



Survey on Macro Invertebrates of Hajati Spring, Fars-West, Kazerun

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Abstract

Background and aim: In order to diagnosis of composition, distribution and abundance of Macrobenthic invertebrates' fauna of Hajati Spring at Kezerun, Fars south-west of Iran, benthic sampling was conducted from March, 2018 to February, 2019.

Materials and Methods: The samples were collected from five different stations along the river. Three phyla of macrobenthic invertebrates were encountered in the river.

Results: They were Arthropoda, represented by eight genera, *Chironomus* sp., *Tipula* sp. and *Odontomyia* sp. (Diptera), *Epithea* sp.(Odonata) , *Centroptilum* sp. (Ephemeroptera), *Hydrobius* sp. and *Hydrochara* sp. (Coleoptera); Annelida represented by one genera, *Uncinaiis* sp. (Haplotaxida) and Mollusca represented by one genera including *Melanopsis* sp.(Sorbeoconcha), Arthropoda dominated the macrobenthic invertebrates with a abundance of 65.6% while Annelida had the least abundance, 6.4% by number. The abundance of Mollusca was 28% by number. Also the abundance and diversity of Arthropoda was more than Mollusca and Annelida.

Conclusion: One-way ANOVA showed that there was a significant relationship between collected samples and seasons ($P \leq 0.05$) while such a relationship was not established between collected samples and stations ($P > 0.05$).

Keywords: *Macroinvertebrates, Benthic composition, Hagati spring, Kazerun*

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Introduction

Benthic organisms are those organisms that live on or inside the deposit at the bottom of a water body (Odum, 1971). These organisms play a vital role in the circulation and recirculation of nutrients in aquatic environments. They constitute the link between the unavailable nutrients in detritus and useful protein materials in fish. Most benthic organisms feed for a wide range of fishes (Imevbore & Bakare, 1970; Adebisi, 1989). Macro benthic invertebrates are also those organisms often retained by mesh sizes of 0.05 m² (Mason, 1981) although the early stages of many macro benthic invertebrates species are smaller than this size. Several benthic species are relatively long lived, with life spans ranging from weeks for some opportunistic worms to months or years for larger taxa (Bamikole, 2009).

Macro benthic invertebrate are biological quality element require for the classification of biological status of the water bodies (Timm & Mois, 2008). Benthic in faunal community studies provide the 'golden standard' in terms of determining whether or not alterations in benthic communities are occurring and together with sediment, toxicity and chemistry, whether or not such changes are due to toxic contaminants in the sediments (Chapman & Anderson, 2005). Over the last decades there has been a considerable effort to document the ecology, composition, spatial distribution and biodiversity of macrobenthic invertebrate communities of Iranian rivers (Abbaspour *et al.*, 2013; Ahmadi *et al.*, 2011; Nemati Varnosfaderany *et al.*, 2010; Pourjomeh *et al.*, 2014; Sharifinia *et al.*, 2012; Montajami *et al.*, 2012). Researchers established a pattern of relationship between macrobenthic invertebrate fauna, depth, substrate type and organic contents of sediment. They reported that areas with high accumulation of sediment and high organic flux rates from riverine sources supported high macro infauna, abundance and biomass. Other studies using macrobenthic invertebrate as bio-indicator of anthropogenic impact on aquatic ecosystem have shown general decrease in macrobenthic invertebrate population and reduction in species diversity and richness (Montajami *et al.*, 2012) and they possess higher ability to tolerate pollution-induced environmental stress than plankton (Rosenberg & Resh, 1998). The Hajati Spring and Shapour River

has been subjected to domestic, agricultural activities. The river is the major source of drinking water to the inhabitants of these communities. This study provides a baseline data on the composition, distribution, abundance of macrobenthic invertebrates of the Hajati Spring.

Materials and methods

Description of study area

The study was carried out in the Hajati Spring which connects to Shapour River with short distance. Shapour River is one of the major rivers in Kazrun, Fars south-west, Iran. It has a length of 220 km originated from the highlands of Kazerun. This is followed by the western region Kazerun after a mountain path and connect multiple branches flows through the Bushehr province and connects to the Dalaki River which flows into the Persian Gulf.

Sampling stations

Five sampling stations (1-5) were chosen (north, south, east, west and center of spring). The coordinates of the sampling stations were taken using Geographic Positioning System (GPS) and approximate distances of the stations were calculated, each station was 100m apart from the other (Akin-Oriola, 2003).

