Mediterranean Marine Science

Vol 9, No 2 (2008)

Preliminary biological data on Pomadasys incisus (Osteichthyes: Haemulidae) in the Aegean Sea, Greece

K. KAPIRIS, E. KALLIAS, A. CONIDES

doi: 10.12681/mms.132

Mediterranean Marine Science
Volume 9/2, 2008, 53-62

Preliminary biological data on *Pomadasys incisus* (Osteichthyes: Haemulidae) in the Aegean Sea, Greece

K. KAPIRIS, E. KALLIAS and A. CONIDES

Hellenic Centre of Marine Research, Institute of Marine Biological Resources,
P.O. Box 712, 19013, Anavissos, Attica, Hellas

e-mail: kkapir@ath.hcmr.gr

Abstract

The present paper gives, for the first time, some biological data concerning Pomadasys incisus in the Argolikos Gulf (C. Aegean Sea). The bastard grunt (Pomadasys incisus) is a thermophilic species well adapted in the above area, but the status of fishery suggests an overexploitation. The sex ratio was in favour of males. The length frequency distribution did not differ between the sexes. Growth in weight was estimated by means of the length-weight relationship. Reproduction seemed to take place in summer. Certain morphometric characters appeared to be useful while comparing populations among the different populations in the Mediterranean.

Keywords: Bastard grunt; Growth in weight; Maturity; Morphometry; Argolikos Gulf.

Introduction

Pomadasys incisus (Osteichthyes: Haemulidae) is a coastal demersal fish, whose common name is bastard grunt, and inhabits brackish or marine waters at depths of 10-100 m., mainly up to 50 m. It is found in the E. Atlantic, from the Spanish coast (MATA *et al.,* 2008) to Angola, the Canary Islands and the Cape Verde Islands, while it has been also reported in the W. and E. Mediterranean (BAUCHOT & HUREAU, 1990; PASTOR *et al.,* 2004). Several references exist on the distribution of this species in the Mediterranean: along the southern Spanish and French coasts (MOREAU, 1891), in the Ligurian (GAVAGNIN *et al.,* 1994), Tyrrhenian (SERENA & SILVESTRI, 1996) and Egyptian Seas (El MOR *et al.,* 2002) and in the Gulf of Tunis (FEHRI-BEDOUI & GHARBI, 2008). Although it has a wide geographic distribution, due to its low commercial value its biology has not been studied extensively on an international level. The only bibliographic reports that exist on the biology of the species are those of PAJUELO *et al.* (2003a, b) from the Canary Islands, where the discarded

demersal species are most abundant, and those of FEHRI-BEDOUI & GHARBI (2008) and CHAKROUN-MARZOUK & KTARI (2006) from the Gulf of Tunis.

In Greek waters the only report on its presence is that of KASPIRIS (1970), in the Ionian Sea. According to this study only one specimen (SL=151 mm) was caught close to Lefkas island (Ionian Sea) by a common commercial trawler at about 100 m depth. Its phenotypic characters have been described in detail. In the Argolikos Gulf the species is known as 'snorer' due to the audible noises it makes when caught. In the last few years it has been caught only in the region of Kiveri-Xeropigado (NW Gulf) with trammel nets of 28-30 mm mesh and with long lines, using small crayfish as bait. In general, there is no available fishery information about this species in Greece. According local fishermen, the bastard grunt was very abundant in the whole of the Argolikos Gulf until 50-60 years ago, but nowadays its numbers has fallen dramatically (1-2 kilos/fishing travel). It is caught mainly during the August-October period, at depths of up to 20 m, on coralligeneous or gravel bottoms.

The ecological role of the bastard grunt in the ecosystems is important, since it could be considered as an indicator of changing marine conditions towards 'tropicalisation' (BRADAÏ *et al.,* 2004). Temperature changes are reflected in substantial changes in its relative abundance and this thermophilic species is frequently reported amongst the 'cold biota' of the northern Mediterranean (SERENA & SILVESTRI, 1996; PASTOR *et al.,* 2004).

The present study constitutes the first attempt to provide information on the biology and ecology of this rather rare species in the northeastern Mediterranean. Outcomes of this study can also contribute to the management of the bastard grunt population in the Argolikos Gulf. Additionally, certain morphometric characters analysed herein may be proved helpful in future comparisons aimed at distinguishing populations coming from different marine regions.

