# SHIPBOARD REPORT

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# RV. PELAGIA CRUISE 123

# OMEBEN-EXPEDITION

## 2 Sept. - 18 Sept. 1998

**G.C.A. Duineveld**
**M.S.S. Lavaleye**

**Netherlands Institute of Sea Research, Texel** **Sept. 1998**

## PARTICIPANTS

| | | |
|---|---|---|
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| Lorendz Boom | technician | ( “ ) |
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| Henk Douma | Officer | ( “ ) |
| Jan Kalf | Engineer | ( “ ) |
| Jaap Seepma | Engineer | ( “ ) |
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## INTRODUCTION

The present cruise was undertaken to fulfill commitments for several EU-MAST[♣] projects viz. OMEX-II[§], ALIPOR[♣] and BENGAL[♠]. Within the framework of OMEX-II, we make a study of the distribution and activity of sea floor communities off NW Spain and concurrently of the sediment concentrations of organic matter (OM) and biomarkers. Preliminary results of two earlier OMEX cruises to the area in NW Spain are reported in Duineveld & Lavaleye (1997) and Lavaleye & Duineveld (1998). During the present cruise we revisited three places of interest (see Fig. 1) in the OMEX study area: 1) the 2200m deep OMEX station off Vigo where long term moorings have been deployed by different OMEX partners, 2) the abyssal plain off La Coruna which seems relatively enriched compared to the OMEX station, and 3) Galicia Bank an offshore seamount covered with pelagic sediments and patches of the deep water coral *Lophelia*. At these stations we retrieved and re-deployed instruments that we had moored during the previous cruise in May/June (a benthic chamber lander, sediment trap and recruitment lander). We furthermore collected sediment samples on these and other locations to get insight into the spatial and temporal variation of pigment biomarkers.

During the second part of the cruise we visited a 4800m deep location on the Porcupine abyssal plain (PAP) which has been the principal station of the BENGAL[♠] program for the past 3 years. The focus in BENGAL is on the temporal variation of the food supply and activity of the abyssal benthic community. For this purpose a high resolution time series of measurements is compiled on a suit of parameters related to the water column properties and the activity measures of the benthic community. The respiratory activity of the benthic community (i.e. bacteria, infaunal metazoans), being one of the parameters in BENGAL, is measured *in-situ* by means of various European bottom landers among them the ALBEX lander of the NIOZ dept. of Marine Ecology. Closely related to BENGAL is the ALIPOR program which supports the development of new lander technology and the inter-calibration of existing instruments. During a rendez-vous with RV Discovery at the PAP site we simultaneously deployed 5 bottom landers for the intercalibration of *in-situ* measurements of sediment respiration. In between deployments we took water and sediment samples that will be appended to the set collected acquired during earlier BENGAL cruises. We also made two hauls with our UW video-trawl which besides video shots of the sea floor yielded tissue of holothurians for the analysis of biochemical parameters.

[♣] Marine Science and Technology (MAST)
[§] Ocean Margin Exchange (OMEX)
[♣] Autonomous Lander Instrument Packages for Oceanographic Research (ALIPOR)
[♠] High resolution temporal and spatial study of the BEnthic biology and Geochemistry of a north-eastern Atlantic abyssal Locality (BENGAL)

## METHODS

At each station, we made a CTD profile of the water column and simultaneously collected samples from the bottom water. The oxygen concentration in these samples were determined with the spectrophotometric Winkler method of Pai *et al*., (1993). A volume of approximately 10 l of bottom water were filtered for analysis of phytopigments in the seston. Sediment samples (phytopigments, $O_2$ porewater profiles, porosity) were (mainly) collected with a multi-corer. Sediment community oxygen consumption (SCOC) was measured *in-situ* with the ALBEX lander which holds 3 independently operating chambers. Respiration i.e. the decrease of oxygen in the chambers headspace, is estimated from the signals of optical oxygen sensors, and from Winkler titrations of sequential samples. Besides the chambers, the ALBEX lander carries a PPS3 sediment trap with a built-in fluorometer that registrates fluorescence of incoming particles. At most stations one to several porewater oxygen profiles were made in decompressed multi-core samples on board of the ship in a cold room (bottom temperature). Megafauna was collected with a video-Agassiz trawl equipped with a video for recording the small-scale topography (ripple marks, burrows, mounds etc.) of the sea floor. The opening of the trawl measures 3.5m in width and the net has a mesh width 1cm. For more details on the methods used, consults the relevant chapters.

Fig.1a and b show the cruise track during the two parts of the cruise and the geographic position of the sampling stations. All the relevant information on the geographic position of the station, the date and time of sampling, the type of samples has been compiled in Appendix A representing a diary of events.

