ALKOR-Berichte

Bachelor MARSYS education cruise in the Baltic Sea

Cruise No. AL598

27th of July 2023 to 6th of August 2023,
Kiel (Germany)
MARSYS

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IMF Institute for Marine Ecosystem and Fishery Science

2023

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1 Cruise Summary

1.1 Summary in English

This cruise was planned as a teaching cruise for bachelor students of the Institute of Marine Ecosystem and Fisheries Sciences (IMF) to learn the most commonly used scientific methods, gears and working procedures of fisheries science and biological oceanography on board of a research vessel.

One objective was to investigate the distribution patterns of certain fish species such as cod, whiting, sprat and herring in the Kiel Bight, Mecklenburg Bight with a focus on juvenile gadeid species.

Another objective were zooplankton and hydrological surveys for which plankton stations were sampled along the cruise track to gain insights into the spatial distribution of zoo- and ichthyoplankton.

All necessary educational content could be taught including on board qualitative assessement of zooplankton distribution both in the Arkona and Mecklenburg Basin. The rest of the analysis will be partly done in the form of Bachelor or Master theses as well as in the context of doctoral theses.

1.2 Zusammenfassung

Diese Fahrt war als Lehrfahrt für Bachelor-Studenten des Instituts für Marine Ökosystem- und Fischereiwissenschaften (IMF) geplant, um an Bord eines Forschungsschiffes die gebräuchlichsten wissenschaftlichen Methoden, Fanggeräte und Arbeitsverfahren der Fischereiwissenschaft und der biologischen Ozeanographie kennenzulernen.

Ein Ziel war es, die Verteilungsmuster bestimmter Fischarten wie Dorsch, Wittling, Sprotte und Hering in der Kieler und Mecklenburger Bucht zu untersuchen, wobei der Schwerpunkt in dieser Reise auf juvenilen Gadeidenarten lag.

Ein weiteres Ziel waren Zooplankton- und hydrologische Untersuchungen, für die Planktonstationen entlang der Fahrtroute beprobt wurden, um Erkenntnisse über die räumliche Verteilung von Zoo- und Ichthyoplankton zu gewinnen.

Alle notwendigen Lehrinhalte konnten an Bord vermittelt werden, einschließlich der qualitativen Bewertung der Zooplanktonverteilung sowohl im Arkonabecken als auch in der Mecklenburger Bucht. Der Rest der Analyse wird teilweise in Form von Bachelor- oder Masterarbeiten sowie im Rahmen von Doktorarbeiten durchgeführt.

2 Participants

2.1 Principal Investigators

Name	Institution
Luisa Listmann, Dr.	IMF

2.2 Scientific Party

Name	Discipline	Institution
Listmann, Luisa, Dr.	Chief scientist	IMF
Dahlke, Flemming, Dr.	Jun. Prof.	IMF

Malzahn, Arne, Dr.	Senior scientist	IMF
Vogel, Marie	PhD student	IMF
Aberle-Malzahn, Nicole, Prof. Dr.	Prof.	IMF
Ressing, Tobias	PhD student	IMF
Möller, Kristof	PhD student	AWI
Harmer, Rachel	Technical Assistant	IMF
3 Students from the Master Program 2nd semester		IMF
10 Students from Bachelor Program 3rd semester		IMF

2.3 Participating Institutions

IMF Institute for Marine Ecosystem and Fishery Science, Hamburg

AWI Alfred Wegener Institute, Bremerhaven

3 Research Program

3.1 Description of the Work Area

Four work areas were part of the cruise and are the following going from the West to the East: Kiel Bight, Mecklenburg Bight, Arkona Basin and Bornholm Basin (Fig. 3.1.1). This cruise included collecting samples from all major compartments of the ecosystem, from coastal to open waters in a 3-dimensional distribution.

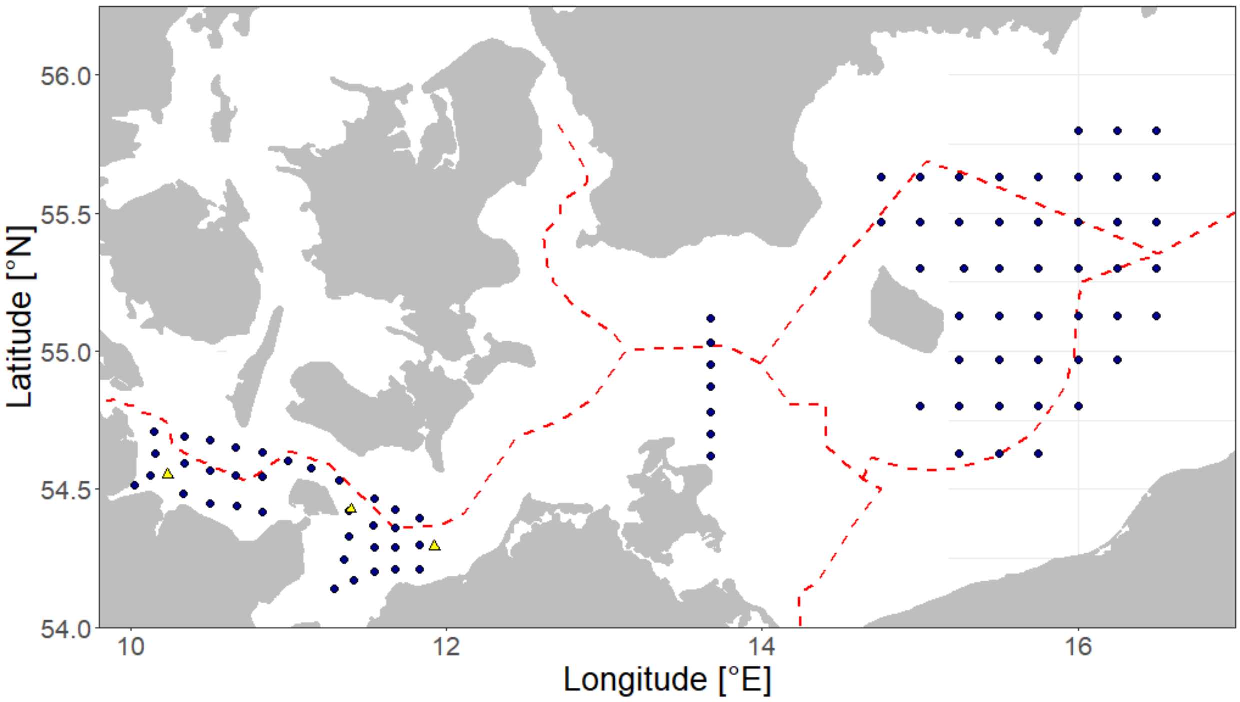

Fig. 3.1.1 Overview map indicating sampling stations of the cruise AL 598. Darkblue dots indicate plankton grid stations (GS). Yellow triangles indicate trawl stations (TW). Dashed red line indicates EEZ borders. Positions per Gear that were realized during the cruise are given in Table 6.1

3.2 Aims of the Cruise

The cruise had three main general objectives with regard to the scientific training of our students:

1. Provide knowledge and practical skills with regard to the operation of a broad range of different gears needed to sample and investigate the different ecological compartments of a marine ecosystem covering ocean physics, chemistry, particularly plankton, and fish.
2. Provide insights and experiences regarding cruise organization and sampling strategies, producing meaningful estimates of abundance, biomass and rates of selected species or species groups in relation to a stratified marine ecosystem.
3. Provide opportunities to gather relevant data and specimens for bachelor, master and PhD theses.

