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THE BIOLOGY OF *Bathygobius fuscus* (Ruppell) AT THE INTERTIDAL MUDFLATS OF KHOR AL-ZUBAIR LAGOON NORTH WEST ARABIAN GULF

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ABSTRACT

The biology of *Bathygobius fuscus* was studied using 602 specimens taken from intertidal mudflats of Khor Al-Zubair lagoon during the period from January 1994 to July 1995. The main size range is (9.0 - 9.9 Cm) representing 24.9 % of the total number. GSI indicate that spawning period of this species was in June. *B. fuscus* is a carnivore feeding mainly on intertidal prey insect (numerically, 26.1 %) and crab (by weight , 32.8 %).

INTRODUCTION

Gobiidae have cosmopolitan distribution at tropical, sub tropical and temperate intertidal zones . Some species entered to the estuaries and even in brakish rivers (Hoda, 1980).

This family represents the major part of the fish assemblage of the intertidal mudflats of Iraq (Al-Noor 1994). Previous studies on this family were limited mostly on their taxonomy, few adult with their biology (Sarker *et al*, 1980 and Al-Barak *et al* 1994).

Al-Noor (1994) performed a comprehensive biological study on two species inhabited the intertidal mud flats of Khor Al-Zubair lagoon (*Periophthalmus waltoni* and *Boleophthalmus boddarti*). *Bathygobius fusus* was

recorded from Khor Al-Zubair lagoon and Shatt Al-Arab River by Hussain and Naama (1989) and Hussain et al (1997) respectively.

No previous biological study was traced to deal with this species. The present study concerned with some biological aspects of this species (Age, growth and food).

MATERIALS AND METHODS

The sampling station situated at the upper reaches of Khor Al-Zubair lagoon near the connection with Saddam river (near the controling dam) . The sampling area characterized by low profiles. Tidal ranges varius between 1.5 - 2 meters . Several species of aquatic plants were present i.e. Phragmites australis.,Halocnemom strobilacum and Sweada The substratum is soft muddy-clay and very slippery.

Fish samples collected during the period from January 1994 to July 1995 by coastal sien net of 10 m length, 2m depth with 0.5 X 0.5 cm mesh size, then net was trawled by four men for a period of ten minutes. Water temperature and salinity were measured at the time of fish sampling. Fishes were preserved in 10 % formaline, the total lehgth (T. L.), total weight (W) and goands weight were measured . Gonado somatic index (GSI) were calculated.

For each stomach the number and weight of each prey taxon and their frequency of occurrence were recorded (Hynes, 1950).

The length cohort analysis (Jones, 1984) was applied to provide information on the growth parameters of B. fuscus . A value of the L_{∞} was taken as 13 cm as a comparsion , the largest individual measured in the samples was 11.9 . To estimate the (K) value, the following equation was used (Jones, 1984).

$$K = \ln [((L_{\infty} - L_1) / (L_{\infty} - L_2))]/Q$$

Where L_1 and L_2 are observed length relevent t two age and time Q a part. The K value obtained was 0.336

RESULTS

1)Temperature and Salinity

Water temperature in upper reaches of Khor Al-Zubair lagoon varied from (13°) c in February to (31°) c in July 1995. Salinity value tend to be more stable ranging from (2.8 ‰) in July 1995 to (6.6 ‰) in June 1994 (Fig. 1).

2)Length Frequency distribution

A total of 602 specimens of B. fuscus were collected throughout the study period . The smallest specimens recorded was (1.7) cm was captured during November 1994, and the largest individual was (11.9) cm caught in October 1994.

Length frequency distribution of B. fuscus is represented in (Fig. 2).

The main size range (9.0 - 9.9 cm) was dominated during May 1994 and April - May 1995 forming (24.9 %) of the total number , the second important size group was (8.0 - 8.9 cm) which occurred in April and July 1994 and formed (20.8 %) of the total number.

The new recruits appeared in November 1994, while the adult frequently occurred during April.