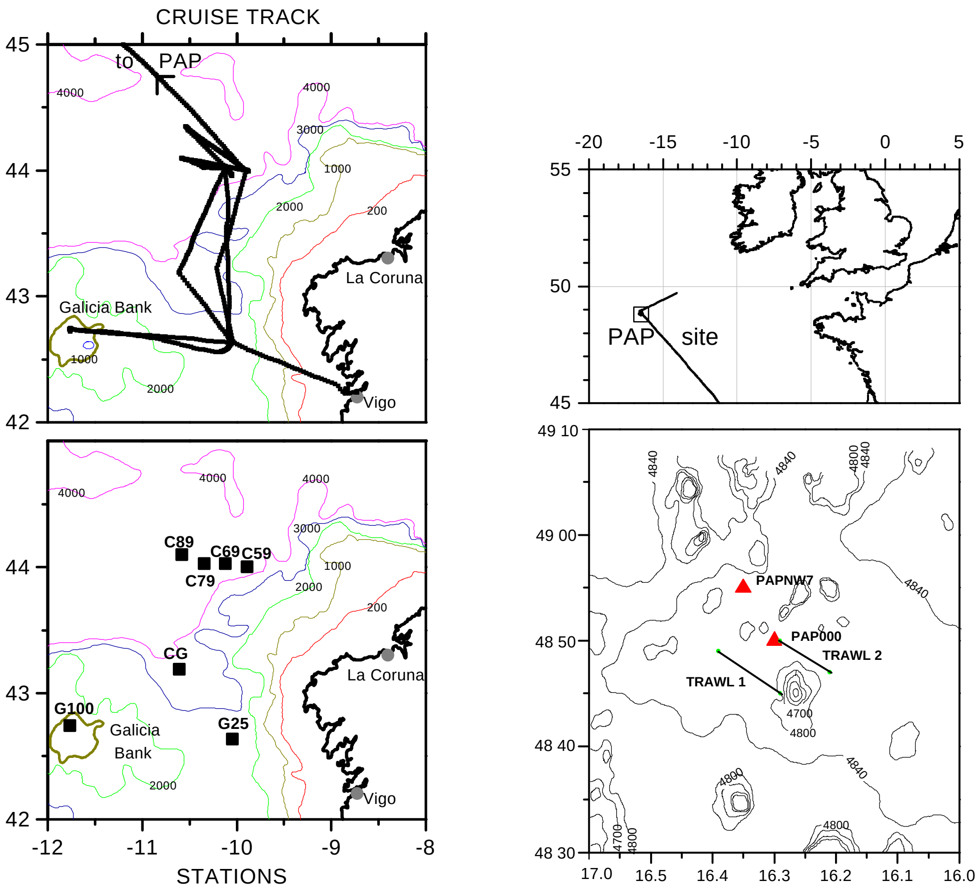


Fig. 1. Upper left panel: cruise track after departure from Vigo Harbour. Lower left panel: stations visited in the vicinity of the OMEX-II work area. Upper right panel: position of PAP-site on the Porcupine Abyssal Plain. Lower right Panel: stations visited in the PAP area. The lander station is PNW7.

**TECHNICAL REPORT "DIENST ZEETECHNIEK"** (W. Polman, L. Boom)

Hieronder een selectie uit het rapport van Dienst Zeetechniek aangaande veranderingen, cq. opmerkingen ten aanzien van verankeringen en zeegaande apparatuur.

**3 Sept.** Om 8 uur met het monsteren begonnen. De bodem lander heeft een release die niet goed reageerde op het signaal uit de transducer dus twee releases is geen overbodige luxe. De multicore heeft goede monsters genomen en werkt goed. Bij het vissen met de Agassiz-trawl hebben we geen voorloper gebruikt tussen de "bom" en de super-Aram kabel; dit ging heel goed vooral bij het wegzetten. De "bom" komt niet aan de grond bij het vissen daar deze niet getekend is door het schuren over de bodem. Dit betekent dat de super-Aram kabel geen gevaar voor slijten heeft door over de bodem te schuren.

**4 Sept.** We hebben de ASF 01 lander opgepikt (zie Settlement Experiment - M. Lavaleye), gecontroleerd en aan het eind van de middag weer weggezet. De hijsspruit van het frame hebben we vernieuwd, de 50m kabel vanaf de hijsspruit tot aan de bollen is vernieuwd, de bollen hebben we gecontroleerd en de 10 meter kabel vanaf de bollen naar de boei is ook vernieuwd. De boei is nu aan de bovenkant voorzien van twee ringen en dan de drijflijn met drijver, dit is gedaan om makkelijker de snelle haak aan de pikstok in een van deze ringen te slaan.

**8 Sept**. Na het wegzetten van de bodem lander zijn we begonnen met het nemen van een multi-core. Deze mislukte vanwege de deining. De tweede multicore ging ook niet goed, de multicore is voor deze omstandigheden niet het meest geschikte apparaat om monsters mee te nemen. De boxcore is voor deze weersomstandigheden beter om mee te werken.

**11 Sept.** Bij het nemen van een multicore op 4800 meter diepte was het resultaat slechts 5 cm sediment in de cores. De tweede multicore op de zelfde diepte ging beter, er zat voldoende sediment in maar vier pijpen waren niet getript. Deze tripten bij het scheep halen. De oorzaak van het niet trippen is dat het triggerstang knijp zat bij het trigger pen mechanisme.

**12 Sept.** De Agassiz-trawl hebben we vanwege de veiligheid i.v.m. de zeegang anders weggezet: eerst de trawl met de 500 meter voorloper hieraan een ring waaraan de super-Aram kabel aan wordt bevestigd, dan hebben we de 600 kg "bom" met de kraan over de potdeksel getild. Aan het gewicht zit een staalkabel van 1 m die bevestigd wordt aan de ring waar de voorloper en de super-Aram kabel aangekoppeld zijn. De super-Aram kabel wordt nu iets opgehaald zodat het gewicht in de super-Aram kabel komt te hangen en de haak van de kraan kan dan losgehaald worden. Als dit gedaan is kan er weer uitgevierd worden. De reden om dit zo te doen is dat er niet meer onder het gewicht gewerkt hoeft te worden en bij slingerend schip dit de veiligheid aan dek verhoogt. Zonder problemen hebben we het vistuig weggezet en weer binnen gehaald.

**14 Sept.** We hebben gekozen voor de boxcore vanwege het slechte resultaat met de multicore. Dit vanwege de deining waar de boxcore minder gevoelig voor is. De opbrengst gisteravond met de multicore was ongeveer 5 cm sediment We hebben de nozzel er uit gehaald zodat de midden zuil sneller door kan zakken naar het sediment maar dit leverde niet het gewenste resultaat.

**TECHNICAL REPORT ELECTRONICS** (H. Franken)

**CTD casts.** CTD profiles were made with a Seabird 911 plus probe. A Seatech transmissometer, a Chelsea fluorometer and an altimeter were connected to auxiliary channels of the probe. The altimeter malfunctioned during the whole cruise and could not be used. For water sampling the system was equiped with 21 NOEX bottles of 12 liter and 4 NOEX bottles of 5 liter. CTD plots and bottlefiles are shown in Appendix B. At the third station the sliprings in the rotating towlink of the CTD frame caused a short circuit. After changing the towlink the system was re-deployed to 200 meters without problems. However, when a third cast was taken again the towlink caused a short circuit and further deployments were done without a rotating towlink. Following is a Table with the positions, dates and file names of the CTD casts:

| Station | date | position | depth | echo | cast | file |
|---|---|---|---|---|---|---|
| G25 | 3/9/98 | 42.637633N<br>10.04600W | 2277.5 | | 1 | OBG25-1.dat |
| C59 | 5/9/98 | 44.002733N<br>9.898833W | 4908 | | 1 | OBC59-1.dat |
| PAP | 12/9/98 | 49.833717N<br>16.499583W | 4804 | | 2 | PAP-2.dat |
| PAP | 12/9/98 | 48.834133N<br>16.497500W | 4804 | | 4 | PAP-4.dat |
| PAPNW7 | 14/9/98 | 48.930167N<br>16.580517 | 4804 | | 1 | PAPNW7.dat |

**Fluorometer measurements on PPS3 trap**. A pilot study was made to investigate the possibility of using the sedimenttrap on the ALBEX lander to monitor phytodetritus fluxes *in situ*. In the event of a high flux, the signal could be used to trigger an incubation measurement of ALBEX during a long-term deployment, thus enabling measurements at moments of supposedly high benthic activity. A small fluorometer was placed between the sampling cup and the funnel of the sediment trap. In this way the funnel concentrated particles containing chlorophyll-a and the content of the collecting cups could be correlated with detected particles. As a first trial, short measurements at an interval of one minute were made during the previous cruise (Lavaleye & Duineveld, 1998). These showed that individual particles could be detected. For long-term deployments it is necessary to reduce the energy demand of both fluorometer and data logger. In order to achieve lower power demands, the data logger needs only to be activated if a particle is detected and the fluorometer must be able to work in a switched mode. Hence the next step was to make high frequent measurements for better understanding for the fluorometer signals and to construct an event triggered data logger. At station PAP (4800 m) high frequent measurements (interval 1 s) were logged with a tattle-tale model 6 data-logger and a prototype event-logger in parallel.

