OCCURENCE, ABUNDANCE, GROWTH AND FOOD HABITS OF SBOUR, *TENUALOSA ILISHA*, JUVENILES IN THREE RESTORED MARSHES SOUTHERN IRAQ

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SUMMARY

A total of 1839 *Tenualosa ilisha* juveniles <14 cm, including three specimens >21 cm, were collected from the East Hammar marsh during the period from July to November 2006. Juveniles were absent in during months from December to February. Mature individuals were not found. Sbour were not caught from two other marshes (Hawizah and Chabaish). *T. ilisha* represents 10.4% of the total numbers of fishes in East Hammar marsh. The unimodal distribution observed clearly indicating that catches were exclusively based on one year-class individuals. The length–weight relationship of the species was W= 0.0132 * L ^ 2.747. The relative condition factor ranged from 0.954 to 1.086. *T. ilisha* grew from 3.5 to 10cm in 82 days. The trophic habit is planktonivorous, food items constituted filamentous algae (40%), diatoms (34%) and zooplankton (18%). The study reveals that East Hammar marsh serves as setting ground for young-of-the-year juveniles.

INTRODUCTION

Shads in the Middle Eastern region of Asia were reviewed thoroughly by (1). The Hilsa shad, *Tenualosa ilisha* (Hamilton), locally known as 'sbour' in Iraq and the region, contributed >50% of the total marine fish landing during 1965-1992 in Iraq (2). Sbour is considered as the most famous fish in south Iraq, especially in the south, due to its popularity and economic importance. (3) mentioned that the annual catch was 3639 tones during 1992 and the highest landing was in May (1796 tones) 1992. The drifting gill net is the main fishing gear used for this species.

The species is largely anadromous, ascending from Iraqi marine waters of the Arabian Gulf to the upper reaches of the Shatt Al-Arab River to spawn near the southern marshes during the period March to August, coincided with the spring flooding of the Tigris and Euphrates rivers (4). The biology and spawning migration of sbour was studied by (4), (5), (6) and (7). (8) studied the stock assessment of this species in Iraqi marine waters and found its exploitation rate was 0.52. (9, 10) pointed out that sbour constituted 0.1% of the artisanal fisheries in junction of Tigris and Euphrates rivers (Qurna) during 2005 and 2006.

Although the biology, life history and fishery of the species in Iraqi marine waters and the Shatt Al-Arab River have been described (3, 4, 5, 6 and 7), little was known about this species in the southern Iraqi marshes.

The specific objective of this work is to investigate the distribution, abundance, growth and food habit of *T. ilisha* in the southern, restored marshes.

MATERIALS AND METHODS

Samples were collected monthly from the three restored marshes (Hawizah, Chabaish and East Hammer) at two stations in each marsh (Fig. 1) from October 2005 to November 2006. The fish were caught by seines (20 m long with a 2.5 cm mesh), electro-fishing gear, fixed gill nets (500 to 1000 m long with 2.5 cm to 10 cm mesh size) and dip nets. Water temperature and salinity were measured. Specimens were immediately transported to the laboratory in crushed ice. The total length (TL) was measured to the nearest 0.1 cm and total body weight (W) to the nearest 0.01 g. The relative abundance (%) was calculated (11) as: ni/ N * 100, where, ni = number of individuals of the species in the monthly sample and N = total number in the monthly sample. The length-weight re1ationship was obtained by fitting the equation (12):

$W = a L^b$, where W = fish weight in (g), L = total length in (cm), and a and b are constants. Relative condition factor (Kn) was calculated from the formula Kn = W'/W, where W' = the observed weight and W = the calculated weight. Growth of juveniles was followed from the mean lengths of fish caught in each month of the sampling period. The method of Hynes (13) was used to evaluate the diet.

