ALKOR-Berichte

Bachelor MARSYS education cruise in the Baltic Sea

Cruise No. AL614

7th of June 2024 to 16th of June 2024,
Kiel (Germany)
MARSYS

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2024

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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.

We investigated the distribution patterns of certain fish species such as cod, whiting, sprat and herring in the Kiel Bight, Mecklenburg Bight and Arkona basin with a focus on juvenile gadeid species. Another objective were Plankton and hydrological surveys for which plankton stations were sampled along the cruise track to gain insights into the spatial distribution of phyto-, zoo- and ichthyoplankton. The hydrographical survey was accompanied by on-board measurements of oxygen profiles at different stations in the basins.

All necessary educational content could be taught. The rest of the analysis was partly done in the form of Bachelor or Master theses as well as in the underlying course of "Field methods in marine science" taught at IMF.

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.

Wir untersuchten die Verbreitungsmuster bestimmter Fischarten wie Dorsch, Wittling, Sprotte und Hering in der Kieler Bucht, der Mecklenburger Bucht und dem Arkonabecken mit dem Schwerpunkt auf juvenilen Gadeidenarten. Ein weiteres Ziel waren Plankton- und hydrologische Untersuchungen, für die Planktonstationen entlang der Fahrtroute beprobt wurden, um Erkenntnisse über die räumliche Verteilung von Phyto-, Zoo- und Ichthyoplankton zu gewinnen. Die hydrographische Untersuchung wurde durch Messungen von Sauerstoffprofilen an Bord an verschiedenen Stationen in den Becken begleitet.

Alle notwendigen Lehrinhalte konnten vermittelt werden. Die restliche Auswertung erfolgte zum Teil in Form von Bachelor- oder Masterarbeiten sowie im Rahmen des am IMF unterrichteten Grundkurses „Feldmethoden in BO und FS".

2.1 Principal Investigators

Name	Institution
Luisa Listmann, Dr.	IMF

2.2 Scientific Party

Name	Discipline	Institution
Listmann, Luisa, Dr.	Chief scientist	IMF
Arne Malzahn, Dr.	Scientist	IMF
Josefine Herrford, Dr.	Scientist	IMF
Saskia Otto, Dr.	Scientist	IMF
Rachel Harmer	Technician	IMF

Silke Janssen	Technician	IMF
5 Students from the Master Program 2nd semester		IMF
11 Student from Bachelor Program 3rd semester		IMF

2.3 Participating Institutions

IMF Institute for Marine Ecosystem and Fishery Science, Hamburg

3 Research Program

3.1 Description of the Work Area

Three work areas were part of the cruise and are the following going from the West to the East: Kiel Bight, Mecklenburg Bight and Arkona 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.

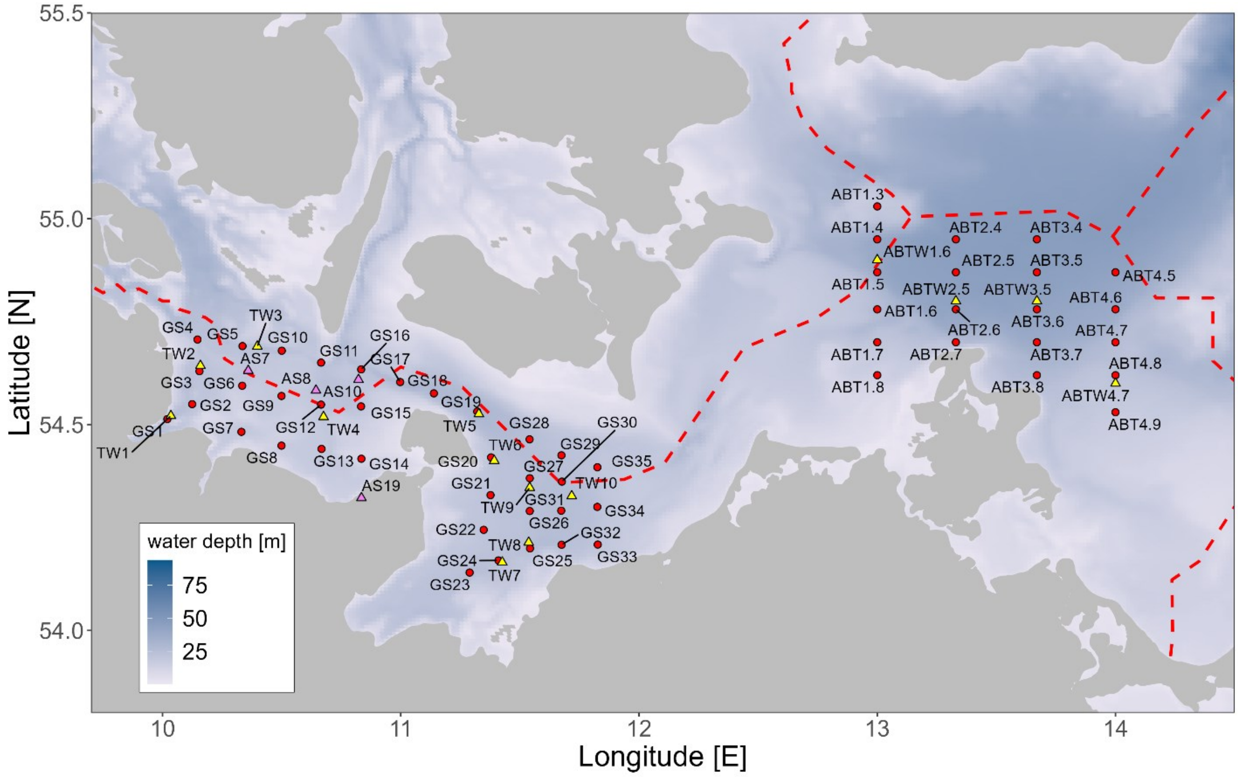

Fig. 3.1.1 Overview map indicating (planned) sampling stations of the cruise AL 614. Red dots indicate plankton grid stations (GS). Yellow triangles indicate trawl stations (TW). Violet triangles indicate Angling stations (AS). Dashed red line indicates EEZ borders. Positions per Gear that were realized 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 analysis in the ongoing field method course as well as bachelor, master theses.

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

The latter served to determine size distributions, maturity status, and length – weight relationships of the two dominant fish species in the system of the Baltic, cod (Gadus morhua) and whiting (Merlangius merlangius) and the length distribution of additional species such as herring (Clupea harengus), sprat (Sprattus sprattus) and pleuronectiformes. Various different samples were obtained for more detailed analyses: stomachs of cod and 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) (e.g. plankton samples).

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 ideally covered and rotated through by every student. Here they received individual training, or in a group of two, to establish a practical knowledge of work on a research vessel.

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.

Additionally and as part of the ongoing field methods course, there were four groups with different main responsibilities of sampling and documenting: Hydrography, Phyto/Microzooplankton, Ichthyoplankton and fisheries.

