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DISTRIBUTION OF GREY MULLETS (MUGILIFORMES; MUGILIDAE) ON KARACHI COAST, PAKISTAN

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ABSTRACT

The present investigation related with the distribution of the four selected mullet species (Mugilidae) found on the Karachi Coast. About 1006 samples of the four selected mullet species were collected from the landings at Karachi fish harbor during the years 2010 and 2011. The total collection included 307 individuals of *Liza melinoptera*, 293 of *Valamugil speigleri*, 244 of *Liza macrolepis* and 162 of *Mugil cephalus*, respectively. Among them, *Liza melinoptera* was found to be the most dominant species, while *Mugil cephalus* was least in the total catch.

Key-words:

INTRODUCTION

The order Mugiliformes includes only single family, Mugilidae, which consists of 17 genera and 81 species (Nelson, 2006). Almost half of the species of this family are included in only two large genera, i.e., *Liza* and *Mugil*. In Pakistan, Qureshi (1955) recorded only six species of family Mugilidae collected from Sindh and Makran coasts of Pakistan; Bianchi (1985) described 3 genera and 12 species, Ahmed and Niazi (1988) reported eight species; while Fahmida (2002) identified the following mullet species from the landings at Korangi fish harbour of Karachi Coast included, *Mugil cephalus, Valamugil seheli, V. speigleri, Liza carinata, L. parsia, L. subviridis, L. vaigiensis.* According to Froese and Pauly (2010), about 3 genera and 10 species of this family have been reported from Pakistan Coast, such as, *Liza carinata, Liza klunzingeri, Liza abu, Liza macrolepis, Liza tade, Liza parsia, Liza subviridis, Mugil cephalus, Valamugil cunnesius, Valamugil seheli* and *Valamugil speigleri*. These are elongated silvery fishes, commonly known as mullets or grey mullets. Body covered with moderate-sized ctenoid or cycloid scales. Maximum length is about 100 cm in total length (TL). World wide distributed family, found in tropical, subtropical and temperate regions, but few species also found in cool waters. They occurr in marine and brackish waters or estuaries. Commonly found in coastal shallow water at 20m depth. Mullets are also caught in commercial fisheries and used as a protein source for humans in Indo-Pacific, Mediterranean and southeastern regions of Asia (Thomson, 1997; Bigelow and Schroeder, 2002; Katselis *et al*., 2006; Koutrakis, 2011).

Though many researchers had studied about the distribution of mullets in the different parts of the world, such as Koutrakis *et al.* (1994) and Cardona *et al.* (2008) reported the distribution of *Chelon labrosus, Liza saliens, Liza ramada, Liza aurata* and *Mugil cephalus* from the coastal lagoon of Northern Greece and Mediterranean estuaries; Trape *et al.* (2009) described the distribution of *Mugil bananensis, Mugil cephalus, Mugil curema, Liza dumerili, Liza falcippinis, Liza bandialensis* and *Liza grandisquamis* in West African estuary; Akinrotimi *et al.* (2010) studied distribution of two *Liza* species (*Liza falcippinis and Liza grandisquamis*) from Buguma creek, Nigeria, however, it had been observed that except *M. cephalus*, previously published literature regarding to the distribution of three selected mullet species (*L. melinoptera, V. speigleri* and *L. macrolepis* of the present study) is still limited. Therefore, the present study would provides valuable information regarding distribution of these four selected mullet species on Pakistan coast that could be useful in fisheries management.

MATERIALS AND METHODS

1. Samples collection

A total of 1006 specimens of the four species of family Mugilidae were collected, by monthly collection, from the landings at Karachi fish harbour, during the period of April 2010 to December 2011. In Pakistan, these fishes

caught mainly with gillnets, castnets, liftnets and beach seines as reported by Bianchi (1985). Each specimen was identified to species level in the field as well as in laboratory by using the FAO field guide (Bianchi, 1985; Harrison and Senou, 1999). Total length (TL) of each specimen was measured in centimetres from the tip of snout to the end of caudal fin by using measuring board. Then fishes were immediately preserved in 10% formaldehyde solution for about one week, and after that stored in 70 % ethanol for long time preservation.

2. Month-wise distribution

Monthly distribution pattern of each mullet species was also recorded during the study period (2010 to 2011).

RESULTS

1. Distribution of mullets

The results of the total catch of four selected species of the family Mugilidae were recorded in the Table 1. The specimens of four selected mullet species such as *Liza melinoptera, Mugil cephalus, Valamugil speigleri* and *Liza macrolepis* were collected monthly from the commercial catches at the main landing sites in Karachi fish harbour during the period from April 2010 to December 2011. A total of 1006 individuals belonging to the four selected mullet species were caught during this study period. Among them, *L. melinoptera* was the most dominant species, accounting for 30.52% of the total catch examined, followed by *V. speigleri* (29.13%), *L. macrolepis* (24.25%) and *M. cephalus* (16.10%).

