



## **Short Report Poseidon Cruise POS487**

# **Biogeochemistry interactions in the anoxic/suboxic Gotland Basin: redox-dependent cycles of nitrogen species and phosphorous, in situ experiments**

Kiel – Rostock  
15. July – 13. Aug. 2015

Cruise lead  
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## **I Objectives:**

The Poseidon cruise POS487 was a follow up cruise of ALKOR cruise AL422, which was carried out in Latvian waters in 2013 in the same working area. Our investigations focus on redox-dependent nutrient, nitrogen and trace metal cycles in the benthic boundary layer of the suboxic to anoxic eastern Gotland Basin.

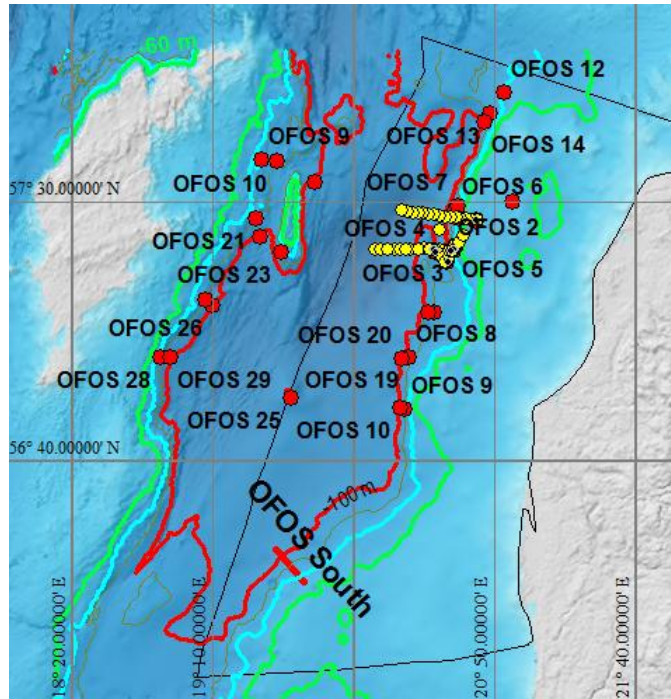
Major aim was to study the effects of a major inflow event, which occurred in Dec. 2014, on the redox-sensitive nutrient mobilization from sediments in the Eastern Gotland Basin. Original aim of this cruise was to experimentally study nutrient mobilization during in situ lander experiments. However, the ventilation event of 2014, which is the 3<sup>rd</sup> biggest inflow event since 1897 and during the past decades became increasingly rare, provided us with the unique opportunity to study the effect of the bottom water oxygenation in the deep basin on nutrient fluxes. This allows to quantify source/sink mechanisms of the benthic boundary layer for nutrients and trace metals under changing oxygen conditions and to assess potential feedbacks on upper mixed layer processes. Alkor cruise AL422 as well as this cruise were conducted in July-August under conditions of a cyanobacterial bloom and allow for direct comparison of the results. Further major aspects were to investigate nutrient turnover and fluxes in sediments covered with extended mats of sulfur bacteria belonging to the genus *Beggiatoa*.

Our investigation included the following instrument deployments:

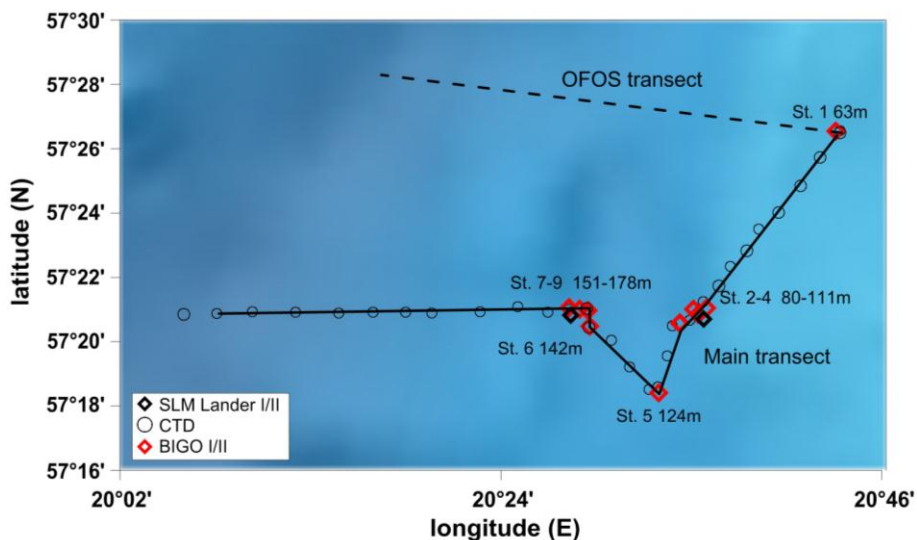
BIGO type lander (**B**iogeochemical **O**bservatory) for in situ flux measurements, the towed video/still-camera system OFOS (Ocean Floor Observation System) for seafloor imaging, and a TV-controlled multiple corer for sediment retrieval and a CTD/Rosette water sampler for investigating the oxygen and nutrient distribution in the water column. Lastly two small bottom observatories (Satellite Mini Lander) were retrieved from water depths at 96m and 123m recording for nine months changes in: CTD, turbidity, chlorophyll, oxygen and currents during the winter and spring situation. The observatories were placed at the seafloor during October 2014 with RV Poseidon (POS476/477).