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 Friday 7th of June 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 near Eckernförde. The working conditions were fine, so that almost all planned plankton grid stations in the Kiel and Mecklenburg Bight as well as three more fishery haul could be carried out until Monday 10th of March. 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 Tuesday, the RV ALKOR steamed to the Arkona Basin where a few more grid stations were done in the morning. Then RV ALKOR steamed to Sassnistz for the exchange of the scientific crew late on Tuesday 11th of June. Due to strong winds on the 12th of June the RV ALKLOR stayed one day in the harbor of Sassnitz. The lecturers and students used the time on board with assistance of the crew to get fully acquainted with all research equipment and procedures which was part of the teaching schedule.

On the 13th of June at 8:00 the RV ALKOR left Sassnitz for further plankton grid work in the Arkona Basin for two days. Two fishing hauls were done in the South East and North West of the Arkona Basin. In the night of the 14th of June the RV ALKOR steamed back to the Mecklenburg and Kiel Bight to carry out the last samplings in the Howachter Bucht and along the Fehmarn Belt. Late in the afternoon of the 15th of June the RV ALKOR returned back to Kiel with all planned station work done.

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. Five different gear types were used during the whole cruise (Fig. 5.1.1 B-H) and in addition at the three deepest stations in Arkona basin a WP3 net was deployed.

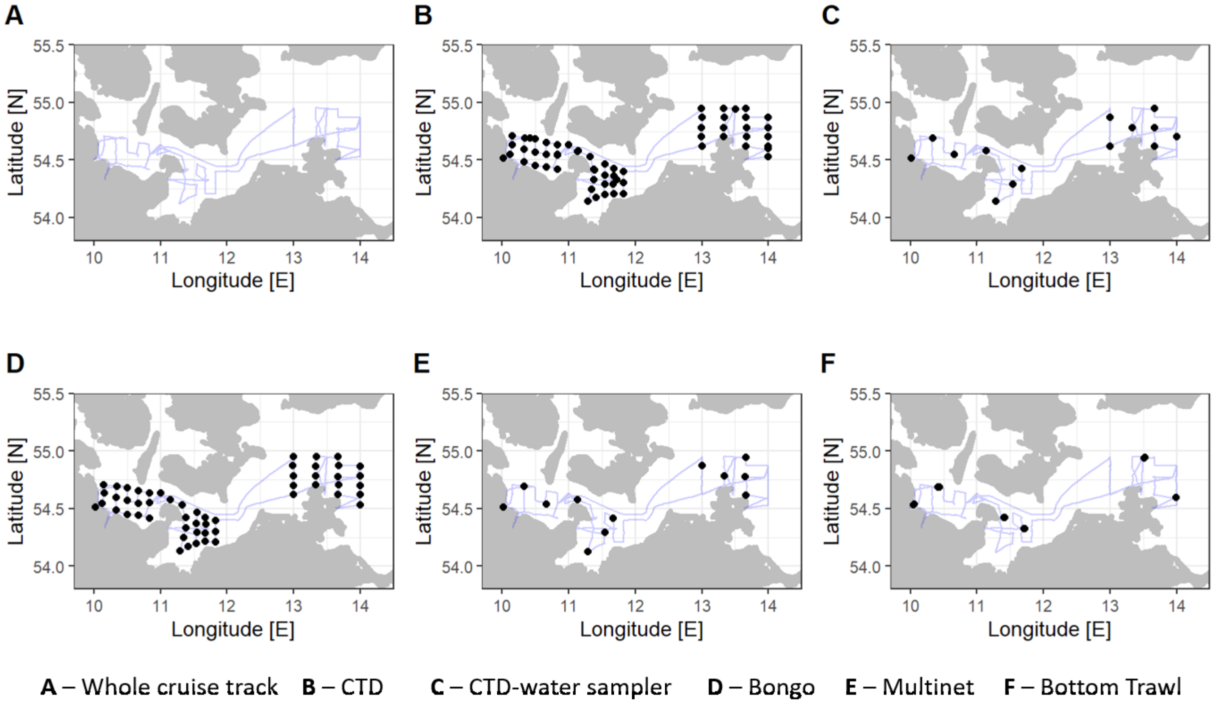

Fig. 5.1.1 Cruise track maps with station overview of the different deployed equipment.

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	63
Watersampler-CTD Rosette	14
Bongo (335µm, 500µm)	55
TV/520 Bottom Trawl	6
Multinet	12
WP3	9
Total	159

5.2 Water and Plankton Sampling with CTD/Rosette

5.2.1 CTD Measurements and Oxygen

Overall we had a temperature and salinity gradient on the surface from West to East (Fig. 5.2.1 B and C): in the Western Kiel Bight there were the highest salinities measured at ca. 15 PSU whereas towards the Eastern Mecklenburg Bight and Arkona Basin we measured lower salinities at around 7.5 PSU. Similarly the temperature decreased from West to East as well but only from ca. 17°C to 14°C (Fig. 5.2.1 A).

The depth distribution of temperature and salinity as well as oxygen was similar across the transect of the cruise (also West to East): a clear halocline as well as thermocline at around 20-30m (Fig. 5.2.1 C-E) can be seen being deeper towards the East. In addition to the horizontal halocline we can detect a vertical halocline at about 110km of transect where salinities decrease from 15PSU to below 10PSU (Fig. 5.2.1 C).

There are two oxygen minimum zones at depths, likely in water masses that have not been aerated since spring inflow events (Fig 5.2.1 E). Oxygen distribution was additionally analysed on board via the chemical Winkler method at 14 selected stations in the basins and were comparable between both CTD-devices and the chemical analysis.

