

Study of Eatable Aquatic Invertebrates in the River Dhansiri, Dimapur, Nagaland, India

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Abstract—A study has been conducted on the available aquatic invertebrates in the river Dhansiri at Dimapur site. The study confirmed that the river body composed of aquatic macroinvertebrate community in two phyla viz., Arthropods and Molluscs. Total ten species have been identified from there as the source of alternative protein food for the common people. Not only the protein source they are also the component of aquatic food chain and indicators of aquatic ecosystem. Proper management and strategies to promote the edible invertebrates can be considered as the alternative protein and alternative income source for the common people for sustainable livelihood improvement.

Keywords—Dhansiri, Dimapur, invertebrates, livelihood improvement, protein

I. INTRODUCTION

TRADITIONALLY-consumed unconventional food items may supplement the dietary requirement of a population, thus preventing the development of a wide range of diseases associated with malnutrition and others [1]. Several reports have been assessed that the world population will reach over 9 billion by 2050 [2], [3]. Researches on demand and supply of agricultural sector implies that about 70% of the agricultural land is used for livestock production and due to the increased demand of livestock, expected required land will be double in 2050 [4], [5]. Increased population requires approximately double the current food production [6]. To fulfill the demand, we need to find the alternative sources of protein. Global warming is the major threat on gradual reduction of the areas used for food production worldwide [7]. Some other noticeable causes like the climate change and the environmental destruction from industrial development also negatively affect the food productivity [8]. To mitigate the demand of food, several alternative food sources have been proposed viz., insects and freshwater molluscs which are consumed in every part of the world [9], [10]. Insects are institutionally accepted as a food in many regions and historically consumed [11], providing sufficient nutritional value for humans [12]. The people of North east India consume insects and other aquatic arthropods along with variety of molluscs in their diets. Devi et al. [9] reported varieties of snails i.e., molluscs are available from the pre-historic periods in Manipur of North East India.

More than 200 species of edible insects have been identified by many scientists and researchers from this region [5]. Edible molluscs are regularly sold in different markets of Manipur and are used as the staple food by the local people [9]. The aquatic

invertebrates viz., arthropods and molluscs are also rich in proteins and other important minerals [5], [9] and therefore, they have a great potential in contributing to global food security. The perennial water bodies are the great sources where the river ecosystems are the main habitat of such invertebrates.

Molluscs and other groups provide economic benefits to humans as food sources through their direct consumption and indirectly because they are important food for freshwater fishes. They are vital links in the aquatic food chain, conveying nutrients from plants and algae to larger organisms. Invertebrates are food for many vertebrates; many are deadly to humans as parasites. Knowing about the aquatic invertebrates can yield valuable clues about human biology, evidence that life has common heritage [13].

A good number of people of Nagaland and other northeastern states prefer to eat some of the aquatic invertebrates like mollusks, arthropods etc. and the river body is the main source of such aquatic invertebrates. But very few reports are available on the aquatic invertebrates of running water. Keeping the above statement in view, the present work has been carried out to identify the available aquatic invertebrates of the river Dhansiri at Dimapur site which can give an idea to promote the culture and marketing of edible aquatic invertebrates for the livelihood improvement of the local poor in a sustainable manner.

II. STUDY SITE

The study has been conducted in the river Dhansiri at Dimapur of the state of Nagaland, India. The district draws its name from the Kachari dialect; 'di' – meaning river, 'ma' – meaning great or big, and 'pur' – meaning city, together connoting 'the city near the great river' [14]. Dimapur lies between 25° 48' and 26° 00' North latitude and 93° 30' and 93° 54' East longitude and covers an area of about 927 km². The district is bounded by Assam on its North and West, Kohima on the East and Peren District in the South. Dhansiri is one of the major rivers flowing through this district [15] which originates from Laisang peak of Nagaland [16]. The average elevation of the district is 260 meters above sea level and has an area of 927 sq km. The city has a heterogeneous mix of people from all over India, and for which it is also known as "mini India". Dimapur district has a population of 379,769 [17]. The sex ratio is 916 females for every 1000 males. Dimapur is an important commercial center for the region, acting as a gateway to Nagaland and the neighboring state of Manipur. This fast-developing district is also the commercial hub of the state. It is

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connected by both rail and air. The National Highway 29 passes through the heart of this commercial center of the state and is 74 km from Kohima, the capital of Nagaland. A large part of the Dimapur district falls in the plains. Only the Medziphema sub divisions and few villages of Niuland sub divisions are located in the foothills.



