Northwest Atlantic Fisheries Organization

Serial No. N138

NAFO SCR Doc. 80/VI/84
(Revised)

SCIENTIFIC COUNCIL MEETING - JUNE 1980

Length measurements of Roundnose grenadier (Marcrourus rupestris) in the Northwest Atlantic

by

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INTRODUCTION

Since studies were first initiated to examine the biology of the roundnose grenadier, researchers have been hampered by the problem of tail breakage and regeneration resulting in the determination of reliable total lengths being at best difficult and at worst impossible. With the commencement of a directed fishery toward this species in the Northwest Atlantic in 1967 the problem has become more pronounced with reliable and consistant frequency and ageing data being required for continued monitoring and evaluation of the stock status.

In 1976, Jensen noted the problem of tail breakage and suggested to ICNAF "to measure the roundnose grenadier from the tip of the snout to the beginning of the anal fin." In conjunction with this recommendation he presented a formula for the conversion of anal fin length to total length as determined from 147 fish measured in 1975 from the 0+1 stock. He pointed out that while the conversion factor could be used for assessment work, it would be much simpler to use the partial length directly. He also suggested that although 3 cm groupings were used with total lengths, a more appropriate grouping for these partial lengths would be ½ cm ("nearest ½ cm below").

A review of Jensen's paper in Redbook (Anon. 1976) noted that his method of measurement could overcome the problem in getting unbiased samples of whole fish, however, the Subcommittee recommended that further discussion be deferred until the following year when more data, including ages, would be available and in the interim length data should continue to be reported as total length by sex in 3 cm groupings.

In 1977 no additional data were provided to ICNAF concerning this problem and the matter was not commented upon in Redbook.

At the ICNAF Annual Meeting in 1978, Parsons et al. indicated once again the problem of broken and regenerated tails in roundnose grenadier. They noted that although measurements were required over a more complete size range than examined by Jensen (for a conversion factor) the procedure of anal fin measurement was preferable and they "strongly urged" the adoption of this method with recordings being made in no greater than 1 cm groupings.

Again in 1978 no comment was made in Redbook.

In 1979, Atkinson suggested the use of anal fin lengths in place of total lengths and noted that Canada had already initiated this practice. It was proposed that further studies be carried out to determine if sex differences exist and that anal fin measurements be made to the nearest 0.5 cm.

At the same meeting, Messtorff and Koch (1979) pointed out that since a large proportion of these fish caught have broken tails it would be desirable to investigate the possibility of using other length dimensions which are significantly related to total length. In conjunction with this they showed significant linear correlations between total length (complete tails only) and pre-anal length (tip of snout to anterior edge of anus).

Also in 1979, Romania (Maxim et al. 1979) commented that since most of the specimens of roundnose grenadier examined had broken tails, it was impossible to obtain total lengths and instead anal fin measurements were taken.

STACRES (Anon. 1979) reviewed the papers by Jensen (1976) and Messtorff and Koch (1979) and although acknowledging that a suitable partial length measurement would be appropriate for roundnose grenadier provided that it was highly correlated with the total length measurement, they considered that the limited information presently available was insufficient for the basis of a decision and thus recommended that studies be undertaken and documented for the 1980 Annual Meeting.

In response to that request, this paper presents the results of Canada's studies in SA 2+3.

METHODS

In 1978 Canada initiated the practice of recording grenadier length frequencies to the nearest 0.5 cm using anal fin lengths (tip of snout to first anal fin ray) as the standard for measurement. For those individuals with complete tails, the total lengths and anal fin lengths were recorded to the nearest millimeter.

Linear regressions of total length on anal fin length were run for males and females separately and for the sexes combined for individuals measured in SA 2+3 in 1978 and 1979.

Also in 1979, the anus length (anterior of) as well as the anal fin length were recorded for a number of specimens. Linear regressions of anus length on anal fin length were carried out (sexes combined) in order to test the relationship.

RESULTS

Measurements (anal fin and total) were obtained from 2347 individuals (1517 males and 830 females), which were deemed to have complete tails. The anal fin lengths ranged from 3-20 + cm in both groups. Highly significant correlations ($F > F_{0.01}$) were obtained for both males ($F = 25{,}022.24$) and females ($F = 16{,}358.88$) and the resultant linear relationships are shown in Fig. 1. The slopes of the two lines were regarded as being idential for practical purposes since at an anal fin length of 20 cm the predicted total lengths for males and females show only a difference of 1.5 cm. Thus the data were combined resulting in the line shown in Fig. 2. The correlation was again highly significant ($F = 41{,}112.37$) at the 0.01 level. It can be seen that the 99% confident intervals (of the mean and predictive) are very narrow.

The regression of anus length on anal fin length can be seen in Fig. 3. Again, the correlation if highly significant ($F = 1{,}349{,}259.12 > F_{0.01}$).

DISCUSSION

The results of this study show that there is a very highly significant linear correlation between the anal fin length and total length of roundnose grenadier in SA 2+3. It may also be inferred that a significant correlation exists with roundnose grenadier from SA 0+1.

