5.5 Are resting eggs an overwintering strategy of neritic calanoid copepods in the Kara Sea?

M. Engel

Alfred Wegener Institute for Polar and Marine Research, Bremerhaven

A number of physical and hydrographical parameters in the Kara Sea display a high seasonal variability. Salinity, for example, cycles strongly, particularly in surface waters, due to dramatic changes in fresh water discharge from Ob and Yenisei Rivers (Pavlov and Pfirman 1995). In late summer, after discharge levels reached their maximum, the river plume can easily be detected even at 78°N. In winter and early spring, on the other hand, surface salinity increases significantly in the Kara Sea. Light intensity also varies on a seasonal basis. During the arctic winter values are small, as the sun stays below the horizon. As a result, photoautotrophic primary production is very low or ceases altogether. Additionally, sea ice, which covers the Kara Sea from approx. November to June (Gloersen et al. 1992), further reduces light penetration into the water. Consequently, herbivorous and brackish water organisms will experience a period of low food availability and inadequate salinity during that time of year.

Calanoid copepods dominate the Kara Sea zooplankton in terms of abundance (Fetzer and Hirche 2002) and biomass (Vinogradov et al. 1995) and therefore play an important role in the ecosystem. Some species are herbivores and many can be found living in intermediate salinities. In the temperate zone a number of neritic calanoids were found to produce resting eggs (Marcus 1996), to overcome adverse conditions. The eggs sink to the sea floor and, in the case of dormant eggs, will only hatch after conditions have improved and are favourable for development. True diapause eggs require a genetically fixed period of time to pass before hatching can occur. Whether species from the Kara Sea also use these strategies to secure population survival is unknown at present.

To answer this question

- unpreserved sediments will be incubated and the overlying water regularly screened for copepod nauplii. Thereby one will get an idea as to whether there are any copepod resting stages in the sediments or not.
- the organic compound will be separated from the sediment of a second set of unpreserved samples. Morphologically similar resting stages will be grouped and incubated. It is intended to raise any hatching nauplii to an identifiable stage. This should enable us to identify resting eggs in preserved samples down to species level.
- a preserved set of samples will be used to get information on the spatial distribution and abundance of resting eggs of neritic calanoid copepods in Kara Sea sediments.

Sediment samples were obtained at 32 stations (Tab. 5.4) using a Multicorer (MUC) equipped with transparent Plexiglas tubes (length 65 cm, inner diameter 6 cm) and capable of collecting up to 12 cores simultaneously. Usually three cores were taken per station. On two occasions samples had to be taken from a large box corer using MUC

Plexiglas tubes. The soft top layer (3-7 cm thick) of each core was spooned into a 500 ml Kautex bottle. Subsequently, the three samples were treated as follows:

Incubation of sediments

The bottle was topped up with 0.2 µm filtered seawater (approx. 34‰, 0°C) and placed in an incubator at 0°C and LD 20:4. The supernatant was decanted every 3-7 days by pouring it through a 55 µm sieve. The bottle was then refilled again with 0,2 µm filtered seawater (approx. 34‰, 0°C) and returned to the incubator. The material retained by the sieve was washed back into a plastic Petri dish and a few drops of Bengal rose solution was added. On the following day the Petri dish was screened for copepod nauplii. If present, they were transferred into a 0.5 ml Eppendorf cap and preserved in 4% borax buffered formalin for later identification and counting.

Incubation of similar morphotypes

The bottle was topped up with 0,2 µm filtered seawater (approx. 34‰, 0°C) and stored in an incubator at 0°C and DD until the return to Bremerhaven.

Distribution and abundance

For later identification and counting of copepod eggs the sample was preserved in 4% borax buffered formalin.

Table 5.4:Sediment sampling stations

Station	Date	Time (GMT)	Latitude ° N	Longitude ° E	Depth (m)	Number of tubes taken	Device used
BP01-01	14.08.01	12:00	74°59.12	76°23.41	38	4	MUC
BP01-11	18.08.01	12:00	72°05.6	81°41.8	12	3	MUC
BP01-14	19.08.01	7:20	71°49.3	82°27.2	21	3	GKG
BP01-19	21.08.01	11:00	72°35.7	80°06.4	28	3	GKG
BP01-26	23.08.01	4:30	74°00.0	80°01.4	33	3	MUC
BP01-28	24.08.01	4:15	75°56.34	89°15.9	51	4	MUC
BP01-30	24.08.01	13:30	76°24.75	88°10.76	47	3	MUC
BP01-31	25.08.01	4:30	77°34.2	87°54.5	88	3	MUC
BP01-34	25.08.01	15:20	77°54.29	89°20.15	91	3	MUC
BP01-35	26.08.01	4:30	77°54.31	83°45.94	160	3	MUC
BP01-37	26.08.01	13:52	77°48.9	86°11.9	144	3	MUC
BP01-38	27.08.01	4:30	77°5.29	86°55.48	110	3	MUC
BP01-40	27.08.01	16:30	76°25.2	85°39.9	52	3	MUC
BP01-41	28.08.01	4:00	75°41.4	87°07.8	42	3	MUC
BP01-43	28.08.01	11:30	75°22.99	85°49.90	48	3	MUC
BP01-45	29.08.01	8:00	77°6.83	84°44.0	87	3	MUC
BP01-46	30.08.01	4:53	77°55.43	75°57.35	323	3	MUC
BP01-48	31.08.01	4:30	77°53.49	81°29.94	202	3	MUC
BP01-51	31.08.01	14:30	77°54.68	79°29.48	158	3	MUC
BP01-52	01.09.01	4:19	77°29.94	79°52.0	75	3	MUC
BP01-55	01.09.01	11:48	77°2.97	79°43.99	83	3	MUC
BP01-56	02.09.01	4:30	76°59.58	75°11.48	176	3	MUC
BP01-58	02.09.01	12:20	76°48.12	78°21.24	94	3	MUC
BP01-59	03.09.01	4:30	76°31.16	74°30.95	176	3	MUC
BP01-61b	03.09.01	13:15	76°12.9	75°53.15	111	3	MUC
BP01-62	04.09.01	4:30	76°12.05	74°12.15	135	2	MUC
BP01-65	05.09.01	4:18	75°42.98	75°50.79	63	3	MUC
BP01-66	05.09.01	11:28	75°10.04	76°55.13	55	3	MUC
BP01-67	06.09.01	4:30	75°14.65	73°45.78	49	3	MUC
BP01-68	06.09.01	12:25	74°35.05	72°14.97	31	3	MUC
BP01-70	07.09.01	7:15	72°40.16	74°0.22	22	3	MUC
BP01-82	11.09.01	4:17	73°11.83	73°01.65	29	3	MUC