Cruise Report POSEIDON 474, 6.09. – 21.09.2014

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2 authors:

Klaus Schwarzer
Christian-Albrechts-Universität zu Kiel

Peter Richter
Christian-Albrechts-Universität zu Kiel

Cruise Report Poseidon 474

6th September - 21st September 2014
(Sylt Outer Reef)

Klaus Schwarzer & Peter Richter

Institute of Geosciences
Sedimentology, Coastal- and Continental Shelf Research
Christian-Albrechts-University, Kiel

Kiel, February 16th 2015
Klaus Schwarzer
Peter Richter

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Abbreviations used in this report:

Side-Scan Sonar (towed)	**SSS**
Multibeam Echosounder (hull mounted)	**MBES**
SES Innomar Subbottom Profiler (Moon Pool)	**SES**
Grab Sampler	**GS**
Giant Box Corer	**GBC**
Underwater Video	**UWV**
CTD	**CTD**

1. Introduction

The cruise P474 was accomplished as part of the national research program “Entwicklung eines standardisierten Verfahrens zur flächendeckenden Erfassung und Beschreibung der sedimentologischen Eigenschaften und Prozesse auf der Meeresbodenoberfläche in der ausschliesslichen Wirtschaftszone (AWZ) von Nord- und Ostsee“ (SEDINO). The performed worked served to investigate the stability of sediment distribution patterns and the impact on benthic habitats in the North Sea:

The sediment distribution pattern of the North Sea seafloor north of the Elbe estuary is very heterogeneous due to the interaction of Pleistocene glacial deposits with present hydrodynamic forces induced by waves, currents and tides. Hitherto sediment sampling on grids was the method to elaborate large scale sediment distribution maps. Recently hydroacoustic systems like multi beam echosounder, side-scan sonar, high resolution sub-bottom profiler and sediment detection systems, partly operating with parametric signals, are used together with exact satellite supported positioning systems and appropriate processing software to collect synoptic data on bathymetry, shelf architecture, sedimentological built up, physical properties of the sediment, habitat structure and distribution of benthic communities. Applying all these methods a much more detailed picture of the seafloor can be elaborated which allows to develop new concepts for the interpretation of morpho- and sediment dynamics and spatial and temporal benthic habitat distribution. In a section of the North Sea shelf where Pleistocene deposits are tracing the coarse scale sediment distribution pattern, the above mentioned measurements have been carried out to map the multifaceted biotic and abiotic properties of the seafloor and to elaborate benthic habitat distribution. During the cruise about 300 km² have been comprehensively mapped (see Fig. 1). The measurements were complimented by 46 grab samples and 6 giant box corer stations.

The study site extends from 55° 2,3’N to 54° 43,5’N and from 07°41,8´E - 07° 33,7 E. Additionally grab samples (20 samples) were taken in the working area of the BMBF-funded project FONA SEE (“From sediment to top predators – Influence of seabed characteristics on benthos and benthivorous birds”), to verify results obtained during cruise Li14-08 (see as well Fig. 1 for the FONA –study site).

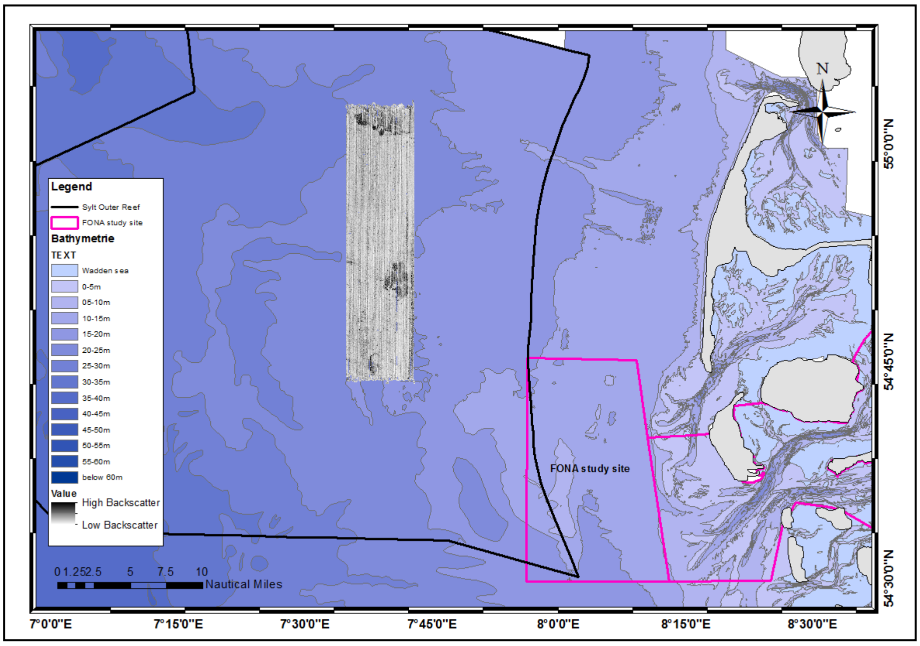

Fig. 1: Overview study site P474 west of Sylt island.

2. List of Participants

Dr. Klaus Schwarzer	Chief Scientist	IFG
Dr. Peter Richter	Scientist	IFG
Kerstin Wittbrodt	Scientist	IFG
David Höft	Scientist	IFG
Jakob Mager	Scientist	IFG
Katharina Lehner	Scientist	IFG
Adrian Metzgen	Scientist	IFG
Annelie Düring	Scientist	IFG
Tina Palme	Scientist	IFG
Jonas Drescher	Scientist	IFG

IFG: Institute of Geosciences, Sedimentology, Coastal- and Continental Shelf Research
Christian-Albrechts-University, Kiel

3. Cruise Narrative (Time in UTC)

<u>5th September 2014</u>
Loading of Equipment in Esbjerg (Denmark)
Installation of devices
Weather: Sunny, 3Bft N-NW

<u>6th September 2014</u>

Departure:	07:00 from Esbjerg Harbour, Transit to working area
12:31	CTD Profile (1x)
13.12	Start profiles of SSS, SES and MBES
Arrival:	Continuation of measurements during the night.
Weather:	Cloudy, 2 Bft NW

<u>7th September 2014</u>

12:22	Cancellation of data acquisition due to a malfunction of the C3D Side-Scan Sonar system. Switching to the backup system Teledyene Benthos 1624 ™ Side-Scan Sonar was not successful due to a short-time overload causing the damaged of a resistor. Several tries on board of FS POSEIDON were done to fix the Sonar systems.
During night:	Staying in working area until next morning. No measurements. Organisation of a replacement of the system. AWI (List/Sylt) offered this opportunity.
Weather:	Cloudy, 4 Bft NW

<u>8th September 2014</u>

05:30	Transit to List (Sylt) to take over an Imagenex Yellow-Finn Sonar System.
Arrival:	11:30 in List-Reede. Taking over an „Imagenex Yellow-Fin“ Side-Scan Sonar system from the Alfred Wegener Institute Sylt. Simultaneously further tests of the C3D Sonar System; successful mending. Weathering at List during night.
Weather:	Cloudy, 6 Bft NW in the afternoon 7 – 8 Bft W-NW.

