LEIBNIZ INSTITUTE FOR BALTIC SEA RESEARCH WARNEMÜNDE

Date: 04.02.2016

Cruise Report

Compiled by: Dr. Ralf Prien

R.V. Poseidon Cruise No.: POS492

Dates of Cruise: from 18.10.2015 to 02.11.2015

Areas of Research: Physical Oceanography, Geochemistry, Microbiology

Port Calls: Rostock (Germany), Rostock (Germany)

Institute: Leibniz-Institute for Baltic Sea Research, Warnemünde, Seestraße 15, 18119 Rostock

Chief Scientist: Dr. Ralf Prien

Number of Scientists: 7

Project: Assessment of temporal and spatial mesoscale variability of the Baltic Sea

Cruise Report

This cruise report consists of 24 pages including cover:

1. Scientific crew
2. Research programme
3. Narrative of cruise with technical details
4. Scientific report and first results
5. Moorings, scientific equipment and instruments
6. Additional remarks
7. Appendix
   A. Mooring protocol
   B. Station list

1. Scientific crew:

Name	Function	Institute	Cruise/Leg
Ralf Prien	Chief Scientist	IOW	POS492
Urmas Lips	Glider operations	MSI	POS492
Olaf Dellwig	Geochemistry	IOW	POS492
David Meyer	in situ Mn analyser	IOW	POS492
Ingo Schuffenhauer	CTD, pCTD,Scanfish	IOW	POS492
Peeter Laas	Microbiology	MSI	POS492
Anne Neun	Nutrients, oxygen	IOW	POS492
Total : 7			

IOW Leibniz-Institute for Baltic Sea Research, Warnemünde
MSI Marine Systems Institute of Tallinn Technical University

Chief scientist:

Dr. Ralf Prien

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2. Research programme (R. Prien (IOW))

The proposed research programme originally concentrated on the detection and quantification of the temporal dynamics in various Baltic basins and their biogeochemical consequences and the assessment of a situation before a major salt water inflow from the North Sea. As such a major inflow occurred in winter 2014/15, the third largest observed so far, the focus shifted to the Gotland basin mainly. Two sections, one by Scanfish leading through the Bornholm basin, Slupsk channel and Baltic proper to the Gotland basin and a CTD section on the way back were the only investigations carried out outside of the Eastern Gotland basin.

The assessment of the temporal dynamics in the Eastern Gotland basin was undertaken by a combination of platforms, namely Scanfish sections, CTD sections, repeated glider paths and a profiling mooring.

The inflow of 2014/15 presented an opportunity to also sample the redox sensitive trace metals and manganese at the multiple redoxclines forming as a consequence of the intrusions of oxygenated waters into the anoxic regions of the Gotland basin. An in situ Mn analyser and high vertical resolution sampling from the pump-CTD was to be used to gain high resolution profiles through the redoxcline(s) on a central station in the Eastern Gotland basin.

A meeting with the Estonian research vessel Salme was planned to conduct Scanfish and CTD sections in parallel at the same time to assess the difference in information gained by the measurements of these two platforms.

The planned investigations on plankton communities' composition in the autumn had to be cancelled due to other commitments of the zooplankton group.

3. Narrative of the cruise with technical details (R. Prien (IOW))

The cruise left Rostock port at 0700 UTC (0900 local time) on **18. October 2015**. At 1500 UTC the science programme started with a CTD cast at station TF113 in the Arkona Sea. The next CTD cast was carried out at TF140 (north of Bornholm Island) at 2200 UTC. After the CTD the first Scanfish transect **P1** through the Bornholm Basin, Slupsk Channel and Baltic proper to the southern section of the main working area in the Eastern Gotland Basin was carried out. The transect ended at 1615 UTC on **20. October** at station GB_B7 from where we proceeded to the central station TF271 for a CTD cast (1820 UTC), a multicorer cast (MUC2 2000 UTC) and a series of Pump-CTD profiles with the metal in situ analyser (METIS) during the night at station TF271.

In the morning of the **21. October** at 0620 UTC the deployment of the MSI glider MIA commenced at MIA1. We then proceeded to station TrKl04 for a CTD cast (1020 UTC), and a multicorer cast (1053 UTC). From here the Scanfish transect **P8** was started at 1111 UTC, ending at TF271 (1445 UTC). Next a CTD cast at station MUC3 was carried out (1600 UTC) followed by a multicorer cast (1643 UTC) and Pump-CTD profiles with METIS. As the wind had picked up to 6 Bft and the forecast was for more wind there was no other sensible option than to use the only instrument that would work in severe weather, the Scanfish.

On **22. October** at 0800 UTC the Scanfish transect **P2** was started and the northwest corner of the working area was reached at 1535 UTC. Meanwhile the wind was blowing at 7 Bft and the sea was too high to take the Scanfish out without risk. As the meeting with the Salme was also impossible as they had to search the cover of land we continued the Scanfish tracks. The northern west-east transect **P3** was started at 1558 UTC and ended at station GB_B21 at 2100 UTC where it was immediately followed by transect **P4** ending at station TF271 on **23. October** at 0741 UTC. As the wind still was blowing at 7 Bft we decided to continue the Scanfish operation with the transect **P7** to the southwest, starting at 0756 UTC and ending at station GB_B3 at 1446 UTC, followed by the southern west-east transect **P6** commencing at 1458 UTC and ending at 2306 UTC at station GB_B10. By this time the wind was down to 4 Bft and the forecast promising a further decrease. We

proceeded from GB_B10 to TF271 where a CTD cast was taken on **24. October** at 0400 UTC. Using the calmer weather we recovered the GODESS mooring without problems (0630 to 0730 UTC). We then went back to TF271 for a series of pump-CTD tests with the SeapHOx sensor (0830 to 1200 UTC). At around 1145 UTC the Estonian research vessel Salme joined Poseidon at TF271. Both vessels carried out casts with pH sensors (on Poseidon the SeapHOx sensor was used on the pump-CTD). Ingo Schuffenhauer went over to the Salme with the RIB to install a reserve sensor for dissolved oxygen as the one on the Salme CTD hat failed. Jens Müller from IOW was transferred with his pH instrument setup to carry out a profile measurement on the outlet of the pump-CTD (1240 to 1430 UTC) after which he was transferred back to the Salme. Next we took CTD-casts along the Scanfish transect **P4** at stations GB_B15 (1730 UTC), GB_B16 (1945 UTC) and GB_B21 (2130 UTC). Next we took CTD profiles for sampling the metals concentrations in the water column on **25. October** at stations BX03 (0715 UTC), BX02 (0915 UTC), TrKl06 (1400 UTC), TrKl08 (1520 UTC) and BX05 (1800 UTC). A further pump-CTD cast was taken at BX05 with the METIS-analyser attached (2200 UTC). In the morning of the **26. October** another CTD cast was carried out at TF271 (0600 UTC), starting the CTD transects along the tracks of Scanfish transects **P5** (GB_B14 (0750), GB_BA (0950), GB_B10 (1140)), **P6** (GB_B9 (1315), GB_B8 (1445), GB_B7 (1620), GB_B6 (1740), GB_B4 (1945), GB_B3 (2110)) and **P7** (GB_B12 (0010), GB_B13 (0230) and TF271). The CTD cast of the last station on these transects was taken on the **27. October** at 0800 UTC. Also on station TF271 a pump-CTD cast was taken with high vertical resolution sampling through the redoxcline (85 samples from 70 m to 230 m with a separation of 2 m (0915 to 1115 UTC).

Next a CTD transect along the Scanfish transect **P2** was carried out with stations TF271 (1400 UTC), P2_1 (1715 UTC), P2_2 (2015 UTC) and GB_B18mod (2320 UTC). After this section we returned to the central area of the Eastern Gotland Basin for the recovery of the MSI glider MIA on **28. October**. Due to the excellent skills of master and crew of Poseidon the recovery went without damages in spite of wind speeds of around 16 kn (5 Bft), more than had been forecast (0726 to 0753 UTC). A CTD cast was taken at the recovery position for comparison with the MIA sensors (MIA_CTD at 0806 UTC). Two CTD casts were carried out at TF271 (0925 and 0938 UTC) with the GODESS sensors tied to the CTD frame and the sensor intake of the CTD rerouted to the GODESS CTD sensors. At 1137 UTC deployment of the GODESS mooring started (in moderate seas but still 4-5 Bft winds) and was finished by 1207 UTC.

We then moved to position GB_B21 for the first cast (1710 UTC) of the CTD transect along Scanfish transect **P3** with further stations GB_B20 (1850), GB_B19 (2020), TF286 (2205) and GB_B18mod (2320). We then transferred to position MUCOD for another CTD cast (**29. October** 0704 UTC) and multicorer cast (0750 UTC). At 0944 UTC the Scanfish transect **P5** was started at TF271 and ended at station GB_B10 at 1457 UTC. A further CTD transect followed from station GB_B7 (1814 UTC) northeastwards through the Eastern Gotland Basin (GB_B7 (1815), GB_BB (2020), TF271 (2225), TF270 (**30. Oct.** 0115), GB_BC (0310) to station GB_B20 (0510)). After transfer back to TF271 a final Scanfish transect **P9** was taken with the Mk III for an extended at sea test. The track led from station TF271 (1012 UTC, start of transect) towards station TF260, ending at 56°40.87’ N, 19°36.93’ E at 1702 UTC.

On the way back the stations along Scanfish transect **P1** were sampled by CTD casts (TF260 (1740), TF263 (2040), TF250 (2325), TF253 (**31. Oct.** 0225), TF255 (0455), TF259 (0630), TF256 (0850), SC_E (1200), TF222 (1425), TF224 (1710), BB1 (1810), TF221 (1930), TF213 (2050 with Apstein and Plankton net hauls until 2230), TF212 (**1. Nov.** 0000), TF211 (0125), TF200 (0330), TF205 (0545), TF140 (0845), AB1 (1505), TF113 (1731 with Plankton net hauls until 1810), TF114b (2010), TF115b (2155) and TF030 (**2. Nov.** 0010)). After the last station the research ended and Poseidon proceeded back to Rostock port.

