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# Concentrations of Heavy Metals in Selected Tissues of Blue Swimming Crab, *Portunus pelagicus* (Linnaeus, 1758) and Sediments from Persian Gulf

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**Abstract:** Persian Gulf supports diverse ecosystems and biota in need of remediation and protection and metal data from this region is needed. The levels of heavy metals (Fe, Hg, Ni and Pb) in tissues (hepatopancreas, muscle and exoskeleton) of blue swimming crab, *Portunus pelagicus* and sediments in the Persian Gulf coasts, south Iran were investigated. Heavy metals analysis was performed by Atomic Absorption Spectrophotometer. The concentration of heavy metals in sediments at all sampling stations occurs in descending order of Fe > Ni > Hg > Pb during both seasons. The distribution pattern of heavy metals in the tissues of crab and sediments was as follows: sediment > hepatopancreasn > muscle > exoskeleton. Maximum concentration of the total heavy metals in sediments and all tissues of *P. pelagicus* observes in Bahrekan station ($P<0.05$) during different seasons. There was no significant difference ($P<0.05$) between the level of heavy metals in the tissues of the crab *P. pelagicus*. In present study recorded that there was negligible differences in heavy metals levels between different seasons. Differences in heavy metals concentrations among the species is likely to have resulted from metal bioavailability, hydrodynamics of the environment, changes in tissue composition, stations of collection and sources of pollution within Persian Gulf.

**Key words:** Heavy Metals · Concentration · Blue Swimming Crab · *Portunus pelagicus* · Persian Gulf

## INTRODUCTION

The Persian Gulf is a body of water in the Middle East between the Arabian Peninsula and Iran. This inland sea is connected to the Gulf of Oman by the Strait of Hormuz [1]. Persian Gulf is a semi-enclosed formation and heavy discharges of the surrounding industries have been ongoing for many decades. Other sources of Persian Gulf pollution include invasions and bombardments that have been staggering in the recent years and are yet to be fully investigated. Although heavy metals are very toxic to both humans and the wildlife, limited research is available on heavy metals pollution in the Persian Gulf area. Aquatic environments, such as Persian Gulf, are especially at high risk for heavy metals contamination since much of the atmospheric deposition and all of the industrial water-runoffs culminate in these ecosystems. Large areas of agricultural lands, local fisheries, oil export facilities and a petrochemical plant operate in the general area. Trace elements are found in natural water bodies at varying concentrations. The most potentially dangerous of these elements are heavy metals. Body levels of essential metals such as copper, chromium, nickel and zinc can be regulated by some decapod crustacean at concentrations below a threshold level. Accumulation of these metals only begins after the organisms are faced with high concentration in the surrounding medium [2], but body levels of nonessential metals such as cadmium

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and lead were not found to be regulated by crustacean [3]. Heavy metals concentrations in aquatic ecosystems are usually monitored by measuring its concentration in water, sediments and biota [4]. Sediments are important sinks for various pollutants such as heavy metals [5, 6] and also play a useful role in the assessment of heavy metal contamination [7]. Crabs belong to a group of animals knows as decapods crustaceans. Most of the marine crabs occurring along the Persian Gulf coasts belong to the family Portunidae. The blue swimming crab, *P. pelagicus* is widely distributed throughout the coastal and estuarine areas of the tropical western Pacific and Indian oceans [8]. *P. pelagicus* is one of the important representatives of decapod crustacean and a species commonly found in Persian Gulf coasts, Iran. Crabs has the capability of accumulating heavy metals [9] and is thus a suitable biondicator for environmental contamination with these agents Hepatopancreas, the key site of heavy metal accumulation in Crustacean, is one of the most important organs that play important roles in metal detoxification [10]. Therefore, it is of great interest to investigate the toxicity of heavy metal on hepatopancreas in blue swimming crabs. Crabs are an excellent bioindicator of metal contamination and can be used to effectively and accurately monitor metal level for several reasons. Anthropogenic pollutants such as industrial, municipal and agricultural wastes finally end up in wetlands; exposing waterfowl to a variety of environmental pollutants.

