# AGE AND GROWTH OF COMBER, *SERRANUS CABRILLA* (L., 1758), IN THE THRACIAN SEA AND THE THERMAEKOS GULF (NORTHERN GREECE)

Chrissi-Yianna POLITOU and Costas PAPACONSTANTINOU

National Centre for Marine Research, Aghios Kosmas, 16604 Hellinikon, Greece

Comber *Serranus cabrilla* is a commercial fish with a disribution ranging from the North Atlantic Sea, up to the North Sea, to the Mediterranean Sea. It is a permanent hermaphrodite species. Aspects of its biology have been reported for the waters of Tunisia (BOUAIN, 1981, 1983), whereas no other references concerning the biology of the species exist. This paper deals with the age and growth of comber in greek waters, since the knowledge of growth parameters is of high importance in biology and fisheries studies.

Sampling was conducted seasonally between June 1992 and December 1993 using a commercial trawler towing a net with a cod-end of 16 mm mesh size (knot to knot). The fork length (FL) of the specimens collected ranged between 102 and 244 mm. The age was studied by otolith reading under reflected light. After counting the number of rings, the distance was measured from the focus to the distal edge of each annulus and to the otolith edge. A marginal increment analysis showed the formation of an annual ring during summer. The back-calculated lengths were fitted to the von Bertalanffy model using the nonlinear least square method.

Otolith reading showed that 8 age groups were present in our samples: 1 to 8. The 0 group was not captured by the gear. The relationship between body length (FL) and otolith radius (R) was expressed by a linear regression, which fitted the data well:

$FL = -18.05 + 4.40R$, $r^2 = 0.85$, N=469

The formula of FRASER (1916) and LEE (1920) was used to calculate the fish length at the time of the formation of each ring and the results obtained are shown in table 1.

| Age | N | FL (mm) observed | Back-calculated FL (mm) 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 33 | 112.7 (8.62) | 81.0 (10.16) | | | | | | | |
| 2 | 183 | 136.6 (12.83) | 78.1 (8.65) | 120.3 (10.40) | | | | | | |
| 3 | 141 | 158.9 (12.12) | 79.1 (9.51) | 122.1 (10.81) | 147.8 (11.23) | | | | | |
| 4 | 53 | 183.1 (9.33) | 80.9 (9.28) | 123.4 (9.81) | 150.9 (10.27) | 171.2 (9.77) | | | | |
| 5 | 25 | 196.7 (9.02) | 83.6 (11.67) | 127.6 (11.66) | 155.7 (10.67) | 174.4 (11.00) | 188.2 (10.16) | | | |
| 6 | 25 | 212.6 (13.61) | 85.1 (8.55) | 130.0 (8.43) | 157.5 (10.29) | 177.5 (10.67) | 193.4 (12.35) | 206.1 (13.16) | | |
| 7 | 7 | 217.6 (16.42) | 78.7 (7.60) | 123.5 (10.69) | 149.3 (11.14) | 169.6 (12.36) | 187.5 (13.38) | 201.4 (13.84) | 212.3 (15.62) | |
| 8 | 2 | 217.0 (8.00) | 73.1 (6.04) | 119.9 (12.28) | 149.8 (17.79) | 167.6 (15.39) | 181.3 (12.81) | 195.9 (9.21) | 206.5 (9.66) | 215.0 (10.03) |
| Mean FL/age | | | 79.6 | 122.3 | 150.3 | 173.2 | 190.1 | 204.5 | 211.0 | 215.0 |
| CL 95% | | | 0.87 | 1.03 | 1.44 | 2.06 | 3.13 | 4.60 | 11.28 | 30.49 |
| N | | | 469 | 436 | 253 | 112 | 59 | 34 | 9 | 2 |
| Mean annual increment | | | 79.6 | 42.7 | 28.0 | 22.9 | 17.0 | 14.4 | 6.5 | 4.0 |

Table 1. Mean observed and back-calculated lengths of *Serranus cabrilla* in northern Greece. In parentheses the standard deviation; N = number of fish examined CL 95% = 95% confidence limits.