9th September 2014:
Weathering at List-Reede
Weather: Sunny, partly cloudy; 7 Bft WNW ; 8 Bft in gusts

10th September 2014:
09:00 Test of the C3D Sonar System at List; System works properly.
13:00 Transit to working area
16:45 CTD measurement.
Weather: Sunny, 5-6 Bft NE
No deploying of the devices due to heavy swell conditions.
During night: Anchoring in the working area

11th September 2014:
04:00 Start profiling of SSS, SES & MBES.
Weather: Sunny, 4 Bft NE-E
Continuation of measurements of SSS, SES & MBES during the night

12th September 2014:
During day: Profiles of SSS, SES & MBES.
10:20 Short stop (~30 min) to calibrate the SES Transducers.
Weather: Sunny, 3 Bft E
Continuation of measurements of SSS, SES & MBES during the night

13th September 2014:
During day: Profiles of SSS, SES & MBES.
Weather: Sunny, 4 Bft NE
Continuation of measurements of SSS, SES & MBES during the night

14th September 2014:
During day: Profiles of SSS, SES & MBES.
Weather: Rainy, 6 Bft NE
Continuation of measurements of SSS, SES & MBES during the night

15th September 2014:
During day: Profiles of SSS, SES & MBES.
Weather: Rainy, 7 Bft E
Continuation of measurements of SSS, SES & MBES during the night
.
16th September 2014:
Until 5:00 Profiles of SSS, SES & MBES.
8:40 CTD measurement
8:50 GS (33 stations).
21:43 Transit to FONA study site
00:00 GS (10 stations)
Weather: Cloudy, 5 Bft, SE

17th September 2014:
4:10 End of GS; transit to SEDINO study site
5:57 CTD measurement

6:55 Profiles of SSS, SES & MBES.
Weather: Sunny, 6 Bft ESE
Continuation of measurements of SSS, SES & MBES during the night

<u>18th September 2014:</u>
Until 6:41 Profiles of SSS, SES & MBES.
6:57 CTD measurement
7:25 GBC (6 stations).
12:32 Profiles of SSS, SES & MBES.
Weather: Sunny, 5 Bft E
Continuation of measurements of SSS, SES & MBES during the night

<u>19th September 2014:</u>
Until 5:55 Profiles SSS, SES & MBES.
6:11 CTD measurement
6:25 Transit to FONA study site and GS (10 garb sampling stations)
11:20 Transit to SEDINO study site and GS (13 grab sampling stations).
18:53 Contunuation of profililing of SSS, SES & MBES.
Weather: Sunny, 4 Bft E
Continuation of measurements of SSS, SES & MBES during the night

<u>20th September 2014:</u>
Wolkig; Wind: E, 3 Bft
Until 5:55 Profiles of SSS, SES & MBES.
6:15 Deinstallation of the devices and transit to Kiel
Weather: Cloudy, 3 Bft E

<u>21st September 2014:</u>
Arrival: 4:30 Kiel, GEOMAr-Pier

4. Equipment

<u>Side scan sonar (SSS)</u>

To obtain high resolution sonographs of the sea floor a Teledyne Benthos C3D Side-Scan sonar system was used. The device was towed behind the vessel in water depth of approximately 10 -15 m running with a towing speed of 4 - 5 knots. The C3D emits high frequency pulses of 200 kHz. A range of 100 m on each side was applied. Profile spacing was 0.1 nautical mile which leads to an overlap of 20 m with the neighboring swath. Data were recorded and mosaiced with the Isis SONAR software (Triton Isis -Version 7.1.500.104).

<u>Multibeam echosounder (MBES)</u>

For morphological mapping of the seafloor, bathymetric data was collected with the multibeam echosounder (MBES) ‘SEABEAM 3100’ (L3-Communications, ELAC Nautic GmbH). Operating with a sonar frequency of 50 kHz, the system collects bathymetric data with a an opening angle of 153°. On POSEIDON the system is hull mounted. The data were acquired using the software Hydrostar (L3-Communications, ELAC Nautik GmbH).

Sediment echo Sounder (SES)

For SES Measurements an Innomar SES-2000 (Narrow beam Parametric Sub-Bottom Profiler) was used, which was applied with two frequencies. The primary frequency was about 100 kHz while the secondary frequency was set between 5 kHz and 15 kHz. To obtain heave, roll and pitch values a Kongsberg - EM 3000 motion sensor was applied.

HELCOM-standard grab sampler

Sampling for ground truthing of the Side-Scan sonar data was carried out with a HELCOM-standard grab sampler. Each grab sample was described, photographed and sampled.

Giant Box corer

To gain in situ samples with an undisturbed sediment surface, a giant box corer was used. It is operated at the sampling station by the vessel's winch. When it hits the seafloor, it is pushed by a weight of app 600 kg into the sediment. While launching the device, the shovel is constantly pulled upward and prevents the sediment of being washed out. Each box was described, photographed and sampled. Altogether 6 stations were successfully executed and sampled (see Fig. 4 and 6).

Underwater video (UV)

For optical ground truthing an underwater video camera (Mariscope Micro) was used. The camera was dragged from the research vessel a few decimetres above the sea floor. The video images are transferred via a coax-cable to a monitor in real-time. The images were stored on a hard disk.

CTD

Sound velocities in the water column depends on water density which is influenced by salinity, temperature and pressure. For this reason, CTD-profiles were taken in order to calculate sound velocity profiles through the water column.