Heavy metal used a widely in modern industry. Heavy metals including both essential and non-essential elements have a particular significance in ecotoxicology, since they are highly persistent and all have the potential to be toxic to living organisms [11]. Heavy metals do not exist in soluble forms for a long time in waters. They are present mainly as suspended colloids or are fixed by organic and mineral substances [12]. Several factors such as size, nature of the environment, seasonal variation and variability in species have been identified as important independent variable influencing metal levels in marine organisms [13]. Over the past century, heavy metals have been discharged into the world rivers and estuaries as a result of the rapid industrialization [14, 15]. Anthropogenic activities are the determining ecological factors in cities and industrial regions [16].

Metals that are naturally introduced into the river come primarily from sources such as rock weathering, soil erosion, or the dissolution of the water-soluble salts. Depending on physicochemical conditions, the pollutants in dissolved form can later be precipitated [17]. The deposition of metals in sediments occurs through an interaction between sediment and water, whereby variations of metal contents of sediment and water depend on variation of water chemistry, for example temperature, pH and solute concentration [18]. Sediments, particularly surficial sediments, may serve as a metal pool that can release metals to the overlaying water via natural anthropogenic processes, causing potential adverse health effects to the ecosystems because of their serious toxicity and persistence [19, 20]. In order to differentiate human impact from natural variability, knowledge of background concentrations of metals and their fluctuations in biomonitor organisms is essential as well as a thorough understanding of accumulation and detoxification strategies. These depend on various aspects, including the biological species and element considered, the applied exposure regime, cation homeostasis mechanisms, life-history status, spatial and temporal scales and other factors [21, 22]. This study was to determine the distribution and concentration of heavy metals (Fe, Hg, Ni and Pb) in sediments and tissues (hepatopancreas, muscle, exoskeleton) of species *Portunus pelagicus* from Persian Gulf coasts located in south Iran.

## MATERIALS AND METHODS

**Study Area:** The study was carried out in the several adjoining coasts in the Persian Gulf such as Khuzestan province (including coasts Abadan and Bahrekan), Boushehr province (including coasts Boushehr and Khark) and Hormozgan province including coasts Bandar Abbas and Jask (Figure 1). The Persian Gulf lies on the South Iran, between longitudes 48°25' and 56°25" East and latitudes 24°30" and30°30' North. It has an estimated area of 260Km2 and extends 600Km offshore to a depth average of about 30-40 meter [1].

**Sampling Stations:** Samples of surficial sediments and available species of blue swimming crabs were collected from 6 coastal localities during two seasons (between February and September 2011) in Persian Gulf coasts a distance of about 909 kilometers. Sampling covered areas of the direct or indirect influence of urban and industrial releases, those located near the mouth of the tributary rivers which carry industrial discharges of pollutants to the offshore waters and a locality not under the influence of industrial or urban releases. The sampling stations were selected to reflect progression of pollution, ecological particularity and human activities in the area.

