ALKOR -Bericht

Cruise No. AL528

18.09.2019 – 28.09.2019
Kiel – Kiel
BiOc-Praktikum-2019

Dr. J. Süling
GEOMAR

2019

Cruise Report

This cruise report consists of 15 pages including cover page.

1 Cruise Summary

1.1 Summary in English

"Praktikum auf See" is a cruise planned for master students of the biological oceanography at GEOMAR-Kiel. The main purpose of the expedition is to engage students in the real ocean science and exposing them to the "research-life on the sea". We are going to sample for different fauna and flora of the central and easterly Baltic to be able to track biodiversity changes along the salinity gradient. This year's cruise is combined with the sampling for the Horizon 2020 Project "GoJelly" in which samples for ecological studies of gelatinous zooplankton will be taken (www.gojelly.eu).

1.2 Zusammenfassung

Das Praktikum auf See ist eine Fahrt für Studierende des Masterstudiengangs Biological Oceanography der CAU, durchgeführt vom GEOMAR. Der Hauptzweck der Reise ist es, Studierende in die reale Ozeanwissenschaft einzubeziehen und sie dem „Forschungsleben auf dem Meer" auszusetzen. Es werden verschiedene Fauna und Flora der zentralen und östlichen Ostsee untersucht, um Veränderungen der biologischen Vielfalt entlang des Salzgehaltsgradienten verfolgen zu können. Die diesjährige Fahrt wird mit der Probenahme für das Horizont 2020-Projekt „GoJelly" kombiniert, bei der Proben für ökologische Studien von galatinösem Zooplankton entnommen werden (www.gojelly.eu).

2 Participants

2.1 Principal Investigators

Name	Institution
Süling, Jörg, Dr.	GEOMAR
Javidpour, Jamileh, Dr.	SDU
Stoltenberg, Ina	SDU
Christiansen, Christian	SDU
Wolf, Fabian	GEOMAR

2.2 Scientific Party

Name	Discipline	Institution
Alberta Widhi Ananda Putri	MSc Student	CAU
Kim Nina Heimberg	MSc Student	CAU
Cindy Giselle Martinez Reyes	MSc Student	CAU
Ashley Coons	MSc Student	CAU
Alistair Ian Wallace	MSc Student	CAU
Jacob Houvener	MSc Student	CAU
Vincent Wüst	BSc Student	CAU

2.3 Participating Institutions

GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel
CAU Christian-Albrechts-Universität zu Kiel
SDU Syddansk Universitet

3 Research Program

3.1 Aims of the Cruise

Purpose of the trip

In addition to research, the GEOMAR Helmholtz Center for Ocean Research also participates in the training of young scientists and offers courses with a focus on marine science. As part of the international master's program in biological oceanography, there is therefore a one to two week student trip on a GEOMAR-owned ship every year. The trip is used to illustrate everyday research on board a research ship. During the trip, the students should get to know various methods, networks and devices for recording marine biological data, and learn to operate them independently.

To ensure this, various stations within the central Baltic Sea are approached and sampled during this trip. This year, not only pelagic but also benthic samples are taken. Most of the samples are for teaching purposes only and are not subordinate to any project. Samples from 4 selected stations, which are taken for the EU Horizon 2020 projects GoJelly and NITROX, are an exception. In addition, for the DTU Aqua in Copenhagen, plankton samples are taken and stored with the bongo network on each Bornholm basin station on the so-called Bongo-Grid.

Project descriptions

EU Horizon 2020 Blue Growth project "GoJelly" (coordinator Dr. J. Javidpour, University of southern Denmark (SDU); and Bord Ina Stoltenberg, SDU; project duration 2018-2021). One goal of this project is to better characterize the ecological role of gelatinous plankton in various marine systems including the Baltic Sea. During the AL528, sample material from gelatinous macrozooplankton and characteristic representatives and components of the pelagic food web will be collected for later analysis with food web tracers (stable isotope analysis of carbon, nitrogen and sulfur, fatty acid analysis). In addition, tissue samples of jellyfish are taken for Norwegian project partners, which are

intended to provide better insight into the population dynamics of jellyfish in the Baltic Sea.

EU H2020 project "NITROX" (PI Carolin Löscher, SDU). The project is concerned with nitrogen regeneration under various scenarios of climate change, including oxygen loss, ocean acidification and temperature change in the sea. In this context, the composition and activity of nitrogen-fixing microbes in DNA and flow cytometry samples is examined and compared with rate measurements. A particular focus will be on better resolving the community of nitrogen-fixing microbes along the natural salinity gradient.