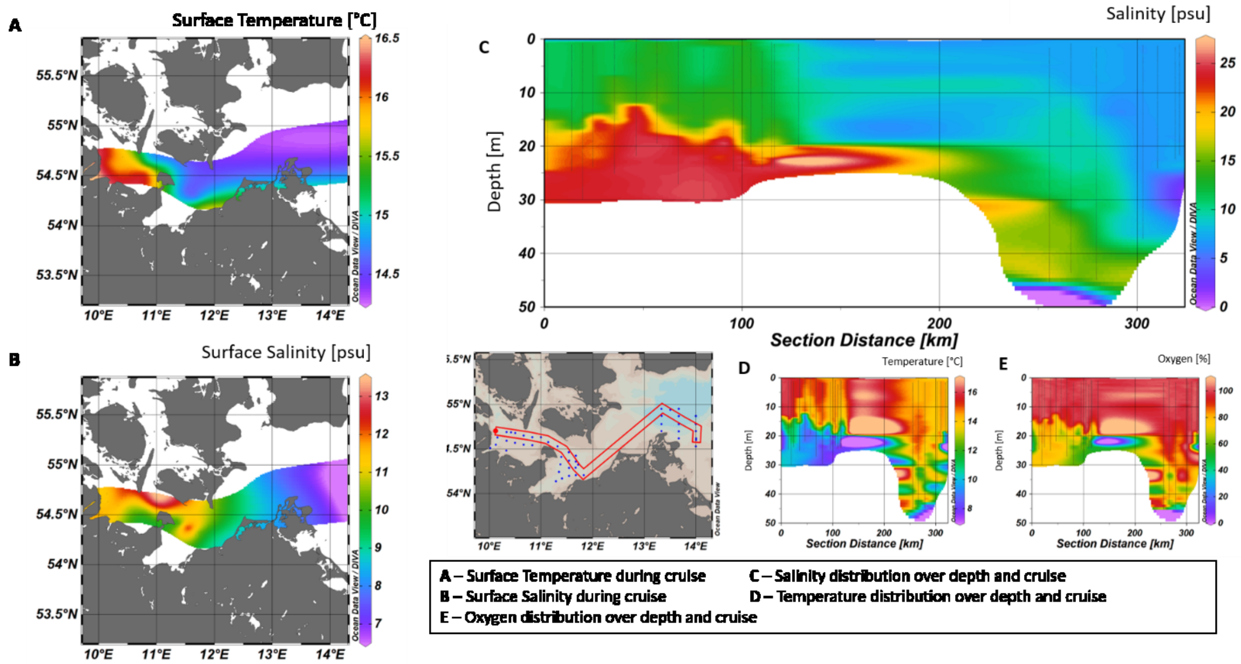

Fig. 5.2.1 Hydrographic data from CTD data during the cruise. Panels a and b show surface water conditions for temperature and salinity, respectively. Panels c to e show salinity, temperature and oxygen conditions along the cruise transect and the whole water column.

5.2.2 Chlorophyll a and Nutrients

At 14 stations across all three basins, nutrients and chlorophyll a were determined at the IMF by the students during their field method course. Chlorophyll was highest (7µg/L) deep in the Mecklenburg Bight and close to the island of Rügen and decreased further away from the coast (Fig. 5.2.2).

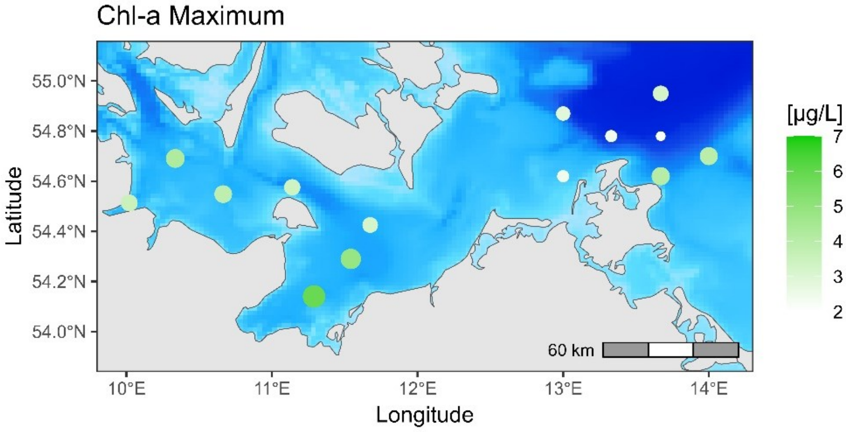

Fig. 5.2.2 Map shows stations where chlorophyll a was measured at the maximum indicated by CTD data. Size and hue of color indicate the concentration of chlorophyll in µg/L (Plot made by Lisa Haves, Vanessa Hartmann, Finn Krauss and Nadine Willkomm).

Nitrogen and phosphate were evenly low (maximum of ca. 4µmol/L) across the three basins and only silicate reached high concentrations of up to 40 µmol/L (Fig. 5.2.3). We expect these low nutrient conditions early in summer when both Spring and summer blooms have passed (Meier et al. 2022; Fridolfsson et al. 123AD) .

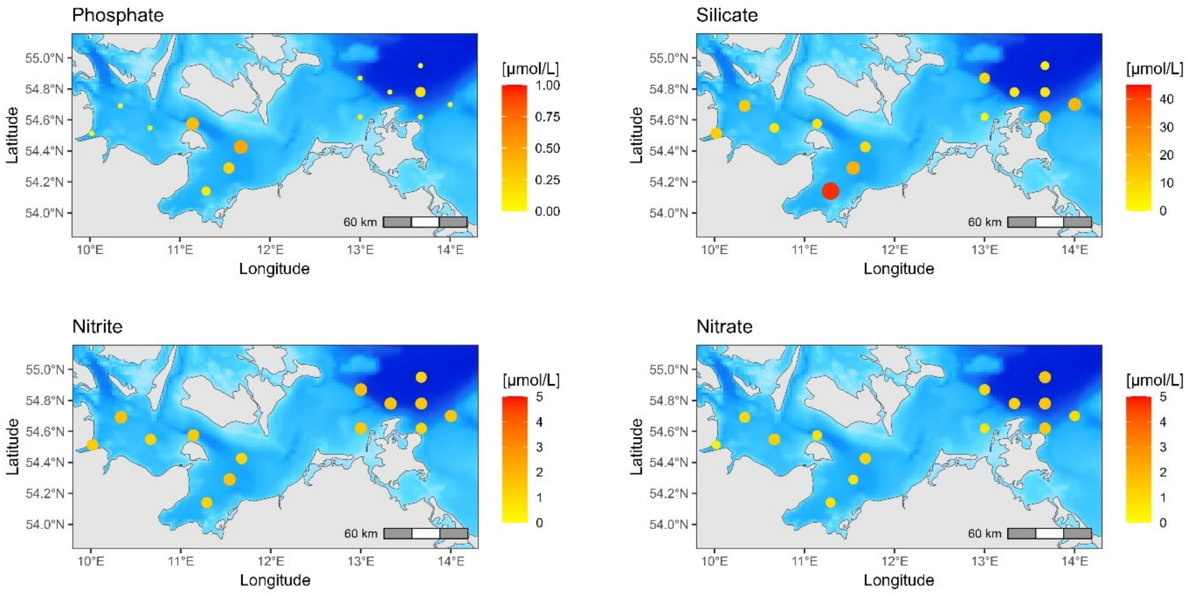

Fig. 5.2.3 Maps show the nutrient concentrations measured at 14 stations across the basins. Nutrient samples were taken at chlorophyll maxima depth. Size and hue of dots indicate the concentrations of the different nutrients in µmol/L (Plot made by Lisa Haves, Vanessa Hartmann, Finn Krauss and Nadine Willkomm).

5.2.3 *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.

We therefore took surface water samples at 10 stations along the cruise track of AL614. 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.

We therefore took surface water samples at 10 stations along the cruise track of AL614. 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. Previous isolations have yielded more than 30 Ostreococcus strains and more than 100 virus strains of which both physiological impacts of temperature and viruses have been investigated (Listmann et al. 2020; n.d.).

5.2.4 Phyto- and Microzooplankton From the Baltic Sea

From phytoplankton and microzooplankton samples collected at six stations (Fig. 5.2.4 left panel) along the cruise transect, species composition was determined via microscopy at the IMF laboratories. The water samples were taken at the Chlorophyll maximum determined via CTD profiles and fixed with Lugol´s iodine on board.