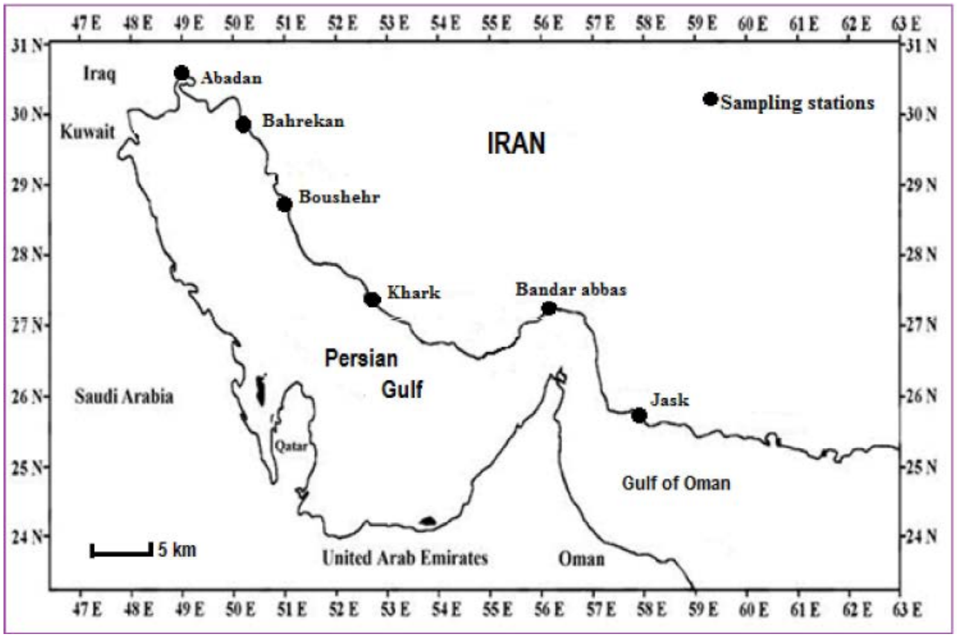


Fig. 1: Map of Persian Gulf coasts showing sampling stations and the Study area.

**Samples Collection:** Sediment Sampling was performed with Van Veen grab from the bottom at all stations. After sampling, the samples were packed in plastic bags, preserved and transferred to laboratory for analysis. Samples of biological material and sediment were immediately transferred to new polyethylene bags. All samples were frozen or stored at about 5°C until further processing. Each aliquot of sediment was digested for 4 h in a water bath at 60°C, after adding 3 ml each of concentrated $HNO_3$, $H_2S\ O_4$ and HF. $H_2S\ O_4$ was used because the sediment from most of the sampling sites contains 8 to 10% of organic matter [23]. The digestion of each sample of sediment was made in duplicate. Each sample of crabs was homogenized in an acid-cleaned mortar and 2 g were digested in triplicate in a water bath at 60°C for 6 h after adding 2.5 ml each of concentrated $HNO_3$ and $H_2S\ O_4$.

Crabs sampling was performed with shrimp trawl. After sampling, samples were transferred to the laboratory in a cooler and stored in a deep freezer for further analysis. Each crab was properly cleaned by rinsing with distilled water to remove debris, planktons and other external adherent and then they were dissected for collect tissues hepatopancreas, muscle and exoskeleton. It was then drained under folds of filter, weighed, wrapped in aluminum foil and then frozen at 10ºC prior to analysis. The tissues were placed in clean watch glasses and were oven dried at $105^0$C for 1 hour and later cooled in the desiccators.

**Metal Analysis:** The analysis of total heavy metals were done by the cold vapor method [24] using a Perkin-Elmer Atomic Absorption System AA-2380 with automatic background correction and a Perkin-Elmer Mercury Analysis System 303-0830. Replicate (3 to 5) measurements were made on each sample. All glass-ware used was cleaned by the procedure described by Ober *et al*. (1987). All the reagents used were of spectroscopic grade and ultra-high purity (99.9%). In all experiences several blanks were performed with the reagents used, in order to check for possible contamination. The data obtained were statistically analyzed for confirmation of the results. Metal toxicity from different tissues and sediments was calculated by using regression equation and results were expressed in µg /gm dry weight.

**Statistical Analysis:** Data were analyzed using the one-way analysis of variance (ANOVA) and group means were compared using Duncans multiple range test. P values $< 0.05$ were considered significant.

## RESULTS

The concentrations of the heavy metals in the sediments from different stations are presented in Table 1. The results showed that the heavy metal concentration in sediments at all sampling stations occurs in descending order of Fe > Ni > Hg > Pb during both seasons. The highest concentrations of the heavy metal in sediment were recorded in Bahrekan station and the least was in Boushehr station during both seasons. The present study recorded that Fe forms the most abundant element in the sediment (54.43±0.40µg/g) during Summer season and Pb had concentration least (0.24±0.30µg/g) during Winter season. There was significant difference (p<0.05) between the level of heavy metals in the different stations during two season.