RESULTS

Distribution and abundance

A total of 28,246 fishes were caught from the three restored marshes during the sampling period (Table 1), 17,677 from Hammar, 5033 from Hawizah and 5536 from Chabaish. The dominant species in the three

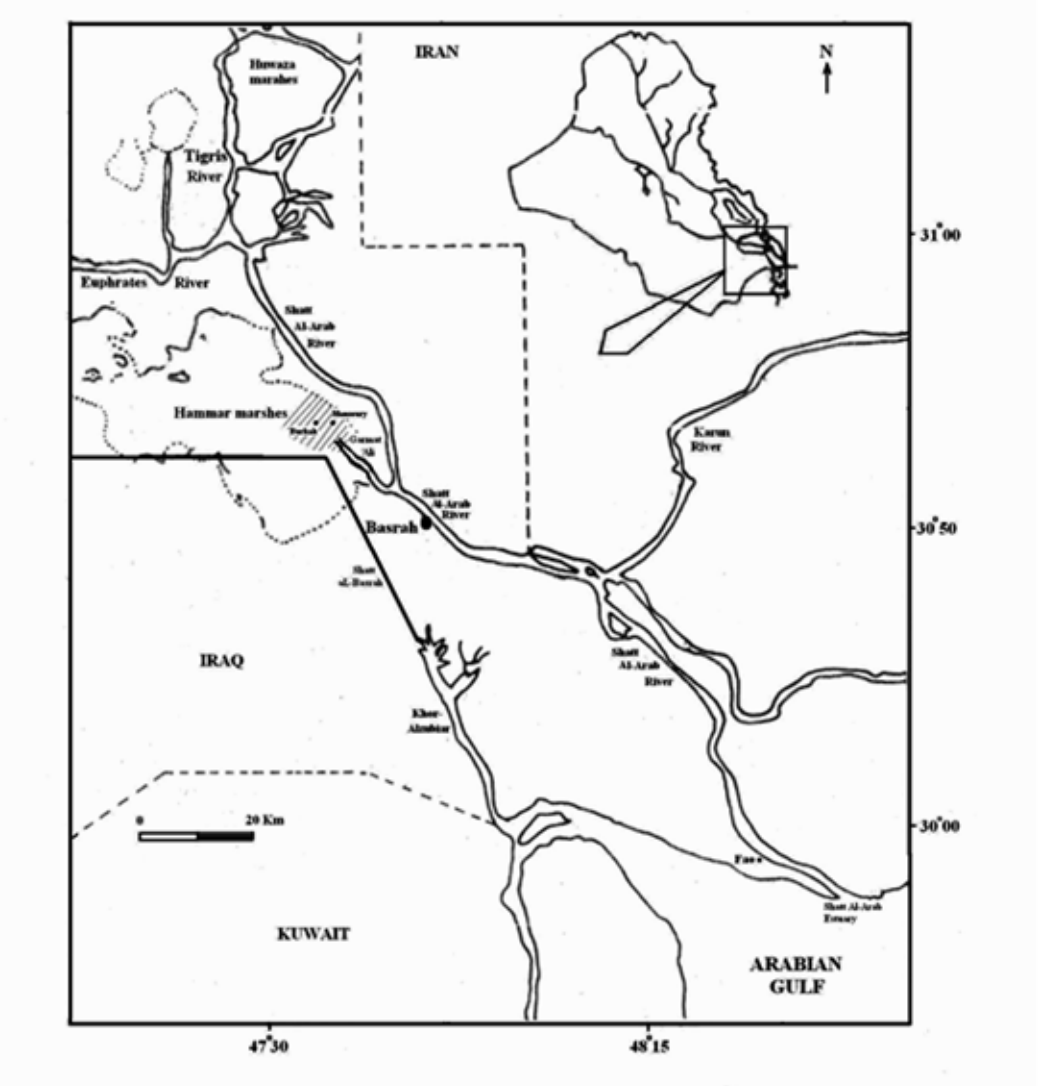

Fig. 1. Map of southern of Iraq, showing the location of sampling site.

Table 1. Total number caught (N) and relative abundance (%) of dominant fish species in the restored marshes.

