

11th October 2013 – 17th October 2013

1. Hole summary

Hole	M0063A	M0063B	M0063C	M0063D	M0063E
Latitude	58°37.340' N	58°37.345' N	58°37.335' N	58°37.350' N	58°37.330' N
Longitude	18°15.250' E	18°15.232' E	18°15.268' E	18°15.260' E	18°15.240' E
First core	October 6 th 10:35	October 11th 10:20	October 13th 02:50	October 15th 00:30	October 17th 00:40
Last core	October 11 th 01:20	October 11th 22:25	October 14th 17:15	October 16th 14:25	Not completed
Cores recovered	37	14	40	40	21
Drilled length (Coring)	101.26m	29m	93.4m	87.1m	42m
Drilled Length (Open Hole)	5.0m	N/A	3m	0.2m	N/A
Recovered length	101.52m	41.12m	120.05m	114.13m	57.69m
Core recovery	100.26%	141.79%	128.53%	131.03%	137.36%
Final depth	105.8m	29m	96.4m	86.8m	
Hole recovery	95.95%	141.79%	124.53%	131.49%	

2. Science

An adapted coring methodology was used at M0063B, based on drilling experience with the expanding gassy muds recovered at M0063A (Operations Section). This method was slower but proved successful. No sediment was lost during coring of the second hole, which was piston cored down through black to greyish Holocene gyttja-clay to a depth of 29 mbsf.

Drilling at Hole M0063B was completed in the early morning of 12th October and the *Greatship Manisha* left for a port call in the Swedish town Nynäshamn. The ship returned to the Landsort Deep the following night and we started to drill a third paleoceanographic hole, Hole M0063C. After the first piston core had successfully been retrieved, the seabed template was fully lowered and coring continued. Due to the 2 m depth increments, the complete expansion of each core could be monitored which lead to a mean apparent recovery of about 150% down to a depth of ca. 55 mbsf. The overpressure of methane gas was causing core expansion in both the Holocene gyttja-clay and in the late-glacial clay below. The physical properties of the gyttja-clay caused large gas voids and cracks to develop, with the cracks possibly following varve structures that were not visible through the core liner. The clay, in contrast, was more coherent and expanded more like a sponge with less of a tendency for the gas to develop large voids. Samples for methane analysis were taken routinely in the middle of each core. The data showed super-saturation relative to ambient gas pressure (>1 bar [CH₄] or >1.5 mM [CH₄]) from 1 mbsf and down to about 56-58 mbsf, in accordance with the observed core expansion down to that depth.

The cored sediment was a black, homogenous gyttja-clay from the surface and down to 16 mbsf. Foraminifera, diatoms and pollen were abundant. At some depths ostracods and bivalves were also present. Only the uppermost core had a strong smell of H₂S. From 18 to 27 mbsf the sediment was a greenish-gray, and in some parts visibly laminated, gyttja-clay that had less abundant foraminifera, diatoms and pollen. A distinct change in sediment type was recorded from 28 mbsf where bluish-gray clay was recovered with only few foraminifera, diatoms and bivalves at the top and otherwise no microfossils. This type of clay is known from other parts of the Baltic Sea to have been deposited during the Ancylus Lake stage. The occurrence of some fossils indicating a

brackish environment in the upper part of the sequence may be due to deposition during the initial Littorina stage with its gradually increasing salinity.

From 57 mbsf varved glacial clay was recorded. The varve thickness varied from a few mm in the upper part of the sequence to several cm in the lower part where the colour also changed from grayish clay into reddish clay. At 93 mbsf a sandy clayey diamicton was encountered overlying well sorted gravel. It was decided to stop drilling of Hole M0063C at this depth.

The *Greatship Manisha* moved ca. 20 m to the NNW and a fourth paleoceanographic hole, Hole M0063D, was established. The different holes were cored with a controlled offset in depths in order to ensure a continuous stratigraphy and varve record of both the Holocene sequence and of the glacial clay. Similar sequences as in the previous paleoceanographic holes were noted from visual observations and from analyses of core catcher samples. Interestingly, a core taken at 18-20 mbsf included a distinct transition at 19 mbsf from the black gyttja-clay to more greenish-grayish clay. Foraminifera were generally abundant both above and below this transition. Diatoms occurred primarily in the upper 25 mbsf but reappeared at lower abundance in the depth interval of 29-34 mbsf. From 47 mbsf varves became sufficiently distinct to be visible through the core liner. They had thicknesses varying from 5 to 50 mm.

