

**SURVEY REPORT “Raan3\_06”**  
**Survey site: Vlake van de Raan**  
**16<sup>th</sup>-18<sup>th</sup> of January, week3, 2006**  
(Thaienne van Dijk, 3<sup>rd</sup> of March 2006)

**Introduction**

The survey “Raan3\_06” is carried out for the EU INTERREG III B project MESH (Mapping European Seabed Habitats, <http://www.searchmesh.net/>), the Delft Cluster 2 project “Sustainable development of the North Sea and the coastal zone” and the TNO knowledge-investment project INHABIT, under the joint TNO project number 005.35156/01.01.02.01.

This document reports the survey details and preliminary results of the survey, during which acoustic measurements were done and box core samples were taken. For the project aims, see the survey plan (TNO network location: U:\d3\j5\p35156\Testing protocols\2006 survey Raan week 3\preparation).

**Crew and vessel**

Vessel: Ms. Zirfaea (Dutch Public Works and Water Management (RWS))  
Investigators RWS: Piet Pronk (PI), Jan van Bree, Peter de Boer  
Investigators TNO: Thaiënne van Dijk (PI), Jan Brouwer, Rogier Westerhoff  
Crew: Royal Boskalis Westminster NV

**Study area**

The study area is the north-eastern flank of the Vlake van de Raan, bound by the following coordinates:

corner	X (WGS84)	Y (WGS84)	X (ED50)	Y (ED50)	latitude	longitude
A	514259	5704690	514351	5704899.421	51°29,59044'	3°12,32358'
B	518214	5709293	518306	5709502.478	51°32,06694'	3°15,75600'
D	509007	5709220	509099	5709429.412	51°32,04084'	3°07,79142'
C	512962	5713823	513054	5714032.518	51°34,51956'	3°11,22282'

The study area location map with bathymetry and sample locations are given in Figure 1, and the survey tracks in Figure 2.

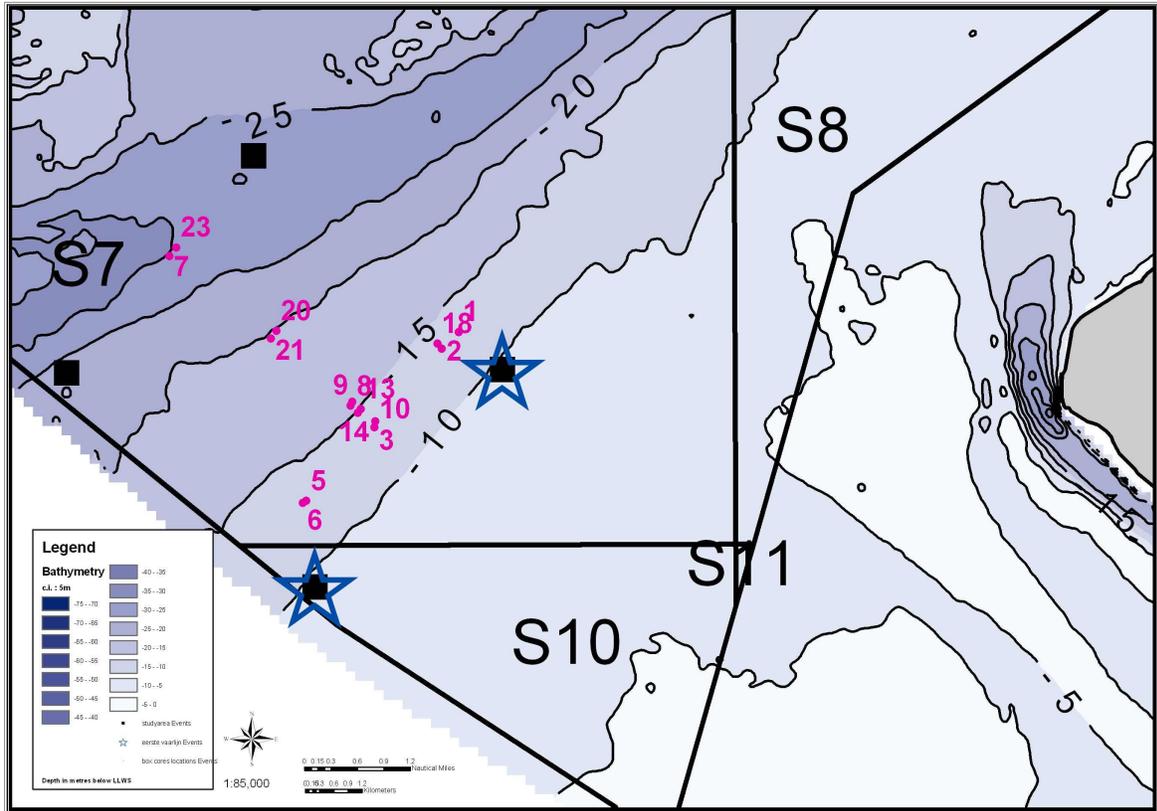
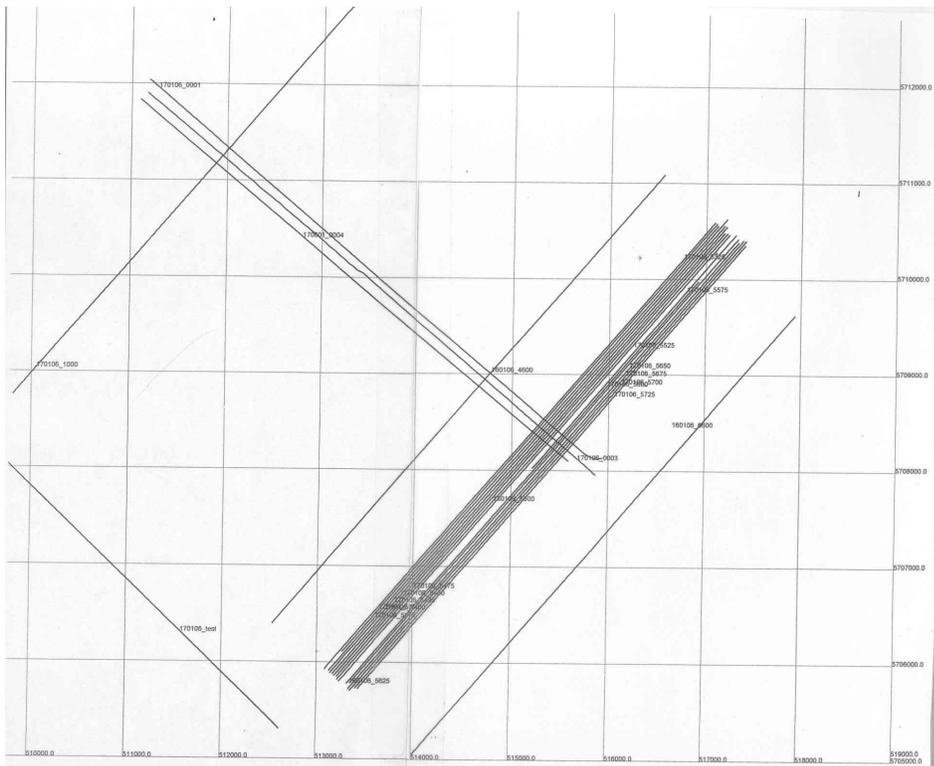


