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Reproductive Biology of the Females of *Nephrops norvegicus* in the Northern Tyrrhenian Sea

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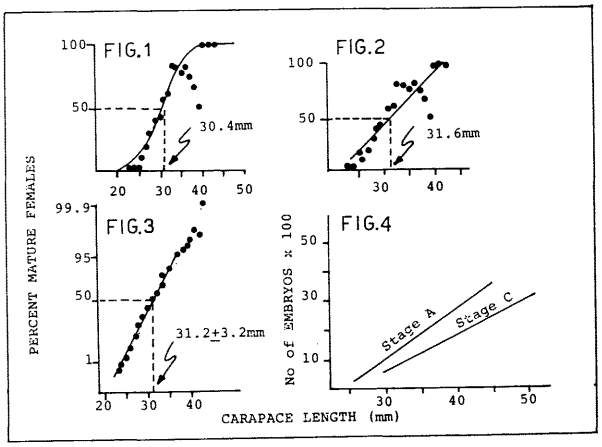
During research trawl surveys carried out in the Northern Tyrrhenian Sea, between the Isles of Elba and Giannutri, data on the reproductive biology of the females of N. norvegicus were collected. Here we report the results from the analysis of the data gathered in 1986/87.

Range size. The carapace length (CL) ranged between 10 and 55 mm. The CL seasonal frequency distributions were essentially unimodal with modal class between 27 and 33 mm CL. Size at sexual maturity. Size at 50% maturity was estimated, on samples caught at September 1986, using three methods: a) fitting the logistic equation, by using non-linear least squares, to percentage of the data classified as mature females by size (DRAPER & SMITH, 1981) (Fig. 1); b) by regressing CL on the percentage of mature females by size (WATSON, 1969) (Fig. 2); c) using a probability paper, on which cumulative percentage of mature females is shown for each size class (WENNER et al., 1974) (Fig. 3). Mature females were considered both those with dark green ovaries and ovigerous ones. All the three methods gave similar estimates of the size at 50% maturity. Our estimates of the size of sexual maturity are similar to those known for other areas of the Mediterranean Sea (FROGLIA & GRAMITTO, 1981; ORSI RELINI & RELINI, 1989). The slight differences among authors could arise either from having included, among mature females, specimens in different maturity stages or from having fitted the logistic curve by different methods. Spawning season. Most mature females spawn yearly. Females with mature ovaries (green and dark green) predominated in late spring catches and were found up to December. Most females with embryos, in agreement with the observations of FROGLIA & GRAMITTO (1981) for the Adriatic Sea, were present from August to February but single specimens were observed up to late Spring (May). Moulting frequency. Moulting of the females occurred throughout the year with monthly percentage floating between 9 - 18% reaching, however, peaks of 27-32% between April and July. Fecundity. The size-fecundity relationships have been calculated separately both for females carrying embryos at stage A and females with embryos at stage C, classified according to FIGUEIREDO & BARRACA (1963). The linear function was adopted to represent the size-fecundity relationships, since it fitted the data set better than the power function (Fig. 4). The ANOVA was used to determine whether the size-fecundity relationships differ between the two groups of females.

Stage A: N = 92; r = 0.902; Y = 181.65 X - 4426.2

Stage C: N = 29; r = 0.865; Y = 128.41 X - 3208.8

The slopes differ significantly (F=20.1; P<0.01) and there is a loss of embryos during the incubation that seems to be directly related to lobster size. Instead MORIZUR et al. (1981) observed a costant loss of 45% for the Norway lobster of the Bay of Biscay.



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B-V3

Relative Growth of the Crusher Propodite of *Nephrops norvegicus* (L.) in the Northern Tyrrhenian Sea

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Though a lot of research has dealt with the relative growth of N. norvegicus only few papers (FARMER, 1974; SARDA' et al., 1981; OBRADOVIC, 1988) have treated the relative growth of the crusher propodite in detail. The aim of this work is to look at the relations of carapace length to various crusher proportions in both sexes of N. norvegicus.

The morphometric study was carried out on the Norway lobsters collected in Spring 1986 in the area comprised between the Isles of Elba and Giannutri. The following measurements were taken by a vernier calliper to the nearest 0.1 mm: Carapace length (CL), from eye socket to the mid-posterior margin of the carapace; Crusher propodite length (CPL), the distance from the tip of the propodus to the articulation with the carpus; Crusher propodite width (CPW), width across the palm; Crusher propodite depth (CPD), depth of the palm measured at CPW level; Anderson cheliped index (CPV), volume index based on the product of CPL, CPW, and CPD divided by carapace length (AIKEN & WADDY, 1980). The various measurements were plotted vs. CL and analyzed according to FINNEY & ABELE (1981) (Tab.1), while comparisons between sexes are shown in Tab.2.

Tab.1 - Estimated parameters between CPL, CPW, CPD, CPV (Y) and CL (X) for both sexes. N = Number of specimens; range = carapace length (mm) range; a = intercept; b = slope; SE = standard error of the slope; AS = allometric status by testing the slope vs a standard of 1, $\alpha = 0.05$; + = positive allometry; 0 = isometry; r = correlation coefficient.

Sex	N	range	a	b	SE	AS	r
Males (CPL)	264	15-68	-0.02415	1.126275	0.01	+	0.990
Females (CPL)	118	13-51	0.12530	1.017720	0.01	0	0.986
Males (CPW)	264	15-68	-0.81021	1.245487	0.01	+	0.987
Females (CPW)	118	13-51	-0.75243	1.200911	0.02	+	0.983
Males (CPD)	264	15-68	-0.97279	1.267291	0.01	+	0.982
Females (CPD)	118	13-51	-0.95454	1.246804	0.02	+	0.971
Males (CPV)	264	15-68	-0.80716	2.639054	0.03		0.982
Females (CPV)	118	13-51	-0.58166	2.465437	0.04		0.977

Tab. 2 - Equality test, at same size range, between the relationships of both sexes N.S. = not significant; * = significant

	Comparisons of the slopes (b)		Comparisons of the intercepts assuming a common slope (b*)		
Groups	t	Statistical differences $\alpha = 0.05$	b*	t	Statistical differences $\alpha = 0.05$
(a) M - F (CPL)	2.88	*	-----	-----	-----
(b) M - F (CPW)	0.54	N.S.	1.193	0.06	N.S.
(c) M - F (CPD)	0.84	N.S.	1.217	0.11	N.S.
(d) M - F (CPV)	0.20	N.S.	2.483	0.23	N.S.

The significative difference between CPL-CL relationships of both sexes is in agreement with FARMER (1974), SARDA' et al. (1981), and OBRADOVIC (1988), though this last author takes into account the total length instead of CL. Contrary to SARDA' et al. (1981) and OBRADOVIC (1988) no significative difference is observed in CPW-CL and CPD-CL between sexes within the same size range. The results obtained by these authors could be due both their having use groups of specimens of different size ranges for comparison and because, at the biggest sizes of CL, greater than 40 mm, the males, show a marked change in the chelae allometry (BIAGI et al., 1990).

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