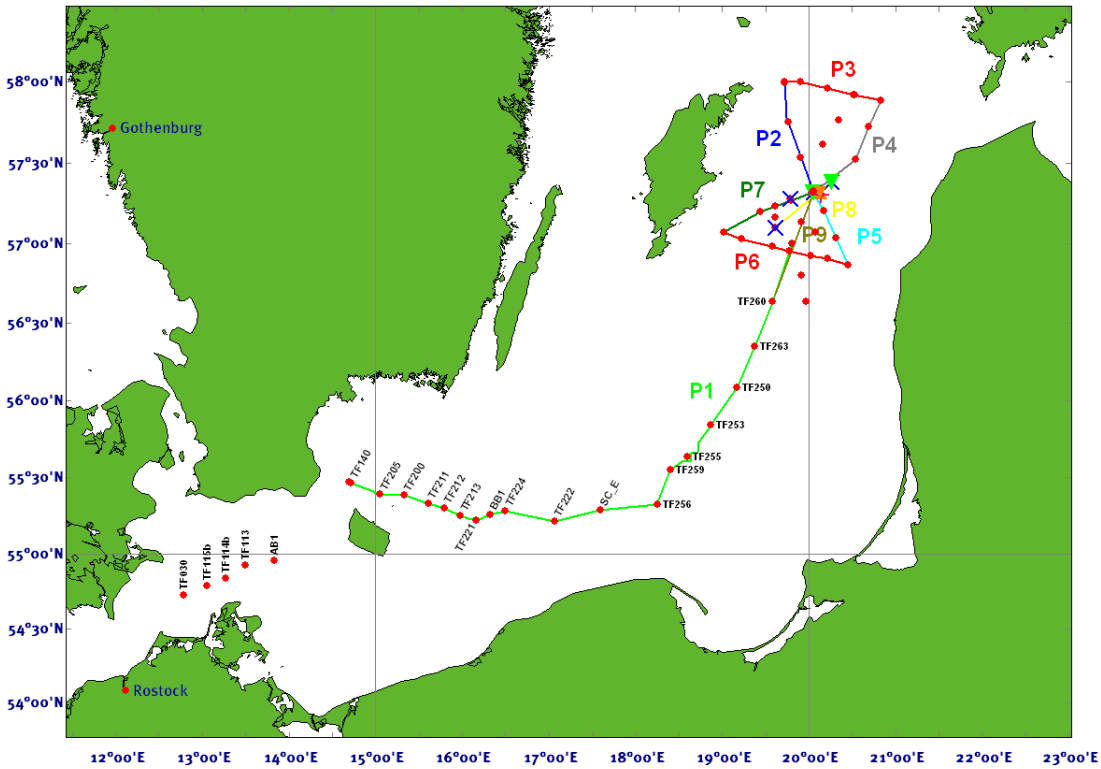

Fig. 1: Poseidon 492 stations and transects. Red dots show CTD stations, lines show Scanfish transects, crosses show multicorer-stations.

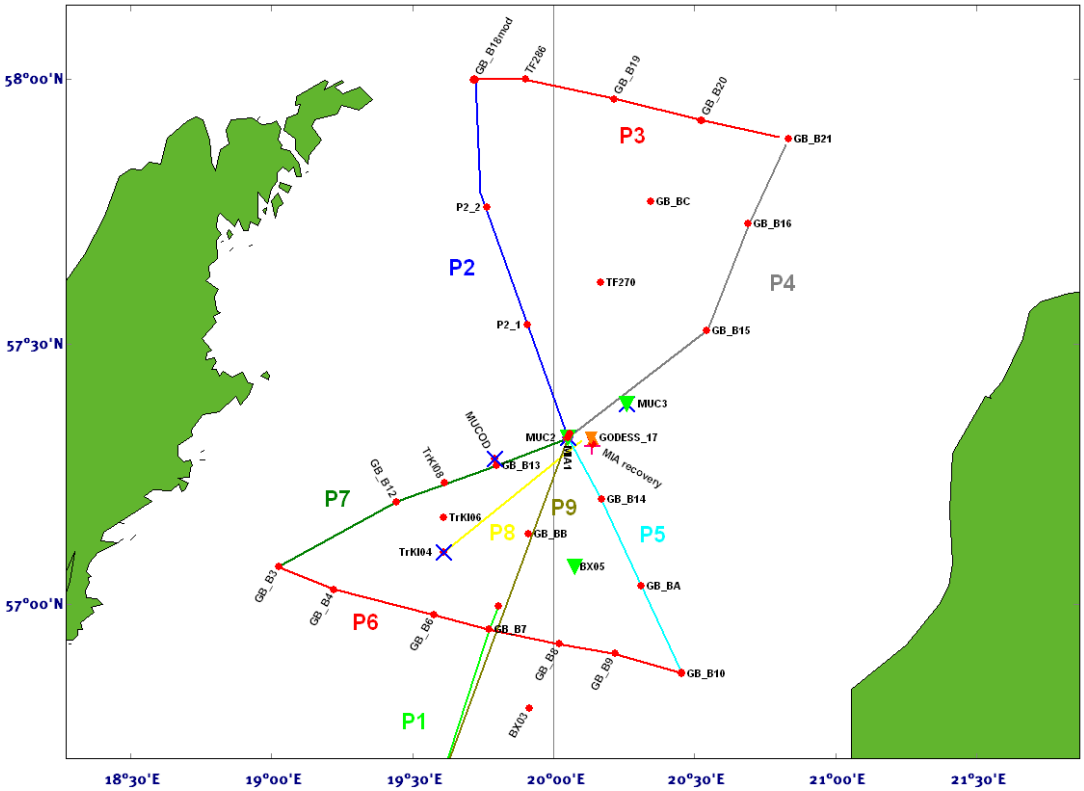

Fig. 2: Poseidon 492 stations and transects in the Eastern Gotland Basin. Red dots show CTD stations, lines show Scanfish transects, crosses show multicorer-stations.

4. Scientific report and first results

4.1 Hydrographic sections (I. Schuffenhauer, R. Prien (IOW), U. Lips (MSI))

In total over 540 nautical miles have been covered with 9 Scanfish transects. Eight out of the nine Scanfish transects have also been covered by vertical CTD casts. While it was planned to do some of the CTD transects with RV Salme at nearly the same time, due to the weather this was not possible. The time between Scanfish and CTD transects ranged between one and ten days.

A first quick look at the Scanfish transect P1 (fig. 3) already demonstrates the high horizontal and vertical resolution, especially in the fine structure of the lower oxygen concentrations in the Gotland Basin below the pycnocline. Some of these structures are too small horizontally to be visible when the same track is covered by vertical CTD profiles at discrete stations. The data collected during the cruise will allow a detailed analysis of the differences in horizontal resolution.

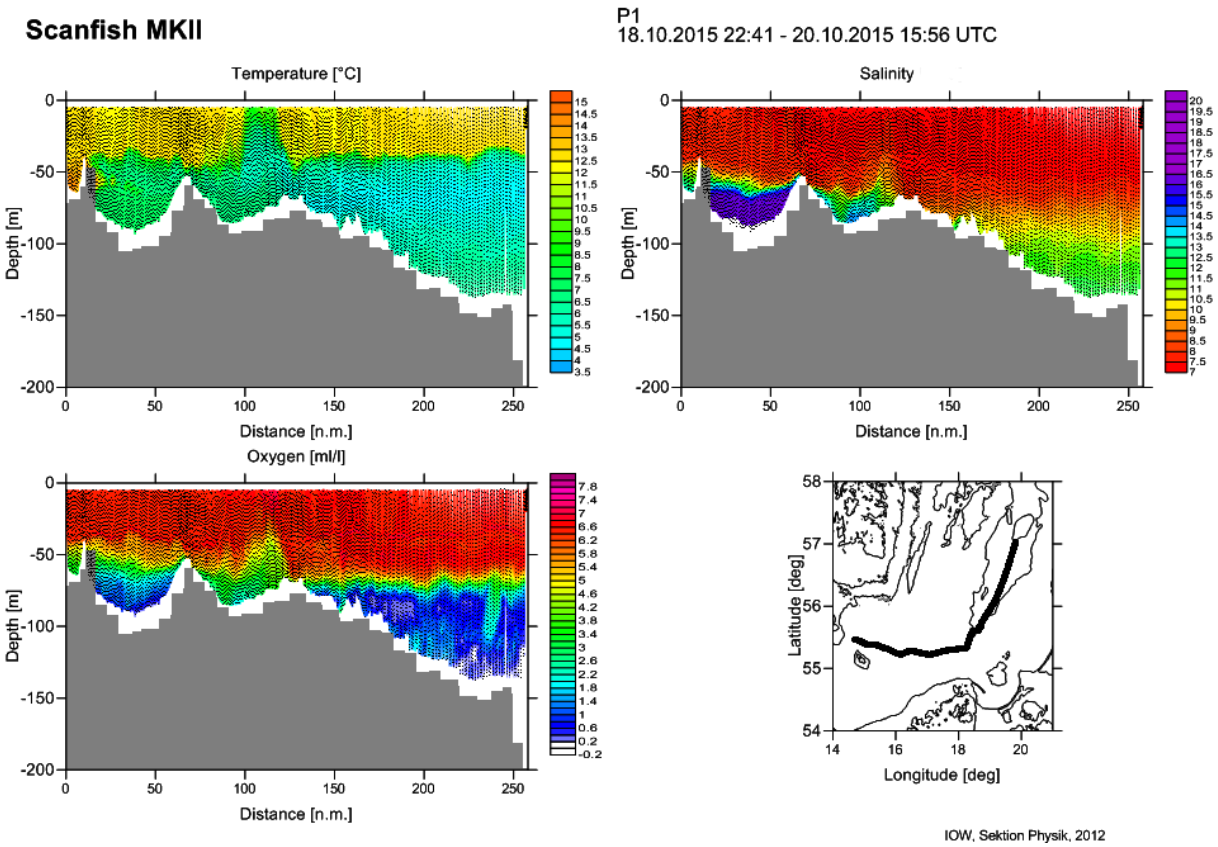

Fig. 3: Poseidon 492 Scanfish transect P1 from Bornholm Basin to the Eastern Gotland Basin. Data for temperature (upper left panel), salinity (upper right) and dissolved oxygen (lower left) as well as Scanfish track (lower right) are shown.

The hydrographic situation in the Eastern Gotland Basin showed that in the Gotland Deep an intermediate layer between 120 and 140 m shows anoxic conditions again after it had been at least hypoxic throughout after the inflow water arrived. In the northwestern Eastern Gotland Basin (station GB_B18mod) the deep water did not show any signs of the inflow water.

The two CTD casts at station TF113 taken on the 18. October and 1. November show the arrival of another inflow of higher salinity waters from the North Sea in the Arkona Basin during the cruise (fig. 4).

