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Some biological aspect of carasobarbus luteus (Heckel, 1843) in hoor al-azim wetland

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A R T I C L E   I N F O

A B S T R A C T

The Population Dynamics and status of Hemeri (Carasobarbus luteus) in Hoor Al-azim wetland (Khuzestan provinces, Iran) were investigated to derive information required for their management. During this study from 2011 to 2012more than 460 specimens C. lutus were measured. Mean±S.D length Values for this species were 228±15 respectively and maximum and minimum total length were 118 mm and 362 mm respectively. Mean ±S.D weight Values for this species were 190±91gr and maximum and minimum weight were 86-416 gr respectively. The length-weight relation were calculated as $Y=0.0018L3.18$ (n=466, R2 =0.96) for total fishes, growth pattern is isometric (P>0.05). The mean Values of condition factor (K) were 1.38± 0.07 in male specimens and 1.43± 0.11 for female specimens. The highest values of K were observed in April and the lowest in October were observed. The mean size at first sexual maturity (Lm) was 210 mm for total fish, and maturity stages indicated that spawning time were occurred during April to July.

1. Introduction

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 (King, 2007). Yet understanding the population biology of fished species is essential to meet one of the main objective of fishery science, that of maximizing yield to fisheries, while safeguarding the long-term viability of populations and ecosystem (Jenning et al., 2000).

Hoor Al- Azim Wetland in Khuzestan province is one of the 18 international wetlands registered on UNESCO's Natural Heritage List. Hoor Al- Azim is parts of a single hydrological system and forms one of the largest permanent freshwater wetlands in Lower Mesopotamia, being located between N 30° 58´- 31° 50´ and E 47° 55´- 47° 20´ (Ghadiri, 2005). This wetland is situated in the North Azadegan Plain, 80 km south-west of Ahvaz city, near the border between Iran and Iraq. The marshes have experienced significant changes during the last two decades and are expected to face further modifications in the next years formerly they extended 85 km from north to south and 40 km from east to west, covering about 254000 ha. The system was fed by two tributaries of the Tigris and by the River Karkheh, which rises on the Zagross Mountains in western Iran. The northern and central parts of the marshes were permanent, while in the south they were largely seasonal (UNEP, 2001).

Order Cypriniformes with six families, 321 genera and some 3268 species (Nelson, 2006) is one of the most widespread and large (specious) orders of fishes all over the world. Thus cyprinids are, as well, a major element in Iran's ichthyofauna, found in all its major drainage basins. The genus Barbus (Cyprinidae, Barbinae), being a member of this group, is a polyphyletic taxon in southwest Asia where one monophyletic clad comprising of six species is reported from the Levant, the Arabian Peninsula, the Tigris-Euphrates basin and neighboring drainages in western Iran (Krupp, 1985).

The barbels, genus Barbus, are found in Europe, Southwest Asia and Africa and comprise about 800 species (Coad, 2006). According to Coad (1995), Abdoli (2000) more than 17 species of Barbus have been reported from different basins of Iran. Hemeri (Carasobarbus (=Barbus) luteus) belong to the order Cypriniformes, the family Cyprinidae, and the genus Barbus. This species widely distributed in the rivers Tigris and Euphrates and adjacent drainage basins. In Iran, it is found in the Tigris River Basin including the Hoor Al-Azim Marsh, the Persian Gulf Basin including the Helleh, Dalaki, Shapur, Mond and Dasht-e Palang rivers and Lake Famur (Parishan), the Lake Maharlu Basin and the Hormozgan Basin and also Iraq and Syria (Berg, 1949; Marammazi, 1995; Abdoli, 2000). Different aspects of biological work of C. luteus have been done by different authors (Szypula et al., 2001, AL Hazzaa, 2005, Gokcek and Akyurt,2008., Hashemi et al., 2010., Eydizadeh et al., 2013), but no work has been done on biological of this species in Hoor Al-azim wetland. Unfortunately, no references from other studies are available regarding Hemeri species in this local. 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.

