

SPAWNING PATTERN OF ROUND SARDINELLA, *SARDINELLA AURITA* VALENCIENNES, 1847, IN RELATION TO SEA SURFACE TEMPERATURE (NORTHERN AEGEAN SEA, GREECE)

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Abstract

Mean monthly gonadosomatic index was calculated for both sexes of round sardinella *Sardinella aurita* Valenciennes, 1847 in northern Aegean Sea (September 2000-August 2002). Gonad development was synchronous for both sexes and significantly correlated ($r > 0.50$, $P < 0.01$) to sea surface temperature. The sharp temperature increase in spring seems to determine the onset of round sardinella spawning.

Keywords: round sardinella, spawning, SST, northern Aegean Sea

Introduction

Round sardinella, *Sardinella aurita* Valenciennes, 1847 (Pisces, Clupeidae) is a stenothermic and stenohaline pelagic, shoaling fish of the subtropical zone (1-3). The breeding pattern of round sardinella has been characterized as an extremely complex phenomenon (3), studied in several areas of its distribution (4-7) including the southern Mediterranean Sea (8, 9). Besides an early work (10), there are no data on its reproduction in Greek waters. The aim of the present work is to identify the effect of sea surface temperature on the spawning pattern of round sardinella.

Materials and Methods

Samples were collected onboard the commercial purse seine fleet for two complete years (September 2000-August 2002) in Kavala Gulf, northern Aegean Sea. The mean gonadosomatic index [$GSI = (\text{gonad weight}) / (\text{total weight}) \times 100$] was calculated on a monthly basis, separately for the two sexes. Sea surface temperature (SST, °C) was recorded monthly using a CTD probe.

Results

The monthly mean GSI showed synchronous gonad maturation for the two sexes and a short spawning season in early summer (Fig. 1). The onset of reproduction varied between the two study years with a time lag of a month observed in gonad development and maturation in 2002. The reproductive activity of round sardinella begun in May or June. Mean monthly SST was 0.5 to 1°C higher during the first study year (mean: 18.15, range: 10.07-27.41) compared to the second one (mean: 17.67, range: 9.62-26.51). Significant cross correlation between GSI and SST was found for lag=1 month:

$$GSI_{f,t} = -0.94 + 0.11SST_{t-1} \quad (r = 0.54, n = 24, P = 0.007),$$

$$GSI_{m,t} = -1.88 + 0.16SST_{t-1} \quad (r = 0.57, n = 24, P = 0.003).$$

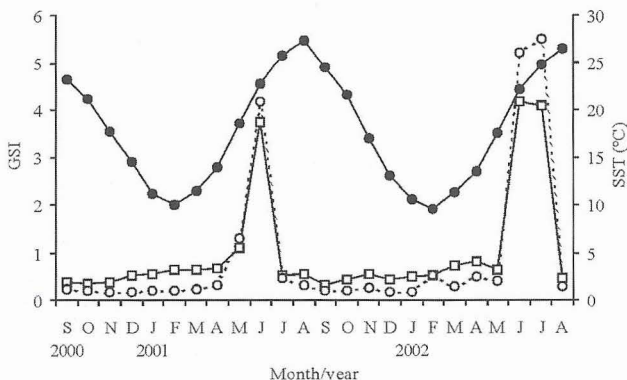


Fig. 1. Monthly variation of SST (solid circles, °C), and GSI values for female (open squares) and male (open circles) round sardinella, northern Aegean Sea (September 2000-August 2002).

Discussion

In general, the cues that trigger gonad development and maturation are environmental, often linked to temperature and daylength variations (11). The process of gonad maturation and spawning may be delayed due to unfavourable environmental conditions (7). In contrast, early maturation may also occur due to extremely favourable conditions. Indeed, the unusual high winter temperatures in northern Aegean Sea during the first year of the study may have caused

favourable conditions for round sardinella that triggered the gonad development earlier in May. Positive relationships between spawning and temperature for round sardinella have been reported for other Mediterranean areas (6, 9, 12) as for the Aegean Sea.

Permanent low water temperatures may completely inhibit round sardinella's spawning and even prevent its distribution (3), an effect that has been reported for other fishes (e.g. 11). In southern Mediterranean, round sardinella's gonad maturation begins when temperature reaches 20°C (13). A threshold seems also to exist in the northern Aegean, at around 20-22°C with the sharp temperature increase in spring setting the signal for gonad development and maturation.

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