

Original Research Article

Food and Feeding Habitats of the Mullet Fish, *Liza abu* from Musa Estuary, Persian Gulf

Seyed Hossein Sajjadi* and Arya Vazirizadeh

Abstract

Department of Fisheries, Natural resources Faculty, Shiraz University

*Corresponding Author's Email:
sajjadih@gmail.com

Liza abu is very important in term of economically and ecologically in the estuaries around the Persian Gulf. Studies on the feeding ecology of *Liza abu* are very important for our better understanding of the biology and the ecological role of this fish for assess reserves and species conservation. The influence of sex and season on the feeding habit of *Liza abu* from Musa estuary in Khuzestan province, was examined. The first, the biometry features were measured then the stomach of each sample was surveyed. Ten different groups of prey were identified, belonging, in order of abundance, to detritus, organic matter, seaweed, Chlorophyceae, Myxophyceae, Bacillariophyceae, Copepods, Insect larvae, Nematodes and other. The comparison indicated that there was striking difference between the contents of male and female stomachs. There were significant differences in the preference for food items in the different season ($P < 0.05$).

Keywords: Feeding Habitats, Ecology, *Liza abu*, Pelagic, Musa Estuary

INTRODUCTION

Liza abu, (DeKay 1842) is a member of Mugilidae fish species and it is a pelagic species which is mainly caught by gill net and trawl in the estuaries of Persian Gulf. It inhabits coastal marine waters, estuaries and fresh water. Most species are adaptable to great changes in salinity, from almost fresh water to salinities of 75 ‰ (Abdoli *et al.*, 1996; Zafer *et al.*, 2013). Most species spawn at sea and feed on bottom detritus by taking in sand and mud and rejecting the most indigestible parts. Due to their rapid growth and hardiness, they are often used in fish pond culture. It is of a high economic value and is widely distributed in many countries around the Persian Gulf (Abbasi, 2006; Sezen and Gulnaz, 2016). It migrated from sea to estuary water and showed rapid distribution in different area with the change of seasons. It has also been observed in freshwater (Abdoli and Naderi, 2009).

Study of the feeding behavior of marine fish is necessary for fish stock assessment, ecosystem modeling and trophic relationships in aquatic communities (Abdul-Razak and Mohamed, 2013). However, very few studies concerning some ecological items such as feeding habit in the *L. abu*. The feeding

preferences of this species of fishes are complex. They are influenced by number of different factors, including the availability, mobility and abundance of prey, environmental factors, developmental stage and sex (Al-Emam, 1978; Ahmed and Hussain, 2000). The biological data are important steps in the field of ecological management. The influence of size and sex on the trophic strategies and feeding habit of the species has not been reported. Biological information to keep track of any ecological alterations as it affects the species in their environment is necessary for their management and conservation. Information on the size related changes in diets of fish, in particular, might facilitate the understanding of appropriate dietary requirement of the fish, as they grow from larva, juvenile to adult in any culture system.

MATERIAL AND METHOD

Khuzestan province, one of the most important coastal lines in the Persian Gulf, is located in the northwest of the