2. Materials and methods

Length-frequency data of C. luteus were collected monthly from the catches from landing at three station, Rofaie, Tabor and Shatali (Table1), from April 2011to March 2012(Fig.1). Fish sampling was carried out by using 12.5m long gill nets, with meshes of 45 mm (stretched). Nets were anchored at each of the sampling stations at sunset and they were removed at sunrise on the following day, remaining 12 h in water. Total length (TL, mm) and total weight (W, g) were measured for each fish. Parameters of the length weight relationship were obtained by fitting the power function $W = a \times LF^b$ to length and weight data where, W is the total wet weight, a is a constant determined empirically, LF is the fork length and b is close to 3.0 for species with isometric growth. In order to verify if calculated b was significantly different from 3, the Students t-test was employed (Zar, 1996).

The Condition Factor (K) equation $K = W \times 10^2 / L^3$ was used to find fish status changes in which w= weight and L = total length (Beckman, 1984). The maturity stage for males and females was determined macroscopically using a 7-stage maturity key (kesteven, 1960). Population sexual structures were examined using χ^2 goodness of fit tests. Independent tests were conducted to determine whether sex ratios differed significantly from unity for whole samples and size categories within samples. The probability level was set at 0.05 (Sokal and Rohlf, 1995) and 1 degree of freedom for each comparison. These stages included, Virgin (I), Maturing Virgin (II), developing (III), late developing (IV), Gravid (V), Spawning (VI) and Spent (VII). 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 (King, 2007). The mean size at first maturity was taken as that at which 50% of individuals were mature. Comparison of K between sexes carried out by analysis of variance (ANOVA). Statistical analyses were performed with SPSS 16 software package and a significance level of 0.05 was adopted.

3. Results

3.1. Length frequency distribution

The total lengths of 466 fish in the size range 118 to 362 mm for C. luteus using a meter scale (1±mm) were measured. Length frequency percentage groups of C. luteus during period from April 2011 to March 2012 are presented in Fig 2. Mean±S.D length Values for this species were 228±15 respectively and maximum and minimum total length were 118 mm and 362 mm respectively.

3.2. Length–weight relationship

Mean ±S.D weight Values for this species were 174±87gr and maximum and minimum weight were 154- 202 gr respectively. The mean value of length for the male and female were calculated as 216±37 mm, 233±38 mm and mean value of Weight for the male and female was as 170±91gr, 211±88 gr respectively. . The length-weight relation were calculated as $Y=0.0018L^{3.18}$ (n=466, R^2 =0.96) for total fishes, Verifying calculated b with 3, using Students t-test there was no significant difference between calculated b and 3 ($P>0.05$), growth pattern is isometric.

3.3. Sex ratio value, condition factor and size at first sexual maturity

The sex ratio value in different was showed in table 2. The male-to-female sex ratio was 0.51,1, and there is no significant different between different months ($p < 0.05$, $\chi^2=4.49$, d.f= 1). The mean Values of condition factor (K) were 1.38± 0.07 in male specimens and 1.43± 0.11 for female specimens. 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, $P>0.05$). The highest values of K were observed in April and the lowest in October were observed (Fig. 4). The mean size at first sexual maturity (Lm) was 210 mm for total fish (Fig).
5), and maturity stages indicated that spawning time were occurred during April to July (Fig).

Table 1
Three stations on Hoor al-azim wetland in Khuzestan province (2011-12).

Station	Longitudes E	Latitudes N
Rofaie	47˚,53´	31˚,35´
Tabor	47˚,51´	31˚,29´
Shatali	47˚,42´	31˚,23´

Table 2
Sex ratio and significant difference male and female of Hemeri species Hoor al-azim wetland (2011-12).

