INT. J. BIOL. BIOTECH., 10 (3): 431-436, 2013.

STUDIES ON THE FECUNDITY AND SEX RATIO OF STRIPED PIGGY FISH, *POMADASYS STRIDENS* (FORSSKAL, 1775) (FAMILY; POMADASYIDAE) FROM KARACHI COAST, PAKISTAN

Amtyaz[1] and Muhammad Atiqullah Khan[2]

[1]*Dept. of Zoology, Sir Syed Govt. Girls College Nazimabad, Karachi-74600, Pakistan. Cell No.0092-3212374804. Email; imtiazsafi76@gmail.com*
[2]*Dept. of Zoology, University of Karachi, Karachi-75270, Pakistan.*

ABSTRACT

Pomadasys stridens (Forsskal, 1775) is excellent food fish and widely distributed in the Indo- pacific region. It inhabits higher part of rocky tide pools, and shallow waters. The fecundity and sex ratio of *Pomadasys stridens* (Forsskal, 1775) has been described. The occurrence of mature specimen of *Pomadasys stridens* (Forsskal, 1775) was found in different size groups. The minimum size of maturity was found in 136 mm and the maximum size of maturity was 210 mm of total length, which is supported by the results obtained from the studies of mature ovaries. Fecundity determined that the relationship between the size of fish, weight and length were directly related to the size of ovary. The frequency distribution of ova suggests that the spawning periods are twice in a year i.e. August to October and January to March in a year. The sex ratio has been obtained during the period of January 2001 to April 2002. The numbers of male and female were calculated. The overall male- female ratios were found to be 1: 1.5. Log-log relationship between fecundity and total length, body weight and ovary weight was reported. It is observed that the right is slightly larger than the left. The number of ova depends on the difference in size of the ovary. Therefore it may be mentioned that the fecundity is generally proportional to the size of the ovary, which in turn is related to the size of the fish. The mean fecundity calculated was 17810.22. The minimum and maximum being 8114.4 and 38494.75 respectively. The mean number of ova/g body weight and mean number of ova/g ovary weight were found to be 231.63 and 4170.57 respectively. The gonads are two lobed; the right lobe is more fecund than the left one.

Key words: Fecundity, sex ratio, *Pomadasys stidens*, Karachi, Pakistan.

INTRODUCTION

Pomadasys stridens (Forsskal, 1775) commonly known as "Dhoter" is an important commercial species found off the coast of India and Pakistan. *Pomadasys stridens* is small to medium sized fish, usually inhabiting shallow coastal water. They occur in coral reef areas as well as in muddy or weedy waters, feeding on bottom invertebrates and fishes. Their flesh is said to be of excellent quality, which keep for a fairly long time without spoiling, and thus it is much excellent as food, marketed fresh also dry salted (Bianchi, 1985).

Some works have been reported on the reproductive biology, growth, ecology, length weight, fecundity, feeding habit and population dynamics of different species of family Pomadasyidae (Grunt) from various countries of South east Asia, America, Australia, India, China, Israel, U.A.E. and Pakistan (Karakar and Bal, 1960; Konchina, 1978; Abu Hakima, 1987; Deshmukh, 1973; Jayabalam, 1991; Blaber, 1997; Imad, 1985; Iqbal, 1989; Bianchi, 1985; Hussain and Ahmed, 1992; Majid *et al*., 1992; Beaumer, 1978; Majid and Imad, 1991; Iwatsuki *et al.*, 1998; Ben-Tuvia, 1976; Al-Ghais, 1995; Amtyaz and Khan., 2004, 2005; Adebiyi, 2013).

Practically, no work has been under taken on fecundity and sex ratio of *Pomadasys stridens* from Pakistan. The present study was there fore, under taken. However some works are available on reproductive biology, fecundity, maturation, spawning and sex ratio of some other important fishes like *Thryssa dussumieri, Drepane longimana, Pomadasys hasta, Polydactylus indicus, Tilapia nilotica, Siganus canaliculatus, Epinephelus diacanthus, Sardinella longiceps, Valamugil cunnesius, Torputitor, Pomadasys stridens, Pomadasys maculatum* and *Perca fluviatilis* etc, notably Hoda (1976), Khan and Hoda (1993), Deshmukh (1973), Karakar and Bal (1960), Babiker and Ibrahim (1979), El-Sayed (1994), Chang-po Chen *et al*. (1980), Dhulkhed (1973), Hoda and Qureshi (1993), Subhan and Hafeez (1998), Amtyaz and Khan (2004, 2005a and b) and Le- Cren, (1951). Since this information is vital for the proper management of the fisheries and for optimum utilization of the resources, it is there fore proposed to carry out research studies on fecundity and sex ratio of *Pomadasys stridens*.

