GROWTH STUDIES ON RABBITFISH *SIGANUS CANALICULATUS* PARK (F:SIGANIDAE) IN THE ARABIAN GULF NEAR DAMMAM, SAUDI ARABIA.

ELHAM A. WASSEF, Prof.Fish Biology
National Institute of Oceanography & Fisheries,
Anfoushy, Alexandria, EGYPT.
Phone : (03) 4807 138 & 4807 140
Fax : (03) 4801 174

HAYAM A. ABDULHADY, Lecturer
Zoology Dept.Fac.Sci.Girl's College,Dammam,
SAUDI ARABIA.

ABSTRACT

Age was determined using both scale-reading and length frequency distribution methods.Growth rates in length and weight are estimated.von Bertalanffy's growth equation was also fitted and their parameters are evaluated.Three formulae are derived to represent weight/length relationship for males, females and sexes combined.Condition factor values are also computed which showed monthly variations that are mainly linked with feeding intensity and breeding cycle.

INTRODUCTION

Siganids, herbivorous fishes associated with coral reefs, are commercially important in the Arabian Gulf region (Al Ghais, 1993).Three Siganus species are recorded along the Saudi coasts (Abdulhady, 1995), of which whitespotted *S.canaliculatus* is the most abundant and popular food fish.Besides, there has been increasing interest in siganids culture in the area, as well as in other areas of the world (Nelson *et al.*, 1992).The present study descibes the growth rates of *S.canaliculatus* with the aim of management of their fishery and development of their culture.

RESULTS AND DISCUSSION

1. Growth in length :

1.1.Scales Interpretation Method

Age was determined by examining minute, cycliod embeded scales from the tail-peduncle region (Hussein, 1986). The regression equation: $L = 2.7886 + 22.1006\ S$ ($n=440$, $r^2=0.995$) was obtained to represent the relation between anterior scale radius (S,mm) and total fish length (L, cm).Back calculated lengths at the end of each year of life, annual increment and specific growth rate are calculated, firstly for separate sexes. Sex variations are tested (ANOVA) to be insinificant ($p<0.05$), then all data were pooled (Table 1).Maximum annual increment (11.3 cm) was attaind by the end of first year of life, then tend to decrease with age.

Table (1): Comparison of calculated length for sexes combined at different years of life from two methods for age determination with the theoretical lengths.

Age	L. frequency method			Scale method			von Bertalanffy's method		
(y)	L^	Increment	% increase	L^	Incr.	% increase	Lt	Incr.	% increase
0	–	–	–	11.30	11.30	34.24	11.18	11.18	33.98
1	15.7	–	0.476	16.23	4.93	14.94	16.14	4.96	15.08
2	19.87	4.17	0.126	20.11	3.88	11.76	20.19	4.05	12.31
3	24.35	4.48	0.136	23.75	3.64	11.03	23.5	3.31	10.06
4	27.0	2.65	0.08	26.54	2.79	8.45	26.21	2.71	8.24
5	29.53	2.53	0.077	28.72	2.18	6.61	28.42	2.21	6.72

von Bertalanffy growth papameters for *S.canaliculatus* proved to be : L_{∞} = 38.48 cm ; K = 0.2014 ; t_0= -0.74 yr for males & L_{∞} = 38.22 cm ; K = 0.2064 ; t_0 = -0.71 yr for females. The von Bertalanffy growth equation was used to evaluate the hypothetical lengths of fish at age as compared with the back-calculated lengths (Table 1).

1.2.Length/Frequency distribution Analysis

By applying a modified probability method of Cassie (1954 & 1963), Fig. (1) had resulted which shows 6 age classes on length/frequency distibution graph (n=2024,df=32).The only females two oldest age groups are discarded.The agreement between the mean lengths of age groups and the corresponding back-calculated is confirmed (Table 1). The validity of scales for ageing such tropical species can be assessed for the first time. Growth rate of the present work, is relatively slower than that recorded by Al Ghais (1993) for the same species, but based on vertebral circuli.

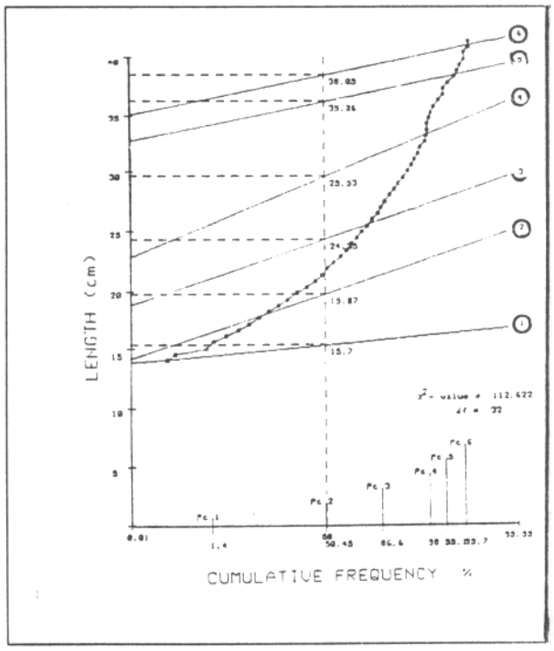

Fig. (1). Probability paper analysis of length frequency distribution of 2024 *S. canaliculatus*. Ringed Nos. = age classes.