## **II Area of investigations**

Major working sites were in the Eastern Gotland Basin of the Baltic Proper along a depth transect including all sites investigated during the RV Alkor cruise AL355 in June 2010 and AL422 in August/September 2013, Fig. 1. This transect included stations covering water depths from about 50 to 240 m. The sites are representative of the Gotland Basin including conditions with oxygenated and anoxic bottom waters. Due to the inflow event sites below about 120 m water depth, which during stagnant conditions were typically euxinic became oxygenated with bottom water oxygen concentrations of about 40 to 60  $\mu\text{mol l}^{-1}$ .



**Figure 1:** Map showing locations of seafloor imaging using OFOS in the eastern Gotland Basin during previous cruises (red dots). OFOS deployments made during POS487 (yellow dots) were conducted in the main working area within the Latvian EEZ (black line). The depth contours given in green, light blue and red indicate depths of 60, 80 and 120 m respectively. Bathymetry Baltic Sea: Hydrographic Commission (<http://data.bshc.pro/#2/58.5/17.5>).



**Figure 2:** Detailed station map of the working area (cf. yellow dots Fig. 1). BIGO investigations (red diamonds) were conducted along the Main Transect in parallel to sediment sampling via the multiple corer. CTD stations for nutrient investigations are indicated by open black circles. Seafloor imaging was conducted along the Main transect and the OFOS Transect.

### III Participants

| <b>Name</b>              | <b>Responsibility</b>             | <b>Institution</b> |
|--------------------------|-----------------------------------|--------------------|
| Sommer, Stefan           | Chief scientist, lander, geochem. | GEOMAR             |
| Braasch, Johanna         | Lander operation                  | GEOMAR             |
| Clemens, Davied          | Membrane Inlet Mass Spectrometry  | GEOMAR             |
| Dale, Andrew*            | Geochemistry                      | GEOMAR             |
| Domeyer, Bettina         | Nutrients, pore water geochem.    | GEOMAR             |
| Qelaj, Kastriot*         | Geochemistry (Trainee)            | GEOMAR             |
| Steffen, Melanie**       | Seafloor imaging                  | GEOMAR             |
| Stolpovsky, Konstantin** | Geochemistry                      | GEOMAR             |
| Thönißen, Verena         | Nutrients, pore water geochem.    | GEOMAR             |
| Türk, Matthias           | Techn. engineer, lander operation | GEOMAR             |
| Wemhöner, Jens*          | Geochemistry (Trainee)            | GEOMAR             |
| Wölfel, Jana**           | Geochemistry                      | IOW                |

Crew exchange in Ventspils at the 30/31 August. Participants marked with \* left RV Poseidon at the 30. Aug.; those marked with \*\* embarked RV Poseidon at the 31. August.

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**IOW:** Leibniz-Institut für Ostseeforschung Warnemünde, Seestr. 15, 18119 Rostock, Germany

### IV Narrative

At the 14<sup>th</sup> July the RV Poseidon was loaded with scientific equipment and we started to establish the laboratories. At the 15<sup>th</sup> July 9 participants boarded RV Poseidon and the establishment of the laboratories was continued. After finishing bunkering at about 14:00 we left Kiel and headed towards the working area in the Eastern Gotland Basin within the Latvian EEZ. After a two days transit we arrived at the first working station. During the transit weather conditions were moderate with moderate seas causing some of the cruise participants became seasick. Station work started with water column investigations using the CTD water sampling rosette, video observations via the towed Ocean Floor Observation System (OFOS) and sediment sampling using the multiple corer (MUC). Unlike other GEOMAR cruises the MUC was not equipped with a camera system. Initially the CTD was not working due to problems with the pump, which is only switched on after a distinct threshold of salinity is reached. The problem was solved by an external battery package, which independently of the CTD supplied the pump with energy. At the beginning of the station works we further checked whether the Satellite Mini Lander 1 and 2 (SLM), which were placed on the seafloor in 95 and 125 m water depth during Poseidon cruise POS 476/477 are still there and active. Both landers were still at their positions. Despite partially strong winds we were mostly able to deploy the BIGO lander. During some deployments their chambers became damaged due to hard ground. In the following days station work was continued with CTD, MUC, BIGO and OFOS. The deployment of the instruments focused on a depth transect, which was also sampled during previous cruises within the EU project HYPOX (RV Alkor cruise

AL 346, AL 355, AL 422, and Poseidon cruise POS476/477, see Figs. 1 and 2). This Poseidon cruise took place within the framework of the SFB754 and the Helmholtz Alliance “ROBEX” (Robotic Exploration of Extreme Environments).

At the 22<sup>nd</sup> of July, during the deployment of BIGO-I-2 the winch caused problems as one bolt of its fixation on deck broke and cannot be used until its repair during the harbour stay in Ventspils (Latvia). Luckily, this problem was overcome by using winch 2, which was used from now on to successfully deploy the BIGO lander and OFOS until the end of the cruise. Although more complicated in handling to deploy the lander over the side this procedure was very smooth and allowed to approach the seafloor much closer before the lander is released from the launcher as compared to the deployment of the BIGO at the aft of the ship via the A-frame. This procedure allowed for a better video image quality to assess whether the seafloor is suitable for the placement of the lander. Consequently the risk damaging the lander was greatly reduced.

At the 26<sup>th</sup> of July strong winds and heavy swell allowed only for CTD and Fram Lot deployments. At the 27<sup>th</sup> of July we still had strong winds in the morning hence we continued with the CTD programme. In the late afternoon winds ceased allowing for a lander deployment (BIGO-II-3).