Specific investigations included a detailed hydrographic survey (oxygen, salinity, temperature, light intensity, fluorescence), plankton surveys (phyto-, zoo- and ichthyoplankton, with the goal to determine the composition, abundance, vertical and horizontal distribution) and fishery hauls in the Western Baltic Sea.

The latter served to determine size distributions, maturity status, and length – weight relationships of the three dominant fish species in the system of the Baltic, cod (Gadus morhua), herring (Clupea harengus) and sprat (Sprattus sprattus). Various different samples were obtained for more detailed analyses, stomachs of cod; otoliths of cod for the determination of the individual age.

Most of the samples are of “dual use” in the sense that they are also either used for thesis work or in international cooperation (DTU Aqua).

Above all we teach the scientific work following the “Declaration of Responsible Research” as well as to the ”Code of Conduct for Responsible Marine Research in the Deep Seas and High Seas of the OSPAR Maritime Area” issued by OSPAR, the Commission protecting and conserving the North-East Atlantic and its resources.

3.3 Agenda of the Cruise

As a basis of the teaching procedure, the daily work plan included a concept of rotation through a range of different subjects. Four different fields of responsibility were determined, in which each student received individual training, or in a group of two, to establish a practical knowledge of work on a research vessel. Therefore, experienced staff members of the institute lead the teaching process and give guidance throughout the entire process, resulting in gapless mentoring.

The students were lead through the following fields of responsibilities:

I. Gear: Deploying gears, including the handling of the voice intercom system, gear software, data documentation and station work coordination.
II. Working on deck: Practical work on deck, including preparation of gears for their use; supporting the crew to manoeuvre the gear in and out of the water.
III. Sampling: Handle the plankton samples correctly until they are labelled, fixed and stored properly. Processing of fish hauls with the trawls, including the coordination of the

working procedures. These included taking adequate subsamples, fish sorting and species identification, length-frequency measurements and determination of sex, maturity as well as otolith preparation, for age determination. These steps add up to apply basic and advanced methods needed for assessment of fish populations.

IV. Lab coordination: On board measurements of, for example phytoplankton samples as well as sorting and determination of fish larvae. Additionally, the students learn the organization of all work procedures in the laboratory.

4 Narrative of the Cruise

The RV ALKOR could be fully loaded on the set-up days prior to the voyage. The voyage began as planned on the Thursday 27th of July at 7:30 am. The first CTD hauls and plankton sampling (Bongo) as well as a first fishing haul were carried out in the Kiel Bight. The calm weather until Saturday resulted in good working conditions, so that almost all planned plankton grid stations in the Mecklenburg and Kiel Bight as well as two more fishery hauls and a wreck angling could be carried out until Saturday 29th of July. The order of the plankton station deviated from the original planning, since due to shooting operations an entry into the shooting area Todendorf was only possible from 5 p.m. on weekdays and due to the training obligation the station processing partly took longer.

In the night to Sunday, the RV ALKOR steamed into the Bornholm Basin and the first Bongo Grid stations were processed there.

On Sunday afternoon, the RV ALKOR arrived as planned in Rönne on Bornholm for the change of scientific crew scheduled for Monday 31st of July.

The RV ALKOR left Rönne on Tuesday 1st of August as scheduled at 7:30 to head for the Bornholm Basin and continue with the eastern Bongo Grid.

The weather conditions were less than optimal due to wind and relatively high swell, so work at night was left out. Until Wednesday 2nd of August afternoon, as many Bongo Grid stations as possible were sampled, but due to the deteriorating weather, the RV ALKOR left towards the west around 5 pm.

In the Arkona Basin the wind and weather conditions were much better, so that a south-north transect could be sampled to make comparative analyses of the water column: Firstly, qualitative and semi-quantitative plankton net samples from the Multinets MSN5 and Bongo net were compared directly on board using several binoculars. Secondly, the oxygen CTD data from the large water sampler CTD were compared with chemically determined oxygen concentrations. The same procedure was carried out again on Friday 4th of August on another transect in Mecklenburg Bight.

On Saturday 5th of August in the morning, another fishing haul was carried out in the Weissnitz Channel and after the haul was processed, everything was stowed and dismantled. The RV ALKOR returned to Kiel on Saturday 5th of August late afternoon and the scientific crew disembarked on Sunday 6th of August.

5 Preliminary Results

5.1 Underway Hydroacoustics

During the whole cruise the EK60 was running and in Fig. 5.1.1 A the cruise track over the whole cruise is shown.

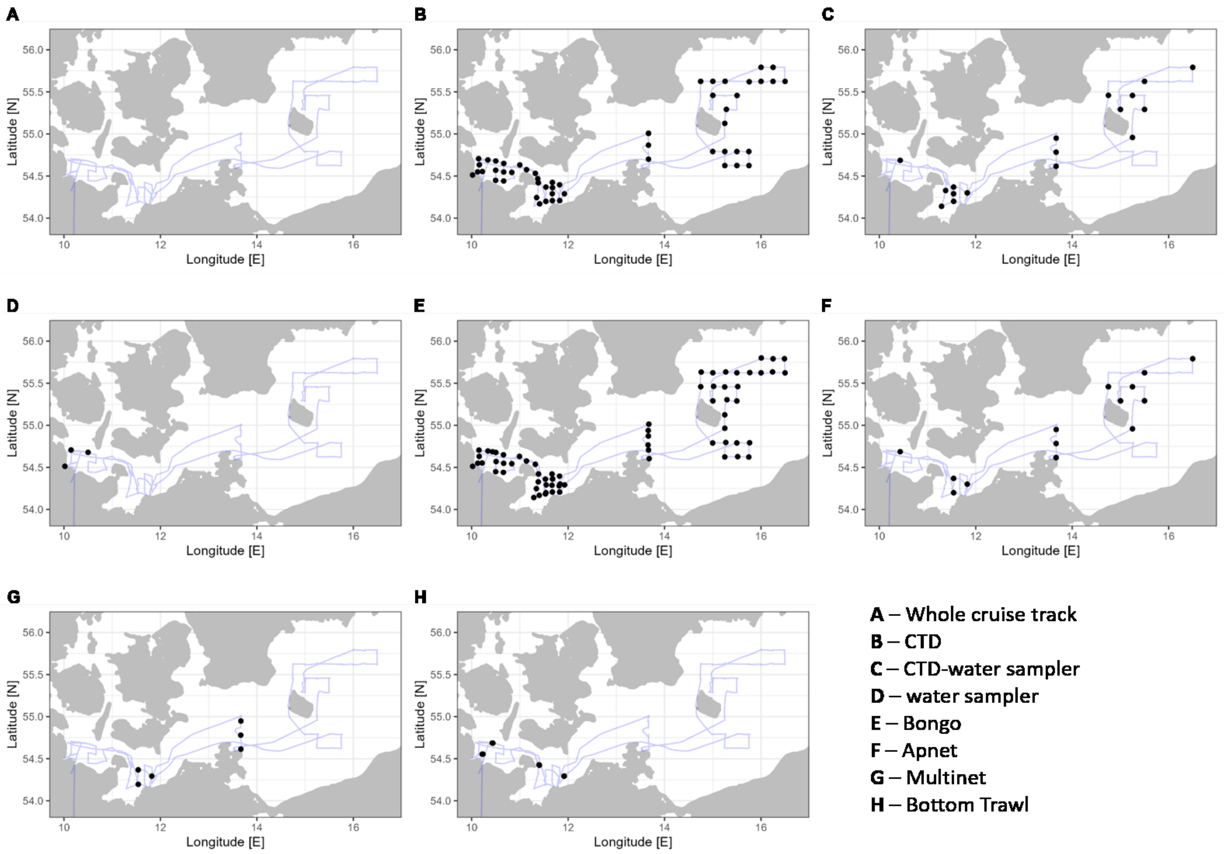

Fig. 5.1.1 Cruise track maps with station overview of the different deployed equipment.