3.2 Description of the Work Area

Stations in the Western Baltic and Arkona Basin

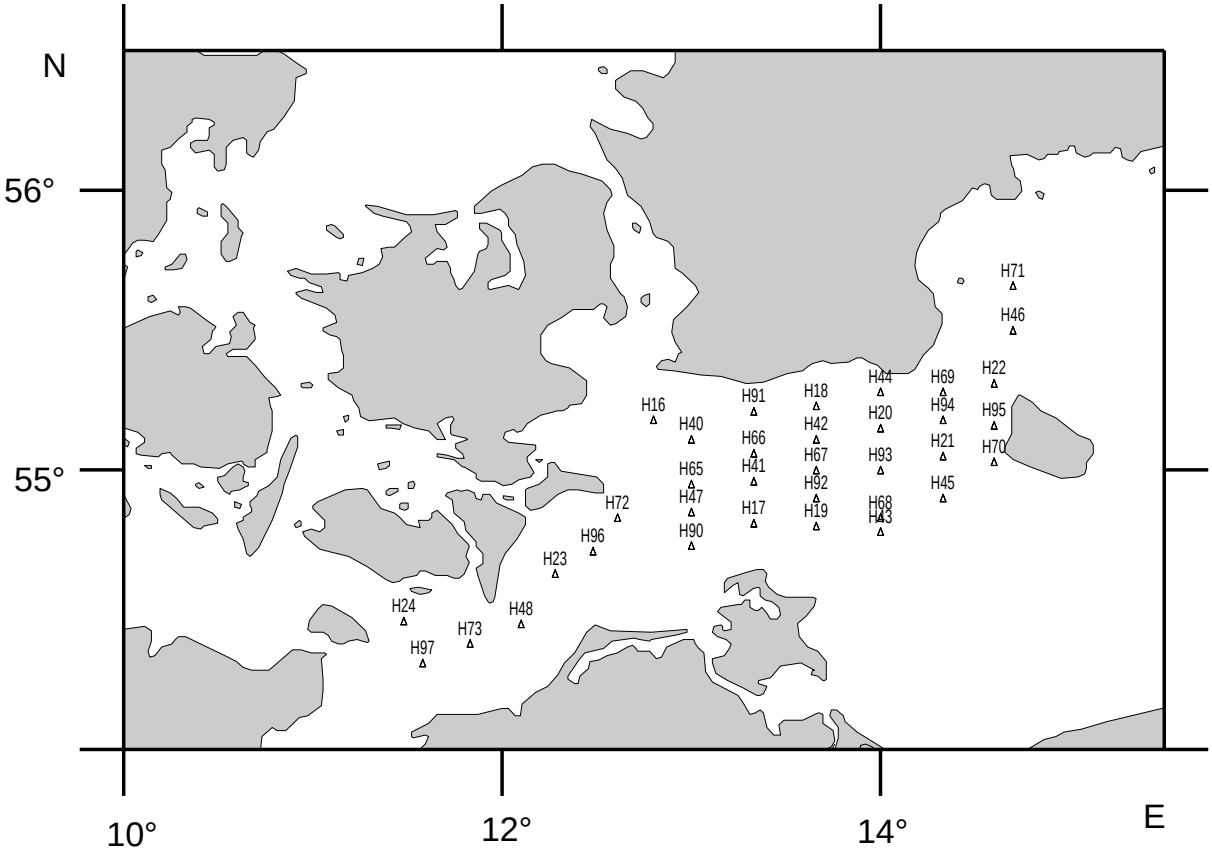

Fig. 1: Stations in the Western Baltic and Arkona Basin

Stations in the Bornholm Basin

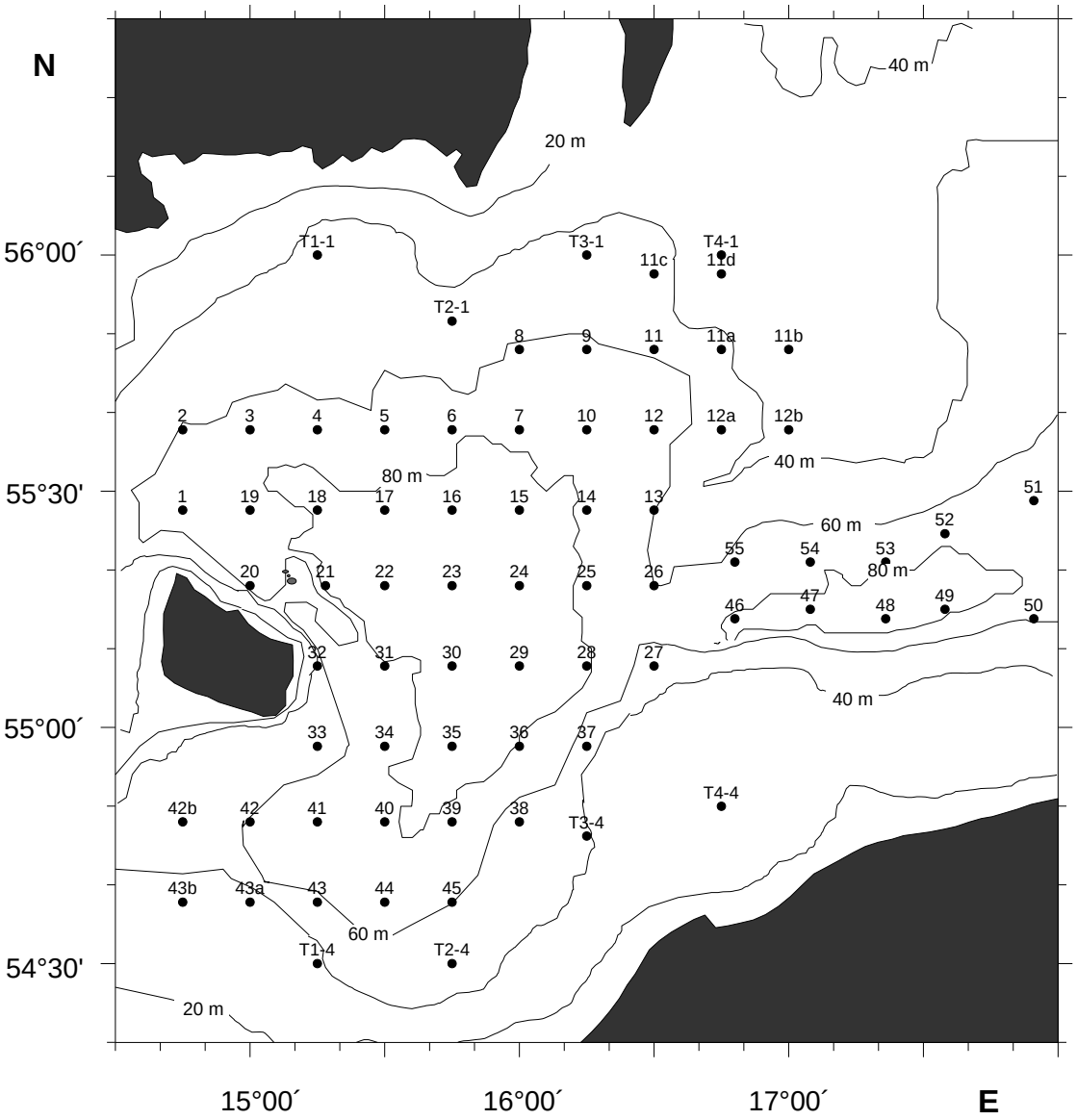

Fig. 2: Stations in the Bornholm Basin

Stations in the Gdansk Deep and Gotland Basin

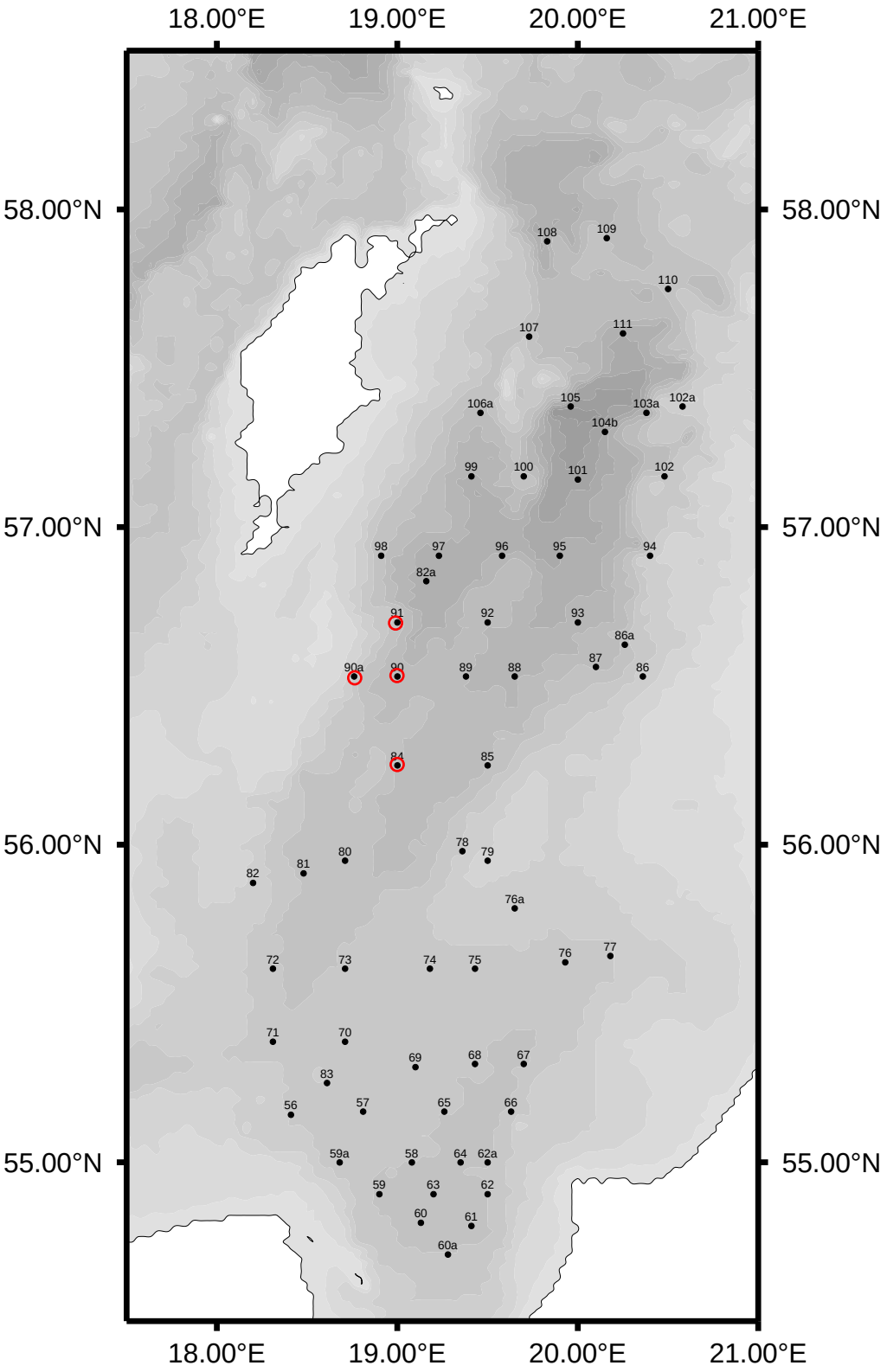

Fig. 3: Stations in the Gotland Basin

.

4 Narrative of the Cruise

Wednesday, 18.09.19
08:00 Leaving Kiel GEOMAR westshore, Start of cruise AL 528
10:12 54°41,51‘ N – 010°10,03‘ E Start of station work - CTD, water sampler, Bongo, WP3, WP2, Benthos grab, Dredge
15:24 54°41,50‘ N – 010°20,45‘ E Station work paused – cruising to SE tip Fehmarn

Thursday, 19.09.19
05:00 54°22,95‘ N – 011°16,26‘ E working area Kadett Rinne
08:00 54°24,01‘ N – 012°10,00‘ E cont. of station work - CTD, water sampler, Bongo, WP3, WP2, Benthos grab, Dredge
09:42 54°23,96‘ N – 012°08,92‘ E pausing station work – cruise to working area Arkona Becken
14:48 54°56,49‘ N – 013°29,98‘ E cont. of station work - CTD, water sampler, Bongo, WP3, WP2, Benthos grab, Dredge
23:24 55°20,87‘ N – 014°37,73‘ E pausing station work – cruise to working area Bornholm Becken