Material and Methods

The samples (39 individuals) were collected in the region of Kiveri (Argolikos Gulf) (Fig. 1), in the period May-August 2008, within the framework of the project *'Study of the fishing viability of the Argolikos Gulf'* (Operational Programme for Fisheries Sector 2000-2006). The individuals were caught with a trammel net of 32-36 mm mesh (stretched) at a 10-15 m depth and they were kept frozen. In each specimen the sex, the stage of maturity – macroscopically, according to the NIKOLSKII scale (1976)- were determined and the body weight (BW) was also recorded. The sex ratio was calculated according to the formula: (M/M+F)*100, where M: males and F: females. Moreover, 22 morphometric characteristics (Fig. 2) were measured as follows: AB: total length (TL), AG: fork length (FL), AD: standard length (SL), RL: maximum body width (MAW), EZ: minimum body width, caudal peduncle (MIW), AH: pre-dorsal length (PL), HX: height of dorsal fin (HDF), MN: height of anal fin (HAF), IS: height of pectoral fin (HPF), QK: height of pelvic fin (HPEF), HP: length of dorsal fin's base (spines) (FSB), OP: length of dorsal fin's base (soft rays) (FRB), NJ: length of anal fin's base (ANB), AW: length of head (LH), YT: eye diameter (ED), AY: pre-

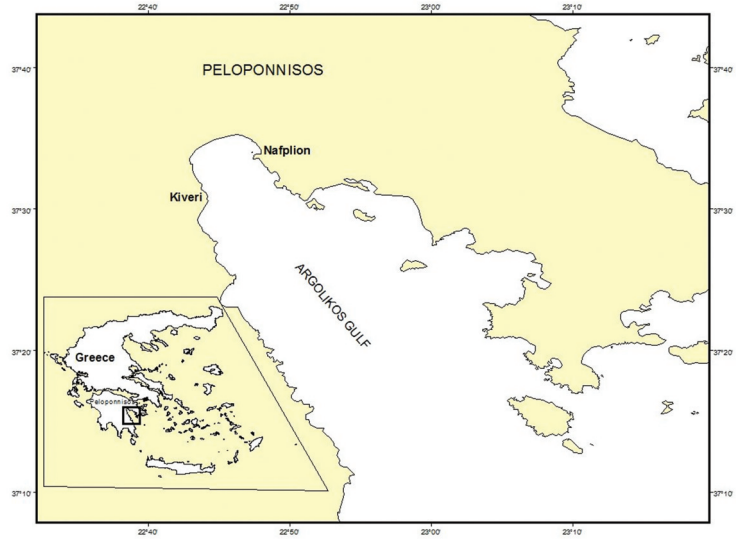

Fig. 1: Sampling area of *Pomadasys incisus* in the Argolikos Gulf.

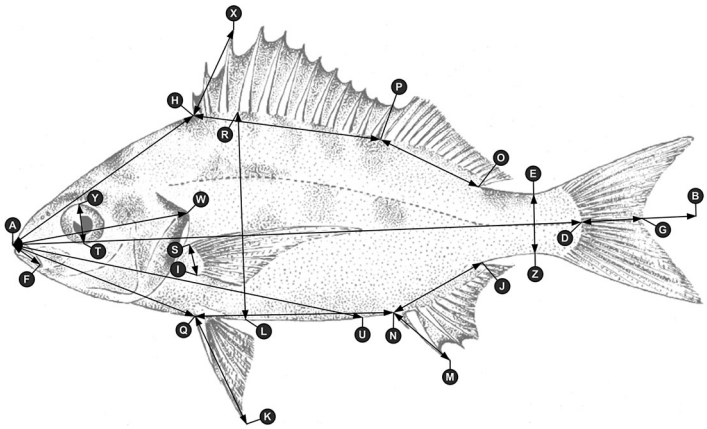

Fig. 2: Morphometric features of *Pomadasys incisus* selected for the study. See text for abbreviations.

orbital distance (POD), AF: mouth length (ML), AQ: snout-pelvic fin distance (SPF), AS: snout-pectoral fin distance (SPEF), AU: snout-anal distance (SA), AN: snout-anal fin distance (SAF), Distance between eyes (EDI).