At 29. July we stopped the station work after the retrieval and sampling of BIGO-II-3 and headed for Ventspils. During the stay in the harbour the winch was repaired and scientific participants were exchanged (see section III participants).

At the 1<sup>st</sup> of August we continued our working programme at the main working area with CTD, MUC, Fram Lot and BIGO deployments. Until the end of our working programme at the 11<sup>th</sup> August weather conditions were fine allowing for a regular and successful deployment of our instruments. At the 9<sup>th</sup> and 10<sup>th</sup> August the SLM 1 and 2 were retrieved. These instruments successfully provided a time series of physical data and measurements as mentioned above covering a time span of Oct. 2014 to August 2015. One highlight of our investigations was the finding that extended mats of sulphur bacteria not only colonized the depth zone between about 80 to 120 m but under the ventilated conditions also populated the deep basin. This would not be possible under stagnant and euxinic conditions due to a lack of electron acceptors. These mats were successfully sampled at the end of the cruise (11. Aug.) using the MUC. After these activities our working programme was finished and we headed towards Rostock. Overall the cruise was very successful and we are grateful for very familiar and friendly atmosphere on board and the very competent and great support of Captain Klaus Ricke, the officers and the entire crew.

## V List of sampling Stations and employed gear

**Table 1:** List of deployed sampling gears with abbreviations

| <b>Gear</b>                | <b>Abbreviation</b> |
|----------------------------|---------------------|
| Biogeochemical Observatory | BIGO 1 / BIGO 2     |
| CTD water sampler rosette  | CTD                 |
| Fram Lot                   | Fram Lot            |
| Multiple corer             | MUC                 |
| Satellite Mini Lander      | SLM                 |

**Table 2:** List of sampling stations of Poseidon cruise POS487. For the OFOS, Position 1 denotes when the gear was at the seafloor and Position 2 indicates when the OFOS transect was stopped and the gear was off bottom.

| St. | Gear No.   | Date    | Position 1 |            | Time  | Depth | Position 2 |            | Time  | depth | Remarks                                 |
|-----|------------|---------|------------|------------|-------|-------|------------|------------|-------|-------|---|
| No. |            | 2015    | Lat. [°N]  | Long. [°E] | [UTC] | [m]   | Lat. [°N]  | Long. [°E] | [UTC] | [m]   |   |
| 310 | CTD 1      | 17. Jul | 57°21.054' | 20°35.315' | 07:14 | 94,4  |            |            |       |       | Salinity problem with CTD pump          |
| 311 | MUC 1      | 17. Jul | 57°21.067' | 20°35.221' | 08:15 | 96    |            |            |       |       | Bacterial mats                          |
| 312 | OFOS 1     | 17. Jul | 57°21.033' | 20°35.345' | 09:19 | 94,7  | 57°21.292' | 20°34.977' | 10:58 | 96,6  | Bacterial mats                          |
| 313 | Hydrophone | 17. Jul |            |            | 11:43 | 96    |            |            |       |       | Search for oceanography lander          |
| 314 | CTD 2      | 17. Jul | 57°21.052' | 20°27.847' | 12:26 | 178   |            |            |       |       | Salinity problem with CTD pump          |
| 315 | CTD 3      | 17. Jul | 57°21.05'  | 20°27.821' | 13:19 | 180   |            |            |       |       | Salinity problem with CTD pump          |
| 316 | CTD 3      | 17. Jul | 57°21.041' | 20°27.97'  | 14:02 | 176   |            |            |       |       | Salinity problem with CTD pump          |
| 317 | MUC 2      | 18. Jul | 57°21.84'  | 20°35.82'  | 06:02 | 82    |            |            |       |       | No bacterial mats                       |
| 318 | BIGO-I-1   | 18. Jul | 57°21.057' | 20°35.881' | 09:17 | 80    |            |            |       |       | Deployment                              |
| 319 | CTD 5      | 18. Jul | 57°21.814' | 20°35.861' | 10:04 | 79,4  |            |            |       |       | Salinity problem with CTD pump          |
| 320 | CTD 6      | 18. Jul | 57°18.758' | 20°33.036' | 11:15 | 123,8 |            |            |       |       | Salinity problem with CTD pump          |
| 321 | Hydrophone | 18. Jul |            |            | 12:00 | 125   |            |            |       |       |   |
| 322 | OFOS 2     | 18. Jul | 57°18.89'  | 20°32.65'  | 12:58 | 122   | 57°18.87'  | 20°31.67'  | 14:00 | 116   | Patchy bacterial mats (see protocol)    |
| 323 | CTD 7      | 18. Jul | 57°20.902' | 20°20.007' | 15:31 | 223   |            |            |       |       |   |
| 324 | MUC 3      | 18. Jul | 57°20.624' | 20°34.178' | 06:00 | 109   |            |            |       |       | No visible bacterial mats               |
| 325 | BIGO-II-1  | 19. Jul | 57°21.017' | 20°35.115' | 08:55 | 94    |            |            |       |       | Deployment                              |
| 326 | CTD 8      | 19. Jul | 57°21.038' | 20°35.038' | 12:02 | 97    |            |            |       |       | external battery for pump / CTD working |
| 327 | CTD 9      | 19. Jul | 57°20.623' | 20°34.274' | 12:58 | 110   |            |            |       |       | external battery for pump / CTD working |
| 328 | OFOS 3     | 19. Jul | 57°20.728' | 20°34.222' | 11:44 | 107   | 57°20.690' | 20°32.072' | 13:43 | 126   | Many yellow patches, no mats            |