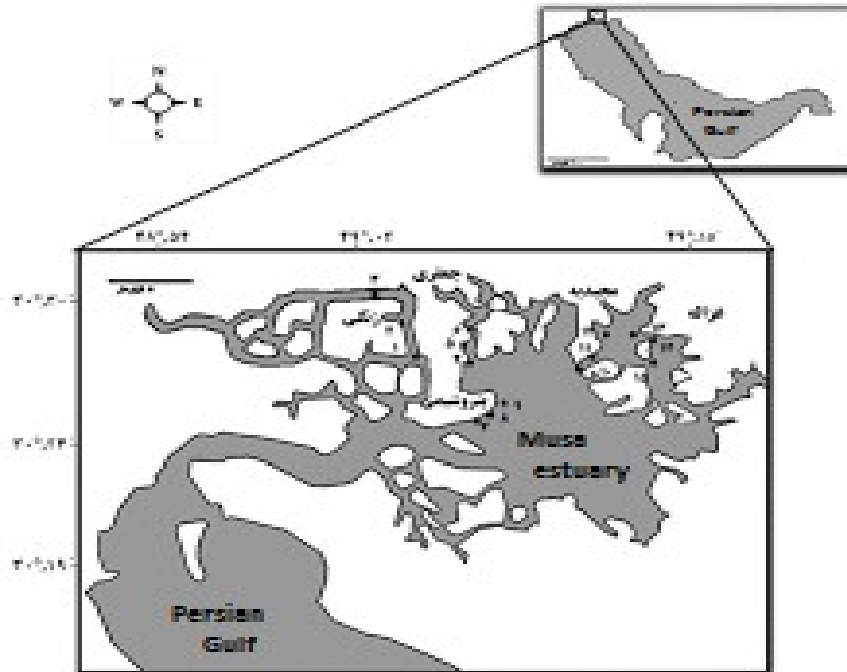


Figure 1. A map showing the study area

Gulf (Figure 1). It has subtropical climate with tow marked seasons including winter and summer. Musa estuary is biggest body water in the Khuzestan coasts and located in the Mahshahr city. This estuary consists of many branches and creeks. Thus, it provides a suitable habitat for fish, shrimp and other economically important aquatic organisms. Mullet fish is one of the most abundant fish species in Khuzestan province, which is caught all over the year in the area.

The study took place during 2 seasons: March and November 2013. Samples were collected from depths between 5 and 40 m. There were in total 125 fish in which stomach samples were collected. The methods of sampling and stomach contents analysis have been described in detail by Palsson (1983). The fishes were dissected; and the viscera were preserved in 10% formalin for detailed study and the food was evaluated by 'points' method. Intensity of feed was designated as gorged, full, 3/4 full, 1/2 full, 1/4 full, barley full and empty and were presented as point categories: 100, 75, 50, 25, 15, 5 and 0 respectively. The food species were identified to the lowest possible taxon.

The Frequency of Occurrence Method (FOM) was used for the analysis of food items. This method gives a measure of the regularity with which food has been taken up in the sample or population and "it is specifically recommended when different food items contribute to the diet" (Palsson, 1983). This method entailed recording the number of stomachs containing individuals of each food category, expressed as percentage of all the stomachs examined according to the formula:

$$\text{Occurrence \%} = \frac{\text{No. of stomachs with particular food group}}{\text{Total no. of stomachs with food}} \times 100$$

For statistical analysis, we used One-Way ANOVA for comparison different items food in the stomach if fish species, and t-test for comparison between winter and summer. Figure 1

RESULTS AND DISCUSSION

In the present investigation, 125 fish were examined out of which 85. 55% had stomachs with food items. Table 1 provides the results on the stomach contents of *L. abu*. According to the table, 17.19% were 100% full; 13.27% were 3/4 full; 29.12% were 1/2 full; 17.25% were 1/4 full; and 23.17% were barely full.

Percentage frequency of occurrence of different food categories (Table 1) showed that the food items were organic matter (43.2%-45.2%), detritus (fine sand and mud) (33.8%-35%), Chlorophyceae (13.0%-13.4%) and seaweeds (3.8%-5.6%). Organic matter and detritus made major contribution to the diet of the *L. abu*, which agrees with the findings of Al-Nasiri et al. (1977). Islam et al. (1982) reported the presence of animal food in the gut of the fish only in spring and fall.