Fig. 1 Map of Dimapur, Nagaland

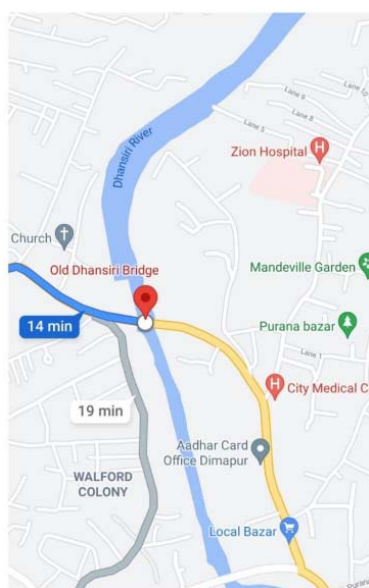


Fig. 2 Dhansiri River Map, Dimapur area

III. OBJECTIVES

- To find out the different species of invertebrates in the water body.
- To study the feasibility of aquaculture in the water body.
- To find out the prospects of the promotion of the culture of aquatic invertebrates in a sustainable manner for better livelihood.

IV. MATERIALS AND METHODS

- The aquatic invertebrates were collected by insect

collecting net and plankton net.

- The collected specimens were cleaned properly with freshwater.
- The organisms were segregated as per the eye observation.
- The different segregated specimens were kept in separate vial in 40% formalin solution.
- They were taken in the laboratory for identification.
- The specimens were identified with eye observation, with the microscope or with the help of literature and website.
- The identified specimens were listed. Some statistical analyses were done for compilation and presentation.

V. RESULTS AND DISCUSSION

The study of the macroinvertebrate fauna of the running water ecosystem is presented in Tables I and II. The water body was composed of total ten species. The invertebrates composed of two phyla including three class and five orders (Fig. 3). Family, genus and species were recorded as 10 from each. Phylum Arthropoda and the phylum Mollusca were the two phyla from the studied site. From the phylum Arthropoda, two classes were recorded viz., class Insecta and class Malacostraca, whereas only one class was recorded from the Phylum Mollusca i.e., Class Gastropoda. From class Insecta total three families were recorded viz., Hemiptera, Coleoptera and Ephemeroptera whereas only one order i.e., order Decapoda was found under class Malacostraca. Class Gastropoda of phylum Mollusca showed only one order i.e., order Architaenioglossa. Out of the total ten species, eight were from the phylum Arthropoda viz., *Notonecta undulate*, *Corixa punctata*, *Nepa cinerea*, *Belostoma flumineum*, *Dytiscus marginalis*, *Caenis latipennis*, *Macrobrachium rosenbergii*, *Barytelphusa cunicularis*. Phylum Mollusca comprised of two species viz., *Bellamya bengalensis* and *Pila globose*. Total 44 individuals were recorded from the ten species. The study of percentage of occurrence of species revealed that highest was shown by *Caenis latipennis* i.e., 18.18 followed by *Bellamya bengalensis* (15.90) whereas the least (4.54) was showed by two species viz., *Dytiscus marginalis* and *Barytelphusa cunicularis* (Table II and Fig. 4).

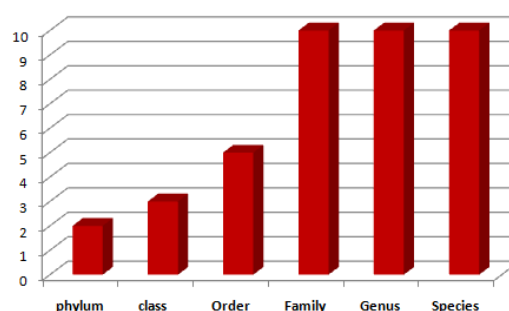


Fig. 3 The taxonomic status of the aquatic macroinvertebrate community

TABLE I
DISTRIBUTION OF MACROINVERTEBRATE AQUATIC FAUNA

Sl No.	Phylum	Class	Order	Family	Genus
1.	Arthropoda	Insecta	Hemiptera	Notonectidae	<i>Notonecta</i>
2.	Arthropoda	Insecta	Hemiptera	Corixidae	<i>Corixa</i>
3.	Arthropoda	Insecta	Hemiptera	Nepidae	<i>Nepa</i>
4.	Arthropoda	Insecta	Hemiptera	Belostomatidae	<i>Belostoma</i>
5.	Arthropoda	Insecta	Coleoptera	Dytiscidae	<i>Dytiscus</i>
6.	Arthropoda	Insecta	Ephemeroptera	Caenidae	<i>Caenis</i>
7.	Arthropoda	Malacostraca	Decapoda	Palaemonidae	<i>Macrobrachium</i>
8.	Arthropoda	Malacostraca	Decapoda	Gecarcinucidae	<i>Barytelphusa</i>
9.	Mollusca	Gastropoda	Architaenioglossa	Viviparidae	<i>Bellamya</i>
10.	Mollusca	Gastropoda	Architaenioglossa	Ampullariidae	<i>Pila</i>