As a result of the multiple holes we expect to have a unique sequence of sediments with good varve resolution ranging from the modern anoxic Landsort Deep back through the Holocene and into late glacial clay. Hole M0063D ended in gravel at 87 mbsf.

Interstitial water analyses have shown very interesting and reproducible results for the upper 100 m of the Landsort Deep sediment. Salinity has a distinct subsurface maximum below which it drops gradually to approach freshwater at the bottom of the glacial clay sequence. A dynamic modeling of these data will provide important information about the salinity history of the Baltic Sea. Alkalinity and ammonium also show distinct maxima in the Holocene gyttja-clay and drop to low values in the glacial clay. There is no detectable sulfide in the pore water but expectedly a high concentration of free iron.

We are currently drilling Hole M0063E which is dedicated to microbiological and geochemical sampling down to about 90 mbsf. The drilling and coring approach is similar to the last two paleoceanographic holes. A perfluorocarbon tracer is pumped into the drilling fluid to a final concentration of ca. 1 mg per liter in order to monitor the degree of potential contamination from sea water when taking sediment samples for microbiology. The sampling program is very intensive and much of the entire core at each depth is sampled to satisfy the many requests. Thus, the number of subsamples from each core varies from 20 to 50. Interstitial water is taken by both Mannheim squeezing and Rhizon sampling in order to satisfy the requirements for IW-splits. Counting of microbial cells in the sediment will be done on board the ship at high depth resolution by several methods. Microscopic counts are done of cells labeled with fluorescent DNA stain, either with acridine orange or with SYBR Green. The latter cells are also counted by flow cytometry on board. Many of the samples are frozen at -80°C for later studies of DNA, RNA, biomarkers, iron-sulfur minerals and other labile compounds. Other samples are kept cold at +4°C for later studies of microbial processes. These live samples will be offloaded from the ship within a few days after the microbiology hole is ended and transported to the requesting laboratories.

