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Some Biological Aspect of Bartail Flathead (*Platycephalus indicus* Linnaeus, 1758) in Northwest of Persian Gulf (Khuzestan Coastal Waters, Iran)

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Abstract: During this study from December 2009 to November 2011, 469 *p. indicus* fish was caught and their weights and lengths were measured. Total number of caught fishes included, 248 males, 198 females and 23 immature fishes. The Mean, maximum and minimum total lengths were 353±180, 1886 mm and 57 mm respectively. The Mean, maximum and minimum total weight for this species was 384±130g, 600 and 140 g respectively. The length-weight relation were calculated as $W=0.000009\ FL^{2.95}$ (n=248, R^2=0.83) for males, $W=0.000005FL^{3.07}$ (n=198, R^2= 0.82) for females and $W=0.000004FL^{3.10}$(n=469, R^2 =0.86) for total fishes. Verifying calculated b with 3, using Students t-test there was significant difference between calculated b and 3 ($P<0.05$), growth pattern is allometric. The mean values of condition factor (K) and Hepatosomatic Index (HIS) was 0.71± 0.14, 1.23±0.65 in male specimens and 0.75± 0.15, 1.32± 0.70 for female specimens. The highest values of K and HIS were observed in November, January and the lowest were in March, June. The mean value of Gonadosomatic Index (GSI) for the male and female were 0.52 ± 0.39 and 1.41 ± 0.62 respectively. For both sexes, the highest GSI values were observed in April and the lowest were in November. Mean GSI value and maturity stages indicated that spawning time were occurred during April to May. The mean size at first sexual maturity (Lm) was 283mm for males and 310 mm for females.

Key words: Biology % *Platycephalus indicus* % Persian gulf

INTRODUCTION

Persian Gulf is one the most important gulf in the world from fishing industries point of view. Iran, Iraq, Saudi A., Kuwait, Oman, Qatar, Emirates are located in the coast of this gulf [1]. The Persian Gulf is a semi enclosed sea that laying almost between the latitudes of 25°-32° N and longitudes of 48°-56° E. This water basin is shallow continental shelf and average of depth was 35m, which is increasing from Arvend estuary and reach to maximum in strait of Hormuz Strata. This area is considered one of the richest areas in fishery resources where large quantities of fish and shrimps are concentrated in different locations, particularly in the territorial waters of the State of Iran [2].

The proper assessment and management of a fishery requires an understanding of the biology, life cycle and distribution of the species on which it is based [3]. According to Smith and Heemstra [4], about 25 species of *platycephalidae* belonging to 10 genera have been identified around the world. *P. indicus* is a benthic fish found on sand or mud bottom in vary shallow area of estuary and near shore to depth of 25m. This species is dominant species of *platycephalidae* family, in Khuzestan province (Iran) and mainly is captured by bottom trawl and gillnet [5]. The amount of catches recorded for this species in Khuzestan Province (Northwest of Persian Gulf) was 410 tons and 917 tons during 2000 and 2010 [5]. *P. indicus* species is among the expensive fishes in Khuzestan province (South of Iran) and costs about 6 US $/kg. Because of its important role in economy of Khuzestan fishery and also in Persian Gulf region countries, this fish is a target species for capture. Different aspects of biological Parameters of *P. indicus* have been studied by different authors in Persian Gulf are those of Nasir [7] in Kuwait waters, Marais [8] and Wu [9] in Hong Kong waters. However, no study so far has been made on this species biology in Khuzestan Coastal Waters (northwest of Persian Gulf).

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The objectives of this study is to provided information pertaining to reproductive biology of this species in northwest of Persian Gulf (Khuzestan Coastal Waters, Iran) and is the first to present complete of reproductive characteristics based on observation and information analysis. These data can be used to better fisheries stock management for this valuable fish.