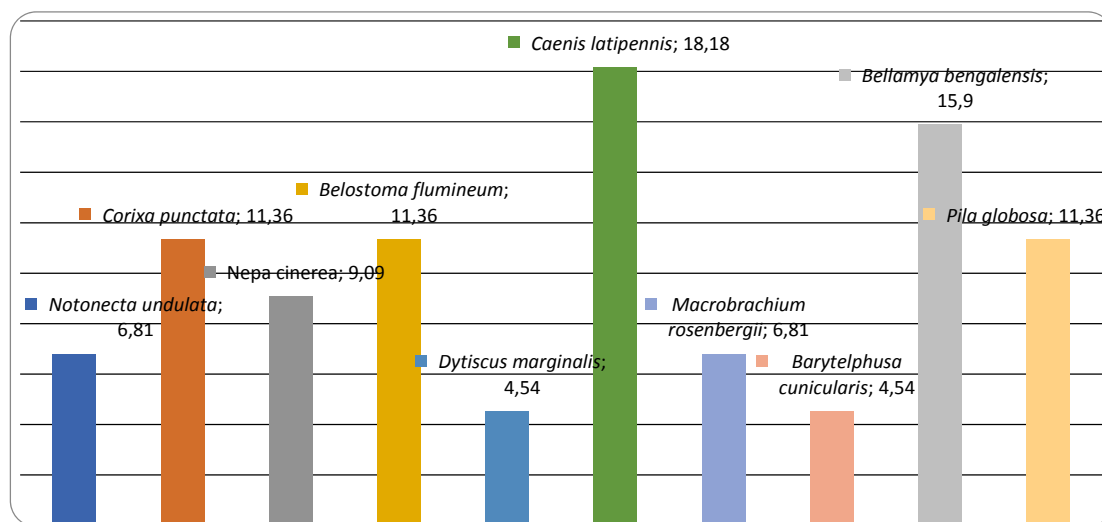


Fig. 4 Percentage of occurrence of the species of aquatic macroinvertebrates

TABLE II
THE NUMBER OF INDIVIDUAL OF THE SPECIES OF AQUATIC
MACROINVERTEBRATE COMMUNITY

Sl No.	Species	No. of individual	Percentage of occurrence
1.	<i>Notonecta undulata</i>	3	6.81
2.	<i>Corixa punctata</i>	5	11.36
3.	<i>Nepa cinerea</i>	4	9.09
4.	<i>Belostoma flumineum</i>	5	11.36
5.	<i>Dytiscus marginalis</i>	2	4.54
6.	<i>Caenis latipennis</i>	8	18.18
7.	<i>Macrobrachium rosenbergii</i>	3	6.81
8.	<i>Barytelphusa cunicularis</i>	2	4.54
9.	<i>Bellamya bengalensis</i>	7	15.90
10.	<i>Pila globosa</i>	5	11.36
Total		44	

The appearance of aquatic invertebrates represent that the aquatic macroinvertebrate community is composed of two phyla viz., Arthropods and Molluscs. The diversity regarding the class, order, family, genus and species are more in case of arthropods as compared to molluscs. Regarding the percentage of occurrence, the highest and the lowest positions are occupied by the arthropods whereas the second position is represented by the species of molluscs. The percentage of occurrence of different species ranges from 4.54% to 18.18%.

Our study confirms the presence of two groups which

disagrees the findings of [18] who has reported four groups from the river Dhansiri at Dimapur. But the present finding confirms the two groups viz., Arthropoda and Mollusca which were also been reported by [18].

The presence of some molluscs and arthropods ensure that the water is a good source for the natural food of fishes as well as for the food source for the local community. The occurrence of molluscan members indicates that the water is suitable natural habitat of fish as well as for human uses. It is clearly evident that the water is less polluted and can be used for human consumption and for other agricultural activities.

VI. CONCLUSION

The present data can be compared to future aquatic macroinvertebrate inventories for the management of the river Dhansiri. The available macrohabitat can be managed under proper initiative. The promotion of the useful invertebrates can give an extra income for the community people to mitigate the protein source from arthropods and molluscs in a sustainable manner. Study of this nature will help in future to assess the impact of various factors in river ecology.

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