MESOZOOPLANKTON ABUNDANCE, BIOMASS AND PROCESSING

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Abstract

The initial stages towards quantifying the abundance, biomass and taxonomic composition within the OMEX II area are described in this report. Progress regarding the measuring of weight-specific growth and herbivorous grazing are detailed. A new global model which may be used to predict growth and production from size distributed biomass and temperature has been constructed and has been accepted for publication in Marine Biology, the accuracy of this is currently being tested, and eventually will be applied to the OMEX II-II data.

Introduction

Mesozooplankton are the dominant trophic link between primary production and fish. They are the principal metazoan grazers in the world's oceans and play an important role with respect to carbon and nutrient cycling, and their loss from the upper mixed layer. The objectives of the SOC deliverables are to quantify the carbon biomass (II.5.5), abundance and taxonomic composition of the mesozooplankton, with spatial and seasonal coverage (II.10.1). Herbivorous grazing measurements are also to be completed to assess feeding impact (II.10.2), and the growth and production of the mesozooplankton are also to be assessed (II.10.2).

Methods

Over the first year of the OMEX II project we have participated in two cruises, one in January ('98) and one in June ('97). The details of the collection are given in Table 1, and the location of sample collections given in Figure 1. Quantitative mesozooplankton samples have been collected using 2 systems: the Longhurst-Hardy Plankton Recorder system (LHPR), and WP2 nets. The first of these gives discrete samples with high vertical resolution, while using the WP2 nets vertically integrated samples were collect over the top 200m of the water column (in waters shallower than 200m collection was restricted to ~90% of water column depth). WP2 samples were immediately preserved in 5% borax-buffered formaldehyde sea water. Upon return to the laboratory the samples were screened through a 2mm mesh to remove macrozooplankton. This macrozooplankton is being identified in total while the <2mm fraction is sub-sampled using a Stempel pipette and an appropriate fraction analysed. These samples are currently being analysed using light-microscopy. LHPR samples were immediately preserved in 5% borax-buffered formaldehyde sea water. Upon return to the UK these samples have been allotted into their collection depths and microscopy has begun.

Herbivorous grazing protocol and experimental design have been decided upon in collaboration with Tromsø (UITØ-b). An inter-calibration exercise with UITØ-b is planned to take place in Tromsø prior to the August CD114b cruise on which this work will be undertaken. Laboratory analysis of the samples will proceed shortly afterwards.

Egg production experiments to be used to determine weight-specific growth were to have been conducted on CD110b, however, this work was severely disrupted as a result of the bad weather. It may be possible to continue this work on CD114b, although this will depend upon available time.

Results

II.5.5 and II.10.1

Analysis of the preserved zooplankton material will continue throughout 1998 with respect to abundance, taxonomic analysis and biomass. Further samples are to be collected on CD114b, and will be collected for us on Belgica 98/15.

II.10.2
Grazing measurements will be taking place in August and samples analysed in the laboratory soon afterwards. We cannot therefore presents these results from our work at this stage. Samples have also been supplied to SAHFOS for their own biomass quantification

The paper 'Towards a global model of *in situ* weight-specific growth in marine planktonic copepods' (AG Hirst & RS Lampitt) has been accepted for publication in journal *Marine Biology*. This paper allows prediction of copepod growth from size distributed biomass and temperature. Predictions from this model are currently being tested against independent measurements and the results will be submitted as a paper to the *Journal of Plankton Research* within the next 2-3 months under the title: 'How accurate are predictions of zooplankton growth using the global model?' (AG Hirst & RS Lampitt). The accuracy of the model is being examined with the aim of allowing errors bars to be placed on the predictions within the OMEX II box.

Growth measurements using the egg production technique were to be extensively undertaken during CD110b. Unfortunately measurements on this cruise were severely hampered by bad weather, and we were only able to collect samples from 2 sites: one offshelf, and one in shelf waters.

II.11.2
Our role to aid IfM in understanding vertical fluxes of faecal pellets will follow later in the project once appropriate results are available.

Discussion and Future work
Arrangements have been made for samples to be collected on the forthcoming Belgica cruise (98/15) using the quantitative WP2 nets. The method for determination of size distributed herbivorous grazing by mesozooplankton has been agreed upon in collaboration with UITØ-b. Inter-calibration will take place in Norwegian waters. A member of the SOC team will travel to Tromsø to allow this to be undertaken. The experiments will then take place on CD114b in August.

With the exception of the egg production work which has been hampered by bad weather on CD114b work is progressing on target. Continued sampling for tasks II.5.5 and II.10.1 will take place during this year, and microscopic analysis will continue through 1998 and in to 1999. Herbivorous grazing will be measured on CD114b after initial inter-calibration.

