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# LENGTH BASED METHODS FOR DETERMINATION OF GROWTH PARAMETERS SEPARATELY BY SEX IN Mullus barbatus

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The different individual growth pattern for males and females in a number of species of Osteichthyes, makes it difficult to use the analysis of the progression of modal classes to determine the parameters of the Von Bertalanffy growth curve. As a matter of fact when are used comprehensive frequency distributions for these species with algorithms like those included in MULTIFAN (Fournier et al., 1990) or in the Compleat ELEFAN (Pauly, 1987), the program can easily misinterpret the alternation of the two sex modes as a succession of year classes, thereby giving the impression that growth is much slower than it really is.

In the case of Mullus barbatus, furthermore, the presence of several false rings in the otoliths (Vrantzas et al., 1992) makes it difficult to use them for growth studies; misidentification of annual rings can bring to an understimate of the K parameter in the growth curve. These causes, as well possible discrepancies in growth patterns of different geographical areas, can have produced the high variability in the estimates of growth parameters for red mullet by different authors.

All specimens of Mullus barbatus caught during 13 trawl surveys were measured in their total lengths divided by sex. In order to avoid any possible bias in the size distribution caused by the selectivity of the fishing instrument, a cover was used particularly in the species' recruitment periods (Auteri and Righini, 1979; Orsi Relini and Arnaldi, 1986).

Sex determinations were always done on fresh specimens, without recourse to freezing, so as to increase the possibility of sex identification in resting period as well as in small size individuals. This strategy drastically reduced the frequency of sex-undetermined individuals. Summer samples included massive quantities of undeterminable small recruits (TL < 10 cm); for these young individuals, considering that sexual differences on mean length were negligible, an even distribution of 50% between the two sexes was made. Data were processed with the above mentioned programs MULTIFAN and ELEFAN, both of which make direct use of size distributions to prepare an estimate of the growth parameters. In order to separate the modal classes, the program NORMSEP (Abramson, 1971) and the Bhattacharya method of the program LFSA (Sparre, 1987) were utilized. Modes were easily aged because the species' reproduction time is known (Orsi Relini and Arnaldi, 1986). The couples of data obtained with both methods were then used as input of the program ETAL (Gaschuetz et al., 1980) for alternative estimates of the growth parameters.

Results are shown in the following table:

|  | FEMALES | | | | MALES | | |
|---|---|---|---|---|---|---|---|
|  | $L_\infty$ | K | $t_o$ | | $L_\infty$ | K | $t_o$ |
| ELEFAN | 29.2 | .68 | | | 22.0 | .74 | |
| MULTIFAN | 27.0 | .70 | | | 20.6 | .70 | |
| BHATTACHARYA+ETAL | 28.1 | .69 | -.42 | | 21.5 | .58 | -.78 |
| NORMSEP+ETAL | 26.5 | .64 | -.37 | | 21.5 | .67 | -.44 |

As the rare Winter surveys would make improbable a good fitting of seasonal growth curves, this hypothesis was not considered even when the program could have calculated them. The results obtained with the four different approaches for each sex are very similar as can be seen in the figures where the four curves for males and females have been drawn. Whichever curve is analyzed, is observed a rapid growth for the species, fasten for females which present a larger size; these approximately agrees with Passelaigue (1974), Gharbi and Ktari (1981), Vrantzas et al. (1992).

A useful mention must be made about the important consequences that a rapid growth performance can

bring regarding the exploitation of this important fishery resource, specially in relation with the application of theoretic assessment models.
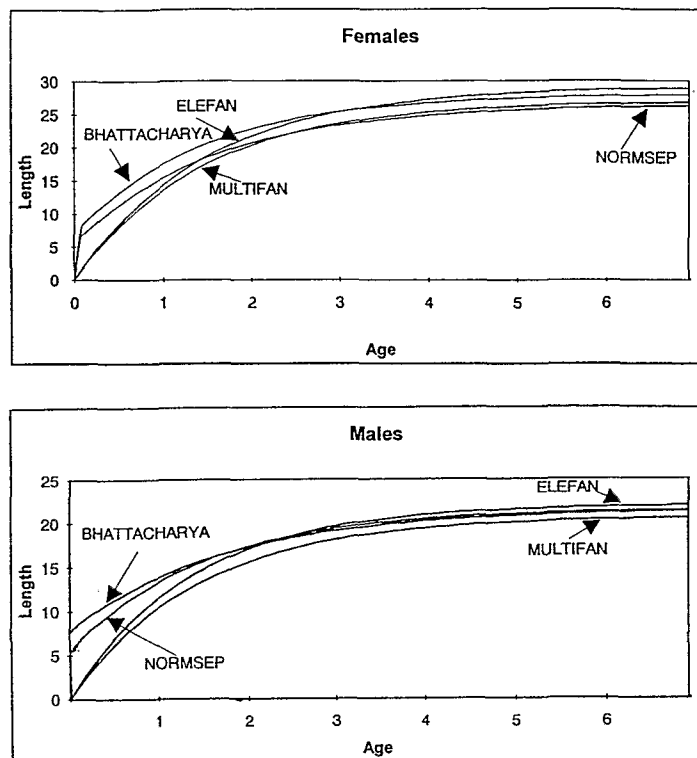
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