| St. | Gear No.   | Date    | Position 1 |            | Time  | Depth | Position 2 |            | Time  | depth | Remarks   |
|-----|------------|---------|------------|------------|-------|-------|------------|------------|-------|-------|---|
| No. |            | 2015    | Lat. [°N]  | Long. [°E] | [UTC] | [m]   | Lat. [°N]  | Long. [°E] | [UTC] | [m]   |   |
| 329 | CTD 10     | 19. Jul | 57°20.898' | 20°14.619' | 15:25 | 240   |            |            |       |       | external battery for pump / CTD working                 |
| 330 | BIGO-I-1   | 20. Jul | 57°21.057' | 20°35.881' | 06:00 | 80    |            |            |       |       |   |
| 331 | CTD 11     | 20. Jul | 57°18.596' | 20°33.081' | 10:10 | 123   |            |            |       |       | external battery for pump / CTD working                 |
| 332 | MUC 4      | 20. Jul | 57°18.518' | 20°33.104' | 10:35 | 124   |            |            |       |       | no bacterial mats                                       |
| 333 | CTD 12     | 20. Jul | 57°20.656' | 20°31.772' | 11:26 | 127   |            |            |       |       | external battery for pump / CTD working                 |
| 334 | CTD 13     | 20. Jul | 57°20.795' | 20°31.078' | 11:56 | 126   |            |            |       |       | external battery for pump / CTD working                 |
| 335 | CTD 14     | 20. Jul | 57°20.901' | 20°30.151' | 12:27 | 125   |            |            |       |       | external battery for pump / CTD working                 |
| 336 | OFOS 4     | 20. Jul | 57°20.479' | 20°29.837' | 13:29 | 126   | 57°20.489' | 20°29.506' | 13:59 | 134   | bacterial mats high coverage                            |
| 337 | OFOS 5     | 20. Jul | 57°20.481' | 20°29.113' | 14:28 | 142   | 57°20.498' | 20°28.616' | 15:16 | 157   | white patches (bacteria)<br>heterogeneous black patches |
| 338 | BIGO-II-1  | 21. Jul | 57°21.085' | 20°35.115' | 06:30 | 96    |            |            |       |       | retrieval   |
| 339 | MUC 5      | 21. Jul | 57°20.580' | 20°34.371' | 09:05 | 110   |            |            |       |       | no bacterial mats                                       |
| 340 | OFOS 6     | 21. Jul | 57°20.609' | 20°34.394' | 10:12 | 108   | 57°20.710' | 20°34.015' | 11:26 | 113   | some small patches of mats                              |
| 341 | OFOS 7     | 21. Jul | 57°20.639' | 20°34.432' | 12:02 | 107   | 57°20.555' | 20°33.946' | 13:20 | 111   | possible greyish mats                                   |
| 342 | CTD 15     | 21. Jul | 57°20.497' | 20°33.891' | 13:35 | 112   |            |            |       |       |   |
| 343 | CTD 16     | 21. Jul | 57°24.804' | 20°30.215' | 14:39 | 170   |            |            |       |       |   |
| 344 | MUC 6      | 21. Jul | 57°20.948' | 20°34.389' | 06:03 | 154   |            |            |       |       | no bacterial mats                                       |
| 345 | BIGO-I-2   | 22. Jul | 57°20.584' | 20°34.315' | 09:03 | 111   |            |            |       |       | during this deployment the winch broke                  |
| 346 | CTD 17     | 22. Jul | 57°18.955' | 20°32.469' | 10:04 | 118   |            |            |       |       |   |
| 347 | Fram Lot 1 | 22. Jul | 57°18.548' | 20°32.875' | 10:56 | 122   |            |            |       |       | failed, tube not tight enough                           |