Marsh	Hammar		Hawizah		Chabaish	
Species	**N**	**%**	**N**	**%**	**N**	**%**
Liza abu	6030	34.1	1837	36.5	3482	62.9
Carassius carassius	4402	24.9	829	16.7	1076	19.4
*Tenualosa ilisha**	1837	10.4	-	-	-	-
Barbus luteus	507	3.1	1473	29.3	194	3.5
Other species	3153	17.6	894	17.5	784	14.2
Total Catch	17677		5033		5536	
No. of species	31		15		14	
No. of families	14		5		7	

marshes overall were *Liza abu* followed by the alien species *Carassius carassius*. In Hawizah, *B. luteus* came second, replacing *C. carassius*, and in Hammar *T. ilsiha* came third in numbers of individuals. Thirty-one species belonging to 14 families were collected from the East Hammar marsh. *L. abu* comprised 34.1%, followed by *C. carassius* (24.9%) and *T. ilisha* (10.4%) of the total numbers. These three species accounted for 69.0% of the total catch in the three marshes. A total of 1834 *T. ilisha* (<14cm) were collected from the Mansoury sampling site, the nearest station to the Shatt Al-Arab River and three specimens (>21cm) from Barka sampling site (the farthest station), both in the East Hammar marsh. Sbour were not caught from the other two marshes or from the winter sampling in East Hammar marsh (December to February). Juveniles appeared in the samples from July to November (Fig. 2).

Length frequency distributions

The monthly length frequency distributions of *T. ilisha* in the catches are illustrated in Figure 3. The smallest individual (3.0 cm) appeared in the catch in July and the largest fish (14.0 cm) in October. The length frequency distributions clearly show the small sizes of fish caught and exhibited one mode in all months. Small sizes of individuals, together with the unimodal distribution observed, clearly indicate that catches were exclusively based on 1 year-class individuals.