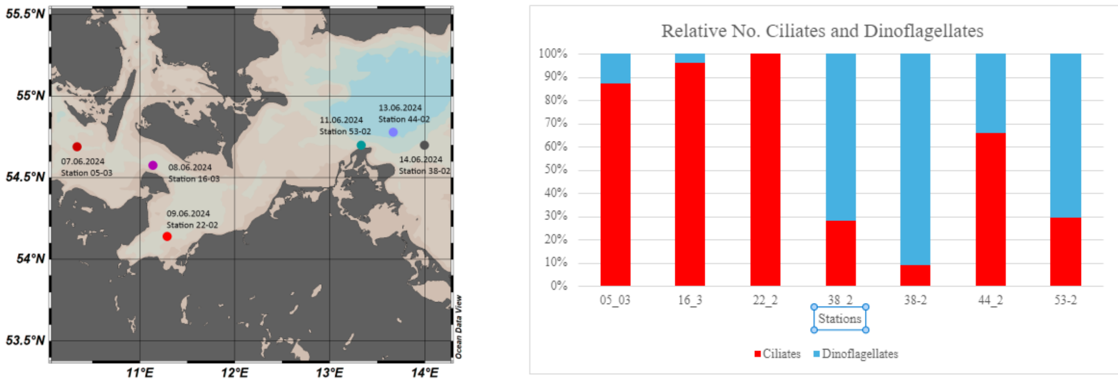

Fig. 5.2.4 The maps shows the sampling stations for the Phyto- and microzooplankton samples. The right panel shows the relative composition of ciliates and dinoflagellates in the different samples. Station numbers are equal to stations on the map. (Plots made by Liaisan Giliazitdinova, Wilhelm Klopp).

The main groups that were found were ciliates and dinoflagellates and their relative composition varied between the different samples (Fig. 5.2.4 right panel). Preliminary analysis indicated higher abundances of dinoflagellates in the Arkona basin vs. high number of ciliates in the Kiel and Mecklenburg Area.

5.2.5 Ichthyoplankton From the Baltic Sea

Larvae from the 500µm Bongo samples were identified and counted via microscopy on board and in the laboratories at IMF. The relative composition varied slightly between the three areas of sampling (Fig. 5.2.5). Both *Clupeid* sp. and *Gobiidae* sp. species were the most common larvae found in the samples both in the Kiel and Arkona samples. The third most common species was common dab in the Mecklenburg Bight whereas in the Kiel basin Herring was more frequently encountered. The high abundances of *Gobiidae* sp. have only in recent years been found in larvae samples since invasion began in the early 2010s. These species were not detected in such high abundances before (see (Klenz 2006) for comparison).

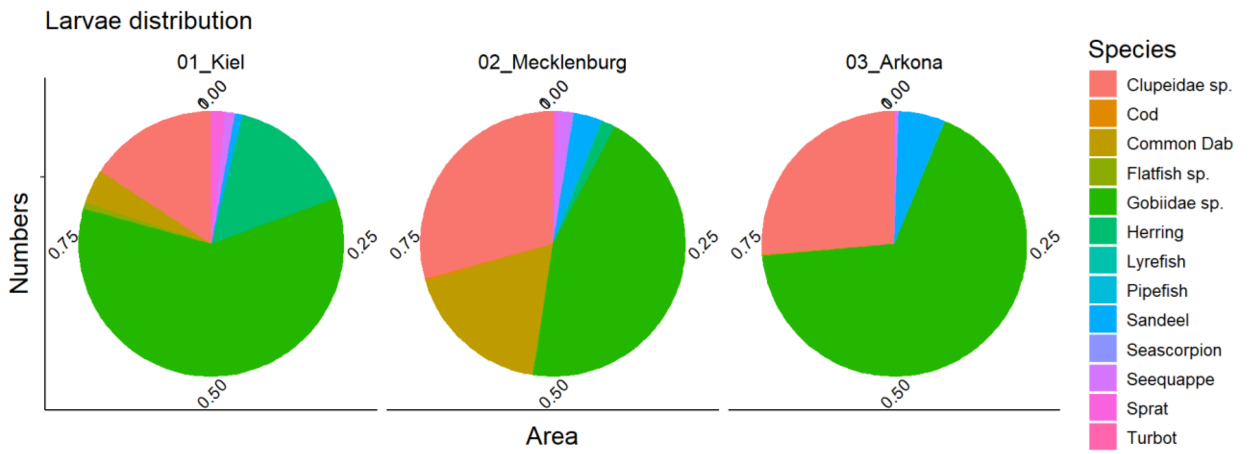

Fig. 5.2.5 Pie charts show the relative abundances of different larvae species in the three areas. Larvae could either be identified to family or species level.

5.3 Fishery

A total of 6 trawl hauls conducted during cruise AL614 (Fig. 5.1.1). The main target of fishing operations during AL614 were juvenile cod and whiting in the Kiel Bight and Mecklenburg Basin and spawning cod or whiting in the Arkona basin. Adult individuals were sampled to collect biological parameters such as length, weight and condition. This data will 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 Möllmann et al. 2021; Receveur et al. 2022) 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

We caught 201 cod individuals with a total weight of 28.188 kg and 281 whiting with a total weight of 52.641. Of each size class (21-30cm, 31-40cm and above 40cm) 30 a max of 30 fish per haul were further analysed for their fitness indices. The rest were only measured and weighed.
All of the fisheries hauls consisted of 19 different fish species were caught with a total weight of 568.071 kg (see Tab. 5.2). The most commonly caught fish species were of the Pleuronectiformes except for one haul in the Arkona basin where most fish caught belonged to whiting and cod.

In general, it has to be noted, cod catches by trawl made in 2024 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 AL6014 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). Spawning cod were mainly caught at wrecks.

Table 5.2 Total trawl catches during AL614 per species.

Species	Total weight [kg]	Total number
Cod (*Gadus morhua*)	28.188	201
Juvenile Cod (*Gadus morhua*)	2.767	959
Fourbeard Rockling (*Enchelyopus cimbrius*)	0.520	10
Herring (*Clupea harengus*)	7.877	187
Sprat (*Sprattus sprattus*)	66.825	4546
Common dab (*Limanda limanda*)	157.828	2472
Plaice (*Pleuronectes platessa*)	189.150	3099
European Flounder (*Platichthys flesus*)	27.465	112
American Plaice (*Hippoglossoides platessoides*)	0.120	3
Turbot (*Pestta Maximus*)	2.660	4
Common sole (*Solea Solea*)	7.650	38
Hooknose (*Agonus cataphratus)*	0.038	1
Snakeblenny (*Lumpenus lampretaeformis*)	15.993	NA
Lemon sole (*Microstomus kitt*)	0.330	1
Sea Scorption (*Myoxocephalus Scorpius*)	4.015	42
Whiting (*Merlangius merlangus*)	52.641	281
Juvenile Whiting (*Merlangius merlangus*)	2.426	74
Common dragonet (*Callionymus lyra*)	0.05	3
Pomatoschistus sp.	0.017	42
Grey gurnard (*Eutrigla gurnardus*)	0.455	7
Haddock (*Melanogrammus aeglefinus*)	0.150	1