| St. | Gear No.   | Date    | Position 1 |            | Time  | Depth | Position 2 |            | Time  | Depth | Remarks           |
|-----|------------|---------|------------|------------|-------|-------|------------|------------|-------|-------|-------------------|
| No. |            | 2015    | Lat. [°N]  | Long. [°E] | [UTC] | [m]   | Lat. [°N]  | Long. [°E] | [UTC] | [m]   |                   |
| 348 | Fram Lot 2 | 22. Jul | 57°18.55'  | 20°32.904' | 11:07 | 123   |            |            |       |       | overfilled        |
| 349 | Fram Lot 3 | 22. Jul | 57°18.539' | 20°32.905' | 11:19 | 122   |            |            |       |       | overfilled        |
| 350 | Fram Lot 4 | 22. Jul | 57°18.557' | 20°32.907' | 11:30 | 123   |            |            |       |       | water was leaking |
| 351 | Fram Lot 5 | 22. Jul | 57°18.540' | 20°32.891' | 11:44 | 122   |            |            |       |       | failed            |
| 352 | CTD 18     | 22. Jul | 57°20.949' | 20°28.991' | 12:36 | 154   |            |            |       |       |                   |
| 353 | CTD 19     | 22. Jul | 57°20.886' | 20°7.598'  | 15:30 | 242   |            |            |       |       |                   |
| 354 | BIGO-II-2  | 23. Jul | 57°18.417' | 20°33.117' | 09:12 | 124   |            |            |       |       | deployment        |
| 355 | CTD 20     | 23. Jul | 57°21.088' | 20°24.972' | 10:08 | 194   |            |            |       |       |                   |
| 356 | CTD 21     | 23. Jul | 57°21.011' | 20°27.935' | 11:05 | 178   |            |            |       |       |                   |
| 357 | CTD 22     | 23. Jul | 57°20.990' | 20°28.980' | 11:45 | 154   |            |            |       |       |                   |
| 358 | CTD 23     | 23. Jul | 57°20.046' | 20°30.389' | 12:31 | 123   |            |            |       |       |                   |
| 359 | CTD 24     | 23. Jul | 57°19.219' | 20°31.437' | 13:20 | 115   |            |            |       |       |                   |
| 360 | CTD 25     | 23. Jul | 57°18.520' | 20°32.564' | 13:57 | 118   |            |            |       |       |                   |
| 361 | CTD 26     | 23. Jul | 57°19.560' | 20°33.616' | 14:50 | 130   |            |            |       |       |                   |
| 362 | CTD 27     | 23. Jul | 57°20.564' | 20°34.036' | 15:39 | 115   |            |            |       |       |                   |
| 363 | BIGO-I-2   | 24. Jul | 57°20.584' | 20°34.315' | 09:06 | 111   |            |            |       |       | retrieval         |
| 364 | CTD 28     | 24. Jul | 57°20.670' | 20°34.815' | 10:04 | 102   |            |            |       |       |                   |
| 365 | CTD 29     | 24. Jul | 57°20.807' | 20°35.266' | 10:43 | 96    |            |            |       |       |                   |
| 366 | CTD 30     | 24. Jul | 57°21.256' | 20°35.693' | 11:23 | 94    |            |            |       |       |                   |
| 367 | CTD 31     | 24. Jul | 57°21.802' | 20°35.920' | 12:03 | 78    |            |            |       |       |                   |
| 368 | CTD 32     | 24. Jul | 57°22.345' | 20°37.260' | 12:52 | 64    |            |            |       |       |                   |



| St. | Gear No.    | Date    | Position 1 |            | Time  | Depth | Position 2 |            | Time  | Depth | Remarks                     |
|-----|-------------|---------|------------|------------|-------|-------|------------|------------|-------|-------|-----------------------------|
| No. |             | 2015    | Lat. [°N]  | Long. [°E] | [UTC] | [m]   | Lat. [°N]  | Long. [°E] | [UTC] | [m]   |                             |
| 369 | CTD 33      | 24. Jul | 57°23.509' | 20°38.897' | 13:41 | 55    |            |            |       |       |                             |
| 370 | CTD 34      | 24. Jul | 57°26.561' | 20°43.573' | 14:53 | 63    |            |            |       |       |                             |
| 371 | BIGO-II-2   | 25. Jul |            |            |       |       |            |            |       |       | retrieval                   |
| 372 | CTD 35      | 25. Jul | 57°21.066' | 20°28.030' | 10:04 | 176   |            |            |       |       |                             |
| 373 | BIGO-I-3    | 25. Jul | 57°20.976' | 20°29.029' | 13:04 | 151   |            |            |       |       | deployment                  |
| 374 | CTD 36      | 25. Jul | 57°26.623' | 20°41.719' | 14:39 | 57    |            |            |       |       |                             |
| 375 | CTD 37      | 25. Jul | 57°26.749' | 20°39.881' | 15:12 | 55    |            |            |       |       |                             |
| 376 | CTD 38      | 25. Jul | 57°26.852' | 20°38.019' | 15:39 | 60    |            |            |       |       |                             |
| 377 | CTD 39      | 26. Jul | 57°20.940' | 20°9.650'  | 06:09 | 240   |            |            |       |       |                             |
| 378 | CTD 40      | 26. Jul | 57°20.928' | 20°12.148' | 07:22 | 240   |            |            |       |       |                             |
| 379 | CTD 41      | 26. Jul | 57°20.917' | 20°16.608' | 08:18 | 236   |            |            |       |       |                             |
| 380 | CTD 42      | 26. Jul | 57°20.922' | 20°18.499' | 09:09 | 230   |            |            |       |       |                             |
| 381 | CTD 43      | 26. Jul | 57°20.938' | 20°22.794' | 10:06 | 205   |            |            |       |       |                             |
| 382 | CTD 44      | 26. Jul | 57°20.927' | 20°26.719' | 11:06 | 183   |            |            |       |       |                             |
| 383 | Fram Lot 6  | 26. Jul | 57°20.988' | 20°29.397' | 12:07 | 142   |            |            |       |       | pore water sampling rhizons |
| 384 | Fram Lot 7  | 26. Jul | 57°20.949' | 20°29.326' | 12:28 | 144   |            |            |       |       | core for PP                 |
| 385 | Fram Lot 8  | 26. Jul | 57°20.592' | 20°34.329' |       | 111   |            |            |       |       | too little sediment         |
| 386 | Fram Lot 9  | 26. Jul | 57°20.604' | 20°34.258' | 13:18 | 110   |            |            |       |       |                             |
| 387 | Fram Lot 10 | 26. Jul | 57°20.588' | 20°34.256' | 13:28 | 113   |            |            |       |       |                             |
| 388 | Fram Lot 11 | 26. Jul | 57°20.590' | 20°34.325' | 13:36 | 109   |            |            |       |       |                             |
| 389 | Fram Lot 12 | 26. Jul | 57°20.586' | 20°34.466' | 13:44 | 111   |            |            |       |       |                             |

