JOAVM
Journal of Alternative Veterinary Medicine
Joavm.kau.ac.ir

Research Article

Islamic Azad University
Kazerun Branch
Fars, Iran

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

Alireza Golchin Manshadi[1]*, Ameneh Rostami[2]

[1]Department of Aquatic Animal health, Faculty of Veterinary Medicine, Kazerun Branch, Islamic Azad University, Kazerun, Iran
[2]Gratuated from Faculty of Basic sciences, Kazerun Branch, Islamic Azad University, Kazerun, Iran

Received: 03/Feb/2021 Revised: 11/Apr/2021 Accepted: 15/May/2021

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 *Odontomiya* sp. (Diptera), *Epitheca* sp.(Odonata) , *Centroptilum* sp. (Ephemeroptera), *Hydrobius* sp. and *Hydrochara* sp. (Coleoptera); Annelida represented by one genera, *Uncinais* 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*

Cite this article as: Alireza Golchin Manshadi, Ameneh Rostami. Survey on macro invertebrates of Hajati Spring, Fars-west, Kazerun. J Altern Vet Med. 2021; 4(8): 459-466.

[DOR: 20.1001.1.2717378.2021.4.8.3.8]

**** Corresponding Author***
Department of Aquatic Animal health, Faculty of Veterinary Medicine, Kazerun Branch, Islamic Azad University, Kazerun, Iran.
E-mail: golchinalireza@yahoo.com, Orcid: https://orcid.org/0000-0002-2627-3491

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 co-ordinates 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.

[DOR: 20.1001.1.2717378.2021.4.8.3.8]

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 *Odontomiya* sp. (Diptera), *Epitheca* sp.(Odonata) , *Centroptilum* sp. (Ephemeroptera), *Hydrobius* sp. and *Hydrochara* sp. (Coleoptera); Annelida represented by one genera, *Uncinais* sp. (Haplotaxida) 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 Melanopnis (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	*Epitheca sp.*
2	Arthropoda	Insecta	Diptera	Stratiomyidae	*Odontomiya sp.*
3	Arthropoda	Insecta	Diptera	Chironomidae	*Chironomus sp.*
4	Arthropoda	Insecta	Diptera	Tipulidae	*Tipula sp.*
5	Arthropoda	Insecta	Diptera	Tabanidae	*Chysops sp.*
6	Arthropoda	Insecta	Coleoptera	Hydrophilidae	*Hydrochara sp.*
7	Arthropoda	Insecta	Coleoptera	Hydrophilidae	*Hydrobius sp.*
8	Arthropoda	Insecta	Ephemenoptera	Baetidea	*Centroptilum sp.*
9	Annelida	Clitellata	Haplotaxida	Naididae	*Uncinais sp.*
10	Mollusca	Gastropoda	Sorbeoconcha	Melanopsidae	*Melanopsis 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

[DOR: 20.1001.1.2717378.2021.4.8.3.8]

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).

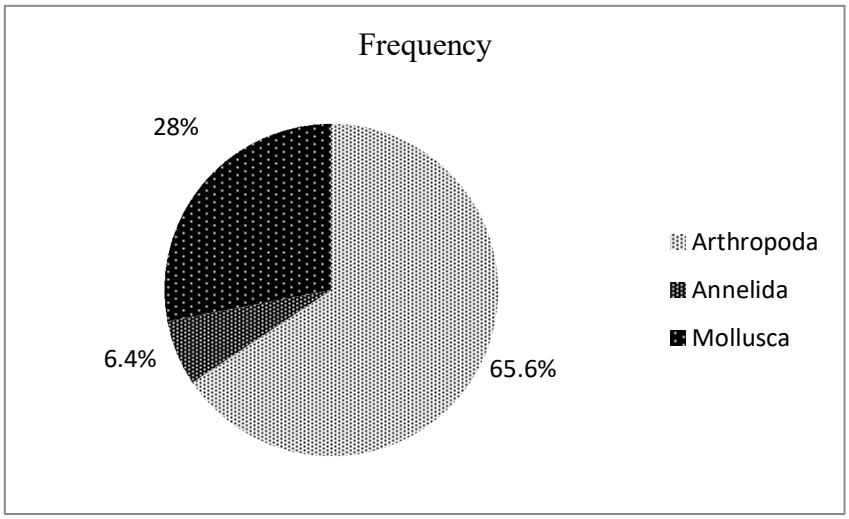

Figure 1. Frequency percentage of Macro benthic invertebrate phylum in five stations.