The concentrations of the heavy metals in the hepatopancreas of crab, *P. pelagicus* from different stations along Persian Gulf coasts presented in Table 2. Results showed that the highest concentrations of the heavy metal in hepatopancreas were Fe (51.80±0.06µg/g) during Summer season and Pb was least (0.14±0.30 µg/g) during Winter season. Generally our results showed that concentrations of the heavy metals in the sediments were higher than hepatopancreas tissue, muscle tissue and exoskeleton. Table 3 shows the concentration of heavy metals in the muscle tissue of crab *P. pelagicus.* The highest concentrations of the heavy metal in muscle tissue were Fe (46.93±0.20µg/g) during Summer season and Pb was minimum (0.11±0.30 µg/g) during Winter season. The concentrations of the heavy metals in the exoskeleton tissue of crab *P. pelagicus* presented in Table 4. The highest concentrations of the heavy metal in exoskeleton was Fe (41.20±0.40µg/g) and Mn was minimum (0.05±0.30 µg/g). The data showed that for crab samples (hepatopancreas, muscle and exoskeleton), Fe was the highest concentration, followed by Ni, Hg and least was Pb. There was no significant difference (p<0.05) between the level of heavy metals in the tissues of *P.pelagicus* during different seasons. The comparison on heavy metal accumulation between hepatopancreas tissue, muscle tissue and exoskeleton showed that bioaccumulation in the exoskeleton was less than hepatopancreas and muscle tissue during both seasons.

Table 1: Concentration of heavy metal (µ g/g dry weight) in Sediments from different stations along Persian Gulf coasts

| | | Station | | | | | |
|---|---|---|---|---|---|---|---|
| Season | Metal | Abadan | Bahrekan | Bushehr | Khark | Banda Abbas | Jask |
| Summer | Hg | 0.800.05 | 6.50±0.05 | 0.40±0.01 | 1.70±0.02 | 0.77±0.02 | 0.56±0.05 |
| | Fe | 18.20±0.06 | 54.43±0.40 | 15.29±0.21 | 28.80±1.09 | 31.16±0.57 | 13.12±1.43 |
| | Pb | 1.49±0.04 | 3.850.04 | 0.26±0.02 | 0.55±0.03 | 1.32±0.03 | 0.42±0.03 |
| | Ni | 19.5±1.22 | 24.7±1.22 | 09.930.58 | 17.01±0.86 | 14.46±0.30 | 11.94±1.96 |
| Winter | Hg | 0.680.05 | 4.600.05 | 0.36.0.05 | 1.400.05 | 0.600.05 | 0.400.05 |
| | Fe | 15.350.04 | 47.85±0.02 | 11.55±0.04 | 23.01±0.16 | 28.80±1.09 | 12.66±0.44 |
| | Pb | 1.06±0.02 | 2.92±0.01 | 0.24±0.30 | 0.40±0.30 | 1.16±0.57 | 0.29±0.10 |
| | Ni | 16.85±0.02 | 20.82±0.02 | 7.34±0.10 | 13.14±0.06 | 13.12±1.43 | 10.79±0.05 |

Table 2: Concentration of heavy metal (µ g/g dry weight) in Hepatopancreas of crab, *P. pelagicus* from different stations along Persian Gulf coasts

| | | Station | | | | | |
|---|---|---|---|---|---|---|---|
| Season | Metal | Abadan | Bahrekan | Bushehr | Khark | Banda Abbas | Jask |
| Summer | Hg | 1.69±0.55 | 4.70±0.80 | 1.05±0.33 | 2.60±0.39 | 1.60±0.44 | 1.42±0.40 |
| | Fe | 16.89±0.04 | 51.80±0.06 | 12.40±0.40 | 25.86±0.20 | 30.28±0.07 | 11.96±0.09 |
| | Pb | 1.04±0.02 | 2.85±0.04 | 0.16±0.02 | 0.75±0.03 | 0.62±0.03 | 0.22±0.03 |
| | Ni | 18.70±1.12 | 22.10±0.20 | 08.30±1.58 | 16.01±1.10 | 13.60±0.25 | 11.01±0.10 |
| Winter | Hg | 1.20±0.05 | 3.60±0.05 | 0.90±0.05 | 1.94±0.05 | 1.23±0.05 | 1.09±0.05 |
| | Fe | 13.35±0.04 | 48.05±0.02 | 10.55±0.04 | 20.01±0.16 | 24.80±1.09 | 09.66±0.44 |
| | Pb | 0.36±0.02 | 1.92±0.01 | 0.14±0.30 | 0.49±0.30 | 0.46±0.57 | 0.20±0.10 |
| | Ni | 15.85±0.02 | 18.02±0.02 | 06.34±0.10 | 14.14±0.06 | 11.12±1.43 | 9.79±0.05 |