The relation between each morphological dimension (Y) vs (X) - body total length (TL) or the length of head (LH) - was studied using the multiplicative model $Y = a*X^b$, where a, b the regression constants. Data were log-transformed to better satisfy the assumptions of regression analysis (SOKAL & ROHLF, 1981). The type of allometry was established by testing the slope (b) of the obtained regression equations against isometry (Ho: b=1 or 3 for

length-weight) applying the Student's t-test. The length-weight relationship was calculated according to the equation $BW=a*(TL)^b$, where a=constant and b=slope of the line. The significance of the relationships among the parameters was examined using the Analysis of Variance. The Mann-Whitney test was applied as a non-parametric test to compare independent samples, at 95.0% confidence level (SOKAL & ROHLF, 1981).

Results

Of the 39 individuals caught during the survey, 15 were female, 23 were male and one unidentified; the ratio between the two sexes was 2:3. Males varied from 140 to 267 mm of total length and weighed from 36 to 228 g. Females' length varied between 145 and 249 mm and body weight between 42 and 231 g. Mean total length and body weight of the females (219.2±26.43 mm, 159.86±53.48 g) did not differ significantly from those of the males (222.6±29.22 mm, 160.65±50.62 g) (Mann-Whitney test, P>0,05, in both cases) (Fig. 3).

The percentage of immature and mature males and females of *P. incisus* is given in Fig. 4. The sampling period coincided, partly at least, with the period of the bastard grunt's reproduction in the study area, since maturity stages V (spawning) and VI (spent) were increased in both sexes; mature females (stages IV, V, VI) were 22%, 26% and 17 % of the total number of females and mature males were 27%, 53% and 7% of the total number of males respectively. Immature females and males (Stage II) were 13% and pre-mature females (Stage III) were 22%. The smallest mature female, belonging to the Stage V, had a total length of 196 mm. The smallest mature male, belonging to the Stage IV, had a total length of 223 mm. 15% of the specimens caught had smaller total lengths than those of the smallest mature individuals. Juvenile specimens (Stage I) were not collected.

Mean values along with their stan-

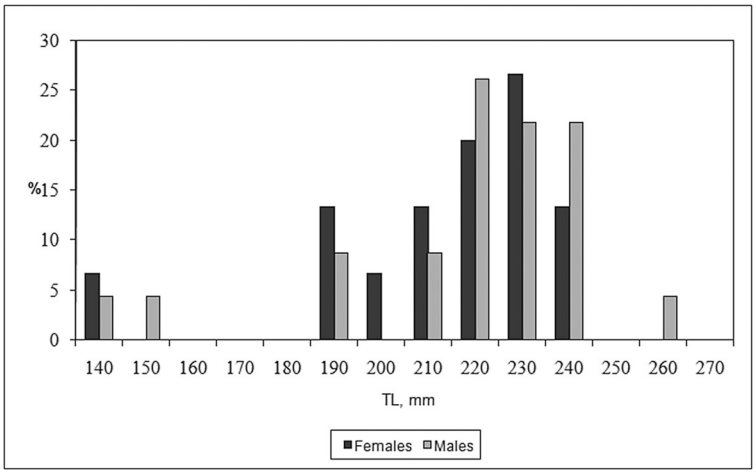

Fig. 3: Length frequency distribution per sex of *Pomadasys incisus* caught in the Argolikos Gulf.

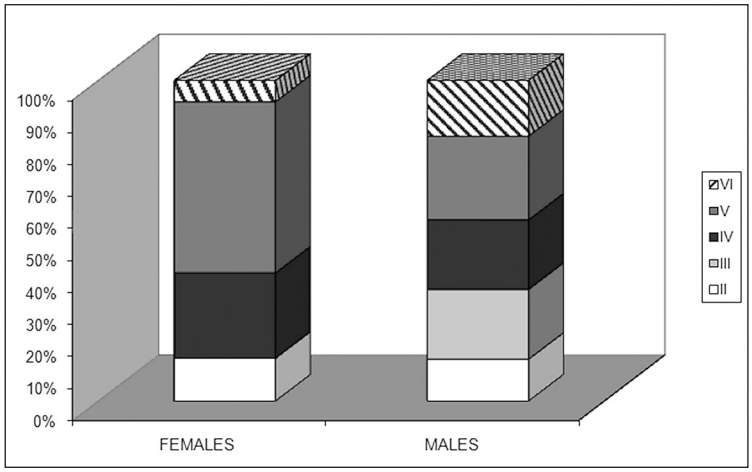

Fig. 4: Maturity stages per sex of *Pomadasys incisus* caught in the Argolikos Gulf.