Sampling procedure

Benthic samples were collected seasonally from from March, 2018 to February, 2019 at five different stations of the study area using a Van Veen grab, usually between 8:00 am and 12:00am. For each sampling station, 3 or 4 hauls were made by sending the grab down into the bottom. The sediment collected were poured into polythene bags, labeled and brought to the laboratory for analysis. The sediments were passed through 3 sieved of 2mm, 1mm and 0.5mm mesh sizes to collect the benthos. The benthos were poured into a white enamel tray, stained with Rose Benger Solution and sorted using forceps. They were sorted out into different groups and preserved in 4% formalin. They were then identified under a compound microscope using the key guide of Environmental Protection Agency (Barbour *et al.*, 1999) and counted.

Data analysis

Data analysis performed by one-way analysis of variance (ANOVA) and statistical analyses were carried out with SPSS version 19.0 for windows.

Results

The examination of samples resulted in a total number of 10 families representing 3 classes and 6 orders of benthic macro invertebrates (Table1). Three phyla of macro benthic invertebrates were encountered in the river. They were Arthropoda, represented by eight genera, *Chironomus* sp., *Tipula* sp. and *Odontomyia* sp. (Diptera), *Epithea* sp. (Odonata), *Centroptilum* sp. (Ephemeroptera), *Hydrobius* sp. and *Hydrochara* sp. (Coleoptera); Annelida represented by one genera, *Uncinai* sp. (Haplotaaxida) and Mollusca represented by one

genera including *Melanopsis* sp. (Sorbeoconcha) (Table1). Arthropoda dominated the macro benthic invertebrates with a total relative abundance of 65.6% while Annelida were the least abundance, 6.4% by number. Also the abundance of Mollusca were 28% by number (Figure 1). Overall, the benthic macro invertebrate communities of the Hajati Spring were dominated by *Melanopsis* (28.06%). Frequency percentage of Macro benthic invertebrate genus in five stations is shown in Figure 2. The frequency of macro benthic invertebrates in station 5 was higher than other stations (Figure 3) and the frequency of samples isolated in autumn was higher than other seasons (Figure 4). One-way ANOVA showed that there was a significant relationship between collected samples and seasons ($P \leq 0.05$) while such a relationship was not established between collected samples and stations ($P > 0.05$).

Sample	Phylum	Class	Order	Family	Genera
1	Arthropoda	Insecta	Odonata	Corduliidae	<i>Epithea</i> sp.
2	Arthropoda	Insecta	Diptera	Stratiomyidae	<i>Odontomyia</i> sp.
3	Arthropoda	Insecta	Diptera	Chironomidae	<i>Chironomus</i> sp.
4	Arthropoda	Insecta	Diptera	Tipulidae	<i>Tipula</i> sp.
5	Arthropoda	Insecta	Diptera	Tabanidae	<i>Chysops</i> sp.
6	Arthropoda	Insecta	Coleoptera	Hydrophilidae	<i>Hydrochara</i> sp.
7	Arthropoda	Insecta	Coleoptera	Hydrophilidae	<i>Hydrobius</i> sp.
8	Arthropoda	Insecta	Ephemenoptera	Baetidea	<i>Centroptilum</i> sp.
9	Annelida	Clitellata	Haplotaaxida	Naididae	<i>Uncinai</i> sp.
10	Mollusca	Gastropoda	Sorbeoconcha	Melanopsidae	<i>Melanopsis</i> sp.

Table 1. Taxonomical list of benthic macro invertebrates which were determined in the Hajati Spring.

Discussion

The number of recorded benthic macro invertebrate's population was generally low because

of some ecological imbalance arising from alterations of some important factors governing the abundance and distribution of the benthic communities. Such factors include water quality, immediate substrates

for occupation and food availability (Dance & Hynes, 1980). According to Brinkhurst (1970) cited by (Yakub & Ugwumba, 2009), the bigger the size of a lotic water body the poorer the macro invertebrate richness. In addition, high human activity around the sampling stations which released wastes into the water could also be a possible explanation. Ogbeibu & Egborge (1995) reported that high biodiversity is expected in ecosystems devoid of significant anthropogenic impacts. Changes made in the

composition of Macro benthic population are often in response to environmental factors and stressful conditions in the river to maintain ecological balance (Fore *et al.*, 1996). Researchers showed that the groups which are sensitive to pollution (Ephemeroptera, Plecoptera, Trichoptera) in contaminated areas are reduced and vice versa, the resistant groups Diptera (Chironomidae & Simullidae) are increased (Ghane *et al.*, 2006).