Table 3: Concentration of heavy metal (µ g/g dry weight) in Muscle of crab, *P. pelagicus* from different stations along Persian Gulf coasts

| | | Station | | | | | |
|---|---|---|---|---|---|---|---|
| Season | Metal | Abadan | Bahrekan | Bushehr | Khark | Banda Abbas | Jask |
| Summer | Hg | 1.40±0.21 | 2.28±0.40 | 0.90±0.51 | 1.50±0.45 | 1.35±0.52 | 1.15±0.66 |
| | Fe | 13.09±0.06 | 46.93±0.20 | 10.02±0.06 | 22.06±0.03 | 26.20±0.50 | 10.70±0.40 |
| | Pb | 0.98±0.10 | 2.40±0.20 | 0.15±0.02 | 0.55±0.03 | 0.58±0.03 | 0.20±0.03 |
| | Ni | 17.50±0.20 | 20.80±1.22 | 07.93±0.50 | 16.01±0.86 | 12.46±0.30 | 10.24±1.96 |
| Winter | Hg | 1.21±0.05 | 1.90±0.05 | 0.74±0.05 | 1.32±0.05 | 1.09±0.05 | 1.02±0.05 |
| | Fe | 11.30±0.04 | 41.10±0.02 | 8.05±0.04 | 19.01±0.16 | 24.30±1.09 | 9.06±0.44 |
| | Pb | 0.66±0.02 | 2.12±0.01 | 0.11±0.30 | 0.40±0.30 | 0.46±0.57 | 0.10±0.10 |
| | Ni | 15.35±0.02 | 17.80±0.02 | 7.54±0.10 | 14.10±0.06 | 11.10±1.43 | 8.70±0.05 |

Table 4: Concentration of heavy metal (µ g/g dry weight) in Exoskeleton of crab, *P. pelagicus* from different stations along Persian Gulf coasts

| | | Station | | | | | |
|---|---|---|---|---|---|---|---|
| Season | Metal | Abadan | Bahrekan | Bushehr | Khark | Banda Abbas | Jask |
| Summer | Hg | 0.90±0.18 | 1.30±0.19 | 0.40±0.72 | 0.98±0.30 | 0.84±0.12 | 0.70±0.08 |
| | Fe | 11.20±0.50 | 41.20±0.40 | 09.20±0.26 | 18.80±0.04 | 23.30±0.53 | 08.50±0.40 |
| | Pb | 0.40±0.05 | 1.90±0.04 | 0.08±0.02 | 0.40±0.03 | 0.45±0.05 | 0.15±0.05 |
| | Ni | 15.7 0±1.22 | 19.10±0.10 | 06.90±0.50 | 15.01±0.60 | 11.40±0.30 | 09.20±1.30 |
| Winter | Hg | 0.65±0.05 | 1.05±0.05 | 0.32±0.05 | 0.60±0.05 | 0.63±0.05 | 0.44±0.05 |
| | Fe | 9.35±0.04 | 40.05±0.02 | 8.55±0.04 | 16.01±0.16 | 20.80±1.09 | 06.66±0.44 |
| | Pb | 0.26±0.02 | 1.50±0.01 | 0.05±0.30 | 0.29±0.30 | 0.26±0.57 | 0.09±0.10 |
| | Ni | 13.75±0.02 | 17.82±0.02 | 6.34±0.10 | 13.04±0.06 | 10.12±1.43 | 8.09±0.05 |

The results indicated that concentrations of all heavy metals in the sediments and tissues of crab during Summer season was higher than concentrations of all heavy metals during Winter season. There was no significant difference ($p<0.05$) between the level of heavy metals during different seasons. In present study recorded that there was negligible differences in heavy metal levels between different seasons.

