

**Survey report BCP, Vlake van de Raan and Thornton Bank, week 42, 2006**  
**16 – 20 October 2006**  
(TvD, Oct 2006)

*Figure 1: Ms Arca of the Ministry of ... and Waterworks (RWS).*

**Vessel:** MS Arca, RWS

**Investigators:**

TNO: Peter Slenders (*mon/tue*), Jens Nielsen (*mon/tue*),  
Thaiënne van Dijk (PI), Pieter Doornenbal  
University of Gent: Isabelle du Four (*mon/tue*)  
RWS: Piet Pronk (PI), Marco van de Sluis  
Bemanning van Boskalis

**Apparatus details:** Positioning: dGPS, DP  
TNO Vibrocorer (see Figure 2)  
EdgeTech 4300 MP-X Sidescan Sonar, 410 kHz  
Simrad EM 3000 multibeam, 300 kHz  
Odom 210 kHz singlebeam

**Journal**

Mon 16.10.2006 SE 4 Bft.	18:45 23:15	departure Scheveningen; late due to repairs on driving axis engine arrival BCP site (4.5 hrs sailing)
Tue 17.10.2006 SE 3-4 Bft.	08:00 14:30 19:15 21:00 23:15	16 vibrocores on BCP (1 location was cored twice due to curved pipe; core details see table 1) (6.5 hours coring) Sailing back to Scheveningen (4hrs 45min sailing) Arrival Scheveningen and unloading onto truck (vibrocorer & cores) (until 21:00); check out of PS, JN and IdF. repairs heave compensator/Gyro (not successful, thus MBES may not be reliable) departure Scheveningen, sailing to Thornton Bank
Wed 18.10.2006 S-SE 3-4 Bft.	08:00 09:10 20:00	Problem with PDS real time (correlating position to swath). Start Multibeam, singlebeam and sidescan sonar echo soundings (see plotlist RWS) (until 20:00)
Thu 19.10.2006 SE 5 Bft.	08:00 19:00 23:00	Box coring: 25 benthos box cores and 24 sediment cores (material at fist location impossible to core) For details: see plotlist Box core Thornton Bank, RWS. Sailing back to Scheveningen Arrival Scheveningen (4 hrs sailing)
Fri 20.10.2006		Repairs on GPS-receivers Unloading the vessel (samples will remain in the quay-accommodation until pocked up with the TNO-van Check out TvD and PD

### Vibrocores on BCP

15 Vibrocores were taken in locations on the BCP that were selected based on seismic interpretations, both on dump sites and in geological features, such as Holocene tidal channels. These cores were taken as part of the collaborative work with the University of Gent in the MESH-project, in search of - among others - previous levels and periods of enhanced biological activity. Results will be presented at the MESH-meeting on Texel, NL, on the 30<sup>th</sup> of November.

*Figure 2: TNO vibrocorer.*

The pipe arrives at the seabed vibrating and continuously vibrates while coring. All but 1 of the vibrocores were more than 4 m long, cut into 1 m samples on board, numbered per sample and were kept and transported upright.

Work No.	UTM X Zone 31 ED50	UTM Y Zone 31 ED50	Length of core [m]
06DW010	508878	5704856	4.30
06DW011	509466	5702415	4.65
06DW012	508049	5701752	4.70
06DW013	507334	5702167	4.55
06DW014	505919	5702316	4.45
06DW015	504717	5703578	4.45
06DW016	502831	5701681	4.90
06DW017	503709	5700872	4.60
06DW018	505352	5699789	4.70
06DW019	503256	5700065	4.75
06DW020	501411	5700431	4.85
06DW021	501073	5698250	3.95
06DW022	502307	5697466	4.50
06DW023	503079	5698553	4.60
06DW024	506010	5700826	4.15

*Table 1: details of vibrocores on BCP. (NB. The co-ordinates are already corrected for the offset of the vibrocorer to the location of the dGPS receiver). For more details, such as time of coring, waterdepth and number of samples, see positioning records RWS (file location on the local TNO-network U....).*

### SSS and MBES

On the Vlakte van de Raan, a small area from the January 2006 survey was selected for re-surveying, because the structures resembled pockmarks. When acquiring high quality sonograms, these appeared to be U-boat (UC14) (or plane?) wrecks.

Across the Thornton Bank and adjacent swales, 3 tracks were sailed in 4 parts, along the border between the Belgium (BCP) and Dutch (NCP) continental shelves, in order to cover both the morphology and surface appearance of the bank: tracks 100, 200, 300 and 70, where 70 is the extension of track 200 (Figure 3). SSS tracks were sailed with 100 m distance and at 4.7 knots, so that tracks overlap and that the sonograms are of a quality that can be used in the QTC SideView classification package (needs at least 3 adjacent tracks). The MBES do not overlap and

were not filled in. 2 Loose tracks (10 and 20) were sailed along each axis of the banks and 2 more loose tracks (30 and 50) were sailed normal to sand wave crests, in order to incorporate the study of sand wave mobility (previous soundings are available at TNO from the Royal Dutch Navy). The other tracks (40 and 60) were recorded when sailing to the next track. The altitude of the SSS fish above the bed was crudely adjusted by changing the cable length to large-scaled morphology over the Thornton bank, in order to keep it parallel to the bed variations, but varied between appr. 5 and 17 m, and was not so much adjusted over the sand waves (only when almost hitting the crest). It is important to keep this in mind with the interpretation, because some changes occur exactly when there also was an opposite morphological change (e.g. on track 60) or when there was no morphological change at all.

