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Weight-Length Relationships of Roundnose Grenadier  
in Subareas 0+1 and 2+3

by

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INTRODUCTION

Savvatimsky (1971) presented a weight-total length relationship for roundnose grenadier from SA 2+3 based upon data collected between 1967 and 1979 and Borrmann (1976) presented a weight-total length relationship from the same area based upon 1971 data. In the same paper, Borrmann also gave a weight-total length relationship for roundnose grenadier from SA 0+1 based upon data collected in 1974. To date, no other studies have been presented to NAFO (ICNAF) (except Jensen (1976) using anal fin lengths) and these formulae have generally been accepted.

This paper presents a brief review of these formulae in light of sampling information submitted to NAFO (ICNAF) since 1973.

METHODS AND RESULTS

The curves presented by Savvatimsky (1971) for linear (total) and weight growth (sexes separate) are as follows:

$$TL_m = 14.896 \text{ AGE}^{0.59} \quad TL_f = 17.2 \text{ AGE}^{0.57}$$

and

$$W_m = 8.77 \text{ AGE}^{1.66} \quad W_f = 13.8 \text{ AGE}^{1.6}$$

When these equations are combined the resulting weight-total length relationship (sexes combined) is:

$$W = 0.0047TL^{2.8042}$$

for 2+3 grenadier. Borrmann's (1976) equation for grenadier in this same area is:

$$W = 0.0094L^{2.6593} \text{ (sexes combined)}$$

The resulting curves are shown in Fig. 1. It can be seen that the curves are quite similar and therefore they were combined with the resulting weight-total length relationship for SA 2+3 being:

$$W = 0.0068TL^{2.7251} \text{ (sexes combined) (Fig. 2)}$$

The weight-total length relationship given by Borrmann (1976) for SA 0+1 is:

$$W = 0.0441TL^{2.3154} \text{ (sexes combined) (Fig. 2)}$$

Analysis of age/total length keys submitted to NAFO (ICNAF) indicates that a possible error exists with the formula for one of the two areas. Von Bertalanffy growth curves constructed from the submitted keys indicate that the grenadier from 2+3 are longer at age than those from 0+1 (Fig. 3). However, when the lengths are converted to weight using the respective formulae, the 0+1 grenadier appear to be heavier at age than those from 2+3, (Fig. 4). Since there is no mention in the literature of any morphological differences between grenadier from the two areas, it may be inferred that an error exists with one or both of the formulae.

Since 1973, commercial and research total length frequencies have been submitted to NAFO (ICNAF). During this time period, mean sample weights have been included only since 1975 for SA 0+1 and since 1976 for SA 2+3. For those samples that included weights, comparisons were made (sexes combined) between the given mean weight and the calculated mean weight (weighted by the number of fish at length) using the formula for the respective area. These are shown in Tables 1 and 2. It can be seen that although there is no significant difference between the given and calculated mean weights for SA 2+3, there is a significant difference in 0+1 when Borrmann's (1976) formula for the area is used. In contrast, there is no significant difference between the observed and expected mean weights in 0+1 if the combined formula for 2+3 is used.

#### DISCUSSION

The results indicate a significant difference between the observed mean sample weights and those expected from Borrmann's (1976) weight-total length relationship for grenadier in SA 0+1 and thus this formula should not be used. There is no significant difference in either SA 0+1 or 2+3 when the formula for 2+3 is used. Thus it is suggested that the one formula:

$$W = 0.0068TL^{2.7251} \text{ (sexes combined)}$$

be used for both areas and that studies be initiated to further differentiate between males and females and also to derive new relationships based upon partial length measurements.

#### REFERENCES

- Borrmann, H. 1976. Preliminary stock assessments of roundnose grenadier in ICNAF Subareas 0+1 and 2+3. ICNAF Res. Doc. 76/VI/27. Ser. No. 3807.
- Jensen, J. M. 1976. Length measurements of roundnose grenadier (Macrourus rupestris). INCAF Res. Doc. 76/VI/93. Ser. No. 3913.
- Savvatimsky, P. I. 1971. Studies of the age and growth of Roundnose Grenadier (Macrourus rupestris) Gunn. in the North Atlantic, 1967-1970. ICNAF Res. Doc. 71/93. Ser. No. 2589.

Table 1. Comparison of given mean weight and calculated mean weight (weighted) of samples from SA 2+3 showing results of t-test.

YEAR	GIVEN MEAN Wt. (gm)	2+3 FORMULA CALCULATED MEAN Wt. (gm)
1976	493	498
	311	327
	477	493
	473	454
	515	518
	337	327
1977	592	554
1978	641	561
	505	505
	444	399
	814	721
	643	573
	637	562
	449	444
	490	424
	553	588
	590	643
	271	262
	423	414
521	545	

No significant difference

$$t = 1.99 < t_{(0.05,19)}$$

Table 2. Comparison of given mean weight and calculated mean weight (weighted) of samples from SA 0+1 using 0+1 formula and 2+3 formula showing results of t-test.