3. HSE and Environmental Activities

N/A

4. Figures

Figure 1 – Recovery and depth versus time plot at Hole M0063A

Figure 2 – Recovery and depth versus time plot at Hole M0063B

Figure 3 – Recovery and depth versus time plot at Hole M0063C

Figure 4 – Recovery and depth versus time plot at Hole M0063D

Figure 5 – Recovery and depth versus time plot at Hole M0063E

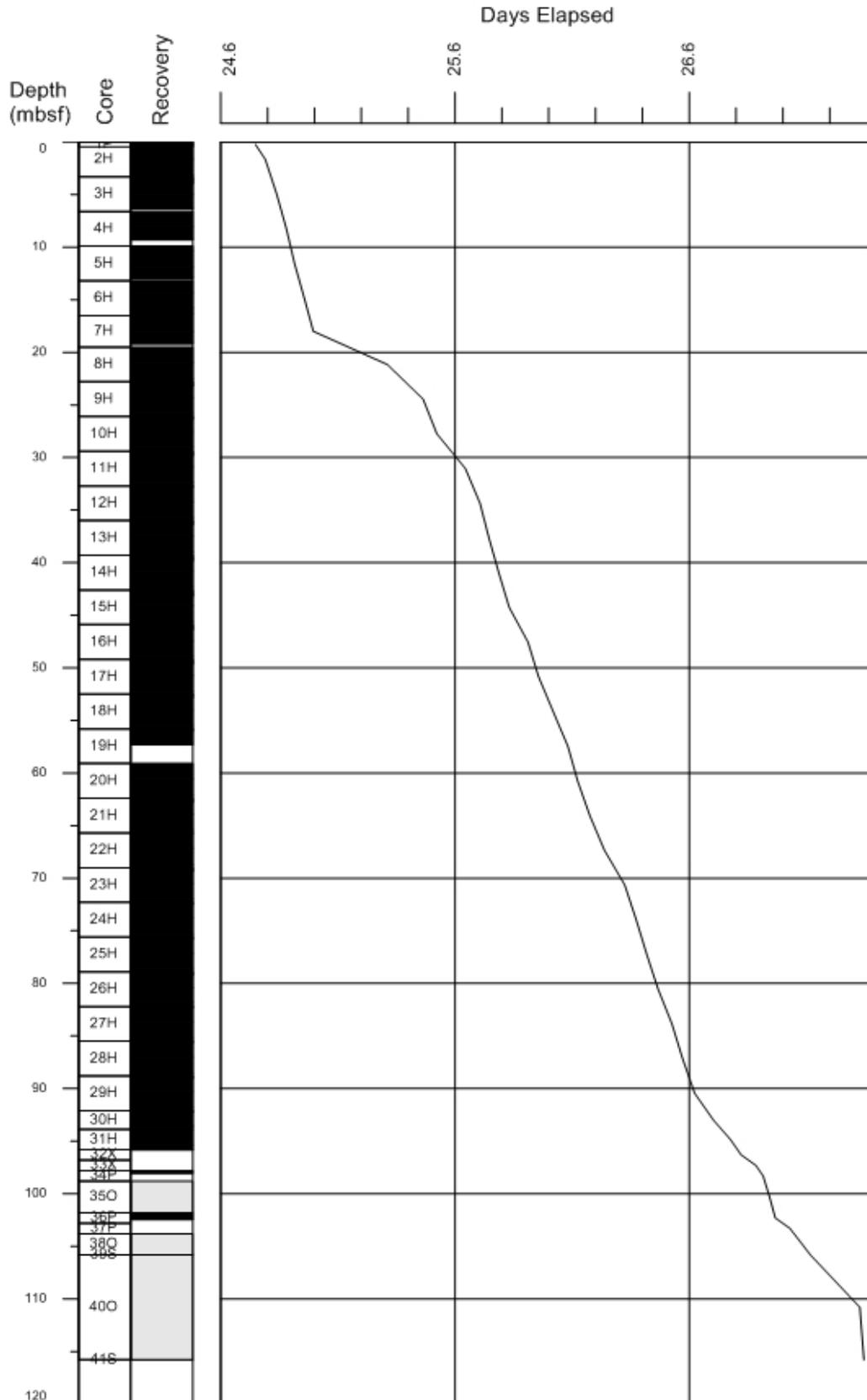
Figure 6 - Breakdown of hours, up to 24:00 hrs on 10th October.

Photos of the week.