5. Performed work and preliminary Results

Sediment sampling was done based on the Side-Scan sonar mosaic (Fig. 2). This mosaic shows a pattern of WNW – ESE striking areas of different backscatter intensities which indicate an alteration of fine grained and coarse grained sediment. This sediment distribution patterns are separated by huge homogeneous sandy areas. This reflects that the overlying Holocene sedimentary sequence consists of large scale areas of fine- to medium-grained marine sands, which were formed during the Holocene by reworking Pleistocene glacial deposits. The Pleistocene subsurface still imprints the seafloor. Partly areas are noticed where Pleistocene sediments are outcropping or appear at least close to the surface.

In figure a more detailed view of small scale changes of areas with fine sand, medium sand and coarse sand are shown. These sediment distribution corresponds very well with the outcropping coarse grained Pleistocene material, shown in the BSH Chart 2900. In detail there are concededly some differences, which result from the different methodological approaches. Whereas the BSH-chart 2900 (Figge 1981, Laurer, 2013) is based on about 40.000 sediment samples taken in a 12 years period between 1964 – 2013 and geostatistical interpolation methods, the hydroacoustic measurements provide a comprehensive and high resolution dataset.

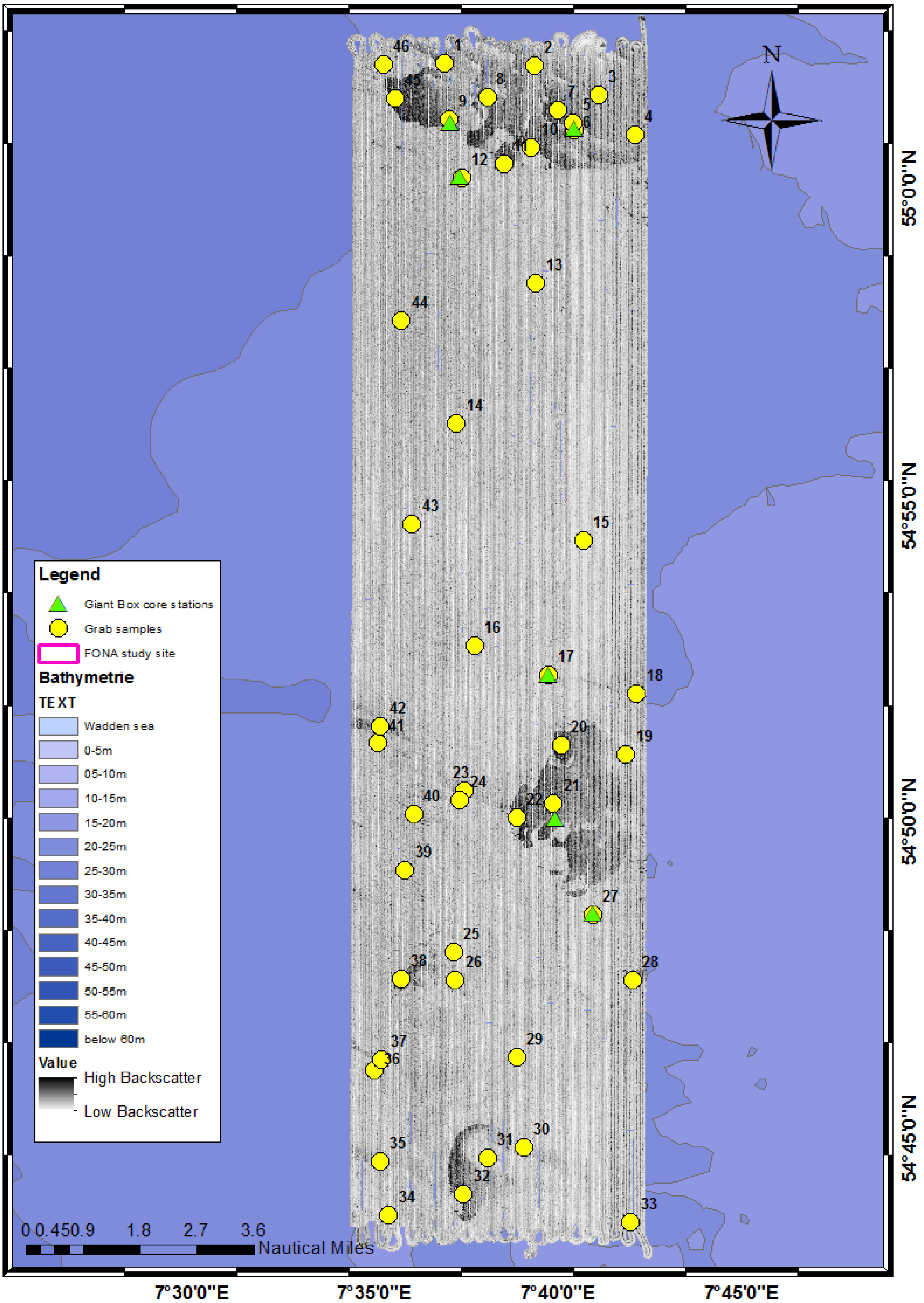

Fig. 2: Sample locations of grab samples and giant box core stations.