| St. | Gear No.  | Date    | Position 1 |            | Time  | Depth | Position 2 |            | Time  | depth | Remarks                            |
|-----|-----------|---------|------------|------------|-------|-------|------------|------------|-------|-------|------------------------------------|
| No. |           | 2015    | Lat. [°N]  | Long. [°E] | [UTC] | [m]   | Lat. [°N]  | Long. [°E] | [UTC] | [m]   |                                    |
| 390 | CTD 45    | 27. Jul | 57°26.989' | 20°36.225' | 06:18 | 88    |            |            |       |       |                                    |
| 391 | CTD 46    | 27. Jul | 57°27.010' | 20°34.317' | 06:59 | 117   |            |            |       |       |                                    |
| 392 | CTD 47    | 27. Jul | 57°27.174' | 20°32.282' | 07:38 | 155   |            |            |       |       |                                    |
| 393 | CTD 48    | 27. Jul | 57°27.431' | 20°30.352' | 08:16 | 187   |            |            |       |       |                                    |
| 394 | CTD 49    | 27. Jul | 57°27.544' | 20°28.486' | 08:54 | 186   |            |            |       |       |                                    |
| 395 | CTD 50    | 27. Jul | 57°27.674' | 20°26.486' | 09:31 | 194   |            |            |       |       |                                    |
| 396 | CTD 51    | 27. Jul | 57°27.808' | 20°24.583' | 10:09 | 196   |            |            |       |       |                                    |
| 397 | CTD 52    | 27. Jul | 57°27.963' | 20°22.663' | 10:51 | 200   |            |            |       |       |                                    |
| 398 | CTD 53    | 27. Jul | 57°27.957' | 20°20.708' | 11:32 | 203   |            |            |       |       |                                    |
| 399 | CTD 54    | 27. Jul | 57°28.201' | 20°18.892' | 12:40 | 208   |            |            |       |       |                                    |
| 400 | CTD 55    | 27. Jul | 57°28.352' | 20°16.953' | 13:21 | 210   |            |            |       |       |                                    |
| 401 | BIGO-II-3 | 27. Jul | 57°21.071' | 20°27.939' | 14:50 | 178   |            |            |       |       | deployment                         |
| 402 | BIGO-I-3  | 28. Jul | 57°21.262' | 20°28.685' | 06:20 | 150   |            |            |       |       | retrieval (very good)              |
| 403 | MUC 7     | 28. Jul | 57°21.063' | 20°28.027' | 08:53 | 177   |            |            |       |       |                                    |
| 404 | OFOS 8    | 28. Jul | 57°27.454' | 20°30.740' | 20:31 | 177   | 57°27.018' | 20°33.626' | 12:59 | 127   | microbial mats fresh organic fluff |
| 405 | CTD 56    | 28. Jul | 57°20.671' | 20°34.911' | 14:14 | 102   |            |            |       |       | bottom water for Andy              |
| 406 | CTD 57    | 28. Jul | 57.21.075' | 20°25.062' | 15:29 | 195   |            |            |       |       |                                    |
| 407 | BIGO-II-3 | 29. Jul | 57°21.071' | 20°27.939' | 06:30 | 178   |            |            |       |       | retrieval                          |
| 408 | CTD 58    | 01. Aug | 57°27.028' | 20°34.284' | 05:06 | 118   |            |            |       |       |                                    |
| 409 | MUC 8     | 01. Aug | 57°26.50'  | 20°43.71'  | 06:35 | 63    |            |            |       |       |                                    |
| 410 | BIGO-II-4 | 01. Aug | 57°20.860' | 20°35.392' | 08:21 | 94    |            |            |       |       | deployment                         |