MATERIALS AND METHODS

The main fishing areas of *P. indicus* in the Northwest of Persian Gulf are located in Liphe-Busafe and Bahrekan fishing area between 29° 44' to 07 'N and 48° 45' to 49° 50' (Fig. 1). A total number of 469 individuals of *P. indicus* were captured during 2009 to 2011 using bottom trawl and gill net, which collected from recreational fishermen and then transferred in ice box to the laboratory. Fork length (±1.0 mm), sex and weight (±0.001 g wet weight) were recorded for each fish in the laboratory. Parameters of the length weight relationship were obtained by fitting the power function $W = a \times FL^b$ to length and weight data where: W is the total wet weight, a is constant determined empirically, FL is the fork length [10]. In order to verify if calculated b was significantly different from 3, the Students t-test was employed [11].

The Condition Factor (K) equation $K=W\times10^2/L^3$ was used to find fish status changes in which w= weight and L = total length [12], Hepatosomatic Index (HIS) were calculated as follows [10]: $HSI = LW\times10^2/BW$; where LW= liver weight (g); BW = body weight (g).

The maturity stage for males and females was determined macroscopically using a 7-stage maturity key [13]. These stages included: Virgin (I), Maturing Virgin (II), developing (III), late developing (IV), Gravid (V), Spawning (VI) and Spent (VII).

Gonadosomatic Index (GSI), calculated by expressing the Mean gonad weight as a proportion of the total body weight [10]. The mean size at first sexual maturity was estimated for females by fitting the logistic function to the proportion of mature fish in 3-cm (FL) size categories Y= 1/1+exp (-a-bX), in which Y is the proportion of the number of all mature male and females to all immature males and females in the same length class, X in total length in cm and a and b are correlation constants [3]. The mean size at first maturity was taken as that at which 50% of individuals were mature. Comparison of GSI values during reproductive period, HIS and K between sexes and its temporal variation in each sex carried out by analysis of variance (ANOVA). Statistical analyses were performed with SPSS 14 software package and a significance level of 0.05 was adopted.

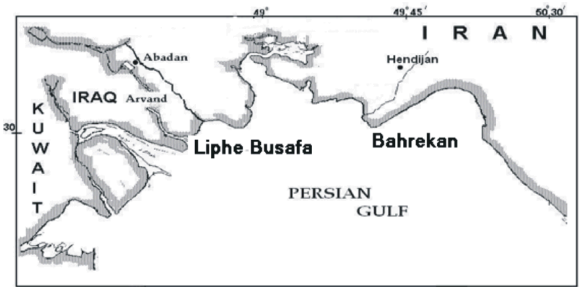

Fig. 1: Location of two landing sites of bartail flathead in Khuzestan Coastal Waters (Iran)

RESULTS

From the total number of caught fishes, 248 were males and the remaining were females, on the other hand 23 of total samples collected were immature. According to Table 1, mean ± SD length values for this species were 353±180 and maximum and minimum total length was 57mm and 1886mm respectively. Mean ± SD weight values were 384±130 (g) and maximum and minimum weight were 140 and 600 (g) respectively. Average length and weight in females were higher than in males. The length-weight relationship were calculated as $W=0.000009FL^{2.95}$ (n=248, R^2=0.83) for males, $W=0.000005FL^{3.07}$ (n=198, R^2= 0.82) for females and $W=0.000004FL^{3.10}$ (n=470, R^2 =0.86) for total fishes (Fig. 2). Verifying calculated b with 3, using Students t-test there was significant difference between calculated b and 3 ($P<0.05$).

The mean Values of condition factor (K) and Hepatosomatic Index (HIS) was 0.71± 0.14 and 1.23± 0.65 in male specimens and 0.75± 0.15 and 1.32± 0.70 for female specimens (Fig. 3, 4). The highest K and HSI value were observed in November, January and the lowest was in March, June, respectively. A comparison of fish condition between sexes in each of different phase pointed, that there is no significant differences between them (ANOVA, $F=0.89$, $P>0.05$) and also same results were observed for HIS between sexes (ANOVA, $F=0.43$, $P>0.05$).

