Short cruise report of ALKOR journey 463

Practical course at sea for students of Biological Oceanography

(MNF-bioc-301 ALKOR cruise)

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Objectives

The main aim of our cruise was to investigate the horizontal and vertical distribution of abiotic factors as well as planktonic and benthic components along the environmental salinity gradient, from the Kiel Bight to the Kattegatt and Skagerrak regions. This included data collection on temperature, salinity and oxygen as well as chl *a*, phytoplankton, mesozooplankton, macroplankton and macrozoobenthos. The hypothesis for the students was to test whether the *Remane*'s concept (Fig. 1) holds for both, pelagic and benthic communities. The main goal was demonstrating what means doing science on a research ship. Nine students of the "Biological oceanography" (M.Sc.) course were permanently trained by three staff scientists: Dr. Jamileh Javid led the cruise and organized the sampling and the evaluation of the plankton, Dr. Christian Pansch organized the sampling and the evaluation of the benthos and Dr. Marco Scotti was responsible for data handling and modeling. Students have learned: (1) how to plan the entire workflow, from sample collections to lab activities (these included the most prominent methods available in planktonic as well as benthic sampling programs); (2) how to perform data analysis and prepare the presentation of the results. At each station, students were actively involved in measurements of the hydrography, net sampling, Van Veen grab collection and benthic dredge trawling. Students have sampled different depth strata to determine the planktonic composition of the upper, middle and bellow halocline water layers. Biodiversity estimates were performed immediately after each sampling cast (i.e., species composition and richness). To strengthen our student's network, a day-visit to the Sven Lovén Centre for Marine Sciences in Kristineberg was organized. Finally we offered two „open ship" days to M.Sc. students of Marine Science at Gothenburg University and presented our work and research on board of Alkor. This led to fruitful discussions on the biological interpretation of the results obtained during the cruise.

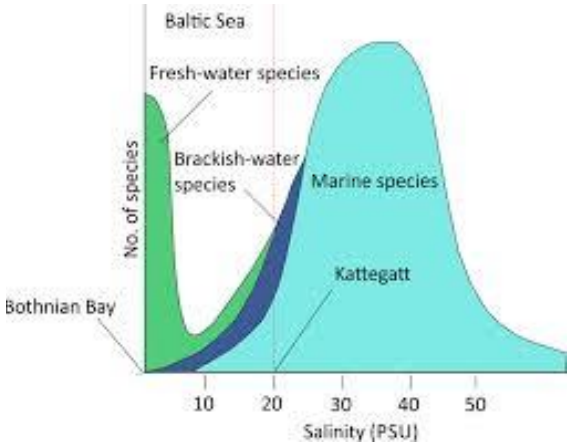


Fig. 1 – Remane's concept explains species diversity along the salinity gradient of the Baltic Sea with more diversity in marine and freshwater areas compared to brackish water. (www.helcom.org)

Work Plan

Samples were taken at 20 sampling stations out of initially submitted 40 stations during two weeks (Table 1). The main reason to cancel half of our stations were partly bad weather in the central BS and partly intense counting time students needed to finish samples before arrival to the next station in Kattegat and Skagerrak.The following instruments were used during the cruise: a water bottle rosette equipped with a CTD, fluorescence and oxygen probes, a WP2 net with 200 µm, a WP3 net with 1 mm mesh size, a double bongo with a 335 µm net and a 500 µm net, a Van Veen grab sampler and a dredge. In order to have depth specific samples of macroplankton (mainly jellyfish), WP2 and WP3 nets equipped with closing mechanism were applied in the two 24h sampling stations (S6 & S42), one in the Baltic Sea and the other in the southern Skagerrak. This enabled students to track water column distribution of both planktonic prey and predators, as well as their diurnal vertical migration. The use of Van Veen grab and dredge at different stations demonstrated the horizontal distribution of macrozoobenthos along the Baltic Sea-Kattegat-Skagerrak salinity gradient. All hydrographical and biological measurements were analyzed and visualized using the R software environment for statistical computing and graphics.

The following specific qestions were adressed with the data obtained from the cruise:

(1) Is there a relationship linking the diveristy of jellyfish and mesozooplankton to the environmental salinity gradient?

(2) Does jellyfish abundance vary along the salinity gradient (specific focus was on the pattern displayed by *Mnemiopsis leidyi*)?

(3) Does the *Remane*'s concept hold for both benthic and pelagic communities?

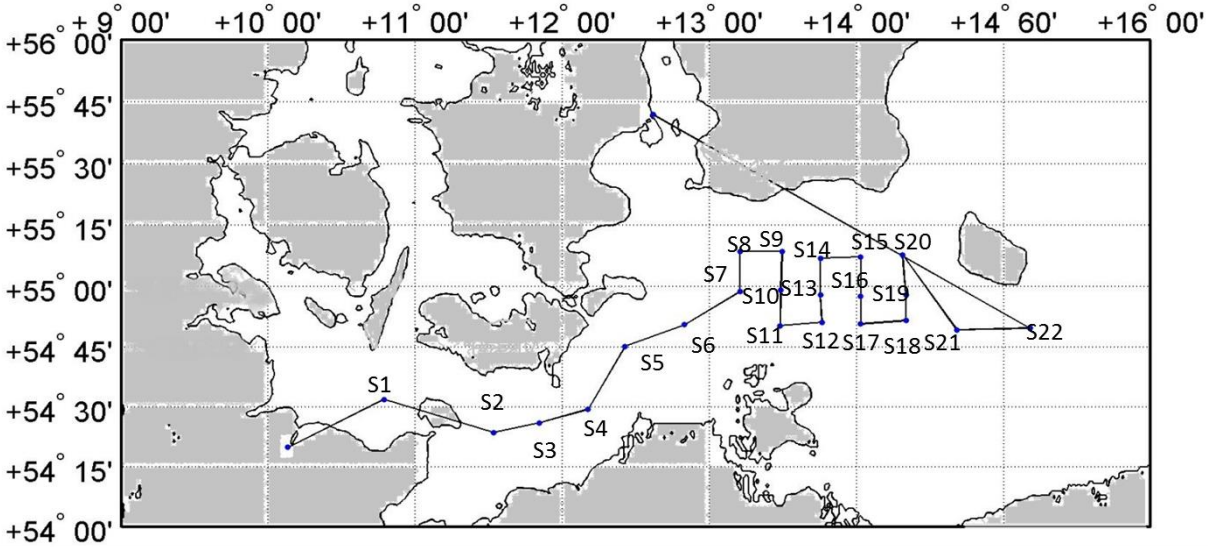
Data analysis involved the following steps:

(1) Importing the data in R from text files (data included information on biomasses, abundances and vertical distributions of abiotic parameters).

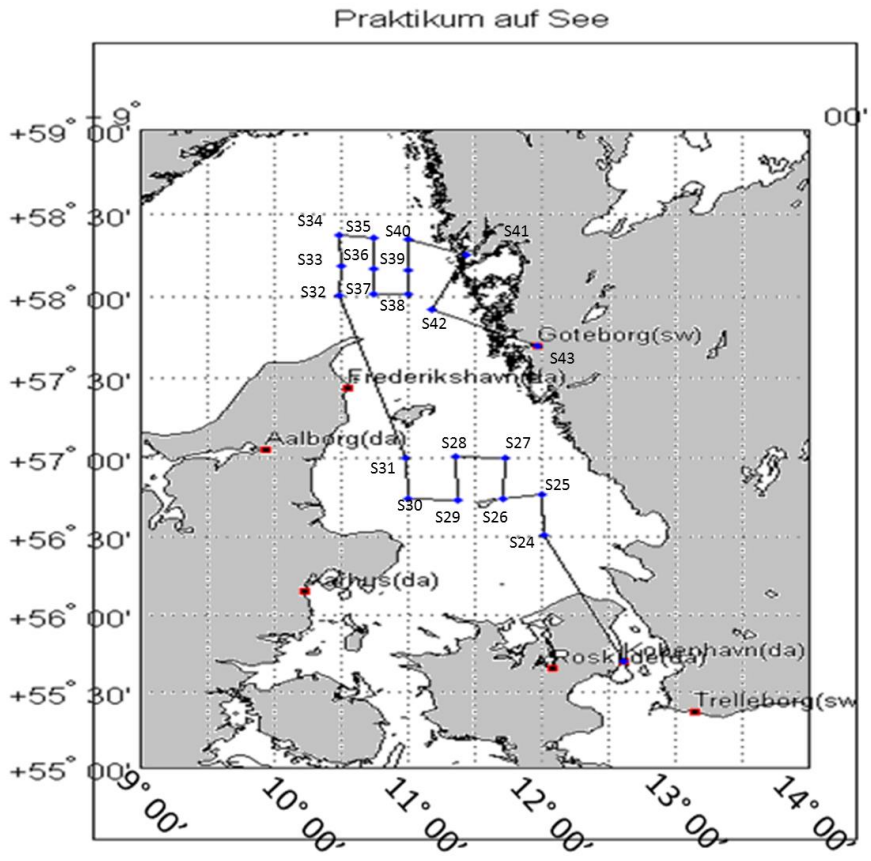
(2) Visualizing the data (i.e., using plots, boxplots and barplots).

(3) Calculating diversity indices and performing statistical analysis with parametric and non-parametric tests.

Map of the Baltic Sea stations



Map of the Kattegat and Skagerrak stations



Coordinates of the sampling sations

Station	Area	Lat	Lon	devices used
1	KB	54° 31'	10° 47'	CTD, Bongo, WP3, Van der Veen, Drege , WP2
2	AB	54° 23'	11° 32'	CTD, Bongo, WP3
3	AB	54° 26'	11° 50'	CTD, Bongo, WP4
4	AB	54° 29'	12° 10'	CTD, Bongo, WP5
5	AB	55° 08'	13° 29'	CTD, Bongo, WP6
6	AB	54° 59'	13° 28'	CTD, Bongo,WP3, WP2,Van der Veen Grab, wate
23	Copenhagen	55° 42'	12° 37'	no sampling
24	Kat	56° 30'	12° 1'	CTD, Bongo, WP3
25	Kat	56° 46.0'	12° 0.3'	CTD, Bongo, WP4
26	Kat	56° 46'	11° 43'	CTD, Van der Veen Grab
27	Kat	56° 59'	11° 43'	CTD, Bongo, WP3
28	Kat	56° 57'	11° 21'	CTD, Bongo, WP3, Dredge
29	Kat	56° 48'	11° 18'	CTD, Bongo, WP3
30	Kat	56° 45'	10° 59'	CTD, Bongo, WP4
32	SK	58° 32'	10° 28'	CTD, Bongo, WP3, Van der Veen Grab
34	SK	58° 22'	10° 29'	CTD, Bongo, WP3
36	SK	58° 10'	10° 44'	CTD, Bongo, WP4
38	SK	58° 0.4'	10° 59'	CTD, Bongo, WP5
41	Lysikel	58° 14.98'	11° 25'	no sampling
42	Kat	57° 54'	11° 10'	CTD, Bongo,WP3, WP2, Watter sampler
43	Gothenburg	57° 42'	11° 58'	no sampling