| St. | Gear No.    | Date    | Position 1 |            | Time  | Depth | Position 2 |            | Time  | depth | Remarks                 |
|-----|-------------|---------|------------|------------|-------|-------|------------|------------|-------|-------|-------------------------|
| No. |             | 2015    | Lat. [°N]  | Long. [°E] | [UTC] | [m]   | Lat. [°N]  | Long. [°E] | [UTC] | [m]   |                         |
| 411 | OFOS 9      | 01. Aug | 57°27.237' | 20°33.521' | 09:44 | 132   |            |            |       |       | not finished            |
| 412 | OFOS 10     | 01. Aug | 57°26.755' | 20°38.923' | 11:25 | 58    | 57°26.845' | 20°37.739' | 12:44 | 62    |                         |
| 413 | CTD 59      | 01. Aug | 57°27.009' | 20°34.313' | 14:07 | 116   |            |            |       |       | wrong station           |
| 414 | CTD 60      | 01. Aug | 57°27.523' | 20°28.440' | 15:08 | 186   |            |            |       |       |                         |
| 415 | MUC 9       | 02. Aug | 57°27.13'  | 20°32.34'  | 05:08 | 154   |            |            |       |       | didnt close, too soft   |
| 416 | MUC 10      | 02. Aug | 57°27.13'  | 20°32.35'  | 05:16 | 155   |            |            |       |       | didnt close, too soft   |
| 417 | MUC 11      | 02. Aug | 57°27.17'  | 20°32.36'  | 05:33 | 153   |            |            |       |       | didnt close, too soft   |
| 418 | MUC 12      | 02. Aug | 57°27.17'  | 20°32.35'  | 05:42 | 154   |            |            |       |       | didnt close, too soft   |
| 419 | MUC 13      | 02. Aug | 57°27,25'  | 20°31.89'  | 06:03 | 169   |            |            |       |       | didnt close, too soft   |
| 420 | BIGO-I-4    | 02. Aug | 57°21.016' | 20°28.555' | 09:13 | 161   |            |            |       |       | deployment NO3 Exp. Ch1 |
| 421 | OFOS 11     | 02. Aug | 57°26.899' | 20°37.682' | 11:16 | 64    | 57°26.958' | 20°35.784' | 12:45 | 96    | mats below 75 m         |
| 422 | CTD 61      | 02. Aug | 57°20.482' | 20°29.872' | 13:58 | 130   |            |            |       |       |                         |
| 423 | BIGO-II-4   | 03. Aug | 57°20.858' | 20°35.437' | 05:13 | 91    |            |            |       |       | recovery                |
| 424 | Fram Lot 13 | 03. Aug | 57°20.847' | 20°35.074' | 08:04 | 96    |            |            |       |       | empty                   |
| 425 | Fram Lot 14 | 03. Aug | 57°20.841' | 20°35.068' | 08:06 | 96    |            |            |       |       | empty                   |
| 426 | Fram Lot 15 | 03. Aug | 57°20.819' | 20°35.051' | 08:10 | 96    |            |            |       |       | empty                   |
| 427 | Fram Lot 16 | 03. Aug | 57°20.854' | 20°35.134' | 08:26 | 96    |            |            |       |       | core retrieval          |
| 428 | Fram Lot 17 | 03. Aug | 57°20.836' | 20°35.142' | 09:02 | 97    |            |            |       |       | empty                   |
| 429 |             |         |            |            |       |       |            |            |       |       |                         |
| 430 | Fram Lot 18 | 03. Aug | 57°20.830' | 20°35.167' | 09:09 | 96    |            |            |       |       | empty                   |
| 431 | Fram Lot 19 | 03. Aug | 57°20.839' | 20°35.190' | 09:26 | 96    |            |            |       |       | empty                   |

| St. | Gear No.  | Date     | Position 1 |            | Time  | Depth | Position 2 |            | Time  | depth | Remarks                                       |
|-----|-----------|----------|------------|------------|-------|-------|------------|------------|-------|-------|---|
| No. |           | 2015     | Lat. [°N]  | Long. [°E] | [UTC] | [m]   | Lat. [°N]  | Long. [°E] | [UTC] | [m]   |   |
| 432 | OFOS 12   | 03. Aug  | 57°26.992' | 20°35.285' | 10:35 | 103   | 57°27.173' | 20°33.567' | 12:26 | 131   |   |
| 433 | OFOS 13   | 03. Aug  | 57°27.355' | 20°30.617' | 13:06 | 181   | 57°27.531' | 20°29.239' | 14:29 | 183   |   |
| 434 | CTD 62    | 04. Aug  | 57°21.113' | 20°8.304'  | 04:56 | 241   |            |            |       |       | for Florian                                   |
| 435 | BIGO-I-4  | 04. Aug. | 57°21.163' | 20°28.362' | 07:00 | 165   |            |            |       |       | retrieval, 15N-NO3 injection conc was too low |
| 436 | OFOS 14   | 04. Aug. | 57°20.991' | 20°25.017' | 09:12 | 191   | 57°20.943' | 20°25.68'  | 09:50 | 188   |   |
| 437 | MUC 14    | 04. Aug  | 57°20.93'  | 20°25.58'  | 10:07 | 188   |            |            |       |       | failed / sediment watery                      |
| 438 | MUC 15    | 04. Aug  | 57°20.96'  | 20°25.61'  | 10:24 | 190   |            |            |       |       | failed / sediment watery                      |
| 439 | MUC 16    | 04. Aug  | 57°20.94'  | 20°25.58'  | 10:59 | 188   |            |            |       |       | failed / sediment watery                      |
| 440 | MUC 17    | 04. Aug  | 57°20.96'  | 20°25.18'  | 11:23 | 191   |            |            |       |       | failed / sediment watery                      |
| 441 | OFOS 15   | 04. Aug  | 57°27.928' | 20°25.499' | 12:44 | 192   | 57°27.756' | 20°26.890' | 14:21 | 192   |   |
| 442 | MUC 18    | 05. Aug  | 57°23.00'  | 20°18.95'  | 05:06 | 228   |            |            |       |       | for Florian, failed                           |
| 443 | MUC 19    | 05. Aug  | 57°22.98'  | 20°19.01'  | 05:29 | 228   |            |            |       |       | for Florian, failed                           |
| 444 | MUC 20    | 05. Aug  | 57°22.99'  | 20°18.97'  | 05:48 | 228   |            |            |       |       | for Florian, ok                               |
| 445 | CTD 63    | 05. Aug  | 57°20.418' | 20°28.306' | 06:52 | 161   |            |            |       |       | for Florian                                   |
| 446 | BIGO-II-5 | 05. Aug  | 57°20.599' | 20°34.346' | 09:17 | 108   |            |            |       |       | deployment                                    |
| 447 | OFOS 16   | 05. Aug  | 57°21.826' | 20°36.285' | 10:24 | 73    | 57°19.436' | 20°33.434' | 14:17 | 120   | winch failed at the end                       |
| 448 | MUC 21    | 06. Aug  | 57°21.03'  | 20°28.53'  | 04:58 | 162   |            |            |       |       |   |
| 449 | CTD 64    | 06. Aug  | 57°20.991' | 20°27.44'  | 05:26 | 185   |            |            |       |       |   |
| 450 | BIGO-I-5  | 06. Aug  | 57°20.486' | 20°29.120' | 08:07 | 142   |            |            |       |       | deployment                                    |
| 451 | BIGO-II-5 | 07. Aug  | 57°20.631' | 20°34.305' | 05:10 | 111   |            |            |       |       | retrieval                                     |
| 452 | CTD 65    | 07. Aug  | 57°20.680' | 20°34.918' | 08:02 | 103   |            |            |       |       |   |