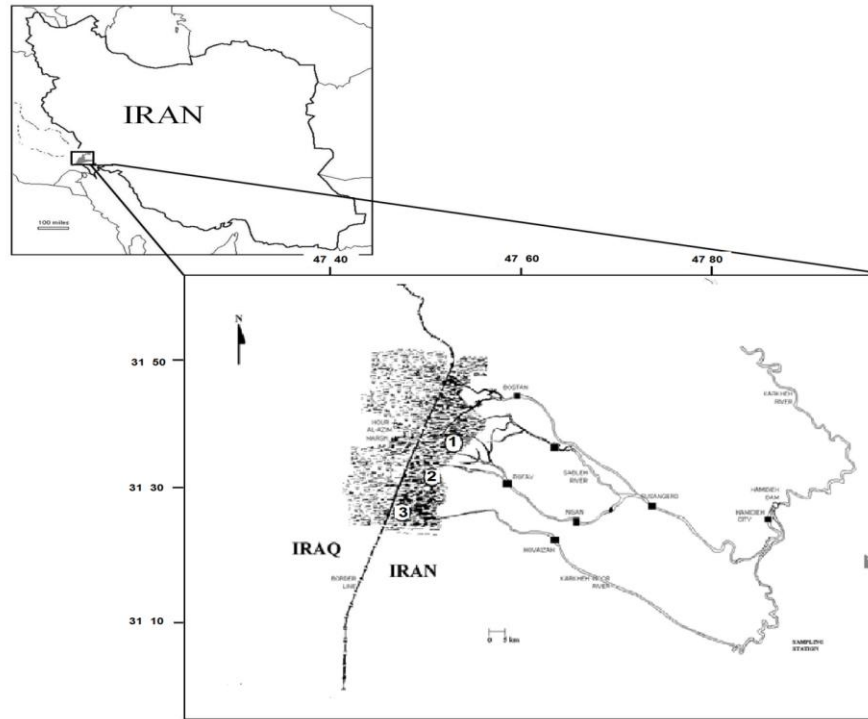| Month	Total	Male	Female	Sexes ratio	X2	P-value
January	42	18	24	0.75	0.86	0.05>
February	45	13	19	0.68	1.13	0.05>
March	1	0	1	-	-	-
April	46	14	32	0.43	7.04	0.05<
May	41	14	27	0.51	4.12	0.05<
June	10	18	31	0.58	3.45	0.05>
July	10	3	4	0.75	0.14	0.05>
August	73	13	27	0.48	4.9	0.05<
September	27	8	19	0.42	4.48	0.05<
October	36	14	20	0.7	1.06	0.05>
November	21	7	14	0.5	2.33	0.05>
December	69	16	53	0.3	19.84	0.05<
SUM	466	138	271	0.51	4.49	0.05<

Fig. 1. The map of Situation on Hoor al-azim wetland(1, Rofaye , 2, Tabar, 3, Shatali) in Khuzestan province (South West of Iran)
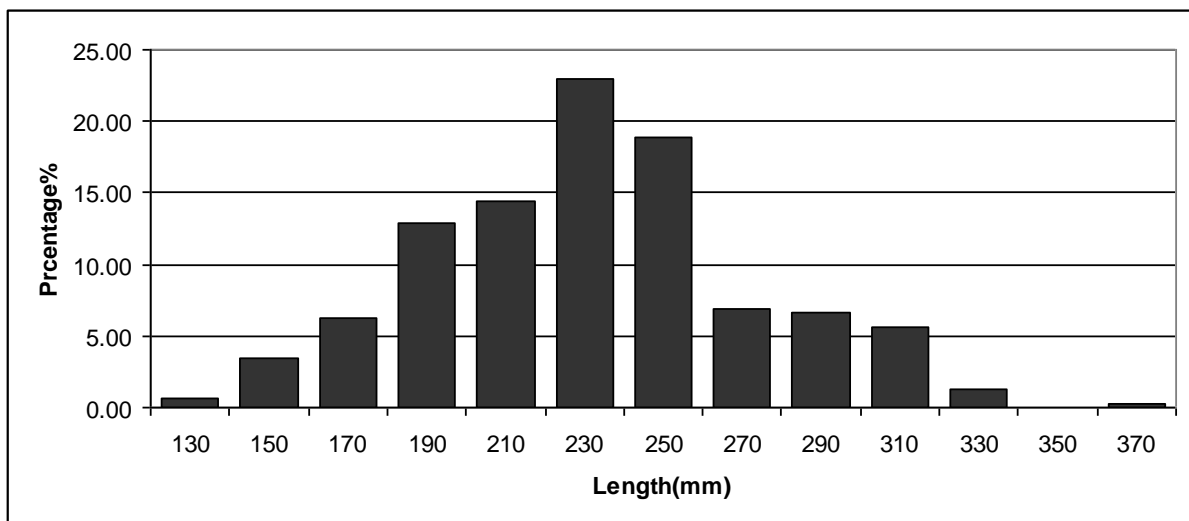