IODP Expedition 347

Latitude: 58° 37.340 N
Longitude: 18° 15.250 E
Water depth: 437.1 m

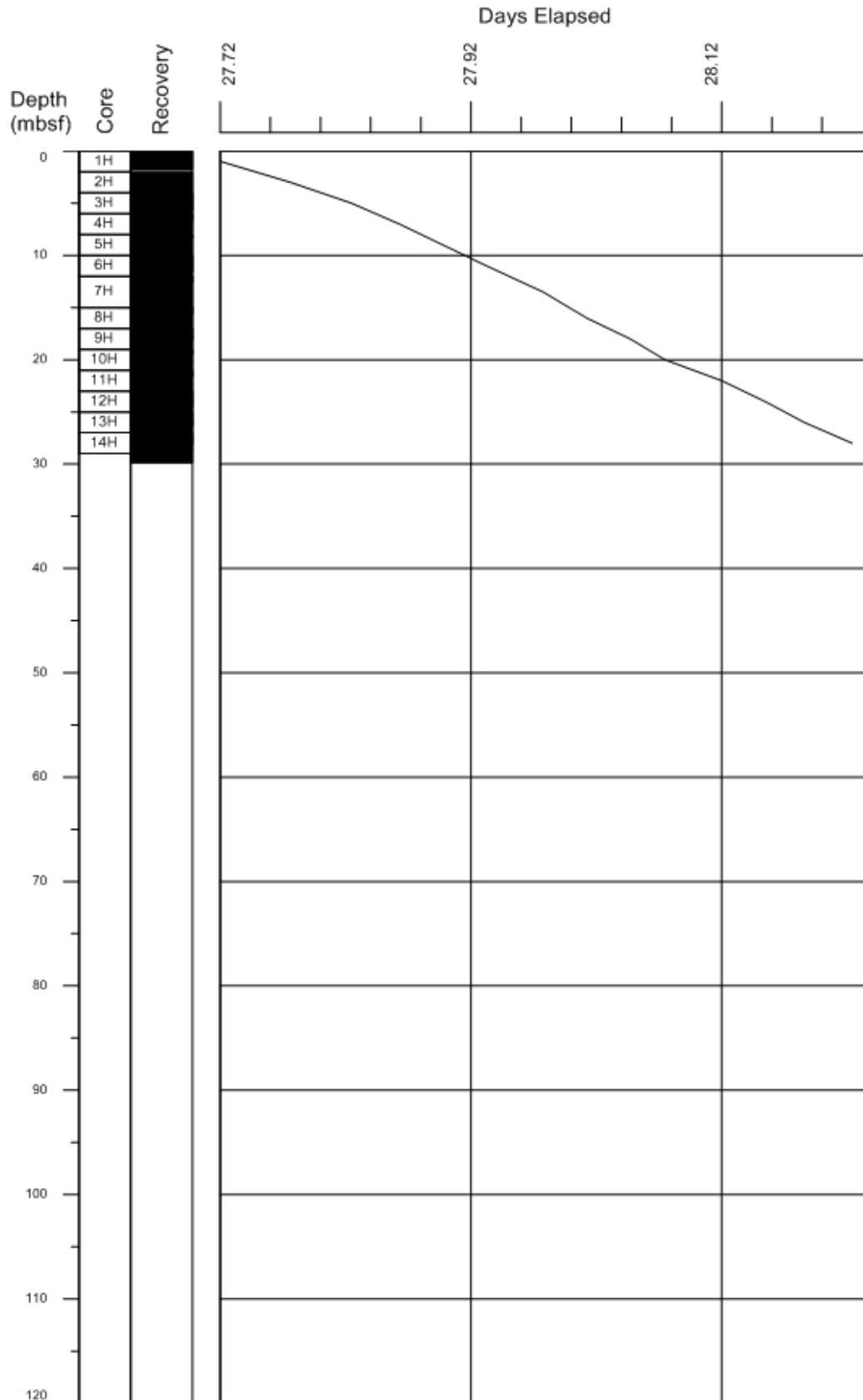
Hole 63A progress summary



IODP Expedition 347

Latitude: 58° 37.345 N
Longitude: 18° 15.232 E
Water depth: 437.1 m