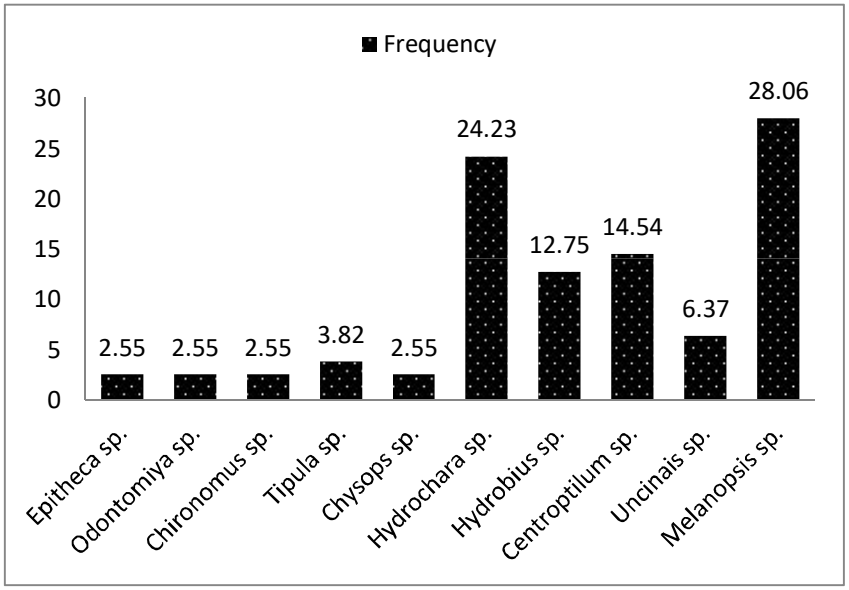

Figure 2. Frequency percentage of Macro benthic invertebrate genus in five stations

[DOR: 20.1001.1.2717378.2021.4.8.3.8]

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 (Andem *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.

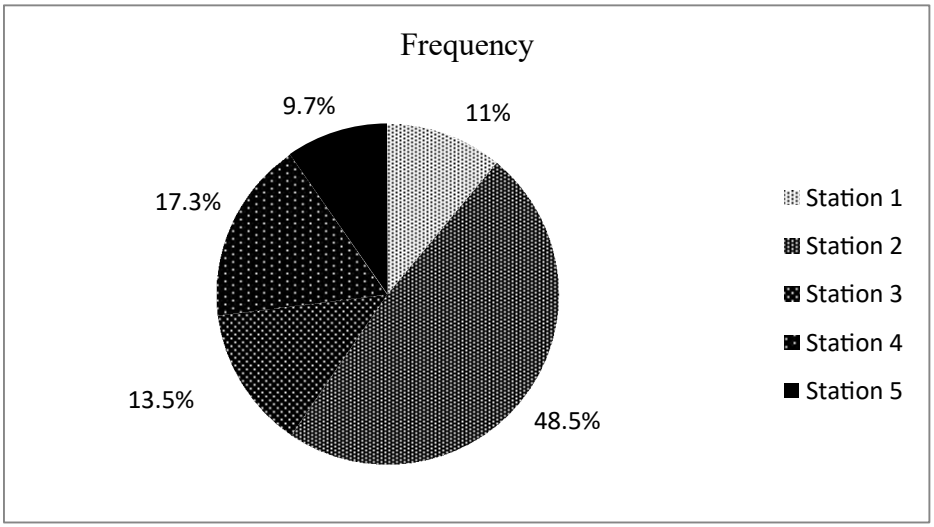

Figure 3. Frequency percentage of Macro benthic invertebrate genus in five stations.