As an example, the upper panel of Fig. 2 shows a signal form measured with the high frequent data-logger and the lower panel the same signal measured with the event logger. The data-logger was programmed to make 5 measurements with 2 seconds interval when triggered. During the 3 day's of deployment nearly 500 particles were counted, but most of the gave only a very short pulse. This could pose a problem for switch-mode operation of the fluorometer.

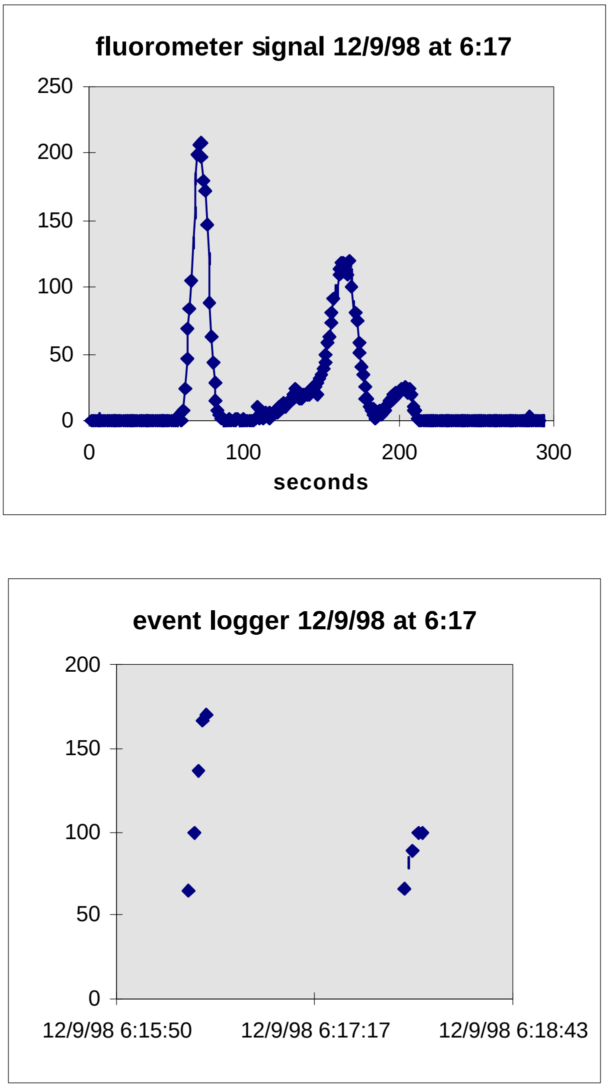


Fig. 2. Output of the fluorometer which is built in the PPS3 sediment trap on the ALBEX lander. The upper panel shows the output of the high frequent data-logger which is activated by the event- logger in the lower panel.

**BENTHIC LANDER / SEDIMENT RESPIRATION MEASUREMENTS**
(R. Witbaard, E. Berghuis, H. Franken, G. Duineveld)

At the beginning of the cruise the ALBEX lander was retrieved from st. G25 (Fig 1a) where it had been deployed in June for a period of 3 months. The lander, composed of three chambers or modules, had been programmed to perform a measurement at the start of July, August and of September. Because of the loss of all but one optrode in the June cruise (see Lavaleye & Duineveld, 1998), unfortunately only one module could be equipped with a sensor. On the other two modules samples from the chambers headspace were collected in cuvettes. The two modules without sensors were activated early August and September, the last one just before our arrival. To get an estimate for the mineralization in the unpreserved cuvette samples, we had attached a bottomwater sample on the lander frame for the duration of the deployment. This sample had been collected with a CTD prior to the lander deployment.

Back on the deck the RVS parts on the modules showed serious corrosion (see report Appendix C by H. Franken) notably in places where the RVS had been covered. This problem should be given priority before any other long-term measurement is attempted. All three modules had fulfilled their programmed measurements with only few functional errors. Due to a programming error the first module (ALBEX81) equipped with the optrode, had not made its second measurement in early September. The optrode data from the first measurement in early July showed a linear decrease of the $O_2$ concentration in the headspace (Fig. 3) yielding a rate (angle) similar to that found in June 98. Also the samples taken by the third module (ALBEX82) shortly before our arrival yielded a similar uptake rate. However, the samples taken by ALBEX86 in early August were rejected because the additional water sample showed substantial mineralization.

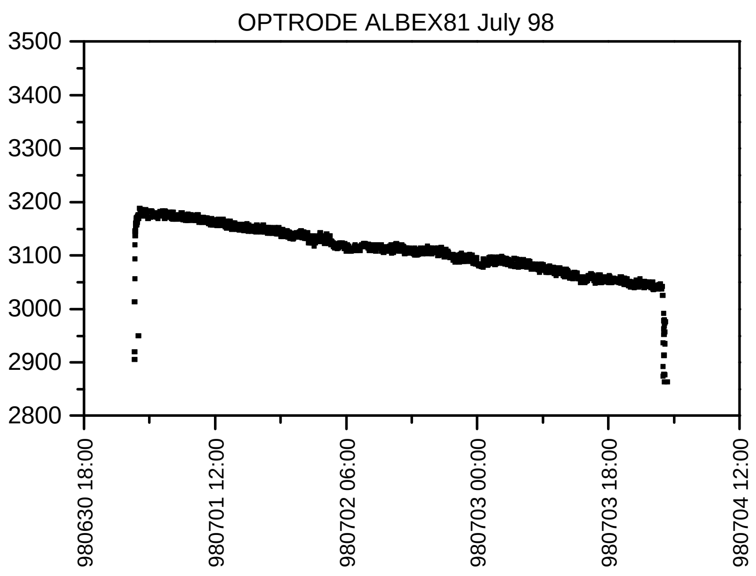


Fig. 3. Decrease of oxygen in headspace of the ALBEX chamber during the incubation at st G25 (2200m).

After retrieval of the lander, two ALBEX modules were taken out and replaced by the BOLAS chamber. ALBEX86 was fitted with a new optrode and remounted in the frame next to the BOLAS. The lander was then re-deployed at station G25 for a period of two days.

