ATLANTIS II CRUISE: COPEPOD ASSEMBLAGES IN DEEP MEDITERRANEAN WATERS

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Summary. Copepod data from R/V Atlantis Cruises II49 and II59 throughout the Mediterranean Sea are discussed.

It is generally accepted that deep Mediterranean waters are poor in zooplankton abundance with an absence of true deep-sea species. Notwithstanding the lack of information as to the uniformity and stability of habitats among the basins comprising the Mediterranean proper, two opposing views are emerging concerning the deep water zooplankton communities. Copepod data collected during an annual cycle at fixed stations in the Tyrrhenian and Adriatic Seas (Hure and Scotto di Carlo,1969)showed deep-water communities to be strikingly similar suggesting a homogeneity among other Mediterranean basins while populations sampled at 8 stations in the Tyrrhenian and Ionian Seas (Vaissière et Seguin, 1980) showed marked differences in species composition. In this paper, we provide evidence in support of the first hypothesis, based on zooplankton collections from discrete depths taken on R/V Atlantis cruises II49, II59 throughout the Mediterranean. This material was kindly made available to us by Dr. George D. Grice and co-workers of WHOI. Zooplankton samples were collected at 18 stations from the surface to 2500 m with 70 cm diameter opening/closing Bongo nets. An 0.239 mm mesh aperture was used on AII49 and 0.333 mm mesh on AII59. Details of station sites and depth intervals sampled are given by Wiebe et al. (1974). Only net tows collected below 400 m are analyzed in this paper.

A total of 72 copepod species were recorded, 69 for the east and 64 for the western Mediterranean. Sixty-one were common for both regions. The remaining species were either rare or surface dwellers that were sporadically present below 400 m. Dominant species are listed in Tables 1 and 2, together with relative percentage composition. For comparative purposes, similar depth intervals for the same geographic region have been pooled together (see tables). Since sampling design (mesh size, depth sampled, sampling time of year) differed for the two cruises, the tables are somewhat difficult to compare with each other. In fact, small copepods such as *O.ornata*, *S. longicornis*, and *S.curtus* were dominant during AII49 but very rare during AII59. In addition, the 400-600 m depth was not sampled during AII49 so that dominant subsurface species such as *N.gracilis*, *S.dentata*, *H.papilliger*, *C.furcifer*, *L.clausi* and *L.flavicornis* were far more common during AII59. Despite such differences, affinities between stations are readily apparent for copepods sampled at the same depths and

Cruise: Atlantis II 49	ALBORAN	BALEARIC			TYRRHENIAN	IONIAN		LEVANTINE	
SPECIES/DEPTH m	St.22 850-1000	St.19 570-725	St. 17 1190-1250	St. 14 2025-2200	St. 12 1100-1175	St. 11 620-650	Sts 8, 10 1000-1250	St. 1 700-800	Sts 3, 5 1100-1400
Oncaea ornata	46.9	35.7	57.9	0.1	36.0	6.9	39.3	6.4	32.6
Gaetanus kruppi	0.4	-	2.6	94.9	4.4	0.2	2.6	1.5	7.4
Spinocalanus longicornis	6.2	5.3	0.4	-	0.3	28.1	3.7	12.5	1.4
Oithona setigera	-	0.6	0.1	-	-	20.5	6.9	2.0	0.1
Spinocalanus oligospinosus	8.7	0.6	1.3	-	5.4	14.1	6.9	0.3	6.5
Monacilla typica	13.4	8.6	15.6	0.4	20.5	1.1	4.5	0.1	2.5
Scaphocalanus invalidus	6.6	0.1	7.9	0.3	10.6	4.2	8.3	2.4	18.1
Haloptilus longicornis	+	+	-	-	-	9.9	0.2	1.6	-
Eucalanus monachus	0.2	0.3	-	-	-	0.9	3.6	59.6	5.2
Mormonilla minor	2.1	25.7	5.4	-	3.4	1.0	0.3	1.2	3.8
Oncaea mediterranea	-	-	-	-	0.3	2.2	7.8	3.2	3.2
Heterorhabdus abyssalis	1.2	-	0.1	-	6.1	0.9	4.8	4.7	6.5
Lucicutia curta	1.4	-	5.9	-	-	0.3	1.3	0.1	0.5
Scaphocalanus curtus	1.1	0.6	-	-	-	2.6	-	0.2	0.1
Spinocalanus magnus	3.4	-	0.1	0.1	2.7	0.7	2.0	0.1	2.6
Oncaea conifera	1.7	14.3	-	-	-	0.1	3.6	-	1.4
Clausocalanus lividus	3.0	-	0.2	0.1	0.7	0.3	0.8	0.1	0.3
Lucicutia longiserrata	-	-	-	2.9	0.3	-	-	-	0.3
Pseudaetideus armatus	0.2	-	-	-	0.3	1.5	+	-	0.1
Mimocalanus heronae	0.3	3.4	0.1	+	1.7	0.1	0.7	0.1	3.4
Pleuromamma abdominalis	0.5	0.3	0.1	+	1.7	0.3	0.3	2.6	0.1
Pleuromamma gracilis	-	-	0.1	-	-	0.2	1.3	0.1	0.1
Lucicutia pera	-	-	-	1.1	0.3	-	-	-	-
Euchaeta acuta	-	-	-	-	0.2	0.3	1.2	0.2	0.2
Eucalanus elongatus	+	1.1	-	-	0.3	0.3	0.1	-	-
Amallothrix europecten	-	-	-	0.1	0.3	-	0.1	0.1	1.4
Calanus helgolandicus	-	0.6	0.1	+	2.0	0.1	+	-	-