MATERIALS AND METHODS

Fortnightly collections of *Pomadasys stridens* were made from the commercial landings at West Wharf and Korangi Creek from January 2001 to April 2002. There were in all 391 of these (155 males, and 236 females) measuring 56-210 mm in total length (TL). Their gonads were dissected out, weighed and preserved in 10% neutral

formalin. Sexual stages were marked according to the scale adopted by International council for the Exploration of the sea (wood, 1930). GSI (Gonado-somatic index) was determined with gonad weight recorded as percentage of the body weight including gonad. Length-weight relationship and condition were calculated by the method of Le- Cren (1951). Counting the ova in a portion of known weight and then calculating the total number from the total weight of the ovary gave fecundity.

RESULTS

MATURITY

The gonads were bilobed, the right lobe a bit larger than the left increasing in size with the size of the fish at different maturity stages. Vasa deferentia were not discernible after maturity stage 2 due to the spreading of gonads into the body cavity. Seven maturity stages, based on color, size and GSI are described.

BREEDING

Females were slightly more numerous than males and a sex ratio of 1.5: 1.00 between females (236) and males (155) was obtained. The same sex ratio was found in different months (Table 1) and different size classes (Table 2) of the fish. Based on size groups, the females were predominant from 130 mm to 219 mm.

Table 1. Sex ratio (Male:Female) of *P. stridens* in different months.

EAR/MONTH	RATIO	PROPORTION OF	X^2
	M : F	MALE	
Jan.2001	10:18	0.36	2.286
Feb.2001	11:14	0.44	0.36
Mar.2001	4:04	0.5	0
Apr.2001	4:10	0.29	2.571
May.2001	8:20	0.29	5.143*
Jun.2001	9:22	0.29	5.452*
Jul.2001	14:21	0.4	1.4
Aug.2001	4:06	0.4	0.4
Sep.2001	7:12	0.37	1.316
Oct.2001	10:11	0.48	0.048
Nov.2001	14:13	0.52	0.037
Dec.2001	12:10	0.55	0.182
Jan.2002	16:21	0.43	0.676
Feb.2002	16:16	0.5	0
Mar.2002	11:26	0.3	6.081*
Apr.2002	5:12	0.29	2.882
Total;	155:236	0.4	16.78*

*Significant at 5% probability level.

FECUNDITY

Thirty-five females of 136 mm to 210 mm TL belonging to stages 4 - 6 (not running) were used for fecundity determination. It was estimated in relation to several variable sizes, TL of fish, body weight of fish and ovary weight (Table 4). For fecundity of each lobe, three samples of ova of 0.2g each (with ovarian tissues) were taken from the anterior, middle and posterior parts for estimating fecundity, and details of average fecundity at various length ranges are given in Table 4, and the mean fecundity of right and left lobes of *Pomadasys stridens* are given in Table 3.

The fecundity ranged from 8100.5 in fish of 156 mm (TL), And 50 g weight to 50177.5 in fish of 200 mm (TL) and 130 g. It is seen from the table 3 that the right ovary which is slightly larger than the left. The number of ova depending on the difference in size of the ovary. Therefore, it may be mentioned here that the fecundity is generally proportional to the size of the ovary, which in turn is related to the size of the fish. The mean fecundity calculated to be 17810.22. The minimum and maximum being 8114.4 and 38494.75 (Table 4). The mean number of ova/g body weight and mean number of ova/g ovary weight is determined to be 231.63 and 4170.57 respectively (Table 4). The gonads are two lobed; the right lobe is more fecund than the left one (Table 3).

Table 2. Sex ratio (Male:Female) of *P. stridens* in different size groups.

