Biological Forum – An International Journal **7**(1): 761-766(2015)

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Size Frequency Distribution Pattern of a Mugilid species, *Mugil incilis* of the family Mugilidae Collected from the Indus river of District Sukkur, Pakistan

Qudsia Jahangir*, *Aqalmina Achakzai* and *Zubia Masood*

**Department of Zoology,*
Sardar Bahadur Khan Women's University, Quetta, Balochistan, Pakistan

(Corresponding author: Zubia Masood)
(Received 07 January, 2015, Accepted 08 March, 2015)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: A total of 128 samples of a mugilid species, *Mugil incilis*, commonly known as "parassi mullet" were collected from the landing sites on Indus River of district Sukkur, province Sindh. During the study, maximum size of *Mugil incilis* was recorded as 125 to 145mm for combined sexes, of which males were ranged from 125 to 143mm, and that of females were found to be in ranged from 130 to 145mm in total length (TL), respectively. The overall result of the present study revealed that most individuals of *Mugil incilis* were abundant in small size groups (>140 mm TL) which shows that habitat conditions and water quality of river Indus were not suitable for this species. Thus, Size frequency distribution is a fundamental management mechanism used in fisheries that could be applied to estimate health condition of fish, its habitat and water qualities of environment. Furthermore, though some studies had been done in the other aspects of this mugilid species throughout the Pakistan, however, it is for the first time that *Mugil incilis* was studying from this point of view.

Keywords: *Mugil incilis*, Size frequency distribution, River Indus.

INTRODUCTION

A mugilid species, *Mugil incilus* belongs to the family Mugilidae are commonly named as "Parassi mullet" (Aurelle *et al.,* 2008). They are typically found in brackish estuaries, coastal water and surf zones, marine and hyper-saline water (Cervigón *et al*., 1992; Harrison, 2002). Spawning takes place at the mouth of river. Females lay millions of relatively large eggs rich in yolk (Thomson, 1978). Juveniles migrate large distances to swamps and river mouths for food and to gain protection against predators (Harrison, 2002). Preliminary results from a study on food composition of *Mugil incilus* indicate that like many other Mugilidae these mullets are detritus feeders (Thomson, 1966). This species is commonly found in 250mm in total length (TL) of *Mugil incilus* (male/unsexed) (Cervigón *et al*., 1992), but Thomson (1978) reported the maximum total length (TL) of male or unsexed of *Mugil incilus* was found to be 400mm in TL, respectively. Hence, in all such case, there was significant differences in total length (TL) of *Mugil incilus* species. Size frequency distribution is very fundamental method for the fish population analysis (Khan and Mustafa., 1989). The study of size frequency distribution pattern of any fish had found to be highly significant to know the status and condition of the size structure of that fish population in nature. It is also the first step to evaluate gear selectivity of catches made by different kinds of gear fished in the same water (Bagenal, 1978). The importance of body size on the life history, ecology and distribution of species had been highlighted continuously in literature (Lindsey, 1966; Allen *et al.,* 2006; Zubia *et al.,* 2015). Study of the size structure (size frequency) in riverine fish unveils many ecological and life history traits such as, breeding period of the fish, river health and stock conditions (Neumann and Allen, 2001). From the size frequency distributions of fish, there are methods that later could be used to determine the ages of fish (Bagenal and Tesch, 1978). Therefore, several workers had been worked on size frequency distribution pattern of fishes including, size frequency distribution of *Garragotylagotyla* (Sucker Head) in different rivers of Nepal (Ranjan *et al.,* 2005).

Size frequency distribution of *Chrysichthys nigrodigitatus* from Nigera had been studied by Andem *et al*. (2013); Khan and Mustafa, (1989) estimated growth and age of Sea bream like *Nemipterus japonicas* through the length frequency based analysis from Bangladesh coast; Michaela (2000) worked on size frequency distribution of shrimp (*Pandalus borealis*) from Barents Sea to evaluate their usefulness in determining stock structure. Size structure of large reef on the northern side of the Heron Island reef had been studied by Bell *et al*., 1984. In order to determine the age and growth of any fish, the size frequency distribution data was considered as a very useful tool in fisheries management. Hence, the present study was designed to measure the total length (size) of a particular species of combined sexes in order was to observe the proportions of various size groups and interpret the river conditions and fish health based on the size frequency distribution as followed the pattern of Ranjan *et al*. (2005).