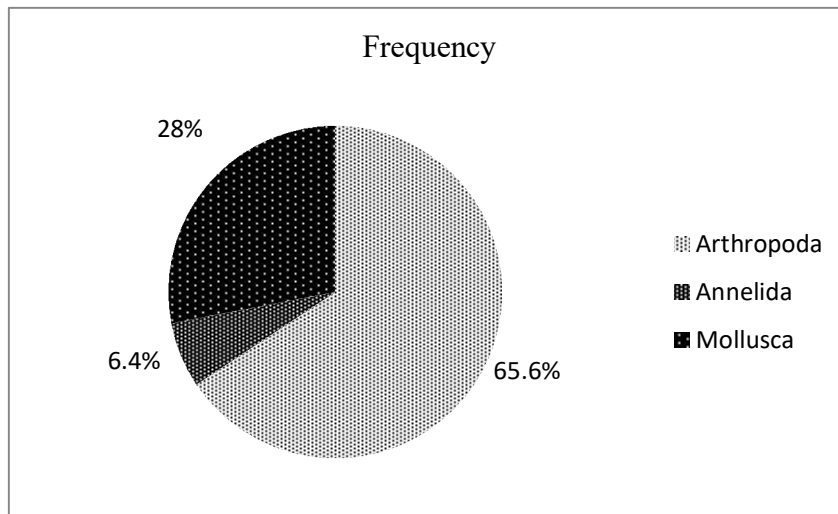


Figure 1. Frequency percentage of Macro benthic invertebrate phylum in five stations.

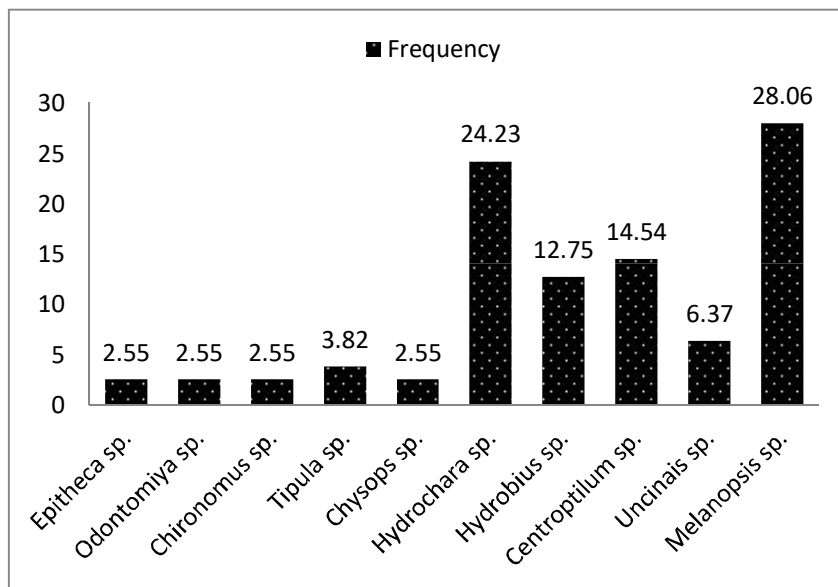


Figure 2. Frequency percentage of Macro benthic invertebrate genus in five stations

Results from the another study showed that the most abundant macrobenthic invertebrate fauna throughout the study period was *Chironomus* larvae, could be attributed to the fact that this insect is known to thrive in polluted environment properly due to possession of hemoglobin a pigment that transport and store dissolved oxygen. Also the present of gastropod recorded during this study attribute to the fact that they were transported by water current and were tolerant of the prevalent water condition. The presence of these indicator species suggests organic

pollution from anthropogenic source (Anderm *et al.*, 2012) However, such a case was found in Hajati spring that seems to be due to lake of the waterpollution. Humans may have the ability to manipulate the environment to suit their needs, but this requires a responsible approach. Our present generation must therefore stand up and be accountable for our actions focusing our knowledge and intuition toward a better future that includes the availability of clean, freshwater for all the nations of the world.

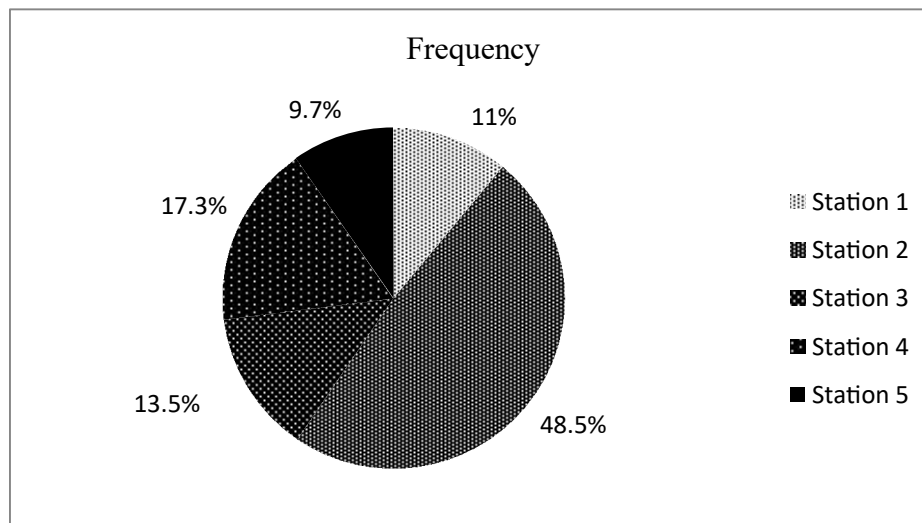


Figure 3. Frequency percentage of Macro benthic invertebrate genus in five stations.