A detailed list of gear deployments (Table 5.1), the station list (Table 6.1), and an overview of first scientific results are provided below.

Table 5.1 Overview of gear deployment. Mesh sizes are given in brackets.

Gear	Total
ADM-CTD vertical	55
Watersampler (Niskin Bottle)	3
Bongo (150µm ,335µm, 500µm)	69
TV/520 Bottom Trawl	4
Fishing at wrecks	3
ADM-CTD-Water sampler	16
Apnet	19
Total	169

5.2 Water and Plankton Sampling With CTD/Rosette

5.2.1 CTD Measurements

From East to West we found a surface gradient in salinity (Fig. 5.2.1 B): in the Western Kiel Bight there were the highest salinities measured at ca. 18 PSU whereas towards the Eastern Mecklenburg Bight we measured lower salinities at around 12 PSU. In the Bornholm Basin the salinities were lowest at ca. 7.5 PSU in the whole basin. The surface temperature varied only slightly and ranged between 17 and 19 °C (Fig. 5.2.1. A)

Below 15 m of depths in addition to the salinity gradient we could also measure a gradient in temperature and oxygen from West to East (Fig. 5.2.1. C to E). Specifically there was a strong stratification in all geographical areas with the strongest oxygen depletion in the deeper Bornholm basin (Fig. 5.2.1. E)

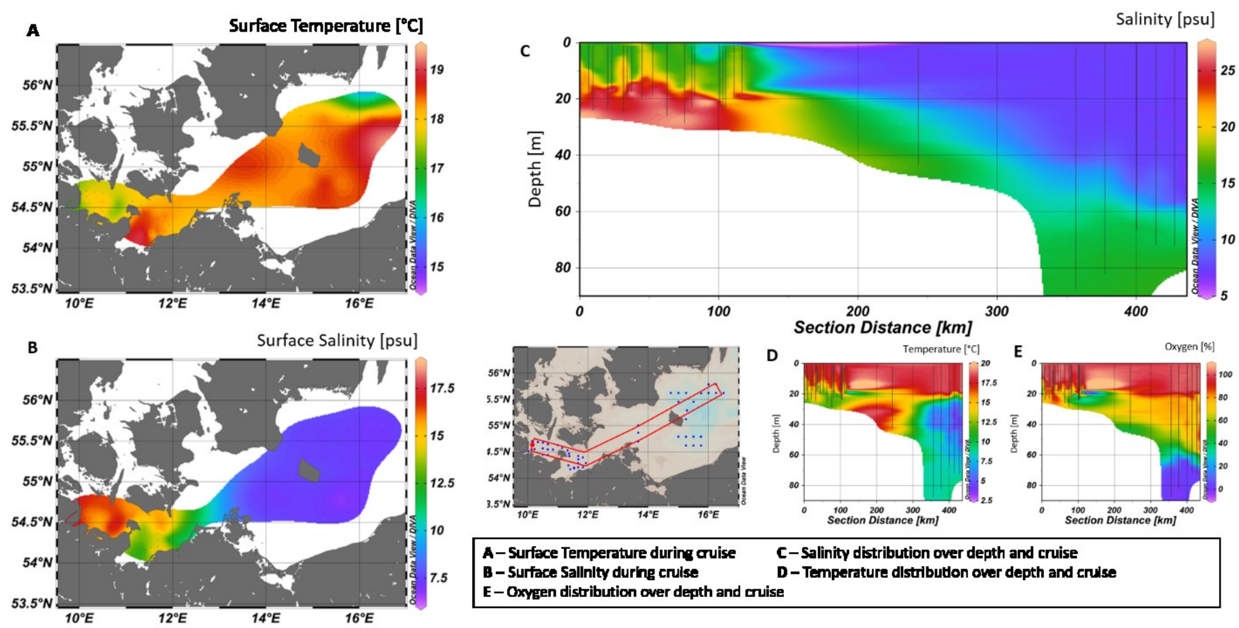

Fig. 5.2.1 Hydrographic data from CTD data during the cruise. Panels a and b show surface water conditions for temperature and salinity, respectively. Panels c to e show salinity, temperature and oxygen conditions along the cruise transect and the whole water column.

5.2.2 *Ostreococcus* and Virus Isolation From the Baltic Sea

As part of this ongoing project on the ecological and evolutionary effects of different temperatures and salinities in the Baltic Sea on host-virus dynamics of *Ostreococcus* and its viruses, we aim to answer the following questions: From which regions of the Baltic Sea can we isolate *Ostreococcus* sp. and its associated viruses And, subsequently, how do the viral dynamics differ between the origins of the hosts and viruses.

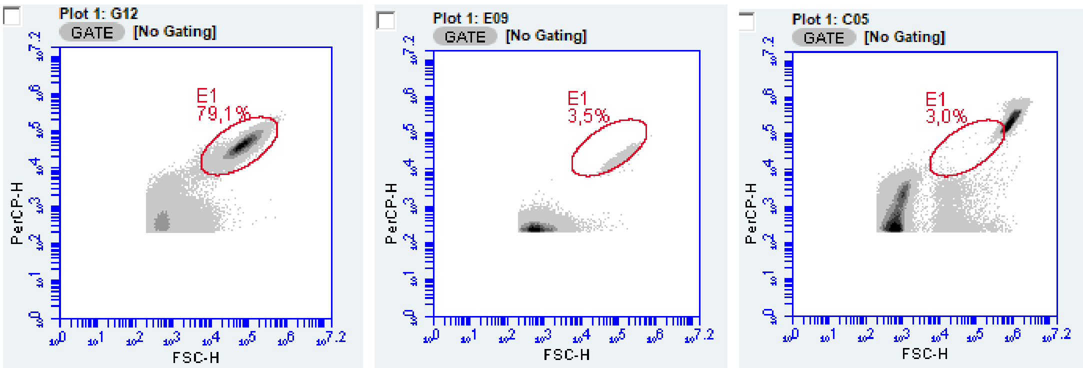

Fig. 5.2.2 Cytometric analysis of a potential Ostreococcus isolate after isolation by dilution. The left panel shows an identified Ostreococcus strain, the middle panel shows an isolate that may potentially be Ostreococcus and the right panel shows an isolate that is no Ostreococcus.

We therefore took surface water samples at 10 stations along the cruise track of AL598. On board, water samples of two size fractions (0.2-2µm and <0.45µm) were collected to isolate picoplankton and viruses, respectively, back in the laboratory at the IMF in Hamburg. The 10 stations were divided into Kiel Bight (3 stations) and Mecklenburg Bight (3 stations) and Bornholm Basin (4 stations).

Previously, isolations of Ostreococcus viruses have also been highly successful yielding ca. 100 new viral strains from water samples ranging from the Kiel Bight up to the Bornholm Basin (water samples from cruises in 2018 - 2022) [1]. Since virus isolations take months we have not yet isolated new virus strains from water samples taken on AL598 both virus and host strains from Ostreococcus will then be used for investigation of infection dynamics in relation to geographical distribution over the Baltic Sea and environmental change that include temperature and salinity changes.

5.2.3 Primary Productivity of Phytoplankton Communities

As part of an ongoing monitoring of primary productivity we analysed photosynthesis and respiration of phytoplankton communities from several stations along the cruise.

We took surface water samples at 6 stations along the cruise track of AL598. On board, we measured photosynthesis and respiratory activity of two different size fractions (0.2-2 µm and 0.2-37.5 µm) immediately after sampling, and assessed these responses over a gradient of salinity and temperature (due to geographical differences). The 6 stations were divided into Kiel Bight (3 station), Mecklenburg Bight (1 station) and Bornholm Basin (3 stations).

