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Research Article

IDENTIFICATION AND MORPHOMETRIC STUDY OF CAUGHT CRUSTACEANS FROM SHAPUR RIVER IN KAZEROON, FARS PROVINCE, IRAN

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ABSTRACT
In terms of biological communities, rivers enjoy special characteristics which cannot be generalized to other water resources; regardless of natural beauty, fish resources, human use etc. running waters have placed many microorganisms within themselves. Crustaceans, on the other hands, have great importance in terms of economic, ecology and health. So, studying distribution level as well as their identification can considerably help completion of fauna of these animals. Evaluation of the crustaceans in Shapur River was conducted in 3 stations from January to March, 2015, also from April to June, 2015. Fishing and random isolation of crustaceans was performed using Trawler net and sieve. Based on illustrated diagnostic keys and measured morphological characteristics, their identification was done in genus and even in species. The results showed that three different species exist among 375 caught crustaceans from Shapur River which include: broad freshwater crab (*Potamon Savigny*, 1862); freshwater shrimp species (*Caridina fossarum Heller*, 1862) and *Gammarus* (*Gammarus fabricius*, 1775). The major population belonged to the genus of broad freshwater crab with 69%, and the lowest population belonged to *Gammarus* genus with 12%. Various environmental factors impact on the level of distribution of these organisms. Study on crustaceans' fauna population of Shapur River was conducted for the first time in Fars Province as well as in the city of Kazeroon. According to the results mentioned above, many factors influence on distribution of organisms as well as organisms' characteristics and bio systematic evaluation of organisms; different seasons and weather conditions can be mentioned. Also, it seems that some subspecies exist in the River which their identity in future will be an important and a necessary step in identifying and completing fauna organism of Kazeroon.

Keywords: *Identification, Morphometric, Crustaceans, Shapur River, Kazeroon*

INTRODUCTION
Rivers have their own features; some of them cannot be generalized to other water resources. Regardless of natural beauty, fish resources, human use, etc. running waters have placed many microorganisms within themselves (Brusca & Brusca, 2003). Arthropods is the largest animal division whose million species have been identified. In terms of number and diversity, they took the first place among animals. The compatibility of arthropods (especially crustaceans) is such an extent that they have occupied all ecosystems and habitats in the world. They can be seen from 5000 meters deep in oceans and 6000 meters high from mountains (Fortey & Thomas, 1998).
Crustaceans have high importance in terms of economic, ecology and heath. Many of them are useful while some of them impose the greatest damages to human. Some are parasites of plants and animals, and some of them such as aquatic animals which will be studied in this paper have been given special importance being included in fish nourishment (Barnes, 1982).
Crustaceans which are a part of Macrobenthos are the largest array (taxon) of animals. Approximately, 95 percent of animal species are placed in this taxon. These animals are the most important terrestrial animals and the most prominent arrays of freshwaters.
However, they have been little known in most parts of the world and especially the tropics regions. Since, first, they have very high diversity and abundance, and second, their study is difficult due to their small size (Stock *et al.*, 1998).

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Due to their position near the base of energy pyramid and food chains, invertebrates play an important role in the process of energy transfer and food supply for other invertebrates and even vertebrates. Some arrays of invertebrates have great importance in economy and ecology. Different arrays of invertebrates are used as indicators of pollution for various running and stagnant waters, since the distribution of large invertebrates are related to different depths of water, the amount of solved oxygen, organic materials and different temperatures (Fortey & Thomas, 1998). Large aquatic invertebrates are almost found in all freshwaters of the earth. Of course, they are more abundant in some waters and habitats, but they may be less in other habitats. For example, they are few in number in cold waters of North and South Arctic, while they are limited to certain taxa (for example, *Chironomidae*). More frequency and varieties are observed in the tropical areas due to sufficient temperature and availability of food as well as other favorable environmental conditions (Ruppert *et al.*, 2004).

This is the first time that the evaluation of the diversity of crustaceans population has been taken place in Shapur River in Kazeroon, Fars province, Iran, in order to identity them. Crustaceans are different from each other in terms of resistance to intensity pollution and reduction of the amount of oxygen. So, some species are able to survive in fresh waters and free from any contamination, and some species live in waters with high pollutions (Poore, 2002).

