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FISHERY BIOLOGY OF GOBIES CAPTURED BY BEACH SEINE IN ABU-KIR BAY

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ABSTRACT

*Gobiid fishes mostly **Gobius niger**, are the main constituent of small beach-seine trash catch from Abu Kir Bay. The growth, mortalities and exploitation ratio of **G. niger** were studied in the present work. Growth was deduced from length frequency data using compleat ELEFAN software. The estimated lengths were 6.49, 11.02 and 13 cm at first, second and third age groups respectively. The von Bertalanffy growth parameters were found to be L_∞ =14.54 cm & K= 0.827 year $^{-1}$. The results also indicated that this species is highly over-fished where the fishing mortality F=2.6161 and exploitation ratio E= 0.7862. This emphasizes the need for good management for beach seine operating in Alexandria waters.*

INTRODUCTION

Gobies are among the most successful teleost groups in the warm temperate and tropical waters. They are typically inshore marine benthic fishes but many inhabit estuarine and fresh waters and are mostly small sized fish forming generally trophic niche of small predators (Miller, 1986)

Gobiid fishes, mainly ***Gobius niger***, are the most abundant species of small beach-seine trash catch from Abu Kir Bay, since they contribute about 60 % of that catch (Faltas, 1997). Despite of the abundance and diversity of gobiid

fishes in the Mediterranean Sea (Ahnelt *et al.* 1994; Ahnelt & Patzner, 1995), the biology and ecology of several gobiid species still remain unknown (Ahnelt & Kovacic , 1997). However, many biological studies have been done for ***G. niger*** in various areas. Abdel - Maguid (1997) studied the growth, feeding habits, reproduction beside mortalities and exploitation rates for ***G. niger*** inhabiting the Egyptian Mediterranean waters of Alexandria (Kayed Bey-El- Montaza).

The present study was thus made to acquire knowledge about some fishery biological aspects of such fish captured by beach seine in Abu Kir Bay and to contribute to their fishery management.

MATERIALS AND METHODS

Samples of trash catch (3-5Kg) and landing statistics were collected twice a month from small beach seiners operating in Abu Kir Bay during the period from October 1994 to September 1995. Gobies of trash catch were identified in the laboratory according to Miller (1986). Total lengths of fish individuals were measured forming groups of different sizes and total weight of each length group was taken.

The sampling data were weighed approximately to the distribution of catch abundance by month in order to obtain a reasonable representative picture of the monthly size distribution.

Age and growth were determined from length frequency data by using the method of Bhattacharya (1967) and application of modal class progression analysis (Gayanilo *et al.*, 1988) as incorporated in the compleat ELEFAN computer program which provides the growth increments.

The commonly used length-weight relationship ($W = al^b$) was applied (Ricker, 1975), where L is total length in cm, W is total weight in gm and a & b are constants.

Theoretical growth was computed using the von Bertalanffy equation developed by Beverton & Holt (1957). Growth parameters (L_∞, K & t_o) were calculated by the method of Gulland (1964).

Table 2: Monthly size composition of *G. niger* captured by beach seine in Abu Kir Bay