dard deviation for each morphometric character are given in Table 1. Fork length (SL) was 92% of the total length (TL), the standard length (SL) 81% of TL, the maximum body width (MAW) 29% of, TL the minimum body width, caudal peduncle (MIW) 8% of TL, the pre-dorsal length (PL) was 35% of TL, the height of dorsal fin (HDF) 11% of TL, the height of anal fin (HAF) 12% of TL, the height of pectoral fin (HPF) 23% of TL, the height of pelvic fin (HPEF) 15% of TL, the length of dorsal fin's base (spines) (FSB) 24% of TL, the length of dorsal fin's base (soft rays) (FRB) 18% of TL, the length of anal fin's base (AB) 14% of TL, the snout-pelvic fin distance (SPF) 31% of TL, the snout-pectoral fin distance (SPEF) 27% of TL, the snout-anal distance (SA) 51% of (TL), the snout-anal fin distance (SAF) 56% of TL. Moreover, on the other hand, the eye diameter (ED) was 26% of length of head (LH), the pre-orbital distance (POD) 33% of LH, the mouth length (ML) 26% of LH, the distance between eyes (EDI) 36% of LH.

The equations referring to the relative growth of each morphometric character in relation to Total Length (TL) or to Length of the Head (LH), are given in Table 2. In the same table the correlation coefficient (r) and the type of allometry are included as well as a comparison of the slopes of the regression lines. For all the variables regressions were statistically significant (ANOVA, $P<0.01$). In all cases the correlations were strong, since the correlation coefficient (r) was high (Table 2). Almost all the characteristics examined seemed to grow isometrically in relation to total length. The dorsal fin's (height, length of spines) and the anal fin's length presented a negative allometry, while the snout-anal distance and the snout-anal fin distance grew faster than total length (positive allometry). The eye's diameter, the pre-orbital distance and the mouth length showed that they grew either faster or at the same rate as the length of the head.

The total length-weight relation-

Table 1
Mean and standard deviation (S.D.) of *Pomadasys incisus* measurements in the Argolikos Gulf (C. Aegean).

Measurement	Mean	S.D.	Measurement	Mean	S.D.
TL	218.12	32.98	ANB	29.53	5.54
SL	200.61	31.64	LH	56.94	9.18
FL	176.82	28.02	ED	14.74	2.37
MAW	63.77	10.90	POD	18.59	3.60
MIW	17.86	2.93	ML	14.75	3.03
PL	75.46	20.36	SPF	66.72	10.58
HDF	24.50	3.66	SPEF	59.15	9.36
HAF	26.41	5.97	SA	111.41	18.18
HPF	50.88	8.79	SAF	121.44	19.24
HPEF	33.80	5.85	EDI	20.63	4.32
FSB	53.27	8.99	BW	156.56	55.62
FRB	38.63	6.61			

TL: total length, SL: standard length, FL: fork length, MAW: maximum body width, MIV: minimum body width, PL: pre-dorsal length, HDF: height of dorsal fin, HAF: height of anal fin, HPF: height of pectoral fin, HPEF: height of pelvic fin, FSB: length of dorsal fin's base (spines), FRB: length of dorsal fin's base (soft rays), ANB: length of anal fin's base, LH: length of head, ED: eye diameter, POD: pre-orbital distance, ML: mouth length, SPF: snout-pelvic fin distance, SPEF: snout-pectoral fin distance, SA: snout-anal distance, SAF: snout-anal fin distance, EDI: distance between eyes, BW: body weight.

ship is given by the equation $BW=0.000005*TL^{3,18}$, (r=0,98). The value of the exponent suggests that in the bastard grunt of the Argolikos, body weight increased faster as compared to body length, yielding fish heavier for their size.

