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MORPHOMETRIC RELATIONSHIPS AND ANNUAL GONAD INDEX OF THE EDIBLE SEA URCHIN *PARACENTROTUS LIVIDUS* FROM NORTH WESTERN SARDINIA

RELAZIONI MORFOMETRICHE E INDICE GONADICO ANNUALE DEL RICCIO DI MARE COMMESTIBILE PARACENTROTUS LIVIDUS *NEL NORD OVEST SARDEGNA*

Abstract - *Weight/diameter, weight/height and height/diameter morphometric relationships were calculated for a shallow rocky* Paracentrotus lividus *population sampled monthly near Alghero (Italy) from November 2004 to October 2005. Gonad index (GI) of the sea urchins was also evaluated. Statistical analyses showed significant differences of GI between 2 distinct periods of the year: late fall-winter and spring-late summer.*

Key-words: *sea urchin, morphometry,* Paracentrotus lividus*, Mediterranean Sea, Sardinia.*

Introduction - Due to the high commercial value of its gonads, the edible sea urchin *Paracentrotus lividus* (Lamarck) is commonly harvested in several Mediterranean countries (Boudouresque & Verlaque, 2001 and references therein). In Sardinia (Italy), although the fishing of this species is regulated by a regional decree (D.A. n.270 dated 03.03.1994 and subsequent amendments), shallow rocky reef populations of *P. lividus* are heavily exploited by authorised fishermen as well as occasional collectors throughout the year. Given the economic importance of this species, the present study was aimed at providing baseline data on some morphometric features of legal-sized edible sea urchins on the north western Sardinian coast.

Materials and methods - Commercial-sized *Paracentrotus lividus* specimens were sampled monthly in a shallow rocky area near Alghero (NW Sardinia) from November 2004 to October 2005. In each sampling 100 individuals were collected by SCUBA divers between 2 and 4 m depth. In the laboratory, morphometric characters like diameter (D, perpendicular to the oral-aboral axis) and height (H, oral-aboral axis) of the test without spines of each sea urchin were measured to the nearest 0.1 mm using a digital calliper. All the aforementioned measurements were always carried out by the same experimenter to improve accuracy. Total wet weight (W) of each specimen was recorded to the nearest 0.1 g by means of an electronic balance after draining residual water on absorbent paper for 10 minutes. Subsequently, the sea urchins were dissected and, after sex determination, gonad wet weight was recorded to the nearest 0.01 g to calculate the gonad index (GI) as follows: GI=(wet weight of gonads/wet body weight) $\times$100 (Lawrence *et al.*, 1965). One-way ANOVA was used to test for differences among the GI monthly values obtained. Data were tested for homoscedasticity by Cochran's C test prior to analysis (Underwood, 1997). Weight/diameter, weight/height and height/diameter allometric relationships (i.e. $W=aD^b$, $W=aH^b$, and $H=aD^b$) were first computed separately for males and females. After linearization, they were then compared using ANCOVA (Sokal & Rohlf, 1995) to detect putative differences between sexes.

Results - Of the 1,200 commercial-sized (D=47.6$\pm$3.6 mm) *Paracentrotus lividus* specimens examined, females accounted for 52.5% (630 individuals), males for 46.8%

(562), while only 0.7% (8) were undetermined. Since ANCOVA did not detect any significant differences between sexes for all the computed regressions, the following equations obtained by pooling male and female measurements were validated: $W=0.0032D^{2.479}$ (r=0.92); $W=0.5396H^{1.417}$ (r=0.77); and $H=0.4252D^{1.035}$ (r=0.72). The mean GI monthly value (4.32±1.80) was lowest in December (2.78) and highest in April (5.62). One-way ANOVA performed on GI values detected significant differences between months ($F=33.69$, $p<0.0001$). A Student-Newman-Keuls post-hoc comparison test indicated significant differences between 2 groups of observations: the first, consisting of late fall and winter months (i.e. from November to February), with lower mean GI values; and the second, consisting of spring and late summer months (i.e. from March to October), characterized by higher mean GI values.

Conclusions - The allometric relationships we detected were quite different from those reported at about the same latitude (Catalonia, Spain) by Ballesteros (1981). Nevertheless, it is worth noting that to calculate the regression functions this author examined only 100 large specimens (D=58.6±4.8 mm). As far as the annual GI is concerned, our results were consistent with those reported by Fenaux (1968) from Villefranche-sur-Mer (France), while only partially in agreement with those reported by Lozano *et al.* (1995) from the Catalonian coast (Spain). However, *P. lividus* GI values may fluctuate from one year to another (Byrne, 1990), and also vary between neighbouring localities (Boudouresque & Verlaque, 2001). Further research for longer periods covering a wider area is thus needed to confirm our preliminary results.

References

BALLESTEROS E. (1981) - Algunos datos biométricos de *Paracentrotus lividus* (Lmk.), *Arbacia lixula* (l.) y *Sphaerechinus granularis* (Lmk.) (Echinodermata, Echinoidea). *Oecol. Aquat.*, **5**: 227-231.

BOUDOURESQUE C.F., VERLAQUE M. (2001) - Ecology of *Paracentrotus lividus*. In: Lawrence J.M. (ed), *Edible sea urchins: biology and ecology*. Elsevier, Amsterdam: 177-216.

BYRNE M. (1990) - Annual reproductive cycles of the commercial sea urchin *Paracentrotus lividus* from an exposed intertidal and a sheltered subtidal habitat on the west coast of Ireland. *Mar. Biol.*, **104** (2): 275-289.

FENAUX L. (1968) - Maturation des gonades et cycle saisonnier des larves chez *A. lixula*, *P. lividus* et *P. microtuberculatus* (Echinides) a Villefranche-sur-Mer. *Vie Milieu*, **19**: 1-52.

LAWRENCE J.M., LAWRENCE A.L., HOLLAND N.D. (1965) - Annual cycle in the size of the gut of the purple sea urchin, *Strongylocentrotus purpuratus* (Stimpson). *Nature*, **205** (4977): 1238-1239.

LOZANO J., GALERA J., LÓPEZ S., TURON X., PALACÍN C., MORERA G. (1995) - Biological cycles and recruitment of *Paracentrotus lividus* (Echinodermata: Echinoidea) in two contrasting habitats. *Mar. Ecol. Prog. Ser.*, **122** (1-3): 179-191.

SOKAL R.R., ROHLF F.J. (1995) - *Biometry: the principles and practice of statistics in biological research*. 3rd edition. W.H. Freeman and Company, New York: 887 pp.

UNDERWOOD A.J. (1997) - *Experiments in Ecology. Their logic design and interpretation using analysis of variance*. Cambridge University Press, Cambridge: 504 pp.