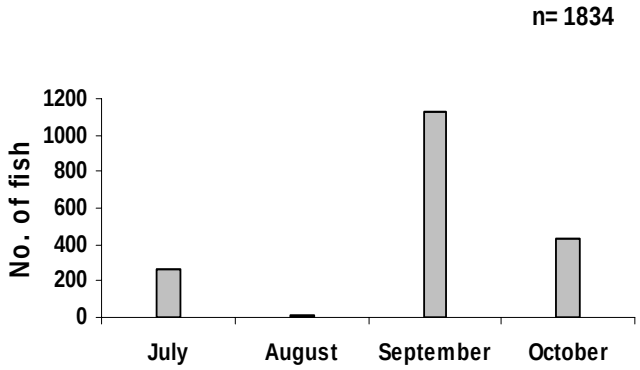

Fig. 2. Monthly variations in the number of *T. ilisha* in Hammar marsh

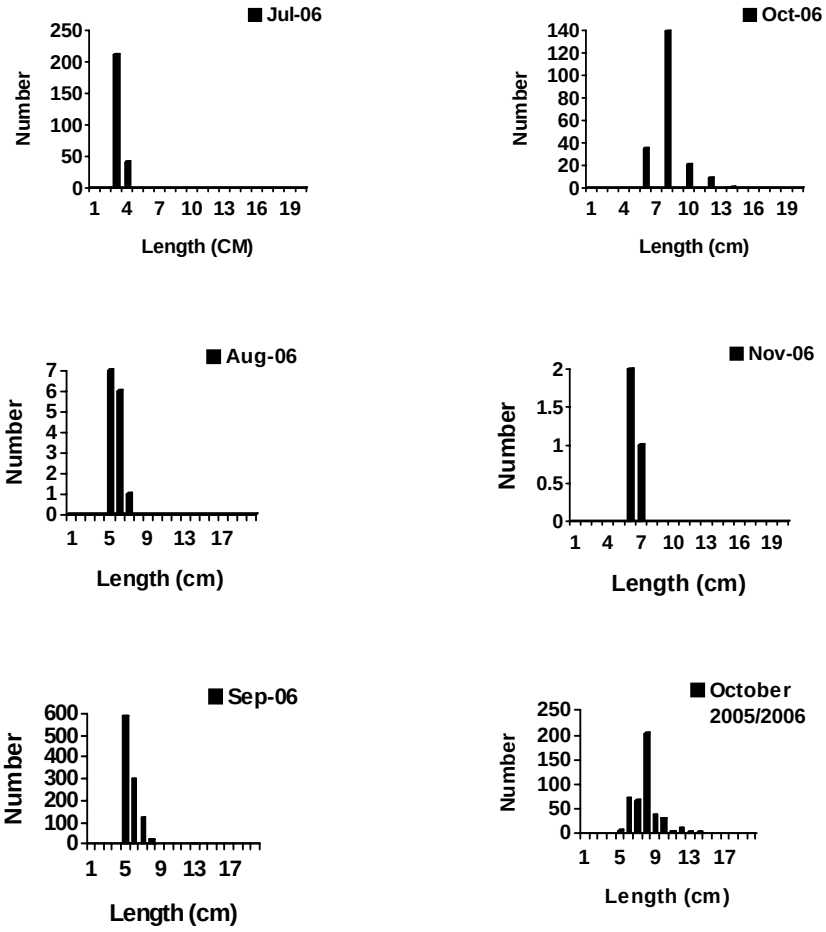

Fig. 3. Monthly length frequency distributions of *T. ilisha* in Hammar marsh

Growth

The length–weight relationship of the species was represented by the following equation: W = 0.0132 * L ^ 2.747 (r^2= 0.997, n = 308 and TL = 4.2-14cm). The relative condition factor ranged from 0.954 for a mean length of 9.4 cm to 1.086 for a mean length of 12.3 cm, with overall mean value 0.999.

The 0+ group of *T. ilisha* started to be caught from the 31 July 2006 sampling onwards (Table 2). The mean length of catches on this date was 3.5±0.5 cm. During the next sampling (31 August), the mean length was 6.0±0.9 cm. The fish caught on 22 September had a mean length of 7.8±1.39 cm and 10±1.41 cm on sampling 21 October. *T. ilisha* grow from 3.5 to 10 cm in 82 days.

Table 2. Growth information of young *T. ilisha* in Hammar marsh

Date of capture	31/07/2006	31/08/2006	22/09/2006	21/10/2006
Fish length (cm)	3.0-4.0	5.0-7.0	5.0-13.0	6.0-14.0
Mean length (cm)	3.5	6.0	7.8	10
SE (±)	0.5	0.9	1.393	1.414
No. of fish	252	14	1127	209

Food habit

Algae were the most important food items (Table 3), with a percentage >33%; more algae were taken in August and September at 43.3% and 45.1% respectively. Diatoms ranked second > 28% and more were consumed in October and November at 37.2% and 35.2 % respectively. Zooplankton (Copepoda, Cladocera, Rotifera and Ostracoda) ranked third and more were eaten in November. The overall percentage composition of dietary components of *T. ilisha* (Fig. 4) was filamentous algae (40%), diatoms (34%) organic materials (8%), Copepoda (7%), Cladocera (5%), Rotifera (4%), and Ostracoda (2%).

DISCUSSION

Previous articles showed that sbour (*T. ilish*a) ascend the Shatt Al-Arab and Bahmanshir rivers and the Khawr az Zubayr estuarine lagoon for spawning from the north-western Arabian Gulf (4, 5, 14, 15).

Table 3. Monthly variations in diet composition (%) of young *T. ilisha* in Hammar marsh

Food items	**Algae**	**Diatoms**	**Copepoda**	**Cladocera**	**Ostracoda**	**Rotifera**	**Inorganic matter**
July 2006	39.8	33.2	10.2	5.3	0.0	4.1	7.4
August	43.3	31.7	8.3	5.0	0.0	5.0	6.7
September	45.1	28.3	6.1	5.3	4.6	3.2	7.3
October	33.4	37.2	4.8	5.2	4.1	4.2	11.2
November	34.2	35.3	7.3	5.5	3.5	5.1	9.1