Fig. 2. Percentage frequency of length C. luteus on Hoor Al-azim wetland in Khuzestan province during 2011-12.
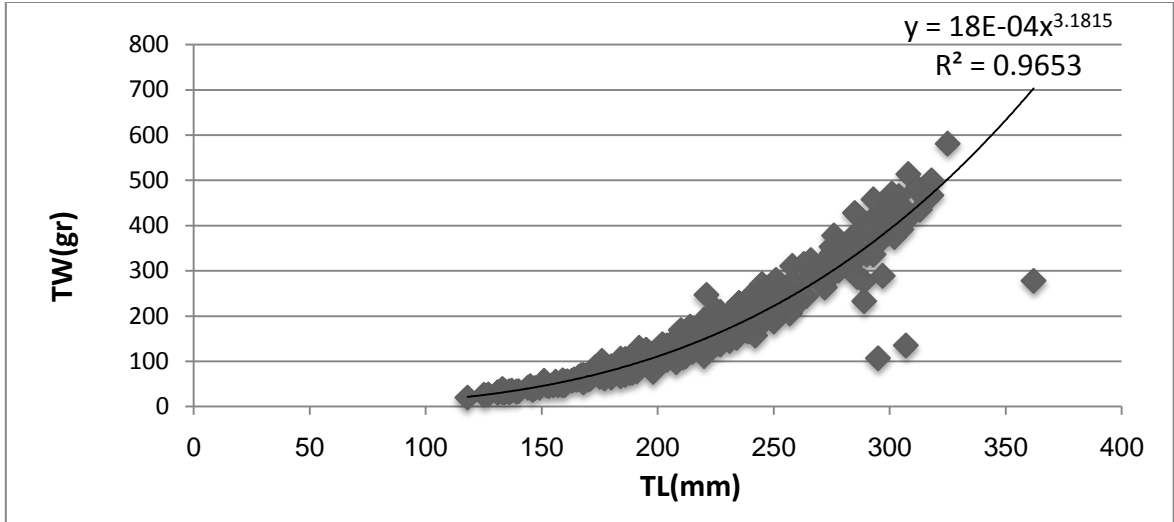
$$y = 18E\text{-}04x^{3.1815}$$
$$R^2 = 0.9653$$