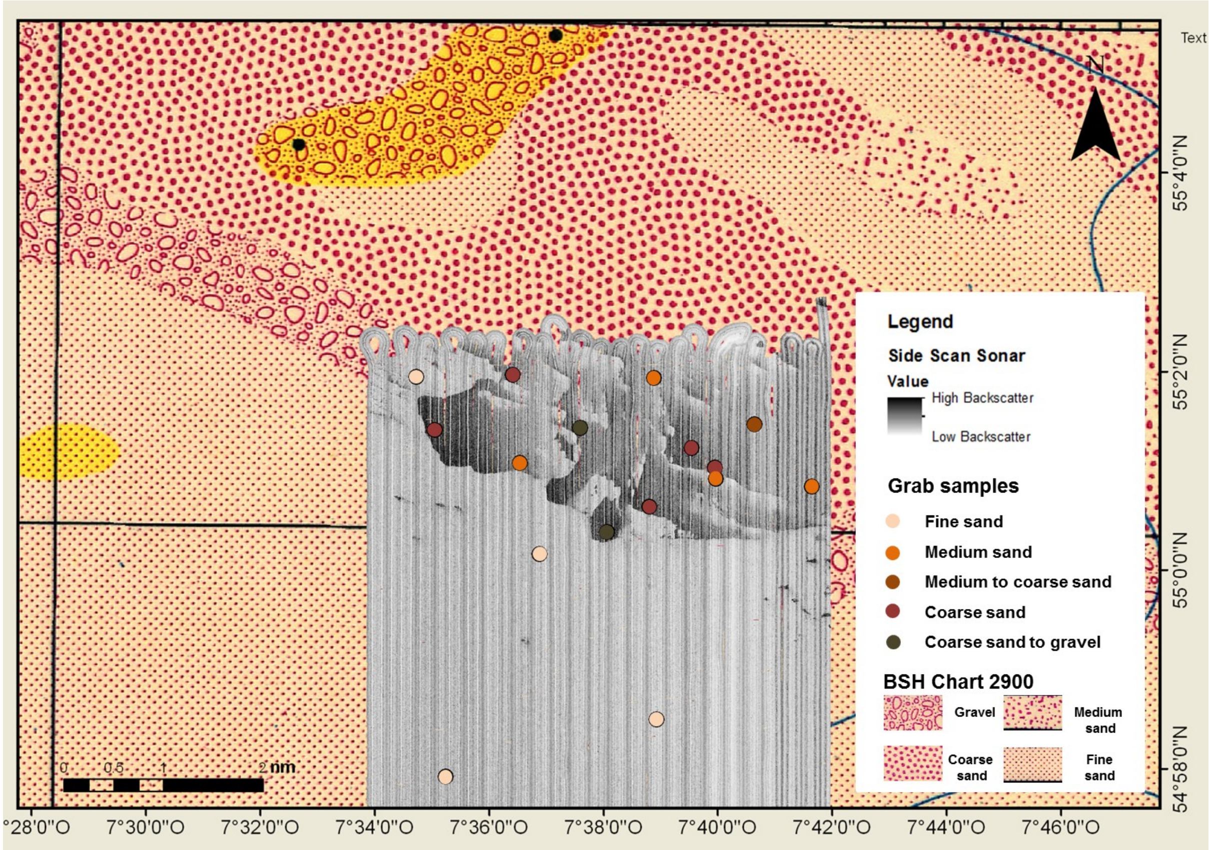

Fig.3: Small scale changes of areas with high backscatter and low backscatter in the Side-Scan sonar mosaic compared to the sediment distribution map BSH chart 2900.

Partly spaciously distributed sorted bedforms show a very different sedimentological build up from the homogenious fine to medium sandy areas. Whereas areas in the Side-Scan Sonar mosaic with high backscatter show a distinctive layering in the giant box core sample with medium- to coarse sand on top and fine- to medium sand at the base, areas with low backscatter are composed by well sorted fine- to medium sand (Fig. 4). Sorted bedforms are highly dependent on sand supply and main current direction and typically extend perpendicular to the shoreline (Goff et al., 2005). They are assumed to be an indicator for sediment dynamics and particularly for a sediment-deficiency of shelf areas (Ferrini & Flood 2005, Goff et al. 2005, Diesing et al. 2006, Coco et al. 2007, Holland & Elmore 2008). Normally they are accompanied with morphological depressions (Fig. 5) up to 1 m in deep.

In areas of alternating high- and low backscatter, the low backscatter represents the fine grained sediment. In these areas the tubeworm Lanice conchilega can be observed (Fig. 6). It has been shown in comparative studies that a dense population of Lanice conchilega can modify the backscatter of Side-Scan Sonar records significantly, looking like a rough surface and coarse sediment.

The same applies to the occurrence of razor shells (*Ensis ensis*). Approximations of the distribution and amount per m² of these organisms are currently under work. Furthermore sediment distribution maps (Fig. 7) digitized on a scale of 1:4000 serve as a basis to assign these organisms to specific sediment distribution patterns.

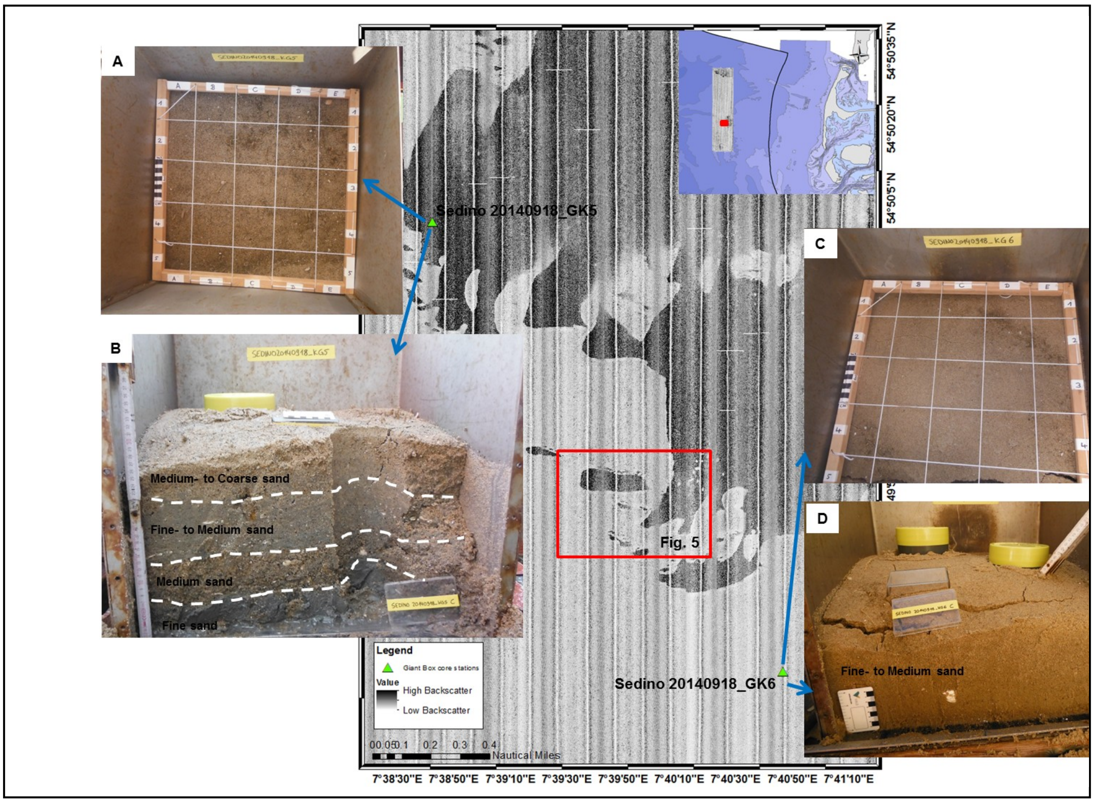

Fig. 4: Side-Scan Sonar image with alternating high- and low backscatter. Giant Box corer samples of areas with high backscatter show a layered sedimentological structure (A, B), whereas areas with low backscatter are composed of homogeneously fine- to medium sand.

