

## MORPHOLOGICAL VARIABILITY AMONG POPULATIONS OF *DIPLodus VULGARIS*(PISCES, SPARIDAE) IN THE MEDITERRANEAN SEA

Beltrano A. M. <sup>1\*</sup>, A. Kallianiotis <sup>2</sup>, L. Cannizzaro <sup>1</sup>, M. Scalisi <sup>3</sup>, S. Vitale <sup>1</sup>, G. Bono <sup>1</sup>, P. Vidoris <sup>2</sup>, A. Milazzo <sup>1</sup>  
<sup>1</sup> IRMA-CNR, Mazara del Vallo, Italy - \* annamariabeltrano@hotmail.com  
<sup>2</sup> FRI-NAGREF, Greece  
<sup>3</sup> MIUR, Italy

### Abstract

Morphological differentiations among *Diplodus vulgaris* populations from Italy (Licata and Mazara) and Greece (Alexandroupolis, Nea Peramos and Stavros) were investigated using multivariate morphometric analysis. MANOVA and all pairwise contrasts among the populations revealed significant differences ( $P < 0.0001$ ). The Greek and Italian populations were discriminated, as showed by discriminant analysis and Mahalanobis distances.

**Key words:** *Diplodus vulgaris*, morphology, population discrimination

### Introduction

*Diplodus vulgaris* (Geoffroy Saint-Hilaire, 1817), lives in coastal waters, on rocky or sandy bottoms, down to a depth of 130 m. The common two-banded seabream constitutes an important resource of commercial and artisanal fishery in Sicily (Italy), the Thracian Sea (Greece), Adriatic Sea and Egypt (1; 2). The importance of identifying different populations and stocks is essential for managing this resource.

In this study we examined the variability of some morphometric characters of *Diplodus vulgaris*, from Italian and Greek fishing grounds, differing in prevailing environmental characteristics, in order to discriminate populations.

### Materials and methods

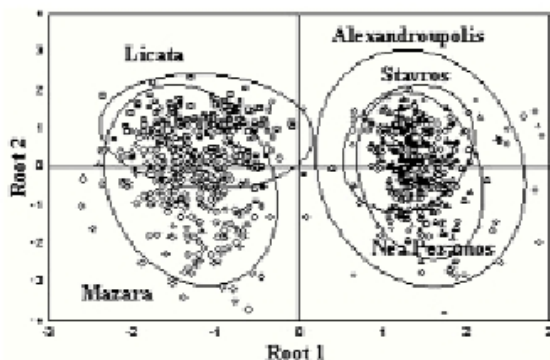
*Diplodus vulgaris* (N=868) were collected, of five localities of Italy (total length TL=95-304 mm; TL=80 mm) and Greece (TL=70-317 mm; TL=175 mm) by artisanal fishery, from October 1987 to September 1999.

Five morphometric measurements were recorded to the nearest 0.1 mm: Total length (TL), Fork Length (FL), Predorsal distance (EPrD), Anal distance (AD), and Maximum body depth (MxBD).

MANOVA was used to test differences among the areas, based on the mean values of the morphometric characters (log transformed). Discriminant Analysis was performed on logarithms of standardised data on a random sub-sample of equal sample size (N=110) (DA) and on a sub-sample of homogeneous size (TL=190-220 mm) (DA\*) to each investigated population. The importance of each variable was estimated by a canonical variables standardised coefficient. An unweighted pair-group medium averages (UPGMA) dendrogram was used, based on the Mahalanobis distances.

### Results

MANOVA presented a significant difference (Wilk's  $\lambda = 0.27$ ;  $F_{(20, 2750)} = 66.525$ ;  $p < 0.0001$ ). All pairwise contrasts among the five populations were highly significant ( $p < 0.0001$ ), except those between Alexandroupolis and Stavros ( $p < 0.01$ ). Canonical analysis indicated three discriminant significant ( $p < 0.0001$ ) functions (root). The first two cumulatively accounted for the 96.96 % of the explained variance (Fig. 1). The 1<sup>st</sup> root discriminated Greek from Italian populations.



**Fig. 1.** Discriminant analysis plot of five populations. The first root discriminates Greek from Italian populations.

The 1<sup>st</sup> root suggest that, with high FL and low TL values, probably the fish belongs to Greek populations (Table 1). The 2<sup>nd</sup> root discriminated mainly Licata and Alexandroupolis populations from the Nea Peramos and Mazara ones; if the values of MxBD and EPrD are high and AD and FL are low, probably the fish comes from the Licata or Alexandroupolis areas. Moreover, the DA\* showed that the size did not discriminate so much to cover the effects related to other morphological variables.

**Tab.1.** Discriminant analysis canonical roots of morphometric characters.

Characters	Root 1	Root 2	Root 3
TL	-2.65	-0.74	-1.37
FL	3.04	0.05	-0.01
EPrD	0.01	-0.22	-0.46
AD	0.15	0.14	0.11
MxBD	-0.11	-0.53	0.05
Classification percentage of population	83.56 %	96.96 %	100.00 %

The UPGMA showed two major groups the Greek and Italian populations. Specifically, the Alexandroupolis population was closer to Stavros, though Nea Peramos was geographically located between the two areas.

### Discussion

The applied methods highlighted that the Italian and Greek populations are morphometrically discriminated. Furthermore, the analysis indicated that the FL and TL values discriminated the two populations more than the other characters. Since phenotypic characters may reflect either genetic differences or environmental and ecological differences (3), we can consider the possibility that these populations show ecophenotypic variations. There are many environmental differences among the study areas. Particularly, the Sicilian coast is dominated by cold Atlantic currents that create a lower mean temperature (15.5 °C) (4) than in the Thracian Sea (21.3 °C) (5) and upwelling phenomena.

Moreover, distance among Greek populations, showed through the UPGMA, is likely due not to geographic distances, but to environmental differences. In fact, Evros and Strimonas rivers seem to determine similar habitats in Alexandroupolis and Stavros areas, respectively (5).

### References

- 1-Fischer W., M.L. Bauchot, M. Schneider, 1987. Fisches FAO d'identification des espèces pour les besoins de la pêche. Méditerranée et mer Noire. Zone de pêche 37. Vol.2. FAO, Rome, pp. 761-1530.
- 2-Wassef, E.A., 1985. Comparative biological studies of four *Diplodus* species (Pisces, Sparidae). *Cybius*, 9 (2): 203-215.
- 3-Vidalis, K., G. Markakis, N. Tsimenidis, 1997. Discrimination between populations of picarel (*Spicara smaris* L., 1758) in the Aegean Sea, using multivariate analysis of phenetic characters. *Fish. Res.*, 30: 191-197.
- 4-Picco, P., 1990. Climatological atlas of the western Mediterranean. ENEA. La Spezia.
- 5-Kallianiotis A., E. Koutrakis, A. Kokkinakis, 2000. Fisheries in the Kavala Prefecture. The current situation-tendencies and impacts on coastal areas. *TERRA-CMZ*:1-29.