Fig. 3. The length-weight relationship curve for C. luteus on Hoor Al-azim wetland in Khuzestan province during 2011-12.
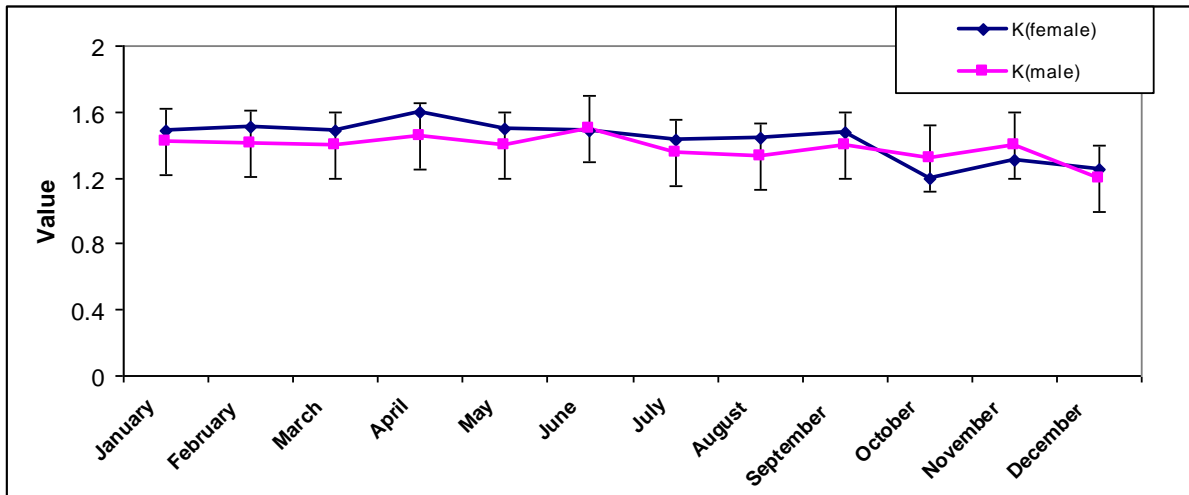

Fig. 4. The K value for C. luteus on Hoor Al-azim wetland in Khuzestan province during 2011-12.
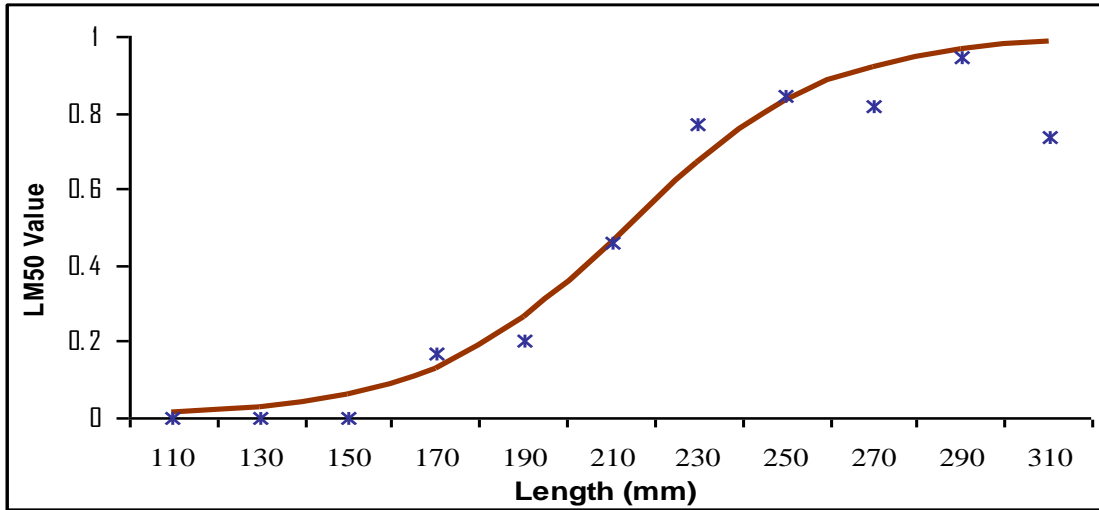
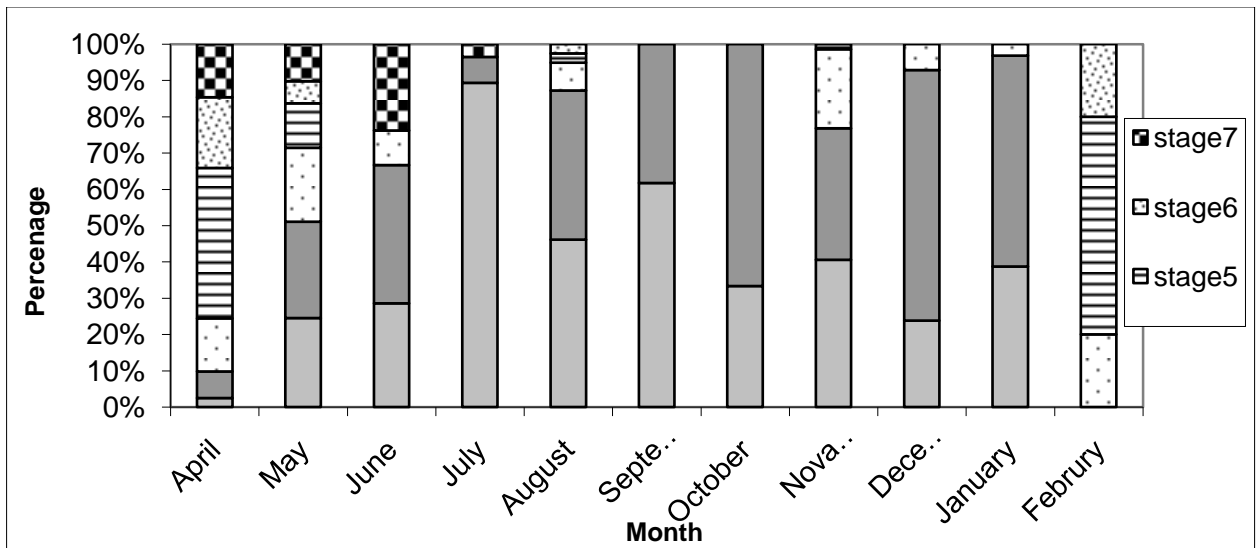**Fig. 5.** LM50 of Hemeri on Hoor Al-azim wetland in Khuzestan province (2011-12).