Year	GIVEN MEAN Wt. (gm)	0+1 FORMULA CALCULATED MEAN Wt. (gm)	2+3 FORMULA CALCULATED MEAN Wt. (gm)
1975	443	545	449
	366	452	361
1976	228	325	247
	403	493	404
	498	594	498
	490	586	493
1978	211	251	190

$t = -10.80 < -t_{(0.05,6)}$   
(difference is significant)

$t = -0.09 > -t_{(0.05,6)}$   
(difference is not significant)

Fig. 1. Weight-total length relationships for roundnose grenadier from SA2+3 according to Borrmann (1978) and Savvatimsky (1971)

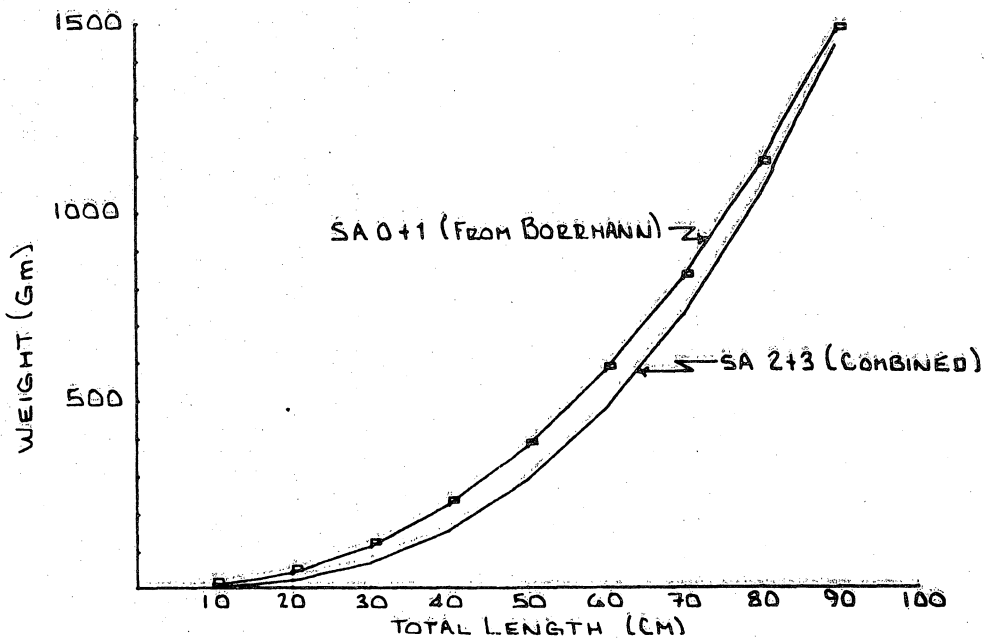
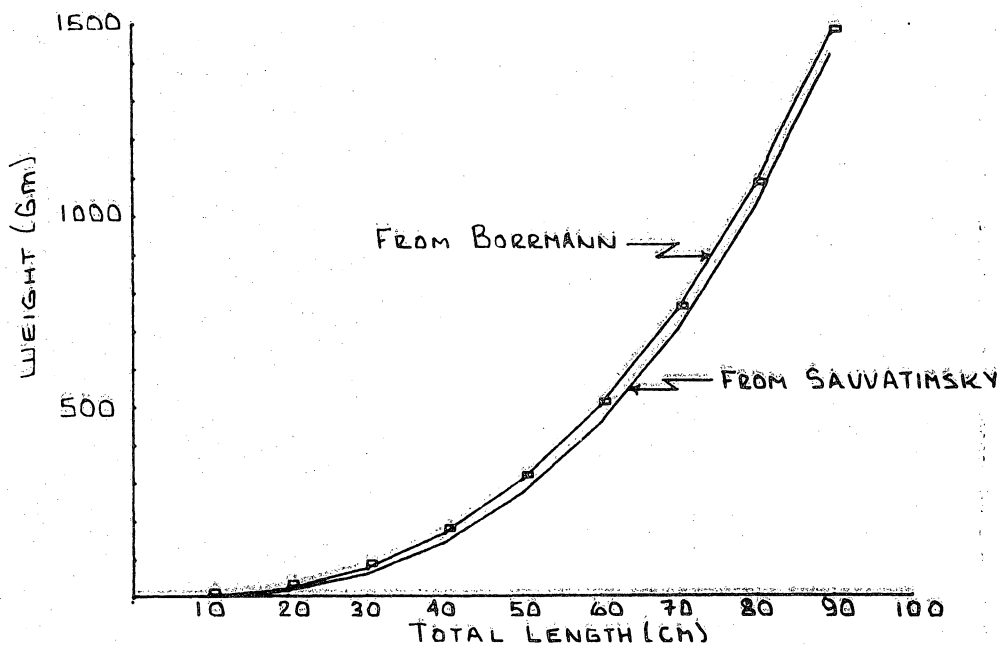


Fig. 2. Weight-total length relationships for roundnose grenadier from SA2+3 (combined from Fig. 1) and SA0+1 (from Borrmann, 1978).