SIZE GROUP	RATIO	PROPORTION	X^2
TL (mm)	M : F	OF MALE	
50-59	1:00	1	1
60-69	-	-	-
70-79	-	-	-
80-89	-	-	-
90-99	4:01	0.8	1.8
100- 109	3:05	0.38	0.5
110- 119	3:06	0.33	1
120- 129	10:08	0.55	0.222
130- 139	0:02	0	2
140- 149	9:14	0.39	1.087
150- 159	17:23	0.42	0.9
160- 169	17:38	0.31	8.018*
170- 179	13:54	0.19	3.176
180-189	38:39	0.49	0.013
190- 199	16:38	0.3	8.963*
200- 209	0:06	0	6*
210- 219	0:02	0	2
50-219	155:236	0.4	16.78*

*Significant at 5% probability level.

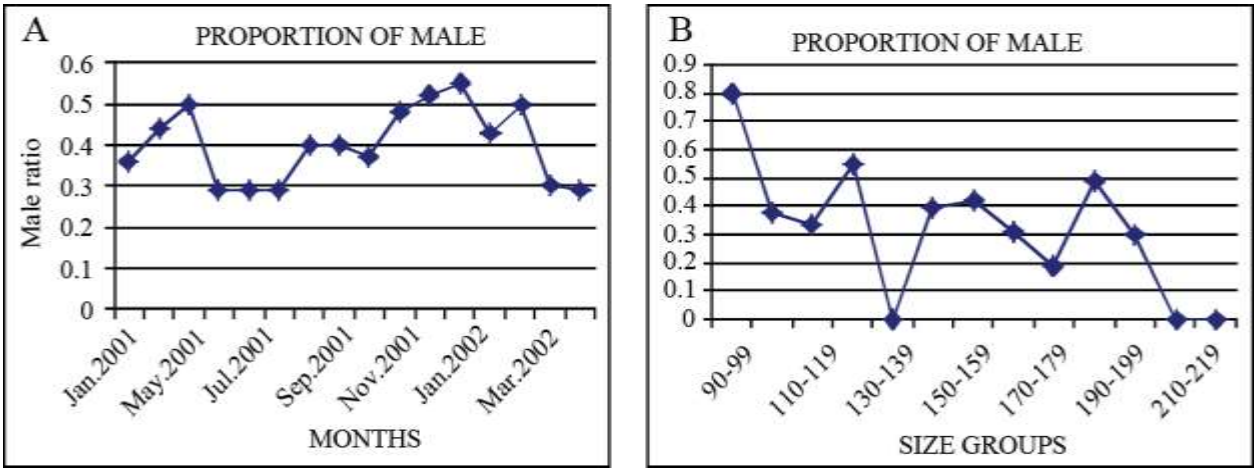

Fig. 1. Proportion of male on different (a) months and (b) different size groups.

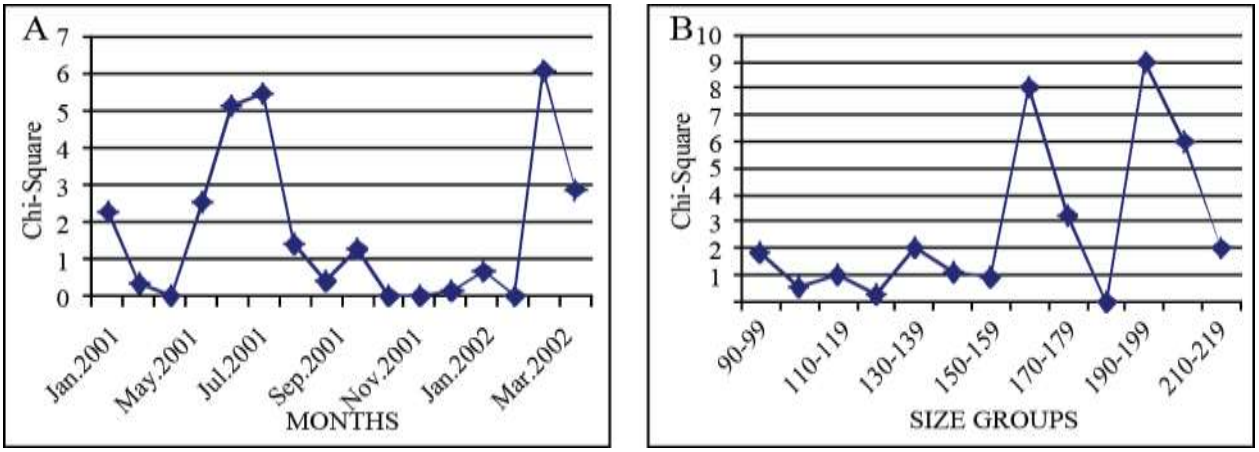

Fig. 2. Chi-square values of Male : female ratio in different (a) Months and (b) Different size groups.