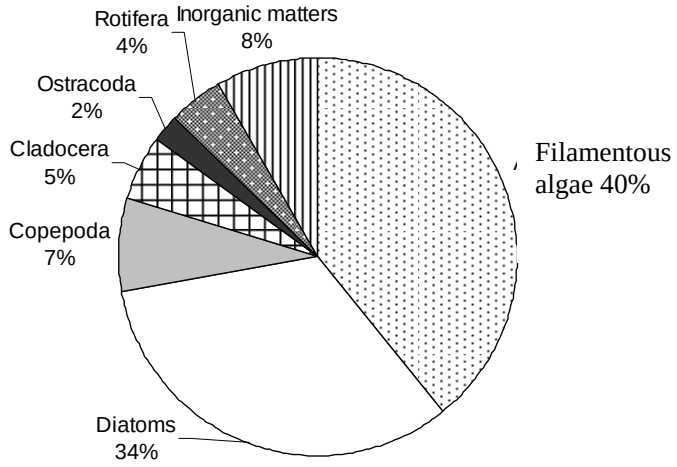

Fig. 4. The overall food items of young *T. ilisha* in Hammar Marsh

(7) showed that *T. ilish*a spawn along the banks of the Shatt Al-Arab River in areas occupied by submerged aquatic plants. The spawning grounds extended along stretches from the Karun River confluence with the Shatt main channel to the confluence of Tigris and Euphrates rivers. These banks are characterized by slow currents due to the thick growth of aquatic plants.

Eggs and juveniles of sbour were also collected from shallow banks in the northern part of the Shatt Al-Arab (15).

In the Shatt Al-Arab River, the spawning migration was reported to extend from March to October (4, 5, and 7) and young of the year could be collected through December.

The East Hammar marsh now plays a role as a nursery and feeding ground for sbour juveniles. The restored marshes have now regained their original role as the nursery ground for sbour.

Adult *T. ilisha* were reported from the marshes before the desiccation during the 1990s and seem now to be returning gradually. A few large fish, over 21 cm long, were collected from Barka, an open water marsh 30 km inside the East Hammar marsh. In the waterway leading to East Hammar marsh, there was active fishing for this species by fishermen using floating gill nets during the sbour fishing season. During the IMRP (Iraqi Marsh Restoration Program), the monitoring team collected one *T. ilisha* of 8 cm total length from Suq al-Shuyukh Marsh, the most western part of the extensive East Hammar marsh. This indicates that after restoration of the marshes in 2003, sbour have started to return to the previous range and the species is expanding in water bodies of southern Mesopotamia.

The environmental conditions of eastern Hammar, characterized by mesotrophic productivity, thick aquatic vegetation and slow current, facilitate the growth of sbour juveniles by offering shelter and food resources.We failed to collect mature individuals in the marsh, revealing that sbour were spawning in the northern part of the Shatt and not in the East Hammar marsh at the time of sampling. Sbour larvae migrate to the East Hammar marsh with the tidal currents, since East Hammar marsh is influenced by semidiurnal tides from the Arabian Gulf.

The juveniles attained 10±1.4 cm TL at the end of October. Previous studies indicate that a growth rate (>2 cm.) was obtained for juveniles from the Shatt Al-Arab River (5), and (8) mentioned that the length of adult *T. ilisha* at the end of the first year was 16.6 cm in the Iraqi waters, northwest Arabian Gulf. It means that the greatest percentage of its growth in the first year of its life achieved in the East Hammar marsh within the Iraqi estuarine system. More algae and diatoms were taken in the diet during fall, coinciding with the autumn bloom of phytoplankton in the East Hammar marsh (16). Increased predation on zooplankton in late fall also followed the huge increase of zooplankton in the restored marshes before the winter decline (16). The same food items previously recorded for sbour were again noticed in the stomachs of the juveniles from Hammar, indicating that sbour is planktonivorous, feeding mainly on filamentous algae, diatoms and zooplankton.

REFERENCES

1- Coad, B. W., N. A., Hussain, T. S. Ali and K. E. Limburg. 2003. Middle Eastern Shads. Amer. Fish. Soc. Symp., 35:59-67.

2- Mohamed, A. R. M. 1997. Production of marine fisheries catch in the Iraqi waters. *In:* A. R. M. Mohamed and N. A. Hussain (Eds.) Iraqi marine fisheries. Marine Science Centre Publication, Basrah, 23: 205-215 (in Arabic).

3- Ali, T. S., A. R. M. Mohamed and N. A. Hussain. 1998. The status of Iraqi marine fisheries during 1990-1994. Marina Mesopotamica, 13 (1): 129-147.

4- Hussain, N. A. 1997. Hilsa shad invade estuary in the Arabian Gulf. Shad Journal 2(4): 2.

5- Hussein, S. A., M. Al-Mukhtar and N. K. Al-Daham. 1991. Preliminary investigation on fishery and some biological aspects of sbour *Hilsa ilisha* from Shatt Al-Arab River, Iraq. J. Agric. Sci., 4(1&2): 141-151.