In year 2010, the members of *V. speigleri* were dominant, accounting for 34.97% of the total catch examined. The second most frequently caught species was *L. melinoptera* (28.96% of the total catch), followed by *Liza macrolepis* (24.04%) and *M. cephalus* (12.02%), as shown in Table 1. Hence, the result shows the clear dominance of first three species in total catches in year 2010, while *M. cephalus* occupied the intermediate position.

On the other hand, in year 2011, *L. melinoptera* was the most abundant one that exhibited the highest percentage (32.39%) of total catch. Whereas, *L. macrolepis* was found to be the second most abundant caught species that constitutes 24.51% of total catch, while *V. speigleri* occupied the third position (22.10%) and *M. cephalus* was considered as less frequently observed species that occupied the fourth position (21.01%) in total catch, respectively. Therefore, the total catch recorded for the year 2011 in Table 2 revealed that among the other mullet species, a marked dominance of the *L. melinoptera* was reported in this study. The other three species contributed equally throughout the whole sampling.

2. Monthly distribution of mullet species

The monthly distribution pattern of four selected mullet species showed the all year presence of these four mulle species on the Karachi coast of Pakistan. The results from the Tables 1a and 1b revealed that during the two years (2010 and 2011) collection, the monthly catch of these four species showed the highest percentage in the month of September and least in July, respectively. In year 2010, it was observed that the monthly catch recorded for the four mullet species was highest in the months of April (13.11), September (23.86%) and December (16.21%) respectively, and lowest in July (5.46%), respectively (Table 1). In year 2011, highest catches of these mullet species were observed in the months of January (10.3%), April (9.63%) and September (14.0%), while least in July (6.13%), as shown in the Table 2.

DISCUSSION

The result of the present study showed the clear dominance of first three mullet species i.e., *Liza melinoptera, Valamugil speigleri* and *Liza macrolepis*. Whereas *Mugil cephalus* can be considered as an intermediate species or occupied subdominant position in the study area, which was in agreement with Mickovic *et al.* (2010) who also observed the distribution of *M. cephalus* from Montenegrin coast. Mehanna (2004) also reported the *M. cephalus* as less dominant species in the mullet's catch from Bitter lakes of Egypt. Nevertheless, the information about the distribution of these four mullet species from the Pakistan coast was yet scarce. However, two mullet species such as, *Mugil cephalus* was reported from Porali river of Bela city of Balochistan province (Ramzan-Mirza *et al.* (2002) and *Liza carinata* from Bhanbhore tidal backwaters along the Sindh coast of Pakistan (Abbas, 2000).

Table 1a. Month-wise distribution of the four species of family Mugilidae collected from Karachi fish harbour, (from April 2010 to December 2010).

No. of Obs.	Species	Size range (TL) in cm.	Months									Total catch of each species examined.		
			Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	n	%	Rank
1.	*Liza melinoptera*	14.5± 18.0	30	23	8	4	11	35	16	12	20	159	28.96	B
2.	*Mugil cephalus*	20.0± 33.9	8	5	11	7	5	4	7	7	12	66	12.02	D
3.	*Valamugil speigleri*	13.1± 19.0	21	12	16	11	12	66	18	9	27	192	34.97	A
4.	*Liza macrolepis*	13.0± 21.5	13	13	14	8	8	26	6	14	30	132	24.04	C
	Total catch/month		72	53	49	30	36	131	47	42	89			
	Percentage/month		13.11	9.65	8.93	5.46	6.56	23.86	8.56	7.65	16.21			
											Total catch of fishes during year 2010 (N) =	**549**		

Total catch of fishes during year 2010 (N) = 549

Table 1b. Month-wise distribution of the four species of family Mugilidae collected from Karachi fish harbour, (during period from January 2011 to December 2011).

No. of Obs.	Species	Size range TL in cm.	Months												Total catch of each species examined		
			Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sept	Oct.	Nov.	Dec.	n	%	Rank
1.	*Liza melinoptera*	15.0-18.0	13	7	8	12	9	10	6	12	31	18	8	14	148	32.39	A
2.	*Mugil cephalus*	22.0-37.8	12	12	6	7	11	7	9	8	6	8	6	4	96	21.01	D
3.	*Valamugil speigleri*	13.1-19.4	9	9	10	16	5	8	5	5	9	8	8	9	101	22.10	C
4.	*Liza macrolepis*	12.5-29.0	13	8	8	9	9	6	8	10	18	5	9	9	112	24.51	B
	Total catch/month		47	36	32	44	34	31	28	35	64	39	31	36			
	Percentage/ month		10.3	7.9	7.0	9.63	7.44	6.8	6.13	7.7	14.0	8.53	6.78	7.88			

Total catch of fishes during year 2011 (N) = 457

Table 3. Total catch of the fishes belonging to the four species of family Mugilidae collected from Karachi fish harbour, in the years 2010 and 2011.

