

Short Cruise Report
METEOR cruise M51/2, 18 Oct. – 11. Nov. 2001

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METEOR sailed from Malaga, Spain, in the morning of 18. October and entered La Valetta, Malta early on 11 November, having completed 60 hydrographic and biological stations covering large parts of the Eastern Mediterranean (additionally three stations in the Western Mediterranean and five in the Sicilian Passage) (see Fig. 1, Tab.1). The principal scientific topics were (i) monitoring the current status of the evolving hydrology of the Eastern Mediterranean deep and intermediate waters, on the basis of observations of various hydrographic parameters, and (b) investigating deep-sea zooplankton and related parts of the marine foodweb. The ship carried a scientific crew of 27, including scientists from Italy and Israel, and three Egyptian observers and one from Algeria (the Algerian observer disembarked when METEOR left Algerian waters.). Favourable weather and absence of technical problems enabled the completion of more station work than had been anticipated, which made the cruise a full success. A special encounter was an abundant deposition of Saharan dust on 20 October.

The hydrological work consisted of CTD measurements (temperature, salinity, oxygen and optical parameters) covering the entire water column, and of collecting water samples using a 24-bottle rosette multisampler concurrently. The water samples served for the measurement of salinity, nutrients, oxygen, anthropogenic tracers (the chlorofluorocarbons F11, F12 and F113; tritium; ^{137}Cs (two stations only)), helium isotopes, CO_2 parameters and stable isotopes; water was also collected for biological investigations and to determine particulate load (see below). Only part of the measurements were carried out aboard, while the remainder has to await analysis in the various home laboratories. Up to 26 October, a line of stations at medium resolution along all of the Eastern Mediterranean and the Sicilian Passage was completed, and was thereafter supplemented by short sections across the sea with emphasis on the Cretan Passage (Fig. 1). Stations were also located on the two main sills connecting to the Aegean Sea. The hydrographic observations were assisted by ADCP observations performed along a considerable portion of the ship's track. The background of the work was that the Eastern Mediterranean deep waters entered a major reorganization in about 1990 (the Eastern Mediterranean Transient, EMT). The evolving EMT has been monitored by METEOR previously in 1995 and 1999, employing similar observations. It is clear that the transient was initiated by the Aegean Sea releasing large amounts of dense water that displaced much of the residing deep waters upwards. Later in the 1990s, the Aegean dense water source slackened, and the deep waters became progressively mixed. The continuation of such mixing was evident in the newly collected data. As an example, Fig. 2 shows a section of the

chlorofluorocarbon F-12 along the basin. The purpose of the work is to complement the observational basis to enable a full description and dynamical explanation of the EMT, and for predicting the evolution toward an expected new quasi-equilibrium state of the Eastern Mediterranean. These goals are to be achieved by a close cooperation of the observationalists involved and of modellers. Add-on work dealt with the Mediterranean as a sink for anthropogenic CO₂, with the role of chlorophyll-a, biogenic silica, and particulate C and N, and with the stable isotopes of carbon, oxygen, and hydrogen to gain information on the sources of water masses and their dispersion.

The biological work was centered around zooplankton catches using a MOCNESS multinet (0.333 mm and partly 0.1 mm mesh), sampling the entire water column at high vertical resolution (sites are indicated by capital letters in Fig. 1). The main sampling area was in the Iera Petra Deep where previous work (METEOR, 1993) had found an abundance of deep zooplankton presumably resulting from the massive influx of Aegean dense waters that the EMT effected in the early 1990s. It was found that the zooplankton abundances had settled to more normal conditions. Subsamples were taken for the determination of CN, lipids, stable isotopes (¹⁵N, ¹³C) and metabolic activity, aimed at elucidating ontogenetical and size structures and assessing trophic level interactions, diets, and carbon demand. Repeated MOCNESS hauls at this site and additional ones between the Cretan Passage and the eastern Levantine Sea (Fig. 1) were carried out to determine zooplankton variability on different scales in space and time, one topic being diel vertical migrations. This work was supplemented by a sediment trap mooring laid out in the main sampling area (traps in 550, 1530, and 2560 m, to be active for about five months). The trap samples will be subjected to analyses of bulk components and organic compounds, to provide information on particulate material fluxes, not the least of carbon. Samples were also obtained by near-surface plankton hauls using less sophisticated equipment and by water sampling by rosette distributed over the entire cruise track. The topics served were spatial changes in bacteria and autotrophic phytoplankton; trophic interactions, diversity and distributions of protozooplankton (the latter also in relation to various biotic and abiotic parameters); and near-surface and near-bottom trophic interactions more generally using the stable isotope approach mentioned above. Somewhat more special subjects were the genetic variability of selected mesozooplankton species and observations concerning the reproductive behaviour of calanoid copepods. The Egyptian observers received a variety of samples from the stations located in Egyptian waters.