Crustaceans are rarely found in running waters habitats; they mostly live in stagnant waters and in lakes. Some of which are very small and microscopic; they do not exist in running waters. They form a part of fauna of water resources. These creatures have a critical role in structure and production of dynamics and health of water resources environment. They can be aquatic food resource which play a key role in the food chain of waters, so that any changes in the environment around them bring harmful damages to these aggregations. Knowing these cases can also be helpful in completion and identification of fauna of creatures of the city, and it is an important step in protecting the environment as well as determining the fauna of crustaceans of this region. So, this study is aimed to identify and study caught crustaceans from Shapur River in Kazeroon, Fars province, Iran.

MATERIALS AND METHODS

The field, laboratory and seasonal sampling was conducted in this paper in two seasons of winter and spring 2015 and in six months of January, February, March, April, May and June. The studied area was Shapur River in Kazeroon, Fars province, Iran. The studied stations were selected among those regions that had had a proper depth of water and a proper condition for surviving crustaceans. The sampling from the crustaceans of each station of the River was done once in a month.

Followed by selection of stations, geographic location of each station was firstly determined using Global Positioning System (GPS) (Table 1). Related information to meters above sea level was prepared from Water Research Center of Kazeroon, and related information to latitude and longitude was prepared from Google Earth. Sampling was conducted six times for each station to study the crustaceans. In a way that it was performed using Trawler net in three replications and randomly from edge and middle of the river. And sampling was also performed using a ladle like fishing net from water of those regions especially from amidst of stones and marginal mosses of the river. Some samples were also taken from the bed of the River using a ladle. By moving the stones of the bed of the river, their bottoms were also evaluated and examined, and some samples were collected. Of course, some large specimens were gathered with hands. All the samples were finally transferred to a tray to be checked regarding the presence of crustaceans. After removing aquatic plants and algae and washing available mush, the insects, worms and mollusks, the samples were isolated and returned to their environment; the crustacean samples which were often accompanied by a number of non-crustacean samples were poured into plastic containers, and white alcohol was poured on them. The profile of fishing location and its history was recorded on the sample containers.

Some of the samples were transferred to the laboratory for examination and identification. To eliminate blur and bad smelling, the available alcohol on the samples was substituted twice in the first week. Their morphological characteristics were measured accurately in the laboratory using a calibrated ruler, acaliper

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device, a laboratory loop and identification keys (identification references). By finding initial information from morphological characteristics as well as accurate photography and valid identification keys, the samples were identified based on genus and sometimes based on their unique species.
And final reports of the paper were presented with related figures, charts and a table, eventually.

Table 1: Details of the Sampling Stations

Station	Geographic Coordinate	Meters above Sea Level
Station No.1	N29˚46′48.74″ E51˚34′59.90″	828
Station No.2	N29˚46′48.70″ E51˚34′59.84″	828
Station No.3	N29˚46′48.34″ E51˚34′59.44″	828

For statistical analysis of the data, charts were plotted using Excel Software to show the frequency.

RESULTS AND DISCUSSION

Results

Three samples of crustaceans called *Potamon sp.*, *Gammarus sp.* and *Fossarum* were collected and identified. Two samples were identified based on their genus and one based on its species (Images 1-4).

Figure 1: Abdominal Surface of Freshwater Broad Female Crab

Figure 2: Abdominal Surface of Freshwater Broad Male Crab

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Figure 3: A *Fossarum*, Freshwater Shrimp

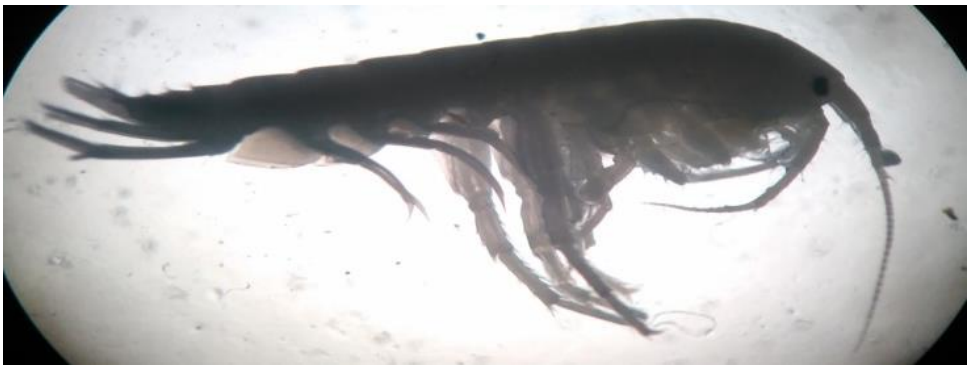

Figure 4: A *Gammarus sp.* Sample

The population density of different crustaceans was studied in three sampling stations. The evaluation of the population density of different species in each station is reported in charts (1-3).

