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Assessment of Total and Natural Mortality of Argentine (*Argentina silus* Ascanius) in the Browns Bank Area[1]

by

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M E M O R A N D U M

The present analysis covers the separate evaluation of fishing and natural mortality of argentine in the Brown's Bank area. As a result of these studies the natural mortality coefficient is assessed as being equal to 0.23.

I N T R O D U C T I O N

Argentine / Argentina silus Ascanius/is one of the species for which commercial fishery have been developed in the North - west Atlantic. At present it became a pending necessity to estimate the stock and the optimum level of exploitation. But it is impossible to solve these tasks without knowledge of natural mortality. Therefore the estimation of natural mortality coefficients deserves special attention.

C O N T E N T S A N D M E T H O D

Length/age data and statistics related to catches in April, I967 and April, I972 were used as basic working material. The fishery in the above years was mainly based on argentine. Fishing effort /fi/ in I972 was higher that in I967. The situation allowed to apply Silliman's method /I943/ for separate evaluation of fishing /F/ and natural /M/ mortality. The method is based on a combined solution of the following equations for two fishing periods:

first period /A/

$$/ F + M /_A = Cf_A + M$$

second period

$$/ F + M /_B = 6{,}4\ Cf_B + M$$

with C - proportionality constant factor for F and fi.
Further the assessment of decline rate / instant mortality coefficient / was made by using the "integration" methods of Beaverton and Holt /I956/. The length/age composition data for April, I967

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and April, 1972 were taken as basic material.

After evaluation of total mortality rate during this period the assessment of M was not a difficult task. The percentage decline resulted from the formula:

$$e - / F + M /$$

R E S U L T S O F R E S E A R C H

For separate evaluation of F and M the knowledge of the total mortality of argentine during the periods considered is essential.

a/ Assessment of the total mortality coefficient in 1967 and 1972.

Table I shows argentine catch-per-unit-effort data by year-classes. Taking the abundance of each year-class as natural logarithm we shall draw a logarithmic diagram for each fishing period / fig.I,2 /. To produce a smooth curve the series of natural logarithms were first of all made even by method of sliding average / Plochinsky, 1970 /.

The slope of the right end of the curve gave the total mortality value for 1967 $z=0,3$, for 1972 - $Z=0,8$ The annual decline rate was 26 % and 55 % correspondingly.

b/ The separate evaluation of F and M.

Table 2 shows that the fishing effort in 1972 was 6,4 times higher that that of 1967.

T a b l e 2

Some data on argentine catch in the Brown's Bank area by years.

Year	Number of vessel-days	Average catch trawl-hour in tons
1967	69	26.6
1972	443	45.6

The natural mortality coefficient is to be calculated by applying Silliman's method. We put the available figures into equation / see above /

$M = 0,21$ $F_A = 0,09$ $F_B = 0,59$

Now we have to find on diagram the value of M by using the method of Beaverton and Holt /fig.3/. Now we show total mortality values on the Y -axis and the total number of vessel days on the X -axis. The values of L and fi for each of two periods are known. Having shown their values on the diagram we can get a straight line crossing two points which cuts the segment of the Y -axis corresponding to the value of M which equals 0,24. Thus, the calculated and graphical values of natural mortality are close and in average equal to 0.23 / the annual decline of 21 % /. This value of M is realistic for argentine if we take into consideration its slow growth rate and late maturity.

C O N C L U S I O N

The assessments given in this study are approximate but realistic for this species. After further accumulation of data the assessments naturally will be precisionized. But the data, which are available at the moment can be used for calculations of changes in argentine abundance.

L I T E R A T U R E

I. Plochinsky N.A., 1970. Biometry. Moscow University publication.

2. Beverton R.T.H. and Holt S.T., 1956.
A review of Method for Estimating Mortality Rates in Exploited Fish Populations, with Special Reference to Sources of Bias in Catch Sampling.

3. Sillman R.P., 1943, Studies on the Pacific pilchard or sardine/ Sardinops caerulea/. SA method of computing mortalities and replacement. U.S. Dept. Int., Fish. and Wildl. Serv., Spec. Sci. Rep. 24.