Friday, 20.09.19
04:00 55°17,45‘ N – 015°44,88‘ E station work Bornholm Becken
08:00 55°17,50‘ N – 015°45,34‘ E cont. of station work - CTD, water sampler, Bongo, WP3, WP2, Benthos grab, Dredge
16:42 55°27,45‘ N – 016°00,03‘ E pausing station work – cruise to Gotland Becken

Saturday, 21.09.19
Anfahrt AG , Stand – by und lfd. Stationsbetrieb Gotland Becken
05:00 56°15,05‘ N – 019°01,43‘ E liegen Stand – by
08:00 56°15,00‘ N – 019°00,01‘ E station work Gotland Becken - CTD, water sampler, Bongo, WP3, WP2, Benthos grab, Dredge
18:00 56°42,10‘ N – 019°00,03‘ E pausing station work – cruise to northern Gotland Becken

Sunday, 22.09.19
05:00 57°36,00‘ N – 019°43,94‘ E cont. of station work - CTD, water sampler, Bongo, WP3, WP2, Benthos grab, Dredge
10:42 57°53,90‘ N – 019°49,91‘ E pausing station work – cruise to Port Visby
16:42 Port Visby – pausing of cruise

Monday, 23.09.19
Port Visby

Tuesday, 24.09.19
Port Visby
18:06 Leaving Port Visby – cont. of cruise

Wednesday, 25.09.19

08:00 55°47,50‘ N – 015°59,51‘ E cont. of station work – Bornholm Becken - CTD, water sampler, Bongo, WP3, WP2, Benthos grab, Dredge

Thursday, 26.09.19
04:00 55°19,27‘ N – 015°29,67‘ E cont. of station work – Bornholm Becken - CTD, water sampler, Bongo, WP3, WP2, Benthos grab, Dredge, Bongogrid

Friday, 27.09.19
04:00 55°27,71‘ N – 015°48,00‘ E cont. of station work – Bornholm Becken
Bongogrid

Saturday, 28.09.19
01:24 55°16,40‘ N – 015°42,89‘ E End of station work (Bongogrid) – Bornholm Becken, Start way back to Kiel
19:30 GEOMAR Westshore reached – end of cruise AL 528

Scientific Equipment

Hydrography:
- ADM-CTD with additional oxygen sensor
- Hydrobios Water Sampler with CTD and oxygen sensor

Zooplankton:
- Baby-Bongo and Bongo-Net (150 µm, 300 µm, 500 µm)
- WP-2, WP-3 nets (100 µm, 200 µm)

Ichthyoplankton:
- Bongo net (300 µm and 500 µm)
- Hydrobios Multinet MAXI (300 µm horizontal hauls)
- Hydrobios Multinet MIDI (50 µm vertical hauls)
- IKS-80 (500 µm)

Benthos:
- *Dredge*
- *Benthos grab*

5 Scientific report and preliminary Results

5.1 Hydrography

Physical water column profiles showed typical highly stratified vertical late summer to autmn structure of the Baltic Sea. A relatively warm, well oxygenated surface waterbody with higher salinity and a sharp thermocline on top of a larger, cooler and less oxygenated waterbody and a strongly deoxygenated to anoxic waterbody in the deepest areas.

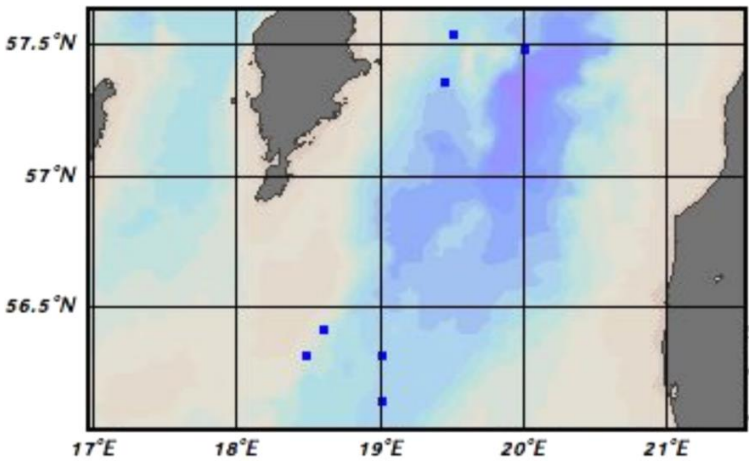

Fig. 4 Sampling area Gotland Basin

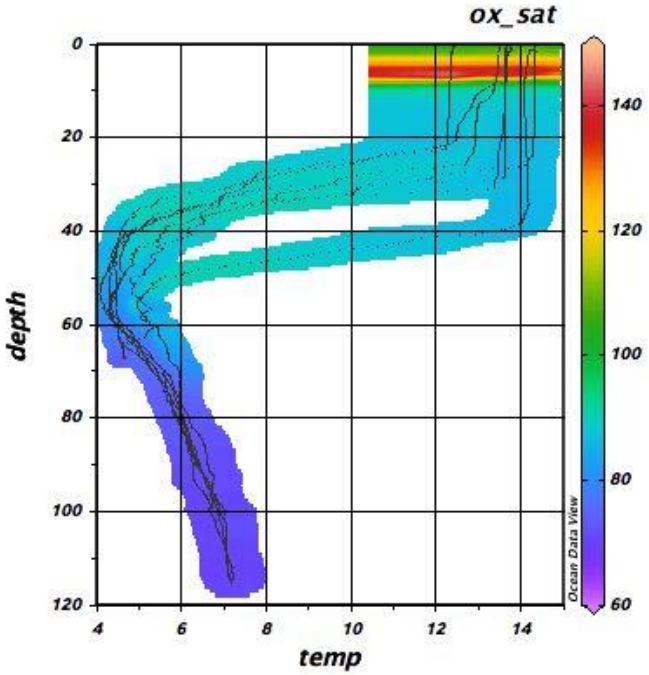

Fig. 5: Oxygen/temperature profile within the Gotland Basin.