Fig. 6. Sexual maturity stages for of Hemeri on Hoor Al-azim wetland in Khuzestan province (2 011-12).

4. Discussion

Size sexual dimorphism was observed in Hemeri species since females dominated in the longer length classes and the males in the shorter. The b parameter values in the weight-length model, W= a Lb are close to 3 for C. luteus, indicating isometric growth (King, 2007).The value of b from other studied for C. luteus b=2.98 and b=3.00 (male and female) in Orontes river of Turkey (Gokcek and Akyurt, 2008), b= 3.06 in Shadegan wetland of Iran (Hashemi et al., 2010) were estimated. The value of b from other studied for this species b=3.09 in Habbaniya lake, b= 2.97 in tharthar lake were estimated in the Iraq country (Szypula et al., 2001). 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 (Diaz et al., 2000; Lizama and Ambrósio,2002).

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 (Nikpey, 1996; Eskandary, 1999; Eskandary etal., 2001). Condition factor is a well-being value and its increasing coincides with fish weight increasing (King, 2007). Seasonal growth amount can be measured by status factor and growth changes may be related to fish food or reproduction stage (Eydizadeh et al., 2013).

Sex ratio (males , females) was found to be 0.51 , 1. In this study, significant differences from 1,1 sex ratio were observed. Sex ratio in Barbus xanthopterus was (1,1) (Eskandary, 1999). Sex ratio for Barbus esocinus shows differ from 1,1 and ratio female & male was 1, 4 (Eskandary etal., 2001).The formation of pairs is consistent with a 1,1 sex ratio, but males suffer a higher mortality rate so that older fish are nearly always females. These results could be typical of many temperate freshwater and marine fish (Pitcher and Hart, 1990). In general variation in sex ratio is a result of immigration, difference in behavior catchbility and different mortality rates (sadovy et al., 1994).

