Estimation of mortality rates and critical age of *Helicolenus dactylopterus dactylopterus* (Pisces-Scorpaeniformes) in the Sicilian Channel (Central Mediterranean Sea)

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The bluemouth rockfish (*Helicolenus dactylopterus dactylopterus* Delaroche, 1809) is widely distributed throughout the Sicilian Channel, commonly inhabiting bottoms between 100 and 750 m, where it represents a frequent by-catch species for local trawl fisheries.

In this note, the authors report some estimates of the natural (M) and total (Z) mortality (per year), of the exploitation rate E = (Z-M)/Z, and of the critical age or age of maximum production (T_{mb}) i.e. the time in the life hystory of the population when the cohort is expected to maximize its biomass (ALVERSON & CARNEY, 1975).

In stock assessment and management, estimates of the rates of growth and mortality are basical inputs in order to evaluate the exploitation rates, as to have the minimum risk of a collapse of the whole population.

Data derive from a larger data-base gathered during a multispecies assessment program of the demersal resources in the Sicilian Channel (seasonally, from May 1985 to February 1987, experimental trawl surveys carried on by I.T.P.P.-C.N.R.; see LEVI, 1990 for further details).

We started from previously derived parameters of the Brodyvon Bertalanffy's growth curve: L_{inf} = 39.2 (TL; cm) K = 0.127 and t_o= -1.46 year (RAGONESE and REALE, in prep.);

An estimate of life span (T_{max} = 22 year) was derived according to TAYLOR (1958) with L_{max} = 0 95*L_{inf}.

Two estimates of M (0.20 and 0.31) were calculated according to HOENIG (1983) and PAULY (1979) respectively (in the second case assuming an average water temperature of 14°C).

A first estimate of total mortality rate (Z = 0.639) has been computed transforming the length frequency distributions, from four seasonal trawl surveys, in a length converted catch curve (Fig. 1a) according to PAULY's methodology (cfr. PAULY, 1984).

By regression of the logarithmic (natural; ln) of cumulative frequency (>= L_i) vs. ln (L_{inf} - L_i), i.e. the Jones and van Zalinge's method (in JONES, 1984)(Fig. 1b), the authors found out an estimate of the ratio Z/K = 5.009 and, multiplying for the above K value, a second estimate of Z = 0.636 consistent with the previous one and suggesting a value of Z = 0.64.

Natural mortality is a very critical parameter to be estimated (VETTER, 1988), but in this case the value of M = 0.31 seems more realistic considering that M = 0.2 is generally assumed for longlived species which reach the larger sizes in cold environments.

The resulting fishing mortality rate (F = 0.33) allows the derivation of an exploitation rate (E = 0.51) which is relatively high, supporting the hypothesis of a general overexploitation of demersal Mediterranean stocks (ANON, 1989).

From these data it has been possible to compute (ALVERSON and CARNEY, 1975; AULT & FOX, 1988) two different values of T_{mb}, 5 and 2 years for the unexploited (Z = M = 0.31) and the exploited (Z = 0.64) cohort, respectively.

The first estimate (T_{mb} = 5 years) sounds reasonable, considering that the bluemouth rockfish in the Mediterranean Sea, reaches sexual maturity at 3-4 years of age (BAUCHOT, 1987); the second estimate suggests that the resources is in growth overfishing.

Since the recruitment appears to be continuous enough (RAGONESE & REALE, in prep.), the management decision of delaying the age (size) of recruitment to the gear, e.g. widening the mesh size at the codend (20 mm of side, at present), could improve the status of the stock of the bluemouth rockfish in the Sicilian Channel.

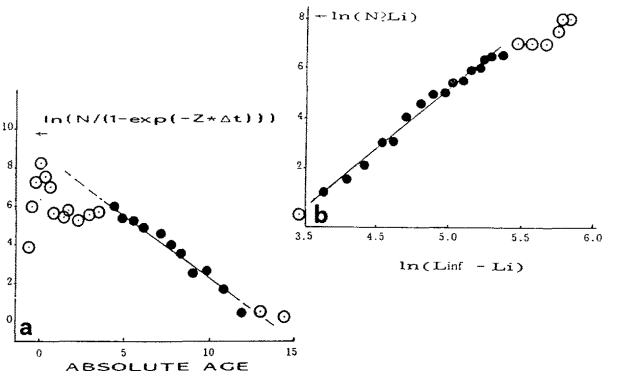

Fig. 1 - a) the length-converted catch curve for the bluemouth rockfish based on the growth data and M = 0.31; b) Jones and van Zalinge's plot. (●) used; (⊙) not used.

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