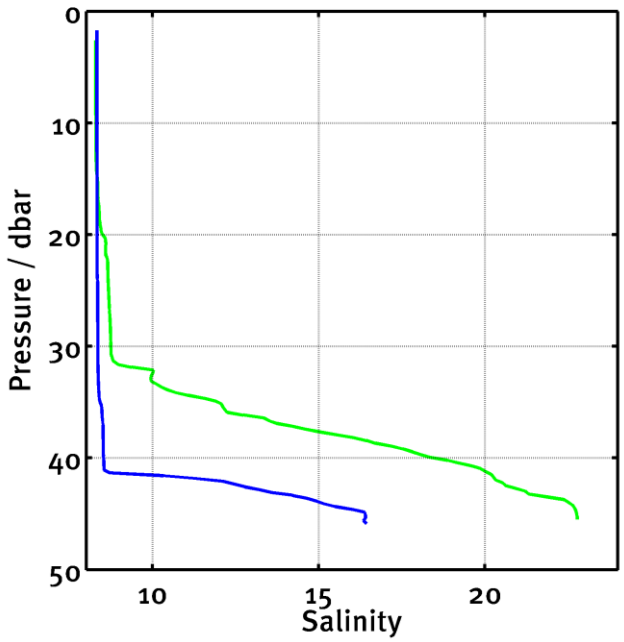

Fig. 4: Salinity from vertical CTD casts at station TF113 in the Arkona Basin, taken on 18. October (blue) and 1. November (green).

4.2 Geochemistry (O. Dellwig, D. Meyer, IOW)

At nine CTD casts (BX02, BX03, BX05, MUC3, 271, TrKl04, TrKl06, TrKl08, MUC OD) water samples were taken from conventional bottle-rosette for determination of dissolved and particulate Mn as well as selected redox-sensitive trace metals like Mo and U. Measurements will be done by ICP-OES/MS at the IOW. At selected depths, water samples were also taken for filtration (0.4 µm polycarbonate) to allow determination of particulate metals. At station 271, a high-resolution Pump-CTD cast was carried out between 70 m and 230 m water depth to obtain water samples for dissolved metals every 2 m.

Sediment samples were taken from four multicorer casts (station 271, TrKl04, MUC3, MUC OD) for geochemical sediment analyses including e.g. determination of major and trace elements by ICP-OES/MS and SEM-EDX investigations for major mineralogical composition. Pore waters were extracted directly onboard ship at stations 271 and MUC OD by using rhizons. These pore waters will be analysed for redox-sensitive trace metals, nutrients, and H_2S. The resulting pore water data will be used for flux calculation of the aforementioned parameters.

4.3 Microbiology (P. Laas (MSI), A. Neun (IOW))

Peeter Laas from Tallinn University of Technology carried out on-board flow cytometer analysis (Accuri C6, Becton Dickinson) using Sybr Green I DNA stain to determine abundances of pigmented and non-pigmented microbial organisms. Over 350 samples were collected and analysed, including samples obtained via pump-CTD for high resolution microbial community profile (fig 5). In addition whole-community DNA samples were collected (over 50), which will be used for identifying bacterioplankton community composition using a next-generation sequencing platform (Illumina) back ashore.

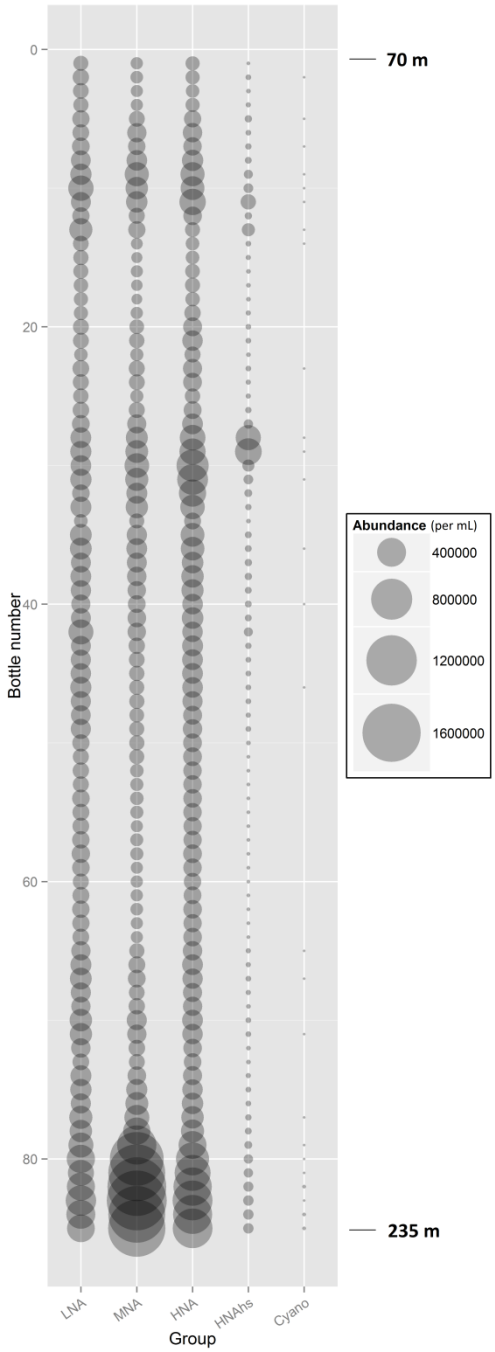

Fig. 5. Abundances of bacteria (and archaea) determined via flow cytometer. Bacteria were discriminated into 5 groups based on their: DNA content (low nucleic acid - "LNA", medium nucleic acid - "MNA" and high nucleic acid - "HNA"); pigmentation (cyanobacteria - "Cyano"); and granularity (high scatter HNA group - HNAhs). Displayed samples were collected on 27.10.2015 at station TF271.

5. Scientific equipment, moorings and instruments

5.1. Scanfish (I. Schuffenhauer, IOW)

The Scanfish is an underwater remotely operated towed vehicle (ROTV) consisting of a wing shaped body that is connected to the ship by a conducting cable. Steering flaps on the Scanfish allow it to be steered up and down in the water column, resulting in a seasaw track through the water column

behind the ship. In the Scanfish body there is room for sensor equipment with access to the water column through openings in both side panels. Inside the Scanfish a Seabird 911plus CTD system with additional dissolved oxygen sensor, Wetlabs fluorometer and turbidity sensor were installed. Two Scanfish were used during the cruise, the majority of profiles (P1 to P8) was taken with the Mark II Scanfish, profile P9 was taken with the Mark III version. In the newer Scanfish (Mark III) the sensor payload was almost identical, the Mark III, however, did not include a fluorometer.

5.2. Pump-CTD (I. Schuffenhauer, IOW)

The IOW Pump-CTDsystem was developed in close co-operation of the IOW instrumentation department and the MPI nutrient group in Bremen based on ideas of Gernot Friedrich et al. (MBARI, USA) from the end of the 1980s.

In combination with high precision CTD- and other standard parameter measurements ordinary rosette water sampling can be carried out with up to 13 pre-programmable 5 l FreeFlow bottles as usual. In addition the CTD-rosette is equipped with an underwater high pressure pump that produces a continuous sample water flow from the CTD through the custom made hose cable and via a dedicated winch to the ships laboratory. The water flow through the hose cable is dependent on the individual cable and cable length, the individual pump and pump motor (submersible deep well pump motor). In the configuration for this cruise a flow of 3.5 l/min was used. The actual flow rate is monitored by a digital flow meter that is connected to a PC. The actual travel time from the inlet to the outlet can be estimated with an accuracy of +/- 1 second, using the flow rate measured by the flow meter.

The Pump-CTD system was also equipped with a TMS-DSL system, allowing to provide live streaming from an underwater HD camera as well as connection of instruments requiring a bi-directional communication line. During this cruise the Pump-CTD was used with the IOW metal in situ analyser (METIS), together with a newly developed pH analyser that was operated in the sample water stream in the ship's lab and for testing a Seabird SeapHOx pH sensor.

It was also used together with a dedicated auto-sampler unit for a high resolution vertical profile through the redoxcline (from 70 m to 230 m depth with a resolution of 2 m). Samples for nutrient analyses were taken, filtered with syringe filters and frozen for analyses in the home lab.

5.3. CTD / water sampling (I. Schuffenhauer, A. Neun, IOW)

The CTD-System is a standard Seabird Electronics oceanographic multi-parameter probe system SBE911plus for vertical profiling down to 6800 m of water depth, combined with a compact size 13 bottle rosette stand (5 l bottles). It has a sensor packages comprising sensors for conductivity, temperature (2 sensors), dissolved oxygen (SBE 43), Chlorophyll a fluorescence (WET Labs ECO-AFL/FL), turbidity (light backscatter WET Labs ECO) and an altimeter. Sample bottles were of the 5 l FreeFlow water bottle type, developed by IOW/HYDROBIOS.

To ascertain correct calibration of the dissolved oxygen sensor at 13 CTD casts bottle samples were taken for oxygen and measured by Winkler titration to be able to apply a post-cruise correction to the CTDs dissolved oxygen data.

Water samples for nutrient analyses were taken at 18 stations in tune with the microbiology samples. The water was filtered and frozen for later analyses in the home lab.

5.4. MSI glider MIA (U. Lips, MSI)

The cruise plan included a glider survey for high-resolution mapping of temperature, salinity, oxygen and turbidity distribution patterns and their variability in the sub-halocline layer of the Gotland Basin. TWR (Teledyne Webb Research) Slocum G2 shallow water glider (Marine Systems Institute at the Tallinn University of Technology) was deployed for 7 days in the vicinity of station TF271 and GODESS. Glider was ballasted in order to have enough buoyancy for surfacing and being able to dive through the halocline. The deployment time was at about 06:40 UTC on 21 October 2015 and the glider was recovered on 28 October 2015 at about 08:40 UTC, thus the mission lasted approximately 7 days and 2 hours. The mission parameters were as follows:

1) The route was defined as a triangle with corners at 57° 17.75' N, 20° 01.85' E; 57° 17.75' N, 20° 10.15' E; 57° 21.35' N, 20° 06.00' E (the applied mission acquisition file "goto-l10.ma" is given below).
2) One cycle consisted of three dives between 5 and 180 m depth (the applied mission acquisition file "yo10.ma" is given below). After that the glider was instructed to surface in order to fix the coordinates, recalculate the average current speed (to be accounted for further navigation) and send the data via Iridium RUDICS connection.
3) Pressure, temperature, conductivity, chlorophyll *a* fluorescence, turbidity and oxygen content were recorded while diving; the sampling interval was 2 seconds.
4) While on the surface glider sent a small amount of flight data and scientific data from every fifth measurement point (time resolution 10 seconds) in order to get information on the glider performance but at the same time keeping the time on the surface as short as possible.
5) At the beginning of the mission, the altimeter was switched on to track the seabed. However, it was found that this caused frequent surfacing since turbid layers (or fish) were interpreted as the seabed (the altimeter did not fix the bottom when starting a dive). Then, the altimeter behaviour was changed – it was switched on when the glider was at the depth of 140 m (`put u_alt_min_depth(m) 140`); this allowed to complete most of the dives to 180 m.