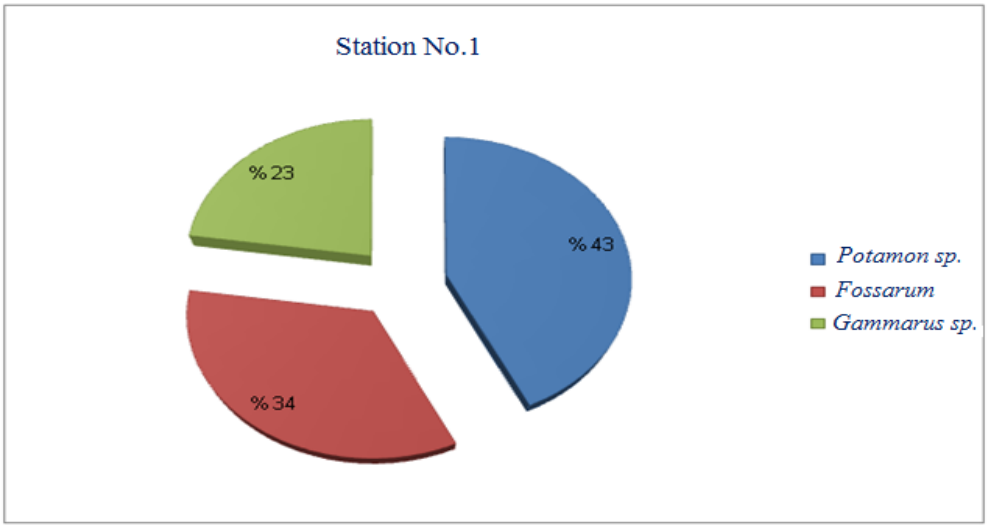

Chart 1: The Percentage of the Population Density of Various Species of Crustaceans in Station No.1

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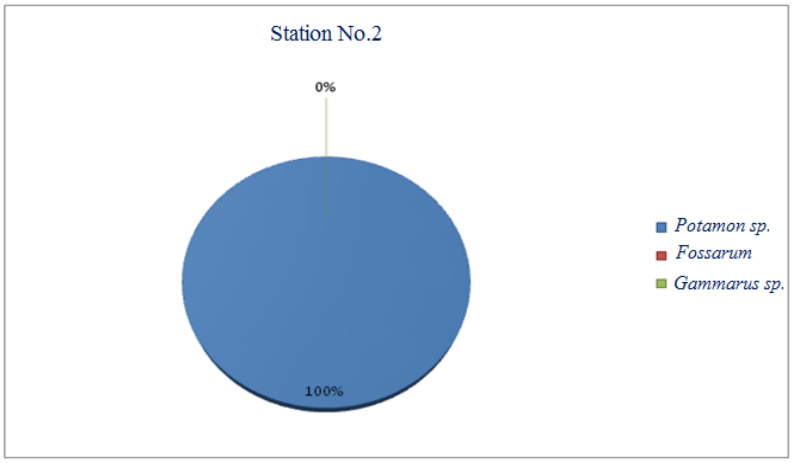

Chart 2: The Percentage of the Population Density of Various Species of Crustaceans in Station No.2