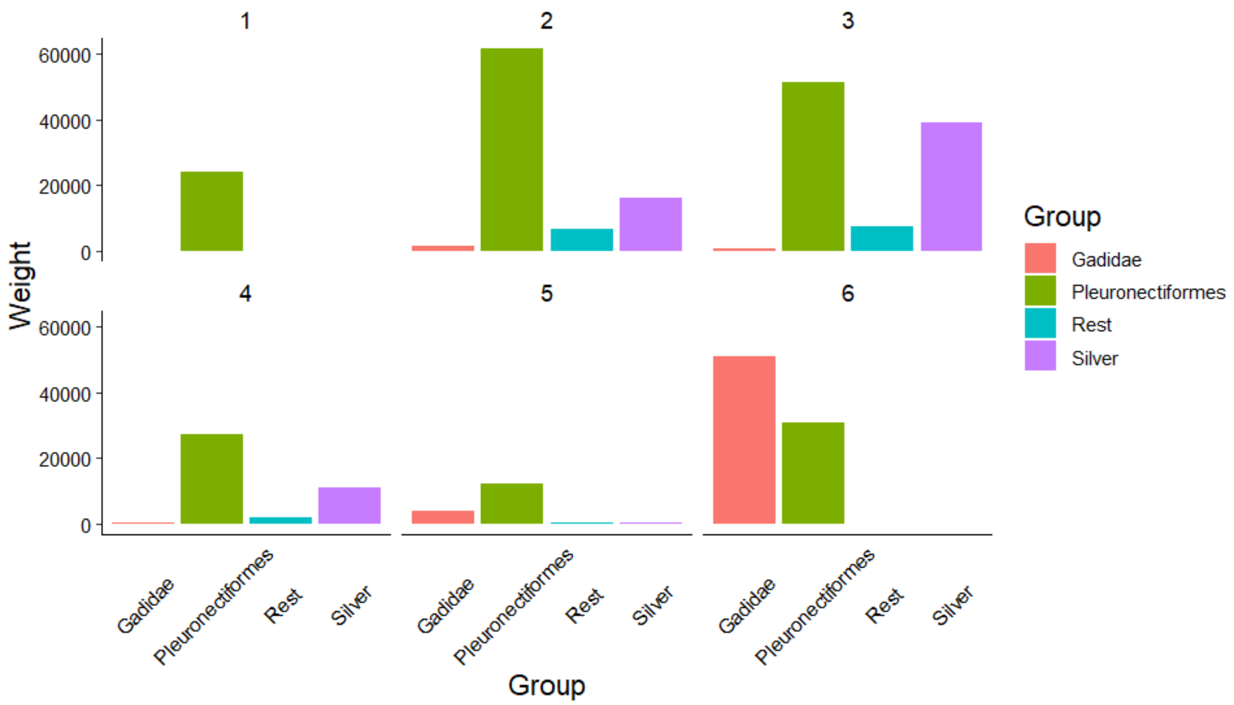

Fig. 5.3.1 Fish catches of AL614. Panel shows the weight distribution between all groups of fish species over the whole cruise.

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 we caught 10 times mor sprat than herring (Fig. 5.3.2).

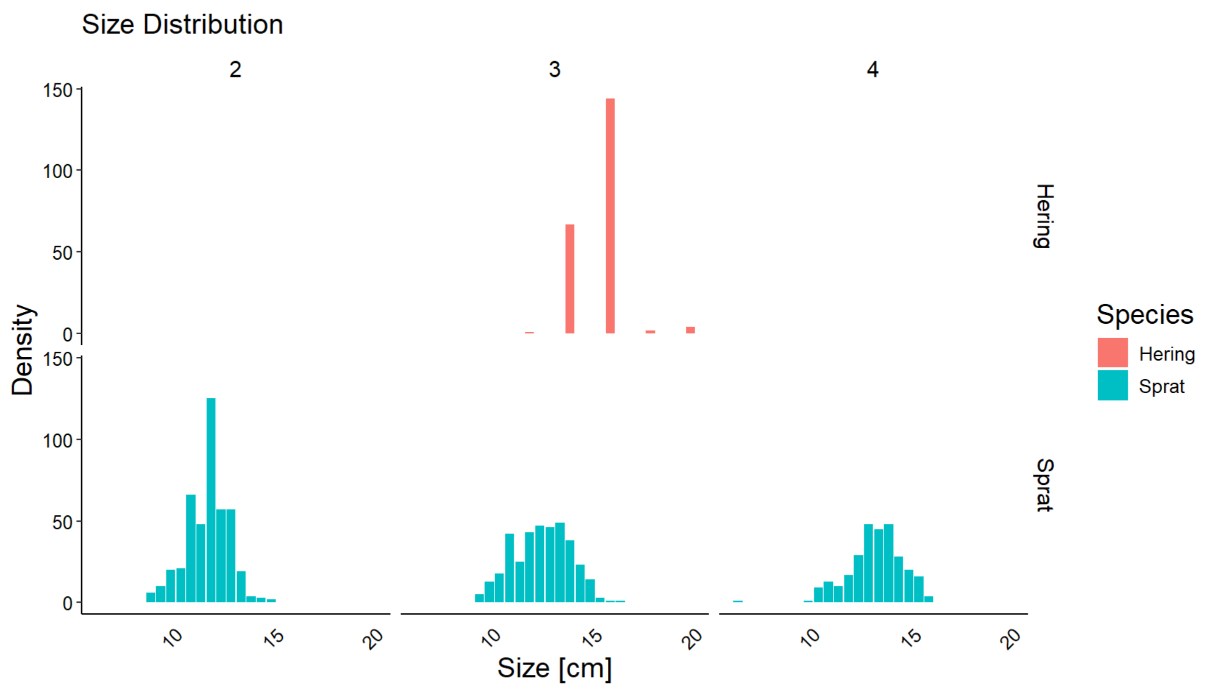

Fig. 5.3.2 Size distribution of herring (red) and sprat (blue) in the four fishery hauls.

Within the group of flatfish the most abundant species was plaice followed by common dab and much fewer flounders. The size distribution of plaice and common dab were similar ranging from ca. 7 to over 30cm whereas the flounders were larger between 20 to 40cm. The size distribution indicates the presence of many juvenile flat fish in the fishery hauls (Fig. 5.3.3.).