Discussion

The sex-ratio of the bastard grunt in the Argolikos Gulf was in favor of males, during the whole study period. The Canary Islands population sex ratio did not statistically differ from 1:1 and, as in our case, both sexes showed the same size range (PAJUELO *et al.,* 2003a, b). In the Gulf of Tunis, the sex-ratio was balanced between males and females in all size classes (FEHRI-BEDOUI & GHARBI, 2008). Conversely, in another study in the same area, a sex ratio in favour of females was estimated (CHAKROUN-MARZOUK & KTARI, 2006).

In Tunisia the spawning of *P. incisus* took place throughout the year (FEHRI-BEDOUI & GHARBI, 2008), but in the Canarian archipelago this period is more limited, mainly from August to October (PAJUELO *et al.,* 2003a; BEN-TUVIA & McKAY, 1986). The lack of seasonal data from the Argolikos Gulf does not allow a thorough observation of the reproductive pattern followed by the species in the particular area. Nevertheless, the increased presence of individuals with gonads in Stages V and VI suggested that this species spawns there, at least during summer months. The minimum total length of mature individuals

Table 2
Allometry of the body parts of *Pomadasys incisus* in the Argolikos Gulf (C. Aegean). r=correlation coefficient. t=Student's t test

Measurement	Relationship	Allometry	r	t
In relation to the Total Length (TL)				
SL	LogSL=-0.11+1.03log TL	Isometry	0.99	1.52
FL	Log FL =0.03+0.94log TL	Isometry	0.92	-0.98
MAW	Log MAW =-0.70+1.07log TL	Isometry	0.95	1.15
LH	Log LH =0.67+1.03log TL	Isometry	0.97	1.82
MIW	Log MIW =-1.10+1.00log TL	Isometry	0.92	0
PL	Log PL =-0.69+1.09log TL	Isometry	0.80	0.68
HDF	Log HDF =-0.53+0.82log TL	Negative	0.89	-2.54
HAF	Log HAF =-0.99+1.03log TL	Isometry	0.76	0.21
HPF	Log HPF =-0.75+1.05log TL	Isometry	0.94	0.82
HPEF	Log HPEF =-0.72+0.96log TL	Isometry	0.90	-0.78
FSB	Log FSB =1.82+0.54log TL	Negative	0.91	-5.71
FRB	Log FRB =-0.73+1.05log TL	Isometry	0.94	0.70
ANB	Log AB =-0.37+0.72log TL	Negative	0.71	-2.30
SPF	Log SPF =-1.10+1.00log TL	Isometry	0.92	0
SPEF	Log SPEF =-0.54+0.92log TL	Isometry	0.97	-0.25
SA	Log SA =-0.40+1.05log TL	Positive	0.98	2.53
SAF	Log SAF =-0.36+1.05log TL	Positive	0.99	2.53
In relation to the Length of Head (LH)				
ED	Log ED =0.64+1.47log LH	Positive	0.84	2.88
POD	Log POD =0.52+1.56log LH	Positive	0.95	6.95
ML	Log ML =0.51+1.47log LH	Positive	0.84	2.88
EDI	Log PSL =0.70+1.11log LH	Isometry	0.72	-1.65

TL: total length, SL: standard length, FL: fork length, MAW: maximum body width, MIV: minimum body width, PL: pre-dorsal length, HDF: height of dorsal fin, HAF: height of anal fin, HPF: height of pectoral fin, HPEF: height of pelvic fin, FSB: length of dorsal fin's base (spines), FRB: length of dorsal fin's base (soft rays), ANB: length of anal fin's base, LH: length of head, ED: eye diameter, POD: pre-orbital distance, ML: mouth length, SPF: snout-pelvic fin distance, SPEF: snout-pectoral fin distance, SA: snout-anal distance, SAF: snout-anal fin distance, EDI: distance between eyes, BW: body weight.

of the present study was higher than that found in the Canarian Archipelago (156 mm, PAJUELO *et al.,* 2003a).