Tbale 3. Mean fecundity of right and left lobes of ovaries of *P. stridens*.

Size range TL (mm)	Frequency	Right lobe	Left lobe	Total eggs
130-139	1	6114.00	5418.00	11532.00
140-149	1	4436.70	3677.70	8114.40
150-159	2	5356.40	4929.85	10286.25
160-169	6	7958.75	6896.48	14855.27
170-179	6	10646.35	9377.16	20023.51
180-189	8	10278.45	7810.32	18088.77
190-199	9	11396.24	0969.64	21086.88
200-209	2	19550.00	18944.75	38494.75
130-209	35	9467.11	7252.78	17810.22

Table 4. Mean fecundity counts in various length groups of *P. stridens*.

Frequency	TL(mm) Range	Mean TL(mm)	Mean fish wt(g)	Mean ovary wt(g)	Mean ova number	Ova/g body wt	Ova/g of ovary
1	130-139	136.00	36.00	1.30	11532.00	320.33	8870.77
1	140-149	145.00	38.00	2.00	8114.40	213.53	4057.20
2	150-159	156.50	53.25	2.95	10286.25	193.17	3486.87
6	160-169	164.50	70.18	4.73	14855.27	211.67	3140.65
6	170-179	175.33	79.08	6.03	20023.51	253.21	3320.65
8	180-189	184.50	87.69	5.46	18088.77	206.28	3312.96
9	190-199	192.66	99.39	6.34	21086.88	160.97	3326.00
2	200-209	200.00	131.00	10.00	38494.75	293.85	3849.48
35	130-209	169.31	74.32	4.85	17810.22	231.63	4170.57