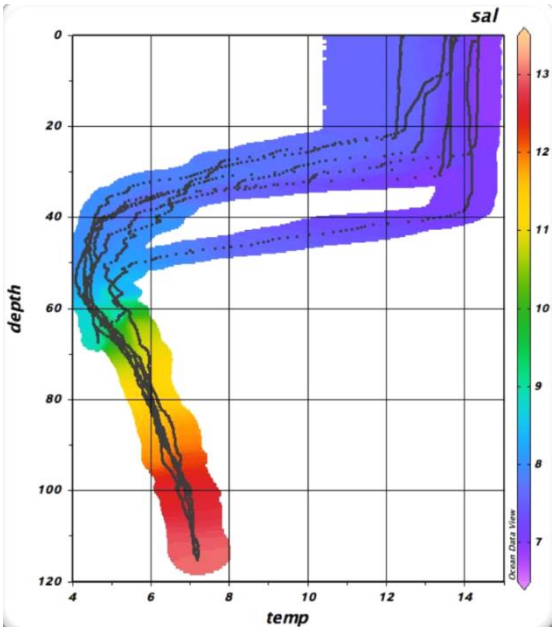

Fig. 6: Salinity/temperature profile within the Gotland Basin.

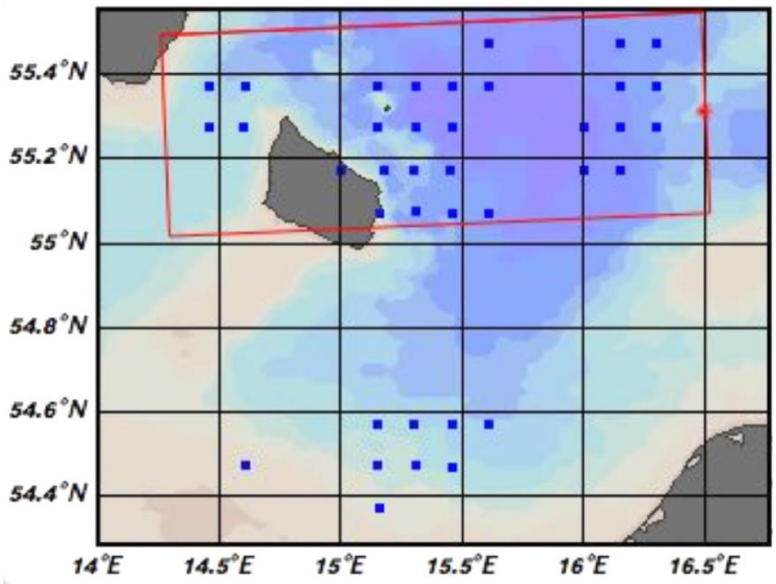

Fig. 7: Sampling area Bornholm Basin (Bongo grid)

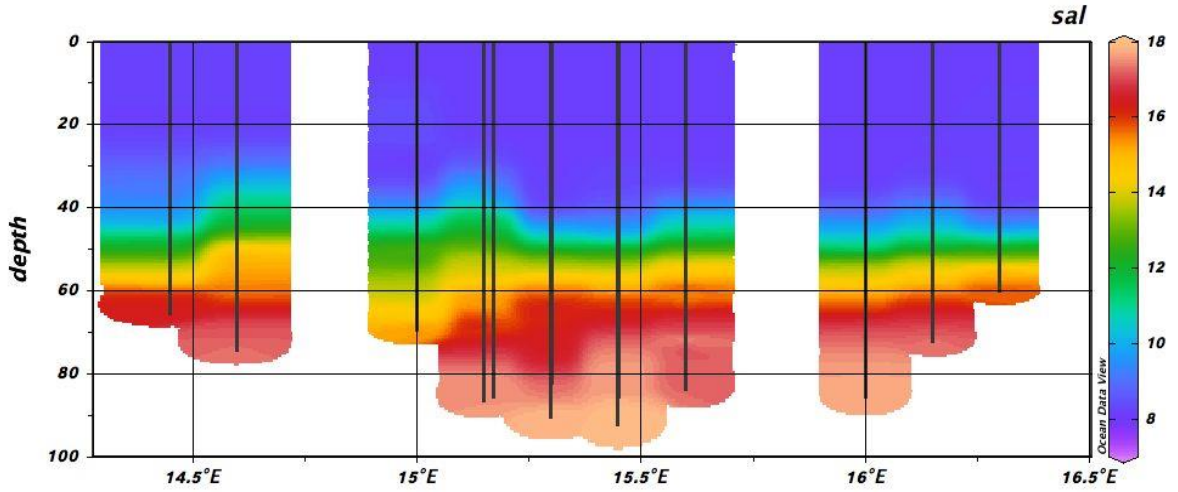

Fig. 8: Saninity/temperature profile within the Bornholm Basin (Bongo grid)