Glider track during the mission is seen in Fig. 6 as a map and in Fig. 7 as a series of diving cycles. Altogether, the glider completed five and a half cycles (triangles) during this 7-day survey. The average speed of the glider was about 28 cm/s and average diving/climbing speed was about 10 cm/s. The estimated average current speed was about 10 cm/s, thus the glider was able to complete the instructed path without problems. Energy consumption during the mission was reasonable – after completing it, the battery voltage was about 13 V (see Fig. 8).

Preliminary results and findings/recommendations of/from the glider mission can be summarised as follows:

1) TWR Slocum G2 shallow water glider is able to conduct surveys in the Baltic Sea through the permanent halocline when properly ballasted and adjusted for the conditions in the Baltic (e.g. high turbidity).
2) Glider is about 10 times slower than towed Scanfish; the main advantage of the glider is that it conducts surveys autonomously and the research vessel presence is not required, except when deploying and recovering the glider.
3) The repeated surveys along a fixed track allow to estimate the spatial and temporal scales of small scale features in the water column, e.g. as existence of patches with different characteristics (temperature, oxygen content and turbidity) as seen in Fig. 9.
4) Care has to be taken to calibrate the optical sensors of the glider by water sampling and laboratory analyses and by comparing the glider data with data acquired by other devices (CTD probe, Scanfish) in the area.

goto_l10.ma

```
behavior_name=goto_list
#  Written by gen-goto-list-ma ver 1.0 on GMT:Tue Feb 19 18:56:54 2002
#  07-Aug-02 tc@DinkumSoftware.com Manually edited for spawars 7aug02 op in buzzards bay
#  07-Aug-02 tc@DinkumSoftware.com Changed from decimal degrees to degrees, minutes, decimal minutes
#  ??-Apr-03 kniewiad@webbresearch.com changed to ashument
#  17-Apr-03 tc@DinkumSoftware.com fixed comments

# goto_l10.ma
# Flies the triangle in the Gotland Deep
# Each leg about 8 km
# Modified by urmas.lips@msi.ttu.ee

<start:b_arg>
b_arg: num_legs_to_run(nodim) -1 # loop
b_arg: start_when(enum) 0 # BAW_IMMEDIATELY
b_arg: list_stop_when(enum) 7 # BAW_WHEN_WPT_DIST
b_arg: initial_wpt(enum) -2 # closest
b_arg: num_waypoints(nodim) 3
<end:b_arg>
<start:waypoints>
2001.8500   5717.7500
2010.1500   5717.7500
2006.0000   5721.3500
<end:waypoints>
```

Yo10.ma

```
behavior_name=yo
# yo10.ma
# climb 5m   dive 80m alt 4m pitch 26 deg
# Hand Written
# 18-Feb-02 tc@DinkumSoftware.com Initial
# 13-Mar-02 tc@DinkumSoftware.com Bug fix, end_action from quit(0) to resume(2)
# 09-Apr-03 kniewiad@webbresearch.com Adjusted for Ashumet

# 20-10-2015 urmas.lips@msi.ttu.ee adjusted for unit-418 in the Gotland Deep

<start:b_arg>
    b_arg: start_when(enum)      2   # pitch idle (see doco below)
    b_arg: num_half_cycles_to_do(nodim) 6   # Number of dive/climbs to perform
                                    # <0 is infinite, i.e. never finishes

    # arguments for dive_to
    b_arg: d_target_depth(m)     180
    b_arg: d_target_altitude(m)   6
    b_arg: d_bpump_value(x)      -200

    b_arg: d_use_pitch(enum)      3   # 1:battpos  2:setonce  3:servo
                                      #   in         rad        rad, <0 dive
    b_arg: d_pitch_value(X)   -0.4528     # -26 deg
    # arguments for climb_to
    b_arg: c_target_depth(m)      5
    b_arg: c_target_altitude(m)  -1

    b_arg: c_use_pitch(enum)      3   # 1:battpos  2:setonce  3:servo
                                      #   in         rad        rad, >0 climb
    b_arg: c_pitch_value(X)     0.4538     # 26 deg

    b_arg: end_action(enum) 2     # 0-quit, 2 resume
<end:b_arg>


# NOTE: These are symbolically defined beh_args.h
# b_arg: START_WHEN     When the behavior should start, i.e. go from UNITIALIZED to ACTIVE
#    BAW_IMMEDIATELY    0   // immediately
#    BAW_STK_IDLE       1   // When stack is idle (nothing is being commanded)
#    BAW_PITCH_IDLE     2   // When pitch is idle(nothing is being commanded)
#    BAW_HEADING_IDLE   3   // When heading is idle(nothing is being commanded)
#    BAW_UPDWN_IDLE     4   // When bpump/threng is idle(nothing is being commanded)
#    BAW_NEVER          5   // Never stop
#    BAW_WHEN_SECS      6   // After behavior arg "when_secs", from prior END if cycling
```

```
#    BAW_WHEN_WPT_DIST  7   // When sensor(m_dist_to_wpt) < behavior arg "when_wpt_dist"
#    BAW_WHEN_HIT_WAYPOINT 8 // When X_HIT_A_WAYPOINT is set by goto_wpt behavior
#    BAW_EVERY_SECS     9   // After behavior arg "when_secs", from prior START if cycling
#    BAW_EVERY_SECS_UPDWN_IDLE 10  // After behavior arg "when_secs", from prior START AND
#                                  //       updown is idle, no one commanding vertical motion
#    BAW_SCI_SURFACE    11  // SCI_WANTS_SURFACE is non-zero
#    BAW_NOCOMM_SECS    12  // when have not had comms for WHEN_SECS secs
#
# b_arg: STOP_WHEN
#   0   complete
#   1-N same as "start_when"
```

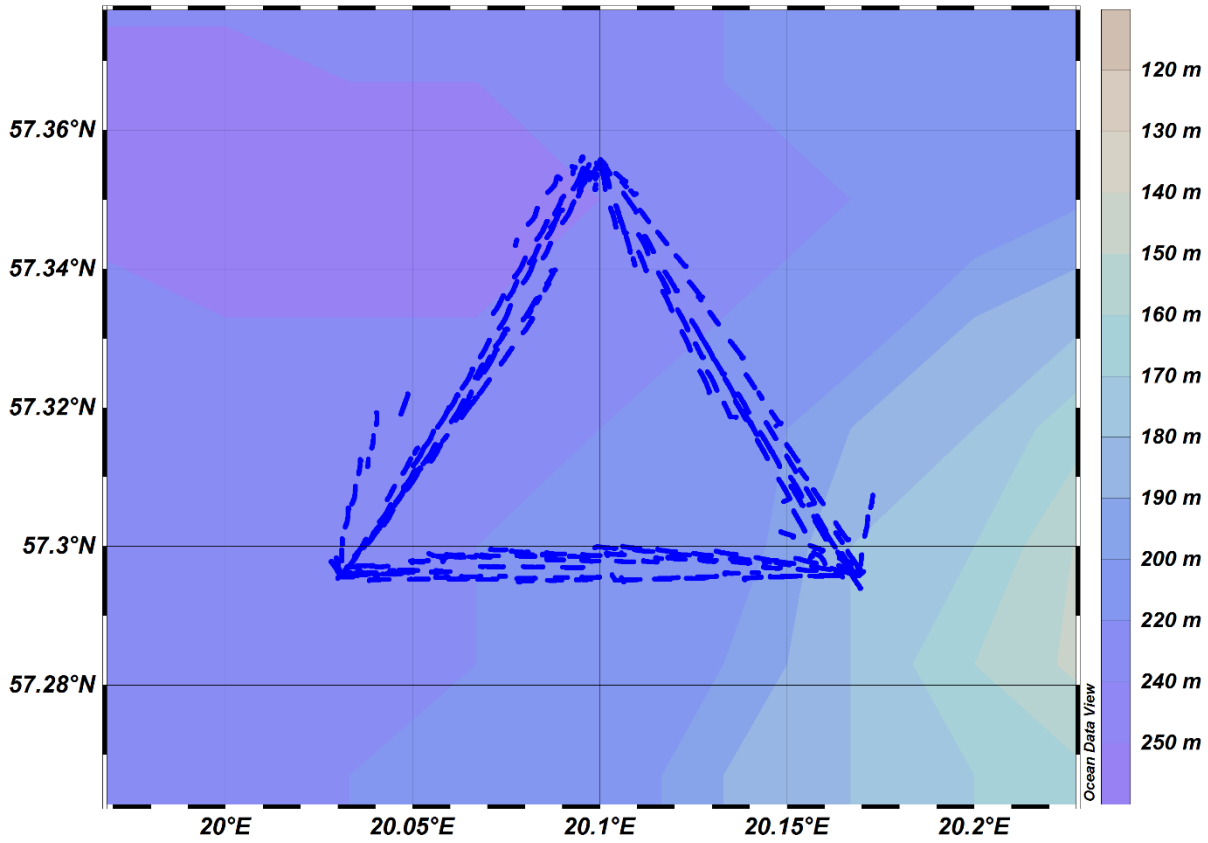

Fig. 6. Map of glider dives during the survey in the Gotland Basin on 21-28 October 2015.

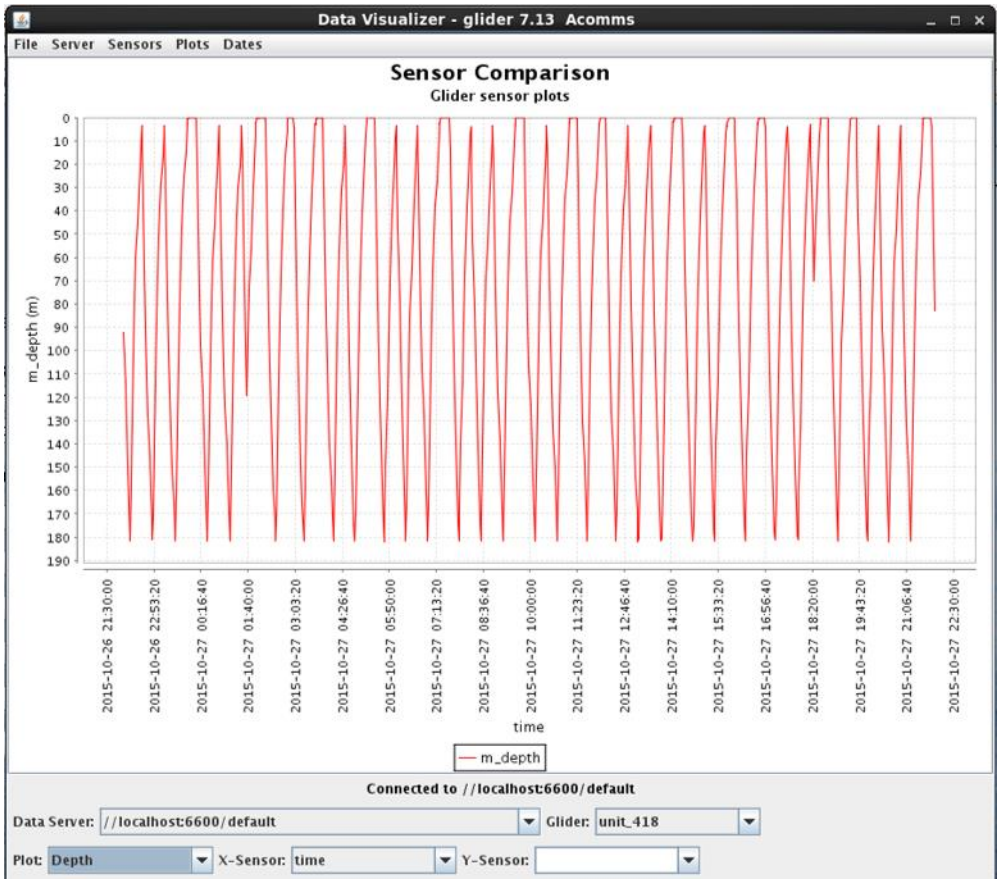

Fig. 7. Graph of glider dives on during the survey in the Gotland Basin on 27 October 2015.