The mean value of Gonadosomatic Index (GSI) for the male and female were 0.52±0.39 and 1.41±0.62 respectively. For sexes, the highest GSI value were observed in April and the lowest was observed in November (Fig. 4). Moreover, there was a significant difference in the mean GSI indices between males and females (ANOVA, $F=5.36$, $P<0.05$). Mean GSI and maturity stage indicated that spawning time was during April to May. The mean size at first sexual maturity (Lm) was 283mm for males (Fig. 5) and 310 mm for females (Fig. 6).

Table 1: Average values (±SD) of size corresponding of bartail flathead in Khuzestan Coastal Waters (2009-11)

Month	N	Male	Female	Mean W±SD (g)	Min-Max	Mean TL±SD (mm)	Min-Max
January	110	82	32	356±72	255-550	362±72	113-1163
February	30	23	6	294±20	224-380	179±20	64-395
March	31	11	17	280±23	201-358	153±23	57-347
April	63	40	23	361±14	266-535	389±72	114-1170
May	33	19	11	317±59	237-550	254±20	11-8410
June	30	19	11	315±43	236-550	264±23	84-1490
July	15	1	13	446±72	317-590	677±72	207-1238
August	13	2	10	357±20	280-515	418±60	141-1097
September	22	6	3	290±23	140-372	185±23	16-344
October	33	6	23	389±72	277-555	525±72	70-1540
November	35	11	23	333±88	235-490	309±40	71-817
December	54	28	26	298±53	285-600	539±63	146-1886
Average	-	-	-	130±384	140-600	180±353	16-1886

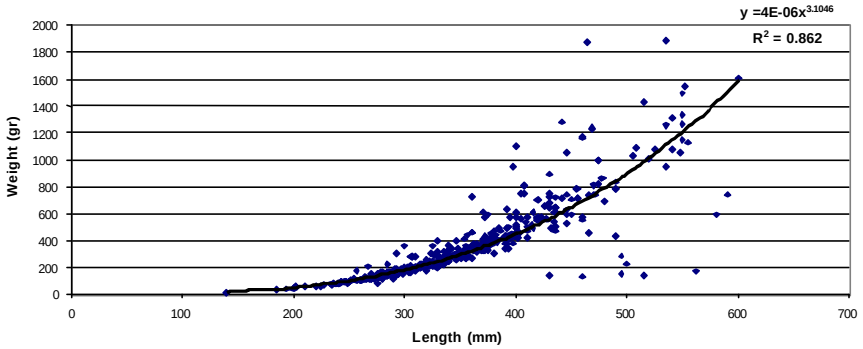

Fig. 2: The length-weight relationship curve for total fish of bartail flathead in Khuzestan Coastal Waters (Iran, 2009-11)

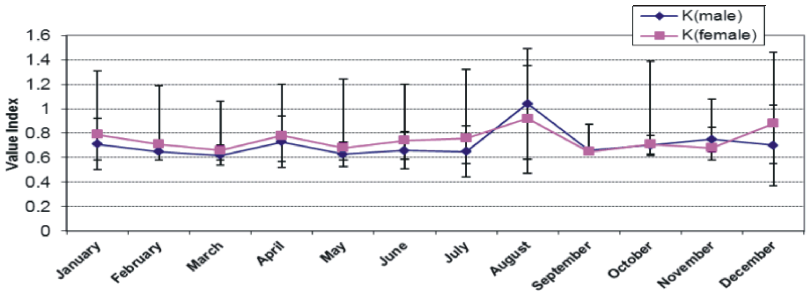

Fig. 3: Monthly variations of K (male and female) of bartail flathead in Khuzestan Coastal Waters (2009-11). Error bars indicate SD