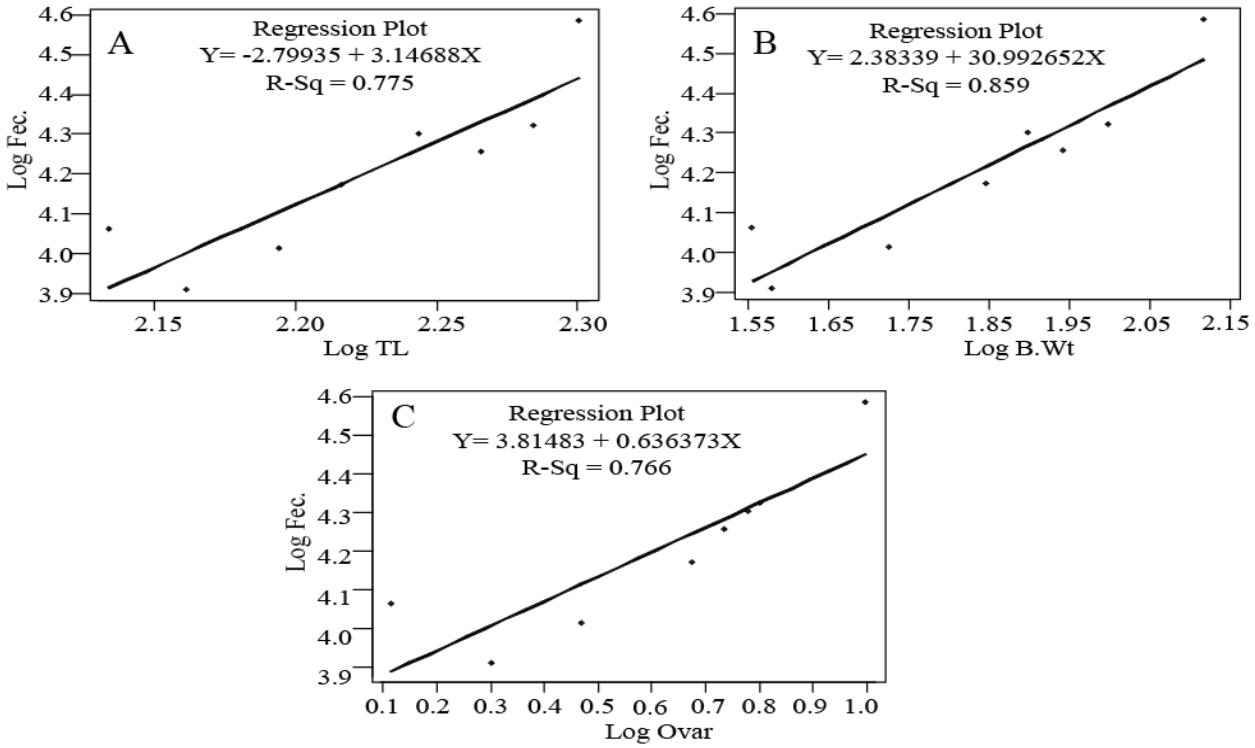

Fig. 3. Log fecundity in relation (a) Log TL (mm); (b) Log body weight (g) and (c) Ovary weight (g).

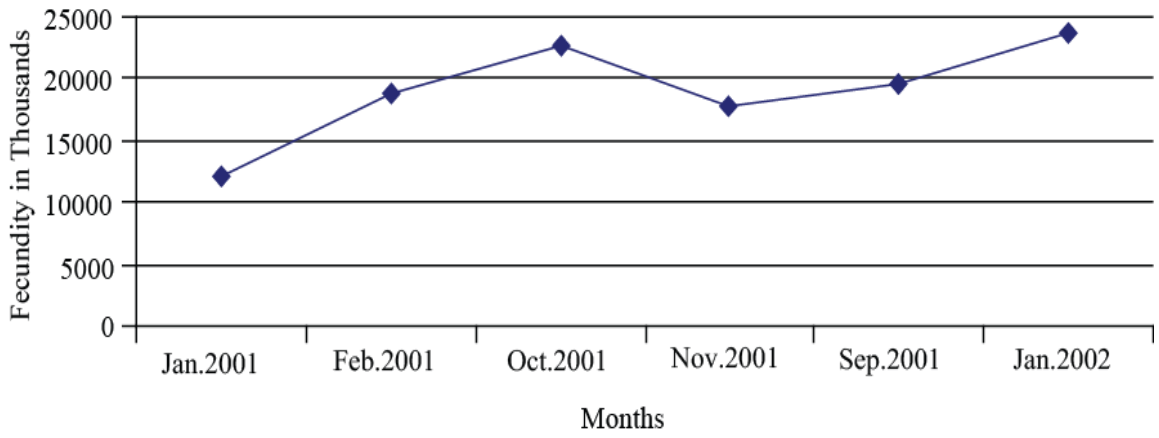

Fig. 4. Monthly changes in fecundity of *P. stridens*, Bar indicates the range of Fecundity.

SEX RATIO

Table 1 and Table 2 show that the female were found slightly more numerous than the male and a sex ratio of 1.5 : 1 between female and male was obtained. The data were subjected to Chi-square test and at 5 % probability level. Chi-square (x^2) values showed that proportion of males in different months was not significantly different and that sex ratio in each month did not differ significantly from the theoretical 1 : 1 ratio except in June and December (Table 1; Fig. 1a & 2a). Chi-square (x^2) test showed significant values at 140 – 149mm, 180 – 189mm and 210 – 219mm TL hinting at their 50% maturity in either sex. The same sex ratio was found in different size groups of the fish (Table 2). Based on size groups the males were predominant up 159 mm while the females were predominant from 160 mm to 219 mm (Table 1). The monthly result shows that the number of females was largely distributed in the month of January, February, March, April, June, August, September and December. And in the remaining months Male were abundant, but overall number of females were abundant to males (Table 1). The same sex ratio was found in different size groups Table 2 of the fish. Based on size groups the females were predominant from 130 mm to 219 mm. The monthly result shows that the number of females was largely distributed in the month of January2001, February2001, April2001, May2001, June2001, July2001, August2001, September2001, October2001, January2002, March2002 and April2002. And in the remaining months males were abundant, but overall number of females was slightly abundant to males.

