
Leydigia acanthocercoides	—	—	—	—	—	—	—	—	—	—	—	—	—	+	1
Lathonura sp.	—	—	—				—			—	—	—	—	—	1
Macrothrix sp.															

Acroperus harpae	—	+	—	—	—	—	+	—	—	+	—	—	—	—	3
Graptoleberis testudinaria	—	+	—	+	+	+	—	—	—	—	—	—	—	+	5
Alona rectangula	+	+	+	+	+	+	+	+	+	—	—	—	—	—	9
A. guttata	+	—	+	—	—	—	—	—	—	—	—	—	—	—	2
Pleuroxus denticulata	—	—	—	—	—	—	—	—	—	+	—	—	—	—	1
P. similis	+	—	—	+	—	—	—	—	—	—	—	—	—	—	2
Chydorus sphaericus	—	—	—	—	—	++	++	—	—	—	—	—	—	—	2
Alonella exigua	—	—	—	—	—	+	++++	—	—	—	—	—	—	+	3
COPEPODA															
Eucyclops speratus	++	++	—	+	—	—	—	—	—	++++	+++	+	+	—	7
Macrocyclops albidus	—	—	—	—	—	+	++	—	—	+++	—	—	—	—	3
Halicyclops sp.	—	—	—	—	—	—	—	—	—	—	—	+	—	—	1
Cyclops sp.	—	++	+	+	+	++	—	++	+	+++	—	—	+	+	10
Calanoid sp.	—	—	—	—	—	—	—	—	—	++	—	—	—	—	1
Harpacticoid sp.	—	—	—	—	—	—	—	—	—	—	—	—	—	+	1
Total occurrences of all the species															76

I–XIV. Water bodies (list of the water bodies given in the text).
+ = Up to 2 individuals/litre.
++ = 2–5 individuals/litre.
+++ = 5–10 individuals/litre.
++++ = More than 10 individuals/litre.

up early in the growing season in the macrophytic vegetation. Such a hypothesis seems plausible as the springs which contain no or very few plant representatives (except Beehama spring, which has a community of macrophytes) are having higher concentrations of the nutrients. Very high NO_3^- and SO_4^- concentrations in the Saida Kadal have been recorded almost throughout the year (unpublished data) and need further investigation.

A total of twenty-six micro-crustacea (twenty cladocerans and six copepods) were collected from fourteen of the seventeen water bodies included in the study (Table II). Three springs, Andernag, Gajinag and Saidakadal, yielded no micro-crustaceans. Year-round samplings from Saidakadal spring have also revealed the absence of copepods and cladocerans (unpublished data).

Anderson[1-2] and Patalas[3-4] have studied the crustacean communities of a number of lakes and ponds. Anderson[2] studied the crustacean communities of 340 lakes and ponds of Canada and concluded that the main role was played by only a few species which contributed 27% of tctal communities. Occurrenee or popnlation of 76 species was recorded in the water bodies during the present survey. Of these, 35·5% were by only four species, *viz.*, *Graptoleberis testudinaria*, *Alona rectangula*, *Eucyclops speratus* and *Cyclops*sp., the second and fourth being present in more than 50% of waters. *Cyclops* sp. was common to all the four types of habitats, whereas *Alona rectangula* was absent in ponds and springs and *Eucyclops speratus* was absent in wetlands. *Graptolaberis testudinaria* was mainly present in lakes. Eleven species (five cladocerans and six copepods) occurred only once and accounted for only 14·5% of the total species occurrences.

Of the 76 species populations, 53 were cladocerans and 23 copepods. The mean number of cladoceran and copepod species per water body was 3·12 and 1·35 respectively, the mean total number of species being 4·47. Comparing the different types of water bodies surveyed it is evident that the highest population density (51·6 individuals/litre) was found in Malla Bagh pond, where a total of 10 species were recorded. Second highest density was recorded in Khush-hal Sar (29·76 individuals/litre) contributed by eight species. The relatively higher population density in these waters may be related to the higher concentration of nutrients in them. Similar correlation has been reported by Green[13] in Lake Mulehe, Uganda. The mean population density in lakes was 14·36 individuals/litre, with 7·14 species per community. Wetlands maintained third position in respect of the population density, which was 3·91 individuals/litre, being contributed by three species per wetland. Springs contained the least number of species (1·43 species/water body) with a population density cf 1·94 individuals/litre. Kaul *et al*[14] have also recorded the highest population density in sewage ponds followed in order by lakes and wetlands.

On the basis of species distribution, this study provides some evidence for ecological definitive limits between lakes, ponds, wetlands and springs as some of the species are restricted in their distribution. *Latonopsis occidentalis*, *Simocephalus vetulus*, *Diaphano-*

soma brachyurum, *Lathonura* sp., *Alona guttata*, *Camptocercus rectirostris*, *Pleuroxus similis*, *Chydorus sphaericus* and *Bosmina longirostris* are found only in lakes, whereas *Leydigia acanthocercoides*, *Halicyclops* sp. and unidentified *Harpacticoid* were recorded in springs only. *Simocephalus serrulatus*, *Pleuroxus denticulatus* and calanoid sp. were present in ponds only and *Macrothrix* sp. was restricted to wetlands.

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