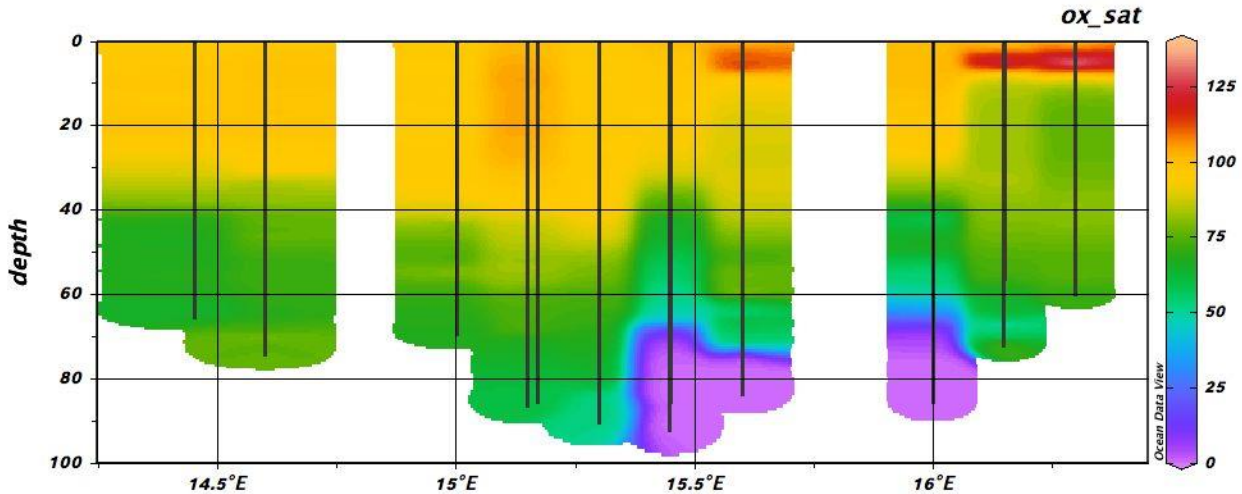

Fig. 9: Oxygen/temperature profile within the Bornholm Basin (Bongo grid)

5.2 Gelatinous macro-zoo plankton sampling

Go Jelly Project:
Find commercial uses of jellyfish and role in environment Identify role of jellyfish in food web Increasing presence of jellyfish in the Baltic Sea 2 types of jellyfish Cnidaria (True Jellyfish) Ctenophores (Comb Jellies)

Jellyfish caught on the cruise:
Cnidaria:
Aurelia aurita
Cyanea capillata
Ctenophores:
Mnemiopsis leidyi

- Sampling:
  - Water Profiling Net 200 µm (WP-2)
  - Water Profiling Net 500 µm (WP-3)
  - Bongo Net + Mini Bongo (150µm, 335µm, 500µm)
- Samples
  - Sizing of specimen from hauls
  - Genetic analyses (Diversity between / within populations / species)
  - Stable isotope