In the present study, results showed that concentrations of the heavy metals in the sediments and tissues of crabs in Bahrekan station were significantly higher ($P < 0.05$) than the other stations during different seasons. There is a growing concern about the physiological and behavioral effects of environmental trace metals in human population and probably due to nearby to petrochemical industries and a high amount wastewaters containing heavy metal always dumped at this station.

## DISCUSSION

The contamination of soils, sediments, water resources and biota by heavy metals is of major concern especially in many industrialized countries because of their toxicity, persistence and bioaccumulative nature [25]. Sequential extraction results can provide information on possible chemical forms of heavy metals in sediments [26]. Levels of contaminants in marine animals are of particular interest because of the potential risk to humans who consume them. In particular, the tendency of heavy metals to accumulate in various organs of crustacean, which in turn may enter the human metabolism through consumption causing serious health hazards. Accumulation of metals in marine animals is the function of their respective membrane permeability and enzyme system, which is highly species specifics and because this fact different metals accumulated in different orders in the studied *P.pelagicus* samples. The effects of heavy metals in the environment depend to a large extent on whether they occur in forms that can be taken up by plants or animals. Therefore, the present study was undertaken to evaluate the heavy metals accumulation of Fe, Hg, Ni and Pb in the sediments and tissues (hepatopancreasn, muscle, exoskeleton) of the crab *P.pelagicus*. A wide range of values for heavy metal concentrations was observed for the sediments. In *P.pelagicus* the distribution pattern of heavy metals was in the increasing order of hepatopancreasn > muscle > exoskeleton. Results showed that Fe had the higher concentrations in the tissues of crab and Pb element had concentrations least. This observation may be due to the major functional differences in their body. The research same, the comparison on heavy metal accumulation between all tissues crustaceans show that bioaccumulation of heavy metals was more in hepatopancreasn than other tissues [27, 28]. The variation is also an indication of the degree to which particular species pick up particulate matter from surrounding water and in particular sediments while feeding. Crabs are bottom feeder and are generally expected to concentrate more metals than surface feeders like prawn which is in agreement with earlier report. There was no significant difference ($p<0.05$) between the level of heavy metals in the tissues of the crab *P.pelagicus* but there was a significant difference ($P< 0.05$) between sediments and tissues of crab *P.pelagicus.* The concentrations of Fe were higher than the other metals, suggesting that there is an influence of the industrial activities in surroundings of the sampled stations. Research same showed that the highest concentrations of Fe in water were found in lakes which had the lowest water pH and the lowest sediment pH [29].The low value of Pb concentration in the present study may indicates that the tissues of *P.pelagicus* is not the target organs for Pb accumulation. The absence or low value of lead in the crab may be due to the activities around the location of the Gulf. The area consist mainly farmland and few residential houses. There are few or no industrial activities around the location. This may agree to the study of Craig and Overnell (2003) [30]. They concluded that Pb concentration in the tissues of crustacean is low than other metals [31]. Research same showed that the highest concentration of lead was found in the Nuuanu watershed (Hawaii) when there were high boating activities [32]. The result of the analysis has shown that crab *portunus pelagicus* can be used as bio-indicator as it contains variable levels of the metals analyzed with high enrichment of Fe, Hg, Ni and Pb observed.

According to field and experimental studies, tissue distribution and accumulation of heavy metals in crabs varies widely depending on size, sex, growth stage, molting, migration, season of sampling, metal bioavailability, hydrodynamics of the environment, changes in tissue composition and reproductive cycle [33]. Crabs in this study have very similar diets; they are all intermediate consumers which feed mainly on invertebrates for example: shrimp, bivalve and vegetation. Foraging grounds of these crabs are also somewhat different which leads to differences in prey size and ultimately metals intake. Crabs also, spends more time in shallow waters and coastal and in terrestrial areas where anthropogenic metals is less widely present. We therefore expected to see dissimilar levels of heavy metal in tissues of this specie. Despite the fact that there were no significant differences in heavy metal levels between tissues of *P.pelagicus.*