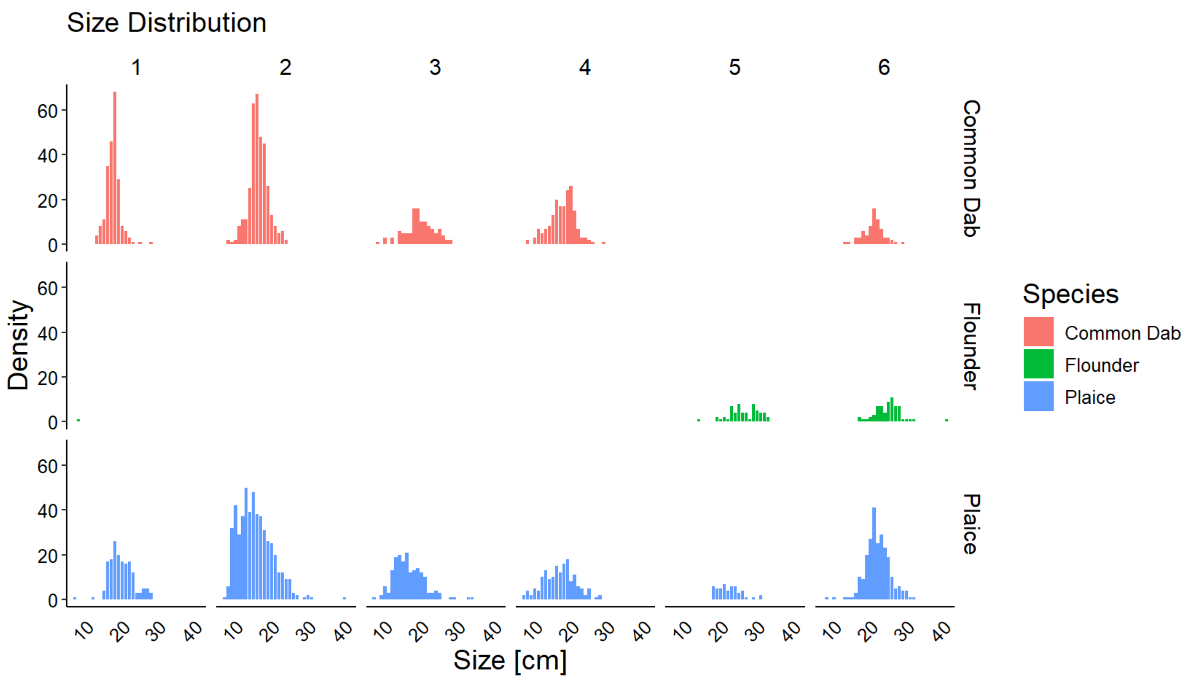

Fig. 5.3.3 Size distribution of flounder (red), common dab (green) and plaice (blue) in the six fishery hauls.

5.3.2 Additional Work with Fishery´s Samples

As part of the teaching topic of fish fecundity and fertilization, spawning plaice and flounder were used for fertilization experiments on board with Prof. Dr. Flemming Dahlke. Egg and sperm from spawning fish were collected directly after the haul was on deck and the fertilization took place on board. To check for mortality in different temperatures eggs were kept for ca. 48h in a temperature controlled table and monitored. Female stage 4 cod gonads were also collected for histological analysis of the gonads. These analyses allow for a better understanding of fecundity of the fish in relation to their size and weight.

The collected samples and data were used in Bachelor and Master theses at the IMF.

6 Station List AL614

Date and time [UTC]	Gear	Latitude [°N]	Longitude [°E]	Depth [m]	Event
07.06.2024 16:45	TSG	54° 29,661' N	010° 12,039' E	20	AL614_0_Underway-2
08.06.2024 16:20	TSG	54° 32,384' N	011° 17,175' E	29	AL614_0_Underway-2
09.06.2024 17:29	TSG	54° 20,339' N	011° 06,774' E	11	AL614_0_Underway-2
10.06.2024 16:10	TSG	54° 26,383' N	012° 13,776' E	20	AL614_0_Underway-2

11.06.2024 09:13	TSG	54° 31,428' N	013° 55,444' E	19	AL614_0_Underway-2
13.06.2024 16:14	TSG	54° 56,677' N	013° 39,455' E	47	AL614_0_Underway-2
14.06.2024 16:26	TSG	54° 48,784' N	012° 40,959' E	17	AL614_0_Underway-2
07.06.2024 07:22	CTD	54° 30,789' N	010° 01,186' E	27	AL614_1-1
07.06.2024 07:29	CTD water	54° 30,766' N	010° 01,203' E	27	AL614_1-2
07.06.2024 07:43	BONGO	54° 30,745' N	010° 01,221' E	27	AL614_1-3
07.06.2024 08:04	MN_S5	54° 30,904' N	010° 01,152' E	28	AL614_1-4
07.06.2024 08:35	BT	54° 32,117' N	010° 03,815' E	27	AL614_1-5
07.06.2024 08:50	BT	54° 31,760' N	010° 03,021' E	28	AL614_1-5
07.06.2024 11:26	CTD	54° 32,962' N	010° 07,474' E	22	AL614_2-1
07.06.2024 11:32	BONGO	54° 32,831' N	010° 07,351' E	22	AL614_2-2
07.06.2024 12:10	BONGO	54° 37,880' N	010° 09,639' E	22	AL614_3-1
07.06.2024 12:19	CTD	54° 37,745' N	010° 09,368' E	22	AL614_3-2
07.06.2024 12:53	CTD	54° 42,445' N	010° 08,842' E	25	AL614_4-1
07.06.2024 12:58	BONGO	54° 42,398' N	010° 08,821' E	25	AL614_4-2
07.06.2024 13:46	BONGO	54° 41,565' N	010° 20,551' E	27	AL614_5-1
07.06.2024 13:53	CTD	54° 41,449' N	010° 20,214' E	25	AL614_5-2
07.06.2024 13:59	CTD water	54° 41,437' N	010° 20,200' E	25	AL614_5-3
07.06.2024 14:08	MN_S5	54° 41,402' N	010° 20,181' E	24	AL614_5-4
07.06.2024 14:54	CTD	54° 35,637' N	010° 20,091' E	16	AL614_6-1
07.06.2024 14:57	BONGO	54° 35,604' N	010° 20,058' E	16	AL614_6-2
07.06.2024 15:43	BONGO	54° 29,031' N	010° 20,205' E	19	AL614_7-1
07.06.2024 15:49	CTD	54° 28,951' N	010° 19,904' E	19	AL614_7-2
08.06.2024 05:44	CTD	54° 41,238' N	010° 25,187' E	31	AL614_8-1
08.06.2024 06:03	BT	54° 41,178' N	010° 26,336' E	29	AL614_8-2
08.06.2024 06:14	BT	54° 41,250' N	010° 25,306' E	31	AL614_8-2
08.06.2024 08:44	CTD	54° 40,796' N	010° 30,017' E	25	AL614_9-1
08.06.2024 08:49	BONGO	54° 40,743' N	010° 30,000' E	24	AL614_9-2
08.06.2024 09:45	BONGO	54° 34,297' N	010° 30,106' E	18	AL614_10-1
08.06.2024 09:51	CTD	54° 34,185' N	010° 29,989' E	18	AL614_10-2
08.06.2024 10:31	CTD	54° 32,874' N	010° 39,920' E	20	AL614_11-1
08.06.2024 10:37	CTD water	54° 32,847' N	010° 39,933' E	20	AL614_11-2
08.06.2024 10:44	BONGO	54° 32,736' N	010° 39,823' E	20	AL614_11-3
08.06.2024 10:51	MN_S5	54° 32,417' N	010° 39,686' E	19	AL614_11-4
08.06.2024 11:57	BONGO	54° 39,151' N	010° 40,187' E	22	AL614_12-1
08.06.2024 12:04	CTD	54° 39,010' N	010° 39,936' E	26	AL614_12-2
08.06.2024 12:43	CTD	54° 38,010' N	010° 50,077' E	22	AL614_13-1
08.06.2024 12:48	BONGO	54° 37,962' N	010° 50,014' E	23	AL614_13-2
08.06.2024 13:27	BONGO	54° 32,918' N	010° 50,078' E	22	AL614_14-1
08.06.2024 13:33	CTD	54° 32,672' N	010° 50,003' E	21	AL614_14-2
08.06.2024 14:27	CTD	54° 37,950' N	011° 00,011' E	20	AL614_15-1
08.06.2024 14:31	BONGO	54° 37,916' N	010° 59,977' E	20	AL614_15-2
08.06.2024 15:17	BONGO	54° 34,771' N	011° 08,574' E	28	AL614_16-1
08.06.2024 15:25	CTD	54° 34,617' N	011° 08,333' E	28	AL614_16-2
08.06.2024 15:29	CTD water	54° 34,613' N	011° 08,345' E	28	AL614_16-3
08.06.2024 15:37	MN_S5	54° 34,608' N	011° 08,227' E	28	AL614_16-4
08.06.2024 16:32	BONGO	54° 31,714' N	011° 19,796' E	30	AL614_17-1
08.06.2024 16:40	CTD	54° 31,825' N	011° 19,387' E	30	AL614_17-2