It can also be seen that a highly significant linear correlation exists between the anus length and anal fin length suggesting that either of these may be used as an alternative to total length measurements for this species in SA 2+3.

Since Messtorff and Koch (1979) obtained highly significant correlations between anus length and total length for two other long tailed speices both present in the Southwest Atlantic, the possibility exists that these relationships may be of common occurrence among a variety of 'rattail' types and thus the problems encountered through breakage and regeneration of the tails can be overcome by the use of another standard such as anus length or anal fin length.

For roundnose grenadier in the Northwest Atlantic it is suggested that the anal fin length is preferable. It is thought that an 'extending appendage' such as the first anal fin ray can serve as a much simpler and quicker guide than can a vent whose exact position must be determined by eye. Also, variability may arise when taking anus length measurements due to distortion of the anus when individuals are brought up from the relatively great depths where they are found. Although this is not indicated in Fig. 3, it must be remembered that these measurements were taken during a special research cruise and some precision and accuracy may be lost during routine sampling.

As suggested by Jensen (1976), although a conversion factor could be incorporated the use of a partial length directly would be much simpler. Thus it is proposed that in future all measurements of roundnose grenadier be made by sex from the tip of the snout to the first anal fin ray and that these measurements be reported to the nearest ½ cm.

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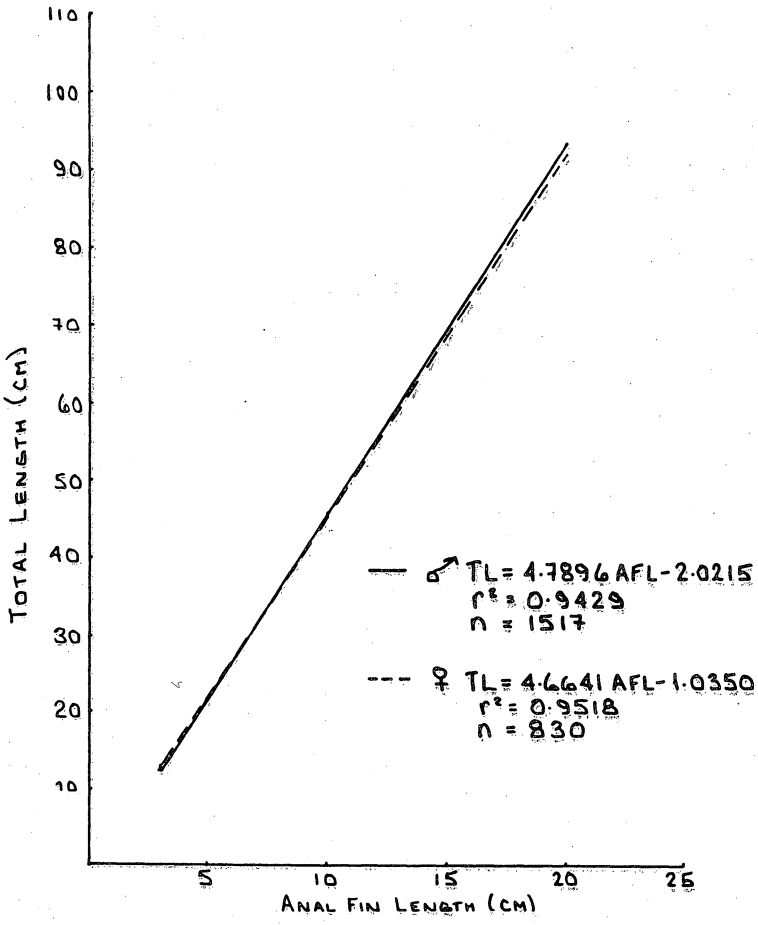

Fig. 1. Linear regressions of total length on anal fin length for male and female roundnose greandier in SA 2+3, 1978-79