The next deployment was at st. C59 (4900m) on the abyssal plain off La Coruna. The lander carried a BOLAS chamber and two ALBEX modules (82 and 86). This deployment was the first deep dive of the new optrodes which were built after the previous version had imploded at 5km depth. Since the intercalibration of landers was also planned to take place at abyssal depth (4800m) a test was considered crucial before course was set to the PAP-site for a rendez-vous with RV Discovery. To our relief the optrodes survived the test dive at st. C59 and also the other functions of the two ALBEX modules performed well. After a turbulent voyage to the PAP-site, we deployed the lander in the same configuration as at st. C59 i.e. one BOLAS chamber and two ALBEX (nrs. 82 and 86). The preliminary results of this deployment were totally in line with the data obtained during previous BENGAL cruises.

On all stations shown in Fig. 1 we made shipboard microprofiles of the porewater oxygen concentration in decompressed multi-core samples. We used a NIOZ microprofiler equipped with Diamond ® electrodes (>20 um tip) and a stepwise resolution of 0.1 mm. Prior to profiling the cores were put in a thermostatted room to regain the *in-situ* bottom temperature. During profiling the headspace was continuously ‘stirred’ by means of a Gilson pump to minimize the stagnant diffusive layer. A resistivity profile was made of each core in order to correct the diffusion coefficient for tortuosity. There was a clear distinction between the profiles from the PAP-site (~4800m) and those made in cores from the abyssal plain off la Coruna (~4900m). In the latter, the oxic layer was much thinner than at PAP. Before estimates for the diffusive sediment water fluxes can be given, the raw profiles first have to be processed and modeled.

**PHYTOPIGMENT SAMPLES** (R. Witbaard, G. Duineveld, D. Podaras)

During the course of both the OMEX-II project and BENGAL program we have collected sediment and bottom water samples for the (HPLC) analysis of algal pigments. Because algal pigments, and specifically free chlorophyll-a, belongs to the category of very labile organic compounds it serves as a tracer for the fresh organic matter. Analysis by means of HPLC not only allows detection of chlorophyll and its degradation products but also of accessory carotenoid pigments. Because several carotenoids are highly specific for algal taxa they provide a clue on the source of the phytodetritus present near the sea floor. Also the short term mixing by benthic fauna can be resolved by means of the downcore distribution of pigments. For this purpose we have sectioned the sediment samples down to 10 cm.

Water samples were collected at the surface, in the Deep Chlorophyll Maximum (if present) and near the bottom. The samples were filtered over 0.45µm CA filters (ø25mm) under slight overpressure of $N_2$ in a cold lab. Additional pigment samples were collected with a sediment trap (PPS3) attached to the benthic lander. With these samples, daily pigment fluxes will be calculated while the pigment composition will be compared with water and sediment samples in order to gain insight into the origin and degradation of the material.

Sediment samples for study of the vertical pigment profiles were collected with a multi-corer. From each station in Fig. 1 we have at least one multi-core sample (see Appendix A). Three cores (∅ 6 cm) from each multicore drop were sliced in a cold lab in the following layers: 0-1 mm, 1-5 mm, 5-10 mm, 10-20 mm, 20-30 mm, 30-40 mm, 40-50 mm, 50-60 mm, 60-80 mm and 80-100 mm. From the third core, only the upper 1 cm was sliced (0-1 mm, 1-5 mm, 5-10 mm). Cores to be sliced were fixed in a frame on top of a hydraulically manipulated piston. This allowed accurate slicing to the nearest 0.01 mm. All phytopigment samples are stored at -80°C awaiting HPLC analysis at NIOZ.

**MEGAFAUNA SURVEY** (M. Lavaleye)

The megabenthos was sampled with a 3.5m Agassiz-trawl equipped with a net of 1cm mesh-size.Two odometers were mounted on the trawl to measure the length of the fishing track. A door in the mouth of the net prevents catching pelagic animals during lowering and hauling. The beam of the trawl carries a programmable UW video camera, which provides a view just in front of the trawl. Despite the adverse weather conditions, the trawl was successfully operated at the 3 stations i.e. G25, C69, and PAP. The video camera worked well, except at station G25 where the pictures are rather dim because of the loss of the reflector of the lamp. Following is short account of the major features exposed by the video camera and the trawl catch.

At station G25 (2450m) the catch existed mainly of fishes (rattail, Synaphobranchus and an Alepocephalidae), small Holothuroidea, large Pycnogonida, shrimps, Gorgonaria (*Acanella*), Sipuncula, and Pectinidae (bivalves). The video showed the sparse filiform and tree-like Gorgonaria and a rather smooth sea floor with some seacucumbers.

The catch at station C69 (4900m) consisted of seacucumbers (*Deima*), brittle stars (Ophiuroidea), Sipuncula, sea-anemones and a crab of the genus Munidopsis. The video recordings of the sea floor at C69 showed the same features as previously observed at station C59 i.e. relatively many “Lebensspuren”, such as tracks of sea-cucumbers, mounds and pits.
At the PAP site (Porcupine Abyssal Plain) two hauls were made at station PNW7. Although the length of the fishing tracks were almost equal the catches were quite different. Both had many small seacucumbers (*Amperima*), but the large cucumbers like *Psychropotes longicauda* and *Pseudostichopus* were absent in the second haul. Likewise *Oneirophanta* which was abundant in the first haul was only present with a few specimens in the second haul. For an abyssal plain, which supposedly is a relatively poor area, especially the first catch was remarkably rich in (holothurian) biomass. The UW videos of the two fish tracks showed the same difference as the catches did e.g. the video from the second track showed almost exclusively one species of sea-cucumber (*Amperima*) in relatively high density but not aggregated. The density and size of the topographic features in the two tracks seemed quite similar.

**THE DEEP WATER CORAL SETTLEMENT EXPERIMENT.** (M. Lavaleye)

During our OMEX cruise in May-June 1998 a settlement lander was deployed at station G100 (780m) at the Galicia Bank in an area where the cold water corals *Lophelia pertusa*, *Madrepora oculata, Desmophyllum cristagalli* are abundant. The lander consists of a frame with 18 vertical plates (45x45cm) and a large sediment trap. The plates are either from PVC, polypropyleen or ethyleen. To each plate, tiles (glazed and unglazed) and oyster shells are attached in a random order. This experiment is to investigate where (substrate preference) and when cold water corals settle, and how quick they grow. This study forms an addition to our current growth studies on *Lophelia* and *Madrepora* skeletons. It will also contribute to the discussion on how quick cold water corals can recover from damage caused by commercial fishing activities. In order to find out whether any bio-erosion by microborers occurs during the deployment period, two pieces of iceland spar had been attached to the lander (cooperation with John Wilson, Holloway University, London).