| St. | Gear No.  | Date    | Position 1 |            | Time  | Depth | Position 2 |            | Time  | depth | Remarks                 |
|-----|-----------|---------|------------|------------|-------|-------|------------|------------|-------|-------|-------------------------|
| No. |           | 2015    | Lat. [°N]  | Long. [°E] | [UTC] | [m]   | Lat. [°N]  | Long. [°E] | [UTC] | [m]   |                         |
| 453 | BIGO-II-6 | 07. Aug | 57°21.813' | 20°35.845' | 12:18 | 79    |            |            |       |       | deployment              |
| 454 | OFOS 17   | 07. Aug | 57°19.122' | 20°33.173' | 13:35 | 123   | 57°18.636' | 20°32.871' | 14:29 | 121   |                         |
| 455 | BIGO-I-5  | 08. Aug | 57°20.486' | 20°29.120' | 05:30 | 142   |            |            |       |       | damage, NO3 add. Failed |
| 456 | CTD 66    | 08. Aug | 57°26.986' | 20°36.237' | 07:48 | 87    |            |            |       |       |                         |
| 457 | BIGO-I-6  | 08. Aug | 57°26.556' | 20°43.336' | 12:08 | 63    |            |            |       |       | deployment              |
| 458 | OFOS 18   | 08. Aug | 57°26.577' | 20°42.985' | 12:44 | 62    | 57°26.615' | 20°42.015' | 14:22 | 54    |                         |
| 459 | BIGO-II-6 | 09. Aug | 57°21.776' | 20°35.756' | 05:15 | 80    |            |            |       |       | retrieval               |
| 460 | MUC 22    | 09. Aug | 57°20.47'  | 20°29.11'  | 07:36 | 140   |            |            |       |       |                         |
| 461 | MUC 23    | 09. Aug | 57°20.48'  | 20°29.13'  | 07:54 | 140   |            |            |       |       |                         |
| 462 | SLM1      | 09. Aug | 57°18.53'  | 20°33.04'  | 09:00 | 124   |            |            |       |       | retrieval               |
| 463 | OFOS 19   | 09. Aug | 57°18.484' | 20°33.070' | 09:38 | 123   | 57°20.44'  | 20°29.215' | 14:24 | 139   |                         |
| 464 | BIGO-I-6  | 10. Aug | 57°26.513' | 20°43.244' | 05:14 | 63    |            |            |       |       | retrieval               |
| 465 | SLM 2     | 10. Aug | 57°20.74'  | 20°35.32'  |       | 96    |            |            |       |       | retrieval               |
| 466 | OFOS 20   | 10. Aug | 57°20.894' | 20°14.666' | 09:18 | 239   | 57°20.893' | 20°15.124' | 09:48 | 239   |                         |
| 467 | OFOS 21   | 10. Aug | 57°20.874' | 20°23.142' | 10:55 | 202   | 57°20.871' | 20°20.871' | 11:44 | 197   |                         |
| 468 | OFOS 22   | 10. Aug | 57°20.923' | 20°26.874' | 12:23 | 182   | 57°20.994' | 20°29.039' | 14:22 | 151   |                         |
| 469 | MUC 24    | 11. Aug | 57°28.19'  | 20°18.87'  | 05:02 | 207   |            |            |       |       | BM sampling             |
| 470 | MUC 25    | 11. Aug | 57°27.69'  | 20°26.47'  | 05:59 | 195   |            |            |       |       | empty                   |
| 471 | MUC 26    | 11. Aug |            |            | 06:43 | 195   |            |            |       |       | BM sampling             |
| 472 | MUC 27    | 11. Aug | 57°27.43'  | 20°30.87'  | 06:43 | 181   |            |            |       |       |                         |
| 473 | MUC 28    | 11. Aug | 57°27.25'  | 20°31.92'  | 07:06 | 161   |            |            |       |       | empty                   |

| <b>St.</b> | <b>Gear No.</b> | <b>Date</b> | <b>Position 1</b> |                   | <b>Time</b>  | <b>Depth</b> | <b>Position 2</b> |                   | <b>Time</b>  | <b>depth</b> | <b>Remarks</b> |
|------------|-----------------|-------------|-------------------|-------------------|--------------|--------------|-------------------|-------------------|--------------|--------------|----------------|
| <b>No.</b> |                 | <b>2015</b> | <b>Lat. [°N]</b>  | <b>Long. [°E]</b> | <b>[UTC]</b> | <b>[m]</b>   | <b>Lat. [°N]</b>  | <b>Long. [°E]</b> | <b>[UTC]</b> | <b>[m]</b>   |                |
| 474        | MUC 29          | 11. Aug     | 57°27.24'         | 20°31.88'         | 07:16        | 162          |                   |                   |              |              | BM sampling    |
| 475        | MUC 30          | 11. Aug     | 57°27.16'         | 20°32.42'         | 07:33        | 152          |                   |                   |              |              | BM sampling    |