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Age determination of Mediterranean Hake and Sardine : Recommendations of an International Workshop (Palma de Mallorca, Spain, 10-15 April 1989)

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The age Reading Workshop on Mediterranean Hake (Merluccius merluccius) and sardine (Sardina pilchardus) was held at the Centro Oceanográfico de Baleares del Instituto Español de Oceanografía on April 1989, sponsored by F.A.O. and with the participation of scientists of nine countries corresponding to west and east Mediterranean areas (Oliver, P. et al., 1989). The techniques used in the various laboratories, the relevant information on the species life cycles and other aspects of age determination were discussed. Practical otolith interpretation exercises were held and the interpretation criteria discussed.

HAKE

The main problem found in hake age determination is the attribution of the 1st annual ring. The capture of big hakes up to 87 cm length by long-lines and cast nets on Catalonia and Gulf of Lion and by trawling in Adriatic Sea rised the question of hake growth rates. The following hake otolith interpretation criteria were recommended:

1-The nuclear otolith zone previous to the first annual ring may be characterized by 2-3 pelagic rings and a demersal ring. Sometimes fishes born in summer might not laid down these false rings in their otoliths. The 1st annual ring might correspond to the hyaline ring laid down after the demersal ring when it corresponds to a fish of 12cm or more. this interpretation has to be supported by the length frequency distributions of the recruited fish and the spawning periods.

2-Annual rings are laid down at regularly decreasing intervals, generally annual rings are laid down in fishes over 35 cm length, while annual opaque zones and hyaline rings are laid down in younger fishes.

3-True winter annuli are identified by their good definition around the otolith. The winter ring could consist of a single hyaline band or a series of 2-3 clustered ones. In the last case measurements should be taken to the outermost ring in the series.

4-Hyaline rings are enumerated for age determination and are considered completely formed when the next opaque ring formation starts.

5-Taking 1st January as arbitrary birth date and winter as the period of hyaline ring formation, otoliths of fish caught between 1st july and 31st December with an hyaline ring in the edge are assigned to an age group by counting all the hyaline annulus except the last one. If the fishes are caught after 1st January all the hyaline annulus are counted.

SARDINE

The species behaviour and long spawning period and the fisheries characteristics highly conditioned the sardine available material. The sardine interpretation criteria were defined as follows:

1-The birth date is 1st January.

2-Each year an opaque and a hyaline ring are formed.

3-Annual growth rings are laid down at regularly decreasing intervals as the fish becomes older.

4-Otoliths with opaque edge during the first semester or hyaline edge during the second semester, are considered to belong to the previous age group.

RECOMMENDATIONS

From the above mentioned discussions and otolith readings the following recommendations were elaborated:

Mediterranean Hake

-The use of thin otolith cross-sections for age-reading of hake bigger than 20 cm in case than the annuli are not clear on whole otoliths.

-In order to make possible direct comparison between the studies conducted in various geographic zones the use of the standard terminology and notation for otolith interpretation of Jensen (1965) was recommended.

-To reduce the risk of errors of interpretations, the interpretation should be done independently following the same criteria by two persons trained in otolith reading, or more than once by the same reader with a time interval between readings. The coincident interpretations should be used for preparing the age-length keys.

-Due to the heterogeneity of data, and the necessity to clarify the 1st annual ring formation, regular sampling, determination of the annual cycle of reproduction and determination of the length distribution of the commercial catches are necessary. When possible, recruitment surveys should be held.

Mediterranean sardine

-Otolith lecture should be done unfixed without mounting the otoliths with Eukitt.

-Statistical procedures should be applied to study the errors on the estimations of growth parameters from the age-length key.

-Studies on daily growth ring in the otoliths could be implement ted to verify growth during the first year of life.

-In order to determine the precise spawning season ichthyoplacton surveys should be held.

-An interchange program on otoliths should be started between different countries to discuss material facing another international meeting.

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The Length-Weight Relationship and Condition Factor as Ageing Functions of Anchovy in the Middle Adriatic

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This paper is an account of the length-weight relationship and cubic condition factor variations as an ageing function as well as the conversion factor relationship between total and standard length of the juvenile and adult anchovy, Engraulis encrasicolus (L.) population from the coastal waters of the Middle Adriatic.

Anchovy specimens were randomly collected from commercial (purse-seining) pelagic catches during spawning season in Summer 1979. A total of 1,847 anchovy specimens were examined. Data on anchovy total and standard lengths are expressed in centimetres. The fishes were weighted to the nearest 0.01 g. Sex determination and state of gonads were by visual inspection. All of the adult anchovy specimens were at the most advanced state of maturity of gonads. The juvenile anchovy gonads were immature. The otoliths were used for aging the anchovy.

The length (L) weight (W) relationship for each age class was described by the equation: $W = a\ L^b$ (LE CREN, 1951). The cubic condition factor per each age class was estimated using equation proposed by HILE (1936) : $K = W \cdot 10^2 \cdot L^{-3}$.

The relationship between total length (L_t) and standard length (L_s) can be described by the following equation : $L_t = a + L_s b$.

The length-weight relationship

The mathematical relationship between the length and weight from all available data of anchovy can be described by the equation: $W = 0.018603\ L^{2.5801}$. Negative allometry is established. This is in agreement with the data of SINOVČIĆ (1978) who noted the negative allometry of anchovy in the Kaštela Bay in 1974.

The length weight relationship of each sex and age class is graphically presented in Fig.1. During the first and second years of life (0 and 1+) the growth of anchovy is isometric (b=3) or very nearly isometric (b=2.9). In the third (2+) and fourth (3+), negative allometry is established (b=2.61, b=2.40, respectively).

The value of the length-weight coefficient decreased as the anchovy increased in age.

Condition

The cubic condition factor varied between 0.497 and 0.653. The value of the cubic condition factor decreased in function of increased age of the anchovy with aberrance of 0 age class which show the lowest value of cubic condition factor. The cubic condition factor for males is larger then that of females probably because female anchovy might become more exhausted during spawning.

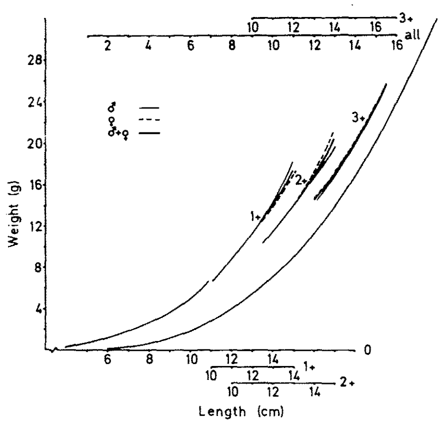

Fig.1. The length-weight relationship coefficient in relation to the anchovy age

Relationship between total length and standard length

Since many papers dealing with this fish species express the length measurements using total length (L_t) while others use standard length (L_s), a knowledge of the relationship between the two measurements is of practical value for comparative purposes. The relationship between total and standard length for small (L_t<8.5 cm), medium (L_t=8.6-13.0 cm), and large (L_t>13.1 cm) anchovy can be described by the following equations respectively:

$L_s = -0.4024 + 0.9021\ L_t;\ r^2 = 0.9988$

$L_s = -0.5750 + 0.9019\ L_t;\ r^2 = 0.9998$

$L_s = -0.8127 + 0.9164\ L_t;\ r^2 = 0.9998$

For all available data the equation is:

$L_t = 0.4179 + 1.1266\ L_s$

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