During the present expedition the lander was succesfully recovered. After replacing 9 of the 18 plates the lander was re-deployed at the same location. The 9 plates that were taken off were stored in a container with cold seawater to be studied later in more detail at the NIOZ. A superficial inspection of the plates and attached tiles and oysters did not reveal an abundant growth of epifauna, though small white tubes (serpulid Polychaeta) were seen. There were no macroscopical traces of coral settlement detectable.

**AMPHIPOD TRAPS and VIDEO OF FISHBAIT** (M. Lavaleye, R. Witbaard)

At all lander stations small amphipod traps (4) baited with fish were attached to the landerframe. A bigger trap was attached 20m above the lander. At all three stations all traps were successful. The trap closest to the bottom caught the highest number of amphipods, while the trap 20m above the bottom had the largest (until 5 cm) amphipods. No other animals were caught. The nylon stocking protection of the bait was easily torn by the sharp mouth parts of the ampipods.

Several mackerels were attached to a pole of the lander frame in such a way that the bait was close to the bottom. This was done for all three deployments. A video camera was pointed at the bait. At all three stations fish appeared within minutes after the lander had landed on the seafloor. At station G25 the most abundant fish attracted by the bait were Alepocephalidae (*Alepocephalus rostratus*), but several other fishes (rattails, *Synaphobranchus kaupi*, *Chimaera monstrosa*, Ophidiidae, Rajidae) and even sea-urchins (Echinothuridae) were also seen. At the two abyssal stations rattails were abundant, and almost the sole animals attracted by the bait. Sometimes 8 large fishes (50cm) were seen in the same picture. A rare sight was that one of the rattails at station C59 tried to swallow a sea-anemone (Cerianthidae), but failed because the anemone retracted quickly in its tube.

**TISSUE SAMPLES** (M. Lavaleye, R. Witbaard)

Tissues for nucleic acid analysis were removed from selected species selected from trawl samples. In the laboratory these tissues will be analysed with respect to the RNA/DNA ratio which is an index for the condition of cells. Animals selected for sampling were immediately removed from the trawl sample and transferred to the cold lab. The animals were measured and dissected to remove various tissue components. In certain echinoderm species, gut contents were also removed for pigment analysis. Tissue samples were placed in the $-80^{o}$ C deep-freezer for transport back to the lab.

**CTD casts** (H. Franken, E. Berghuis)

Appendix B shows the CTD plots made at the sampling stations. There were no samples taken for nutrients. In the deepest sample from the near-bottom water, the oxygen concentration was determined in order to compare it with the value in the water overlying the boxcore samples.

**JOURNAL OF EVENTS**.

Time is local time (GMT = local time minus 2 hours)

**Tuesday, 1 Sept.** Most of the participants arrive by airplane in Vigo and stay the night at Hotel del Mar. The RV. Pelagia is already in the harbour.

**Wednesday, 2 Sept.** Because the containers and equipment, which are transported over the road to Vigo, have not yet arrived, a visit is made to the fishery harbour. Large numbers of blue marlins (peixe espada) and sharks are traded here every day. The truck with our containers has come to a stand still with engine problems at 280 km from Vigo. With the help of a Spanish company our equipment arrives at 20:00 at the dock. Unloading the containers and building up the equipment and laboratories can now finally be started. The captain and the last crew members and participants arrive. However their luggage has been left behind in Madrid. Our colleague from the NIOO/CEMO (Yerseke) feels sick, and decides at the last moment not to join our expedition. His assistant Eleni from Greece departs with him. At 24:00 when the ship is ready to leave the harbour, the luggage from Madrid arrives. Just in time.

**Thursday, 3 Sept.** During the night the ship sails to the first station st. G25. The weather is foggy and rainy, and there is a swell. Immediately after breakfast sampling is started while there is also still a lot of work to do on the preparation of the laboratories and the equipment. Because of the late arrival of the truck there was limited time for this yesterday. After a cast with the CTD and Rosette sampler, the acoustic releasers of the ALBEX lander, which was deployed here 3 months ago, are activated. Without any problems the ALBEX lander carrying 3 units is picked up. After the first inspection of the lander we realize that we are fortunate not to have it deployed any longer, because unexpected corrosion of RVS parts and electrical connectors would have made intact retrieval unlikely. Despite the corrosion, the lander seems to have functioned properly. The multi-core samples are successful, all cores took a nice sample. A second CTD cast is made to sample the chlorophyll maximum. The fluorometer, however, does not work well and consequently there is no maximum discernible. In the mean time the Agassiz-trawl is prepared with video and odometers. Fishing at these depths takes about 4 hours and it has become a long day when the trawl is back on deck (23:00). The largest part of the catch consists of a rat-tail, some eel-like fish (*Synaphobranchus*), small seacucumbers and large seaspiders. As for some unknown reason the reflector of the videolamp has been lost during the haul, the video pictures are rather dim. During the night the ship steams to the Galicia Bank to station G100.

**Friday, 4 Sept.** After breakfast, the settlement lander (ASF) is recovered. Though we feared that the megaripples might have partly buried the frame, the many floats (20) easily drag the lander to the surface. There is almost nothing in the vials of the sediment trap and also the tiles and oyster of the frame do not show abundant growth of epifauna. During the day both the settlement lander as well as the ALBEX lander are prepared for a re-deployment. After the substitutions of nine of the 18 settlement plates the ASF-lander is put back in the water again. Immediately afterwards we steam back to station G25.

**Saturday, 5 Sept.** Early in the morning at 01:00 we arrive at station G25 and deploy the ALBEX lander. Two of the three ALBEX units are substituted by the BOLAS chamber. We have furthermore attached a video camera and a bait to the lander as well as five amphipod traps at various depths from the bottom. During the night and part of the morning we steam to station C59 on the "La Coruna" transect. Sampling at this abyssal locality (4900m) starts with a CTD. The heavy swell at C59 is thought to be the cause for the failure of the first multi-core drop. The second attempt is more successful. In the meantime the PPS-sediment trap, which was deployed here beginning of June is recovered. It has worked fine and all 12 week bottles contain detritus. The heavy swell that is bothering us is caused by the cyclone Danielle, which moves to the Porcupine Abyssal Plain (PAP), being the place for the rendezvous with the RV Discovery. We have contact with the Discovery about alternative rendez vous sites, but their landers standing out in the Porcupine Seabight and the gale force winds keep them stuck in the north. There is no use for us going to the PAP-site now as the bad weather will almost certainly prevent any work. We continue the work off la Coruna with a multicore sample at a station 10 miles from C59, called C69, in order to get insight into the extent of the enrichment in this area. At 23:00 we head for station CG.