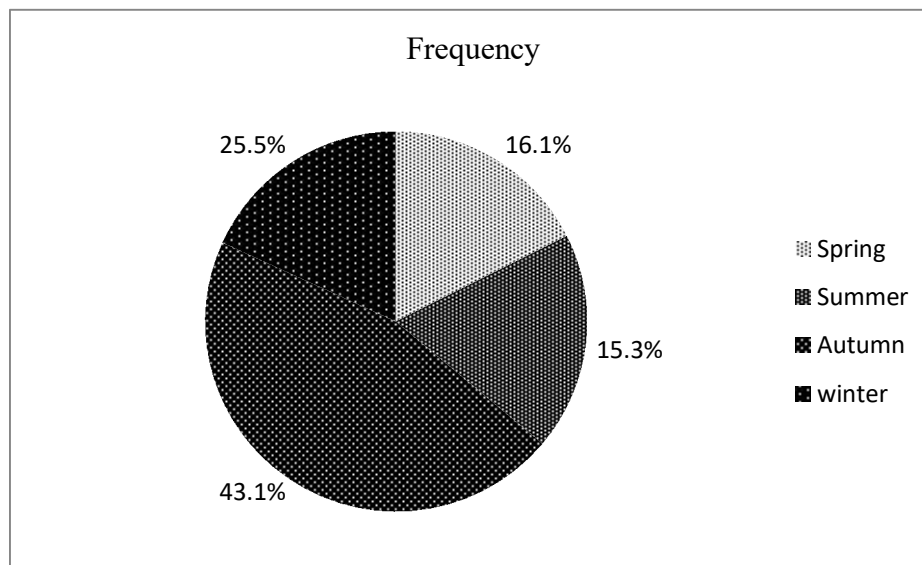


Figure 4. Frequency percentage of Macro benthic invertebrate genus in four seasons.

Conclusion

As a conclusion we could say:

- I. Arthropoda was the most abundant taxonomic group in terms of numerical abundance.
- II. The benthic macro invertebrate communities of the Hajati Spring were dominated by *Melanopsis* sp.
- III. It could be concluded that Hajati Spring water is not under stress due to organic pollutants from anthropogenic sources such as the surrounding industries and waterfront dwellers releasing raw human excreta, detergents, wastewater and cleaning agents from the industries but may when the path goes and close to the sea the river be polluted that further research is needed.

Acknowledgment

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Conflict of interest

The authors have no conflict of interest to declare.

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مطالعه ماکروبتوزهای چشمه حاجتی واقع در شهرستان کازرون، غرب استان فارس

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چکیده

هدف و زمینه: به منظور تشخیص ترکیب، پراکندگی و فراوانی فون بی مهرگان ماکروبتوز چشمه حاجتی واقع در کازرون، جنوب غرب فارس، نمونه برداری از اسفند ۱۳۹۶ تا بهمن ۱۳۹۷ انجام شد.

مواد و روش ها: نمونه ها از پنج ایستگاه مختلف در حاشیه رودخانه جمع آوری شد. سه شاخه از بی مهرگان ماکروبتوز در رودخانه شناسایی گردید.

یافته ها: نمونه های جداسازی شده شامل بندپایان از هشت جنس شیرونوموس، تیپولا، ادونتومیا (دوبالان)، اپیتکا (ادوناتا)، ستروپتلیوم (افروپترا)، هیدروبیوس و هیدروکارا (کلئوپترا)؛ کرم های حلقوی با یک جنس انسینائیس (هاپلوتکسیدا) و نرم تنان با یک جنس ملانوپسیس (سوربئو کونکا) بودند. بندپایان با ۶۵/۶ درصد بیشترین درصد فراوانی ماکروبتوز های بی مهره بودند در حالی که کرم های حلقوی کمترین فراوانی را با ۶/۴ درصد را داشتند. فراوانی نرم تنان ۲۸ درصد بود. همچنین فراوانی و تنوع بندپایان بیشتر از نرم تنان و کرم های حلقوی بود.

نتیجه گیری: آنالیز واریانس یک طرفه نشان داد که بین نمونه های جمع آوری شده و فصول رابطه معنی داری وجود دارد ($P < 0.05$) در حالی که بین نمونه های جمع آوری شده و ایستگاه ها چنین رابطه ای وجود نداشت ($P > 0.05$).

واژه های کلیدی: ماکروبتوزهای بی مهره، ترکیب ماکروبتوزی، چشمه حاجتی، کازرون

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