No. of Obs.	Name of species	Size range (TL) in cm.	Total catch of each species	Percentage of each species examined	Rank
1.	*Liza melinoptera*	14.5-18.0	307	30.52	A
2.	*Mugil cephalus*	20.0-37.8	162	16.10	D
3.	*Valamugil speigleri*	13.1-19.4	293	29.13	B
4.	*Liza macrolepis*	12.5-29.0	244	24.25	C

Total number of samples (N) = 1006; *TL = Total body length

The overall result showed that both *Liza* species (*L. melinoptera* and *L. macrolepis*) and *V. speigleri* were the dominant species, while *M. cephalus* was found to be least in the total catches of both years. Hence, the total catch of four selected mullet species was found to be varied during the study period. This could be due to the type of gear used, tidal condition, time or month of capture, diurnally and seasonally as reported by Angelescu *et al.* (1958) or might be due to the migratory movement of fish from its habitat (Renato *et al.*, 2000) or their range of tolerance as reported by Jalal *et al.* (2012). It has been observed that the abundance of fish species mostly depends on its range of tolerance. Hence, if they can tolerate the wide range of salinity, temperature and environmental stress, than they found to be the most dominant species. However, if their range of tolerance is less than in all these conditions they will become less abundant. Trape *et al.* (2009) observed that mullet fishes could tolerate a wide range of salinity because of their ability to gain their osmoregulation capacity, even from their juvenile stage. Munshi *et al.* (2005) reported that about half of the total catch of finfish landings at Pakistan coast includes only two types of fishes i.e., mullets and sardines. According to Jalal *et al.* (2012), as human population increasing throughout the world, therefore, coastal zones start utilizing for housing, recreation and industrial purpose that destroying the habitats of various fish species especially in estuaries and coastal area. Furthermore, seasonal changes in water quality can also have some impact on fish biodiversity in estuary. Hence, the distribution and composition of each fish species in its particular habitat mostly depends on certain physical and chemical characteristics of the aquatic environment as well as the geographical location of their habitat. Hence, the total catch of mullet species was seem to be decreasing from 17,580 metric tones in year 1998 to 8,218 metric tones in year 2008, according to the record of Marine fisheries department (MFD) of Karachi. This decline in just ten year is because of over-fishing, marine pollution and the cutting of mangroves that serves as nursery grounds of fish. The effect of temperature changes on the total catch of mullets had also been reported in Pakistan (Zarrien-Ayub, 2010).

Monthly distribution pattern of four mullet species showed that high catch of all these selected species was observed during the months of January, April September and December, however, their catching was reduces during rainy season (July to August). This might be because commercial catch of fishes in seawater prohibited due to rough weather (Monsoon season) and floods on Pakistan coast. However, grey mullet were also available in commercial catch during the rainy season. This may be due to their smaller body size and occurrence in shallow water habitat at 20m depth. The permanent presence of all these species throughout the study period was indicating that the habitats and environmental condition of Pakistan coast were more suitable for the growth of these mullet species. Thus, the result of the present study revealed that mullets are ecologically and economically important group of fishes in Pakistan that can captured all year around with significant seasonal differences that can be observed in their landing per month (Ghaninejad *et al.*, 1993). The abundance and distribution of mullets throughout the sampling period might be due to their successive adaptation according to their environment as well as due to low predation, wide range of salinity tolerance and their changing in feeding habits (Araoye, 1997; Lawson and Jimoh, 2010). While Lawson *et al.* (2010) reported that the occurrence of mullet species (e.g., *Liza falcipinnis*) throughout the year might be due to their changing in feeding habits according to the season and availability of different food items. Hence, like many other fishes, mullets have ability to adapt themselves according to the changing in the environmental conditions in which they lived. As the distribution of mullet species in the monthly catch was found to be extremely influenced by seasonality and salinity (Koutrakis *et al.*, 2000; Akinrotimi *et al.*, 2010), therefore, salinity, turbidity and abundance of food had been found to be the limiting factors that can affect on the distribution and abundance of mullets, and among them salinity was found to be the key factor, as mention by above workers.

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