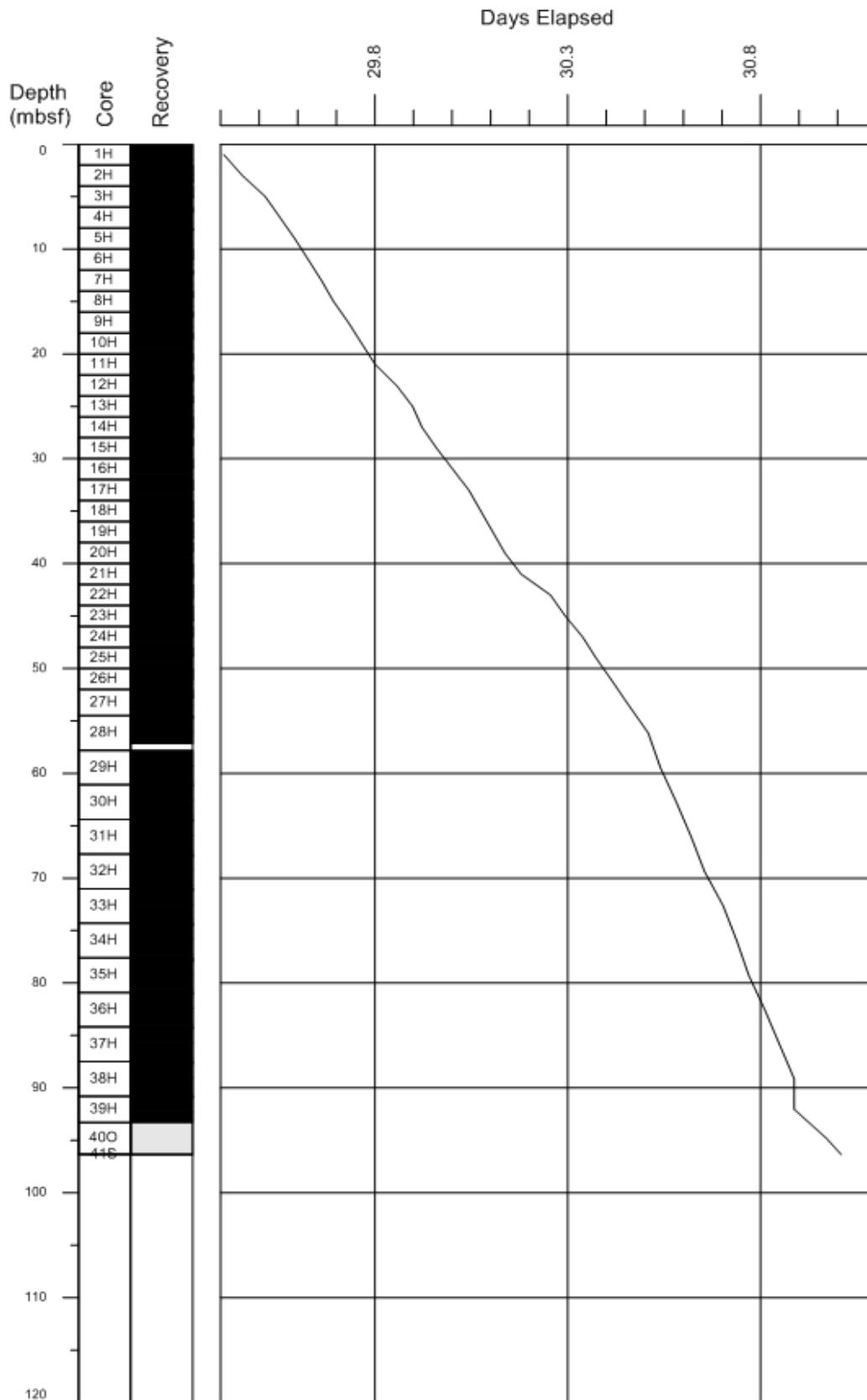
Hole 63B progress summary



IODP Expedition 347

Latitude: 58° 37.335 N
Longitude: 18° 15.268E
Water depth: 437.1 m

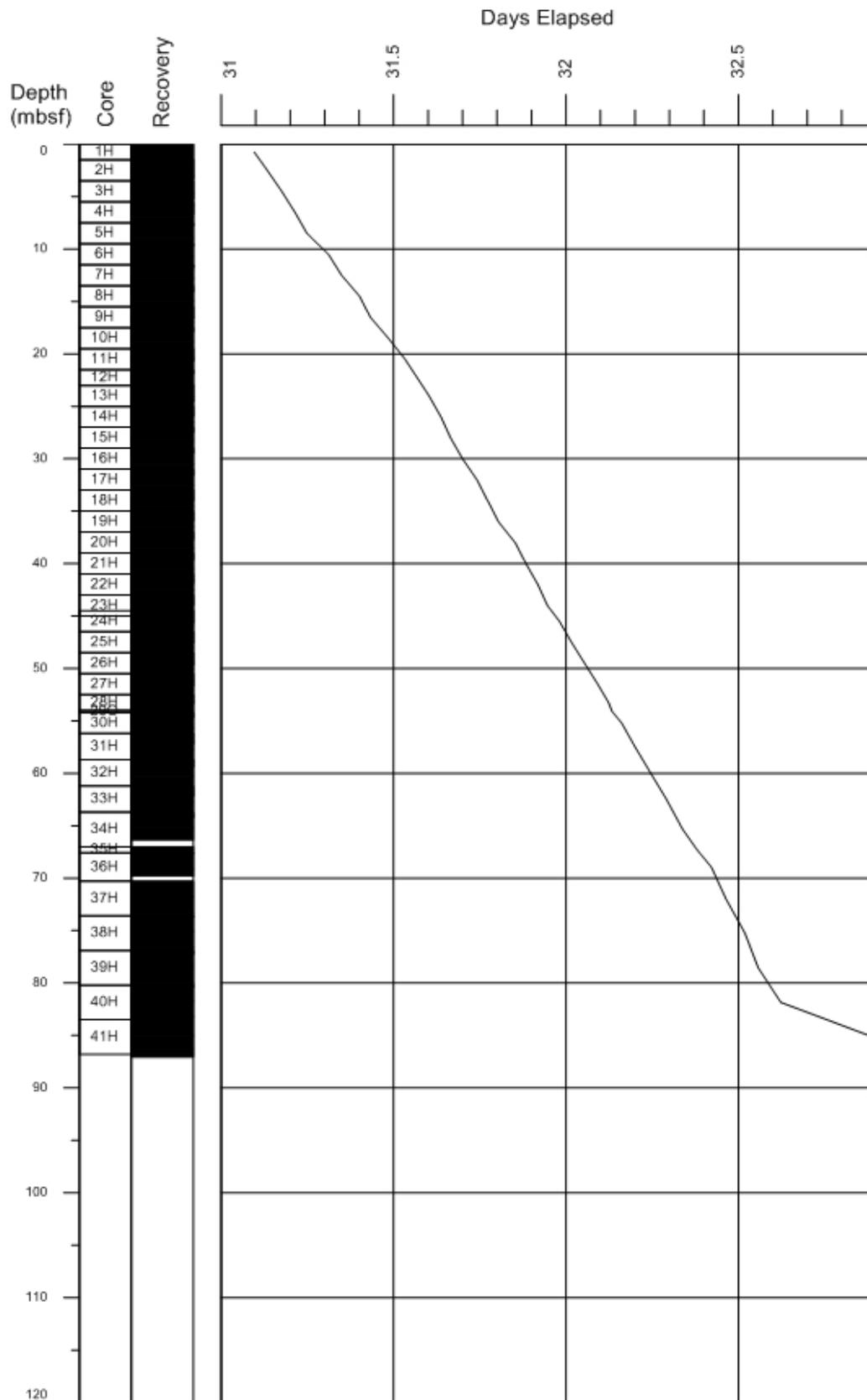
Hole 63C progress summary



IODP Expedition 347