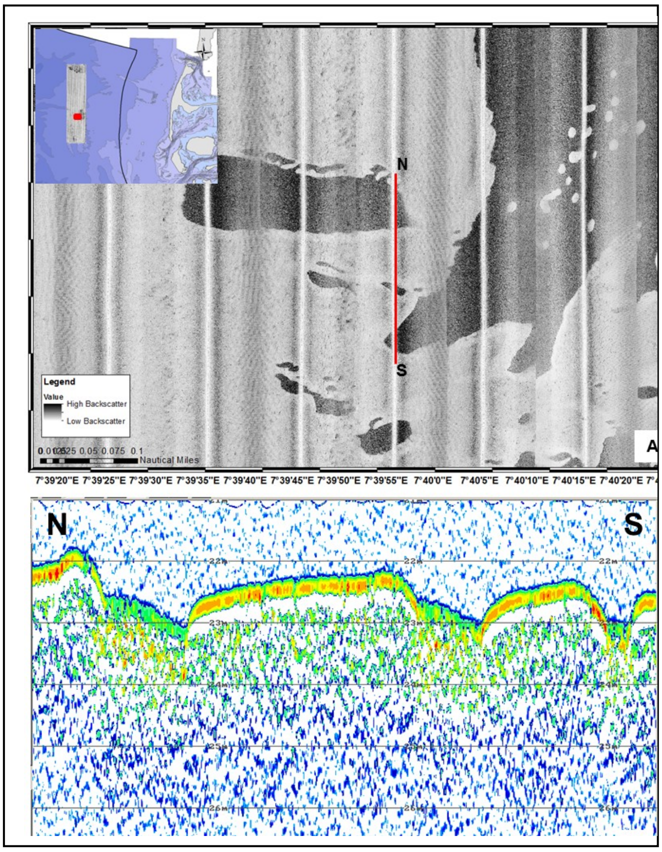

Fig. 5: Side-Scan Sonar image with sorted bedforms (A). The N-S orientated SES profile shows clearly depressions at the positions of the sorted bedforms, which cause differences up to 1 m in depth.

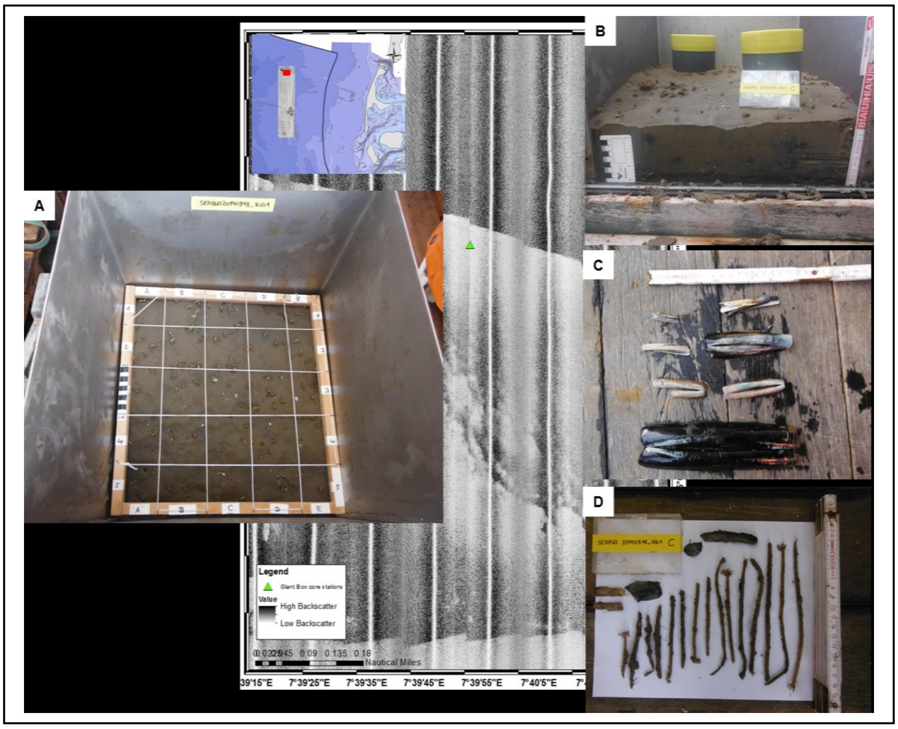

Fig. 6: Side-Scan Sonar image showing alteration of fine grained and coarse grained sediment. In areas with fine grained sediment the tubeworm *Lanice conchilega* can be widely spreaded observed (A,B,D). This often coincides with the occurrence of razor clams (*Ensis ensis*) (C).