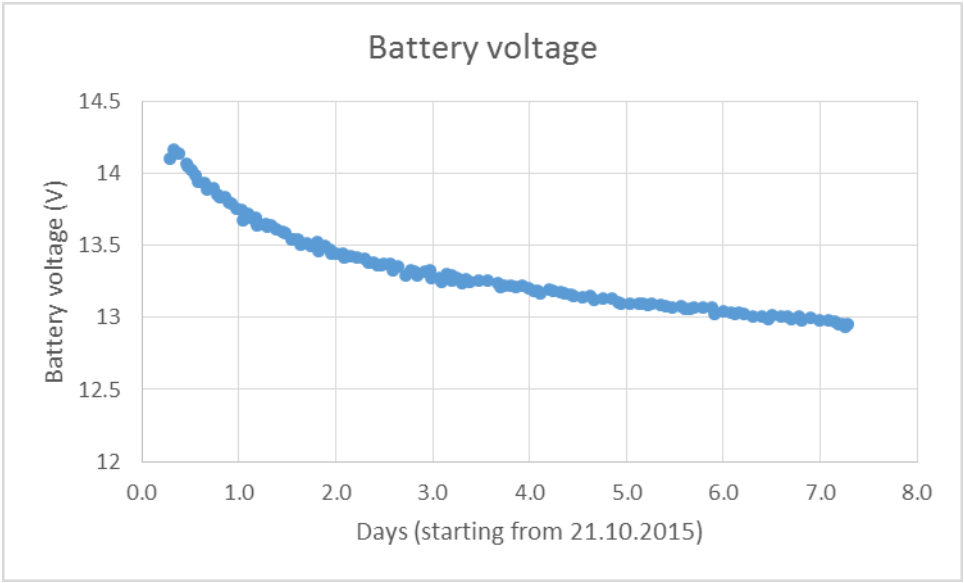

Fig 8. Changes in the glider battery voltage during the mission in the Gotland Basin on 21-28 October 2015 (on the x-axis time is presented as days from 0:00 on 21.10.2015).

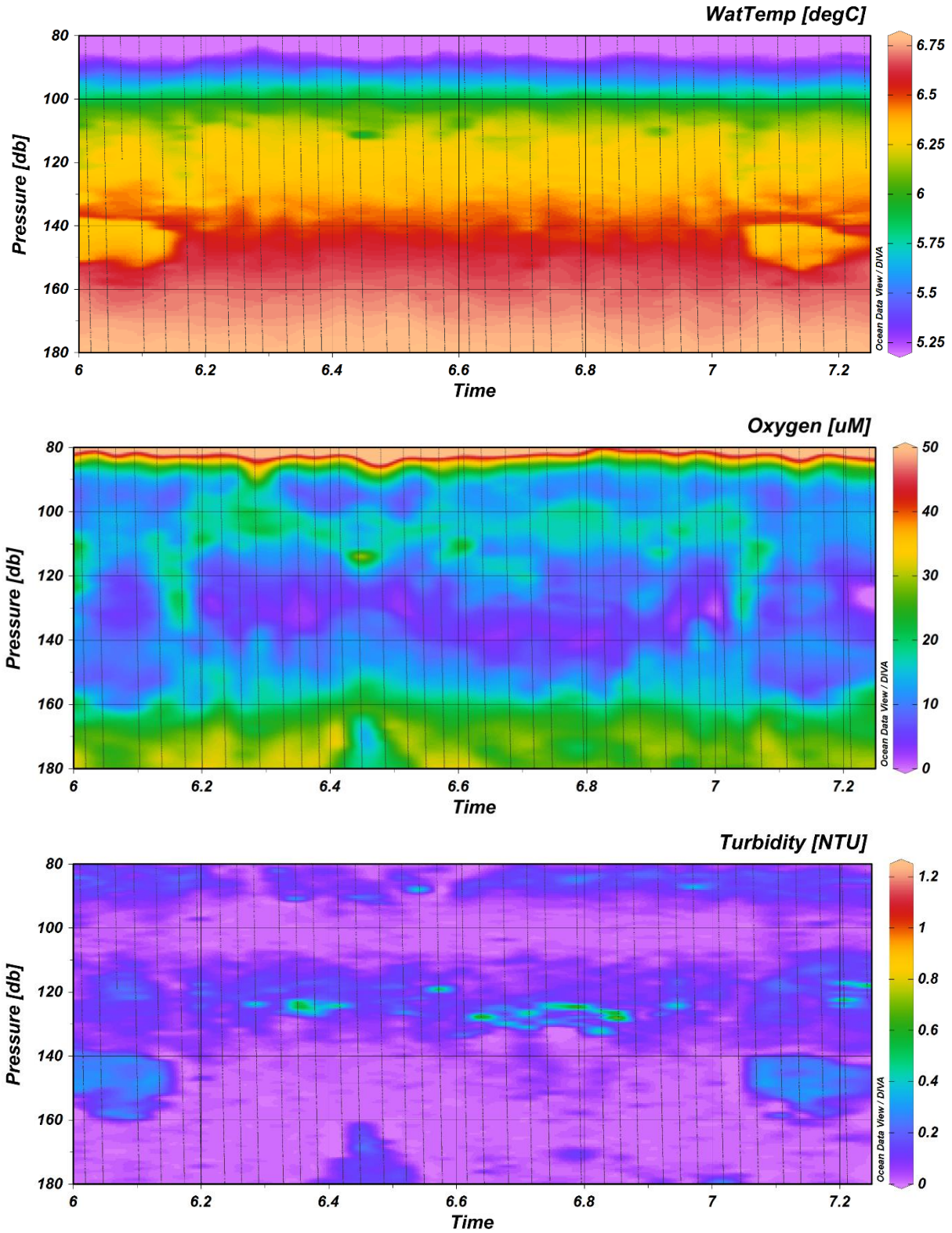

Fig. 9. Vertical sections of temperature, dissolved oxygen and turbidity during the last cycle on 27-28 October 2015 (see track in Fig. 1). Raw data is presented (oxygen and turbidity are not calibrated against laboratory analyses).

5.4. In situ Mn-analyser METIS (D. Meyer, IOW)

Manganese plays an important role in the biogeochemistry of stratified marine environments and it can be best analyzed by using in situ methods which are more cost- and time-effective and have a higher resolution in time and space compared to on-board and on-shore analyses.

In this study we tested the wet chemical analyser METIS by using a deep sea telemetry system installed in a vertical profiling CTD-rosette complex to get (1) real-time information of the underwater behavior of the analyzer and (2) perform high-resolution measurements of dissolved manganese in the water column of the central Baltic Sea.

The study area was located in the Eastern Gotland Basin (three stations). The water column was sampled by METIS 8 times in total. Figure 9 shows the results of the last cast which was carried out at the 27th of October at station TF271. The CTD/rosette was lowered at a speed of 0.1 m/s. Discrete water samples for ICP-OES measurements were taken by using the pump-CTD (every 2 m between 70 m and 235 m depth). It was found that METIS absorbance values strongly correlate with the measurements made by an independent laboratory method (ICP-OES).

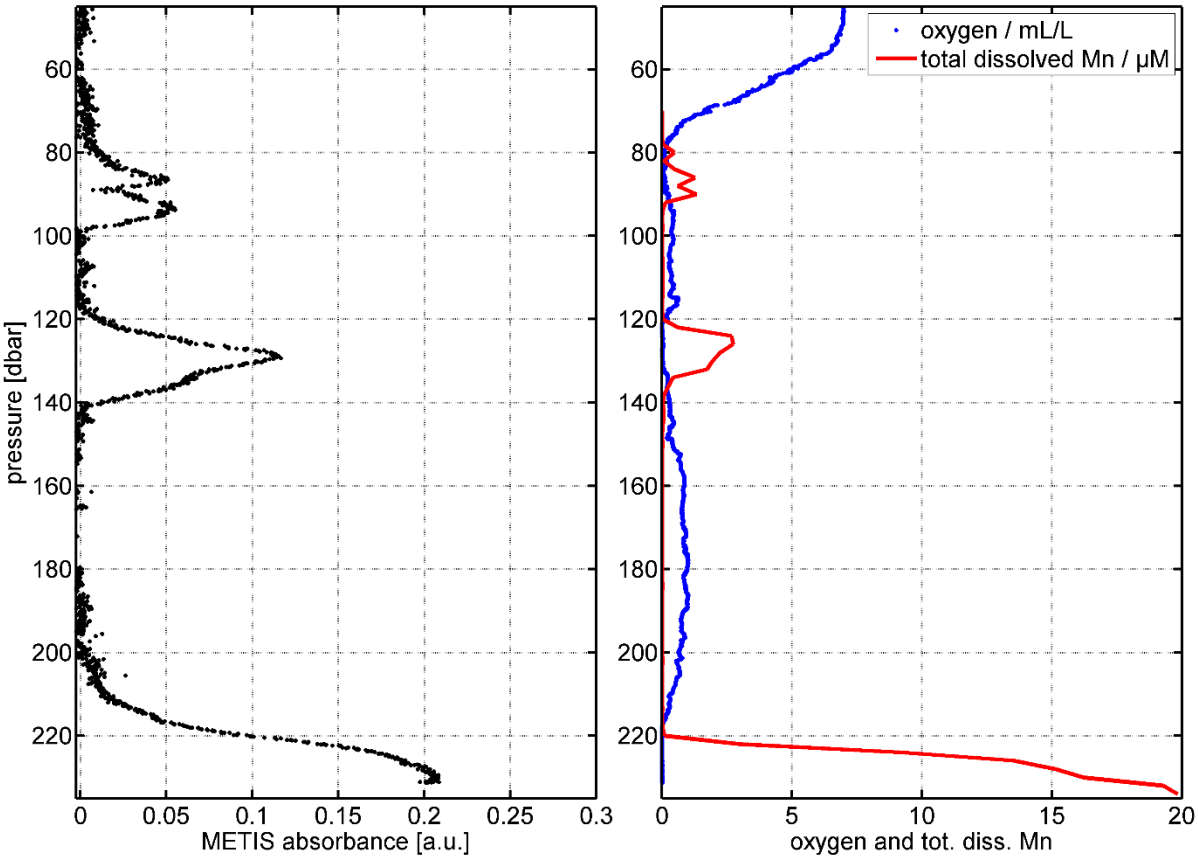

Fig. 10 Depth profiles of total diss. manganese measured by METIS (left panel) and dissolved oxygen measured by CTD and total diss. Mn measured by ICP-OES (right panel) at station 271. METIS absorbance values strongly correlate with the total diss. manganese measurements made by ICP-OES.