Cruise: Atlantis II 59	BALEARIC			IONIAN			
SPECIES/DEPTH m	St.13 400-600	Sts 13,15 600-1200	Sts 14,15 1200-1800	Sts 3,8 400-600	Sts 4, 8 1000-1400	Sts 4,8,9 1200-2100	St. 9 2100-2500
Monacilla typica	4.6	44.0	48.5	1.3	7.0	8.9	0.2
Eucalanus monachus	6.9	10.1	0.2	5.4	16.3	22.2	1.0
Pleuromamma gracilis	6.9	0.1	0.2	22.5	-	4.0	-
Lucicutia longiserrata	-	-	9.9	-	-	4.5	79.5
Gaetanus kruppi	-	0.4	12.3	1.9	14.9	8.4	1.7
Pleuromamma abdominalis	7.8	2.3	0.1	12.3	0.8	2.0	-
Spinocalanus oligospinosus	7.4	4.3	1.1	5.5	3.4	7.9	-
Eucalanus elongatus	9.7	10.3	-	0.1	0.6	1.5	-
Scaphocalanus invalidus	4.0	3.3	2.3	1.0	11.5	6.4	0.2
Haloptilus longicornis	+	-	-	9.6	1.4	-	-
Lucicutia curta	-	5.4	16.2	-	4.5	1.3	-
Oncaea mediterranea	7.4	4.1	-	1.9	2.3	2.0	-
Neocalanus gracilis	2.0	1.0	-	1.1	0.2	0.5	-
Spinocalanus magnus	3.5	1.1	2.3	0.5	4.5	1.0	3.0
Mimocalanus heronae	6.9	1.8	0.6	1.3	3.9	1.6	0.4
Euchirella messinensis	2.0	0.9	0.4	1.5	2.3	0.7	-
Scolecithricella dentata	6.9	0.2	-	1.6	0.6	0.2	-
Heterorhabdus abyssalis	1.4	0.6	0.8	2.6	3.9	2.6	-
Heterorhabdus papilliger	2.3	0.1	-	0.4	0.6	0.1	-
Mormonilla minor	2.9	0.1	0.1	0.1	-	0.5	-
Oithona setigera	3.4	-	0.8	3.5	3.7	1.8	-
Oncaea conifera	2.9	3.2	0.4	0.9	1.1	3.0	-
Corycaeus furcifer	5.2	0.3	-	3.3	-	0.7	-
Rhincalanus nasutus	1.1	4.4	0.4	-	-	-	-
Amallothrix europecten	-	0.1	2.3	-	-	6.6	-
Eucalanus attenuatus	0.3	-	-	4.1	3.9	4.9	-
Clausocalanus mastigophorus	0.3	-	-	3.4	5.6	3.4	-
Euchaeta acuta	0.6	0.1	-	2.3	1.1	1.0	-
Lucicutia clausi	0.6	-	-	2.8	-	-	-
Lucicutia flavicornis	+	-	-	3.0	-	-	-
Candacia elongata	-	0.1	0.4	0.1	1.7	0.5	14.0

Table 1, 2 - *Relative percentage composition of major species (comprising > 1% of the copepod population on at least one sampling occasion) for Cruise AII49 from 13/5/69-8/6/69 and Cruise AII59 from 20/9/70-3/10/70.*

on the same occasion. For example, *O.ornata, S.longicornis, S.invalidus* and *S.oligospinosus* were major species from 570-1000 m in the Alboran, Balearic, Ionian and Levantine Seas during AII49. Intermediate depths (1000-2000 m) in the latter three regions and in the Tyrrhenian Sea were dominated by *O.ornata, M.typica, S.invalidus, S.oligospinosus* and *G.kruppi*. During AII59, *P.gracilis, P.abdominalis, S.oligospinosus* and *E.monachus* dominated the 400-600 m depths in the Balearic and Ionian Seas. *Monacilla typica, L.curta, G.kruppi, S.invalidus* and *L.longiserrata* were dominants from 1000-2000 m. Both *L.longiserrata* and *G.kruppi* were dominants below 2000 m at the Balearic station during AII49 and Ionian station during AII59. Marginal differences in species composition between stations relate in part to problems inherent in the sampling procedure that involved the patchy distribution of species. Each analysis is in fact the result of a single sample or the vertical profile of samples. Variability between stations also included species that were always more common in the western (*M.typica* and *M.minor*) or eastern (*H. longicornis* and *E.monachus)* Mediterranean. In contrast to the above, Hure and Scotto di Carlo (1969) cite all four species as dominant annually in the Adriatic and Tyrrhenian Seas.

Briefly, our results show uniformity in deep copepod assemblages.The Siculo-Tunisian sill separating the eastern and western Mediterranean does not isolate the two deep-living populations.This is not only reasonable but theoretically predictable if we consider that the sill depth (300 m) does not exceed the upper limits in vertical range of those midwater species inhabiting the deepest waters in the Mediterranean. Variability from west to east may therefore only involve changes in the relative proportions of major species.

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