DISCUSSION

Malhotra (1971) and Misra (1982) correlated the fish weight and fecundity and found straight line relationship between fish weight and fecundity. The findings of the present work are in agreement with their observations and it also reveals that the mean production per gram of fish decreased with higher weight grouping of fishes.

Pomadasys stridens (Forsskal, 1775) the fecundity is more closely related to fish length than fish weight. Similar views are expressed by Misra (1982) in *Schizothorax richardsonie* and Joshi and Khanna (1980) in *Lasio gonius*.

Ghiselin (1969) suggested that when fecundity increases more rapidly with age in one sex than the other, then individuals should be born into one sex where fecundity increases less rapidly with age. The age is more important in the life history of the animal than its length and weight. The relationship usually is of one form, $F = a L^b$ where "F" is fecundity "L" is the length, "a" and "b" are constants.

ACKNOWLEDGEMENT

My sincere gratitude is extended to the staff members and fellow colleagues of the centre (MRC & RC), Department of Zoology, University of Karachi and Department of Zoology, Sir Syed Govt. Girls College, Nazimabad, Karachi.

REFERENCES

Abu-Hakima, R. (1987). Aspects of the reproductive biology of the grouper, *Epinephelus tauvina* (Forskal), in Kuwati water. *J. Fish. Biol*., 30: 213-222.

Adebiyi, F. A. (2013). The sex ratio, gonadosomatic index, stages of gonadal development and fecundity of sompat grunt, *Pomadasys jubelini* (Cuvier, 1830). *Pak J Zool*., 45(1): 41- 46.

Al-Ghais, S. M. (1995). Aspects of the biology of *Pomadasys stridens* (Forskal, 1775) from the western coast of the United Arab Emirates. *Arab Gulf Jr. scient. Res*., 13 (2): 401-419.

Amtyaz and M.A. Khan (2004). Studies on the fecundity and sex ratio of saddle grunt fish, *Pomadasys maculatum* (Bloch, 1797) (Family;Pomadasyidae) from Karachi coast, Pakistan. *International Journal of Biology and Biotechnology*, 1(1): 11-115.

Amtyaz and M. A. Khan (2005a). Observation on the food and feeding habits of striped piggy, *Pomadasys stridens* (Forsskal, 1775) (Family: Pomadasyidae) from Karachi coast. *25th Pakistan congress of Zoology (International congress)*. FEWFM-40.

Amtyaz and M. A. Khan (2005b). Observation on the food and feeding habits of Spotted grunt fish, *Pomadasys maculatum* (Bloch, 1797) (Family: Pomadasyidae) from Karachi coast. *International Journal of Biology and Biotechnology*, 2(4) p. 875-881.

Babiker, M. M. and H. Ibrahim (1979). Studies on the biology of reproduction in the cichlid *Tilapia nilotica* (L); gonadal maturation and fecundity. *J. Fish biol.,* 14: 437-448.

Ben-Tuvia, A. (1976). Occurrence of Red Sea fishes *Herklotsichthys punctatus,Autisthes puta* and *Rhoncisicus stridens* (*Pomadasys stridens*) in the eastern Mediterranean. *Israel Journal of Zoolog*, 25: 212-213.

Beumer, J. P. (1978). Feeding ecology of four fishes from a mangrove creek in north Queens land (Australia). *Journal of Fish Biology*, 12: 475- 490.

Bianchi, G. (1985). *Field guide to the commercial marine and brackish water species of Pakistan. FAO, Rome.,* 200p.

Blaber, S. J. M. (1997). *Fish and fisheries of tropical estuaries (Haemulidae)*, Chapman & Hall, Boundary Row London; 208-209.

Chang-Po Chen, Hwey-Lian Hsieh and Kun- Hsiung Chang (1980). Some aspects of the sex chang and reproductive biology of the Grouper, *Epinephelus diacanthus* (Cuvier Et Valenciensis). *Bull. Inst. Zool. Academia Sinic.,* 19 (1): 11-17.

Deshmukh, V. M. (1973). Fishery and biology of *Pomadasys hasta* (Bloch). *Indian Journal of Fisheries*., 20 (2): 497- 522.