C. luteus was spawning during April to July. Hashemi et al.,(2010) found spawning of Hemeri during April to June in Shadegan wetland of Iran. Ghafari and Jamili (2010) found that Barbus pectoralis spawned in karoon river (Khuzestan province) during March to April. Spawning season of Barbus xanthopterus in April (Eskandary, 1999), Barbus esocinus in May (Eskandary etal., 2001), Barbus gyrpus and Barbus sharpegii between March to April (Nikpey, 1996) were reported. This could be related to the geographical and ecological differences between the stocks of Barbus genus. The single spawning period during late winter and spring mentioned in other Barbus species in Khuzestan provinces (Maramazi, 1995,Eskandary, 1999). In fisheries studied, spawning season is an important factor (king, 2007).

Mean size at first sexual maturity (Lm) for C. luteus was estimated 210 mm. Hashemi et al.,(2010) reported Mean size at first sexual maturity of Hemeri 157 mm in Shadegan wetland of Iran. Mean sizes at first sexual maturity have been reported 30 cm (males) and 49 cm (females) for Barbus xanthopterus (Eskandary., 1999), 15 cm (males) and 50 cm (females) for Barbus esocinus (Eskandary etal., 2001). Ghafari and Jamili (2010) found length at maturity for B. pectoralis 35-40 cm in males and 50-55 cm in females (Khuzestan provinces, Iran). Sexual maturity is a critical life stage and length at first maturity may be different in various populations (Molye, 1990). 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.

Acknowledgments

References

AL Hazzaa, R., 2005. Some Biological Aspects of the Himri Barbel, Barbus luteus, in the Intermediate Reaches of the Euphrates River. Turk. J. Zool., 29 , 311-315.

Abdoli, A., 2000. The Inland Water Fishes of Iran. Iranian Museum of Nature and Wildlife, Tehran. 378 pp. In Farsi.

Beckman,C.W., 1984. The Length-Weigth relationship,Factor for conversions between standard and total lengths, and coefficients of condition for seven Michigan fishe. trans. Am. fish-Soc., 75,237-256.

Berg, L.S., 1949. Presnovodnye ryby Irana i sopredel'nykh stran [Freshwater fishes of Iran and adjacent countries]. Trudy Zoologicheskogo Instituta Akademii Nauk SSSR., 8,783-858.

Biswas, S.P., 1993. Manuel of methods in fish biology, fish biology & Ecology   laboratory, Dibruyarh university, Dibrugarh., pp157.

Coad, B.W., 2006. Endemicity in the freshwater fishes of Iran. Iran. J. Anim. Biosystematics., 1(1)(2005),1-13.

Coad, B.W., 1995. Fresh Water Fishes of Iran. Acta Sci. Nat. Acad. Sci. Bohemicae., 29,1-164.

Diaz, L.S., Roa, A., Garcia, C.B., Acero, A., Navas, G., 2000. Length-weight relationship of demersal fishes from the upper continental slope off Columbia. NAGA., 23(3), 23-25..

Eydizadeh, A., Eskandary, G.h., Mohammadi, G.h.,. Hashemi, S.A.R., 2013. Population Dynamics and Assessment of Carasobarbus luteus (Heckel, 1843) in hooral-Azim Wetland (Khuzestan provinces, Iran). World J. Fish. Mar. Sci., 5 (4), 430-436.

Eskandary, G.R., 1999. The biology of Barbus xanthopterus in karkhe river and hour-Al- Azim area (Khuzestan Province). The Scientific Research Results of the Iranian fisheries Org., Tehran-Iran, 91pp. (In Persian).

Eskandary, G.R.Deghan,S. Nikpy,M. and Miahi,Y., 2001. The biology of Barbus esocinus in Dez dam lake(Khuzestan Province). Sci. Res. Res. Iran. fish. Org., Tehran-Iran., 75pp. (In Persian).