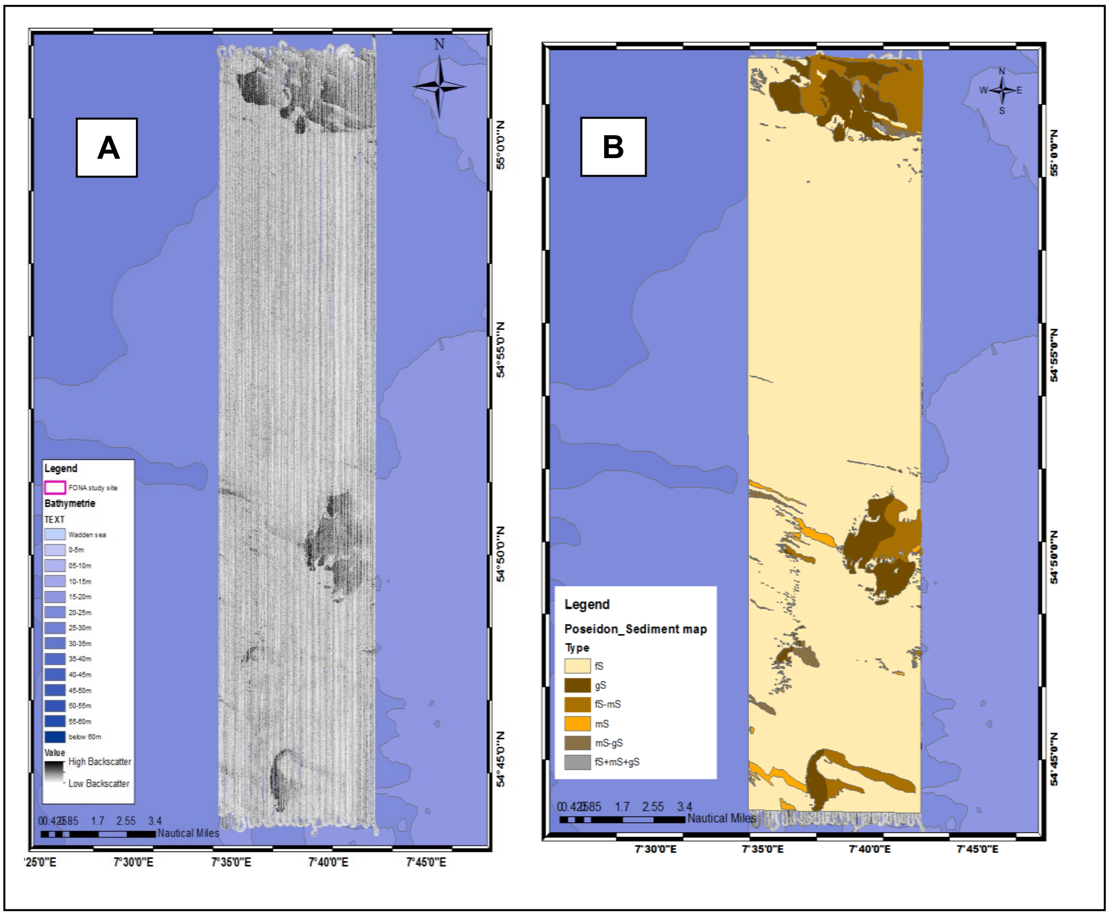

Fig. 7: Side-Scan Sonar mosaic (A) with sediment distribution overlay (B). The overlay shows the sediment distribution pattern

6. Acknowledgements

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7. References

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8. Appendix
(Time in UTC)

Hydroacoustic Profiles:

Profil	Date Time	Easting	Northing	Comment
Profil 1	06.09.2014 13:02:12	07° 41, 622	55° 02, 717	Start
Profil 1	06.09.2014 16:48:33	07° 42, 272	54° 43, 459	Ende
Profil 2	06.09.2014 17:02:18	07° 42, 115	54° 43, 616	Start
Profil 2	06.09.2014 20:37:59	07° 41, 580	55° 01, 937	Ende
Profil 3	06.09.2014 20:46:02	07° 41, 424	55° 01, 992	Start
Profil 3	07.09.2014 00:28:25	07° 41, 927	54° 43, 554	Ende
Profil 4	07.09.2014 00:38:29	07° 41, 725	54° 43, 842	Start
Profil 4	07.09.2014 04:05:46	07° 41, 275	55° 00, 971	Ende
Profil 5	07.09.2014 04:26:34	07° 41, 070	55° 01, 986	Start
Profil 5	07.09.2014 08:08:32	07° 41, 588	54° 43, 535	Ende
Profil 6	07.09.2014 08:14:54	07° 41, 439	54° 43, 571	Start
Profil 6	07.09.2014 11:55:57	07° 40, 896	55° 02, 028	Ende
Profil 7	11.09.2014 00:00:00	07° 40, 086	55° 30, 024	Start
Profil 7	11.09.2014 09:13:55	07° 41, 127	54° 43, 353	Ende
Profil 8	11.09.2014 09:24:56	07° 41, 110	54° 43, 367	Start
Profil 8	11.09.2014 13:52:25	07° 40, 056	55° 02, 050	Ende
Profil 9	11.09.2014 14:01:26	07° 40, 038	55° 01, 945	Start
Profil 9	11.09.2014 18:32:54	07° 40, 093	54° 43, 350	Ende
Profil 10	11.09.2014 18:40:55	07° 40, 073	54° 43, 360	Start
Profil 10	11.09.2014 23:12:24	07° 40, 023	55° 02, 023	Ende
Profil 11	11.09.2014 23:20:25	07° 40, 009	55° 01, 953	Start
Profil 11	12.09.2014 03:56:54	07° 40, 058	54° 43, 354	Ende
Profil 12	12.09.2014 04:06:55	07° 40, 040	54° 43, 365	Start
Profil 12	12.09.2014 08:39:24	07° 39, 989	55° 02, 065	Ende
Profil 13	12.09.2014 09:29:30	07° 39, 973	55° 01, 987	Start
Profil 13	12.09.2014 13:09:54	07° 40, 025	54° 43, 349	Ende
Profil 14	12.09.2014 13:16:54	07° 40, 008	54° 43, 361	Start
Profil 14	12.09.2014 16:53:18	07° 39, 955	55° 01, 979	Ende
Profil 15	12.09.2014 17:04:19	07° 39, 937	55° 01, 932	Start
Profil 15	12.09.2014 20:39:41	07° 39, 993	54° 43, 346	Ende
Profil 16	12.09.2014 20:47:42	07° 39, 973	54° 43, 358	Start
Profil 16	13.09.2014 00:33:06	07° 39, 921	55° 02, 015	Ende
Profil 17	13.09.2014 00:40:06	07° 39, 907	55° 01, 911	Start
Profil 17	13.09.2014 03:00:22	07° 39, 937	54° 50, 043	Ende
Profil 18	13.09.2014 03:43:25	07° 39, 947	54° 46, 688	Start
Profil 18	13.09.2014 08:13:54	07° 38, 888	55° 02, 032	Ende
Profil 19	13.09.2014 08:20:55	07° 38, 870	55° 01, 875	Start
Profil 19	13.09.2014 11:53:18	07° 39, 924	54° 43, 353	Ende
Profil 20	13.09.2014 12:34:22	07° 39, 907	54° 43, 368	Start
Profil 20	13.09.2014 17:02:51	07° 38, 854	55° 02, 046	Ende