Lastly, dust samples were collected on the uppermost deck for estimating the aerial supply of bioavailable inorganic nitrogen and phosphorus to the photic zone. The evaluation of the data from the cruise will to a large degree be cooperative, primarily among the participating groups. At this point however, a substantial portion of the data still has to await measurement at the home institutions.

Sstation map for cruise M51/2 October-November 2001 (Eastern Mediterranean)

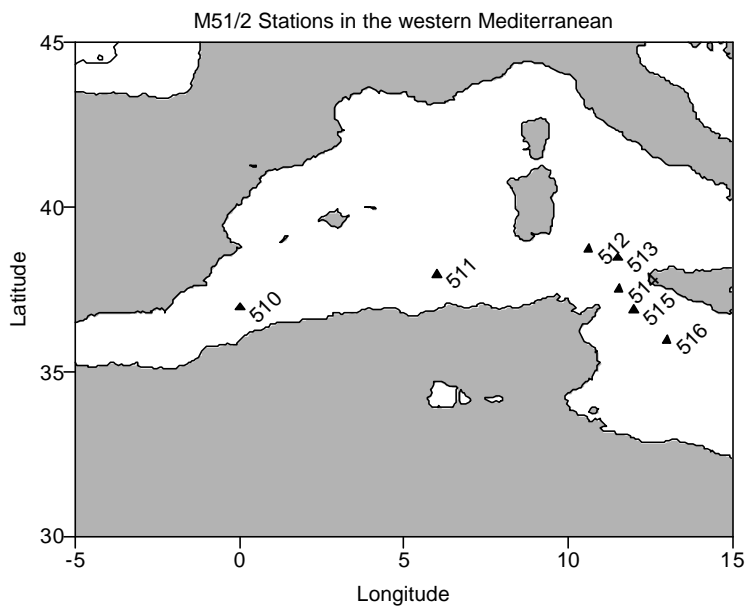
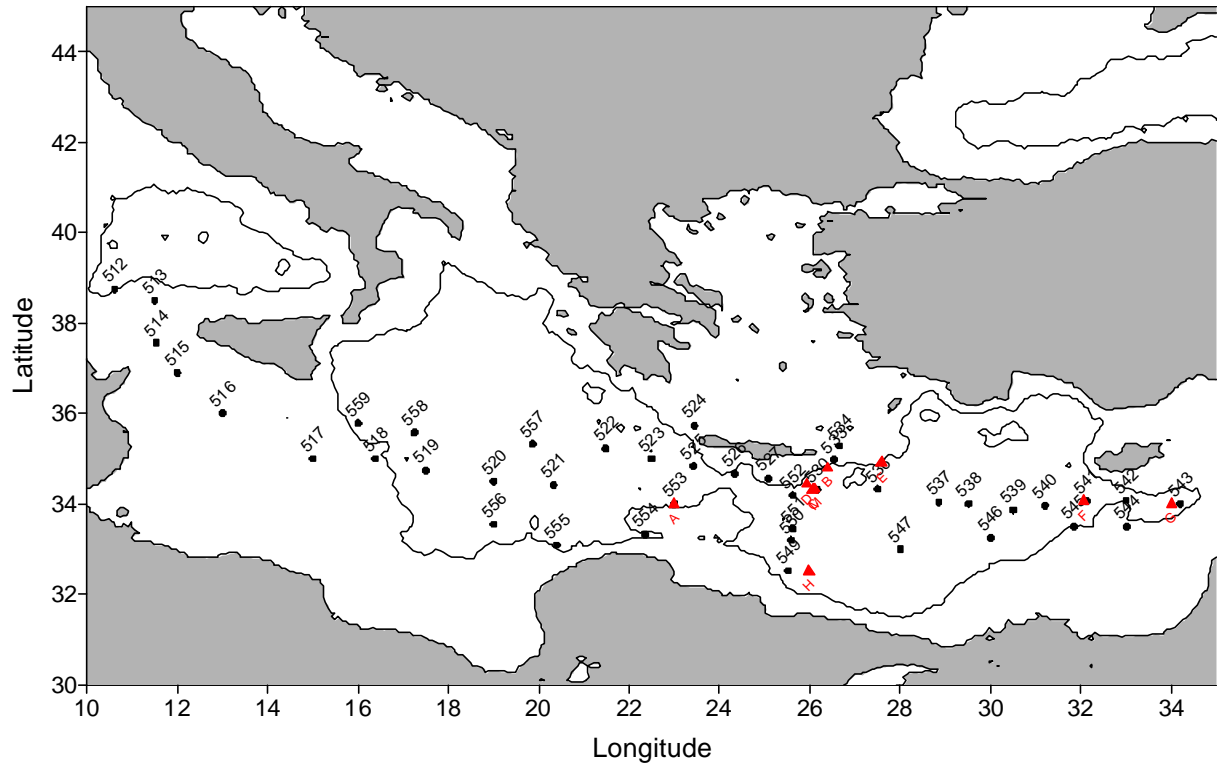