Fig. 3. Von Bertalanffy curves for roundnose grenadier from SA 0+1 and 2+3 derived from A/L keys submitted to NAFO (ICNAF).

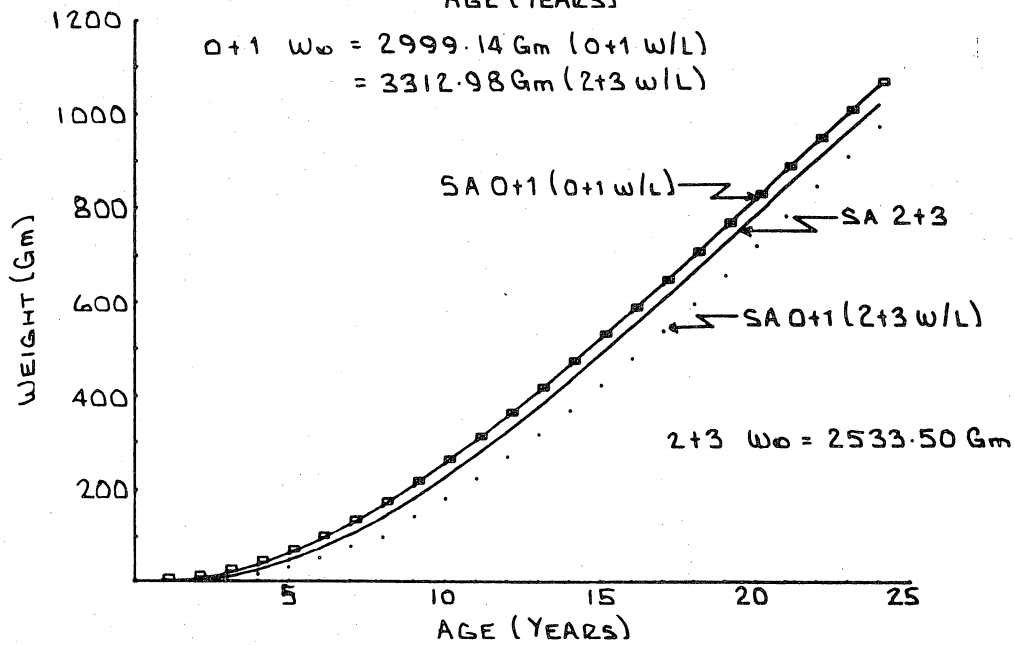
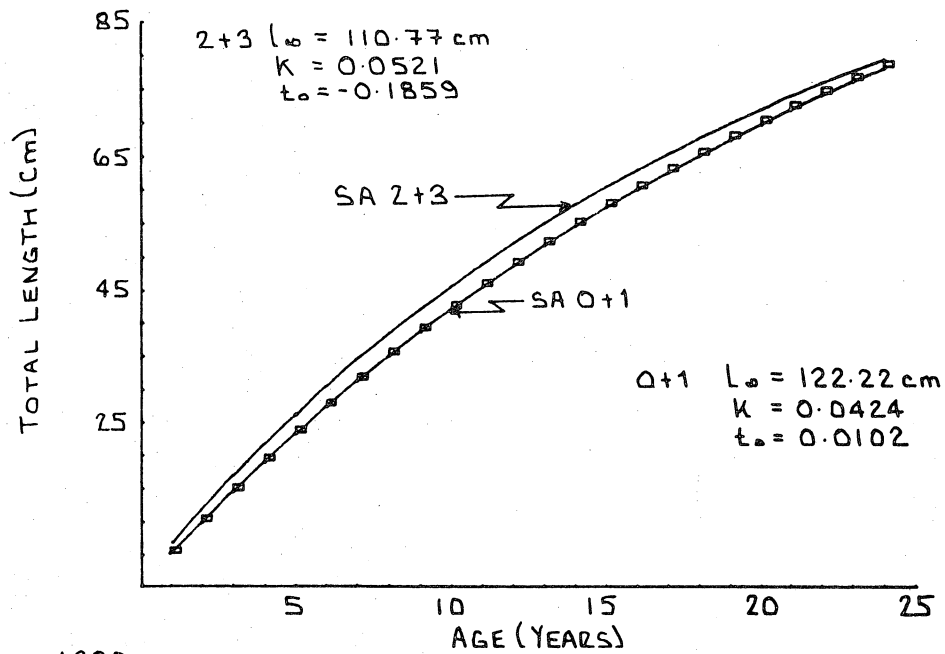


Fig. 4. Von Bertalanffy curves for roundnose grenadier from SA 0+1 and 2+3 derived from Figure 3 and weight-total length relationships from Fig. 2.