2.Weight/Length relationship

The following equations are derived for *S.canaliculatus* using total length (L, cm) and weight (W, g):

for males $W = 0.03496\ L^{2.7242}$ (1)

(n=1056, r=0.9984)

for females $W = 0.0311\ L^{2.7751}$ (2)

(n=968 , r=0.9982)

Sex variations are tested (ANOVA) to be insignificant ($p<0.05$), accordingly,

for both $W = 0.0343\ L^{2.7352}$ (3)

(n=2024, r=0.9979)

3.Condition Factor (K)

Variations of mean K values with fish length (Fig 2) shows a decreasing trend with the increase in size.Mean K, for both sexes = 1.48 (Fulton's);1.2 (Clark's) & 0.99 (relative condition K_n). Comparatively lower values are recorded in June (postspawning), particularly for females, and in September due to the decreased feeding intensity (Fig 3).

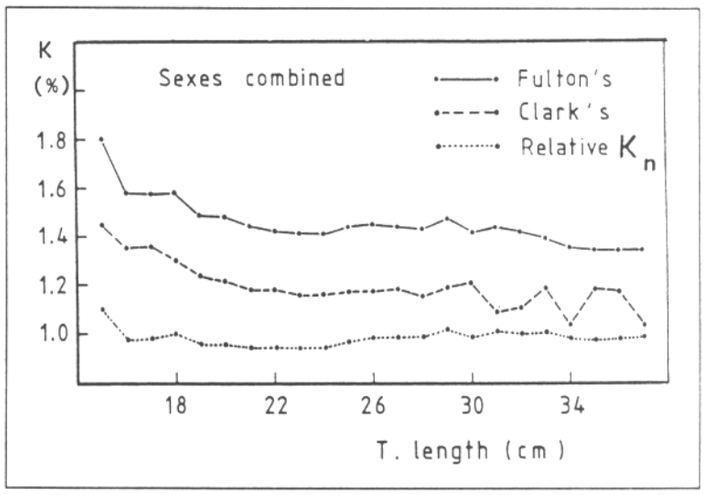

Fig. (2). Variations of conditon factor with fish length for *S. canaliculatus*.

4.Growth in weight

Having the weight/length formulae 1,2 & 3, it is possible to evaluate average calculated weights corresponding to average back-calculated lengths in Table (1). Annual increment and specific growth rate are also computed (Table 2).The highest weight increment (71 g) as well as % increase (14.6%) were attained in the third year of life. However, fish can reach a marketable size (=126 g) at the end of their second year of life. W_∞ was computed to be 727.9 for males and 765.2 g for females.

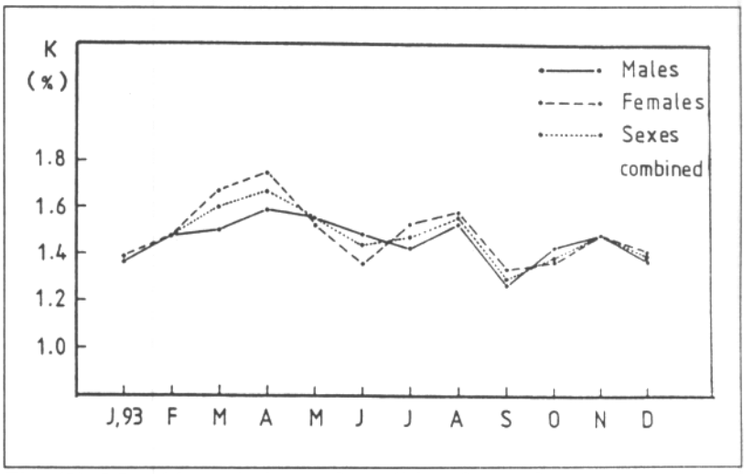

Fig. (3). Monthly variations of condition factor for *S. canaliculatus*.

Table (2): Percentage and relative increase in weight with age for *S. canaliculatus* in the Arabian Gulf.

Age (y)	Males				Females				Sexes combined			
	Calc. wt (g)	Increment (g)	% increase*	Relative** increase (%)	Calc. wt (g)	Increment (g)	% increase	Relative increase (%)	Calc. wt (g)	Increment (g)	% increase	Relative increase(%)
0	25.90	25.90	5.41	100.00	25.84	25.84	3.00	100.00	26.08	26.08	5.33	100
1	69.00	43.10	9.00	166.41	70.95	45.11	5.23	174.57	70.08	44.00	9.00	168.71
2	124.68	55.68	11.62	80.70	127.71	56.76	6.58	80.0	125.87	55.79	11.40	79.61
3	193.84	69.16	14.43	55.47	203.39	75.70	8.78	59.27	197.01	71.14	14.55	56.52
4	261.14	67.56	14.10	34.85	278.79	75.40	8.75	37.07	267.90	70.89	14.50	35.98
5	326.75	65.35	13.64	25.02	347.99	69.20	8.03	24.82	333.93	66.03	13.51	24.65

* In relation to the calculated weight at the last year of life.

** In relation to the weight attained for the preceding year.

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