08.06.2024 17:25	CTD	54° 25,245' N	011° 22,750' E	20	AL614_18-1
08.06.2024 17:30	BONGO	54° 25,245' N	011° 22,624' E	20	AL614_18-2
09.06.2024 05:45	CTD	54° 24,715' N	011° 23,619' E	22	AL614_19-1
09.06.2024 06:02	BT	54° 25,447' N	011° 25,073' E	23	AL614_19-2
09.06.2024 06:10	BT	54° 25,113' N	011° 24,627' E	22	AL614_19-2
09.06.2024 08:58	CTD	54° 19,754' N	011° 22,631' E	21	AL614_20-1
09.06.2024 09:02	BONGO	54° 19,700' N	011° 22,630' E	21	AL614_20-2
09.06.2024 09:42	BONGO	54° 14,748' N	011° 21,096' E	21	AL614_21-1
09.06.2024 09:49	CTD	54° 14,658' N	011° 20,886' E	21	AL614_21-2
09.06.2024 10:38	CTD	54° 08,404' N	011° 17,368' E	26	AL614_22-1
09.06.2024 10:42	CTD water	54° 08,375' N	011° 17,379' E	26	AL614_22-2
09.06.2024 10:55	BONGO	54° 08,010' N	011° 17,266' E	26	AL614_22-3
09.06.2024 11:05	MN_S5	54° 07,522' N	011° 17,020' E	26	AL614_22-4
09.06.2024 11:51	BONGO	54° 10,379' N	011° 24,787' E	23	AL614_23-1
09.06.2024 11:59	CTD	54° 10,224' N	011° 24,609' E	23	AL614_23-2
09.06.2024 12:34	CTD	54° 11,990' N	011° 32,536' E	24	AL614_24-1
09.06.2024 12:40	BONGO	54° 11,939' N	011° 32,518' E	24	AL614_24-2
09.06.2024 13:21	BONGO	54° 17,486' N	011° 33,034' E	24	AL614_25-1
09.06.2024 13:28	CTD	54° 17,407' N	011° 32,699' E	24	AL614_25-2
09.06.2024 13:31	CTD water	54° 17,396' N	011° 32,696' E	24	AL614_25-3
09.06.2024 13:39	MN_S5	54° 17,375' N	011° 32,689' E	24	AL614_25-4
10.06.2024 05:44	CTD	54° 19,623' N	011° 43,133' E	25	AL614_26-1
10.06.2024 05:54	BT	54° 19,675' N	011° 43,326' E	25	AL614_26-2
10.06.2024 06:04	BT	54° 19,452' N	011° 42,619' E	25	AL614_26-2
10.06.2024 07:59	CTD	54° 22,193' N	011° 32,532' E	24	AL614_27-1
10.06.2024 08:05	BONGO	54° 22,121' N	011° 32,497' E	24	AL614_27-2
10.06.2024 08:47	BONGO	54° 28,012' N	011° 32,732' E	25	AL614_28-1
10.06.2024 08:55	CTD	54° 27,883' N	011° 32,404' E	25	AL614_28-2
10.06.2024 09:34	CTD	54° 25,475' N	011° 40,593' E	24	AL614_29-1
10.06.2024 09:38	CTD water	54° 25,467' N	011° 40,593' E	24	AL614_29-2
10.06.2024 09:46	BONGO	54° 25,340' N	011° 40,414' E	24	AL614_29-3
10.06.2024 09:53	MN_S5	54° 25,049' N	011° 40,124' E	24	AL614_29-4
10.06.2024 10:27	BONGO	54° 21,718' N	011° 40,974' E	25	AL614_30-1
10.06.2024 10:34	CTD	54° 21,672' N	011° 40,590' E	25	AL614_30-2
10.06.2024 11:09	CTD	54° 17,491' N	011° 40,368' E	25	AL614_31-1
10.06.2024 11:14	BONGO	54° 17,361' N	011° 40,283' E	25	AL614_31-2
10.06.2024 11:48	BONGO	54° 12,733' N	011° 40,499' E	25	AL614_32-1
10.06.2024 11:55	CTD	54° 12,527' N	011° 40,533' E	25	AL614_32-2
10.06.2024 12:31	CTD	54° 12,471' N	011° 49,627' E	20	AL614_33-1
10.06.2024 12:35	BONGO	54° 12,451' N	011° 49,602' E	20	AL614_33-2
10.06.2024 13:14	BONGO	54° 18,128' N	011° 49,888' E	22	AL614_34-1
10.06.2024 13:23	BONGO	54° 17,938' N	011° 49,454' E	23	AL614_34-2
10.06.2024 13:32	CTD	54° 17,958' N	011° 49,307' E	23	AL614_34-3
10.06.2024 14:13	CTD	54° 23,798' N	011° 49,575' E	21	AL614_35-1
10.06.2024 14:18	BONGO	54° 23,773' N	011° 49,534' E	21	AL614_35-2
11.06.2024 05:57	CTD	54° 52,211' N	014° 00,012' E	43	AL614_36-1
11.06.2024 06:03	BONGO	54° 52,160' N	013° 59,939' E	43	AL614_36-2
11.06.2024 06:40	BONGO	54° 47,086' N	014° 00,040' E	39	AL614_37-1
11.06.2024 06:49	CTD	54° 46,778' N	013° 59,958' E	39	AL614_37-2

