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Some aspects of biology and population dynamics of the Hake (*Merluccius merluccius*) from the Adriatic Sea

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Among the heavily exploited demersal stock in the middle and northern part of the Adriatic, the population of the european hake from the Jabuka Pit (open middle Adriatic) has been an important target of the commercial trawl fishery. Annual fluctuations of the juvenile and the spawning stock for the period 1960-1986, point to similar, although opposite trend in abundance indices, the annual fluctuations of spawning stock however, lagging behind those of juveniles for two or three years. Calculations suggest that a density dependent relationship exists between the stock recruit strength and the adult stock.

On the basis of monthly fluctuations of indices of relative abundance of juvenile hake it may be stated that juvenile stock reaches a significant maximum in spring (May) and another, lower, in autumn (ALEGRIA and JUKIC, 1988). All evidences show that the reproductive cycle of this species extends almost all year round. The earlier spawning begins in winter, in deeper sea water layers (about 200 m). In spring-summer hake spawn in shallower waters (ZUPANOVIC and JARDAS, 1986). As to the life cycle of the Adriatic hake it was found that the smallest mature male in samples from 1988-1989 measured 23 cm and female 28 cm in total length. According to ZUPANOVIC (1968), males mature at 20-28 cm and females at 23-33 cm total length. It was confirmed that individuals attaining first maturity leave the channel regions of the eastern Adriatic coast, i.e. their feeding grounds, and migrate towards the open and deeper waters of the Jabuka Pit. This area is held to be the main hake spawning ground in the Adriatic. The larger number of eggs and larvae were found in this area during autumn-spring, with maximum in January and February (KARLOVAC, 1965). Juvenile individuals remain in this area by the end of the first year and the beginning of the second year, changing food and feeding habits (JUKIC, 1972).

All these changes are reflected upon the hake otoliths. During the first year of life period two to four not clearly distinct hyaline zones are formed round the otolith primordius. The last one is best developed and may be easily distinguished as a complete hyaline zone and is very likely indicative of the habitat change.

The following growth parameters were calculated: L_∞ = 92.83 cm total length, K = 0.097 and t_o = -0.692. Obtained values are slightly higher than those obtained earlier by ALEGRIA et al. (1982), but smaller than those calculated using the length at age data of ZUPANOVIC (1968). However, growth pattern was observed to differ between males and females coinciding with the different minimum body length at the onset of first maturity.

It was found that otolith length of males of 12-38 cm exceeded that of the females of 14-55 cm. However, if only juvenile and adolescent individuals are considered, the intervals of slow growth coincide to a certain extent. A possible explanation of these differences is that males grow slowly in comparison to females and that they have bigger otoliths than the same size females.

On the other hand, if the onset of first maturity of females occurs at older age than in the case or males, than the reproductive life of females is shorter. This problem should be accounted for by further and more detailed studies, especially the influence and relationship of the reproductive potential of spawning stock on recruit stock strength.

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