**Sunday, 6 Sept.** Because of the swell the ship only makes 7 knots and finally at 09:30 we arrive at station CG (3800m) where we start with a multi-core sample. After a successful sample we set course to station G25 to pick up the ALBEX-lander. A moonfish (*Mola mola*) is seen swimming alongside the ship. The ALBEX is put on deck at 18:15 and we see that the fish bait in front of the video camera has gone. The video pictures reveal that especially black fishes (Alepocephalidae) are responsible for taking the bait. Other fishes like *Synaphobranchus*, *Chimaera*, *Raja*, rattails and an Ophidiidae are attracted as well, but are hardly able to get anything. Even some sea urchins (Echinothuridae) are slowly moving towards the bait. The short deployment (1.5 day) of the ALBEX-lander was useful and revealed a few malfunctions. We leave the Galicia transect and make our way towards C69 again.

**Monday, 7 Sept.** At station C69 there is still a heavy swell and we have difficulties in launching the trawl. The net is washed around the frame, but after two attempts we succeed and start fishing at 4900m. Because we work with a light-weight Aramide cable we have to connect a heavy weight (600kg) to the line in order to keep the trawl on the bottom. Under the current circumstances hoisting the weight turns out to be quite dangerous: a rope to prevent the weight from swinging breaks with a loud noise but no harm is done. We, however, change the procedure of putting out the weight. Because of the swell, the ship is rolling rather badly, and hauling takes a long time because of the constant jerks on the cable. The catch is not very large. A few seacucumbers (*Deima*), ophiuroids and sea-anemones form most of the catch. The seacucumbers are dissected and stored in -80$^{o}$ C for later analysis. As the weather forecasts from this morning for the PAP-site seemed better, we decide to head for the rendez-vous position. However, after 3h of steaming we receive new weather charts plus a message from RV Discovery that they are in really bad weather and cannot move towards us. Because the charts predict that a new gale, Earl this time, rapidly approaches the PAP site we reverse course and return to NW Spain.

**Tuesday, 8 Sept.** Back at station C59 we start preparations for the deployment of ALBEX. We not only consider this as a crucial test of the lander for the future rendez-vous PAP-site but the video shots from the sea floor in this area showed clear patches of phytodetritus and we would like to measure the impact of this material on the sediment. At 12:00 we manage to put the lander out in the water. We have detached the fluorometer for repairs**.** After having deployed ALBEX, we continue with the coastal-offshore transect we had started with sta. C59 and C69. At station C79 the first multi-core is a failure, but the second yields good samples. Late at night we try to obtain a multi-core sample from station C89, but the odds are against us. The new weather forecast for the PAP-site for the next days is rather positive: the cyclones Danielle and Earl are forced to the north and north-west and the Azores high is expanding. Time is pressing; if we do not take the risk of going to the PAP-site tomorrow we have to cancel the rendez-vous definitely. First we sail back to C59 to pick up the ALBEX lander the following morning.

**Wednesday, 9 Sept.** At 09:40 the ALBEX-lander is sighted floating at the surface. It took the lander 100 minutes to travel through the 4900m water column. The new flag breaks when the lander collides with the ship but the lander itself is recovered without damage. The new optrodes have survived the pressure of 500 bar. Moreover, the measurements have been successful. This is important as the deployment also served as a test for the intercalibration excercise at the PAP-site. Notably the highest amphipod trap, 20m above bottom, contains a good catch with lots of large (5cm long) *Eurythenes gryllus*. The other traps closer to the bottom have caught only small amphipods. The video shows that ALBEX landed nearby a *Cerianthus* anemone and that a rattail attracted by the bait tries to swallow the anemone. The anemone however retracts quickly into its burrow. Besides several rattails, one white Ophididae is seen. After the Winkler analysis of the ALBEX samples has been completed we start the 540 miles journey to the Porcupine Abyssal Plain.

**Thursday, 10 Sept.** The swell and wind keep the speed down to 8.5 knots. During the day we prepare the lander for the PAP deployment, do administrative tasks, and take part in the abandon ship drill.

**Friday, 11 Sept.** We reach the PAP-site at 15:00. The wind and swell are moderate, but it is foggy. We are glad to have left the Cape Finistere region, because the windforce there at the moment is nine. The RV Discovery is apparently still occupied in the Porcupine Seabight retrieving the gear. Because we have no time to loose, we deploy the ALBEX lander at 15:40 at the position given to us by RV Discovery 7 miles NW of the central station. We then move to the central station (PAP0) and start sampling with the multi-corer. The instrument reaches the bottom just when a few exceptionally high waves pass by. The result is an empty multi-corer. However, the second drop is partly successful (4 small cores failed to trip), and comes aboard just before 22:00.

**Saturday, 12 Sept.** We start with a CTD at station PAP0 (4800m). After lowering it 1350m the bottom alarm goes off and the electric connection is lost. Back on deck, seawater in the tow link is found to have caused the malfunction. Because repairs will take some time, the trawl is prepared in a hurry and at 10:50 we start trawling for more than six hours. Because of the wind the ship drifts rather quickly and we have difficulties in keeping the trawl on the bottom. By regularly paying out more wire we manage to lengthen the fishing-track. The catch is exceptionally good, lots of sea-cucumbers belonging to at least five species. In view of the short trawl track the abyssal plain must be exceptionally rich in megabenthos here. Several sea-cucumbers are dissected for later DNA & RNA analyses while their gut contents are preserved for phytopigment analysis. We get a message from RV. Discovery that they will arrive at 23:00. Because of the hazy weather it is not likely that we see them. Meanwhile after repairs on the CTD and two tests, a successful CTD cast is taken and finished at 23:00.

**Sunday, 13 Sept.** The start of the day is not very good. Our multi-corer fails to take a sample. As there is still a considerable swell we do not risk another attempt, but use the more heavier boxcorer instead. However the sediment is so soft here and quite different from our other abyssal station, that the corer is too full and the sample consequently disturbed. We sieve the top 15 cm for macrofauna, but the rest discarded. After the penetration depth of the boxcorer has been adjusted for soft sediment, the second drop is successful. Several subcores are taken from the sample for making profiles of oxygen, resitivity and phytopigments. Because of the surprisingly rich trawl catch and the fact that the UW video that we made yesterday is still the only one for the PAP site, we make another haul. This time the catch is smaller and large holothurians are missing. The video shots from the sea floor are good and show lots of small sea-cucumbers (*Amperima*) but hardly any large sea-cucumbers. We are surprised that the two fish tracks, which are very close to each other, contain such a different epifauna.