3) Length-Weight relationship

Length - Weight relationship for both male and female were calculated using the whole samples . The results shown in Fig.3 and Fig. 4 are represented by the following equation

$$W = 0.1174\ L^{3.193} \quad \text{(female)}$$
$$W = 0.1520\ L^{2.874} \quad \text{(male)}$$

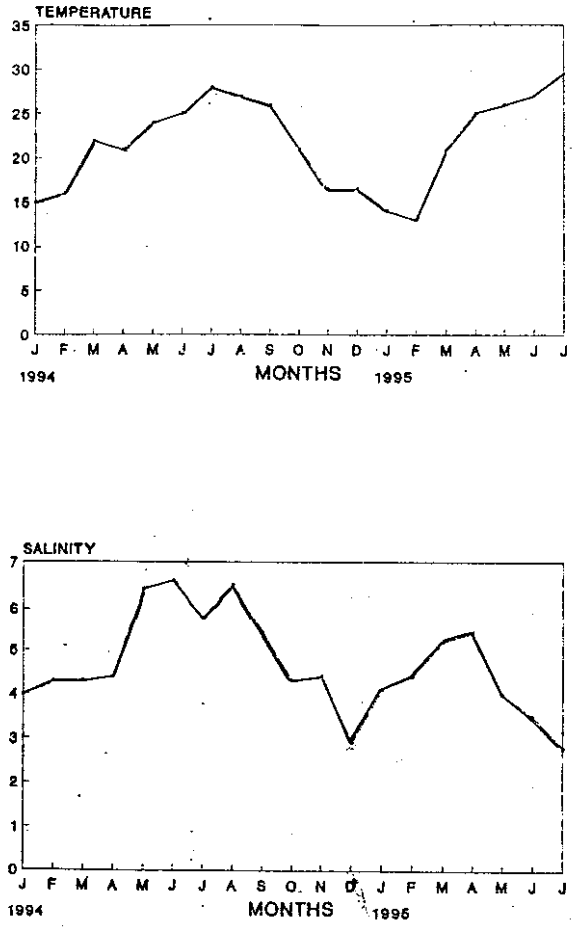

Fig. 1: Monthly variation in temperature (°C) and salinity (S‰) 0f upper reaches of Khor-Al-Zubair lagoon (1994-1995).

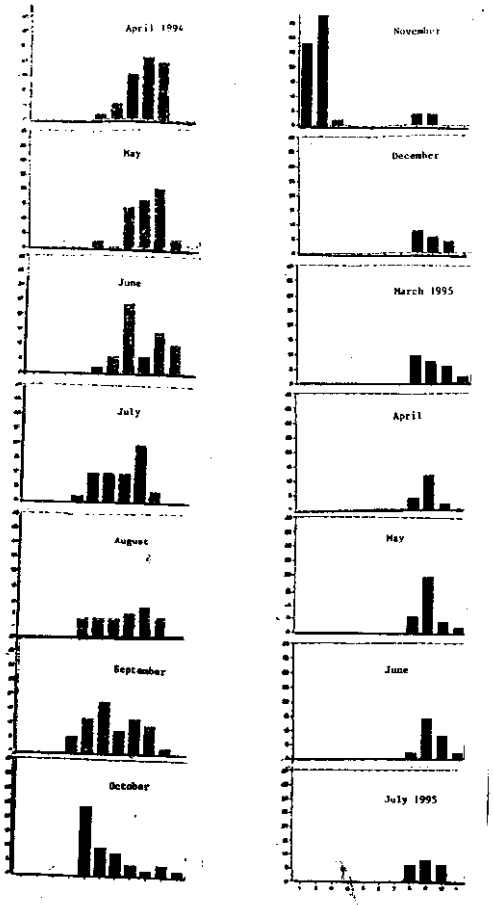

Fig. 2: Length-Frequency distribution of *B. fuscus*.