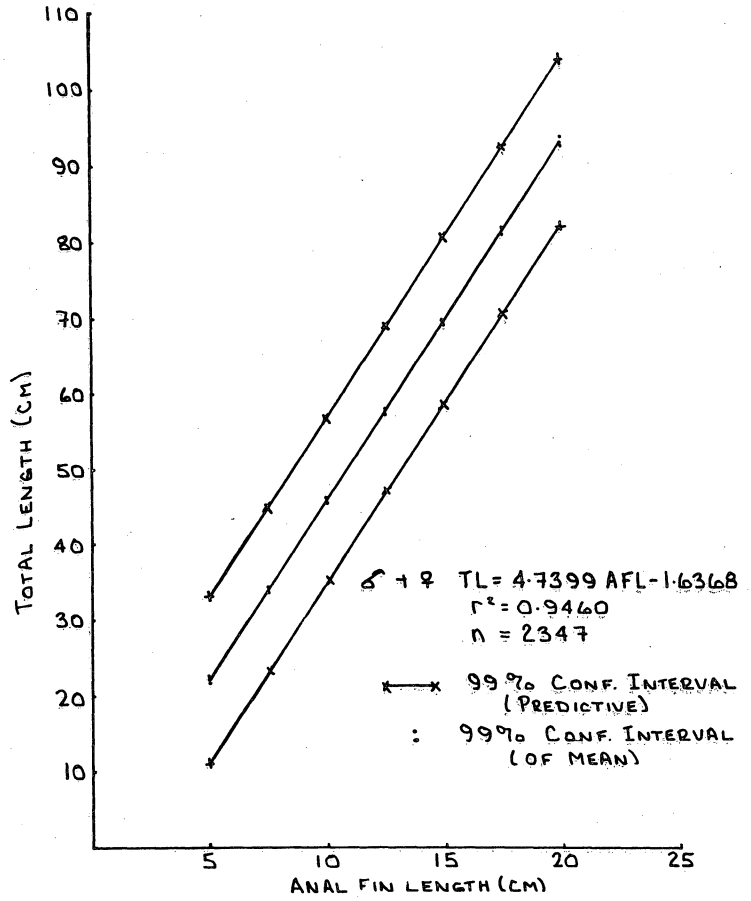

Fig. 2. Linear regression of total length on anal fin length for roundnose grenadier (sexes combined) in SA 2+3, 1978-79 showing the 99% confidence intervals.

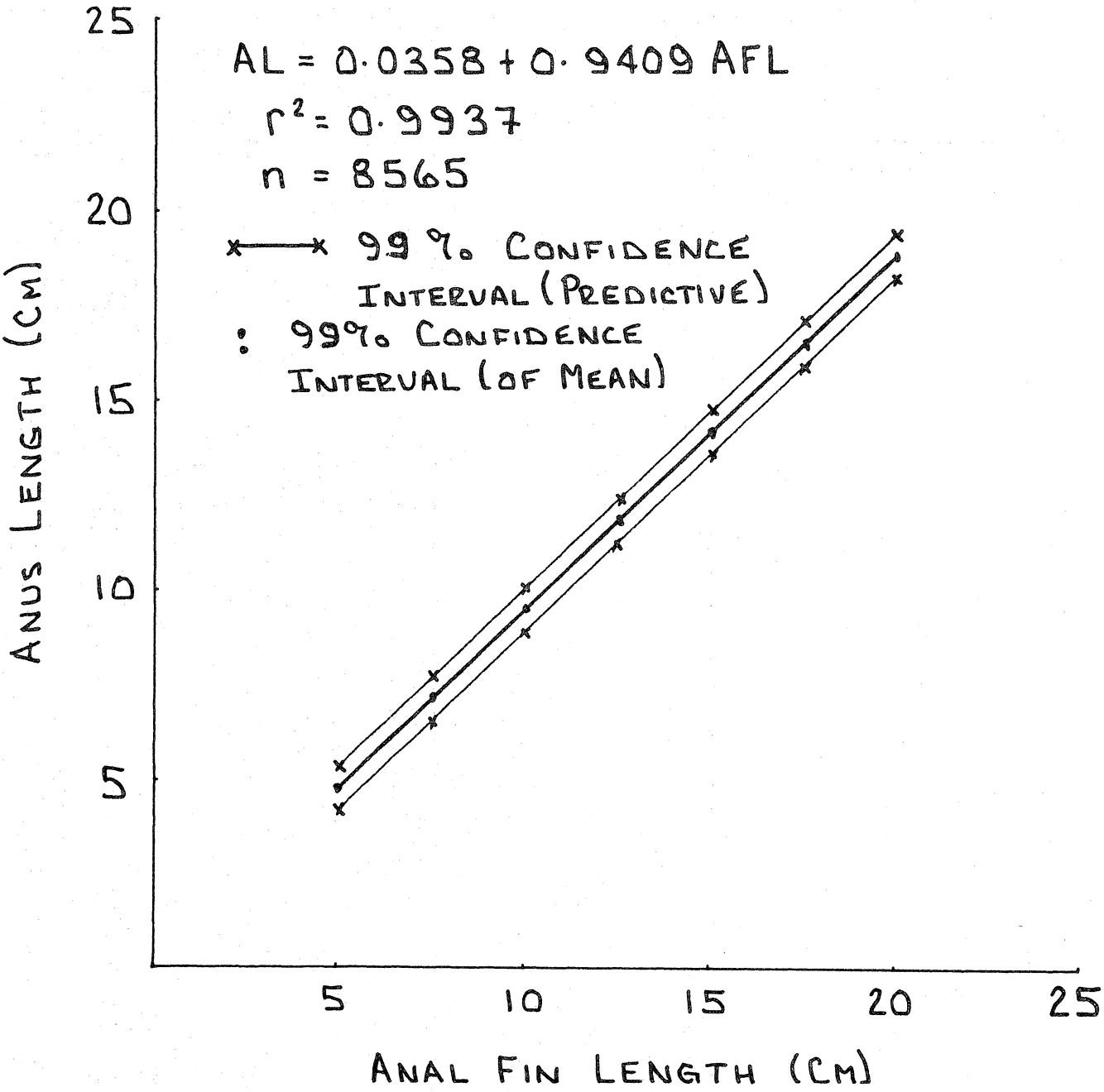

Fig. 3. Linear regression of anus length on anal fin length for roundnose grenadier (sexes combined) in SA 2+3, 1978-79, showing 99% confidence intervals.