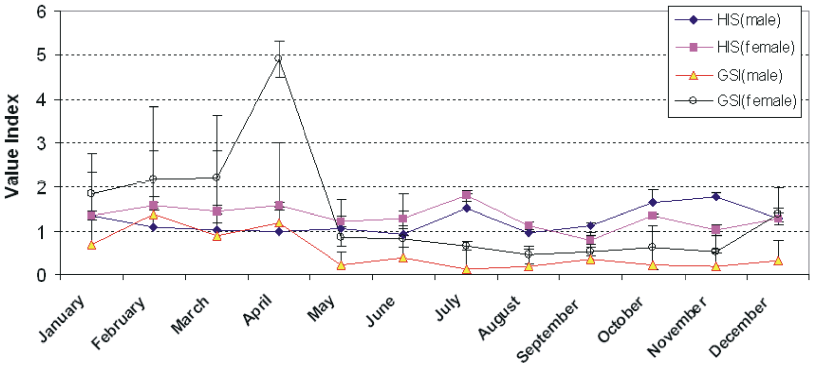

Fig. 4: Monthly variations of GSI (male and female) and HIS (male and female) of bartail flathead in Khuzestan Coastal Waters (2009-11)

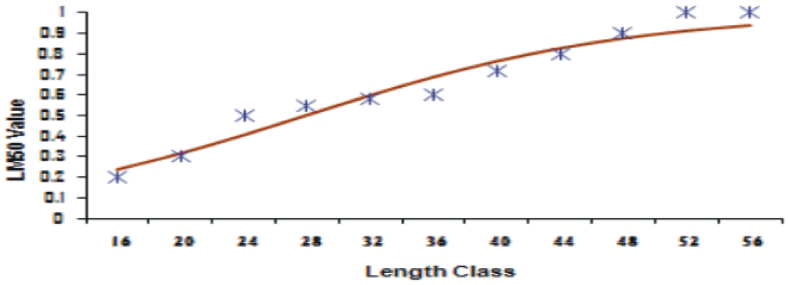

Fig. 5: LM_{50} (male) of bartail flathead in Khuzestan Coastal Waters (2009-11)

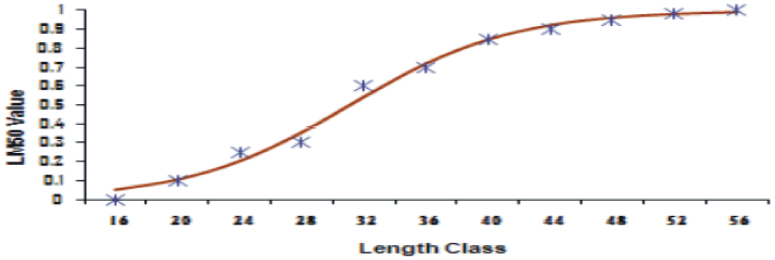

Fig. 6: LM_{50} (Female) of bartail flathead in Khuzestan Coastal Waters (2009-11)

DISCUSSION

The length-weight relationship in fish is of great importance in fishery assessments [14]. Length and weigh relationship in conjunction with age data can give information on the stock composite, age at maturity, life span, mortality, growth and production. The relative robustness or degree of well-being of a fish expressed as the coefficient of condition (condition factor) is an important tool for the study of fish biology, mainly when the species lies at the base of the higher food web [15,16].

The b values in the weight-length model were measured close to 3 for *p. indicus* fishes that indicating that weight increased allometrically with length [3]. The value of b for Indian waters (the Netravati Gurpur Estuary, Mangalore) were estimated 2.99 and 2.91 for male and female respectively [17]. The b values of weight-length relationship was 3.32 for total fish of this species in Kuwait waters [18]. The variation of b in the different regions could be by seasonal fluctuations in environmental parameters, physiological conditions of the fish at the time of collection, sex, gonad development and nutritive conditions in the environment of fish [3]. Length-weight relationship is a practical index of the condition of fish and may vary over the year according to several exogenous and endogenous factors such as food availability, feeding rate, health, sex, gonad development, spawning period and preservation techniques [19, 20]. According to Marthin (1994) the range of "b" could be from 2.5 to 4 and Tesch (1968) believed "b=3 in fish with isometric growth" [20, 21].

The highest amount of (k) was observed in spring after a full feeding season and decreased after spawning time in April which shows the effect of ovary weight on fatness. K value decreased after spawning time due to use of energy in spawning time. Low value of k could be explained with ripe season [22, 23 and 24]. Condition factor is a well-being value and its increasing coincides with fish weight increasing [3]. Seasonal growth amount can be measured by status factor and growth changes may be related to fish food or reproduction stage [3].