Cruise	Collection Device		Site Name	Sample Depth	Date	Time (GMT)	Night/Day
CD105b	**WP2**		N100*	0-110m integrated	11/06/97	01:50	N
			N1600#	0-200m integrated	11/06/97	12:30	D
			N2300*	0-200m integrated	12/06/97	00:20	N
			N3300#	0-200m integrated	12/06/97	11:30	D
			O140*	0-120m integrated	13/06/97	02:00	N
			Q2500*	0-200m integrated	14/06/97	01:00	N
			41.970°N 10.147°W #	0-200m integrated	14/06/97	12:15	D
			V2600*	0-200m integrated	15/06/97	03:59	N
			U150*	0-130m integrated	16/06/97	02:45	N
			T200*#	0-150m integrated	17/06/97	02:35	N
			S200#	0-160m integrated	17/06/97	13:40	D
			R1000*	0-200m integrated	18/06/97	01:10	N
			S500*	0-200m integrated	19/06/97	03:40	N
			nr. Q100*	0-110m integrated	20/06/97	23:20	N
			42.494°N 9.224°W				
	LHPR	start	43.000°N 9.655°W	-	11/06/97	13:14	D
		end	42.999°N 9.565°W	-	11/06/97	14:40	D
		start	42.990°N 10.279°W	-	12/06/97	12:24	D
		end	42.932°N 10.285°W	-	12/06/97	13:32	D
		start	41.978°N 19.154°W	-	14/06/97	12:42	D
		end	41.946°N 10.156°W	-	14/06/97	13:57	D
		start	41.425°N 9.715°W	-	14/06/97	23:52	N
		end	41.429°N 9.686°W	-	15/06/97	00:44	N
		start	41.997°N 9.375°W	-	17/06/97	00:45	N
		end	41.995°N 9.348°W	-	17/06/97	01:25	N
		start	42.154°N 9.229°W	-	17/06/97	12:04	D
		end	42.164°N 9.257°W	-	17/06/97	12:44	D
CD110b	**WP2**		O3100	0-200m integrated	08/01/98	13:54	D
			T1000	0-200m integrated	09/01/98	19:41	D
			V110	0-90m integrated	10/01/98	16:46	N
			P200	0-165m integrated	14/01/98	17:28	D
			P1000	0-200m integrated	15/01/98	15:34	D

Table 1 Summary of zooplankton collections, including location, time and method of sampling. *Pre-dawn cast collection at same location and date, #WP2 sample at beginning or end of LHPR tow to allow quantitative comparison.

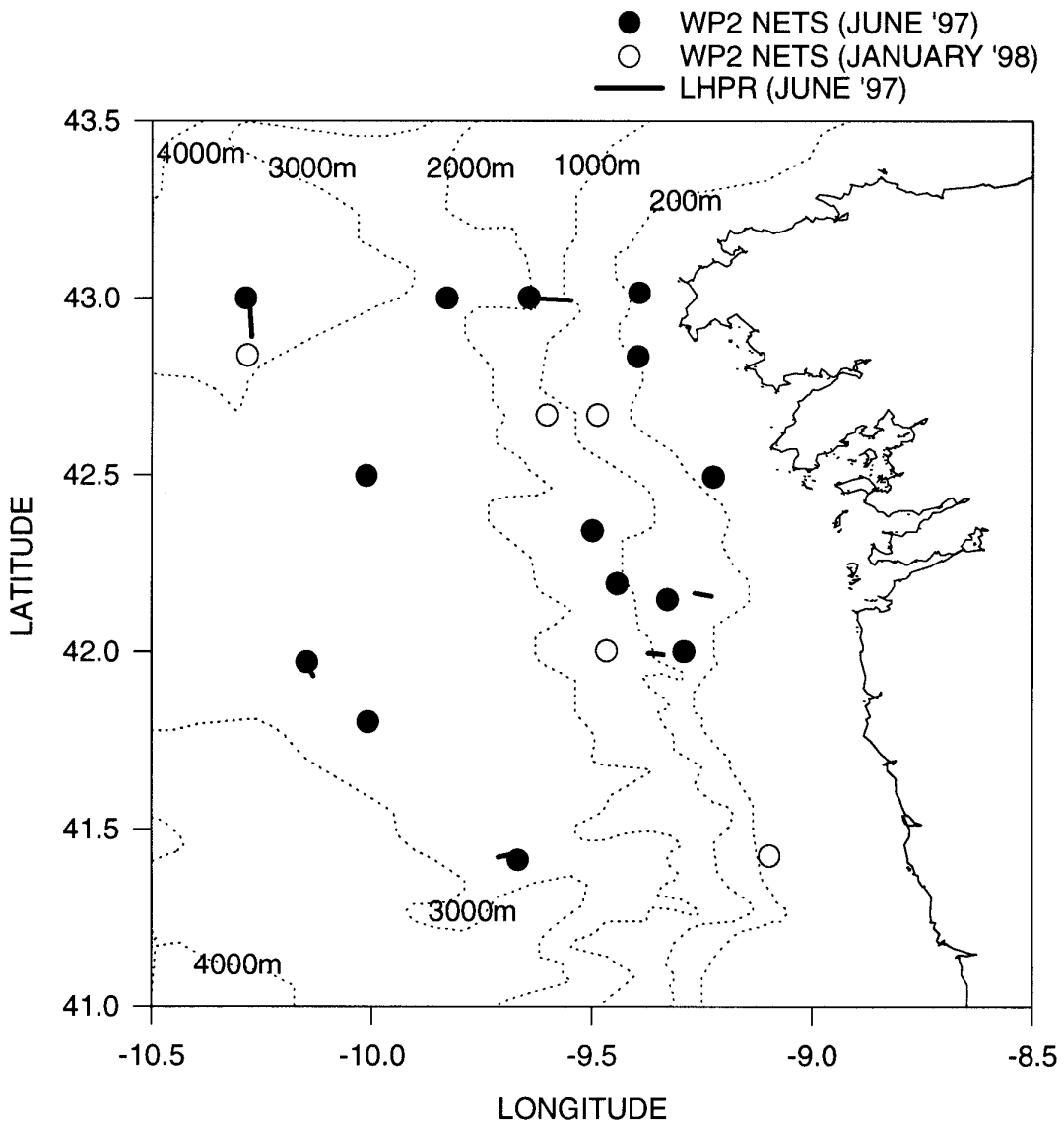

Figure 1 Locations at which mesozooplankton samples have been collected using the WP2 nets and LHPR system to date.