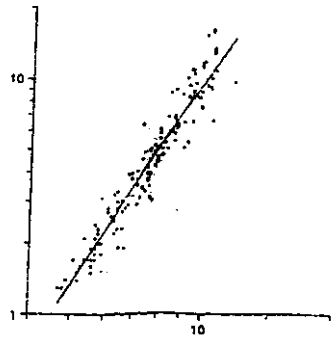

Fig. 3: Length-Weight relationship of *B. fuscus* (male).

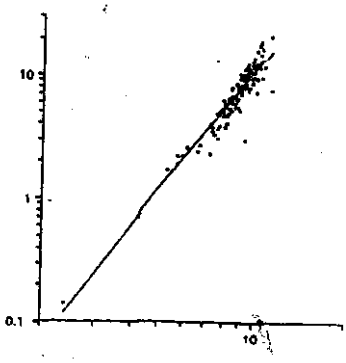

Fig. 4: Length-Weight relationship of *B. fuscus* (female).

4) Gonado Somatic Index (GSI)

The GSI results of males and females were shown in Fig. 5. The lowest males value (0.01) observed in December and (0.05) for females. The highest value was recorded during June (0.11 for male and 0.611 for female) . The results indicate that the spawning period of B. fuscus was in June .

5)Food

A total of 304 stomachs of B. fuscus were examined (Table 1). The results indicated that insect (Curculionidae, Endalus sp, Corixidae and Dampul flies) dominated the diet of B. fuscus forming (26.1 %) numerically. It was dominant the food item in three months (May, June and August 1994) formed 54 , 50 and 75.6 % repectively .

Crab (Seserma belangeri) was the second important food item (24.4 % numerically and 27.3% occurred), Crab was dominant food item in five months (April, September, October, November 1994 and June 1995) formed 34.3, 43.1 32.4 , 30.8 and 50 % respectively . Fishes (Liza carinata and Aphanius dispar) were the third important food item forming (20.3 %) of the total number. Fishes was dominant food item in three months (July 1994 , March and May 1995) formed 35, 100 37.5 % respectively. Crustecae formed (occurrence 19 % and total number 15.5 %) Crustecae were dominant in three months (December 1994 , April and June 1995) formed 72.2 , 82.8 and 58.3 % repectively. Shrimp (Expalemon styliforus) occurred in (%) of the examined fishes and forming (13.6 %) of the total number and it dominant food item especially in September 1994 were they formed (43.1 %) of the total number. Aquatic plant formed less than 1 % .

Results obtained from gravimetric method are shown in Table (1). Crab were the most dominant food item , it consisted (32.8 %) of the total weight and dominant

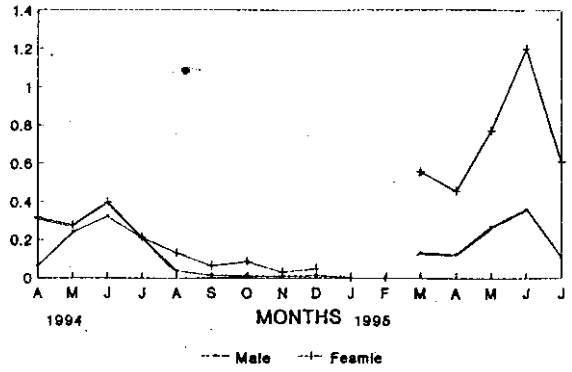

Fig. 5: The gonado-somatic index (GSI) of *B. fuscus.*

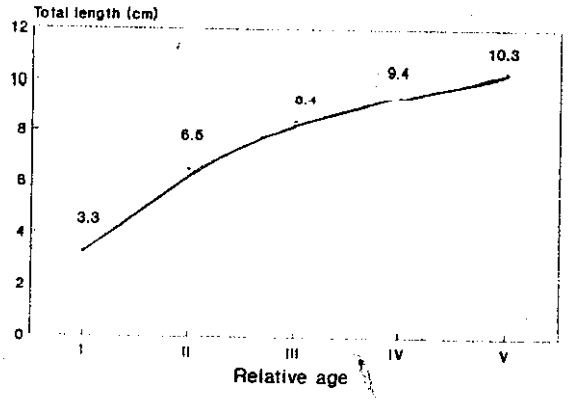

Fig. 6: Growth curve of *B. fuscus.*

Table (1): Food analysis of Bathygobius fuscus.

