Growth of *Pomadasys kaakan* (Haemulidae) off the Coast of Pakistan

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Abstract

The growth parameters of javelin grunter *Pomadasys kaakan* (= *P. hasta*, Haemulidae) were estimated from length-frequency samples collected from December 1988 to February 1989 along the Pakistan coast. They are L_∞ = 62.5 cm, and K = 0.247 year^{-1} and in general agreement with the results of previous studies on this and related fishes.

Introduction

Grunters (family Haemulidae), known in Pakistan as "dhoter", contributed from 1985 to 1989 from 4.4 x 10^3 t to 6.1 x 10^3 t year^{-1} (all species combined), representing 1.3 to 1.8% of the country's total marine catch. The javelin grunter *Pomadasys kaakan* (= *P. hasta*, see Bianchi 1985) is one of the most abundant grunter species of Pakistan (Imad 1985). Iqbal (1989), based on the method of Wetherall (1986) and length-frequency data sampled in 1983 by R/V Dr. Fridtjof Nansen estimated, for this species L_∞ = 62.5 cm and Z/K = 3.0, and also suggested that the value of K may be between 0.33 and 0.75 year^{-1}.

In this contribution, an attempt is made to improve on Iqbal's initial estimation of K; we refer to Munro (1948) and Deshmukh (1973) for discussions of the distribution and biology of this species, respectively.

Materials and Methods

Length-frequency data were collected from December 1988 to February 1989 during a demersal survey of the Pakistan coast. These data were pooled into a single sample (n = 414), which was then separated into component normal distribution using the method of Bhattacharya (1967).

A Ford-Walford plot was used to check the fit of successive mean lengths (assumed to represent annual cohorts) resulting from this decomposition, to a von Bertalanffy curve (Pauly 1983). The final parameters were then estimated using the ETAL I program of Gaschütz et al. (1980), using the inverse of the standard errors about the mean lengths at age as weighting factors; this technique was also applied, to enable comparisons, to the length-at-age data in Table 5 of Deshmukh (1973).

Results and Discussion

Fig. 1 (lower part) shows the sample analyzed here, while Table 1 gives the mean lengths of the first four components in Fig. 1 (the larger fish could not be clearly separated).

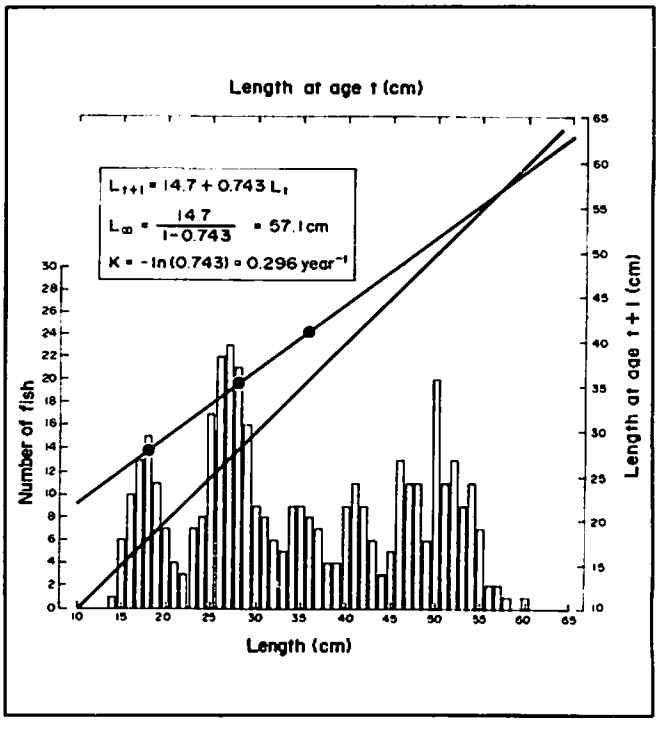

Fig. 1. First steps in the estimation of growth parameters of *Pomadasys kaakan* off Pakistan. *Below*: the pooled length-frequency sample representing the period December 1988-February 1989, and identifying the first four peaks, assumed to be separated by annual intervals (the actual decomposition of the sample, using Bhattacharya's method is not shown, but see Table 1 for results). *Above*: Ford-Walford plot showing that the first four peaks do indeed match a von Bertalanffy growth curve.

Table 1. Mean length and number of individuals in the first four components of the sample in Fig. 1.

Mean length (cm)	Standard deviation (cm)	No. of fish
18.2	2.09	66
28.0	2.46	130
35.9	1.97	48
41.1	1.45	32

Table 2. Growth parameter estimates for *Pomadasys kaakan* and *P. argenteus*.

Species	Locality	L_∞ (cm)	K (year^{-1})	ϕ'[a]	Source/Remarks
P. argenteus	Kuwait	67	0.238	3.03	Mathews and Samuel (1990), based on otoliths
P. kaakan	Kutch and Dwarka Regions, India	97.9[b]	0.148	2.98	This study, based on (otolith) length-at-age in Deshmukh (1973)
P. kaakan	Pakistan	62.5	0.247	2.98	This study

[a] $\phi' = \text{Log}_{10}K + 2\text{log}_{10}L_\infty$ (Pauly and Munro 1984).
[b] Note that maximum reported size is only 80 cm (Bianchi 1985).

The Ford-Walford plot (upper part of Fig. 1) shows that the data in Table 1 conform to the von Bertalanffy growth function, and led to preliminary estimates of L_∞ = 57.1 cm, and K = 0.296 year^{-1}. Our largest fish was 61 cm. To account for this and to allow comparison of our results with those of Iqbal (1989), we used the ETAL I program to estimate K with L_∞ fixed at 62.5 cm; this led to K = 0.247 year^{-1}. This is lower than the lower limit of his suggested range for K, but closely agrees with the growth parameters in Table 2. This suggests that the first four peaks in Fig. 1 are indeed separated by intervals of one year, as assumed.

If one assumes that longevity $t_{max} \approx 3/K$, we obtain t_{max} = 12 years, which is higher than the highest age (five years) reported for this species by Deshmukh (1973) but below the maximum age of 19 years reported for *P. argenteus* in Kuwait by Mathews and Samuel (1990).

We note, finally, that the estimate of Z/K presented by Iqbal (1989) implies a value of Z/K·K = Z ≈ 12 year^{-1}, which is extremely high and which suggests that the length-frequency samples he used may not have been representative of the sampled populations.

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