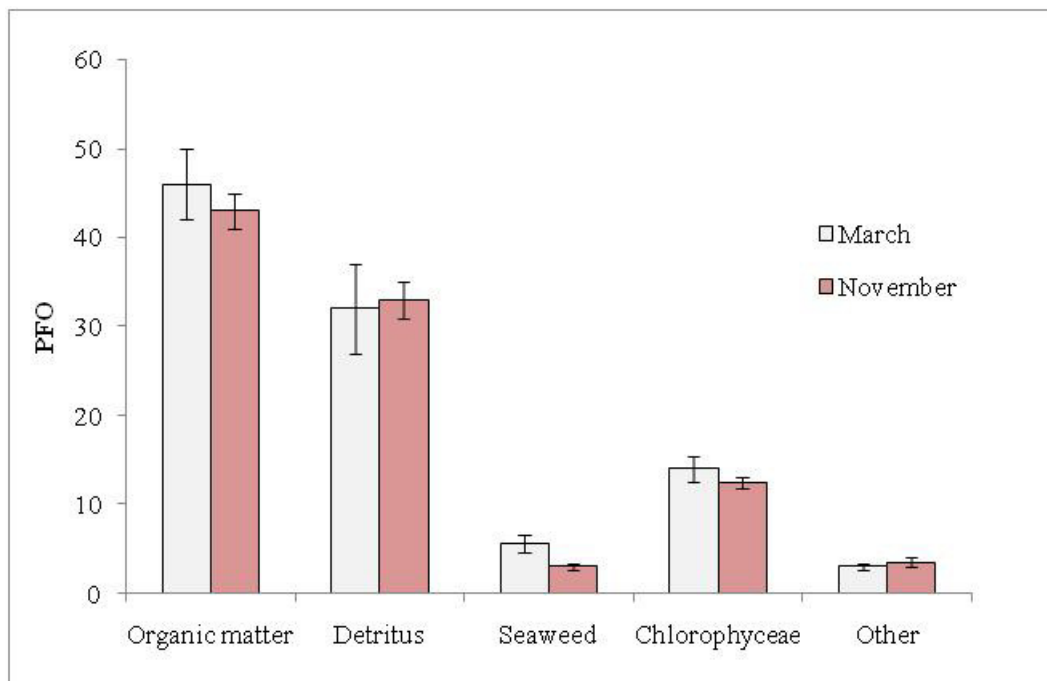
The details according to the sex of the fish are given in Table 2. Detritus and organic matter were higher in the diet of females, while seaweed, Myxophyceae and

Table 1. Percentage of intensity of feeding in *L. abu*

Month	Full	$\frac{3}{4}$ full	$\frac{1}{2}$ full	$\frac{1}{4}$ full	Barely full
March	12	7	19	10	14
November	14	8	17	11	14
Total %	17.19	13.27	29.12	17.25	23.17

Table 2. Percentage frequency of occurrence of food items in the diet of *L. abu* in the whole year

Food item	PFO	
	Male	Female
Detritus	33.8%	35%
Organic matter	43.2%	45.2%
Seaweed	5.6%	3.8%
Chlorophyceae	13.4%	13%
Myxophyceae	1.2%	0.8%
Bacillariophyceae	0.6%	0.5%
Copepoda	0.4%	0.2%
Insect larvae	0.4%	0.2%
Nemaitode	0.2%	0.2%
Other	1.2%	0.9%

**Figure 2.** Seasonal differences between percentage frequency of occurrence of food items in the diet of *L. abu*

Chlorophyceae were higher in the diet of males. The other items were negligible differences between sexes. Our results were similar to those on the diets of *L. abu* from different areas (Al-Emam 1978; Dahdouh-Guebas et al., 1999; Abdul-Razak and Mohamed. 2016). The similarity of the diet in both sexes, of *L. abu*, suggests a similar feeding preference, probably due to the occupation of the same habitat by the two sexes at least during a large part of the life cycle.

The results indicated that the frequency of occurrence of the food items was also influenced by season (Figure 2). In general, the maximum percentage of organic matter, seaweed and Chlorophyceae was observed in March. For detritus, the frequency of occurrence was higher in November than in March. The seasonal difference in diet regimes may be associated with energy required growth and reproduction. Both factors may play a significant role in the diet of fish (Joelle and Lai, 2010).

Besides, variation in environmental factors, such as water temperature, may affect food consumption (Wear and Haddon, 1987). In general, the seasonal differences in diet composition could be related to changes in, space and time in the benthic fauna composition, the habitats available for foraging, shifts due to life-history patterns of prey, and the feeding activities of predator.