Preliminary analyses of the temperature curves (see Figure 5.2.3) show that the size fractions differ in their metabolic activity. In-depth analyses are ongoing, and point toward regional environmental forcing (e.g. comparisons between Kiel/Mecklenburg Bight and Bornholm Basin) having an impact on par with that of seasonal forcing (e.g. comparisons between spring and summer). Our results suggest that while populations from either region can swiftly adjust their metabolic profiles along gradients of environmental change, the underlying mechanisms differ.

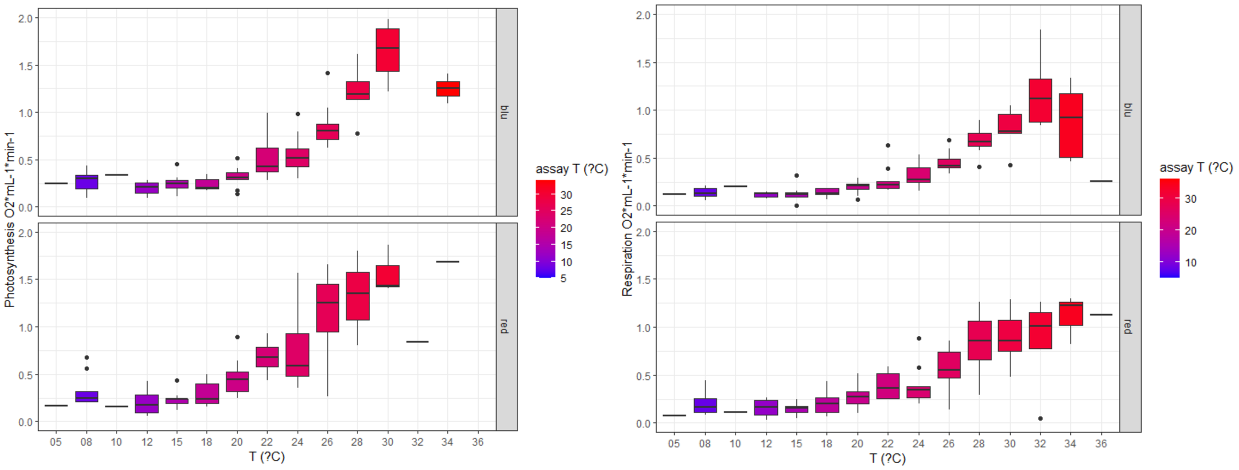

Fig. 5.2.3 Gross photosynthesis (left panel) and Respiration (right panel) rates of the two size fractions (blu <2µm, red <35.7µm) measured at different temperatures (colors indicate assay temperature). Respiration rates are generally lower than Photosynthesis indicating net primary production in the communities analysed.

5.3 Fishery

A total of 4 trawl hauls and 2 rod and reel fishery hauls were conducted during cruise AL598 (Fig. 5.1.1). The main target of fishing operations during AL598 were juvenile and adult cod for subsequent staging of individuals as well as to collect biological parameters length, weight and condition. This data should be used for subsequent comparison with data from previous cruises to give insights on potential long- or short-term changes in biological parameters. This campaign aims to track potential changes in spawning phenology of the stock (see [2, 3]) and is conducted by the University of Hamburg in cooperation with the Danish Technical University (DTU Aqua), GEOMAR and the University of Aarhus.

Total Catches

In total a number of 25 cod individuals with a total weight of 2.591 kg were caught during AL598. During the four conducted trawl hauls a total of 18 different fish species were caught with a total weight of 959 kg (see Tab. 5.1 and 5.2) including a total number of 9 cod with 2.951 kg. In general, it has to be noted, cod catches made in 2023 have been again considerably low compared to catches in previous years (with exception of 2021 when cod catches have been ever lower than in 2021). However, the small number of cod caught during AL598 fits well to the poor stock status of the western Baltic cod, which is at present considered to be at a historic low level (ICES, 2021).

Table 5.1 Total trawl catches during AL569 per species.

Species	Total weight [kg]	Total number
Cod (*Gadus morhua*)	2.951	16
Juvenile Cod (*Gadus morhua*)	7.05	Ca. 4500
Herring (*Clupea harengus*)	5.485	614

Sprat (*Sprattus sprattus*)	38.096	
Common dab (*Limanda limanda*)	277.21	
Plaice (*Pleuronectes platessa*)	603.8	
European Flounder (*Platichthys flesus*)	4.146	
American Plaice (*Hippoglossoides platessoides*)	1.49	22
Turbot (Pestta Maximus)	3.82	9
Common sole (*Solea Solea*)	0.399	4
Hooknose (*Agonus cataphratus)*	0.031	2
Great Sandeel *(Hyperolus lanceolatus)*	0.095	3
Snakeblenny (*Lumpenus lampretaeformis*)	0.836	31
Fourbeard Rockling (*Enchelyopus cimbrius*)	0.62	3
Butterfish (*Pholis gunnellus)*	0.126	7
Lemon sole (*Microstomus kitt*)	0.89	3
Sea Scorption (*Myoxocephalus Scorpius*)	7.783	127
Whiting (*Merlangius merlangus*)	2.806	54
Juvenile Whiting (*Merlangius merlangus*)	0.321	100

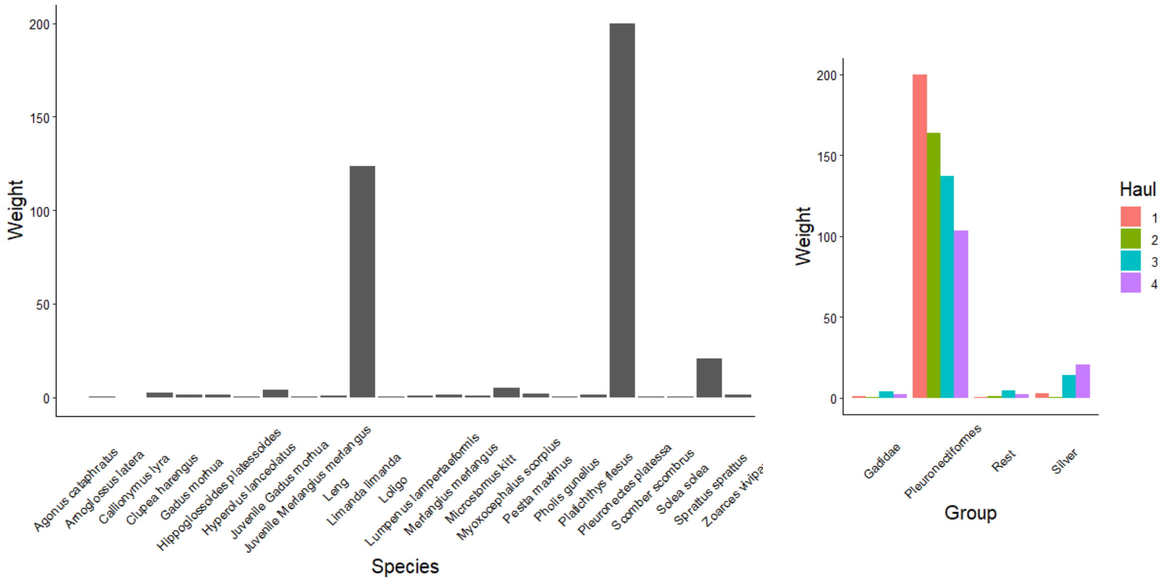

Fig. 5.3.1. Fish catches of AL598. Left panel shows the weight distribution between all species over the whole cruise. Right panel shows the weight distribution of the major fish groups over the four fishery hauls.

