

DAILY EGG PRODUCTION METHOD FOR SPAWNING BIOMASS ESTIMATES OF ANCHOVY IN THE SOUTH-WESTERN ADRIATIC DURING 1994

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Abstract

During the month of July 1994, an Egg Production Method Cruise was carried out with the purpose of evaluating the spawning biomass of the anchovy (*Engraulis encrasicolus* L.) along the Apulian coasts of the lower Adriatic. The area, covering a surface of 14,790 km², extends from Gargano to Otranto. The results of the egg production and of the biological parameters relative to the adult population, are compared to those of other Mediterranean areas. The D.E.P.M. applied in July 1994 estimated a spawning stock biomass of 8,129 metric tons (CV = 0.235) for the South-Western Adriatic anchovy population. The D.E.P.M. experimental research shows an anchovy biomass evaluation 7.3 times smaller than the one reckoned with the egg and larva method.

Key-words: *Fishes, biomass, spawning, Adriatic Sea*

Introduction

The spawning biomass is defined, in the Daily Egg Production Method (D.E.P.M.) (1), as the relationship between the daily egg production during the survey and the daily fecundity of the adult population. The biomass estimate is based on the following equation:

$$B = \frac{KPoAW}{RFS}$$

where B = the spawning biomass in metric tons, P_o = the number of eggs per sampling unit (m² per day), A = total survey area (in m² per sampling units), W = average weight of mature females (grams), R = sex ratio (fraction of mature females by weight), F = batch fecundity (average number of eggs per mature female), S = fraction of mature females spawning per day, k = conversion factor from grams to metric tons. The daily egg production in the zone is based on the sampling of eggs at sea and on the temperature dependent model of the speed of egg development, while the parameters of the daily fecundity of the population are based on the capture of adult samples during the fishing campaign. The egg surveys and adult surveys are thus obtained as part of campaigns carried out at the same time during the peak of the spawning season.

This research applies for the first time the D.E.P.M. to the lower Adriatic *Engraulis encrasicolus* L., as part of the "small pelagic biological resources" programme financed by the Ministry of Agricultural, Food and Forestry Resources in this area. Two other methods have been employed in the evaluation of the biomass estimate for Clupeiforms in Apulian waters: the echo survey (2) from 1976 and the egg and larva method (3) since 1984. Until this year the D.E.P.M. had been applied for Mediterranean anchovy by Palomera and Pertiera (4) (North Eastern Spanish coast), Garcia *et al.* (5), Garcia and Palomera (6) (North Western Mediterranean).

Material and Methods

The survey was carried out between 3 July and 3 August 1994, both during the day and at night, covering most of the reproductive zone in the eastern arc of the lower Adriatic. Both the egg surveys and adult surveys were carried out using chartered research ships equipped with midwater otter trawls. In order to catch more adult samples were additionally used commercial vessels equipped with flying midwater pair trawls and purse seine. The methodology used for the sampling and the elaboration of data in relation to the egg survey and adult survey has been described by Casavola (7), Casavola *et al.* (8, 9, 10).

The samples of plankton were collected using a CalVET net (335 m mesh) in order to keep a continuity with samplings carried out in the previous years, when Bongo 60 with the same kind of mesh was used. The net was raised, where possible, from a depth of 100 metres, with coverage of 14,790 km² of the surface of the sea. In the area examined samples were taken at 88 stations (Fig. 1) situated at a distance of 7 NM, along 23 transects also at a distance of 7 NM, angled at 45°. These latter continued until, examining the plankton collected, anchovy eggs could be found and above all knowing, through many years' experience (since 1984) in the egg-larva method research, the limits of the spawning grounds. Temperature and salinity profiles were recorded at the same stations using the multi-parameter OCEAN SEVEN probe. The anchovy eggs (Fig. 2) were counted and subdivided in the laboratory by stage of embryonic growth. This classification was carried out taking into account the relationship between the length of egg development and the temperature of the water according to the model obtained by Regner (11) for the Adriatic anchovy. Then the stages of the anchovy eggs were regrouped manually into "spawning nights"

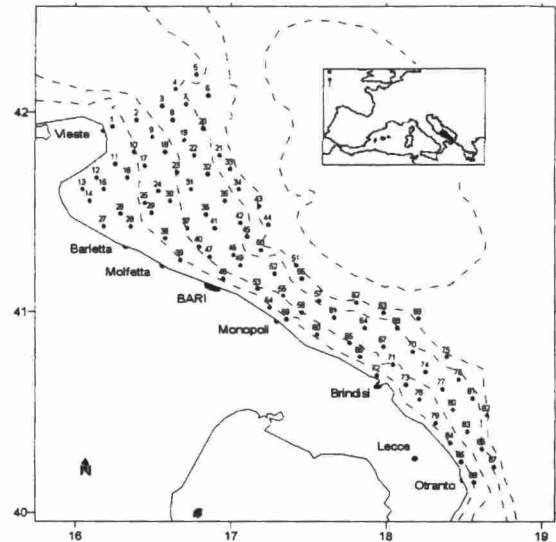


Fig. 1 - D.E.P.M. *Engraulis encrasicolus* egg survey.

and the ages of the eggs were recalculated on the basis of the time that passed after 24:00 (GMT) (the time of maximum spawning assigned by the authors) and the time of egg collection.

The whole zone investigated, with the understanding of the reduction of the variance, has been post-stratified, following the procedure employed by Picquelle and Stauffer (12), into two strata: stratum 0 (egg production = 0) and stratum 1 (positive stations). The elaboration of the data relative to the positive stratum, obtained using a weighted nonlinear least squares regression (13), has made it possible to define

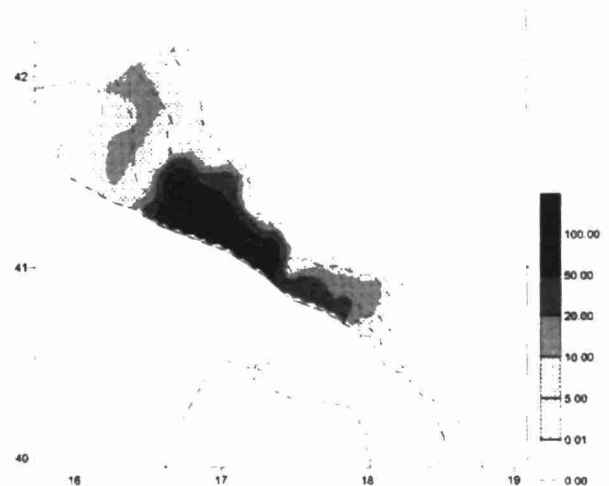


Fig. 2. Distribution and abundance of *Engraulis encrasicolus* eggs (No/m²) during the July 1994 survey in the lower Adriatic Sea.