**Monday, 14 Sept.** Finally this morning we have visual contact with the RV Discovery. Because of the weather conditions and the time schedule it is not possible to visit the vessel. After a CTD cast, we prepare the boxcorer with a square corer which we think gives a better sample than the circular corer which is normally used. The sample shows that our assumption was right. While we are waiting for the ALBEX-lander to come to the surface, the RV Discovery passes us at close distance to allow the crew to wave us good-bye. We then take the ALBEX-lander on board which appeared to have worked quite well. After a pause during which the oxygen titrations are done, we start the 900 mile journey back to Texel.

**Tuesday-Friday, 15-18 Sept.** During the journey home the weather stays surprisingly calm and the westerly wind helps us to gain speed. Containers and equipment are cleaned and packed. On Thursday the traditional barbecue is substituted by a party with snacks and Spanish wine from Vigo. Friday at 14:00 we arrive on Texel: home.

## APPENDIX-A

SUMMARY of PELAGIA CRUISE **PE123**

**NOTE:**

ASF= Recruitment lander
MC= Multi-Corer
rBC= circular BoxCorer
sBC= square BoxCorer
TR= Aggasiz Video Trawl
PPS= PPS3 sedimenttrap
ALBEX= bottom lander
Local= GMT + 2 hours

| | STATION | DAY | DATE | INSTR | TIME | DEPTH | degr N | | degr W | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | G25 | Thu | 3-Sep-98 | CTD | 08:40-10:00 | 2278 | 42 | 38.26 | 010 | 02.78 | file = OBG25-1.dat |
| 2 | G25 | Thu | 3-Sep-98 | ALBEX | 11:15-12:00 | 2278 | 42 | 38.50 | 010 | 02.72 | retrieval: units 81,82 and 86 |
| 3 | G25 | Thu | 3-Sep-98 | MC1 | 13:38-14:50 | 2269 | 42 | 38.20 | 010 | 02.64 | nr.1 |
| 4 | G25 | Thu | 3-Sep-98 | MC2 | 15:26-16:30 | 2266 | 42 | 38.14 | 010 | 02.54 | nr.2 |
| 5 | G25 | Thu | 3-Sep-98 | CTD | 16:35-16:47 | 2261 | 42 | 38.14 | 010 | 02.44 | only to 100m depth |
| 6 | G25 | Thu | 3-Sep-98 | TR | 19:04-23:00 | 2446 | 42 | 34.81 | 010 | 06.78 | stop paying out cable |
| 7 | G100 | Fri | 4-Sep-98 | ASF | 08:25-09:05 | 0780 | 42 | 44.61 | 011 | 46.04 | recovering the settlement frame |
| 8 | G100 | Fri | 4-Sep-98 | ASF | 16:55-17:25 | 780 | 42 | 44.61 | 011 | 46.04 | deployment of the settlement frame |
| 9 | G25 | Sat | 5-Sep-98 | ALBEX | 01:30 | 2262 | 42 | 38.19 | 010 | 02.61 | deployment lander (+ Bolas, video, PPS) |
| 10 | C59 | Sat | 5-Sep-98 | CTD | 10:40-13:15 | 4908 | 44 | 00.13 | 009 | 53.69 | |
| 11 | C59 | Sat | 5-Sep-98 | MC1 | 13:30-15:30 | 4908 | 44 | 00.15 | 009 | 53.79 | nr.1, sampling failed |
| 12 | C59 | Sat | 5-Sep-98 | PPS | 14:43-15:50 | 4908 | 44 | 00.14 | 009 | 53.81 | retrieval sediment trap 3 mo mooring |
| 13 | C59 | Sat | 5-Sep-98 | MC2 | 16:47-19:30 | 4908 | 44 | 00.12 | 009 | 53.87 | |
| 14 | C69 | Sat | 5-Sep-98 | MC | 20:47-23:00 | 4908 | 44 | 01.77 | 010 | 07.50 | |
| 15 | CG | Sun | 6-Sep-98 | MC | 09:30-11:15 | 3794 | 43 | 11.36 | 010 | 36.72 | |
| 16 | | Sun | 6-Sep-98 | Aquaflow | 15:50 | surface | | | | | Running until end of cruise |
| 17 | G25 | Sun | 6-Sep-98 | ALBEX | 1700-1815 | 2262 | 42 | 38.45 | 010 | 02.74 | Retrieval lander |
| 18 | C69 | Mon | 7-Sep-98 | TR | 09:30-15:10 | 4904 | 43 | 59.94 | 010 | 05.73 | |
| 19 | C69 | Mon | 7-Sep-98 | ALBEX | 16:30-16:45 | 4904 | 43 | 59.94 | 010 | 05.73 | test suspended on cable failed |
| 20 | C59 | Tue | 8-Sep-98 | ALBEX | 11:26 | 4909 | 43 | 59.99 | 009 | 53.78 | deployment lander (+ Bolas, video, PPS) |
| 21 | C79 | Tue | 8-Sep-98 | MC1 | 14:15-16:45 | 4920 | 44 | 01.58 | 010 | 20.86 | nr.1, sampling failed |
| 22 | C79 | Tue | 8-Sep-98 | MC2 | 16:59-19:30 | 4920 | 44 | 01.50 | 010 | 20.98 | nr.2 |
| 23 | C89 | Tue | 8-Sep-98 | MC | 21:30-24:00 | 4926 | 44 | 05.91 | 010 | 34.96 | sampling failed |
| 24 | C59 | Wed | 9-Sep-98 | ALBEX | 08:00-09:40 | 4909 | 43 | 59.99 | 009 | 53.78 | retrieval lander |
| 25 | PNW7 | Fri | 11-Sep-98 | ALBEX | 15:41 | 4804 | 48 | 55.77 | 016 | 34.95 | Deployment lander (+ Bolas, video, PPS) |
| 26 | PAP0 | Fri | 11-Sep-98 | MC1 | 16:33-19:03 | 4804 | 48 | 49.98 | 016 | 29.82 | nr.1, sampling failed |
| 27 | PAP0 | Fri | 11-Sep-98 | MC2 | 19:07-21:47 | 4804 | 48 | 50.10 | 016 | 29.84 | 4 small cores are empty, rest ok |
| 28 | PAP0 | Sat | 12-Sep-98 | CTD1 | 0828-0915 | 4804 | 48 | 49.98 | 016 | 29.55 | nr.1; sampling failed |
| 29 | PAP0 | Sat | 12-Sep-98 | TR | 1050-1719 | 4804 | 48 | 47.92 | 016 | 36.00 | nice catch |
| 30 | PAP0 | Sat | 12-Sep-98 | CTD2 | 1832-1844 | 4798 | 48 | 50.03 | 016 | 29.99 | nr.2; test failed |
| 31 | PAP0 | Sat | 12-Sep-98 | CTD3 | 1925-2035 | 4804 | 48 | 50.03 | 016 | 30.21 | nr.3; test failed |
| 32 | PAP0 | Sat | 12-Sep-98 | CTD4 | 2150-2325 | 4804 | 48 | 50.04 | 016 | 29.99 | nr.4; finally successful |
| 33 | PAP0 | Sun | 13-Sep-98 | MC | 0830-1130 | 4804 | 48 | 50.10 | 016 | 30.07 | sampling failed |
| 34 | PAP0 | Sun | 13-Sep-98 | rBX1 | 1153-1408 | 4804 | 48 | 50.07 | 016 | 29.63 | circular corer, sample disturbed, discarded |
| 35 | PAP0 | Sun | 13-Sep-98 | rBX2 | 1443-1704 | 4798 | 48 | 49.88 | 016 | 29.82 | circular corer |
| 36 | PAP0 | Sun | 13-Sep-98 | TR | 1753-2300 | 4798 | 48 | 49.38 | 016 | 25.87 | |
| 37 | PNW7 | Mon | 14-Sep-98 | CTD | 0808-1054 | 4804 | 48 | 55.80 | 016 | 34.97 | |
| 38 | PNW7 | Mon | 14-Sep-98 | sBX | 1103-1310 | 4804 | 48 | 55.81 | 016 | 35.03 | large square boxcore |
| 39 | PNW7 | Mon | 14-Sep-98 | ALBEX | 1215-1419 | 4804 | 48 | 55.79 | 016 | 35.02 | retrieval lander |