Size distributions of Clupeids and Pleuronectiformes

For clupeid fish species as well as flatfish species we measured the length distributions on board both on whole catches but also on subsamples of the whole catches. The size range of the herring varied between 6 to 20 cm whereas the size range of the sprat varied between 5 and 15cm. Overall more sprat than herring was caught (Fig. 5.3.2).

Within the group of flatfish the most abundant species was plaice followed by common dab and a few flounders. The size distribution of plaice and common dab were similar ranging from ca. 7

to over 30cm whereas the flounders were much larger between 20 to 40cm. The size distribution indicates the presence of many juvenile flat fish in the fishery hauls (Fig. 5.3.3.).

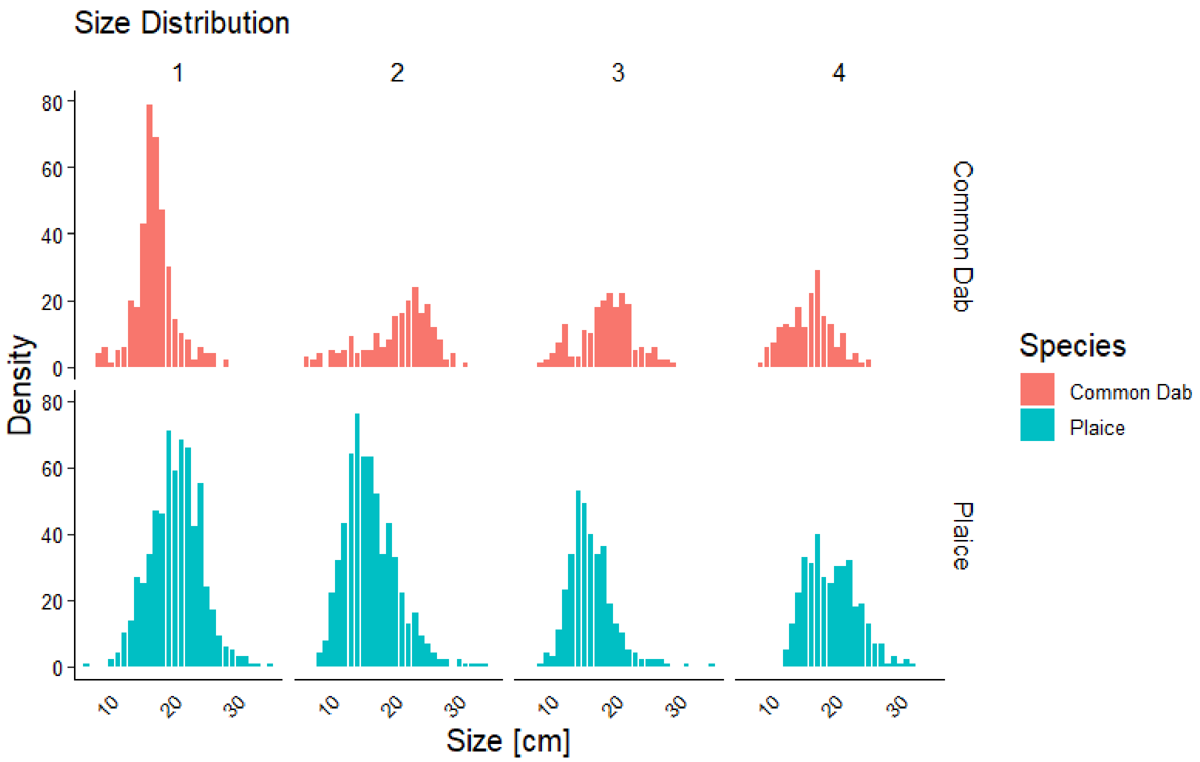

Fig. 5.3.2. Size distribution of herring (red) and sprat (blue) in the four fishery hauls.

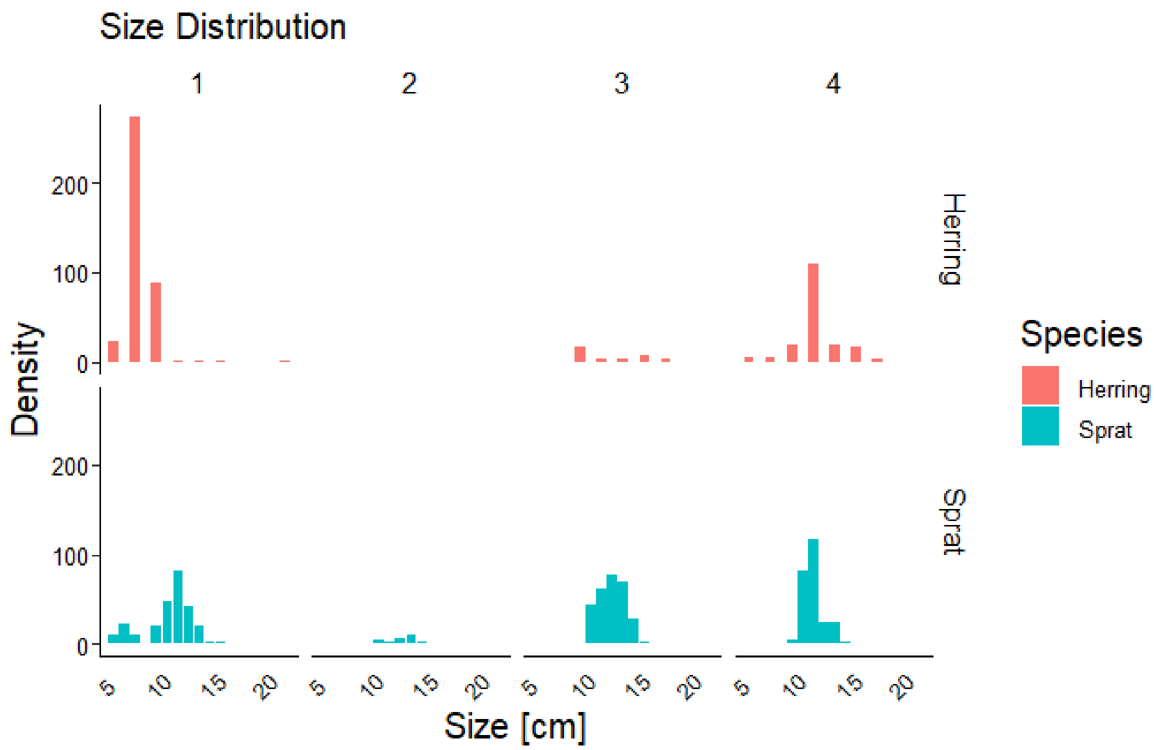

Fig. 5.3.3. Size distribution of common dab (green) and plaice (blue) in the four fishery hauls.