MATERIALS AND METHODS

A. Sampling location

Indus is largest and longest river of Pakistan. It is originating from highlands of Kailas Mountains of Tibetan Plateau; it runs from north to south through the entire length of Pakistan and after collecting waters from all other Pakistani rivers it finally unloads in to the Arabian sea near Karachi. The total length of the river is around 3200KM (website: www. pakistangeographic.com/rivers.html).

B. Fish sampling

For the analysis of size frequency distribution pattern, a total of 128 samples of Mugilid species, *Mugil incilus* commonly known as parassi mullet were collected from the monthly from the period of January 2014 to December 2014 from the landing sites on Indus River of district Sukkur of Sindh province. Identification of this species was done by using identification field guide of Bianchi (1985) and Froese and Pauly (2011). Measurement of total length was taken in millimeter by using measurement scale attached on meter board. The total length (TL) of the fish is measured as the distance from the tip of the snout of the fish to the tip of the longest caudal fin ray. The data from samplings were grouped into size groups of small, medium and large.

C. Size frequency distribution data

Size frequency data was estimated separately for male, female and combined sexes of *Mugil incilus* species of this study as shown in Tables 1-3 and Figures a-c, respectively.

Class mid point was also measured for all size groups with the help of following equation as follows;

$$\text{Class mid point} = \frac{\text{lowest class limit} + \text{upper class limit}}{2}$$

RESULTS

Size frequency distribution pattern for the male, female and combined sexes of *Mugil incilus* was analyzed in the present study. A total of 128 samples of *Mugil incilus* were collected from the landing sites on Indus River of district Sukkur, province Sindh. Out of 128 samples, 72 were males and 56 were females. The total length of this species varied from minimum of 125mm to the maximum of 145mm for combined sexes and there were all the size groups in between such size range. The individual's of *Mugil incilus* were divided into five size groups with equal class intervals. The results of the present study revealed that the distribution and abundance of the number of individuals for the male, female and combined sexes of *Mugil incilus* were found to be varied among the different size groups, as shown in the Tables 1-3 and Figs. 1-3, respectively.

Table 1: Size frequency data for the combined sexes of *Mugil incilus* (January 2014 to December 2014).

Size group	Class midpoint	Number of samples (N)	% frequency	Rank
mm.	**mm**.			
125 - 129	127	16	12.5	**C**
130 - 134	132	60	46.9	**A**
135 - 139	137	28	21.9	**B**
140 - 144	142	16	12.5	**C**
145 -149	147	8	6.3	**D**
Total		**128**	**100.0**	

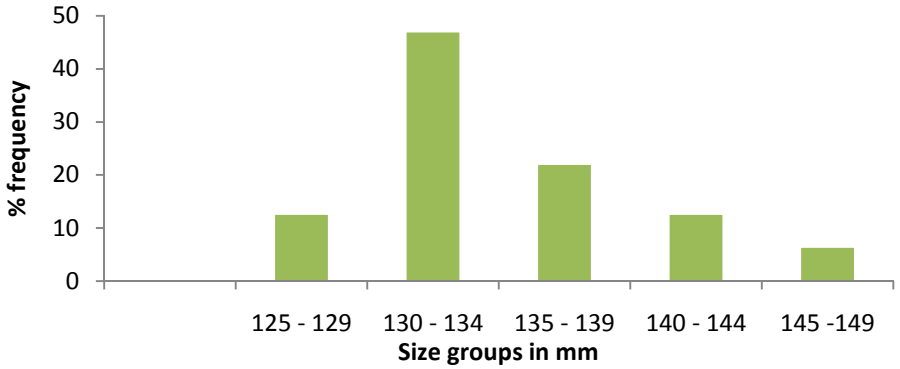

Fig. 1. Size frequency data for combined sexes of *Mugil incilus.*

A. Size frequency data of the combined sexes of Mugil incilus

Size frequency data for combined sexes of *Mugil incilus* was recorded in the Table 1 and Fig. 1, respectively. The size frequency distribution of combined sexes indicating that the specimens between 130 to 134mm TL showed highest peaks and represented 46.9% of total samples for the combined sexes of *Mugil incilus.* While small sized individuals ranged from 145 to 149mm TL represent 6.3% of total specimens, respectively.

B. Size frequency data of the males of Mugil incilus

For the male of *Mugil incilus* species, size frequency data was presented in the Table 2 and Fig. 2 respectively. The result of size frequency data for the male of *Mugil incilus* species indicating more individuals with the length category of 130-134mm represent 50% of the total catch, while there were some individuals ranged from 125 to 129mm TL represent 20% of the total specimens. Size group 135-139mm and 140-144mm were found less frequently showed 10% of total specimens. There was no specimen with the length category of 145-149mm.