## APPENDIX-B

CTD PLOTS (see Fig. 1 and APPENDIX-A for positions)

| | | |
|---|---|---|
| Station G25 | 3 sept 98 | 2277 m |
| Station C59 | 5 sept 98 | 4908 m |
| Station PAP | 12 sept 98 | 4804 m |
| Station PAP | 12 sept 98 | 4804 m |
| Station PAPNW7 | 14 sept 98 | 4804 m |

**APPENDIX-C**

Status report van ALBEX lander na deployment op OMEX station G25 na 3 maanden
datum: 3 september 1998 (H. Franken)

**Box nr. 81 (met optrode)**
- flowmeter goed, resistivity goed, drukschakelaar goed
- geen fluorinert kwijt, geen water in fluorinert
- bloedzak niet helemaal vol water
- alle spuiten goed gespoeld
- sediment geraakt bij tweede poging bij een tot flowcount van 8245
- optrode profiel is goed, inclusief amplitude
- samples goed genomen
- slechts 1 keer geïncubeerd door fout in beveiliging voor maximum meetinterval, daardoor het programma niet afgewerkt.

**Box nr. 82**
- flowmeter goed, resistivity slecht, drukschakelaar goed
- geen fluorinert kwijt, geen water in fluorinert
- bloedzak niet helemaal vol water
- alle spuiten goed gespoeld
- niet voldoende in sediment gepenetreerd door ruis op resistivity uitlezing; gestopt bij een tot. flowcount van 4801
- samples goed genomen

**Box nr. 86**
- flowmeter goed behalve bij klep 16 en 11 (spuit 5)
- resistivity goed, drukschakelaar goed
- geen fluorinert kwijt, geen water in fluorinert
- bloedzak nog bijna vol water
- alle spuiten goed gespoeld
- niet voldoende in sediment gepenetreerd doordat de bodem te hard is; gestopt bij een tot flowcount van 6805
- samples goed genomen, sample 5 echter op volle snelheid

**Frame**
- Radiobaken is goed
- Flitser is goed
- Release nr. 613 is goed, release 708 door leesfout niet getest
- Fluorometer logger heeft naar behoren gewerkt maar twee bulkhead connectoren zijn door het ontbreken van de DELRIN tussen schijven ernstig gecorodeerd en moeten vervangen worden
- Sedimentval heeft goed gewerkt
- Argos boei is direct uitgezet en is dus niet getest
- Batterij bol heeft goed gefunctioneerd

Frame is nog niet geschilderd en heeft wat witte puisten gekregen

## ■ APPENDIX-D

| ACTIE-LIJST t.a.v. LANDER en andere zaken | |
|---|---|
| ALBEX-blokjes uit cylinders van spuiten halen | Johan |
| ALBEX-duidelijke nummers op spuiten graveren | Johan |
| ALBEX-Transparante zijkant + maatverdeling | Johan |
| ALBEX-gereedschapskist nakijken en evt. Aanvullen | Eilke |
| ALBEX-functioneren optrodes testen | Eilke/Henk |
| ALBEX-fluorometer testen m.b.t. spikes met demiwater | Eilke/Henk |
| ALBEX-programma LINK3.3 aanpassen m.b.t. keuze interval (100 niet!) | Henk |
| ALBEX-schuiven boxjes veranderen | Johan |
| ALBEX-permanente behuizing Fluorometer maken met aansluiting voor 1) voeding 2) communicatie 3) fluorometer 4)….??… | Henk |
| ALBEX-nieuw frame | Lorendz |
| ALBEX-Eventlogger proefprint omzetten in definitieve versie | Henk |
| ALBEX-corrosie probleem oplossen (anodiseren?) | Johan/Henk |
| ALBEX-goede cuvet houders maken | Johan |
| ALBEX-cuvetten nieuwe nozzles aan onderkant maken met schroefdraad; nieuwe Delrin koppelstukjes voor bovenkant nieuwe inserts met O-ring | Johan |
| ALBEX-NiCd batterij bol voor 2x ALBEX en 1x Fluorometer plus handige bekabeling | Henk |
| BOLAS-cuverthouder moet vleugelmoeren krijgen i.p.v. inbus | Johan |
| CONTAINER16-schilderen; strips vastzetten; haken aan deuren | Lorendz |
| CONTAINER16-gereedschapsbord aan grote deur maken | ? |
| FRAME-2 nieuwe NIOZ stroommeters | Henk |
| FRAME-nieuwe amphipoden vallen maken die deelbaar zijn | ? |
| FRAME- nieuwe vlaggestok (veerconstructie) | Johan |
| FRAME-niskin fles lekt | Johan |
| FRAME-coaten ook van binnen. Gaten aan de onderkant | Johan |
| FRAME-testen ARGOS boei droog en in het water | Eilke |
| MULTICORES-passend kratje voor multicores | Rob |
| MICROPROFIEL-kast nazien (accu’s), aansluiting resistivity | Henk/Ruud |
| STROOMMETER 3DACM-stroommeter opsturen | Rob/Eilke |
| VIDEO-nieuwe reflector bestellen; gereedschapskist kopen | Eilke |
| VIDEO-indicatie batterijspanning tijdens programmeren | Henk |
| WINKLER- reserve capillair | Eilke |