5.4 Toxin analysis

(Kristof Möller, AWI)

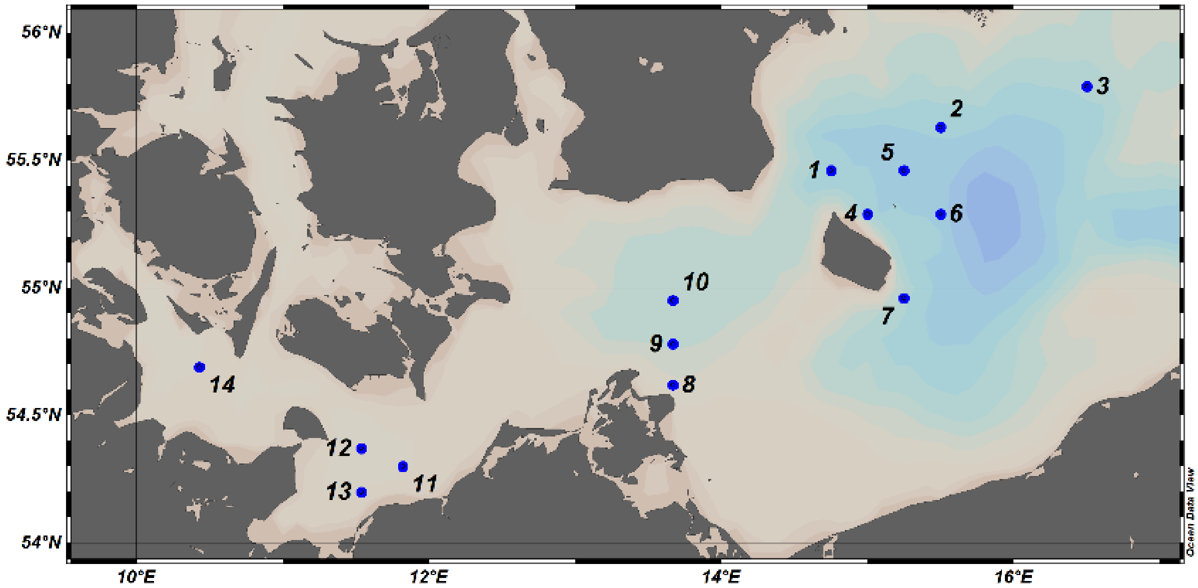

Fig. 5.4.1. Net-tow and CTD stations for phycotoxins.

Harmful algae blooms (HABs) pose a global threat to public health and coastal communities, causing intoxications and economic losses. These blooms are primarily caused by dinoflagellates, which produce phycotoxins capable of accumulating in seafood, including shellfish and mollusks, and directly impacting fish populations.

To assess the occurrence and distribution of HAB species and their phycotoxins in the Baltic Sea, we conducted sampling at a total of 14 stations (Fig. 5.4.1) covering the Kiel and Mecklenburg Bight, the Arkona Basin, and the Bornholm Basin. Throughout the entire cruise, we utilized the ship's seawater pump to collect dissolved toxin samples, providing a time and space integrated view of toxin levels in the water column. Additionally, we employed two distinct methods to sample particular toxin contents. Phytoplankton net-tows (20m vertical, 20 µm mesh size) were conducted to obtain integrated water column samples, increasing sampled water masses and thus algae biomass. These net-tow concentrates were further processed by size-fractionation (20, 50, 200 µm), and aliquots were separated for different extraction protocols (lipophilic and hydrophilic toxins, as well as DNA samples). Aliquots were subsequently centrifuged to create a dry algae pellet that was frozen at -20 °C for post-cruise toxin extraction. Furthermore, small HAB species, primarily those from the Azadinium genus, were targeted through filtration of Niskin bottle water from 10m and surface waters using 5 µm filters. While some phycotoxins can be directly connected to a producing organism, others have multiple producers and therefore aliquots of both sampling schemes were preserved for potential microscopic identification and/or enumeration of HAB species post-cruise.

Preliminary results underline the ongoing expansion/establishment of goniodomin producing Alexandrium pseudogonyaulax in the Baltic Sea. In addition, spirolides were found indicating the presence of Alexandrium ostenfeldii and pectenotoxins pointing towards various species within the Dinophysis genus.

5.5 Zooplankton and Oxygen Assessment of the Watercolumn

In the Arkona basin and Mecklenburg bight two small transects were sampled to investigate the distribution of zooplankton and oxygen over the watercolumn. To analyze the zooplankton 5 multinet samples were taken over the whole water column and compared to a bongo net sample that integrates the abundance of zooplankton over the whole water column. The samples were then analyzed qualitatively on board using binoculars. Fig. 5.5.1. shows the qualitative analysis of the zooplankton distribution on board the research vessel where dominant groups of cladozerans, gelatinous zooplankton and copepods could be found. In the Mecklenburg bight much less cladozerans could be found and more gelatinous plankton such as Aurelia and Mnepiosis could be found as well Fig. 5.5.2. This is in line with first analysis of the Bongo samples (data not shown).