HIS in *p. indicus* were relatively low from May to June. Since most individuals began to spawn in April to May, HIS may decrease 3-4 months before spawning. From July to September, most ovaries were in the recovery phase. Changes in HSI followed a similar pattern during gametogenesis. This finding is similar to that reported for other species [22-24].

The spawning time of Bartail flathead during April to May supports the view that seasonal reproductive cycles are common among tropical ?shes. According to Vander Elst and Adkin (1991) the spawning of Bartail flathead occurred during July to November in Southern African waters [25]. Hashemi *et al*., (2011) found that Spotfin flathead spawned in northwest of Persian Gulf (Khuzestan Coastal Waters, Iran) during April [2]. This could be related to the geographical and ecological differences between the stocks of this genus. The single spawning period during spring in Khuzestan waters was mentioned by Hashemi *et al*., 2011 [2].

GSI patterns was shows, this species reproductive cycles are similar other tropical fishes [26]. Regarding differences between mean value of GSI for males and females, in reviewing the reproductive biology of the most fish it is noted that values of males are commonly lower than those of females. Buxton (1990) pointed out that the cost of producing sperm is thought to be less than for producing eggs [27]. The difference in male and female gondosomatic indices suggests that energy invested in gamete production by male is probably less than that invested by females.

During the ripping season, temperature increased. It has been observed that warm water induced later maturity stages. This pattern is similar to that reported by other authors [23, 24]. The present of significant variability in the mean monthly and seasonal GSI value confirm the fact that *p. indicus* has an all year round reproductive pulse.

Mean size at first sexual maturity (Lm) for bartail flathead was estimated 283mm (males) and 310m (females). Males mature earlier, therefore their growth is slower than that of females, as a result of the high energy they need in earlier years for their growth and reproduction [28]. Mean sizes at first sexual maturity have been reported 410 mm for this species in southern Africa waters [25]. Hashemi *et al*., (2011) found length at maturity for Spotfin flathead 213 mm in both sex [2]. Sexual maturity is a critical life stage and length at first maturity may be different in various populations [29]. The results of the present study showed that bartail flathead needs a protection during the spawning period from April to May, which could help in the management of its stocks.

Further research as population dynamics and stock assessment, is needed in order to obtain an adequate and comprehensive understanding of biology and ecology in this important order in future.

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REFERENCES

1. Hashemi, S.A.R and T. Valinassab, 2011. Stock assessment of demersal resources in the West northern Of Persian Gulf waters. World J. Fish and Marine Sci., 3(6): 480-485.
2. Hashemi, S.A.R., S.A. Taghavimotlagh and G.R. Eskandary, 2011. To determine the ecological relationship amongst economic fishes within the Persian Gulf waters. Final Report South of Iran aquaculture fishery research center: Iranian Fisheries Research Organization, pp: 33. (In Farsi).
3. King, M., 2007. Fisheries biology & assessment and management. Fishing News Press, pp: 340.
4. Smith, M.M. and P.C. Heemstra, 1986. Smith's Sea Fishes. Springer Velage, Berlin Heidelberg, New York, London, Paris, Tokyo, pp: 1047.
5. Parsamanesh, A., M.T. Kashi and G.H. Eskandari, 2000. Stock assessment of commercial fish in coastal waters of Khuzestan province. Final Report South of Iran aquaculture fishery research center: Iranian Fisheries Research Organization, pp: 70. (In Farsi).
6. Anonymous, 2007. Annual Khuzestan Fishery Report. Iranian Fishery Organization Press, pp: 235.
7. Nasir, N.A., 2000. The food and feeding relationships of the fish communities in the inshore waters of Khor Al-Zubair, Northwest Arabian Gulf. Cybium, 24(1): 89-99.
8. Martine, W.R., 1949. The mechanics of environmental control of body form in fishes.Univ.Toronto stud. Biol., 58: 1-91.
9. Wu, R.S.S., 1984. The feeding habits of seven demersal fish species in a subtropical estuary. Asian Mar. Bio., 1: 17-26.
10. Biswas, S.P., 1993. Manuel of methods in fish biology, fish biology & Ecology laboratory, Dibruyarh University, Dibrugarh, pp: 157.
11. Zar, J.H., 1996. Biostatistical analysis. 3rd edition. Prentice-Hall Inc., New Jersey, USA, pp: 662.
12. Beckman, C.W., 1984. The Length-Weight relationship, Factor for conversions between standard and total lengths and coefficients of condition for seven Michigan fishes. American Fish. Soc., 75: 237-256.
13. Kesteven, G.L., 1960. Manaual of field methods in fisheries biology. FAO Man. Sci., 1: 152.
14. Haimovici, M. and G. Velasco, 2000. Weight relationship of marine from southern Brazil. NAGA, 23(1): 14-16.
15. Diaz, L.S., A. Roa, C.B. Garcia, A. Acero and G. Navas, 2000. Length-weight relationship of demersal fishes from the upper continental slope off Columbia. NAGA, 23(3): 23-25.
16. Lizama, M., A.P. De Los and Ambrósio, 2002. Condition factor in nine species of fish of the Characidae family in the Upper Parana River floodplain, Brazil. Braz. J. Biol., 62(1): 113-124.