Total catches of the bastard grunt are unknown, but according to fishermen operating in the Argolikos Gulf in the last few decades, the stock is heavily overexploited there, since it constitutes one of the discarded by-catch species in a fishery targeting mullets and hake. Moreover, the fact that 15% of individuals caught in the present study had a smaller length than that of the smallest mature specimen, possibly suggests that part of the exploited stock comprises individuals that have not reached sexual maturity, which might also have a negative impact on the bastard grunt population status in the area.

Comparing anatomical features of organisms has been a central topic of biological studies for many years. Taxonomic classification and gaining insight into issues related to the diversity of biological life have historically been based on descriptions of morphological forms (DEAN *et al.,* 2004). In fish, morphometric characters represent one of the most important tools for studying their systematic ontogeny, growth variability, ontogenetic study and/or various demographic parameters (KOVÁČ & COPP, 1999). In the Argolikos' bastard grunt most body parts grew isometrically to total length. These characters (SL, FL, MAW, MIW, PL, HAF, HPF, HPEF, FRB, SPF, SPEF) could be used in future taxonomic and/or comparative studies with other populations of the same species. On the other hand, the diameter of its eye (ED), the pre-orbital distance (POD) and the mouth length (ML) show that these increase more rapidly than the length of the head and only the distance between the eyes (EDI) increased isometrically to it.

The value of the slope (b=3.18) of the length-weight relationship is included in the range where 50% of the Greek fish fluctuated. (STERGIOU & MOUTOPOULOS, 2001). A positive allometry of the somatic weight has been also observed in the Gulf of Tunis (3.07) (CHAKROUN-MARZOUK & KTARI, 2006). In contrast to this positive allometric growth, the only known values of b in the literature come from Cape Verde Islands (2.49) (MAGNUSSON & MAGNUSSON, 1987), from S.E. Turkey (2.60) (CAN *et al.,* 2002), and from the Atlantic Spanish coast (2.96) (MATA *et al.,* 2008), indicating that in these regions the species exhibits a negative allometric growth. Many factors, such as season, gonads maturity, diet, stomach fullness and type of habitat play a role in the configuration of the relation of length-weight in a fish (BAGENAL & TESCH, 1978). It is worth noting that during the sampling period most of the individuals were in an advanced stage of maturity; this might have had an impact on the weight measurements.

The present work provides for the first time important information relating to certain biological aspects of the bastard grunt in the Argolikos Gulf. In spite of its tropical origin *P. incisus* seems to have found favourable conditions for its reproduction in the Argolikos Gulf. However, the small number of specimens/samples suggests that this effort could constitute a reference to be used in future studies, while further research is required to elucidate various biological and ecological aspects of this species.

Acknowledgements

The authors are grateful to Mr. Varvouletos for supplying the samples and Mr. Kavvadas for his technical support. We also thank Mrs. Linda Kiousi for her linguistic assistance.

References

BAGENAL, T.B. & TESCH, F.T., 1978. Age and growth. p. 101-136. In: *Methods for Assessment of fish production in fresh waters,* T.Bagenal (Ed.), Oxford, Blackwell Scientific Publications.

BAUCHOT, M.L., HUREAU, J.C., 1990. Haemulidae. p.786-787. In: *Check-list of the fish of the eastern*

tropical Atlantic, J.C.Quero, J.C.Hureau, C.Karrer, A.Post & L.Saldanha (Eds), Paris, France, UNESCO.

BEN-TUVIA, A. & McKAY, R., 1986. Haemulidae. p. 858-864. In: *Fishes of the north-eastern Atlantic and the Mediterranean,* volume 2, P.J.P.Whitehead (Ed), M.L.Bauchot, J.C.Hureau, J.Nielsen and E.Tortonese, Paris, France, UNESCO.

BRANDAÏ, M.N., QUIGNARD, J.P., BOUAIN, A., JARBOUI, O., OUANNES-GHORBEL, A., BEN ABDALLAH, L., ZAOUALI, J. & BEN SALEM, S., 2004. Ichthyofaune auchtone et exotique des côtes tunisiennes: recensement et biogéographie (Autochtonous and exotic fish species of the Tunisian coasts. Inventory and biogeography). *Cybium,* 28(4): 315-328.