Fig. 1: Station network of METEOR cruise M51/2, 2001, in the Eastern Mediterranean (upper pane) and in the Western Mediterranean (lower panel); A – H = MOCNESS haul sites; M= Mooring position.

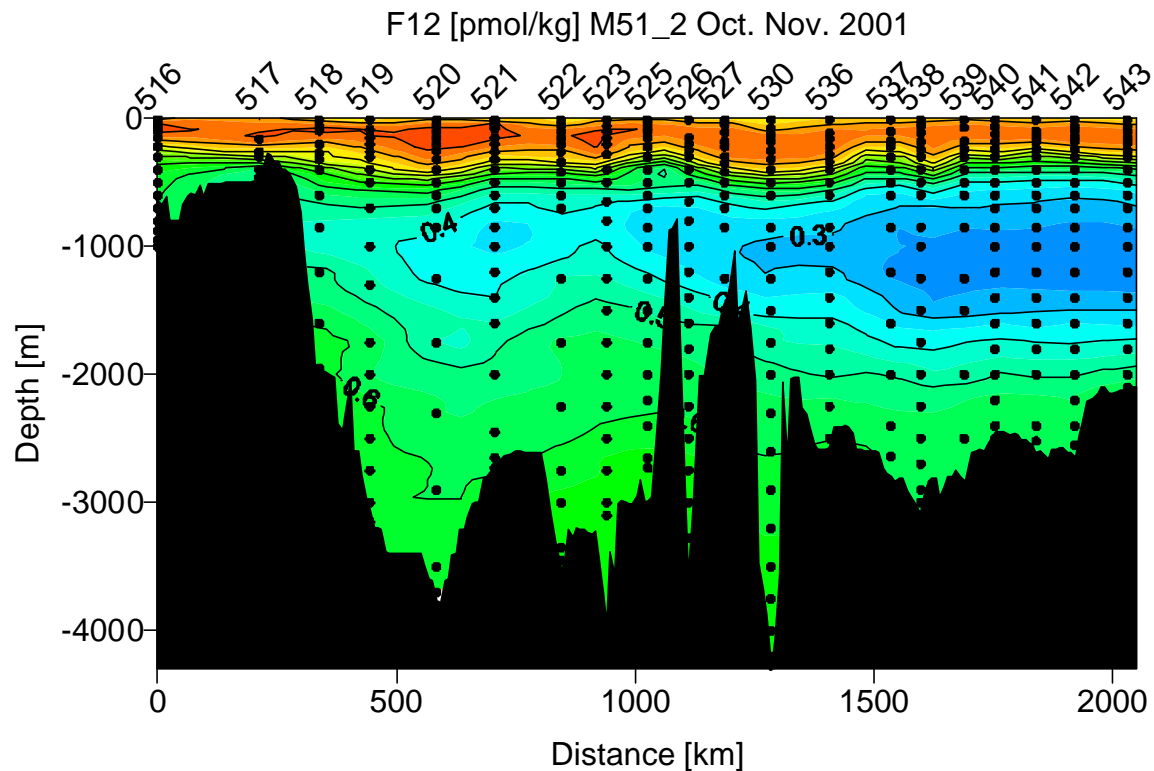


Fig. 2: Isolines of the chlorofluorocarbon F12 (pmol/kg) along a vertical section from the Sicilian Passage (left) up to the Lebanese coast.