Profil 21	13.09.2014 17:10:52	07° 38, 836	55° 01, 961	Start
Profil 21	13.09.2014 20:47:14	07° 38, 893	54° 43, 346	Ende
Profil 22	13.09.2014 20:55:14	07° 38, 871	54° 43, 360	Start
Profil 22	14.09.2014 01:31:44	07° 38, 820	55° 01, 994	Ende
Profil 23	14.09.2014 01:38:45	07° 38, 804	55° 01, 949	Start
Profil 23	14.09.2014 04:46:05	07° 38, 847	54° 46, 696	Ende
Profil 24	14.09.2014 05:27:09	07° 38, 858	54° 43, 349	Start
Profil 24	14.09.2014 10:05:39	07° 37, 787	55° 01, 734	Ende
Profil 25	14.09.2014 10:16:40	07° 37, 769	55° 01, 958	Start
Profil 25	14.09.2014 14:41:09	07° 38, 823	54° 43, 352	Ende
Profil 26	14.09.2014 14:50:10	07° 38, 807	54° 43, 360	Start
Profil 26	14.09.2014 19:14:37	07° 37, 752	55° 02, 005	Ende
Profil 27	14.09.2014 19:24:38	07° 37, 731	55° 01, 929	Start
Profil 27	14.09.2014 23:45:06	07° 37, 790	54° 43, 354	Ende
Profil 28	14.09.2014 23:53:07	07° 37, 776	54° 43, 351	Start
Profil 28	15.09.2014 04:28:35	07° 37, 716	55° 01, 998	Ende
Profil 29	15.09.2014 04:44:37	07° 37, 701	55° 01, 925	Start
Profil 29	15.09.2014 08:46:03	07° 37, 757	54° 43, 352	Ende
Profil 30	15.09.2014 08:55:04	07° 37, 738	54° 43, 359	Start
Profil 30	15.09.2014 13:07:31	07° 36, 685	55° 02, 023	Ende
Profil 31	15.09.2014 13:15:32	07° 36, 670	55° 01, 924	Start
Profil 31	15.09.2014 17:30:00	07° 37, 723	54° 43, 354	Ende
Profil 32	15.09.2014 17:38:00	07° 36, 698	54° 43, 355	Start
Profil 32	15.09.2014 21:25:24	07° 36, 650	55° 01, 989	Ende
Profil 33	15.09.2014 21:35:25	07° 36, 631	55° 01, 902	Start
Profil 33	16.09.2014 01:17:49	07° 36, 689	54° 43, 350	Ende
Profil 34	16.09.2014 01:26:50	07° 36, 673	54° 43, 358	Start
Profil 34	17.09.2014 06:33:57	07° 37, 041	54° 43, 447	Ende
Profil 35	17.09.2014 06:55:59	07° 36, 521	54° 43, 595	Start
Profil 35	17.09.2014 11:07:26	07° 36, 003	55° 01, 891	Ende
Profil 36	17.09.2014 11:16:27	07° 35, 836	55° 01, 050	Start
Profil 36	17.09.2014 15:06:52	07° 36, 394	54° 43, 476	Ende
Profil 37	17.09.2014 15:15:53	07° 36, 228	54° 43, 609	Start
Profil 37	17.09.2014 19:00:17	07° 35,970	55° 01,150	Ende
Profil 38	17.09.2014 19:08:17	07° 35, 475	55° 01, 309	Start
Profil 38	17.09.2014 22:55:42	07° 36, 060	54° 43, 516	Ende
Profil 39	17.09.2014 23:05:43	07° 35, 889	54° 43, 583	Start
Profil 39	18.09.2014 02:47:05	07° 35, 331	55° 02, 334	Ende
Profil 40	18.09.2014 02:56:06	07° 35, 164	55° 01, 095	Start
Profil 40	18.09.2014 12:31:33	07° 34, 961	55° 02, 944	Ende
Profil 41	18.09.2014 12:32:33	07° 34, 962	55° 02, 131	Start
Profil 41	18.09.2014 14:49:47	07° 35, 379	54° 43, 340	Ende
Profil 42	18.09.2014 15:38:53	07° 35, 525	54° 44, 700	Start
Profil 42	18.09.2014 19:13:15	07° 34, 836	55° 01, 464	Ende
Profil 43	18.09.2014 19:19:16	07° 34, 831	55° 02, 344	Start
Profil 43	18.09.2014 22:50:39	07° 35, 224	54° 43, 486	Ende

Profil 44	18.09.2014 22:59:40	07° 35, 057	54° 43, 572	Start
Profil 44	19.09.2014 02:13:00	07° 34, 487	55° 01, 417	Ende
Profil 45	19.09.2014 02:23:01	07° 34, 314	55° 01, 751	Start
Profil 45	19.09.2014 18:54:23	07° 34, 161	55° 01, 800	Ende
Profil 46	19.09.2014 18:55:23	07° 34, 167	55° 01, 963	Start
Profil 46	19.09.2014 22:37:46	07° 34, 712	54° 43, 528	Ende
Profil 47	19.09.2014 22:46:47	07° 34, 536	54° 43, 491	Start
Profil 47	20.09.2014 02:26:11	07° 33, 976	55° 02, 065	Ende
Profil 48	20.09.2014 02:35:11	07° 33, 810	55° 01, 173	Start
Profil 48	20.09.2014 05:54:32	07° 34, 372	54° 43, 891	Ende

Grab samples (SEDINO II – study site):