In general, areas with megaripples and sand waves were extensive, but uniformly grainy, spickled and mottled areas were also observed on the sonograms. Some boundaries between areas with megaripples and other areas were sharp. Ripples were directed to the opposite direction on either side of a sand wave crests, and were in small areas immediately “behind”, i.e. at one side of, the crests absent. For details and exact locations/interpretations of pipes and cables, extraction marks and beam trawl marks, see fieldnotes TvD (also plot MBES and SSS mosaics in GIS maps with wrecks, cables and pipes, etc.

Although there was a problem with the PDS real time (the link of position to swath and thus it was thought that the MBES was not reliably working), the MBES data of crossing lines match so well that these data are perfectly suitable for seabed research. The nadir echo also corresponds very well to the singlebeam echo sounding. The MBES data will be corrected for the tide at RWS.

*Figure 3: sailed tracks for MBES and SSS (for details see “combi plotlist” RWS ) and box core locations.*

Technical details:

- Sailing time was 11 hrs (i.e. more than planned, because the sailing speed was lower than anticipated (for extra quality of the sonograms)).
- Sss properties: white is low backscatter (shadow) black is high backscatter intensity
- MBES 4 to 5 pings per second, SBES 9 pings per second + wider angle of beam, )
- Position when replay sss: give in manually the heading, then positions are exact (already corrected for cable length, so positions clicked on the screen on the sonograms are the exact positions for the box cores.)
- All times are given in ITC, i.e. 2 hrs earlier than present local time.
- 42\_28 in the plotlist means: 42 = extra length of cable (normal length (offset sss fish) is set to zero); 28 is the distance (offset) between the antennae and the rear of the ship.

### **Box coring**

Box core locations were selected after the acquisition of MBES and SSS data, based upon morphological units and acoustic facies. One sample was taken in each morphological unit across the Thornton Bank, and one on the slopes, crests and in troughs of three sandwaves (see Figure 3), in order to investigate not only contrasts in acoustic facies, benthos and grainsize

distribution across sand banks, but also to investigate these variations over sand waves and link that to mobility.

The box corer is pushed in the seabed by a weight of lead when the tension on the cable is released, when hitting the bed. Being pulled up, a pen is removed by the tension of the cable and the knife cuts underneath the box corer. Two box cores were taken at the same location: one entirely for benthos sampling, from the other, a sediment core was resampled with a 100 mm plastic tube. Photos were made of each benthos sample in the sieve. The benthos samples were sieved on a 1 mm sieve, and kept and transported in buckets or plastic jars while covered with formaldehyde. Intended algae samples for the link to mobility were not taken (seemed not useful in mobile sands and extremely coarse material).

In general, the material over the Thornton Bank was very variable, ranging from extremely coarse [large pebbles (6 cm) and very large shells (~10 cm)] to well sorted fine sand on finely laminated anaerobic clays. Benthos were very scarce. The box cores in the sand waves were all sandy with very little benthos, but grain sizes varied more than found in earlier studies, in which variations were in the order of a few tens of microns. Here, one sample consisted of fine sand that was washed through the 1 mm sieve, whereas the other consisted of coarse sand that all remained on the sieve.

The planned box cores in the so-named pock marks were not taken, since these appeared to be wrecks. Instead, more attention was paid to variations over sand waves.

NB. Box cores were taken at the rear of the vessel and the coordinates in the plot list are exact coordinates of the box core locations (already corrected for the offset between the GPS receiver and the rear of the vessel).

**Other:**

Seismic data acquisition was not done, because part of the equipment (Knudsen) was in use and another (ORE) not operational. Also, seismic technical staff were already doing other research (some abroad).

The backscatter from MBES were not recorded, because the portable CTD for pH, salinity and temperature measurements, was not available on such short notice.

**Results already received from RWS (on board):**

- All plotlists (both digitally and printed)
- Digital SSS data on DVD

**Processing plan and actions:**

- Box core samples and sampling materials will be collected by TNO at the RWS quay on Friday the 20<sup>th</sup> of October or in week 43.
- Vibrocores will have to be transported from Velzen Noord to Utrecht.
- Offsets and measurements Ms Arca can be acquired from Piet Pronk.
- Vibrocores will be described and sub-sampled for grain size analyses by Isabelle du Four (University of Gent) at TNO in Utrecht, NL. Grain size analyses will be done at the

University of Gent. Descriptions, grain size analyses and interpretations will be imported in the TNO-database.

- MBES digital data will be corrected at RWS for tides and be made available to TNO on CD/DVD (together with the metadata). Best to contact Michel Hofsteede about who corrected the data and when and how it will be done.
- SSS and MBES data of the Thornton Bank will be combined with data of the adjacent Belgian study site (U. Gent) and interpreted collaboratively.
- Sediment cores of the box core samples will be described and sub-sampled for grain size analyses by TNO. Grainsize analyses will be done at the joint TNO-University of Utrecht laboratory.
- Benthos samples will be analysed by IMARES TNO.

!!! For survey plan week 46: Brown Bank:

- Getijde meter plaatsen aan het begin bij aankomst, moet minimale recording hebben van 39 uur (minimaal 3 getijde cycli). Zeker bij de Bruine Bank nodig, want daar zijn geen vaste getijde meters.
- ! Vaarplan op tijd indienen met verzoek: getijdemeter, losse CTD, losse camera en ADCP te monteren op de Ms. Arca
- Box cores: ook kratten om ze in te zetten en vervoer terug regelen!
- Lap top meenemen met GIS and GPS optie (neem mee: Gis kaart met wrakken, pijpleidingen en kabels en bathymetrie.