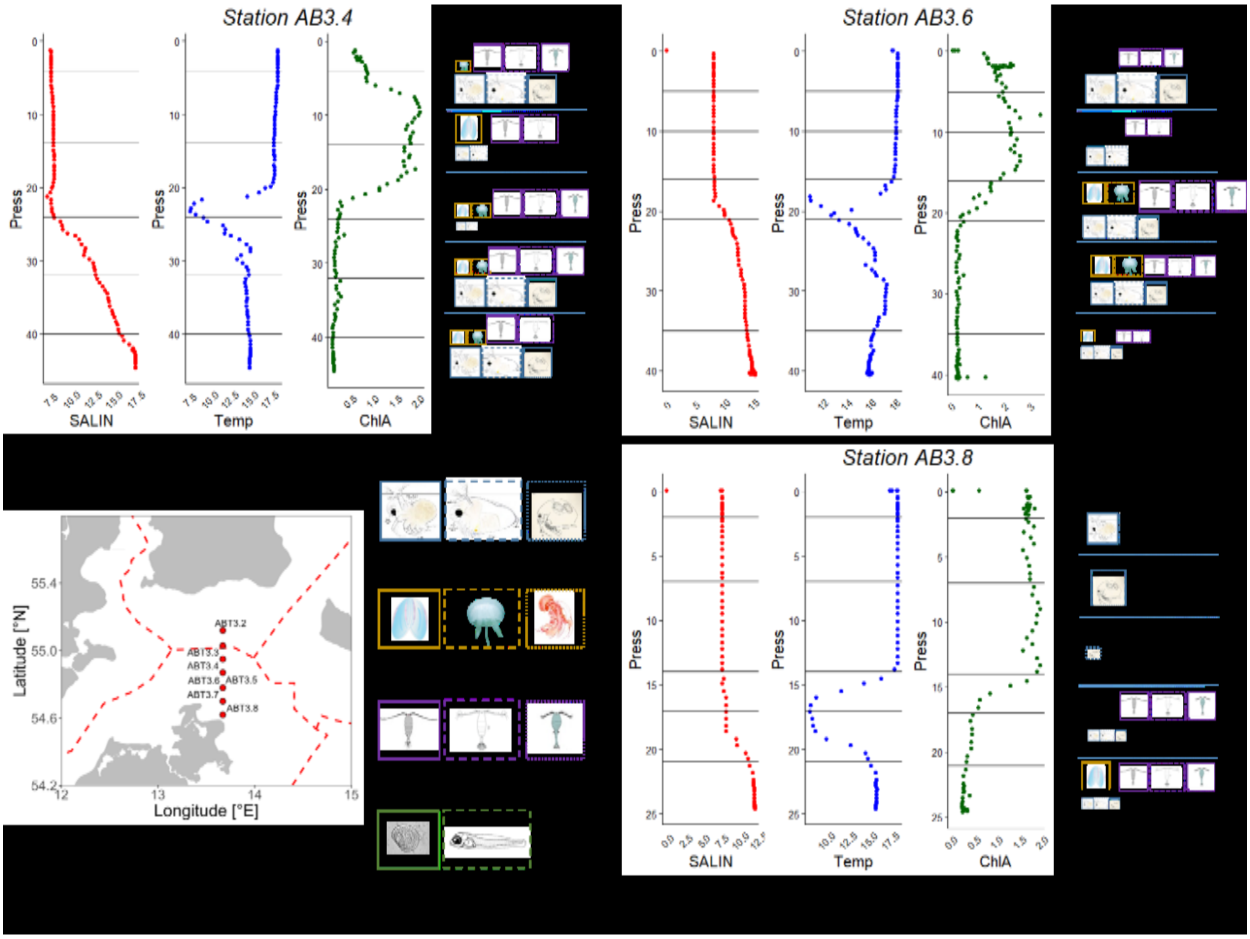

Fig. 5.5.1. Qualitative zooplankton distribution in the Arkona Basin

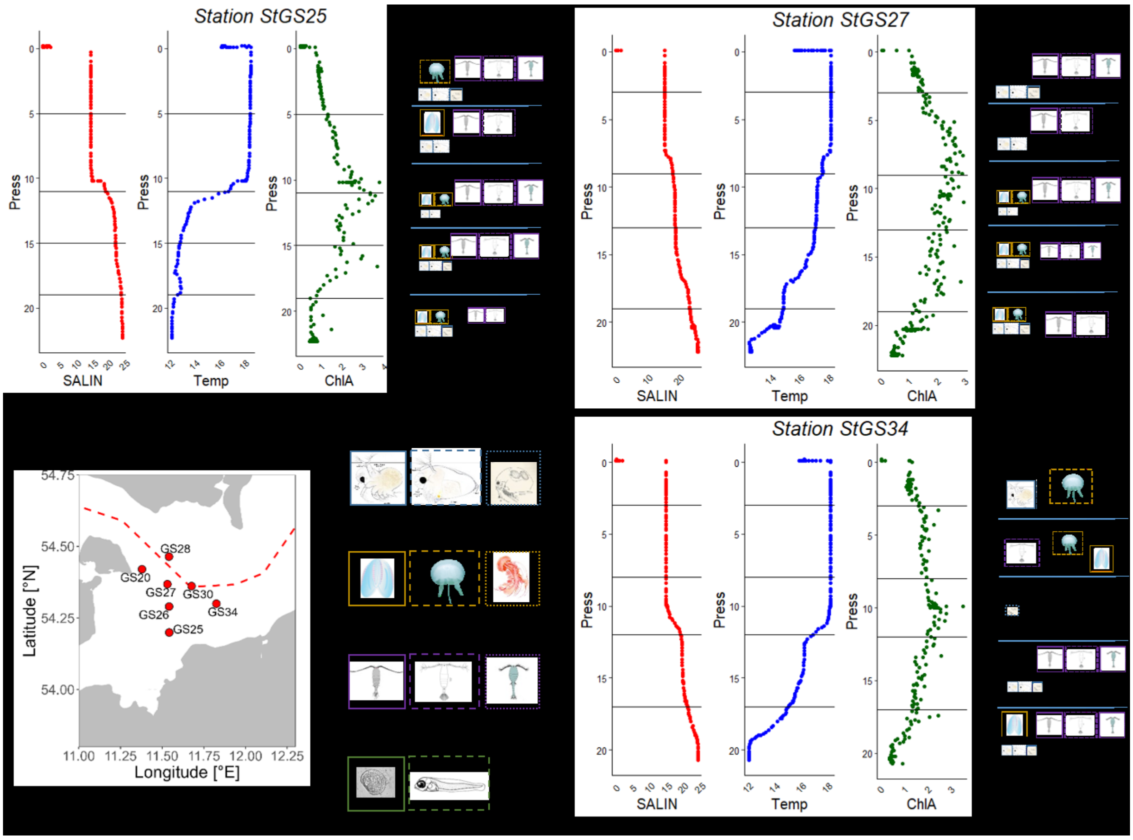

Fig. 5.5.2. Qualitative zooplankton distribution in the Mecklenburg Bight

6 Station List AL598

Table 6.1: Start positions for all used gears are given (in actionlog noted as "in water"). For fishing the "Start Fishing" positions are listed.

Date and time [UTC]	Gear	Latitude	Longitude	Depth (m)	Remarks
ALKOR			[°N]	[°E]	
27.07.2023 07:13	CTD	54° 30.783' N	010° 01.173' E	26	
27.07.2023 07:19	BUCKET	54° 30.782' N	010° 01.196' E	26	
27.07.2023 07:26	BONGO	54° 30.780' N	010° 01.283' E	26	
27.07.2023 08:12	BONGO	54° 33.153' N	010° 13.038' E	18	
27.07.2023 08:19	CTD	54° 33.219' N	010° 13.385' E	18	
27.07.2023 08:28	BT	54° 33.260' N	010° 13.112' E	19	
27.07.2023 08:38	BT	54° 33.270' N	010° 14.157' E	18	
27.07.2023 11:32	CTD	54° 33.000' N	010° 07.425' E	22	
27.07.2023 11:38	BONGO	54° 32.961' N	010° 07.536' E	21	
27.07.2023 12:16	BONGO	54° 37.854' N	010° 09.414' E	22	
27.07.2023 12:22	CTD	54° 38.039' N	010° 09.570' E	22	
27.07.2023 12:53	CTD	54° 42.422' N	010° 08.741' E	24	
27.07.2023 12:59	BUCKET	54° 42.427' N	010° 08.873' E	25	
27.07.2023 13:09	BONGO	54° 42.350' N	010° 09.130' E	26	
27.07.2023 13:51	BONGO	54° 41.702' N	010° 20.306' E	30	
27.07.2023 14:00	CTD	54° 41.476' N	010° 20.183' E	25	
27.07.2023 14:40	CTD	54° 40.762' N	010° 30.035' E	24	

27.07.2023 14:47	BUCKET	54° 40.724' N	010° 30.018' E	24
27.07.2023 14:54	BONGO	54° 40.658' N	010° 30.147' E	23
27.07.2023 15:31	BONGO	54° 38.993' N	010° 39.658' E	28
27.07.2023 15:38	CTD	54° 39.002' N	010° 40.008' E	25
27.07.2023 16:18	CTD	54° 32.894' N	010° 39.916' E	20
27.07.2023 16:22	BONGO	54° 32.900' N	010° 39.871' E	20
27.07.2023 16:58	BONGO	54° 34.187' N	010° 30.444' E	18
27.07.2023 17:05	CTD	54° 34.160' N	010° 29.961' E	18
27.07.2023 17:52	CTD	54° 26.944' N	010° 29.848' E	16
27.07.2023 17:56	BONGO	54° 26.929' N	010° 29.908' E	16
27.07.2023 18:33	BONGO	54° 26.466' N	010° 39.549' E	18
27.07.2023 18:39	CTD	54° 26.499' N	010° 39.900' E	18
28.07.2023 05:32	CTD	54° 32.626' N	010° 49.992' E	20
28.07.2023 05:39	BONGO	54° 32.649' N	010° 49.965' E	20
28.07.2023 06:12	FR	54° 36.495' N	010° 49.386' E	20
28.07.2023 07:33	BONGO	54° 37.856' N	010° 59.527' E	21
28.07.2023 07:40	CTD	54° 37.945' N	010° 59.933' E	20
28.07.2023 08:19	CTD	54° 34.559' N	011° 08.312' E	27
28.07.2023 08:23	BONGO	54° 34.548' N	011° 08.259' E	27
28.07.2023 09:18	BONGO	54° 32.235' N	011° 19.297' E	29
28.07.2023 09:26	CTD	54° 31.947' N	011° 19.268' E	29
28.07.2023 10:18	CTD	54° 25.234' N	011° 22.914' E	19
28.07.2023 10:24	BONGO	54° 25.298' N	011° 23.160' E	21
28.07.2023 10:37	BT	54° 25.632' N	011° 23.869' E	21
28.07.2023 10:48	BT	54° 25.360' N	011° 24.339' E	22
28.07.2023 12:03	CTD	54° 28.113' N	011° 22.253' E	24
28.07.2023 12:15	FR	54° 28.055' N	011° 22.250' E	24
28.07.2023 13:22	FR	54° 25.180' N	011° 22.950' E	19
28.07.2023 14:24	CTD water	54° 19.721' N	011° 22.553' E	21
28.07.2023 14:34	BONGO	54° 19.709' N	011° 22.884' E	21
28.07.2023 15:13	BONGO	54° 14.852' N	011° 20.599' E	20
28.07.2023 15:20	CTD	54° 14.673' N	011° 20.889' E	21
28.07.2023 16:04	CTD water	54° 08.454' N	011° 17.443' E	25
28.07.2023 16:13	BONGO	54° 08.500' N	011° 17.354' E	25
28.07.2023 16:46	BONGO	54° 10.095' N	011° 24.195' E	23
28.07.2023 16:54	CTD	54° 10.198' N	011° 24.605' E	23
28.07.2023 17:31	CTD	54° 11.967' N	011° 32.390' E	24
28.07.2023 17:36	BONGO	54° 11.936' N	011° 32.477' E	24
28.07.2023 17:59	FR	54° 12.097' N	011° 34.041' E	24
29.07.2023 05:32	CTD	54° 12.500' N	011° 40.490' E	24
29.07.2023 05:37	BONGO	54° 12.475' N	011° 40.486' E	24
29.07.2023 06:12	BONGO	54° 17.283' N	011° 40.010' E	24
29.07.2023 06:20	CTD	54° 17.421' N	011° 40.370' E	24
29.07.2023 06:52	CTD	54° 21.732' N	011° 40.598' E	24
29.07.2023 06:56	BONGO	54° 21.702' N	011° 40.614' E	24
29.07.2023 07:25	BONGO	54° 25.311' N	011° 40.001' E	24
29.07.2023 07:33	CTD	54° 25.474' N	011° 40.447' E	23
29.07.2023 08:10	CTD	54° 23.778' N	011° 49.513' E	20
29.07.2023 08:14	BONGO	54° 23.742' N	011° 49.448' E	21