Total length (cm)	October		November		December		January		February		March		April		May		June		July		August		September		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
2											26	3.03													26	0.48
3											92	10 74	18	4 76			2	2 44			14	3.27			126	2.31
4											356	41.54	60	15 87	27	4 84	4	4 88	5	1.69	138	32.24	215	22 87	805	14 79
5	85	11 92	23	5.18	12	2.82			5	3.21	304	35 47	83	21.96	189	33.87	4	4.88	77	26.10	170	39 72	395	42.02	1347	24.75
6	329	46.14	164	36.77	112	26.55			20	12.82	40	4 67	86	22.75	171	30 65	21	25.61	127	43 05	60	14 02	190	20.21	1320	24.25
7	220	30 86	192	43.05	218	51.29	5	3 03	23	14 74	26	3 03	91	24 07	126	22 58	36	43.90	62	21 02	23	5.37	110	11.70	1132	20.80
8	79	11.08	54	12.11	77	18.12	24	14.55	40	25 64	13	1 52	29	7.67	27	4.84	12	14.63	24	8.14	18	4.21	10	1.06	407	7 48
9			11	2.47	6	1.41	55	33.33	25	16 03			3	0 79	9	1.61	3	3.66					10	1.08	122	2.24
10			2	0 45			41	24.85	25	16.03			5	1.32							5	1.17	5	0.53	83	1.52
11							26	15.76	15	9.62			3	0 79	9	1.61							5	0.53	58	1 07
12							7	4 24	3	1 92															10	0.18
13							5	3 03																	5	0.09
14							2	1 21																	2	0.04
Total	713		446		425		165		156		857		378		558		62		295		428		940		5443	
Average length	6 41		6 71		6 89		9 67		8 35		4 43		5 83		6 02		6 62		6 08		5 04		5 34		5 93	
Stander deviation	0.84		0 87		0.78		1 37		1.68		1 05		1 51		1.23		1 2		0.93		1.22		1.17		1.57	

Concerning monthly variations in the mean total length of *G. niger*, it was found to vary from 4.4 cm in March to 9.4cm in January. The following trends could also be noticed: From March to July, the mean length tends to increase steadily till it attains 6.1 cm in July, then it drops in August (5cm), afterwards, it shows a second rise during the months from September (5.3 cm) to January (9.7cm) & February (8.4cm), later it declines sharply in March (4.4cm).

IV - Growth in length:

The length frequency data suggested three age groups for *G. niger* (Table 3). The estimates of mean lengths were 6.49, 11.02 and 13.00 cm at first, second and third age groups respectively . The higher increment was noticed in the first age group (6.49 cm) , then the increment tends to decrease onwards.

Table (3): Mean length and mean weight calculated from length frequency distributions using Bhattacharya's (1967) method (Bh) and corresponding values estimated from von Bertalanffy formulae (v.B.)

Age group	Mean weight (gm)		Mean weight (gm)	
	Bh.	v. B.	Bh.	v. B.
I	6.49	6.49	3.16	3.17
II	11.02	11.02	14.29	14.29
III	1300	13.00	22.89	22.89

V - Length-weight relationship:

The relationship between total length (L) and total weight (W) was found to be represented by the equation:

$$\text{Log } W = -1.8140 + 2.8490 \text{ Log } L \quad (r = 0.9978)$$

The observed values of lengths and weights were plotted and the calculated length- weight curve were found to fit the data (Fig. 2).

VI - Growth in weight:

The calculated growth in weight (Table 3) was obtained by applying length -weight relationship to the lengths at different age groups. The mean weights of

Table 2: Monthly size composition of *G. niger* captured by beach seine in Abu Kir Bay

Total length (cm)	October		November		December		January		February		March		April		May		June		July		August		September		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
2											26	3.03													26	0.48
3											92	10.74	18	4.76			2	2.44			14	3.27			126	2.31
4											356	41.54	60	15.87	27	4.84	4	4.88	5	1.69	138	32.24	215	22.87	805	14.79
5	85	11.92	23	5.16	12	2.82			5	3.21	304	35.47	83	21.96	189	33.87	4	4.88	77	26.10	170	39.72	395	42.02	1347	24.75
6	329	46.14	164	36.77	112	26.55			20	12.82	40	4.67	86	22.75	171	30.65	21	25.61	127	43.05	60	14.02	190	20.21	1320	24.25
7	220	30.86	192	43.05	218	51.29	5	3.03	23	14.74	26	3.03	91	24.07	126	22.58	36	43.90	62	21.02	23	5.37	110	11.70	1132	20.80
8	79	11.08	54	12.11	77	18.12	24	14.55	40	25.64	13	1.52	29	7.67	27	4.84	12	14.63	24	8.14	18	4.21	10	1.06	407	7.48
9			11	2.47	6	1.41	55	33.33	25	16.03			3	0.79	9	1.61	3	3.66					10	1.06	122	2.24
10			2	0.45			41	24.85	25	16.03			5	1.32							5	1.17	5	0.53	83	1.52
11							26	15.76	15	9.62			3	0.79	9	1.61							5	0.53	58	1.07
12							7	4.24	3	1.92															10	0.18
13							5	3.03																	5	0.09
14							2	1.21																	2	0.04
Total	713		446		425		165		156		857		378		558		82		295		428		940		5443	
Average length	6.41		6.71		6.89		9.67		8.35		4.43		5.83		6.02		6.62		6.08		5.04		5.34		5.93	
Stander deviation	0.84		0.87		0.78		1.37		1.68		1.05		1.51		1.23		1.2		0.93		1.22		1.17		1.57	

