

# BATCH FECUNDITY OF ANCHOVY, *ENGRAULIS ENCRASICOLUS*, IN THE NE AEGEAN SEA

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## Abstract

Adult samples collected onboard the purse-seine fleet, as well as a research vessel by means of a pelagic trawl, were used to estimate batch fecundity of anchovy in the NE Aegean Sea during June 1993 and June 1995. Relative fecundity differed significantly between years which seemed to be associated with differences in the adult feeding environment. In June 1993 waters were colder, less saline and richer in zooplankton. Adult condition, egg size and batch fecundity were higher in 1993 than in 1995.

**Keywords :** *Reproduction, Aegean Sea*

## Introduction

Batch fecundity is a parameter of the Daily Egg Production Method (DEPM), an ichthyoplankton-based method being used increasingly around the world to estimate biomass of small pelagic stocks (1). Besides biomass estimation, batch fecundity is an important biological variable of fish stocks, which can improve our insight into the reproductive biology of multiple spawning fishes, particularly when it can be compared between species and stocks (2).

In the present communication we present the first estimates of batch fecundity of anchovy of the NE Aegean Sea and relate them to the biotic and abiotic conditions of the pelagic environment.

## Materials and methods

Adult samples were collected on board both the commercial purse seine fleet and the R/V "PHILIA" by means of a pelagic trawl in June 1993 and June 1995. The location of sampling stations is shown in Fig. 1. Sampling was carried out from 22:00 to 05:00 local time. Fish were fixed onboard immediately after collection, using 15 l jars filled with 10% buffered formalin. Each sample consisted of random collection of 1.5-2 kg of anchovies.

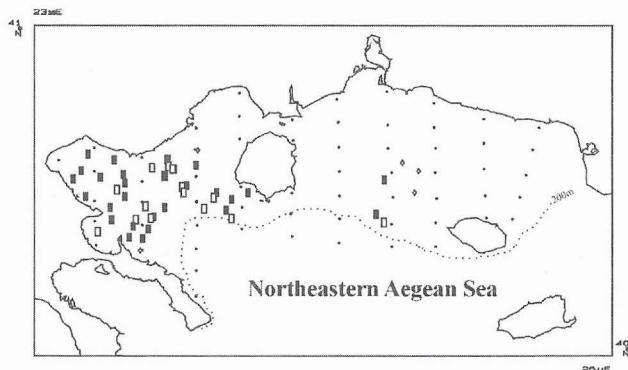


Fig. 1. The location of adult and planktonic/hydrographic sampling sites. Black squares : purse seine stations in 1993. Open squares : Purse seine stations in 1995. Open triangles : Pelagic trawl stations in 1995. Dots : Bongo-net and CTD

In the laboratory, all macroscopically detected hydrated or running females were weighted and their gonads weighted and preserved in formalin. The hydrated oocyte method was used for batch fecundity measurements (3). Only gonads with fully hydrated oocytes but no postovulatory follicles were used which had previously been tested through histological analysis of one of the two ovaries. Hydrated oocytes were counted in 40-60 mg subsamples (containing 100-200 eggs) per fish, taken from the anterior, middle and posterior part of the gonad.

For each year, data on the number of eggs per batch and the ovary free weight recorded for the hydrated females were used to fit a linear model. The regressions were forced through zero since the intercepts were not significant at the 0.05 level.

Relative condition factor of females (4), egg size, sea temperature and salinity and zooplankton biovolumes were also examined. Plankton and hydrographic data were available from a research survey made concurrently with the adult sampling (Fig. 1).

## Results and discussion

The upper water column was generally cooler and less saline in 1993 than in 1995 (Table 1). Mean zooplankton displacement volume (ZDV), measured from the catch of the 0.250-mm mesh net, was significantly higher in 1993 than in 1995 (Table 1).

Table 1. Mean values for environmental and anchovy reproductive parameters being significantly different between 1993 and 1995 ( $P < 0.05$ ).

		1993	1995
Temperature (°C)	5 m	21.20	23.55
	0-40m	16.74	18.93
Salinity (psu)	5 m	32.49	33.65
	0-40m	34.70	36.18
Zooplankton displacement volumes (ml/m <sup>2</sup> )		24.31	18.72
Egg size (mm <sup>3</sup> )		0.206	0.195
Relative condition factor (100*W/L <sup>b</sup> )		0.550	0.526
Relative fecundity (eggs/g)		563	325

Hydrated females were found only in samples collected before 02:00 a.m. (n=2 and n=5 in 1993 and 1995 respectively). Batch fecundity was measured for a total of 25 females in 1993 and 70 females in 1995. The slope of the fecundity-on-gonad free weight equation (relative fecundity, Fig. 2) was significantly higher in 1993 (95% confidence intervals : 518-608 eggs/g) than in 1995 (298-353 eggs/g).

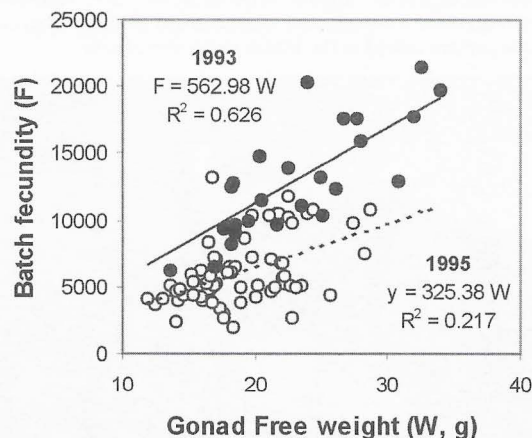


Fig. 2. Batch fecundity models. Black circles : 1993. Open circles : 1995.

The relative condition factor of females and mean egg size were significantly higher in 1993, when zooplankton biovolumes were also higher and temperature and salinity were lower (Table 1).

These results suggest an enhancement of adult condition and reproductive traits (fecundity and egg size) when zooplankton abundance is higher, i.e. in a superior trophic environment for the spawners. Higher zooplankton abundance in the NE Aegean Sea during June 1993 might have been due to a severe winter during that year (5).

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