Months		Apr. 1994	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mar. 1995	Apr.	May	Jun.	Jul.
No. of fish examined		33	27	31	28	15	35	27	36	9	13	9	16	13	10
% Empty stomachs		27.3	14.8	22.6	17.9	6.7	14.3	18.5	21.1	11.1	23.1	0	43.8	7.7	30
Food item	methods														
Shrimp	O	6.9	8.7	12.5	26.1	21.4	50.0	22.7	23.7	0	0	22.2	0	0	28.6
	N	8.6	4.0	6.0	27.0	8.9	43.1	13.5	17.3	0	0	6.9	0	0	25.0
	W	18.7	23.0	25.1	13.1	23.6	49.1	24.7	30.9	0	0	10.1	0	0	34.2
Fish	O	27.6	13.0	8.3	47.8	0	16.7	45.5	46.7	37.5	100	11.1	45.5	50.0	0
	N	25.7	10.0	14.0	35.0	0	11.8	27.0	26.9	16.7	100	3.4	37.5	33.3	0
	W	30.0	9.0	3.7	71.8	0	14.3	25.0	4.2	30.3	100	14.4	50.5	44.1	0
Insect	O	6.9	43.5	50.0	4.3	50.0	3.3	13.6	40.0	0	0	11.1	0	0	0
	N	25.7	54.0	50.0	8.1	75.6	2	24.3	23.1	0	0	3.4	0	0	0
	W	8.1	40.6	20.0	1.0	54.2	4	9.2	8.4	0	0	0.5	0	0	0
Crustecea	O	3.4	8.6	0	4.3	0	0	9.1	3.3	75.0	0	88.9	9.0	8.3	57.1
	N	5.7	20.0	0	16.2	0	0	2.7	1.9	72.2	0	82.8	31.3	16.7	58.3
	W	4.2	15.0	0	1.7	0	0	3.9	2.3	61.6	0	63.5	9.9	6.6	42.3
Crab	O	24.1	13.0	37.5	17.4	35.7	53.3	40.9	53.3	12.5	0	11.1	27.2	41.7	14.3
	N	34.3	10.0	30.0	13.5	15.6	43.1	32.4	30.8	11.1	0	3.4	31.3	50.0	16.7
	W	38.9	8.6	51.2	12.4	22.2	32.6	37.2	34.2	8.1	0	11.5	39.4	49.3	23.4
Aquatic plants	O	0	4.3	0	0	0	0	0	0	0	0	0	0	0	0
	N	0	2.0	0	0	0	0	0	0	0	0	0	0	0	0
	W	0	3.7	0	0	0	0	0	0	0	0	0	0	0	0

O : Occurrence; N : Number and W : Weight

in five months (April, June, October, November 1994 and June 1995) formed 38.9, 51.2 , 37.2, 34.2 and 49.3 % respetively. Fishes formed the second important food item, it consist 27.5 % of the total weight and dominant in two months (July 1994 and May 1995) were they formed 71.8 % and 57.2 % respectively. The third food item was shrimp (17.4 %), it dominant in September 1994 (49.1 %).

Crusateca formed the fourth food items (12.8 %), it dominant in three months (December 1994, April and July 1995) formed 61.6, 63.5 and 42.3 % respectively . Later insect formed (9.2 %) of the total weight and it dominant in three months (May, June 1994 and August 1995) formed 72.2, 82.8 and 58.3 % respectively.

