REPRODUCTIVE BIOLOGY OF *DIPLODUS VULGARIS* (FAMILY SPARIDAE) IN THE SYRIAN COAST

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Abstract
In this work, results on the reproductive cycle, the length at first maturity, and hermaphroditism of *Diplodus vulgaris* in the coast of Syria are presented. The spawning period occurs from December to February, and the length at first maturity is 18 and 18.5 cm for females and males. This species is characterized by a rudimentary hermaphroditism, with sexual inversion taking place at 16-19 cm.
Keywords : Fishes, Reproduction, Mediterranean Ridge, Species Introduction.

Introduction
The Sparidae is one of the most important marine fish families that inhabit the Syrian Coast. *Diplodus vulgaris* is one of the most abundant species of the family, but its biology is not well known. The aim of this study is to describe the reproductive biology of *D. vulgaris*, including the spawning season, length at first maturity and hermaphroditism.

Materials and methods
Samples of *Diplodus vulgaris* were collected on a monthly basis with a commercial bottom trawler off the coast of Syria from November 1999 to March 2001.
The depth of sampling stations ranged from 5 to 50 m. A total of 435 specimens were collected. The maturity stage was determined using the gross sexual classification scale of Nikolsky [1]. The monthly evolution of GSI mean values and the proportion of spawning specimens during a period of 17 months were used to determine the spawning season. The size at first maturity (L_{50}), the size at which 50% of the individuals were mature, was estimated by fitting the logistic function (using non linear least squares regression):
$P=1/1+\exp[b(L-L_{50})]$
Lenght frequency distribution was used for calculating the length at sexual inversion.

Results and discussion
The mean values of GSI% ranged from 0.09% in June to 10.91% in January for females and from 0.05% in August to 4.52% in December for males.
Figure 1 shows that *D.vulgaris* is a winter spawner, with the highest GSI values occurring between December and the end of February for females, with a single annual spawning peak in January. The resting period clearly extends from April to the end of September.
Analysis of advanced maturity stages showed that females were in emission from December to the end of February, with the greatest percentage of females in maturity stage (V) in January. Males showed the same patterns as the females in terms of maturity stages. Nevertheless the presence of stage (V) males in December, with a single spawning peak in December, suggests earlier maturation for males.

The GSI values of the females throughout the year were larger than those for males. This is due to the fact that the eggs as the end product of ovogenesis in females are much heavier than spermatozoa or the end product of spermatogenesis for males, as noticed by ather authors for *D. sargus* [2].
However, the spawning period is different in the Mediterranean, occurring earlier in the North and West and later in the South and East [3-5], reflecting the differences in the environmental conditions in this region.

Length at first maturity was not significantly different between sexes (Hotelling's T^2 test, $p>0.05$), being 18 cm and 18.5 cm for females and males respectively, corresponding to 2 years of age. Therefore, an increase in the minimum legal length should improve the stock management and conservation of this species.

Histological examination of gonads in the present study indicated that *D.vulgaris* shows a rudimentary hermaphrodism, in addithion to the rate of individuals that developed directly as a primary females and primary males. We found that 32.16% of the individuals had both male and female tissue, and most often these gonads showed one sex as being more developed than the other, with higher average total length for the individuals with a more developed ovary. Females at the onset of development and with a small male part were found up to the beginning of the spawning season. Functional males under spermiation (stage V) with a reduced and developing female part were also found in January, during the spawning season.
In all hermaphrodite gonads the testis and ovary were clearly separated by connective tissue. Sexual inversion takes place at approximately 16-19 cm (2-3 years of age).
However the size or age at which sex reversal happens is not established genetically, and this may be dependent on demographic changes [6].

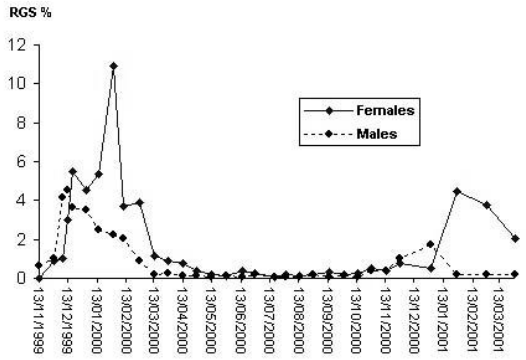

Fig. 1. The mean monthly gonadosomatic indices for females and males of *Diplodus vulgaris*, coast of Syria.

References

1 - Nikolskii G.V.,1963. The ecology of fishes .Academic press, London and New York, 352p.
2 - Zaki M. I., Baghdadi H.H., El-Gharabawy M.M. and El- Greisy Z.A., 2001.Reproductive biology of Diplodus sargus in the Mediterranean environment. *Rapp. Comm. int. Mer Medit*., 36: 336.
3 - Kentouri M. and Divanach P., 1982.Differences et similitudes dans la genese des comportment locomoteur et trophique des stades pre larvaires de *Sparus auratus*, *Diplodus vulgaris* et *Diplodus sargus*. *Aquaculture*, 27: 355-376.
4 - Bauchot M. L. and Hureau J. C., 1986. Sparidae. In fishes of the north eastern Atlantic and the Mediterranean. Eds: P. J. P. Whitehead, M. L.Bauchot, J. C. Hureau, J. Nielsen and E. Tortonese. Paris: UNESCO.PP 883-907.
5 - Ficher W., Bauchot M .L.and Achneider M.,1987. Identification des especes pour les besoins de la peche. (Rrvision I). Mediterranee et mer Noire. Zone de peche 37. vol.11.Vertebres. Fiches FAO, Rome: 761-1530.
6 - Buxton C.D. and Garrat P.A.,1990.Alternative reproductive styles in sea breams (pisces: Sparidae). *Env. Biol. Fish*., 28:113- 124.