5.5. Profiling mooring GODESS (R. Prien, IOW)

The redoxcline in the Gotland Basin is a dynamic system with rapidly changing conditions of many redox relevant compounds. Sporadic visits with research vessels such as in the framework of the

IOW long term observation programme only provide temporal snapshots of the situation at the times of visits (i.e. five times a year). Repeated CTD casts over a period of a few days have shown the dynamics of changes, e.g. by intrusions of waters with higher dissolved oxygen concentration into the hypoxic depths. Changes occur on the scale of a few hours already. To assess the statistics of these dynamic changes they have to be observed on the appropriate time scale over extended periods of time.

Methods:
A profiling mooring provides the means for observations of the redoxcline over longer periods (e.g. 3 months). A sketch of the mooring is shown in fig. 11.

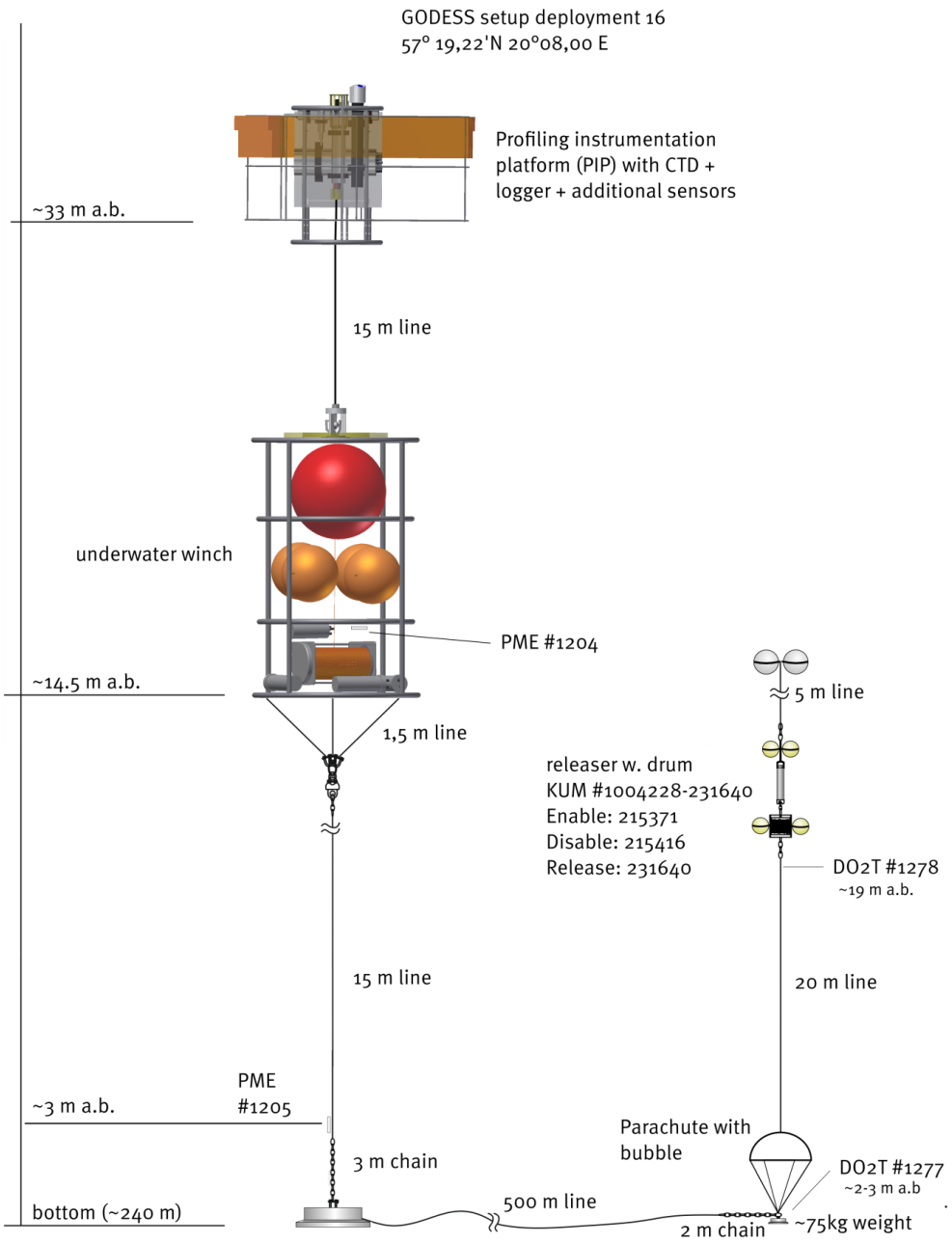

Fig. 11 Sketch of the GODESS mooring deployment 16 as recovered during the cruise. The layout for deployment 17, deployed during the cruise, is almost identical.

The profiling mooring GODESS (GOtland Deep Environmental Sampling Station) was recovered in the morning of the 24. October. The underwater winch line had not been spooled completely so that the profiling instrumentation platform (PIP) had more than the usual 15 m of line to the underwater winch out. The data logs showed that on 23. October the winch was not able to reel in the line completely. Examination of the line showed that some of the plastic shroud protecting the Kevlar strength member showed some bulging, so much so that the line would not fit through the guiding system. A probable cause may be that some floating plastic was caught by the line during a profile and jamming in the guiding system when the PIP was reeled in. In such a case the underwater winch repeatedly tries to haul the line in. This assumption fits the log file data and the fact that the winches motor batteries were drawn empty. However, the cause for this damage to the underwater winches line cannot be established.
Unfortunately the data logger in the PIP did not record any data during the deployment.

The mooring equipment was readied again and deployed around noon on 28. October over the stern of the ship using the A-frame. The PIP went to water at 11:37 UTC at position 57°19.25' N, 20°07.87' E, the bottom weight went to water at 11:41 UTC and was lowered using the ground line. Bottom contact was made at 11:49 UTC when the ship's position was 57°19.22' N, 20°07.97' E. The end of the mooring line with releaser, recovery unit and buoyancy with the small weight was slipped at 12:06 UTC (ship position 57°19.18' N, 20°08.23' E), the line dragging to port side slightly.
Wind was blowing at 4 Bft, current was SW at 0.3 kn, waves about 2 m.

Results from the profiling mooring will only be available after recovery of the mooring (expected early February 2016).

5.5. Plankton nets (R. Prien, IOW)

At two stations in the Arkona (TF113) and Bornholm Basin (TF213) plankton net hauls were carried out. At station TF213 we conducted three hauls with the Apstein net (55 µm mesh width), at both stations three hauls with the WP-2 net (100 µm mesh width). These hauls are part of a longer time series conducted by Jörg Dutz at IOW.

6. Additional Remarks

6.1. Acknowledgements

We thank Captain Matthias Günther and the crew of R/V Poseidon for their support and help during this cruise.

7. Appendices

Appendix A: Mooring protocol

Briese Schiffahrts GmbH & Co. KG Abteilung Forschungsschifffahrt
Hafenstraße 12 26789 Leer Germany

Forschungsschiff / Research Vessel
„POSEIDON" DBKV IMO 7427518
Phone: +49 421 944024 3011
Fleet77: 00870 761651773
GSM: 0049 1716070932
Fax: 00870 60027 3636
E-Mail: bruecke@poseidon.briese-research.de

Verankerungsprotokoll

Datum:	28.10.2015
Reise Nr.:	POS 492
Stations Nr.:	699
Zeitzone:	UTC +1

Verankerung

Bezeichnung:	GODESS
Betreiber:	IOW
Kurzbeschreibung:	L-förmige Verankerung mit Instrumentenplattform, Geräterahmen, 2 Grundgewichten mit 500 m Grundleine und Bergeleine auf Haspel mit Auslöser

Wetter/Seebedingungen

Wetter:	Wolkenlos
Luft:	6,5 °C
Wasser:	11,8 °C
See/Dünung:	2,0 m
Strom:	SW 0,3 kn
Luftdruck:	1028,4 hPa
Wassertiefe:	244 m

Zeit	Aktion	Position	
11:37 UTC	Instrumentenplattform PIP zu Wasser	57°19,25´N	020°07,87´E
11:38 UTC	Geräterahmen zu Wasser	57°19,25´N	020°07,90´E
11:41 UTC	Grundgewicht 1 zu Wasser	57°19,24´N	020°07,90´E
11:49 UTC	Grundgewicht 1 am Grund	57°19,22´N	020°07,97´E
12:03 UTC	Kopfboje und Releaser zu Wasser	57°19,18´N	020°08,18´E
12:06 UTC	Grundgewicht 2 zu Wasser und geslipt	57°19,18´N	020°08,23´E

Position der Verankerung (Grundgewicht 1 und Geräterahmen):
57°19,27´N 020°07,94´E

Position der Verankerung (Grundgewicht 2 und Releaser mit Kopfboje):
57°19,18´N 020°08,23´E

Bemerkungen: Verankerung aufgrund der Konstruktion mit 0,5 kn. Fahrt übers Heck ausgesetzt.