Age and Growth

The result of length cohort analysis of 602 fish ranging from 1.0 to 11.9 cm is present in Table (2) . The growth cruve of B. fuscus constructed by plotting the length against corresponding relative age (fig. 6).

DISSCUSSION

Bathygobius fuscus occupied a different niche from the other Gobiidae (periophthalmus waltoni and Boleophalmus boddarti) in Khor Al-Zubair lagoon, characterizied by harder substratum i.e more silt than clay . Again B. fuscus seem to tolerate oligohaline environment as that recorded in northern the Khor (2.87 - 6.6 %.). Hussain et. al, (1997) found that B. fuscus live in oligohaline tidal river (Shatt Al-Arab) arround the year . The small number of older B. fuscus could be related to predation by bigger fish and bird (Miler, 1975). The disapperance of this species from intertidal zone during winter (January - March) could be due that retreate back to subtidal zone to avoid severe Winter. The same behaviour was noticed by Tyler

Table (2): Cohort analysis of B. fuscus at Khor Al-Zubair lagoon.

length class (cm)	No.	t_1	t_2	t	ln (N/Δt)	Relative age(year)
1 - 1.9	28	0.24*	0.47	0.23	4.80	0.35
2 - 2.9	40	0.50	0.75	0.25	5.08	0.63
3 - 3.9	2	0.78	1.06	0.28	1.97	0.92
4 - 4.9	8	1.09	1.41	0.32	3.22	1.25
5 - 5.9	56	1.44	1.80	0.36	5.05	1.62
6 - 6.9	34	1.84	2.25	0.41	4.88	2.05
7 - 7.9	84	2.30	2.78	0.48	5.16	2.54
8 - 8.9	125	2.84	3.43	0.59	5.36	3.14
9 - 9.9	130	3.51	4.27	0.76	5.29	3.89
10 - 10.9	51	4.36	5.43	1.07	3.86	4.89
11 - 11.9	4	5.54	7.35	1.78	0.81	6.46

and Vaughan (1983) during their study on the B. dentatus and P. koelreuterii on the coast of the Arabian Gulf .

B. fuscus is carnivorus species with high tendency to be piscevorus feed mainly on preys aviable on the interidal zone such as crab (Seserma belangeri) and juvniles of Liza carinata , the first occurr in large number on the banks of the tidal crecks of the area which explain that crabs is the a major food item . The high abundance of crabs during Spring and early Summer is in accordance with Jones and Clayton (1983) on the mud flat of Kuwait. Juvniles of L. carinata present in the area in huge number (Final report of Mugil project) which explain their presence in the stomach of B. fuscus.

Exopalemon styliforus is the commonest shrimp species in Khor Al-Zubair, explaning importance as a food item B. fusucs (Soud 1992).

The high contribution of insect in spring (April - May) as a food of B. fusus was due to the increase in thier numbers throughout this period , the same was noticed by Al-Noor (1994) when he examined the food of P. waltoni in the same period.

Hussain and Ahmed (1999) showed two peaks of Gobiidae larva the first in March and the second. in June. The second peak corresponding with the spawning season of B. fuscus as showen by (GSI) values .

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حياتية اسماك *Bathygobius fuscus* في مسطحات الطين المدية لخور الزبير / شمال غرب الخليج العربي

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الخلاصـــة

دراست حياتية اسماك ***Bathygobius fuscus*** فـــي مســطحات الطين المدية لخورالزبير للفترة من كـــانون الثـــاني ١٩٩٤ الـــى تمـــوز ١٩٩٥. جمعت ٦٠٢ عينة للدراسة، حيث شكلـــت مجموعة الطـــــول (٩ – ٩,٩) سم ٢٤,٩ % من الصيد. دلت دالة المناسل (GSI) ان فـترة التكاثر كان خلال شهر حزيران وان (GSI) هذا النـــوع يتغـــذى علـــى الحشرات بنسبة عددية (٢٦,١ %) وحلى الـ رطانات بنسـ ة وزنيـــة (٣٢,٨ %).