Station	Cast	Latitude	Longitude	Date	Work
510	1	36 59.92 N	000 00.25 E	19 10 2001	Multinet
510	2	36 59.75 N	000 00.53 E	19 10 2001	Bongonet
510	3	36 59.76 N	000 00.70 E	19 10 2001	CTD/Rosette
510	4	36 59.64 N	000 00.62 E	19 10 2001	Multinet
511	1	37 59.68 N	005 59.67 E	20 10 2001	CTD/Rosette
511	2	37 59.77 N	005 59.78 E	20 10 2001	Multinet
511	3	37 59.75 N	005 59.75 E	20 10 2001	CTD/Rosette (Tracer, Nut, Bio)
511	4	37 59.68 N	005 59.42 E	20 10 2001	Multinet
511	5	37 59.69 N	005 59.02 E	20 10 2001	CTD/Rosette (Tracer)
512	1	38 45.17 N	010 37.00 E	21 10 2001	CTD/Rosette (Tracer, Nut, Bio)
513	1	38 29.93 N	011 30.03 E	22 10 2001	CTD/Rosette (Tracer, Nut, Bio)
514	1	37 34.05 N	011 31.96 E	22 10 2001	CTD/Rosette (Tracer, Nut, Bio)
515	1	36 54.14 N	012 00.00 E	22 10 2001	CTD/Rosette (Bio)
515	2	36 54.20 N	012 00.21 E	22 10 2001	Multinet
515	3	36 54.14 N	011 59.97 E	22 10 2001	CTD/Rosette (Tracer, Nut, Bio); parallel Plankton net
516	1	36 00.15 N	013 00.08 E	22 10 2001	CTD/Rosette (Tracer, Nut, Bio)
517	1	35 00.01 N	015 00.06 E	23 10 2001	CTD/Rosette (Tracer, Nut, Bio)
518	1	35 00.19 N	016 22.76 E	23 10 2001	CTD/Rosette (Bio)
518	2	35 00.26 N	016 22.80 E	23 10 2001	Multinet
518	3	35 00.31 N	016 22.75 E	23 10 2001	CTD/Rosette (Tracer, Nut, Bio); parallel plankton net
519	1	34 44.62 N	017 30.10 E	23 10 2001	CTD/Rosette (Tracer, Nut, Bio)
520	1	34 29.99 N	018 59.97 E	24 10 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
521	1	34 24.93 N	020 19.81 E	24 10 2001	CTD/Rosette (Bio)
521	2	34 24.89 N	020 19.68 E	24 10 2001	Multinet
521	3	34 25.13 N	020 19.56 E	24 10 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
522	1	35 13.92 N	021 28.88 E	25 10 2001	CTD/Rosette (Tracer, Nut, Bio)