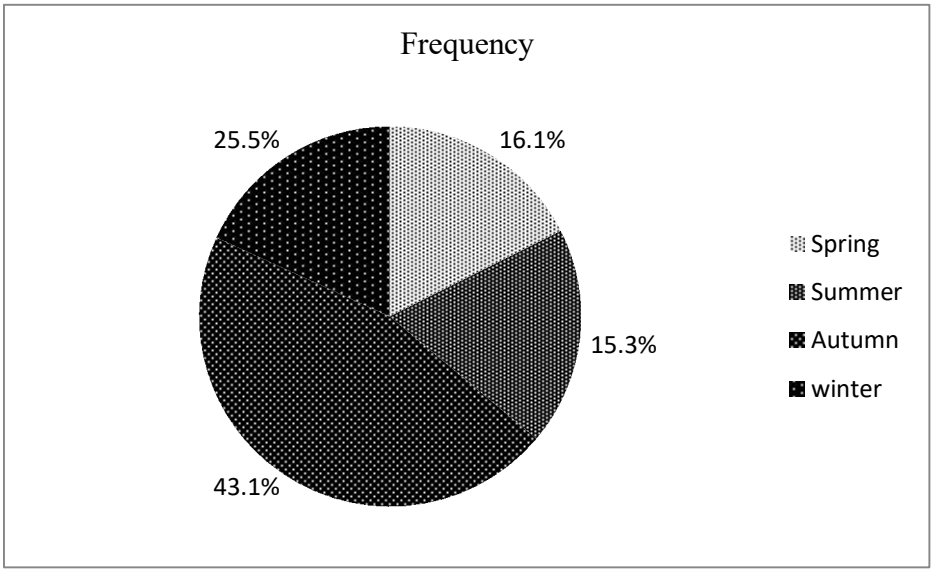

Figure 4. Frequency percentage of Macro benthic invertebrate genus in four seasons.

[DOR: 20.1001.1.2717378.2021.4.8.3.8]

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

The authors sincerely thank Parasitology laboratory, Faculty of veterinary medicine, Islamic Azad University, Kazerun Branch for providing necessary facilities to conduct the study.

Conflict of interest

The authors have no conflict of interest to declare.

References

Abbaspour M., Hedayatifard HR., Alizadeh S., Hassanzadeh H. and Karimi JM. Bioassessment of macrobenthic fauna of the Cheshmeh Kileh River, Northern Iran. Am Eurasian J Agric Environ Sci, 2013; 13 (6): 747-753.

Adebisi AA. A Report Prepared for Agro Team. Ibadan, Nigeria, 1989; pp. 7-8.

Ahmadi R., Mohebbi F., Hagig P., Esmailly L. and Salmanzadeh R. Macroinvertebrates in the Wetlands ofthe Zarrineh estuary at the south of Urmia Lake. Int J Environ Restor, 2011; 5(4): 1047-1051.

Akin-Oriola AG. Zooplankton associations and environmental factors in Ogunpa and Ona Rivers, Nigeria. Rev Biol Trop, 2003; 51 (2) pp. 391-398.

Andem AB., Okorafor KA., Udofia U., Okete JA. and Ugwumba AAA. Composition, Distribution and Diversity of Benthic Macroinvertebrates of Ona River, South-west, Nigeria. J Zool Res, 2012; (2): 47-53.

Bamikole WA., Ndubuisi, AO. and Olaronke OO. Macrobenthic Fauna of Snake Island Area of Lagos Lagoon, Nigeria. Res j biol sci, 2009; 4: 272-276.

Barbour MT., Plafkin JL., Bardley BP., Graves CG. and Wisseman RW. Rapid bioassessment protocols for use in streams and Wade Able River: pryphyton, benthic invertebrates and fish. 2nd edition EPA, Washington DC, 1999; pp. 408.

Brinkhurst RO. Organic pollution, In: Pollution; causes, effect and control, Ed. Harrison RR. the Royal Society of Chemistry. London, 1970; p. 103.

Chapman PM., and Anderson J. A Decision-Making Framework for Sediment Contamination. Integrated Environ Assess Manage, 2005; 1: 163-173.

Dance KW. and Hynes HB. Some effects of agricultural land use on stream insect communities. Environ Sci, Environ pollut service, 1980; 22: 19-28.

Fore LS., Karr JR. and Wisseman RW. Assessing macroinvertebrate responses to human activity. J North Am Benthol Soc, 1996; 15(2): 212-231.

Ghane A., Ahmadi M., Esmaelie A. and Mirzajani A. The Biological assessment of Chafroud River Guilan Province) using Macro benthos demographic structure, 10 Year. Int J Agric Sci Natur Resour, 2006; 1: 247-257.

Imevbore AM. and Bakare O. The food and feeding habits of non-cichlid fishes of the river Niger in the kanji reservoir area in Kanji: A Nigerian man-made lake Kanji Lake studies, Ecology Ed. S.A. Vissser, 1970; 7: 87-98.

Mason CF. Biology of fresh water pollution. Longman International, New York, 1981; p. 23.

Montajami S., Hosseini SA., Ghorbani R. and Mehdizadeh M. Investigation of some physicochemical characteristics of farobroman river water by using benthic macroinvertebrates as biological indicator. J Fish Mar Sci, 2012; 4(6): 645-650.

Nemati Varnosfaderany M., Ebrahimi E., Mirghaffary N. and Safyanian A. Biological assessment of the zayandeh Rud river, Iran, using benthic macroinvertebrates. Limnology, 2010; 40: 226-232.