age groups I, II & III, were found 3.16, 14.29 & 22.89 gm respectively. It appears that the higher weight increment was noticed in age group II.

VII - Theoretical growth:

The von Bertalanffy growth model is usually used to describe the growth of fishes.

The equations obtained were as follows:

$L_t = 14.54 [1 - exp. - 0.82695 (t - 0.28494)]$

$W_t = 31.49 [1 - exp. - 0.82704 (t - 0.28530)]^{2.849}$

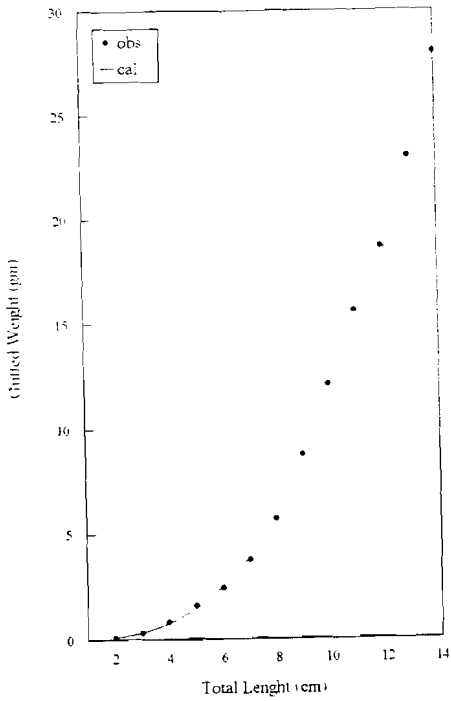

Fig. (2): Length-weight relationship of *G. niger* captured by beach seine in Abu-Kir Bay.

VIII - Growth performance:

It is used as an indicator to the growth of a fish and for comparing its growth performance. It was deduced from the formula:

$\phi = \log K + 2 \log L_\infty$ (Moreau *et al.* , 1986) and was found to be 2.24 for ***G. niger.***

IX - Mortalities and exploitation ratio:

Total mortality (Z) of ***G. niger*** was obtained from the slope of descending limb of catch curve. Its estimate was 3.3276.

Natural mortality (M) was computed from the formula given by Djabali ***et al.***, (1994) using growth parameters (L_∞ = 14.54 & K = 0.8270). Its value obtained was 0.7115. The equation Z = M+ F was used to calculate the fishing mortality which was assessed as 2.6161for ***G. niger***. The exploitation ratio as deduced from E = F / Z was 0.7862.

DISCUSSION

Gobiidae is well represented family in the Mediterranean where 52 species are documented, of which 7 species were found in the Egyptian Mediterranean waters (Miller, 1986). Rizkalla (1995) and Faltas ***et al.*** (1998) reported that Gobiidae landings of trawling trash from the Egyptian Mediterranean waters of Alexandria consisted only of ***G. niger***. Another Gobiidae species ***O. papuensis*** was listed among Lessepsian fish immigrants into Israeli (Ben-Tuvia, 1983) and Alexandria waters (Rizkalla, 1997). Further Faltas (1997) mentioned that gobies captured by beach-seine consisted mainly of ***G. niger*** (62.8 %) while ***G. paganellus*** (0.1 %) and ***O. papuensis*** (0.8 %) accounted only a minor portion of the catch of Alexandria. Abdel- Maguid (1997) found that family Gobiidae was represented by 4 species (***Gobius niger***, ***G. bucchichi***, ***G. paganellus*** and ***G. cobitis***)in Alexandria waters.