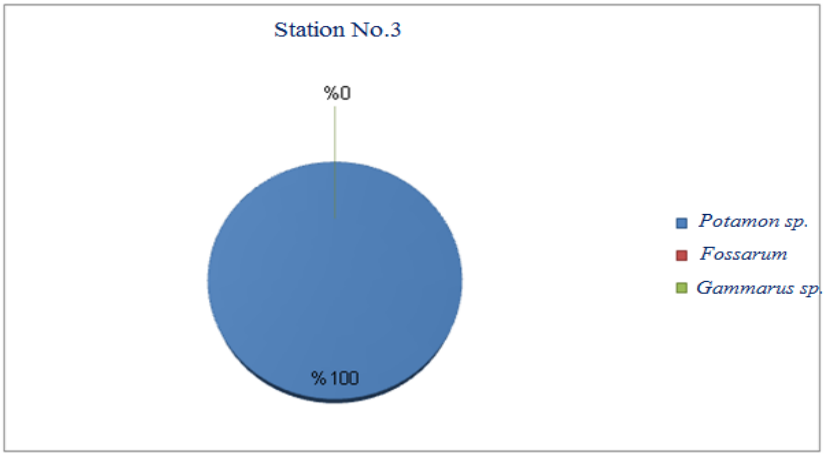

Chart 3: The Percentage of the Population Density of Various Species of Crustaceans in Station No.3

According to chart (4), of total 375 evaluated samples, the largest population of the crustaceans in Shapur River belonged to *Potamon sp.* genus with 69%, and the least belonged to *Gammarus sp*. genus with less than 12%.

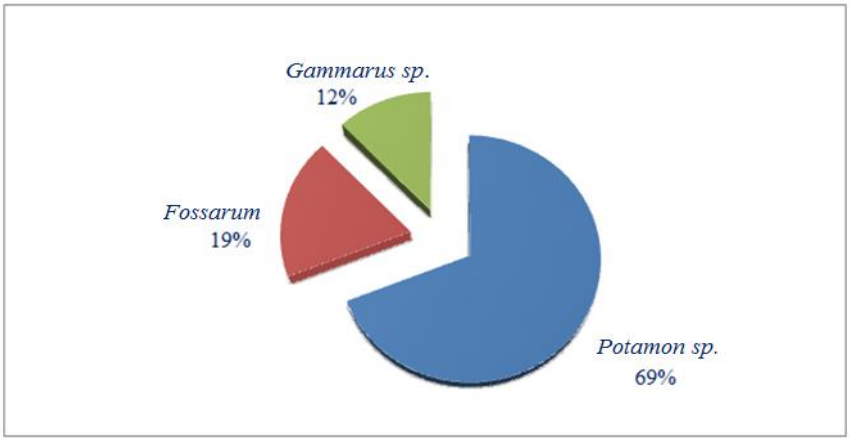

Chart 4: The Percentage of the Population Density of Various Species of Crustaceans in Shapur River

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The identified freshwater crustaceans in each three stations have been separately collected in charts (5), (6) and (7).

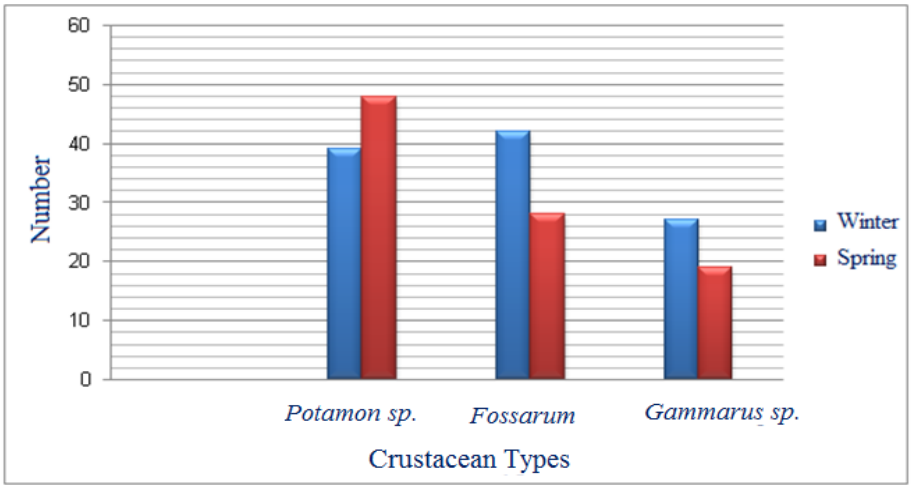

Chart 5: The Fluctuations of the Crustaceans in Station No.1, in Spring and Winter