[DOR: 20.1001.1.2717378.2021.4.8.3.8]

Odum EP. Fundamentals of ecology, 3rd W.B. Saunders Company, Philadelphia, 1971; pp. 574.

Ogbeibu AE. and Egborge ABM. Hydrobiological studies of water bodies in the Okomu forest reserve (Sanctuary) in Southern Nigeria. 1. The distribution and diversity of the invertebrate fauna. Trop Freshwat Biol. 1995; 4: 1-27.

Pourjomeh F., Hakim Elahi M., Rezai H. and Amini N. The Distribution and abundance of macrobenthic invertebrates in the hormozgan province, the Persian Gulf. J Persian Gulf (Marine Science), 2014; 5 (15): 25-32.

Rosenberg DM. and Resh VII. Fresh water biomonitoring and benthic macro invertebrates. New York Chapman and Hall, 1998; p. 488.

Sharifinia M., Imanpour Namin J. and Bozorgi Makrani A. Benthic Macroinvertabrate distribution in Tajan River Using Canonical Correspondence Analysis. Caspian J Env Sci, 2012; 10(2):181-194

Timm H. and Mois T. Do shallow-water macroinvvertebrate assemblages correspond to physico-chemical habitats of streams and lakes. Verh Interna Verein Limnol, 2008; 30:138-140.

Yakub AS. and Ugwumba AAA. A study on the macroinvertebrate fauna of lower Ogun River at Ishasi South west Nigeria. The Zoologist, 2009; 7: 65-74.

[DOR: 20.1001.1.2717378.2021.4.8.3.8]

JOAVM
Journal of
Alternative Veterinary Medicine
Joavm.kau.ac.ir

مقاله پژوهشی

Islamic Azad University
Kazerun Branch
Fars, Iran

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

علیرضا گلچین منشادی[1*]، آمنه رستمی[2]

[1]گروه بهداشت و بیماری های آبزیان، دانشکده دامپزشکی، واحد کازرون، دانشگاه آزاد اسلامی، کازرون، ایران
[2]دانش آموخته کارشناسی ارشد، گروه زیست شناسی، واحد کازرون، دانشگاه آزاد اسلامی، کازرون، ایران

تاریخ دریافت: ۱۳۹۹/۱۱/۱۵ اصلاح نهایی: ۱۴۰۰/۰۱/۲۲ تاریخ پذیرش: ۱۴۰۰/۰۲/۲۵

چکیده

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

مواد و روش‌ها: نمونه‌ها از پنج ایستگاه مختلف در حاشیه رودخانه جمع‌آوری شد. سه شاخه از بی مهرگان ماکروبنتیک در رودخانه شناسایی گردید.

یافته‌ها: نمونه های جداسازی شده شامل بندپایان از هشت جنس شیرونوموس، تیپولا، ادونتومیا(دوبالان)، اپیتکا(ادوناتا)، سنتروپتلیوم (افمروپترا)، هیدروبیوس و هیدروکارا (کلئوپترا)؛ کرم های حلقوی با یک جنس انسینائیس (هاپلوتکسیدا) و نرم تنان با یک جنس ملانوپسیس (سوربئوکونکا) بودند. بندپایان با ۶۵/۶ درصد بیشترین درصد فراوانی ماکروبنتوز 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.

نتیجه‌گیری: آنالیز واریانس یک طرفه نشان داد که بین نمونه‌های جمع‌آوری‌شده و فصول رابطه معنی‌داری وجود دارد ($P<0/05$) در حالی که بین نمونه‌های جمع‌آوری‌شده و ایستگاه‌ها چنین رابطه‌ای وجود نداشت ($P>0/05$).

واژه‌های کلیدی: *ماکروبنتوزهای بی مهره، ترکیب ماکروبنتوزی، چشمه حاجتی، کازرون*

علیرضا گلچین منشادی، آمنه رستمی. مطالعه ماکروبنتوزهای چشمه حاجتی واقع در شهرستان کازرون، غرب استان فارس. مجله طب دامپزشکی جایگزین. ۱۴۰۰؛ ۴(۸): ۴۵۹-۴۶۶.

[DOR: 20.1001.1.2717378.2021.4.8.3.8]

* نویسنده مسئول: گروه بهداشت و بیماری های آبزیان، دانشکده دامپزشکی، واحد کازرون، دانشگاه آزاد اسلامی، کازرون، ایران.
Orcid: https://orcid.org/0000-0002-2627-3491 ،Email: golchinalireza@yahoo.com