C. Size frequency data of the female of Mugil incilus

Table 3 and Fig. 3 showed the size frequency data recorded for thethe female *Mugil incilus.* In this study, size groups i.e., 130-134mm and 135-139mm were found to be most frequent representing 35.7% and 35.7% of the total catch, respectively, while female of the small size ranged from 140-144mm and 145-149mmTL showed minimum percentage 14.3% of the total specimens. However, no female individual were reported in size group 125-129mm of this study.

Table 2: Size frequency data for the male of *Mugil incilus* (January 2014 to December 2014).

Size group	**Class mid point**	**Number of samples (N)**	**% frequency**	**Rank**
mm.	**mm.**			
125 - 129	127	16	22.2	B
130 - 134	132	40	55.6	A
135 - 139	137	8	11.1	C
140 - 144	142	8	11.1	C
145 -149	147	0	0.0	-
Total		**72**	**100.0**	

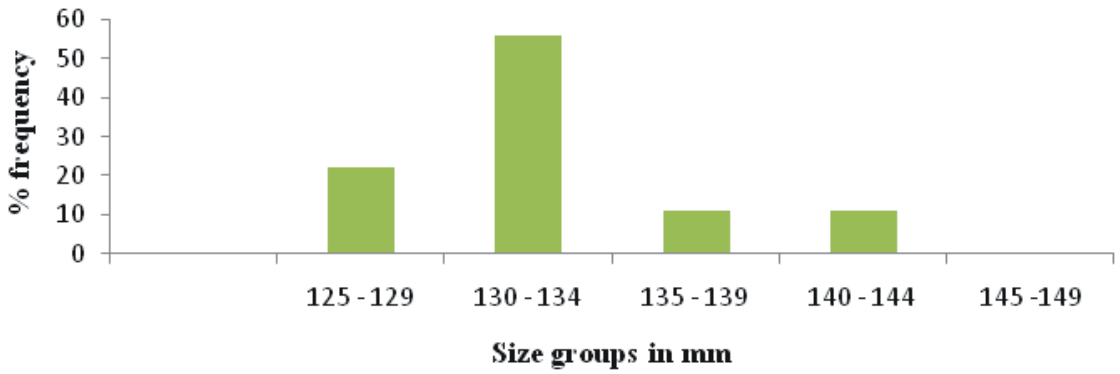

Fig. 2. Size frequency data for the male of *Mugil incilus.*

Table 3: Size frequency data for the female of *Mugil incilus* (January 2014 to December 2014).

Size group	Class mid point	Number of samples (N)	% frequency	Rank
mm.	**mm.**			
125 - 129	127	0	0.0	-
130 - 134	132	20	35.7	A
135 - 139	137	20	35.7	A
140 - 144	142	8	14.3	B
145 -149	147	8	14.3	B
Total		**56**	**100.0**	