Nr.	Name	Easting	Northing	Date	Time
1	SEDINO20140916_G1	7° 36.255	55° 1.845	16.09.2014	08:53
2	SEDINO20140916_G2	7° 38.737	55° 1.843	16.09.2014	09:13
3	SEDINO20140916_G3	7° 40.511	55° 1.393	16.09.2014	09:33
4	SEDINO20140916_G4	7° 41.532	55° 0.779	16.09.2014	09:50
5	SEDINO20140916_G5	7° 39.833	55° 0.949	16.09.2014	10:17
6	SEDINO20140916_G6	7° 39.852	55° 0.838	16.09.2014	10:33
7	SEDINO20140916_G7	7° 39.414	55° 1.146	16.09.2014	10:52
8	SEDINO20140916_G8	7° 37.457	55° 1.324	16.09.2014	11:18
9	SEDINO20140916_G9	7° 36.418	55° 0.962	16.09.2014	11:41
10	SEDINO20140916_G10	7° 38.694	55° 0.542	16.09.2014	12:02
11	SEDINO20140916_G11	7° 37.963	55° 0.284	16.09.2014	12:21
12	SEDINO20140916_G12	7° 36.788	55° 0.046	16.09.2014	12:38
13	SEDINO20140916_G13	7° 38.896	54° 58.402	16.09.2014	13:04
14	SEDINO20140916_G14	7° 36.783	54° 56.159	16.09.2014	13:36
15	SEDINO20140916_G15	7° 40.325	54° 54.364	16.09.2014	14:11
16	SEDINO20140916_G16	7° 37.397	54° 52.664	16.09.2014	14:46
17	SEDINO20140916_G17	7° 39.433	54° 52.222	16.09.2014	15:07
18	SEDINO20140916_G18	7° 41.861	54° 51.962	16.09.2014	15:32
19	SEDINO20140916_G19	7° 41.597	54° 51.000	16.09.2014	15:55
20	SEDINO20140916_G20	7° 39.815	54° 51.129	16.09.2014	16:21
21	SEDINO20140916_G21	7° 39.639	54° 50.193	16.09.2014	16:42
22	SEDINO20140916_G22	7° 38.650	54° 49.967	16.09.2014	17:08
23	SEDINO20140916_G23	7° 37.189	54° 50.376	16.09.2014	17:32
24	SEDINO20140916_G24	7° 37.081	54° 50.230	16.09.2014	18:01
25	SEDINO20140916_G25	7° 36.982	54° 47.824	16.09.2014	18:32
26	SEDINO20140916_G26	7° 37.058	54° 47.375	16.09.2014	18:46
27	SEDINO20140916_G27	7° 40.772	54° 48.461	16.09.2014	19:19
28	SEDINO20140916_G28	7° 41.896	54° 47.435	16.09.2014	19:40
29	SEDINO20140916_G29	7° 38.771	54° 46.170	16.09.2014	20:09
30	SEDINO20140916_G30	7° 39.003	54° 44.763	16.09.2014	20:30
31	SEDINO20140916_G31	7° 38.022	54° 44.574	16.09.2014	20:48

32	SEDINO20140916_G32	7° 37.388	54° 44.010	16.09.2014	21:04
33	SEDINO20140916_G33	7° 41.962	54° 43.611	16.09.2014	21:36
34	SEDINO20140919_G1	7° 35.361	54° 43.643	19.09.2014	13:26
35	SEDINO20140919_G2	7° 35.085	54° 44.492	19.09.2014	13:43
36	SEDINO20140919_G3	7° 34.892	54° 45.930	19.09.2014	14:04
37	SEDINO20140919_G4	7° 35.067	54° 46.098	19.09.2014	14:19
38	SEDINO20140919_G5	7° 35.575	54° 47.383	19.09.2014	14:40
39	SEDINO20140919_G6	7° 35.620	54° 49.105	19.09.2014	15:15
40	SEDINO20140919_G7	7° 35.824	54° 49.991	19.09.2014	15:36
41	SEDINO20140919_G8	7° 34.817	54° 51.105	19.09.2014	15:56
42	SEDINO20140919_G9	7° 34.858	54° 51.355	19.09.2014	16:10
43	SEDINO20140919_G10	7° 35.620	54° 54.568	19.09.2014	16:49
44	SEDINO20140919_G11	7° 35.224	54° 57.783	19.09.2014	17:26
45	SEDINO20140919_G12	7° 34.916	55° 1.276	19.09.2014	18:07
46	SEDINO20140919_G13	7° 34.575	55° 1.805	19.09.2014	18:20

Grab samples FONA – study site

Nr.	Name	Easting	Northing	Date	Time
1	STopP-See20140917_G1	7.95113	54.53513	17.09.2014	00:00
2	STopP-See20140917_G2	7.96862	54.52372	17.09.2014	00:18
3	STopP-See20140917_G3	7.98728	54.49670	17.09.2014	00:42
4	STopP-See20140917_G4	7.95598	54.50630	17.09.2014	01:04
5	STopP-See20140917_G5	7.90303	54.52088	17.09.2014	01:40
6	STopP-See20140917_G6	7.87497	54.50535	17.09.2014	02:08
7	STopP-See20140917_G7	7.86810	54.50382	17.09.2014	02:24
8	STopP-See20140917_G8	7.82663	54.49950	17.09.2014	02:51
9	STopP-See20140917_G9	7.83255	54.52478	17.09.2014	03:14
10	STopP-See20140917_G10	7.87207	54.53462	17.09.2014	03:53
11	STopP-See20140919_G1	7.99132	54.49487	19.09.2014	11:01
12	STopP-See20140919_G2	7.96433	54.49807	19.09.2014	10:43
13	STopP-See20140919_G3	7.91603	54.49755	19.09.2014	10:19
14	STopP-See20140919_G4	7.88135	54.50178	19.09.2014	09:58
15	STopP-See20140919_G5	7.88073	54.50588	19.09.2014	09:48
16	STopP-See20140919_G6	7.87718	54.50695	19.09.2014	09:39
17	STopP-See20140919_G7	7.82263	54.50705	19.09.2014	09:16
18	STopP-See20140919_G8	7.82772	54.50815	19.09.2014	08:59
19	STopP-See20140919_G9	7.81190	54.52827	19.09.2014	08:40
20	STopP-See20140919_G10	7.82353	54.53093	19.09.2014	08:23

Giant Box core stations:

Nr	Name	Easting	Northing	Date
1	Sedino 20140918_GK1	7° 39.851	55° 0.837	18.09.2014
2	Sedino 20140918_GK2	7° 36.418	55° 0.961	18.09.2014

3	Sedino 20140918_GK3	7° 36.787	55° 0.045	18.09.2014
4	Sedino 20140918_GK4	7° 39.433	54° 52.221	18.09.2014
5	Sedino 20140918_GK5	7° 38.650	54° 49.967	18.09.2014
6	Sedino 20140918_GK6	7° 40.772	54° 48.460	18.09.2014

CTD -stations:

Name	Date	Time	Easting	Northing	Water Depth
P474_20140906_1	06.09.2014	12:31	55° 03,023	7° 41,776	17,0
P474_20140910_1	10.09.2014	16:00	55° 02,987	7° 41,006	19,0
P474_20140917_1	17.09.2014	05:57	54° 43,376	7° 36,950	20,0
P474_20140918_1	18.09.2014	06:57	54° 43,386	7° 35,891	21,3
P474_20140919_1	19.09.2014	06:11	54° 43,396	7° 35,165	20,0