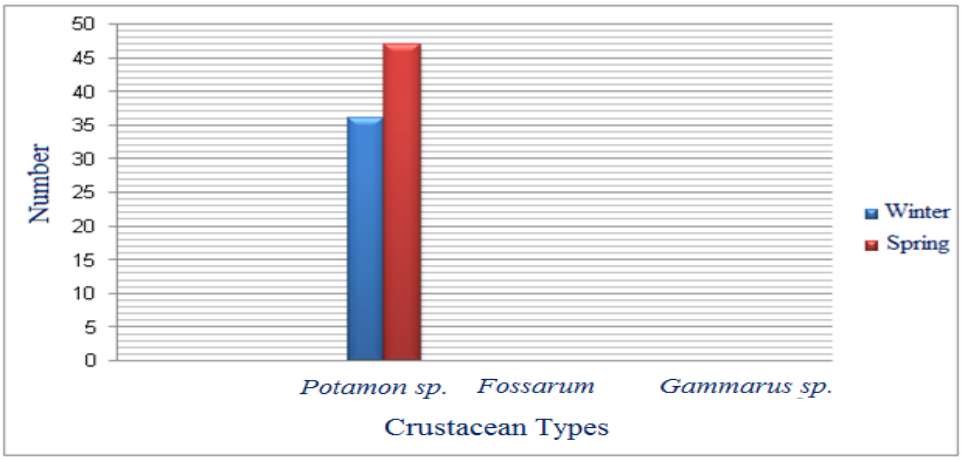

Chart 6: The Fluctuations of Crustaceans in Station No.2, in Spring and Winter

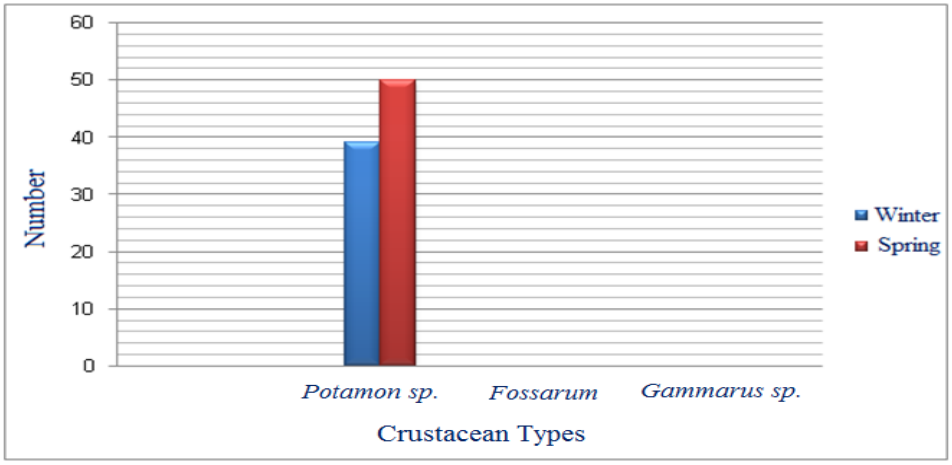

Chart 7: The Fluctuations of the Crustaceans in Station No.3, in Spring and Winter

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The population density of crustaceans from Shapur River from January to June in winter to spring 2015 were studied and evaluated based on the various stations and the results are reported in the chart (8).

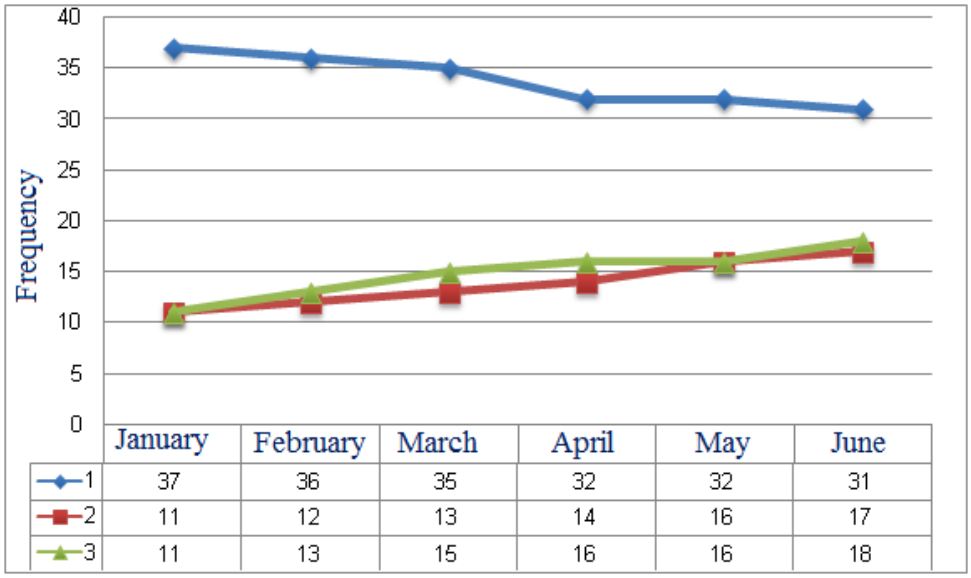

Chart 8: The Fluctuations of the Crustaceans of Shapur River in January to June, (Stations No.1 to No.3)