Dhulkhed, M. H. (1973). Sex ratio in oil sardine. *Indian J. of Fisheries*, 2 (2), 236-239.

El-Sayed, A. M. (1994). Life cycle and fecundity of rabbit fish, *Siganus canaliculatus* (Teleostei; Siganidae) in the Arabian Gulf. *Oebalia*., 20: 79-88.

Ghiselin, M. T. (1969). The evolution of hermaphrodism among animals. *Quart. Rev. Bio.,* 44: 189-208.

Hoda, S. M. S. (1976). Reproductive biology and length- weight relationship of *Thryssa dussumieri* (Valenciennes) of the Pakistan coast. *J. Mar.Boil. Ass. India,* 18 (2): 272-287.

Hoda, S. M. S. and N. Qureshi (1993). Aspect of the reproductive biology of the mullet *Valamugil cunnesius* (V) in Karachi- Sindh waters. *J. Mar. Bio. Ass. India.,* 35: 123-130.

Hussain, S. M. and E. Ahmed (1992). Length- weight and structural indices for *Pomadasys kaakan* from Arabian Sea. *Marine Research.*, 1 (1): 61-69.

Iwatsuki, Y., H. Kohno and H. Ida (1998). Redescription of a poorly-known haemulid fish , *Pomadasys unimaculatus* Tian 1982 from Malaysia and comparison with *P. maculatus* (bloch, 1797) (Perciformes: Haemulidae). *Ichthyol. Res.,* 45(2): 195-200.

Imad, A. (1985). Dhoter fishery of Pakistan coast. *Fish. Newsl.,* 3 (3 & 4): 28-35.

Iqbal, M. (1989). Anote on the population dynamics of *Pomadasys kaakan* (Haemulidae) from Pakistan. *Fish Byte*., 7(3): 4-5.

Jayabalam, N. (1991). Food and feeding habits of the Pony fish, *Leiognathus splendens* from Porto novo coast. *Indian Journal of Marine Sciences*, 157- 160.

Joshi, S. N. and S. S. Khanna (1980). Relative fecundity of Cario gonius (Ham.) from Nanak Sagar reservoir. *Jr. Indian food Sc.*, 57: 343-348.

Karkar, P. S. and D.V. Bal (1960). A study of the maturity and spawning of *Polydactylus indicus* (Shaw). *Indian J. Fish*., 7: 147-165.

Khan, M. A. and S. M. S. Hoda (1993). sex ratio of the sole, *Euryglossa orientalis* (Bal and Schneider) (Family; Soleidae) from the Karachi coast. *Pakistan J. Mar. Sc.*, 2(2): 157-159.

Konchina, Y. V. (1978). Some data on the biology of grunters (Family Pomadasyidae). *Journal of Icthiology*, 17: 548- 558.

Le-Cren, E. D. (1951). The length- weight relationship and seasonal cycle in gonad weight and condition in the Perch (*Perca fluviatilis*). *J. Anim. Ecol*., 20: 201-219.

Malhotra, Y. R. (1971). Studies on the seasonal changes in the ovary of *Schizothorax niger* (Hechd) from dal lake in Kashmir. *Jap. J. Icth*., 17: 110-116.

Majid, A., and A. Imad (1991). Growth of *Pomadasys kaakan* (Haemulidae) off the west of Pakistan. *Fish byte*., 9(2): 28- 29.

Majid, A., M. Wasim ans M. Khaliluddin (1992). *Commercially important marine fishes of Pakistan*. Pp. 170- 177.

Misra, M. (1982). *Studies on fishery biology of Schizothorax richardsoni (Gray)*. An economically important food fish of Garhwal Himalayas. Phil. Res. Grahwal University Srinagar Garhwal.

Subhan, F., and M. A. Hafeez (1998). Gonadal maturation and breeding biology of the Putitora Mahaseer, *Torputitora* Hamilton from Rawal lake, Islamabad. *Pakistan J. Zool.,* 30 (4): 347- 355.

Wood, H. (1930). Scotish herring shoals. Pre- spawning and spawning movements. Scotland fish. *Sci. Inves.,* 1: 1-71.

(*Accepted for publication June 2013*)