CAN, M.F., BAŞUSTA, N. & ÇEKIÇ, M., 2002. Weight-length relationships for selected fish species of the small-scale fisheries off the South Coast of Iskenderun Bay. *Turkish Journal of Veterinary and Animal Science,* 26: 1181-1183.

CHAKROUN-MARZOUK, N. & KTARI, M-H., 2006. Caractéristiques de la reproduction et de la croissance pondérale relative de *Pomadasys incisus* (Haemulidae) du golfe de Tunis. *Cybium,* 30(4): 333-342.

DEAN, C.A., RHOLF, F.J. & DENNIS, E.S., 2004. Geometric morphometrics: Ten years of progress following the revolution. *Italian Journal of Zoology,* 71: 5-16.

EL MOR, M., EL-ETREBY, S. & SAPOTA, M.R., 2002. Species composition and size structure of beach seine by-catches in Port-Said fishing harbour. *Egyptian Oceanological Studies,* 31(3-4): 31-43.

FEHRI-BEDOUI, R. & GHARBI, H., 2008. Sex-ratio, reproduction and feeding habits of *Pomadasys incisus* (Haemulidae) in the Gulf of Tunis (Tunisia). *Acta Adriatica,* 49(1): 5-19.

GAVAGNIN, P.S., GARIBALDI, F. & RELINI, M., 1994. Occurrence of *Pomadasys incisus* (Bowdich) (Osteichthyes, Haemulidae) in Italian waters. *Biologia Marina Mediterranea* 1(1): 285-286.

KASPIRIS, P., 1970. Presenza di *Pomadasys incisus* (Bowd.) nelle acque della Grecia (Pishes Percoidei). *Doriana* IV, 192: p. 3.

KOVÁČ, V. & COPP, G.H., 1999. Morphometry of the stone loach *Barbatula barbatula* (L.). Do metric characters reflect the species' life history thresholds? *Environmental Biology of Fishes,* 56: 105-115.

MOREAU, E., 1891. Histoire naturelle des Poissons de la France (Natural history of the fishes of France). Histoire des Poissons de France Supplémentaire, 1-144.

MAGNÚSSON, J. & MAGNÚSSON, J.V.V., 1987. ICEDA/Cape Verde Islands Fisheries Project. Survey of demersal fish resources in the waters off Cape Verde Islands. IV. Report: summary of information on species. Icelandic International Development Agency/Marine Research Institute, 114 pp.

MATA, A.J, MORALES, J. & MARQUEZ, L., 2008. Weight-length relationships for 26 demersal fish species of the Spanish South-Atlantic coastal waters. Journal of Applied Ichthyology, 24(3) : 330-333.

NIKOLSKII, G.V., 1963. *The ecology of*

the fish. Academic Press, London.

PAJUELO, J.M., LORENZO, J.M. & GREGOIRE, M., 2003a. Age and growth of the bastard grunt (*Pomadasys incisus:* Haemulidae) inhabiting the Canarian archipelago, Northwest Africa. *Fishery Bulletin* 101: 851-859.

PAJUELO, J.M., LORENZO, J.M., GREGOIRE, M., DOMÍNGUEZ-SEOANE, R., 2003b. Life history of *Pomadasys incisus* (Osteichthyes: Haemulidae) in the Canarian Archipelago. *Scientia Marina,* 67(2): 241-248.

PASTOR, J., ASRUCH, P., PRATS, E., DALIAS, N. & LENFANT, P., 2008. Premières observations en plongée de *Pomadasys incisus* (Haemulidae) sur la côte catalane française. *Cybium,* 32(2) : 185-186.

SERENA, F. & SILVESTRI, R., 1996. First record of *Pomadasys incisus* (Haemulidae) in the Northern Tyrrhenian Sea. *Cybium,* 20(4); 409-414.

SOKAL, R.R. & ROHLF, F.J., 1981. *Biometry* (W.H. Freeman and company, New York), 859 pp.

STERGIOU, K. & MOUTOPOULOS, D.K., 2001. A review of length-weight relationships of fish from Greek marine waters. *Naga,* The ICLARM, 24(1-2): 23-39.

Submitted: October 2008
Accepted: November 2008
Published on line: December 2008