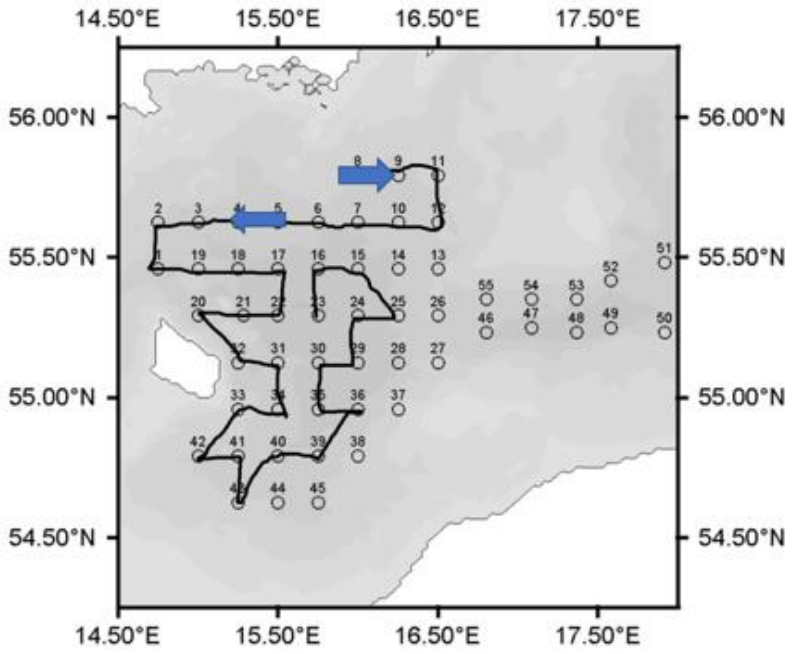

Fig. 10: Cruise track for Bongo grid in the Bornholm Basin

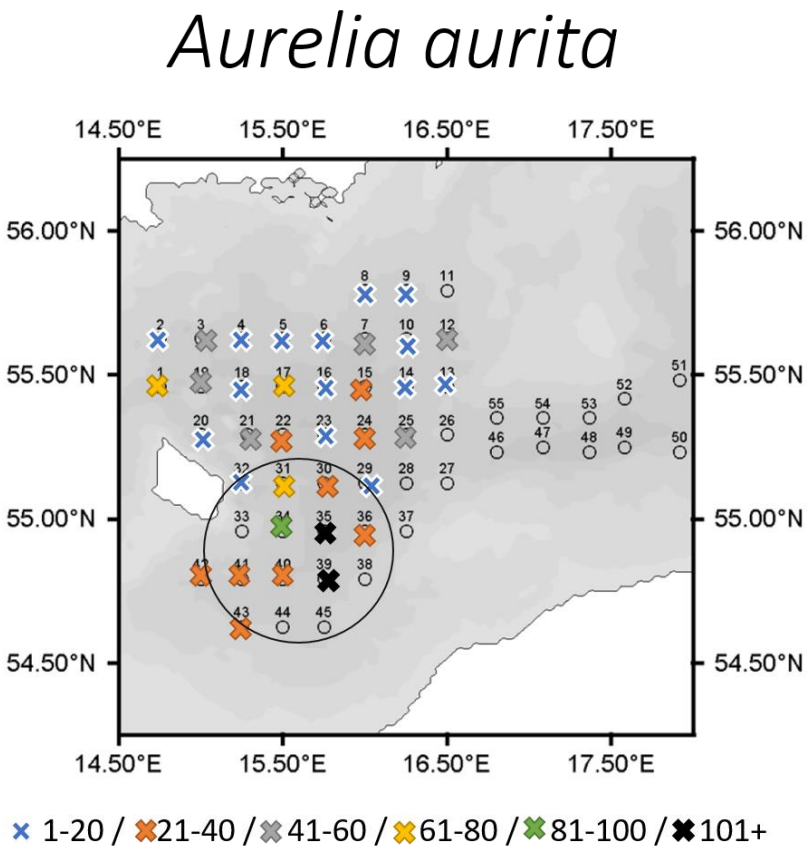

Fig. 11: Abundance of *Aurelia aurita* in the Bornholm Basin

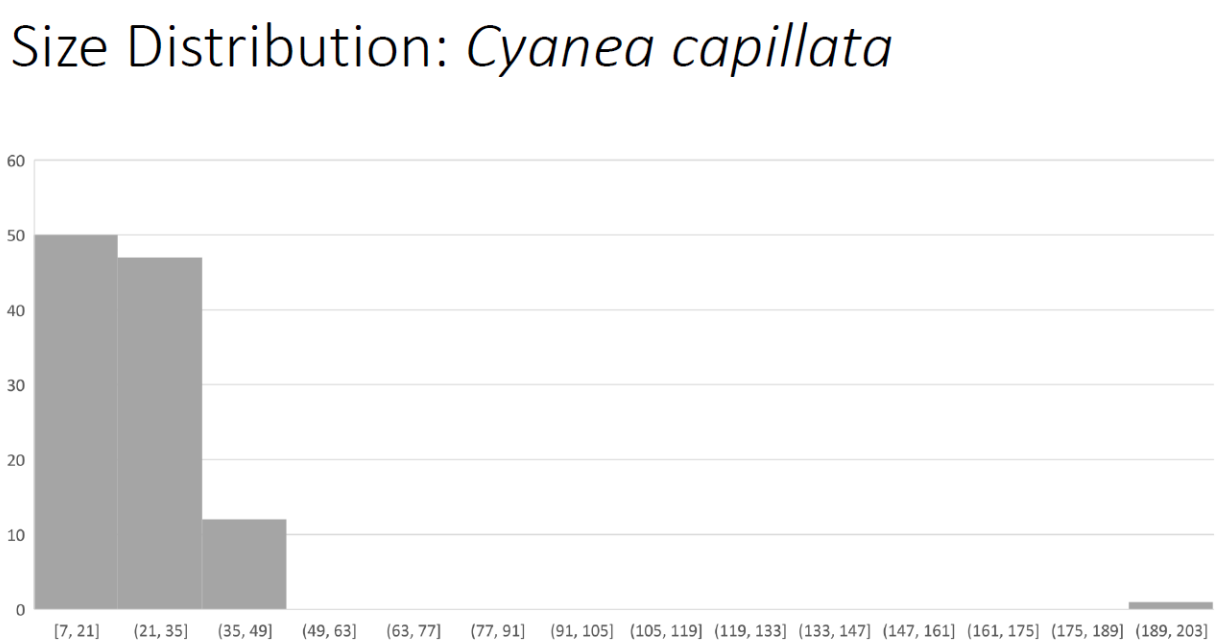

Fig. 12: Size distribution of *Cyanea capilata*

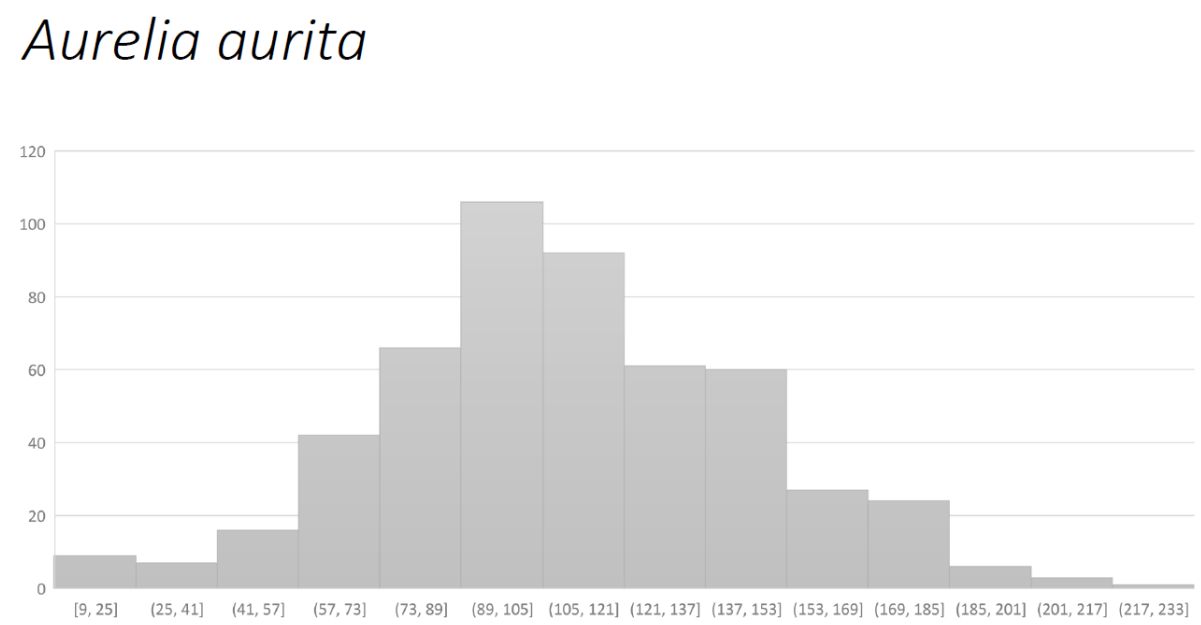

Fig. 13: Size distribution of *Aurelia aurita.*

For two scyphozoan species present in the Baltic Sea, here *Aurelia aurita* and *Cyanea capillata*, long term data from previous monitoring activities conducted at GEOMAR are available and now allow for direct comparisons of abundance and depth distribution in the major basins of the Baltic Sea over the past 20 years

