Comparisons of the Growth of West African Stock of *Sardinella maderensis* with Emphasis on Cameroon

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Introduction

The artisanal pelagic fishery in Cameroon is directed towards the clupeid family. Among these, *Sardinella maderensis* is a major component. This fish is readily caught throughout the year and is affordable to the average citizen.

Growth parameters of *S. maderensis* have been estimated in Nigeria (Marcus 1984), Sénégal (Postel 1955; Samb 1988), Congo (Rossignol 1955; Ghéno and LeGuen 1968) and recently in the southern coast of Cameroon (Djama et al. 1989).

This study is a completion of growth studies on *S. maderensis* in Cameroon waters, with special emphasis on the use of the growth performance index ϕ' (Pauly and Munro 1984).

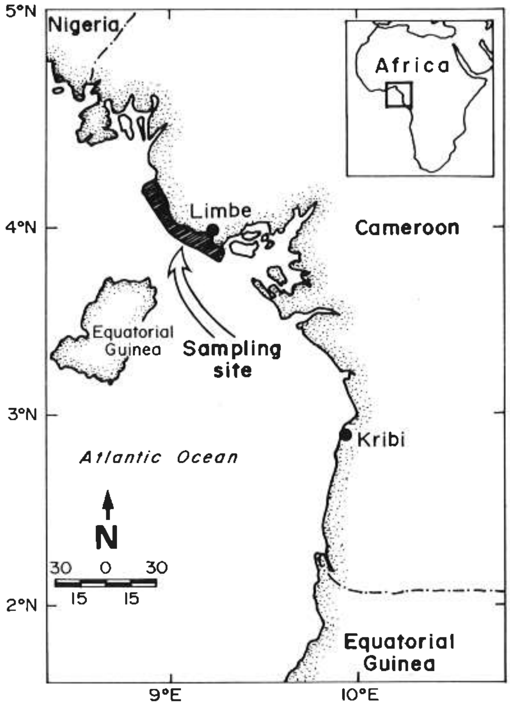

Fig. 1. Sampling area, coast of Cameroon

Materials and Methods

Random samples of fish caught with gill nets (4-5 cm stretched mesh) were bought once a month from fishermen at Idenau and Limbé landing sites (Fig. 1) from June 1988 to May 1989 (Fig. 1). The total length of the fish was measured to the centimeter below using a measuring board. ELEFAN I and the Wetherall (1986) method were applied to the data.

ELEFAN I method to estimate L_∞ and K

The ELEFAN I program was developed by Pauly and David (1981). The basis of the method is to split a composite distribution into peaks and troughs, and to find the best growth curve passing through the maximum number of peaks and avoiding troughs as far as possible.

Wetherall method to estimate L_∞ and Z/K

Wetherall (1986), starting from the classical Z equation of Beverton and Holt (1956), re-expressed $\bar{L}$ as a linear function of L', i.e.,

$$\bar{L}_1 = a + bL'_1 \qquad ...1)$$

where $\bar{L}_1$ is the mean length of fully selected fish, computed from L'_1 upward (L'_1 is the lower limit of the first length class used in computing L_1). From equation (1), we get:

$$L_\infty = a / (1-b)$$
$$Z/K = b / (1-b)$$

To obtain a and b, only the straight part of the plot of $\bar{L}_1$ on L'_1 is used for the regression analysis.

Pauly and Munro's (1984) ϕ' equation

The concept refers to the fact that, when the same units are used, the quantity

$$\phi' = \log K + 2 \log L_\infty \qquad ...2)$$

is normally distributed within the different populations of a given fish species (Pauly and Munro 1984). The index ϕ', used in conjunction with

Table 1. Estimates of growth parameters for *Sardinella maderensis*, with their corresponding ϕ' values.

Stock	L_∞ (cm)	K ($year^{-1}$)	ϕ'^a	Source
Sénégal	39.5	0.45	2.85	Samb (1988)[b]
Sénégal	35.0	0.61	2.88	Postel (1955)
Congo	39.0	0.28	2.64	Rossignol (1955)
Congo	24.9	1.00	2.79	Ghéno and LeGuen (1968)
Cameroon	32.5	0.59	2.79	Djama et al. (1989)
Nigeria	37.5	0.34	2.68	Marcus (1984)
Mean			2.75	

[a] $\phi' = 2\log L_\infty + \log K$
[b] seasonality not accounted for

estimates of L_∞ obtained through the method of Wetherall (1986), thus allows an estimate of K. Table 1 lists available estimates (K, L_∞) of *S. maderensis* from the literature giving a mean $\phi' = 2.75$.

Results and Discussion

Estimates from the ELEFAN I program for L_∞ and K were 29.1 cm and 0.83 $year^{-1}$, respectively. The Wetherall plot, combined with the mean ϕ' value of 2.75, led to $L_\infty = 26.4$ cm and $K = 0.81$ $year^{-1}$.

In the absence of evidence of which method is the best, average values of the two methods were considered to be our final estimates of $L_\infty = 27.7$ cm and $K = 0.82$ $year^{-1}$, giving $\phi' = 2.80$.

This ϕ' value is equal to estimates obtained by Ghéno and LeGuen (1968) in Congo, and Djama et al. (1989) in Kribi area (southern coast of Cameroon).[a] These values are slightly different from those obtained by Marcus (1984) in Nigeria, and Rossignol (1955) in Congo, but this can be explained through the concept defining the index (which is a normally distributed variate). Thus, some variability in ϕ' values observed in Senegal, Congo, Cameroon and Nigeria can be expected. However, not all variability in the growth performance index can be explained by random fluctuations. Thus, we note that in Table 1, the two highest ϕ' values are from fish occurring in Sénégalese waters.

This may be explained by the important upwellings in that area. This confirms the suggestion of Munro and Pauly (1983) that ϕ (= $\log_{10}K + {}^2/_3 \log W_\infty$, which is closely related to ϕ') can be used to distinguish various ecosystems. In other words, the mean ϕ' used in conjunction with the Wetherall method to estimate K should be derived from ϕ' values from the same ecological area (mangroves, estuaries, upwellings, lagoons, etc.) in order to maximize the accuracy of the estimated K value for "the next user".

[a]Editor's note: there is a certain amount of circularity here, but apparently, this does not invalidate the point made.

From the foregoing, one can conclude that the growth performance index ϕ' will continue to be a useful tool in growth parameter estimations. However, the experience of the scientists (his or her acquaintance with the fishery and ecosystem concerned) remains the key factor of any progress in parameter estimation.

Acknowledgment

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