Briese Schiffahrts GmbH & Co. KG

Matthias Günther, Kapitän FS Poseidon

POSEIDON

Appendix B: List of stations

date	station	start	end	lat	lon	data file	comment
18.10.2015	Rostock	09:00		54°05.00'N	12°07.00'E		Sailing
18.10.2015	Rostock.1			54°15.89'N	12°05.98'E		
18.10.2015	Rostock.1			54°38.79'N	12°37.68'E		
18.10.2015	TF113	15:00	15:16	54°55.50'N	13°30.00'E	V0001F01	vCTD
18.10.2015	TF140	21:53	22:07	55°28.15'N	14°42.06'E	V0002F01	vCTD
18.10.2015	TF140	22:40	22:55	55°28.15'N	14°42.06'E	F0001S01	Start Scanfish P1
18.10.2015		22:56	23:55	55°27.74'N	14°44.16'E	F0001S02	
18.10.2015		23:56	00:57	55°25.48'N	14°54.20'E	F0001S03	
19.10.2015		00:57	01:59	55°24.44'N	14°58.70'E	F0001S04	
19.10.2015		02:00	02:59	55°23.26'N	15°09.21'E	F0001S05	
19.10.2015		03:00	04:00	55°23.01'N	15°19.72'E	F0001S06	
19.10.2015		04:01	05:07	55°21.17'N	15°29.65'E	F0001S07	
19.10.2015		05:08	06:00	55°19.18'N	15°40.89'E	F0001S08	
19.10.2015		06:00	07:29	55°17.60'N	15°49.53'E	F0001S09	
19.10.2015		07:30	08:34	55°14.27'N	16°03.76'E	F0001S10	
19.10.2015		08:35	09:41	55°14.34'N	16°14.46'E	F0001S11	
19.10.2015		09:42	10:42	55°16.33'N	16°25.37'E	F0001S12	
19.10.2015		10:43	11:43	55°16.33'N	16°35.72'E	F0001S13	
19.10.2015		11:44	12:43	55°15.08'N	16°46.33'E	F0001S14	
19.10.2015		12:44	13:45	55°13.83'N	16°56.92'E	F0001S15	
19.10.2015		13:46	14:47	55°13.47'N	17°07.55'E	F0001S16	
19.10.2015		14:48	16:44	55°14.85'N	17°18.16'E	F0001S17	
19.10.2015		16:45	17:45	55°17.33'N	17°38.25'E	F0001S18	
19.10.2015		17:46	19:10	55°17.98'N	17°48.81'E	F0001S19	
19.10.2015		19:11	20:44	55°18.89'N	18°03.63'E	F0001S20	
19.10.2015		20:45	22:09	55°22.40'N	18°16.86'E	F0001S21	
19.10.2015		22:10	23:44	55°30.20'N	18°22.14'E	F0001S22	
19.10.2015		23:44	00:45	55°36.47'N	18°32.72'E	F0001S23	
20.10.2015		00:46	02:26	55°39.67'N	18°38.75'E	F0001S24	
20.10.2015		02:26	03:26	55°46.70'N	18°47.22'E	F0001S25	
20.10.2015		03:27	04:27	55°51.63'N	18°53.51'E	F0001S26	
20.10.2015		04:28	05:28	55°56.67'N	18°59.76'E	F0001S27	
20.10.2015		05:29	06:30	56°01.72'N	19°06.04'E	F0001S28	
20.10.2015		06:30	07:31	56°07.03'N	19°11.62'E	F0001S29	
20.10.2015		07:32	08:39	56°12.62'N	19°16.11'E	F0001S30	
20.10.2015		08:40	10:14	56°18.75'N	19°21.05'E	F0001S31	
20.10.2015		10:14	11:51	56°27.52'N	19°27.50'E	F0001S32	
20.10.2015		11:52	12:54	56°36.50'N	19°33.93'E	F0001S33	
20.10.2015		12:55	13:57	56°42.44'N	19°37.59'E	F0001S34	
20.10.2015		13:58	15:00	56°48.34'N	19°41.04'E	F0001S35	
20.10.2015		15:01	15:54	56°54.30'N	19°44.54'E	F0001S36	

20.10.2015	GB_B7	15:55	16:15	56°59.43'N	19°47.97'E	F0001S37	End Scanfish P1
						V0004F01	
						V0004F02	
20.10.2015	TF271	18:20	19:37	57°19.17'N	20°03.00'E	V0004F03	vCTD
20.10.2015	MUC2	19:44	20:03	57°19.19'N	20°02.98'E		MUC
20.10.2015	TF271	20:56	21:24	57°19.21'N	20°02.98'E	P0005F01	pCTD w. METIS
20.10.2015	TF271	21:27	21:50	57°19.21'N	20°02.98'E	P0005F02	pCTD w. METIS
20.10.2015	TF271	23:33	00:36	57°19.21'N	20°02.98'E	P0005F03	pCTD w. METIS
21.10.2015	TF271	01:12	01:12	57°19.21'N	20°02.98'E	P0005F04	pCTD w. METIS
21.10.2015	TF271	03:32	04:02	57°19.21'N	20°02.98'E	P0005F05	pCTD w. METIS
21.10.2015	MIA1	06:20	06:52	57°19.02'N	20°03.00'E		Glider deployment
						V0006F01	
21.10.2015	TrKl04	10:20	10:50	57°06.02'N	19°36.62'E	V0006F02	vCTD
21.10.2015	TrKl04	10:53	11:00	57°06.04'N	19°36.62'E		MUC
21.10.2015	TrKl04	11:11		57°06.04'N	19°36.62'E	F0007S01	Start Scanfish P8
21.10.2015				57°05.77'N	19°36.30'E	F0007S02	
21.10.2015				57°06.06'N	19°36.69'E	F0007S03	
21.10.2015				57°17.49'N	20°02.70'E	F0007S04	
21.10.2015	TF271	14:37	14:47	57°18.86'N	20°05.87'E	F0007S05	End Scanfish P8
						V0007F01	
21.10.2015	MUC3	15:52	16:22	57°23.12'N	20°15.54'E	V0007F02	vCTD
21.10.2015	MUC3	16:25	16:34	57°23.12'N	20°15.54'E		MUC
21.10.2015	MUC3	16:43	16:52	57°23.12'N	20°15.54'E		MUC
21.10.2015	MUC3	20:16	22:40	57°23.12'N	20°15.54'E	P0008F01	pCTD w. METIS
21.10.2015	MUC3	23:54	01:38	57°23.12'N	20°15.54'E	P0008F03	pCTD w. METIS
22.10.2015	TF271_P2	08:07		57°19.20'N	20°03.01'E	F0008S01	Start Scanfish P2
22.10.2015		09:11	10:20	57°23.47'N	20°00.18'E	F0008S02	
22.10.2015		10:21	11:21	57°29.72'N	19°56.09'E	F0008S03	
22.10.2015		11:21	12:34	57°35.28'N	19°52.42'E	F0008S04	
22.10.2015		12:35	13:35	57°41.99'N	19°47.96'E	F0008S05	
22.10.2015		13:35	14:37	57°47.95'N	19°44.40'E	F0008S06	
22.10.2015	GB_B18mod	14:41	15:35	57°54.33'N	19°43.79'E	F0008S07	End Scanfish P2
22.10.2015	GB_B18mod_P3	15:58	16:59	58°00.01'N	19°43.25'E	F0008S08	Start Scanfish P3
22.10.2015		16:59	18:00	57°59.94'N	19°54.85'E	F0008S09	
22.10.2015		18:01	19:00	57°58.60'N	20°05.96'E	F0008S10	
22.10.2015		19:01	20:01	57°57.34'N	20°16.63'E	F0008S11	
22.10.2015		20:01	21:02	57°53.54'N	20°47.85'E	F0008S12	End Scanfish P3
22.10.2015		21:02	21:47	57°52.65'N	20°49.30'E	F0008S13	
22.10.2015	SF_P4	22:13	23:17	57°52.26'N	20°49.13'E	F0008S14	Start Scanfish P4
22.10.2015		23:17	00:56	57°43.73'N	20°41.49'E	F0008S15	
23.10.2015		00:57	02:04	57°31.56'N	20°32.68'E	F0008S16	
23.10.2015		02:05	03:05	57°36.82'N	20°36.48'E	F0008S17	
23.10.2015		03:06	04:07	57°32.86'N	20°33.61'E	F0008S18	
23.10.2015		04:08	05:22	57°29.72'N	20°28.36'E	F0008S19	

23.10.2015		05:23	06:40	57°26.01'N	20°19.53'E	F0008S20	
23.10.2015		06:40	07:41	57°19.21'N	20°03.03'E	F0008S21	End Scanfish P4
23.10.2015	SF_P4end	07:41	07:55	57°19.72'N	20°04.27'E	F0008S22	Start Scanfish P7
23.10.2015	SF_P7start	07:56	08:56	57°19.17'N	20°02.88'E	F0008S23	
23.10.2015		08:57	09:59	57°17.70'N	19°55.84'E	F0008S24	
23.10.2015		09:59	10:57	57°15.73'N	19°46.53'E	F0008S25	
23.10.2015		10:57	11:57	57°14.00'N	19°37.63'E	F0008S26	
23.10.2015		11:58	13:22	57°12.11'N	19°27.87'E	F0008S27	
23.10.2015		13:23	14:23	57°08.30'N	19°14.63'E	F0008S28	
23.10.2015	SF_P7end	14:24	14:46	57°05.49'N	19°05.22'E	F0008S29	End Scanfish P7
23.10.2015	SF_P6start	14:51	16:13	57°04.25'N	19°00.79'E	F0008S30	Start Scanfish P6
23.10.2015		16:14	17:23	57°01.56'N	19°14.33'E	F0008S31	
23.10.2015		17:24	18:26	56°59.90'N	19°26.54'E	F0008S32	
23.10.2015		18:27	19:34	56°58.35'N	19°37.65'E	F0008S33	
23.10.2015		19:34	20:35	56°56.72'N	19°49.47'E	F0008S34	
23.10.2015		20:36	21:42	56°55.43'N	20°00.64'E	F0008S35	
23.10.2015		21:44	22:45	56°54.34'N	20°12.76'E	F0008S36	
23.10.2015	SF_P6end	22:45	23:10	56°52.60'N	20°23.56'E	F0008S37	End Scanfish P6
24.10.2015	TF271	03:57	04:31	57°19.19'N	20°03.00'E	V0010F01 V0010F02	vCTD
24.10.2015	GODESS	06:36	07:32	57°19.04'N	20°08.31'E		GODESS recovery
24.10.2015	TF271	08:39	11:55	57°19.19'N	20°03.00'E	P0011F01 - P0011F06	pCTD
24.10.2015	TF271	12:40	14:32	57°19.19'N	20°03.00'E	P0012F01	pCTD
24.10.2015	GB_B15	17:36	18:07	57°31.50'N	20°32.62'E	V0013F01 V0013F02	vCTD
24.10.2015	GB_B16	19:45	20:09	57°43.68'N	20°41.37'E	V0014F01 V0014F02	vCTD
24.10.2015	GB_B21	21:30	21:45	57°53.31'N	20°50.00'E	V0015F01	vCTD
25.10.2015	BX03	07:14	07:40	56°47.87'N	19°54.77'E	V0016F01 V0016F02	vCTD
25.10.2015	BX02	09:15	09:38	56°37.91'N	19°58.38'E	V0017F01 V0017F02	vCTD
25.10.2015	TrKl06	13:58	14:29	57°09.99'N	19°36.57'E	V0018F01 V0018F02	vCTD
25.10.2015	TrKl08	15:20	15:41	57°14.04'N	19°36.74'E	V0019F01 V0019F02	vCTD
25.10.2015	BX05	18:06	18:34	57°04.31'N	20°04.51'E	V0021F01 V0021F02	vCTD
25.10.2015	BX05	19:18	21:23	57°04.31'N	20°04.51'E	P022F01	pCTD w. METIS
25.10.2015	BX05	22:07	23:43	57°04.31'N	20°04.51'E	P022F02	pCTD w. METIS
26.10.2015	TF271	06:04	06:32	57°19.20'N	20°03.03'E	V0022F01 V0022F02	vCTD
26.10.2015	GB_B14	07:53	08:16	57°12.17'N	20°10.27'E	V0023F01	vCTD