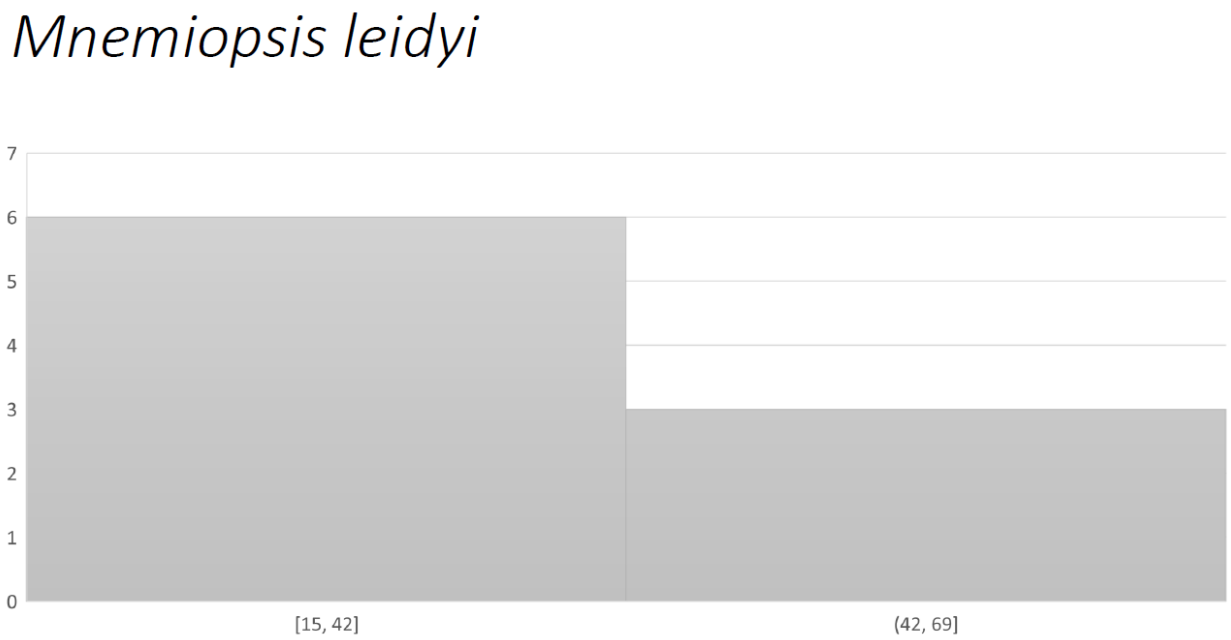

Fig. 14: Size distribution of *Mnemiopsis leidyi* in the Bornholm Basin

Gelatinous macrozooplankton organism were identified and sized belonging to two different phyla and four species. Namely, we caught the ctenophore species, the invasive American sea walnut *Mnemiopsis leidyi*.

Ctenophores were present in low densities as the seasonal succession shows that invasive comb jelly abundances in the Baltic Sea peak during autumn (Haraldsson et al., 2013; Jaspers et al., 2013).

5.2 Benthic sampling

At a total of 9 stations, 27 van-Veen Grabs and 2 Dredges were deployed.
The dredge the samples were sorted on deck and the most common species were identified and ranked according to their abundance (dominant to only single individuals). Individuals, which could not directly be identified, were taken to the onboard laboratory to examine them more carefully.
For the grabs, firstly the type of sediment (sand, mud, clay) and the filling level were determined. Afterwards, the sediment was sieved and all organisms were directly identified in the onboard laboratory.
A total of 46 different species from 29 families and 14 classes were found, of which 15 species were only sampled with the dredge, 19 species only with the grabs and 12 species with both gears.
For the grabs the highest diversity with 24 species from 18 families and 5 classes was found in the Arkona basin at station “H31”. The diversity (Shannon-Index) significantly decreases with increasing depth and decreasing salinity.

6 Station List AL528

6.1 Overall Station List

See attached Excel table.

7 Data and Sample Storage and Availability

Samples and data:

- Javidpour, Jamileh, Dr.: SDU (Syddansk Universitet)
- Stoltenberg, Ina: SDU/GEOMAR
- Christiansen, Christian: SDU
- Wolf, Fabian: GEOMAR

8 Acknowledgements

I want to thank Captain Jan Lass and the entire crew of RV ALKOR for their outstanding support throughout the cruise, Svend Mees for his unwavering support in all technical matters for the cruise. Finally, thank you to the scientific personal and student assistants on AL528 for their enthusiasm and motivation.

9 References

Condon, R. H., Graham, W., Pitt, K. and Cathy, H. (2012) Questioning the Rise of Gelatinous Zooplankton in the World's Oceans. *Bioscience,* **62**, 160-169.
Haraldsson, M., Jaspers, C., Tiselius, P., Aksnes, D. L., Andersen, T. and Titelman, J. (2013) Environmental constraints of the invasive *Mnemiopsis leidyi* in Scandinavian waters. *Limnol. Oceanogr.,* **58**, 37-48.
Jaspers, C., Haraldsson, M., Lombard, F., Bolte, S. and Kiørboe, T. (2013) Seasonal dynamics of early
life stages of invasive and native ctenophores give clues to invasion and bloom potential in the Baltic Sea. *J. Plankton Res.,* **35**, 582-594.

10 Appendix E1: Station list of AL528

Supplied with the report in electronic form as Excel table,

“Appendix_E1_AL528_station_list.xlsx”.