17. Naik, S.K., S.L. Shanbhogue, N. Jayabalan and C. Krishna-Bhat, 1990. Observations on *Platycephalus indicus* from the Netravati Gurpur Estuary, Mangalore. Environ. Ecol., 8(4): 1311-1313.
18. Bawazeer, A.S., 1989. The stock and fishery biology of Indian flathead (wahar) *Platycepahlus indicus* (Linnaeus), family Platycephalidae in Kuwait waters. Kuwait Bull. Mar. Sci., 10: 169-178.
19. Bangenal, T., 1978. Method for assessment or fish production in freshwater. Blackweu Scientific Pub, Oxf, Lon., pp: 365.
20. Tesch, F.W., 1968. Age and growth in methods for assessment of fish production in freshwater. Ed. W.E. Ricker. IBP Handbook, pp: 3.
21. Martine, W.R., 1949. The Mechanics of environmental control of body form in fishes. Univ. Toronto Stud. Biol., 58: 1-91.
22. Nikpey, M., 1996. The biology of *B. sharpegi* and B. *grypus* in Khuzestan Province. The Scientific Research Results of the Iranian fisheries Org., First program, Tehran-Iran, pp: 83. (In Persian).
23. Eskandary, G.R., 1999. The biology of *B. xanthopterus* in Karkhe river and hour-Al- Azim area (Khuzestan Province). The Scientific Research Results of the Iranian Fisheries Org., Tehran-Iran, pp: 91. (In Persian).
24. Eskandary, G.R., S. Deghan, M. Nikpy and Y. Miahi, 2001. The biology of *B.s esocinus* in Dez dam lake (Khuzestan Province). The Scientific Research Results of the Iranian fisheries Org., Tehran-Iran, pp: 75. (In Persian).
25. Sadovy, Y.J., 1996. Reproduction of reef fishery species. In Reef Fisheries (N.V.C. Polunin and C. Roberts, eds.), pp: 15-59. Chapman and Hall, London.
26. Van Der Elst, R.P. and F. Adkin, (eds.) 1991. Marine linefish: priority species and research objectives in southern Africa. Oceanogr. Res. Inst. Spec. Publ., 1: 132.
27. Buxton, C.D., 1990. The reproductive biology of Chrysoblephus laticeps and *C. cristiceps* (Teleostei: Sparidae). J. Zool., 220: 497-511.
28. Rajaguru, A., 1992. Biology of two co-occurring tongue fishes, *Cynoglossus arel* and *C.lida* from Indian water. Fish. Bull., 90(2): 325-367.
29. Moyle, P.B. and J.J. Gech, 1988. Fishes an introduction to Ichthyology prentice hall, Englewood cliffs, New Jersey, pp: 559.