6- Hussain, N. A., M. K. Jabber and U. H. Yousif. 1994. The biology of sbour *Tenualosa ilisha* (Hamilton) in the Shatt Al Arab River, south of Iraq, with notes on their distribution in the Arabian Gulf. Marina Mesopotamica, 9(1): 115-139.

7- Al-Noor, S. S. H. 1998. Reproductive biology of *Tenualosa ilisha* in the Shatt Al-Arab River. Ph.D. thesis, College of Agriculture, Basrah University, 161p. (in Arabic).

8- Mohamed, A. R. M., T. S. Ali and N. A. Hussain. 2001. Stock assessment of. Hilsa shad *Tenualosa ilisha* in the Iraqi waters, Northwest Arabian Gulf. Marina Mesopotamica, 16(1): 1-9.

9- Mohamed, A. R. M., S. S. Al-Noor and R. A. K. Faris. 2006. Analytical study of the fisheries in the lower reaches of the Tigris River, North Qurna, Basrah, Iraq. Iraqi Journal of Aquaculture, 3(1): 57-73. (in Arabic).

10- Mohamed, A. R. M., S. S. Al-Noor and R. A. K. Faris. 2007. Composition, abundance and fishery of the lower Euphrates River, Qurna, Iraq. MS/ 49/a in16/11/2006. The 2nd Conference Iraqi Environment, 8 Nov, 2007. (in Arabic).

11- Odum, W. A. 1970. Insidious alternation of the estuarine environment. Trans. Am. Fish. Soc., 99: 836-847.

12- LeCren, 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.

13- Hynes, H. B. N. 1950. The food of freshwater sticklebacks *Gasterosteus aculeatus* and *Pygosteus pungitius* with a review of methods used in studies of the food of fishes. J. Animal Ecol., 19: 36-58.
14- Murmide, J. K., B. H. Keybibe and F. Bahbihen. 1995. A study on identification and biological aspects of sbour *Tenuolasa ilisha* (Ham. Buch 1822) in Bahmanshir River, Khuzestan, Iran. Department of Natural Resources, College of Teachers. (abstract).
15- Hussain, N. A.. K. H. Younis and U. H. Yousif. 1997. The composition of small fish assemblages in the river Shatt Al Arab near Basrah (Iraq). Acta Hydrobiologia, 39(1/2): 29-37.
16- Iraq Marshlands Restoration Program (IMRP) 2006. Monitor marsh ecosystem recovery 183- 230, Final Report, USAID/Development Alternative Inc. 528 pp.

تواجد ووفرة ونمو وطبيعة غذاء يافعات اسماك الصبور *Tenualosa ilisha* في أهوار جنوب العراق المعادة

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خلاصة

جمعت 1839 يافعة (<14سم) من اسماك الصبور *Tenualosa ilisha*، بينها ثلاثة نماذج أكبر من 21سم من منطقتي البركة والمنصوري ضمن هور شرق الحمار خلال الفترة من تموز إلى تشرين الثاني 2006. لم يتم الحصول على اليافعات في أشهر الشتاء (كانون الأول إلى شباط) ولا على اسماك ناضجة. كذلك لم يتم صيد اسماك الصبور من الاهوار الأخرى (الحويزة والجبايش). شكلت يافعات الصبور 10.4% من إجمالي إعداد الأسماك واحتلت المركز الثالث من ناحية وفرة الاسماك في أهوار شرق الحمار. لوحظ توزيع أحادي الشكل لأطوال الأسماك وان الصيد متكون من اسماك ضمن جيل سنوي واحد. كانت علاقة الطول بالوزن للأسماك: $W= 0.0132 * L ^{2.747}$. تراوح قيم معامل الحالة النسبي بين 0.954 إلى 1.086. أزداد معدل طول الأسماك من 3.5 سم إلى 10سم خلال 82 يوما. كانت الطبيعة الغذائية للأسماك planktonivorous، وان المواد الغذائية تتضمن الطحالب الخيطية (40٪)، ديتومات (34٪) وهائمات حيوانية (18٪). هذه اليافعات متواجدة في منطقة حضانتها في أهوار شرق الحمار.