Figure 1: study area location, bathymetry, locations of box core samples.



## Equipment

- Knudsen, 12 kHz (hull-mounted)
- ORE Geopulse, 3.5 kHz (towed)
- Simrad Kongsberg EM3002 multibeam echo sounder (MBES), 327 kHz (hull-mounted), 160 beams, 130° total beam (2\*65°), footprint width 35 m (depending on waterdepth), 8Hz measurement frequency.
- EdgeTech MPX Side-scan sonar (SSS), 410 kHz (towed), 2 pulses/second, 80% power, ISIS-software.
- Vertical echo sounder
- Cylindrical box corer, outer diameter 33 cm
- dGPS + NR203 integrated multi-differential GPS receiver (all positions in UTM zone 31, ED50)

## Journal (local time (*N.B. RWS uses UTC on board*))

### *Monday 16th of January 2006*

S-SSW 5/6 Bft; Wave height 0.5 m

09:30 Loading and connecting equipment

14:15 Departure from Scheveningen

19:30 Velocity profile measurement ~2 nautical miles to the east of the study area

20:00 Arrival at Vlakte van de Raan; start survey with only SSS, MBES en Knudsen (no ORE); track 6850 was a test and not recorded.

20:30 3 tracks, surveying with Knudsen, MBES en SSS (see survey plot list)

22:15 End of survey

Not anchored, but drifted.

### *Tuesday 17<sup>th</sup> of January 2006*

S 4/5 Bft; Wave height ~0.5 m

08:00 SSS and ORE over board; SSS-cable runs out of wheel, and system software needed to be restarted

09:00 Start survey MBES, SSS, Knudsen and ORE

15:30 SSS over board, western part of SSS-tracks filled with MBES until area-covering

22:20 End of survey

Not anchored, but drifted.

### *Wednesday 18<sup>th</sup> of January 2006*

WNW 4; wave height ~ 1m

07:00 Finishing last tracks with MBES, Knudsen, ORE

08:30 End of MBES, Knudsen and ORE survey

09:30 Start Box core sampling; delay due to rusted bolt, restarted at 10:50

17:00 End of box core sampling

21:30 Moored in Scheveningen; unloaded into truck (Knudsen still on board)

## **Adjustments to the survey plan and sampling strategy**

The original survey plan and sampling strategy, as described in survey plan, states that data must be area-covering in the most eastern part of the survey area and may be wider spaced in the western part of the area.