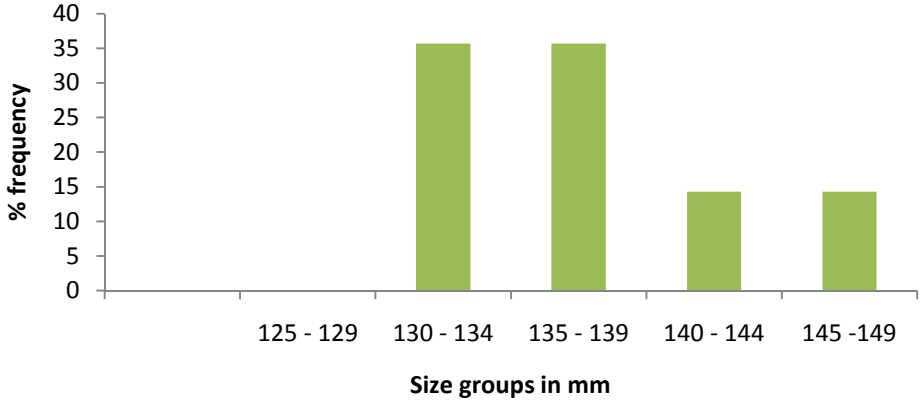

Fig. 3. Size frequency data for the female of *Mugil incilus.*

DISCUSSIONS

The size frequency data of any fish species will portrays its short spawning season with a rapid uniform growth, from which the modal length of first few age groups could also be determined very easily (Bagenal., 1978). No previous records on size frequency distribution pattern of *Mugil incilus* of this study could be traced from the literature. However, few authors had mentioned its maximum size 40.0 cm in total length (TL) as determined by Thomson (1978), while the most common length recorded for this species was 25.0 cm in TL in Northern Coast of South America (Cervigón *et al*., 1992). The total catch samples collected in the present study ranging from 125 to145mm in total length (TL) for the combined sexes of *M. incilis*. In the present study, both males and females of the *M. incilis* was most frequently observed in smaller size groups, because their highest frequency percentage i.e., 55.6% and 35.7% were recorded for the same size groups i.e., 130-134mm, whereas the lowest frequency percentage were recorded for the large size groups, as shown in Tables 2-3). In male, lowest frequency percentage (10%) was noted for the size groups of 135-149mm, respectively. Similarly, In case of combined sexes, highest frequency percentage (46.9%) were recorded for size groups of 130-134mm and lowest (6.3%) for size groups of 145-149mm, as shown in Table 1. The range of lengths and the distribution of size frequency of any fish species show great variation in time and space, and suggesting that habitat conditions and health might vary among the different habitats in which fish lived. The results obtained for size frequency distribution patterns of *Mugil incilus* of this study did not give any tangible results. Out of 128 samples, 80 were below 140 mm in total length (TL), whereas, the most common length of *Mugil incilus* had been found to be 250 mm in total length TL as determined by Cervigón *et al*. (1992). The reason behind such huge difference could be due to the fishing gears used in collecting the specimen. Towards the end of the year, the migration spawning of *Mugil incilus* begins because the condition of the mullets are best at this time and they will be fat and sexually mature. Furthermore, at this time, the bottom of the river becomes enriched with detritus and high bacterial productivity. In this regards, it can be concluded that the habitat and environmental conditions are distressing as over the years, factories on the banks of the River Indus are increasing the levels of water pollutions not only in the riverine bank but also effects the environment around it. Such highest level of pollutants in the river Indus had led to the deaths of various fish species and also makes the unhealthy environments for the remaining surviving genera. Therefore, further research work on size frequency distribution is required in this area using selective gears, in order to determine and establish the true picture of size frequency distribution pattern of *Mugil incilus* in Indus River of Sukkur district of Pakistan.

CONCLUSIONS

The present study was carried out to observe and analyze the size frequency distribution pattern of *Mugil incilus* categorized into male, female and combined sexes. Body length of any fish species is an important parameter for the determination of growth, age as well as the conditions of their habitats (Zubia and Rehana, 2010; Naeem *et al*., 2011). From the above study, we have tried to highlight the baseline information on the *Mugil incilus* species regarding to this parameter. As most specimens were recorded in small size groups below the length 140 mm in TL, therefore, our study was clearly shows that habitat conditions and water quality for this species were not good in river, as size frequency distribution data of *Mugil incilus* species of Indus river did not show healthy population, thus, steps should be taken along this area in order to provides protection to the populations of this mugilid species.

REFERENCES

Andem, A.B., George, U.U. and Eyo, V.O. (2013). Length frequency distribution of (*Chrysichthys nigrodigitatus*) (lecepede, 1803) (*Chrysichthys*, Bagridae) from itu head brigde, in akwaibom state, Nigeria. *International Journal of Science and research (IJSR)*, **2**: 258-260.

Bagenal, T.B. and Tesch, F.W. (1978). *Age and growth*. In Bagenal, T.B. (eds.). Methods for Assessment of Fish Production in Freshwaters. Blackwell Scientific Publications, Oxford, London, 101-136.

Bagenal, T.B. (1978). "Aspects of fish fecundity. In: methods of assessment of ecology of freshwater fish production (Ed. Gerking, S.D)", Blackwell Scientific Publication, Oxford, p. 75-101.

Bianchi, G. (1985). *FAO species identification sheets for fishery purposes*. Field guide to the commercial marine and brackish-water species of Pakistan. Prepared with the support of PAK/77/033 and FAO (FIRM) Regular Programme. Rome, FAO, pp. 200.

Lindesy, C.C. (1966). Body size of poikilotherm vertebrates at different latitudes. *Evolution*, **20**: 456-465.

Cervigón, F., Cipriani, R., Fischer, W., Garibaldi, L., Hendrickx, M., Lemus, A.J., Márquez, R., Poutiers, J.M., Robaina, G., Rodriquez, B. (1992). Field Guide to the Commercial Marine and Brackish-water Resources of the Northern Coast of South America.