29.07.2023 08:50	BONGO	54° 18.091' N	011° 50.021' E	22
29.07.2023 08:58	CTD water	54° 17.998' N	011° 49.575' E	22
29.07.2023 09:42	CTD	54° 12.510' N	011° 49.631' E	20
29.07.2023 09:46	BONGO	54° 12.430' N	011° 49.618' E	20
29.07.2023 10:38	BONGO	54° 17.537' N	011° 55.726' E	18
29.07.2023 10:45	CTD	54° 17.368' N	011° 55.479' E	19
29.07.2023 11:03	BT	54° 17.628' N	011° 55.416' E	19
29.07.2023 11:12	BT	54° 17.606' N	011° 54.863' E	19
30.07.2023 04:09	CTD	54° 47.477' N	015° 30.015' E	76
30.07.2023 04:16	BONGO	54° 47.453' N	015° 29.968' E	73
30.07.2023 05:19	BONGO	54° 47.563' N	015° 45.884' E	70
30.07.2023 05:34	CTD	54° 47.489' N	015° 44.901' E	71
30.07.2023 06:39	CTD	54° 37.487' N	015° 45.073' E	59
30.07.2023 06:46	BONGO	54° 37.415' N	015° 44.886' E	59
30.07.2023 07:43	BONGO	54° 37.692' N	015° 31.075' E	63
30.07.2023 07:56	CTD	54° 37.513' N	015° 30.070' E	63
30.07.2023 08:53	CTD	54° 37.486' N	015° 15.053' E	58
30.07.2023 08:59	BONGO	54° 37.478' N	015° 14.998' E	58
30.07.2023 10:07	BONGO	54° 47.777' N	015° 16.292' E	67
30.07.2023 10:24	CTD	54° 47.483' N	015° 15.013' E	67
30.07.2023 11:23	CTD	54° 47.499' N	014° 59.966' E	59
30.07.2023 11:30	BONGO	54° 47.413' N	014° 59.912' E	59
01.08.2023 07:43	CTD water	55° 27.543' N	014° 45.080' E	68
01.08.2023 07:54	APNET	55° 27.539' N	014° 45.055' E	68
01.08.2023 08:00	APNET	55° 27.536' N	014° 45.058' E	68
01.08.2023 08:08	BONGO	55° 27.524' N	014° 45.041' E	68
01.08.2023 09:20	BONGO	55° 37.943' N	014° 45.655' E	64
01.08.2023 09:34	CTD	55° 37.505' N	014° 44.968' E	67
01.08.2023 10:34	CTD	55° 37.533' N	015° 00.128' E	75
01.08.2023 10:42	BONGO	55° 37.468' N	015° 00.088' E	75
01.08.2023 11:49	BONGO	55° 38.039' N	015° 16.172' E	72
01.08.2023 12:02	CTD	55° 37.567' N	015° 15.371' E	72
01.08.2023 12:57	CTD water	55° 37.509' N	015° 30.011' E	67
01.08.2023 12:58	APNET	55° 37.499' N	015° 30.023' E	67
01.08.2023 13:04	APNET	55° 37.474' N	015° 30.036' E	67
01.08.2023 13:09	BONGO	55° 37.452' N	015° 30.033' E	67
01.08.2023 14:10	BONGO	55° 37.593' N	015° 46.082' E	69
01.08.2023 14:23	CTD	55° 37.228' N	015° 45.370' E	69
01.08.2023 15:19	CTD	55° 37.496' N	016° 00.079' E	74

7 Data and Sample Storage and Availability

Data availability

a) The station list meta data (time. position. gear) will be transferred to the DOD.

b) CTD data will be quality checked and transferred into PANGEA.

c) A cruise summary report (CSR) will be send by the cruise leader to the BSH.

d) The cruise leader confirms the data transfer from a) and b) in his cruise report.

e) The cruise leader will supply information about the analysis of samples and long term storage of the data and samples in his cruise report. Diplomatic mandatory data transfers to visited states will be conducted by the cruise leader

Sample availability and storage
a) Samples will be analysed within the IMF teaching modules and student thesis's and stored within the IMF.
b) IMF has its own cruise data base and a certified storage for formalin samples. Frozen samples will be stored in -20°C. -40°C. or -80°C containers at the IMF which are equipped with an automatic. mobile phone based. alarm system.
c) Samples will be labelled including a barcoding scheme which is also used for professional archiving of all samples (long-term storage via an external company).

Data storage
a) Tentative scientific data from this cruise will be
  a. CTD data. light measurements. fluorescence data
  b. Hydroacoustic data (EK 60)
  c. Fisheries data
b) Paper protocols will be entered in a database continuously during the entire cruise (including daily back up) and conserved as hard copies as well.
c) After quality checks and after their use in publications. data will be submitted to the PANGEA database. The data transfer will be done within three years. Before transfer the data will be stored within the IMF data storage server system (RAID 5 & tape libraries).

Table 7.1 Overview of data availability

Type	**Database**	**Available**	**Free Access**	**Contact**
hydrography		Date	Date	E-Mail
TRIMBLE Hydroaccoustic Plankton CTD Fisheries	PANGAEA	Dec. 2023	Jan 2023	luisa.listmann@uni-hamburg.de

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9 References

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11 Abbreviations

CTD	Conductivity Temperature Depth probe
WS	Water Sampler (Niskin Bottle)
Bongo	Plankton Net
MSN	Multi opening/closing net (MultiNet)
FishNet	Youngfishtrawl (for pelagic and bottom near use) with a trawl-eye