11.06.2024 07:22	CTD	54° 42,038' N	013° 59,969' E	25	AL614_38-1
11.06.2024 07:27	CTD water	54° 42,049' N	013° 59,928' E	25	AL614_38-2
11.06.2024 07:34	BONGO	54° 42,034' N	014° 00,031' E	25	AL614_38-3
11.06.2024 08:05	BONGO	54° 37,378' N	014° 00,127' E	23	AL614_39-1
11.06.2024 08:11	CTD	54° 37,174' N	014° 00,039' E	23	AL614_39-2
11.06.2024 08:47	CTD	54° 31,786' N	014° 00,017' E	17	AL614_40-1
11.06.2024 08:51	BONGO	54° 31,787' N	013° 59,958' E	18	AL614_40-2
13.06.2024 06:55	CTD	54° 36,023' N	014° 00,036' E	22	AL614_41-1
13.06.2024 07:04	BT	54° 35,910' N	013° 59,770' E	22	AL614_41-2
13.06.2024 07:08	BT	54° 35,812' N	013° 59,434' E	22	AL614_41-2
13.06.2024 08:55	CTD	54° 37,207' N	013° 40,013' E	27	AL614_42-1
13.06.2024 09:01	CTD water	54° 37,200' N	013° 40,009' E	27	AL614_42-2
13.06.2024 09:11	BONGO	54° 37,120' N	013° 39,949' E	27	AL614_42-3
13.06.2024 09:18	MN_S5	54° 36,825' N	013° 39,732' E	27	AL614_42-4
13.06.2024 10:17	BONGO	54° 42,141' N	013° 40,601' E	38	AL614_43-1
13.06.2024 10:25	CTD	54° 41,999' N	013° 40,112' E	38	AL614_43-2
13.06.2024 11:06	CTD	54° 46,803' N	013° 40,098' E	43	AL614_44-1
13.06.2024 11:13	CTD water	54° 46,771' N	013° 40,070' E	43	AL614_44-2
13.06.2024 11:24	BONGO	54° 46,702' N	013° 39,839' E	43	AL614_44-3
13.06.2024 11:34	MN_S5	54° 46,419' N	013° 39,117' E	42	AL614_44-4
13.06.2024 13:16	CTD	54° 52,226' N	014° 00,039' E	43	AL614_45-1
13.06.2024 13:25	WP3	54° 52,221' N	014° 00,024' E	43	AL614_45-2
13.06.2024 13:33	WP3	54° 52,218' N	014° 00,005' E	43	AL614_45-3
13.06.2024 13:41	WP3	54° 52,208' N	014° 00,020' E	43	AL614_45-4
13.06.2024 15:00	BONGO	54° 52,338' N	013° 40,685' E	46	AL614_46-1
13.06.2024 15:09	CTD	54° 52,203' N	013° 40,048' E	46	AL614_46-2
13.06.2024 15:48	CTD	54° 57,004' N	013° 40,031' E	47	AL614_47-1
13.06.2024 15:54	CTD water	54° 56,974' N	013° 40,058' E	47	AL614_47-2
13.06.2024 16:05	BONGO	54° 56,893' N	013° 39,944' E	47	AL614_47-3
13.06.2024 16:16	MN_S5	54° 56,636' N	013° 39,421' E	47	AL614_47-4
13.06.2024 16:34	WP3	54° 56,301' N	013° 38,690' E	47	AL614_47-5
13.06.2024 16:42	WP3	54° 56,342' N	013° 38,742' E	47	AL614_47-6
13.06.2024 16:50	WP3	54° 56,285' N	013° 38,773' E	47	AL614_47-7
13.06.2024 18:07	BONGO	54° 57,158' N	013° 20,470' E	46	AL614_48-1
13.06.2024 18:16	CTD	54° 56,993' N	013° 19,969' E	46	AL614_48-2
13.06.2024 18:53	CTD	54° 52,235' N	013° 20,118' E	45	AL614_49-1
13.06.2024 19:01	BONGO	54° 52,114' N	013° 19,936' E	45	AL614_49-2
14.06.2024 05:45	CTD	54° 56,438' N	013° 30,315' E	47	AL614_50-1
14.06.2024 06:02	BT	54° 56,606' N	013° 31,567' E	47	AL614_50-2
14.06.2024 06:15	BT	54° 56,377' N	013° 30,577' E	47	AL614_50-2
14.06.2024 08:06	CTD	54° 46,829' N	013° 19,969' E	42	AL614_51-1
14.06.2024 08:12	CTD water	54° 46,821' N	013° 20,043' E	42	AL614_51-2
14.06.2024 08:23	BONGO	54° 46,804' N	013° 20,089' E	42	AL614_51-3
14.06.2024 08:35	MN_S5	54° 46,835' N	013° 20,030' E	42	AL614_51-4
14.06.2024 09:47	BONGO	54° 42,134' N	013° 19,645' E	24	AL614_52-1
14.06.2024 09:54	CTD	54° 42,010' N	013° 19,970' E	24	AL614_52-2
14.06.2024 09:57	CTD	54° 42,010' N	013° 19,984' E	24	AL614_52-3
14.06.2024 11:11	CTD	54° 37,207' N	013° 00,002' E	13	AL614_53-1
14.06.2024 11:15	CTD water	54° 37,205' N	012° 59,994' E	13	AL614_53-2

14.06.2024 11:22	BONGO	54° 37,162' N	013° 00,166' E	13	AL614_53-3
14.06.2024 11:55	BONGO	54° 42,029' N	012° 59,611' E	21	AL614_54-1
14.06.2024 12:03	CTD	54° 42,002' N	012° 59,933' E	21	AL614_54-2
14.06.2024 12:35	CTD	54° 46,798' N	012° 59,932' E	28	AL614_55-1
14.06.2024 12:39	BONGO	54° 46,798' N	012° 59,955' E	28	AL614_55-2
14.06.2024 13:20	BONGO	54° 52,250' N	012° 59,457' E	37	AL614_56-1
14.06.2024 13:29	CTD	54° 52,188' N	012° 59,972' E	38	AL614_56-2
14.06.2024 13:35	CTD water	54° 52,190' N	012° 59,977' E	38	AL614_56-3
14.06.2024 13:46	MN_S5	54° 52,187' N	013° 00,047' E	38	AL614_56-4
14.06.2024 14:31	CTD	54° 57,009' N	012° 59,956' E	40	AL614_57-1
14.06.2024 14:38	WP3	54° 57,019' N	012° 59,956' E	40	AL614_57-2
14.06.2024 14:44	WP3	54° 57,023' N	012° 59,958' E	40	AL614_57-3
14.06.2024 14:50	WP3	54° 57,021' N	012° 59,953' E	40	AL614_57-4
14.06.2024 14:58	BONGO	54° 57,026' N	012° 59,972' E	40	AL614_57-5
15.06.2024 06:02	CTD	54° 34,554' N	011° 08,283' E	28	AL614_58-1
15.06.2024 06:40	CTD	54° 37,946' N	010° 59,936' E	21	AL614_59-1
15.06.2024 07:30	CTD	54° 32,630' N	010° 49,990' E	21	AL614_60-1
15.06.2024 08:39	CTD	54° 25,033' N	010° 50,059' E	12	AL614_61-1
15.06.2024 08:43	BONGO	54° 25,019' N	010° 50,151' E	12	AL614_61-2
15.06.2024 10:00	BONGO	54° 26,558' N	010° 39,997' E	19	AL614_62-1
15.06.2024 10:08	CTD	54° 26,440' N	010° 40,108' E	19	AL614_62-2
15.06.2024 10:51	CTD	54° 26,931' N	010° 29,958' E	17	AL614_63-1
15.06.2024 10:55	BONGO	54° 26,855' N	010° 29,895' E	17	AL614_63-2

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

b. 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
CTD Fisheries	PANGAEA	Dec. 2024	Feb 2025	luisa.listmann@ uni-hamburg.de

8 Acknowledgements

I want to thank the captain Jan Lass and the entire crew of RV ALKOR for their outstanding support throughout the cruise. A big thanks also goes to the students involved in this training cruise

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10 Abbreviations

CTD	Conductivity Temperature Depth probe
WS	Water Sampler (Niskin Bottle)
Bongo	Plankton Net
MSN	Multi opening/closing net (MultiNet)
Trawl	Bottom Trawl