Latitude: 58° 37.350 N
Longitude: 18° 15.260E
Water depth: 437.1 m

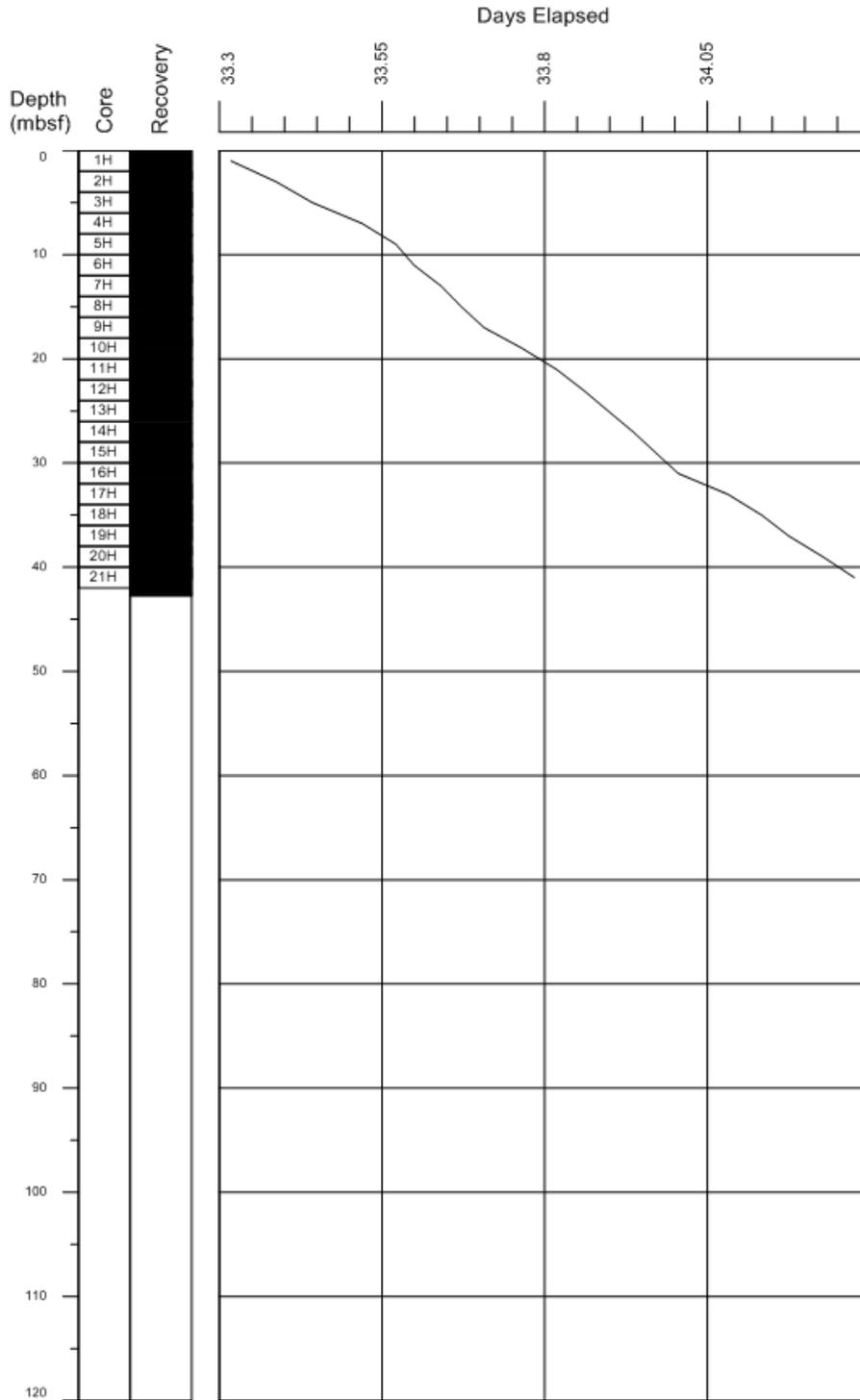
Hole 63D progress summary

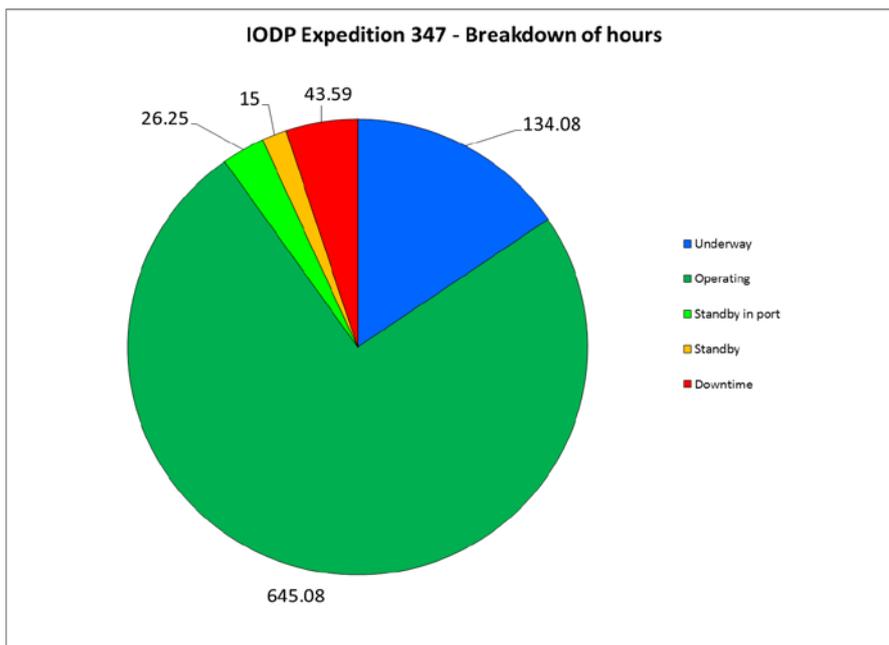


IODP Expedition 347

Latitude: 58° 37.330 N
Longitude: 18° 15.240E
Water depth: 437.1 m

Hole 63E progress summary





Photos of the week



Autumn in Nynäshamn. CarolineSlomp©ECORD_IODP



Friendly visitors! Mary Mowat©ECORD_IODP



Carol Cotterill©ECORD_IODP



Nadine Quintana Krupinski©ECORD_IODP