Ghadiri, H., Ghadiri, M., 2005. Marsh lands of Mesopotamia and the rivers that feed them. 8 th International River Symposium 2005, 5-9 September, Brisbane, Australia.

Kesteven, G.L., 1960. Manaual of field method. fish. boil., FAO Man. Sci. No.1,152pp.

King, M., 2007. Fisher. Boil. Assess. Manag. Fish. news press., pp340.

Krupp, F., 1985. Systematik und Zoogeographie der Süßwasserfische des levantinischen Grabenbruchsystems und der Ostküste des Mittelmeeres. Dissertation zur Erlangung des Grades "Doktor der Naturwissenschaften" am Fachbereich Biologie der Johannes Gutenberg Universität in Mainz. 215 pp., Anhang, Abbildungen, Karten, Tabellen., 169 pp.

Lizama, M., de Los, A.P., 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.

Ghafari, S.M., Jamili, S.h., 2010. Certain Aspects of the Reproductive Biology of Berzem (Barbus pectoralis) in Karoon River. J. Fisher. Aquat. Sci., 5(1),33-41.

Gökçek, C.K., Akyurt, I., 2008. Age and growth characteristics of himri barbel (Barbus luteus Heckel, 1843) in Orontes River, Turkey. Turk. J. Zool., 32(4),461-467.

Jenning, S., Kasier, M., Reynold, J., 2000. Mar. Fisher. Ecol. Blackwell Sci., 391p.

Hashemi, S.A.R., 2010a. Survey growth parameters of fish species in the Shadegan wetland. National Wildlife Conference, Azad University, Ahvaz, March 2010. 14 pp. In Farsi.

Hashemi, S.A.R., 2010b. Study of some biology characteristics of fish main species in the Shadegan wetland. National Wildlife Conference, Azad University, Ahvaz., March 2010. 13 pp. In Farsi.

Maramazi, G.h., 1995. Ichthology report of marsh Shadegan, South of Iran aquaculture fish. res. center, Ahwaz. Iran. 63 p. In Farsi.

Moyle, P.B., Gech, J.J., 1988. Fishes an introduction to Ichthyology prentice hall, Englewood cliffs, New Jersey., PP. 559.

Nelson, J.S., 2006. Fishes of the World. 3rd Edition. John Wiley & Sons, New York. xix + 601 pp.

Nikpey, M., 1996. The biology of Barbus sharpeyi and Barbus grypus in Khuzestan Province. Sci. Res. Res. Iran. Fisher. Org., First program, Tehran-Iran, 83 pp. (In Persian).

Pitcher,T., Hart, J.B., 1990. Fisher. Ecol. Chapman and Hall, London, 414 pp.

Sadovy, Y.A., Rosario., Roman, A., 1994. Reproduction in an aggregation grouper, the red hind, Epinephelus gattatus. Environ. biol. Fish., 41,269-289.

Sadovy, Y.J., 1996. Reproduction of reef fishery species. In Reef Fisheries, pp. 15e59. Ed. by N. V. C. Polunin, and C. M. Roberts. Chapman & Hall, London. 477 pp.

Sokal, R.R., Rohlf, F.J., 1995. Biometry. Princ. Pract. Stat. Biolog. Res., third ed., W.H. Freeman and Co., New York, 887 pp.

Szypula, J., Epler, P., Bartel, R., Szczerbowksi, J., 2001. Age and growth of fish in lakes Tharthar, Razzazah and Habbaniya. Arch. Pol. Fish., 9 (Suppl. 1),185-197.

UNEP., 2001. The Mesopotamian Marsh-lands, Demise of an Ecosystem, Early Warning and Assessment Technical Report. Unit. Nat. Env. Programme. UNEP/DEWA/TR.01-3.

Zar, J.H., 1996. Biostatistical analysis. 3rd edition. Prentice-Hall Inc., New Jersey., USA. 662P.