Craig, R. A., Gamestani, A.S., Havlicek, T.D., Marquet, P.A., Peterson, G.D. (2006). Patterns in body mass distributions: sifting among alternative hypothesis. *Ecol. Lett.,* **9**: 630-643

Aurelle, D., Barthelemy, R-M., Quignard, J.P., Trabelsiand, M., Faure, E. (2008). molecular phylogeny of mugilidae (teleostei: perciformes). *The Open Marine Biology journal*, **2**: 29-37.

Fafioye, O.O. and Oluajo, O.A. (2005). "Length-weight relationship of five fish species in Epe lagoon, Nigeria''. *African Journal of Biotechnology*, **4**(7): 749-751.

Froese, R. & D. Pauly. (2010). Fish Base. World Wide Web electronic publication. Available at: http//www.fishbase.org/. Accessed October, 2010.

Harrison, I.J. (2002). *Mugilidae: mullets*. In: Carpenter K, editor. The living marine resources of the Western Central Atlantic.Vol. **2**. Bony fishes part 1 (Acipenseridae to Grammatidae). FAO Species identification Guide for Fisheries purposes. Rome: FAO. pp 1071–1085.

http://pakistangeographic.com/rivers.html

Jacobo, A. and Blanco, R. (1983). The condition factor of *Mugil incilus*hancock and its seasonal changes in the cienagagrande de santamarta (colombia). *An. Ins. Inv. Mar.Punta de Betin*, **13**: 133-142.

Bell, J.D., Craik, G.J.S., Pollard, D.A. and Russell, B.C. (1985). Estimating length frequency distributions of large reef fish underwater. *Coral reef*, **4**: 41-44.

Jha, B. R., Waidbacher, H., Sharma, S. and Straif, M. (2005). Study of the length frequency distribution of sucker head, *Garragotylagotyla* (Gray, 1830) in different rivers and seasons in Nepal and its applications. *Kathmaandu University Journal of Science, Engineering and Technology*, **1**(1): 1-14.

Giasuddin, MD. K. and Gulam, MD. M. (1989). Length-frequency based population analysis of the threadfin bream *Nemipterus japonicas* of the Bangladesh coast. *Indian Journal of Fisheries*, **36**(2): 163-166.

Michaela, A. (2000). Spatial variability in length frequency distribution and growth of shrimp (*Pandalus borealis* kroyer 1838) in the Barents sea. *J. Northw . Atl. Fish .Sci .*, **27**: 93-105.

Muhammad, N., Abdus, S., Muhammad, A., Muhammad, K. and Abir, I. (2011). External morphometric study of hatchery reared mahseer (*Tor putitora*) in relation to body size and condition factor. *African Journal of Biotechnology*, **10**(36): 7071-7077.

Olagbemide, P. T. (2010). Length frequency distribution and length-weight relationship of *schilbemystus* from lekki lagoon in lagos, nigeria. *Journal of Agriculture and Veterinary Sciences* , **2**: 63-69.

Renjini, P.K. and Bijoy, N.S. (2011). Length-weight relationship, condition factor and morphometry of gold spot mullet *Liza parsia* (Hamilton, 1822) from Cochin estuary. *Indian Journal of Geo-Marine Sciences*, **40**(4): 567-571.

Robert, M.N. and Micheal, S.A. (2001). Analysis and interpretation of freshwater fisheries data. Department of Natural Resources Management and Engineering University of Connecticut.

Thomson. J. M. (1966). The grey mullets.*Oceanogr. Mar. Biol.*,**4**: 301-335

Thomson, J.M. (1978). *Mugilidae.* In W. Fischer (ed.) FAO species identification sheets for fishery purposes. Western Central Atlantic (Fishing Area 31).Vol. **3**.[pag. var.]. FAO, Rome.

Zubia, M. and Rehana, Y. F. (2010). Size frequency distribution pattern of the genus *Leiognathnus* (Leiognathidae: Perciformes) collected from Karachi creek, Karachi coast, Pakistan. *International journal of biology and biotechnology*, **7**(1-2): 141-144.

Zubia M., Rehana Y., Musarrat-ul-ain, Hameed, U.R, Asim-Ullah, Naveed-ullah, Sundus, N., Shama, Z., Sidra, T.M. and Laila, M. (2015). Size frequency distribution patterns of the four mugilid species of the family Mugilidae (Order Mugiliformes) collected from the Karachi fish harbor, Pakistan. *Biological Forum-An International journal*. Vol. **7**(1): 459-469.