26.10.2015	GB_BA	09:51	10:05	57°02.09'N	20°18.73'E	V0024F01	vCTD
26.10.2015	GB_B10	11:39	11:58	56°51.98'N	20°27.25'E	V0025F01 V0025F02	vCTD
26.10.2015	GB_B9	13:14	13:42	56°54.31'N	20°13.00'E	V0026F01 V0026F02	vCTD
26.10.2015	GB_B8	14:46	15:00	56°55.38'N	20°01.16'E	V0027F01	vCTD
26.10.2015	GB_B7	16:21	16:39	56°57.13'N	19°46.21'E	V0028F01	vCTD
26.10.2015	GB_B6	17:42	18:04	56°58.83'N	19°34.61'E	V0029F01 V0029F02	vCTD
26.10.2015	GB_B4	19:44	20:11	57°01.72'N	19°13.26'E	V0030F01 V0030F02	vCTD
26.10.2015	GB_B3	21:11	21:32	57°04.39'N	19°01.49'E	V0031F01 V0031F02	vCTD
27.10.2015	GB_B12	00:07	00:24	57°11.85'N	19°26.59'E	V0032F01	vCTD
27.10.2015	GB_B13	02:30	02:41	57°15.99'N	19°47.79'E	V0033F01	vCTD
27.10.2015	TF271	08:00	08:29	57°19.19'N	20°02.99'E	V0034F01 V0034F02	vCTD
27.10.2015	TF271	09:13	11:19	57°19.25'N	20°02.98'E	P0035F01	pCTD w. METIS high res. cast
27.10.2015	TF271	11:46	14:01	57°19.21'N	20°02.94'E	P0035F09	pCTD for pH system
27.10.2015	TF271	14:08	14:30	57°45.49'N	19°45.77'E	V0034F03 V0034F04	vCTD
27.10.2015	P2_1	17:15	17:29	57°32.10'N	19°54.57'E	V0036F01	vCTD
27.10.2015	P2_2	20:18	20:33	57°45.48'N	19°45.76'E	V0037F01	vCTD
27.10.2015	GB_B18mod	23:22	23:53	57°59.97'N	19°42.95'E	V0038F01 V0038F02	vCTD
28.10.2015	MIA	07:26	07:53	57°18.28'N	20°08.26'E		Glider recovery
28.10.2015	MIA_CTD	08:06	08:40	57°18.43'N	20°08.42'E	V0039F01 V0039F02	vCTD
28.10.2015	TF271	09:25	09:33	57°19.21'N	20°07.98'E	V0040F01	vCTD
28.10.2015	PIP_comp	09:38	10:03	57°19.24'N	20°07.95'E	V0040H02	vCTD PIP reference
28.10.2015	GODESS_depl	11:37		57°19.25'N	20°07.87'E		GODESS deployment PIP out
28.10.2015	GODESS_17	11:49		57°19.22'N	20°07.97'E		GODESS deployment weight 1 out
28.10.2015	POS492/699-1		12:07	57°19.18'N	20°08.25'E		GODESS deployment completed
28.10.2015	GB_B21	17:10	17:21	57°53.30'N	20°50.00'E	V0041F01	vCTD
28.10.2015	GB_B20	18:51	19:00	57°55.38'N	20°31.41'E	V0042F01	vCTD
28.10.2015	GB_B19	20:22	20:43	57°57.80'N	20°12.91'E	V0043F01 V0043F02	vCTD
28.10.2015	TF286	22:06	22:31	58°00.01'N	19°54.04'E	V0044F01	vCTD
28.10.2015	GB_B18mod	23:20	23:39	58°00.05'N	19°43.09'E	V0045F01	vCTD

						V0046F01	
29.10.2015	MUCOD	07:04	07:38	57°16.79'N	19°47.40'E	V0046F02	vCTD
29.10.2015	MUCOD	07:52	08:00	57°16.78'N	19°47.39'E		MUC
29.10.2015	TF271	09:39	09:44	57°19.61'N	20°02.61'E	F0047S01	Start Scanfish Profile P5
29.10.2015		09:45	10:59	57°19.15'N	20°03.06'E	F0047S02	
29.10.2015		11:00	12:01	57°12.82'N	20°09.54'E	F0047S03	
29.10.2015		12:01	13:07	57°07.40'N	20°14.23'E	F0047S04	
29.10.2015		13:08	14:10	57°01.32'N	20°19.33'E	F0047S05	
29.10.2015	GB_B10	14:11	14:57	56°55.89'N	20°23.94'E	F0047S06	End Scanfish Profile P5
29.10.2015	GB_B7	18:14		56°57.10'N	19°46.31'E	V0048F01	vCTD
29.10.2015	GB_BB	20:19	20:36	57°08.17'N	19°54.60'E	V0049F01	vCTD
29.10.2015	TF271	22:24	22:42	57°19.22'N	20°03.00'E	V0050F01	vCTD
30.10.2015	TF270	01:15	01:27	57°36.95'N	20°10.02'E	V0051F01	vCTD
30.10.2015	GB_BC	03:07	03:17	57°46.20'N	20°20.71'E	V0052F01	vCTD
30.10.2015	GB_B20	05:07	05:20	57°55.39'N	20°31.48'E	V0053F01	vCTD
30.10.2015	SF_n_start	10:06		57°19.72'N	20°03.39'E	F0054S01	Start Scanfish MkIII P9
30.10.2015		10:33				F0054S02	tech. probl.
30.10.2015		11:43				F0054S03	tech. probl.
30.10.2015		12:47	13:46			F0054S04	
30.10.2015		13:46	14:47			F0054S05	
30.10.2015		14:47	15:48			F0054S06	
30.10.2015		15:48	16:49			F0054S07	
30.10.2015	SF_n	16:49	17:02	56°40.87'N	19°36.93'E	F0054S08	End Scanfish P9
						V0055F01	
30.10.2015	TF260	17:37	17:58	56°38.02'N	19°35.00'E	V0055F02	vCTD
30.10.2015	TF263	20:38	20:51	56°20.79'N	19°22.66'E	V0056F01	vCTD
						V0057F01	
30.10.2015	TF250	23:25	23:45	56°05.02'N	19°10.05'E	V0057F02	vCTD
31.10.2015	TF253	02:25	02:33	55°50.41'N	18°51.99'E	V0058F01	vCTD
						V0059F01	
31.10.2015	TF255	04:52	05:10	55°38.01'N	18°35.98'E	V0059F02	vCTD
31.10.2015	TF259	06:29	06:40	55°32.98'N	18°23.98'E	V0060F01	vCTD
						V0061F01	
31.10.2015	TF256	08:48	09:04	55°19.60'N	18°15.11'E	V0061F02	vCTD
31.10.2015	SC_E	11:57	12:09	55°17.17'N	17°35.62'E	V0062F01	vCTD
31.10.2015	TF222	14:23	14:36	55°12.99'N	17°03.99'E	V0063F01	vCTD
						V0064F01	
31.10.2015	TF224	17:07	17:18	55°16.98'N	16°30.00'E	V0064F02	vCTD
31.10.2015	BB1	18:11	18:22	55°15.46'N	16°19.18'E	V0065F01	vCTD
31.10.2015	TF221	19:29	19:39	55°13.29'N	16°10.01'E	V0066F01	vCTD
31.10.2015	TF213	20:48	20:58	55°14.99'N	15°58.97'E	V0067F01	vCTD
31.10.2015	TF213	21:05	21:22	55°14.99'N	15°58.97'E		Apstein Net
31.10.2015	TF213	21:25	21:42	55°14.99'N	15°58.97'E		Apstein Net
31.10.2015	TF213	21:43	21:59	55°14.99'N	15°58.97'E		Apstein Net

31.10.2015	TF213	22:06	22:13	55°14.99'N	15°58.97'E		Plankton Net
31.10.2015	TF213	22:16	22:22	55°14.99'N	15°58.97'E		Plankton Net
31.10.2015	TF213	22:24	22:30	55°14.99'N	15°58.97'E		Plankton Net
31.10.2015	TF212	23:58	00:18	55°18.14'N	15°47.81'E	V0068F01	vCTD
01.11.2015	TF211	01:25	01:36	55°19.81'N	15°36.92'E	V0069F01	vCTD
01.11.2015	TF200	03:26	03:37	55°22.99'N	15°19.99'E	V0070F01	vCTD
01.11.2015	TF205	05:45	05:55	55°23.43'N	15°03.37'E	V0071F01	vCTD
01.11.2015	TF140	08:45	09:02	55°28.00'N	14°42.98'E	V0072F01	vCTD
01.11.2015	AB1	15:05	15:14	54°57.48'N	13°49.84'E	V0073F01	vCTD
01.11.2015	TF113	17:31	17:45	54°55.48'N	13°30.05'E	V0074F01	vCTD
01.11.2015	TF113	17:50	17:54	54°55.48'N	13°30.05'E		Plankton Net
01.11.2015	TF113	17:57	18:01	54°55.48'N	13°30.05'E		Plankton Net
01.11.2015	TF113	18:03	18:07	54°55.48'N	13°30.05'E		Plankton Net
01.11.2015	TF114b	20:10	20:18	54°50.07'N	13°16.55'E	V0075F01	vCTD
01.11.2015	TF115b	21:56	22:04	54°47.40'N	13°03.49'E	V0076F01	vCTD
02.11.2015	TF030	00:08	00:15	54°43.43'N	12°46.97'E	V0077F01	vCTD end of research