The back-calculated lengths agreed reasonably with lengths at capture. Differences, such as larger mean observed than back-calculated length, are attributed to growth following mark formation or to recruitment of the larger specimens only for the first age group. Apparently back-calculated lengths did not display Lee's phenomenon.

The von Bertalanffy model applied for comber gave the following growth parameters: $L_\infty = 238.1$ mm, $K=0.3$, $t_0=-0.367$

The mean square error between back-calculated lengths and those estimated using the von Bertalanffy model was low (1.04) indicating a good fit of the model to the data.

The maximum length calculated for comber in northern Greece was lower than that obtained for the south-east coast of Tunisia, where older specimens (9 years old) were also found.

Finally the length (FL) - weight (W) relationship was computed and expressed by the following regression:

$$W = 0.0000521 \cdot FL^{2.725},\ r^2=0.90,\ N=665$$

**REFERENCES**

BOUAIN A., 1981. Les serrans (Téléosteens, Serranidés) des côtes sud de la Tunisie - Taille de première maturité, période de reproduction. *Cybium*, 5(4): 65-75.
BOUAIN A., 1983. Croissance linéaire des serrans des côtes sud-est de la Tunisie. Rapp. P.-V. Reun. CIESM, 28(5): 87-91.
FRASER C. McL., 1916. Growth of the spring salmon. *Trans. Pacif. Fish. Soc. Seattle*, for 1915: 29-39.
LEE R. M., 1920. A review of the methods of age and growth determination by means of scales. *Fishery Invest.*, Lond., Ser.II, 4(2): 32 pp.

# STOCK ASSESSMENT OF WHITING (*MERLANGIUS MERLANGUS EUXINUS* NORDMANN) ALONG BULGARIAN BLACK SEA COAST DURING 1976-1993

Kamen PRODANOV[1] and Georgy DASKALOV[2]

[1] Department of Marine Biology,Institute of Oceanology, Varna, Bulgaria
[2] Department of Ichthyology, Institute of Fisheries,Varna, Bulgaria

The catches of whiting are obtained with trapnets and also – it appears as bycatch – in the sprat fishery, with the bathypelagic trawl. All this embarrasses the correct determination of actual catches on account of which the whiting has always been considered as a poorly exploited fish (DOMASHENKO and SEROBABA, 1990). The largest catches have been realized by Turkey : the mean catch during 1981-1991 is 20.46 thousand tons. Length composition of these catches varied from 8-10 to 30-34 cm , while the Bulgarian catches ranged whitin 5-25 cm.

Whiting biomass during 1976-1993 was calculated by VPA (MESNIL, 1989) and Jones'length converted cohort analysis (LCOHORT) (SPARRE, 1987). The fishing efforts, respectively the values of Fst for sprat are according to IVANOV's (1989) and DASKALOV's (1993) data. As it was mentioned, the whiting catches are realized mainly as a bycatch in the sprat fishery. That's why we used the sprat values for Fst although the whiting is a demersal fish, while the sprat is a mudfish. Besides, the eldest age groups of whiting (5 and 6 years old) keep away from the shore in contrast to sprat whose fishery is going on in the coastal zone (20-40m depth). Having in mind all these differences, we consider that the assessment made have to examine as an attempt for determining the margin stock of whiting along Bulgarian Black sea coast.

In table 1, the results from VPA and LCOHORT are represented. It appears that assessments obtained by the above mentioned methods differ from one another mainly during 1990-1991. Accordig to VPA and LCOHORT analyses the initial and mean biomasses of whiting had varied from 27 273.6 tons (1976) to 10 893.4 tons (1988) and from 16 072.3 tons (1978-1979) to 2 554.1 tons (1990-1991), respectively. Having in mind the abundance of offspring, we consider that the assessments made by LCOHORT analysis reflect more correctly the actual state of whiting's stocks during the last 4 years. The sharp decrease of the whiting's biomass is due to the low abundant generations from 1987 to 1989. The increase of whiting's biomass after 1991 is conditioned by the streigth abundant generation of 1990 : more than 50 and 7 times in comparison with generations of 1987 and 1988, respectively.