In the present study, it was found that ***G. niger*** was the most abundant species of gobies all the year round. This finding goes parallel with that of Abdel Maguid (1997), who mentioned that ***G. niger*** was more or less abundant and was recorded at all stations and in all seasons. The abundance of ***Gobius***

niger may be due to the ability of this species to get adapted to the different environmental conditions (Bouchereau, 1995).

All gobies are less than 28 cm except ***Mesogobius batrachocephalus*** (34.5 cm) but mostly they are below 15 cm (Miller, 1986). In the present study, the largest *G.* ***niger*** measured 14 cm which coincides with the maximum length given by Abdel Maguid (1997) in Alexandria waters. The maximum length of *G.* ***niger*** recorded in the Mediterranean was 15 cm (Miller, 1986; Fischer ***et al.***, 1987). The largest *G.* ***niger*** recorded was 13 cm in Stanwood Bay, England (Vesey & Langford, 1985) and Lake Grevelingen, Netherlands (Doornbos & Twisk, 1987).

In the present study, the mean total length (5.9 cm) was less than that given by Abdel-Maguid (1997) which was 8.8cm for males and 7.9 cm for females. This difference may be attributed to different fishing methods and sampling locality.

The decrease in the monthly mean length in March (4.4 cm) could be explained by entrance of new recruits (<4 cm) to the fishing ground and to the migration of the larger fish to deeper waters. As reported by Abdel-Maguid (1997), the young fish appear in Alexandria waters during June. According to Doornbos & Twisk (1987) juvenile *G.* ***niger*** (3.5 cm) was first caught in August in Lake Grevelingen, Netherlands.

Miller (1986) and Fischer ***et al.*** (1987) mentioned that the life span of *G.* ***niger*** is at least 4 years in the Mediterranean . Four year classes were also recorded for *G.* ***niger*** in English south- coast bay (Vesey & Langford, 1985) and lagoon of Mauguin, French Mediterranean (Joyeux ***et al.***, 1991) . In the present study, the maximum age of *G.* ***niger*** was 3 age groups. This is in agreement with Muus (1967) for *G.* ***niger*** in Danish estuaries and lagoons. However, Abdel- Maguid (1997) indicated the presence of two year classes for the same species in Alexandria waters while Doornbos & Twisk (1987) recorded 5 year classes in Lake Grevelingen , Netherlands.

The length at different age groups was found to be 6.5, 11 & 13 cm for the first, second, and third age group respectively. The length estimated at first age group was comparable to the corresponding values given by Abdel -Maguid (1997) (6.1 cm for males & 6.9 cm for females) in Alexandria waters; Vesey &

Langford (1985) (5.6 cm) in English coast bay and Joyeux ***et al.*** (1991) (6.4 cm) in lagoon of Mauguin , French Mediterranean. The mean lengths at the other age groups more or less varied with other findings. Abdel- Maguid reported 8.9 cm for males & 8.3 cm for females for the second year class, while Joyeux ***et al.*** (1991) gave 12.2 cm for 3 years females.

The asymptotic length and weight (L_∞ =14.5 cm &W_∞ = 31.5 gm) of the present study were generally close to the maximum length and weight observed in the present study (14 cm & 28.3 gm). This is in agreement with Pauly (1979) who stated that asymptotic length and weight in small fishes are generally close to the maximum length and weight of oldest fish. Abdel- Maguid (1997) gave estimated L_∞ 15.4 cm for males & 13.8 cm for females.

G. niger received more fishing effort as indicated from the estimated higher fishing mortality coefficient (F = 2.61) and exploitation ratio (E = 0.79) deduced in the present study. These findings are more or less in agreement with those given by Abdel - Maguid (1997) who reported F = 3.68 & 1.29 and E = 0.82 & 0.70 for males and females respectively. This emphasizes the need for good management of beach seine fisheries in Alexandria waters particularly this fishing method is operating in the nursery grounds.

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