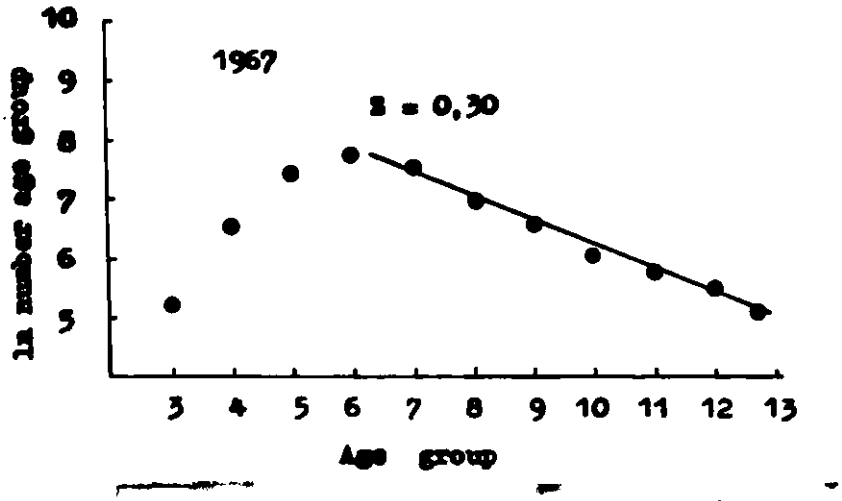

Fig. 1. Age composition of argentine in 1967 in the Brown's Bank Area.

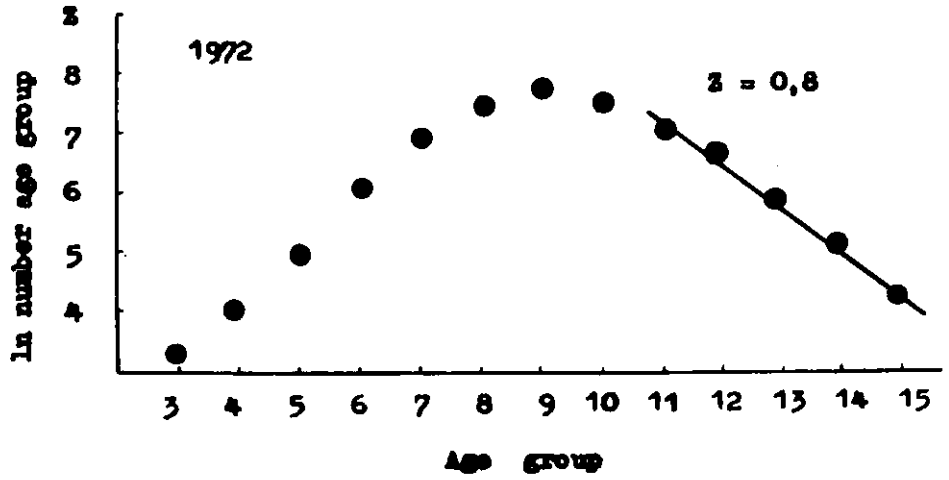

Fig. 2. Age composition of argentine in 1972 in the Brown's Bank Area.

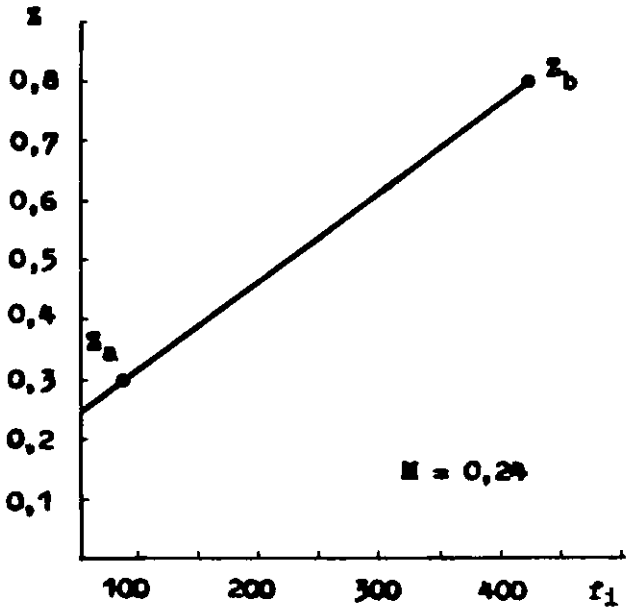

Fig. 3. The manner of changes of total mortality of argentine in 1967 (Z_A) and in 1972 (Z_B) depending on fishing effort.