ARKHIPOV and ROVNINA's (1990) data confirm the considerable decrease of the abundance of the generations after 1987, which comes to show that the natural reproduction of whiting was seriously disturbed between 1987-1989. The reasons for that are complex and are related to the significant alterations of the environment : the "blooms" of the phytoplancton were more frequent and more extensive. The food supply of the larvae and young fish was also subjected to rapid variations connected with the overall changes of the environment as well as with the mass development of the new ctenophore *Mnemia mccradyi*, which appears to be a vigorous competitor in relation to the small-size crustaceans from Copepoda and also presents itself as a predator on eggs and maybe fish larvae (ZAIKA, SERGEEVA, 1991).

Table 1. Initial (calculated by VPA) and mean biomasses (calculated by LCOHORT) of whiting along Bulgarian Black Sea coast (1976 - 1993)

| Years | $*B_{1\text{-}4+}$ | $*F_{1\text{-}4+}$ | $**B_{10\text{-}18+}$ | $**F_{10\text{-}18+}$ |
|---|---|---|---|---|
| 1976 | 27273.6 | 0.0628 | 12652.2 | 0.0997 |
| 1977 | 25281.6 | 0.0797 | 12652.2 | 0.0997 |
| 1978 | 25234.4 | 0.1219 | 16072.3 | 0.1161 |
| 1979 | 25104.2 | 0.1157 | 16072.3 | 0.1161 |
| 1980 | 21610.6 | 0.2451 | 12441.1 | 0.1946 |
| 1981 | 17861.1 | 0.2284 | 12441.1 | 0.1946 |
| 1982 | 15693.3 | 0.2703 | 10415.6 | 0.1945 |
| 1983 | 13469.7 | 0.1545 | 10415.6 | 0.1945 |
| 1984 | 14687.6 | 0.1497 | 10568.9 | 0.1557 |
| 1985 | 14632.4 | 0.1324 | 10568.9 | 0.1557 |
| 1986 | 13967.5 | 0.1137 | 6886.1 | 0.1511 |
| 1987 | 12760.9 | 0.1314 | 6886.1 | 0.1511 |
| 1988 | 10893.4 | 0.1230 | 6343.2 | 0.1245 |
| 1989 | 12100.6 | 0.0765 | 6343.2 | 0.1245 |
| 1990 | 14543.4 | 0.0253 | 2554.1 | 0.1113 |
| 1991 | 15399.6 | 0.0206 | 2554.1 | 0.1113 |
| 1992 | 15123.8 | 0.0427 | 6397.7 | 0.0690 |
| 1993 | 12813.5 | 0.0657 | 6397.7 | 0.0690 |

**B1-4+ - amount of the initial biomasses of the age groups from 1 to 4+ ;*F1-4+-the mean value of fishing mortality coefficient from 1 to 4+;**B10-18+-amount of the mean biomasses of length classes from 10 to 18+ cm; **F10-18+-the mean value of fishing mortality for length classes from 10 to 18 cm;*

**ACKNOWLEDGEMENTS**: the present study was partly supported by the Research Support Scheme of the Central European University, no:182\1041\91-92.

**REFERENCES**

ARKHIPOV, A.G and O.A.ROVNINA,1990. Liv. resources in Black sea, Moskow, 64-80
DASKALOV, G.1993. Rapport de DEA, Univ. Aix-Marseille II, OSU(COM)
DOMASHENKO, G.P and I.I.SEROBABA.1990. Liv. res. in Black sea, Moskow, 142-145
IVANOV,L.S.1989. *Hydrobiology*, Sofia, v.34, 68-89
MESNIL B.1987. IFREMER/RH, Nantes CEDEX 01, pp. 73
SPARRE P.1987. FAO Fish Tech. Rapp.101, Suppl.2
ZAIKA V.E and SERGEEVA N.G,1991. *Gidrobiol. jurnal*, 27, 2 : 15-19

V