Comparison of the total population of the crustaceans from stations No.1 to No.3 is collected in the chart (9).

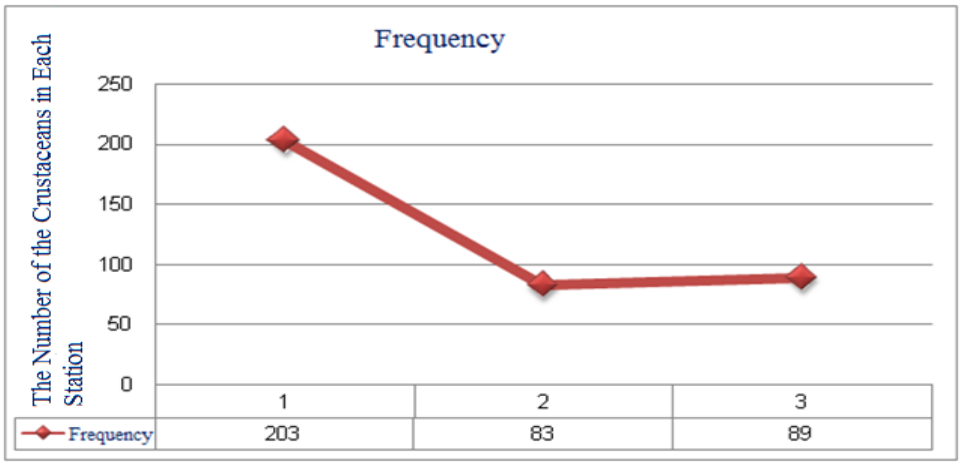

Chart 9: The Total Number of the Crustaceans in the Station No.1, No.2 and No.3

Discussion

The identified crustaceans of Shapur River in Kazeroon in three stations are as follows:
Broad freshwater crab, gender: *Potamon sp.*
Freshwater shrimp, species: *Fossarum*
Amphipoda, *Gammaridae*, gender: *Gammarus sp.*
According to their classification and their identification, then it can be said that:
The identified running water crustaceans of Shapur River had been from one division and two orders (Nam *et al.*, 2005):