Biomonitors can be used to establish geographical and/or temporal variations in the bioavailabilities of heavy metals in the marine environment, offering time-integrated measures of those portions of the total ambient metal load. Heavy metal accumulation strategies vary between crustacean taxa and the regulation of body levels of Hg as an accumulation strategy would seem to be present only in decapods [2]. The result of the analysis has shown that crab *portunus pelagicus* can be used as bio-indicator as it contains variable levels of the metals analyzed with high enrichment of Heavy metal observed. As far as the crabs consume organic substances present in the bottom of sediments of aquatic systems, they are good biomonitors for pollutants presents in the ecosystems. It is also important the fact that this species represents both source of income and nourishment for the marginal populations effects. Differences in heavy metals concentrations among the species is likely to have resulted from metal bioavailability, hydrodynamics of the environment, changes in tissue composition, reproductive cycle, different feeding mechanism, temperature, salinity, stations of collection and sources of pollution within Persian Gulf. The high concentrations of heavy metals in commercially important crustaceans sampled from Persian Gulf (Bahrekan station) is a cause of concern and requires regular monitoring of water quality around the point sources present opposite to the Northwestern part of the Persian Gulf, in combination with the fact that crab consumption is the main source of heavy metal intake in people not occupationally exposed, amplifies the need for preventive measures to safeguard public health.

Seasonal variation may effect metal concentration in body organism. This variation could result in internal biological cycle in organism or variation in bioavailability of metal in environment. Temperature, food availability and water could increase metal concentration in Summer than Winter [34] such this condition was happened during present study and mercury levels in different tissues showed higher in Summer season compared to Winter season. In other words, most levels of Hg in body organism is in the form methy1 mercury which is soluble in fatty tissues, thus seasonal reproduction could be cause reduce mercury in Winter season. Similarly in the present study, less metal uptake was showed during Winter season. According to different studies the heavy metal concentrations in invertebrates showed higher in Winter and early Spring [35, 36]. It was revealed that algae and invertebrates all show similar seasonal patterns in metal concentrations it would seem likely that environmental factors (discharges to the estuary, pH, salinity, suspended matter, etc.) are having a greater overall influence on seasonality than biological factors (metabolism, reproduction, fluctuations in tissue weight, etc.). Seasonal variation in metal levels may be caused by such factors as land drainage to the marine environment availability of food, temperature and reproductive cycle and condition of the organism.

Very limited data on heavy metals exposure in Persian Gulf invertebrates are available. The data suggests that sediments have higher mercury levels than crab species. Information for evaluating the ecological risk implications of these isolated observations is lacking and more information on heavy metals in sediments and in invertebrates is needed. To understand the impacts of heavy metals on biota and ecosystems, it is necessary to systematically collect data on a group of representative species (bioindicators) from a wide variety of ecosystems, stratified by presumed exposure to metals. A systematic assessment of heavy metals should be carried out in conjunction with other bioaccumulative pollutants in Persian Gulf animals.

The knowledge of heavy metals concentrations in crustaceans are very important with respect to nature management, human consumption of these species and to determine the most useful biomonitor species and the most polluted area. Information on the distribution pattern of toxic heavy metals pollutants in aquatic environment becomes important so as to know the accumulation of such pollutants in the organisms and final transfer to man through sea foods. The International official regulatory agencies have set limits for heavy metals concentrations above which the crab is considered unsuitable for human consumption. The present study is important not only from the human health point of view, but it also presents a comparative account of heavy metal in edible crabs from six different stations of Persian Gulf that are physico-chemically different. The results of this study suggested that the accumulation of heavy metal in the aquatic organisms of the present study may be dependent on some factors such as metal bioavailability, hydrodynamics of the environment, stations of collection, temperature, salinity, sex and sources of pollution. The heavy metals accumulation in the different tissues and sediments increased as the exposure time increased. So, heavy metal will reach the tissues of human beings through the food chain. Therefore, it should be mentioned by industrialists and they should take steps to reduce the aquatic pollution. The magnification order of heavy metals in the sediments and tissues of crab was as follow: sediments > tissues. It can be concluded from the present study that the tissues of crabs studied contain mercury less than the sediments and is safe for human consumption according to WHO criteria.

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