CONCLUSION

This study provides information about the effect of sex of *L. abu* on its feeding habit in different seasons. The results of the percentage frequency of occurrence of different food categories showed that the food items were organic matter, detritus, Chlorophyceae and seaweeds. The items of detritus and organic matter were higher in the diet of females, whereas, seaweed, Myxophyceae and Chlorophyceae were higher in the diet of males. The highest percentage of organic matter, seaweed and Chlorophyceae was observed in March, while the highest percentage of detritus was observed in November.

ACKNOWLEDGMENT

This study was supported by the research fund of Zystab sanaat of Persian Gulf of Institute, Iran.

REFERENCES

- Abbasi K (2006). Identification and distribution of fish fauna in Hevigh River (Guilan Province). *Iranian Journal of Biology* 18(4): 370-382.
- Abdoli A, Naderi M (2009). Biodiversity of Fishes of the Southern Basin of the Caspian Sea. Abzian Scientific Publications, Tehran. 243 p. (In Farsi)
- Abdoli A, Naderi M, Aboo M, Fazli H, Afraee MA (1996). Spawning time and fecundity of the mullet, *Liza auratus* (sic) in south eastern part of the Caspian Sea. *Abzeeyan*, Tehran 7(2): 24-26.
- Abdul-Razak M, Mohamed (2013). Stock assessment of freshwater mullet, *Liza abu* (heckel, 1843) populations in three restored southern marshes, Iraq. *Croatian J. Fisheries*, 72: 48 – 54
- Ahmed SM, Hussain NA (2000). Egg and larvae of mullets (Mugilidae) in the north western Persian Gulf. *Pakistan Journal of Marine Biology* 6(1): 1-7.
- Al-Emam NA (1978). Food habits of three Iraqi fishes. *Aphaniis dispar*, *Liza abu* and *Alburnus missuleitix* in Al-Saklawiah irrigation drainage system. MS. Thesis. University.
- Al-Nasiri SK, Sarker AL, Hoda SMS (1977). Feeding ecology of Mugilid fish, *Liza abu* (Hsckel) in Biasrah, Iraq. *Bulletin Basrah Nat History Mussa*, 4, 27-40.
- Dahdouh-Guebas F, Giuggioli M, Oluoch A, Vannini M, Cannicci S (1999). Feeding habits of non-ocypodid crabs from two mangrove forests in Kenya. *Bulletin of Marine Science*, 64, 291-297.
- Islam AKMS, Khalaf AN, Jaferv AR, Sadek SE (1982). Seasonal pitierns of feeding of Khishni, *Liza abu* «(Heckel), in Rashdiya hreservoir, Baghdad, Iraq Baigaludish. *J. Zoo I*.
- Joelle C, Lai Y (2010). A revision of the *Portunus pelagicus* (Linnaeus, 1758) species complex (Crustacea: Brachyura: Portunidae), with the recognition of four species. *The Raffles Bulletin of Zoology*, 58, 199–237.
- Noori AN, AK Naama (1988). *Liza Abu* (Heckel, 1843) (Pisces: Mugilidae): A new record from Khor Al-Zubair, north-west of the Arabian Gulf. *Mahasagar*, 21:113-115.
- Palsson OK (1983). The feeding habits of demersal fish species in Icelandic waters. *Rit Fiskideildar*, 7: 1-60.
- Sezen A, Gulnaz O (2016). Some aspects of the biology of Abu mullet *Liza abu* (Heckel, 1843) in the Orontes River, Turkey. *Croatian J. Fisheries*, 74: 49-55
- Wear RG, Hadden M (1987). Natural diet of the crab *Ovalipes catharus* (Crustacea, Portunidae) around central and northern New Zealand. *Marine Ecology Progress Seriese*, 35, 39–49.
- Zafer D, Erdinc S, Faruk A, Ramazan S (2013). The growth characteristics of *Liza* (Mugil) *abu* (Heckel, 1843) in Atatürk Dam Lake. *African Journal of Agricultural Research*, 84: 4434-4440.