1- Amphipoda order
2- Crabs order

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According to chart (1), the highest percentage of frequency in station No. 1belonged to *Potamon sp.* genus which is a broad freshwater crab and the lowest density belonged to *Gammarus sp.* genus which is *Gammaridae*, and it is considered as the food for aquatic animals, and almost lives on the bed of the river.
According to chart 2, the highest percentage of frequency in station No. 2 belonged to *Potamon sp.*genus, and the lowest density belonged to *Gammarus sp.* genus and *Fossarum* species.
According to chart 3, the highest percentage of frequency in station No. 3 belonged to *Potamon sp.*genus, and the lowest density belonged to *Gammarus sp.* genus and *Fossarum* species.
According to chart 4, of total 375 evaluated samples, the largest population of crustaceans in Shapur River in Kazeroon belonged to *Potamon sp.* genus with 69%, and the lowest belonged to *Gammarus sp.* genus with less than 12%.
The identified crustaceans in Shapur River had been collected from ten locations. This volume of identification has been taken place in Shapur River for the first time. No certain research was separately done in the past about identification of the crustaceans of this river, and only its insects have separately been identified before (Schäferna, 1992; Stock *et al.,* 1998). Its macrobenthos has also been identified in this River which includes crustaceans from two species of crab and freshwater shrimp (Schäferna, 1992; Stock *et al.,* 1998).
This is in accordance with the results of this study but the difference is that one genus is recorded more in this paper (Schäferna, 1992; Stock *et al.,* 1998). The identified freshwater shrimp (*Caridinafossarum*) is a native species of Iran. Lack of information about this species indicates that it does not have commercial value while it is the food source of carnivorous fish (Naderi *et al.,* 2011).
The density of crustaceans varies significantly with the change of season. According to charts (5) to (7), it is observed that the density of *Gammarus sp.* genus and shrimp was more in winter than in spring. The frequency of the crustaceans in winter was far more than in spring. This is in accordance with other studies (Brusca & Brusca, 2003).
On the other hand, the population density of broad freshwater crab in spring was higher, and whatever the weather became warmer, their population density increased. The comparison between seasons shows that the dispersion and activation of the crabs in Shapur river, and increase in their frequency in this water ecosystem can be attributed to enhancement of water and weather temperatures of this region. This is in accordance with the study of Khatami *et al.,* which was performed on identification of broad freshwater crab in Jajrood (Skurdal *et al.,* 1995; Williams *et al.,* 2002; Zvyagintsev *et al.,* 2007; Kowalewski *et al.,* 2005; Martens *et al.,* 2012; Martens *et al.,* 2008). According to chart (8), the fluctuation of the crustaceans in station No. 1 showed the maximum and the minimum densities in January and in June, respectively.
Invertebrates have the lowest diversity and abundance in spring, since their reproductive cycles have not been yet completed, and aquatic plants have not grown sufficiently. Due to overflowing of the River in spring and washing of existing colonies, frequency is also less in this season. The water of the River became muddy and overflowed due to the rains, especially in 2015. This is in accordance with results of Jorjani et al. in 2008 which had been carried out on benthoses fauna of Madarsou Stream in Golestan National Park, Iran (Jorjani *et al.,* 2008).
According to chart (8), the fluctuation related to population of the crustaceans in stations No.2 and 3 experienced the maximum and the minimum densities in June and in January, respectively. This is in accordance with the results of other studies (Jorjani *et al.,* 2008).
The density of population of the crustaceans, according to chart (9), was related to stations No.1 and No.3 with the maximum and the minimum frequencies, respectively. Their densities were higher in places which enjoyed more organic materials (Kowalewski *et al.,* 2005; Martens *et al.,* 2012; Martens *et al.,* 2008).
The organisms which are in need of fresh water and are sensitive to contaminations were seen in station No.1 and *Gammarus sp.* Genus, and shrimp were not observed in station No.2 and No.3. These two species were seen in clean and clear water of station No.1, near each other in amidst of the stones and were not seen at the other stations. This can be due to more appropriate temperature of water which is

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forced out from its fountain, as well as less contamination of it in this part and since water temperature was higher at stations No.2 and No.3. This is in accordance with Pazira *et al.*, (2008). It seems that living conditions had been almost the same in the different stations. In recent years, drought and loss of seasonal streams caused reduction and disappearance of crustacean species in all stations, since they are very vulnerable to habitat destruction and other adverse factors (Pazira *et al.*, 2008).

In this studied region, due to presence of currents of water that sometimes change seasonally their paths for agricultural use and flattened waters up to maximum of ten centimeters, all contributing factors are provided in this area for the loss of crustaceans (Pazira *et al.*, 2008).

Probably, since station No.1 is located at the water source, and the level of contaminants is also low, a lot of arrays (taxa) of invertebrates existed within it. Due to the role of plants in different stages of invertebrates life cycle, they can be considered as an important determinant. Plants are important especially since they can be considered as a food source. Quality and variety of foods can determine animal species of a region.

The role of predatory invertebrates should not be underestimated. The number of these creatures was low and usually not observed. This is in accordance with the results of Jorjani *et al.*, (2008), which had been carried out on benthoses fauna of Madarsou Stream in Golestan National Park, Iran.

Conclusion

The determined crustaceans in Shapur River were reported in Kazeroon for the first time. *Gammarus sp.* genus has been recorded for the first time in this River. The freshwater shrimp species (*Caridinafossarum Heller*) has been recorded for the second time in Shapur river. The freshwater crab (*Potamon sp.*) is very consistent with the conditions of Shapur River and is considered as the most abundant or in other words, the dominant species and biomass among the crustaceans of this river. It seems that some species also exist which their identification will be necessary and an important step in order to identify and complete animal fauna of Kazeroon.

According to the results mentioned above, different factors influence on distribution as well as characteristics of animals and bio systematic evaluation of organisms of a region including different seasons and weather conditions.

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