

CANNIBALISM IN ANCHOVY (*ENGRAULIS ENCRASICOLUS*) IN THE NORTH AEGEAN SEA (GREECE)

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Abstract

Egg and larval cannibalism was characterized in the European anchovy (*Engraulis encrasicolus*) during the spawning season in the North Aegean Sea. About 3 % of the sampled fish had consumed eggs and 7 % larvae. Egg consumption was observed during the night and larval consumption during the day. Cannibalism seems to be an opportunistic feeding strategy of anchovy, depending on prey availability and proximity of adults, larvae and eggs in relation with the diel vertical migrations of the fish.

Keywords : Fish Behaviour, Pelagic, Diet, Aegean Sea.

In the North Aegean Sea, as in other parts of the Mediterranean Sea, anchovy (*Engraulis encrasicolus*) has a high economic importance. It constitutes one of the main target species of the fisheries and occupies a key role in balancing the energy flows through the food web, being one of the main links between secondary producers and higher level predators. Anchovy is known to be mainly zooplanktivorous and feeds preferentially on copepods and other small prey items [1]. Egg cannibalism has been reported in anchovy [1] but only a few indications have been given on the mechanisms implicated in this behaviour and its incidence. However, conspecific larvae have never been described in anchovy diet. This is the first study of cannibalistic behaviour in anchovy in the North Aegean Sea.

Sampling was carried out in the Thracian Sea and Thermaikos Gulf (North Aegean Sea) during survey cruises in June 2004 and June-July 2005, which corresponded to the spawning season of anchovy in eastern Mediterranean. 21 samples, comprised of 11 to 21 fish each (total number of fish = 356) were caught at different hours of day and night with a semi-pelagic trawl or a mid-water trawl. Total length and sex were determined and the stomach content qualitatively analyzed. For each fish sample, the volume contribution of anchovy eggs and larvae to the diet was calculated and, when possible (depending on digestion state), their total length was measured.

The total length of the analysed fish ranged between 80-160 mm (mean = 125 ± 17 mm). Females made up 58.1 %. Of the total of 356 anchovies, 11 (3,1 %) were egg-feeders, with their stomachs containing from 1 to 6 anchovy eggs (egg size range = 0,38-1,45 mm; mean size = 0,62 mm; n = 21) and 25 (7,0 %) were larva-feeders, with their stomachs containing from 1 to 24 anchovy larvae (larval size range = 3,75-25 mm; mean size = 10,54 mm; n = 144). Egg-feeders were therefore not abundant and the contribution of eggs to the diet was low, representing at most 0,5 % of the stomach content volume in one sample (caught at 4:16 h; n = 13). In contrast, predation on larvae was a feeding strategy more frequently used by anchovy. In one sample (caught at 18:39 h; n=19), 57 % of the fish were larva-feeders and the diet was clearly dominated by anchovy larvae (volume contribution = 73,6 %).

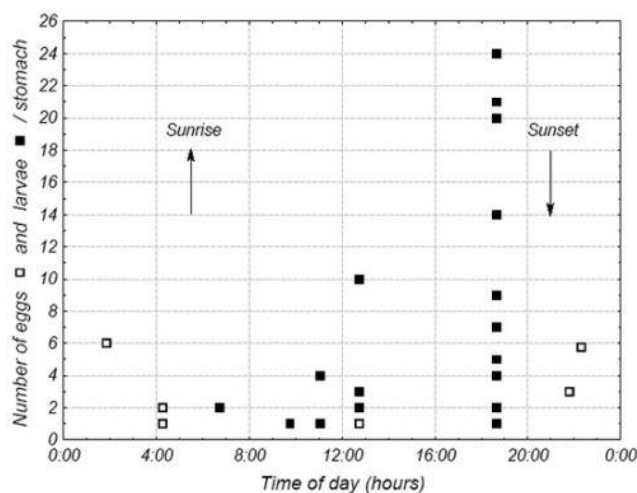


Fig. 1. Number of anchovy eggs and larvae found in the anchovy stomachs versus sampling time.

Neither sex nor size had a significant effect on the occurrence of cannibalism (Mann-Whitney U test, difference between two proportions test, $p > 0.05$).

On the other hand, the intensity of cannibalistic behaviour varied with time of the day (Fig. 1). Except in one sample where only 1 egg was found in the stomach of one individual, egg consumption was observed only during the night. In contrast, larval cannibalism was only diurnal and a consistent proportion of individuals specialized on anchovy larvae consumption a few hours before sunset.

In our study, cannibal and non-cannibal fish were found in the same samples, suggesting that egg and larval cannibalism must be considered as an opportunistic behaviour underlying prey availability dependence [2]. As observed in the Catalan Sea [1], egg consumption was very low and could result from spatio-temporal segregation of feeding and spawning activity. Eggs were found in the stomach contents during night, when anchovy migrates to the upper layers where the bulk of the eggs are confined [3]. In contrast, consumption of larvae was high in some samples, oriented towards large-sized larvae and observed only during daylight, when fish are close to the bottom. Whereas small larvae are mainly distributed above the thermocline, larvae longer than 10 mm carry out vertical migrations from the surface at night to deeper layers during the day [4]. Thus, larval cannibalism could result from adults and larvae proximity and conditions of reduced availability of other prey items. Indeed, increased consumption of larvae occurred just before sunset, when a consistent proportion of zooplanktonic organisms started to vertically migrate towards the surface layers.

Consequently, the factors influencing egg, larval and adult distributions as well as the diel rhythm of anchovy activity and food availability might play an important role in anchovy feeding and potential cannibalism.

References

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