The study area is overlain with tracks with a spacing of 25 m, which are numbered from 25 in the west to 6850 in the east. It was decided to start the survey at track 5725 going westward, because:

- the quality of the sidescan sonar test recording on track 6850 and the recording of track 6600, at waterdepths of approximately 10 and 12 m, respectively, was very low due to a sonar fish height of only 4.5 m above the seabed and the turbulence due to rotation of the screws.
- The waterdepth for the multibeam was critical (less spikes at larger depths), and the multibeam footprint in shallow water is small, so many tracks would have to be sailed in order to collect area-covering data.
- At 6 Beaufort and a waterdepth of 10 m, the sonar fish may touch the seabed.

In conference with RWS, the SSS tracks have a spacing of 100 m (50% overlap) and the area was later filled with multibeam tracks with a spacing of 25 m, which – certainly in shallow parts – was necessary for area-covering data.

The available time only allowed the collection of area-covering data between tracks 5725 en 5325; individual tracks 4600 and 1000 and 3 perpendicular tracks (east-west) together provide an overview of the study area. The MBES measurements were expanded on the eastern side, in order to cover the location of sample number 1.

Box cores were taken on locations based upon the sidescan sonar facies. Few samples on the perpendicular tracks were taken to get insight in the variation on the slope of the shoreface. In consultation with Jan van Dalssen (TNO), two samples were taken on each location: one was emptied on the sieve for benthos sampling, and from the other, sediment cores (diameter 10 cm) were sub-sampled. For the sampling procedure details, see TNO network location: U:\d3\j5\p35156\Testing protocols\2006 survey Raan week 3\preparation\ER-097 V1 Bemonstering Macrobenthos.pdf (in Dutch).

Box core field notes are located on TNO network location: V:\d3\j5\p35156\Testing protocols\2006 survey Raan week 3\survey reports\box core fieldnotes Raan\_wk3\_2006.doc.

## **Equipment details**

### *MBES*

For the tidal correction of multibeam measurements, water height measurements of a nearby monitoring station will be used. Placing a tidal probe was not necessary (verified with and by Piet Pronk).

Approximately 2 miles outside the study area, a velocity profile was measured.

The MBES signal will be collected as already corrected for heave, roll, pitch, sailing speed and the variation in propagation speed in the water column by stratification. Heave, roll and pitch are used to adjust the orientation of the MBES transducer before transducing the signal, so that the beam is always directed vertically. For heave correction, wave height was measured, with two wave height meters (TSS en Octans), one with light intensity, the other is mechanic. The vertical velocity profile, that serves as input model for the correction of MBES velocity variations of the signal in the water column, was measured at intervals of approximately 0.6 tot 1 m. The velocity varied between min. 1463.3 and max. 1463.9 m s<sup>-1</sup>. Single beam and multibeam echo soundings differ ~ 0.2 m due to the hull location.

### SSS

The slant range of the sonar is 100 m.

The fish height is variable, especially on the east-west tracks, and normally about 10 m above the seabed (layback or cable length is given on the plot lists of RWS).

### *Knudsen*

The Knudsen was mounted in the moonpool. The Knudsen depth of transducing is 5.41 m below the water surface.

### **Preliminary conclusions:**

1. The simultaneous use of all acoustic equipment was successful.
2. The ORE penetrates to a maximum of 15 m.
3. The seismic data reveal a horizontal top layer and channels at depth.
4. The box-core samples suggest a reasonably homogeneous sedimentary record in the study area (a thin oxidised top layer of sand and shell material, with a reduced fine sand and underlying clay beds) and a variation in the benthos composition and density.

### **Immediate follow-up actions:**

1. Ronnie van Overmeeren and TvD of TNO contacted Simon Bicknese/Bob de Jong and Rob Lambij of RWS about the supply of multibeam en sidescan sonar data, respectively.
2. JB and RW made a reconnaissance interpretation of the Knudsen and ORE data.
3. Box cores have been photographed, described and sampled for grain size analyses by TvD. Cores are imported into the DINO database by Pieter van der Klugt and Peter Zonneveld.
4. The benthos samples and attributes were taken by Monique Blankendaal to be analysed at the TNO-MEP lab by Wilma Lewis and/or Jan van Dalssen. TvD e-mailed a list with sample numbers and details to Wilma en Jan. Benthos samples have been counted.
5. The TNO & UU Geo-lab has analysed 21 near-surface samples.
6. Oene Dijkstra collected the Knudsen at the RWS quay te Scheveningen.
7. The promise to write a letter of appreciation to RWS-DNZ was made.