Station	Cast	Latitude	Longitude	Date	Work
523	1	35 00.15 N	022 30.17 E	25 10 2001	CTD/Rosette (Bio); parallel bongo net
523	2	35 00.07 N	022 29.92 E	25 10 2001	CTD/Rosette
523	3	34 59.99 N	022 29.92 E	25 10 2001	Multinet
523	4	35 00.12 n	022 29.81 E	25 10 2001	CTD/Rosette (Tracer, Nut, Bio)
524	1	35 43.78 N	023 26.53 E	25 10 2001	CTD/Rosette (Tracer, Nut)
525	1	34 50.00 N	023 25.21 E	26 10 2001	CTD/Rosette (Tracer, Nut, Bio)
526	1	34 40.00 N	024 20.02 E	26 10 2001	CTD/Rosette (Tracer, Nut, Bio)
527	1	34 33.84 N	025 05.20 E	26 10 2001	CTD/Rosette (Bio)
527	2	34 33.86 N	025 05.15 E	26 10 2001	Multinet
527	3	34 33.78 N	025 05.16 E	26 10 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
528	1	34 26.45 N	025 55.73 E	26 10 2001	Mocness cast
528	2	34 19.78 N	026 08.54 E	26 10 2001	Mocness cast
528	3	34 18.81 N	026 08.49 E	27 10 2001	Mocness cast
528	4	34 18.85 N	026 08.36 E	28 10 2001	Mocness cast
528	5	34 19.32 N	026 08.28 E	28 10 2001	Mocness cast
528	6	34 19.22 N	026 08.26 E	28 10 2001	Mocness cast
528	7	34 19.46 N	026 03.01 E	28 10 2001	Mocness cast
528	8	34 18.91 N	026 05.67 E	29 10 2001	Mocness cast
528	9	34 18.59 N	026 03.56 E	29 10 2001	Mocness cast
529	1	34 19.90 N	026 06.44 E	30 10 2001	Mooring deployment
529	2	34 26.59 N	026 12.36 E	30 10 2001	CTD/Rosette (Bio)
530	1	34 19.17 N	026 10.00 E	30 10 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
531	1	34 18.70 N	026 03.51 E	30 10 2001	Mocness cast
532	1	34 48.16 N	026 24.28 E	31 10 2001	Mocness cast
533	1	34 58.94 N	026 32.27 E	31 10 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
534	1	35 17.08 N	026 39.02 E	31 10 2001	CTD/Rosette (Tracer, Nut)
535	1	34 55.06 N	027 34.92 E	31 10 2001	Mocness cast
536	1	34 19.86 N	027 30.06 E	01 11 2001	CTD/Rosette (Bio)
536	2	34 19.38 N	027 30.18 E	01 11 2001	Multinet
536	3	34 19.95 N	027 30.00 E	01 11 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
537	1	34 02.02 N	028 51.05 E	01 11 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
538	1	34 00.03 N	029 30.05 E	01 11 2001	CTD/Rosette (Bio)
538	2	34 00.30 N	029 30.11 E	01 11 2001	Multinet
538	3	34 00.42 N	029 30.67 E	01 11 2001	CTD/Rosette (Tracer, Nut, Bio)
539	1	33 51.94 N	030 30.06 E	02 11 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
540	1	33 57.70 N	031 12.12 E	02 11 2001	CTD/Rosette (Bio)
540	2	33 57.62 N	031 12.00 E	02 11 2001	Multinet
540	3	33 57.72 N	031 11.91 E	02 11 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
541	1	34 03.64 N	032 03.22 E	02 11 2001	Mocness cast
541	2	34 03.89 N	032 07.28 E	02 11 2001	CTD/Rosette (Tracer, Nut, Bio)
541	3	34 04.00 N	032 07.30 E	02 11 2001	Mocness cast
542	1	34 04.97 N	032 59.97 E	03 11 2001	CTD/Rosette (Bio)
542	2	34 04.98 N	032 59.92 E	03 11 2001	Multinet
542	3	34 04.99 N	032 59.80 E	03 11 2001	CTD/Rosette (Tracer); parallel bongo net
542	4	34 05.00 N	032 59.86 E	03 11 2001	Multinet
542	5	34 04.82 N	032 59.85 E	03 11 2001	CTD/Rosette (Tracer, Nut, Bio)
543	1	34 00.01 N	034 00.33 E	03 11 2001	Mocness cast
543	2	34 00.00 N	034 11.49 E	03 11 2001	CTD/Rosette
543	3	34 00.10 N	034 11.53 E	03 11 2001	Multinet
543	4	34 00.20 N	034 12.08 E	03 11 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
544	1	33 29.97 N	033 00.04 E	04 11 2001	CTD/Rosette (Bio)
544	2	33 29.99 N	033 00.22 E	04 11 2001	Multinet
544	3	33 29.82 N	033 00.62 E	04 11 2001	CTD/Rosette (Tracer, Nut); parallel bongo net
545	1	33 29.96 N	031 50.34 E	04 11 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
546	1	33 14.92 N	029 59.84 E	04 11 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
547	1	33 00.04 N	028 00.23 E	05 11 2001	CTD/Rosette; parallel bongo net
547	2	33 00.04 N	028 00.17 E	05 11 2001	CTD/Rosette (Tracer, Nut, Bio)
548	1	32 30.12 N	025 59.16 E	06 11 2001	Mocness cast

Station	Cast	Latitude	Longitude	Date	Work
549	1	32 30.96 N	025 31.91 E	06 11 2001	CTD/Rosette (Bio)
549	2	32 30.99 N	025 31.71 E	06 11 2001	Multinet
549	3	32 31.33 N	025 31.40 E	06 11 2001	CTD/Rosette (Tracer, Nut); parallel bongo net
549	4	32 31.50 N	025 30.67 E	06 11 2001	Bongo net
550	1	33 12.07 N	025 35.06 E	06 11 2001	CTD/Rosette (Tracer); parallel bongo net
551	1	33 27.39 N	025 37.21 E	06 11 2001	CTD/Rosette (Tracer, Nut); parallel bongo net
552	1	34 11.46 N	025 37.16 E	07 11 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
553	1	34 00.00 N	022 59.93 E	07 11 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
553	2	34 00.01 N	022 59.95 E	07 11 2001	Mocness cast
554	1	33 19.90 N	022 21.11 E	08 11 2001	CTD/Rosette (Tracer, Nut); parallel bongo net
555	1	33 05.35 N	020 24.07 E	08 11 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
556	1	33 33.09 N	019 00.15 E	09 11 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
557	1	35 19.89 N	019 51.95 E	09 11 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
558	1	35 34.87 N	017 14.91 E	10 11 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net
559	1	35 47.07 N	016 00.07 E	10 11 2001	CTD/Rosette (Tracer, Nut, Bio); parallel bongo net

Tab.1: List of station work performed during cruise M51/2.