

Report R.V. HEINCKE cruise No. 161

Institute: Institute for Marine Research Kiel, Department of Fisheries Biology,
Kiel University

Date: from 14.11.2001 to 26.11.2001

Area: German Bight, Fisher, Skagerrak

PARTICIPANTS:

Jens Floeter	IHF Hamburg University (Chief scientist)
Kristina Barz	IHF Hamburg University
Sonja Brendl	IfM Kiel
Rabea Diekmann	IfM Kiel
Caroline Kammerichs	IfM Kiel
Sven Klimpel	IfM Kiel
Svend Mees	IfM Kiel
Sabrina Peterhänsel	IHF Hamburg University
Carolin Peters	IHF Hamburg University
Katrin Roth	IHF Hamburg University
Christian Rückert	IHF Hamburg University
Frederikke Sørensen	DIFRES Kopenhagen

OBJECTIVES OF THE CRUISE:

The aim of this cruise focuses on the investigation how hydrographic frontal systems in the North Sea impact the recruitment success of commercially important North Sea fish stocks such as those of cod (*Gadus morhua*), whiting (*Merlangius merlangus*), sandeels (*Ammodytes* sp.) and herring (*Clupea harengus*). The investigations form the basis of the transnational EU-project Linking hydrographic frontal activity to ecosystem dynamics in the North Sea and Skagerrak: Importance to fish stock recruitment (Q5RS-2000-30183: LIFECO). Cruise no. 161 of RV HEINCKE is the seventh cruise of an intensive field programme, which is performed during LIFECO. The following objectives have been addressed during the cruise:

- Determine the location of the frontal zones in the two project areas and assess their spatio-temporal variability as well as their status of frontal breakdown.
- Resolve the horizontal distribution and abundance of key zooplankton and fish species/life stages in frontal and adjacent non-frontal regions.
- Estimate the production of key phytoplankton species in relation to quantity and quality of available nutrients and food resources in different frontal and non-frontal areas.
- Resolve the impact of predation on the abundance of zooplankton as well as larval and early juvenile fish by planktivorous and piscivorous predators in frontal regions relative to stratified non-frontal regimes via the analysis of stomach contents and the utilisation of food web biomarkers.
- Estimations of mortality rates will be based on the observed distributions and abundance of different species relative to water column characteristics.

WORK AT SEA, AREA OF INVESTIGATION, AND FIRST SCIENTIFIC RESULTS:

Scientific work on RV HEINCKE covered intensive fisheries investigations and a fine-scale sampling of phytoplankton, zooplankton and micronekton along three station transects (T1, T4 and T9) - core transects according to the LIFECO field sampling programme (see Fig. 1; station map).

Due to heavy weather conditions (see Time schedule) the field sampling had to be interrupted several times for shorter and longer periods. This resulted in a severe shortage of the scientific programme: None of the 3 initially planned 24h sampling stations at T9 could be performed.

On Friday the 23.11.2002 the BIOMOC was lost during its deployment at station no. 1746 (T9S15; position 55° 40,92 N / 005° 11,99 E). The grip which connects the gear with the cable slipped for an unknown reason. The weather situation was normal and no extraordinary high tension had been observed during the deployment. A more detailed report in German language can be found in the annex. At the following stations the Biomoc sampling was replaced by two Bongo (310 µm) net hauls per station.

Before the beginning of station work at each transect a video-hydrographic profile with the Ichthyoplankton Recorder (IPR: video imaging of zooplankton and ichthyoplankton organisms, CTD: density, temperature, salinity) was conducted. The IPR was towed with 5 knots along each transect undulating from the surface to 100 m depth or in shallower parts close to the seafloor, respectively. The density profiles of the CTD-recordings were analysed and the expected frontal breakdown was confirmed at every transect.

On transects T1 and T4 3 stations and at T9 4 stations were sampled

Transect No. 1 (T 1): (from north to south) # 5, # 3 (prior frontal station), # 1

Transect No. 4 (T 4): (from north to south) # 6, # 8 (prior frontal station), # 10

Transect No. 9 (T 9): (from east to west) # 15, # 14, # 13 (prior frontal station), # 12

Generally at each station the following gears were used (for exceptions see Time schedule).

- CTD, (with chlorophyll sensor and water bottle rosette, 1 haul)
- Apstein Net, (vertically hauled, 1 haul)
- WP-2 Net, (200µm, vertically hauled, 1 hauls)
- Multinet (0,25m², 150µm, vertically hauled, 1-2 hauls)
- BIOMOC (MOCNESS-type multiple-opening-closing plankton net equipped with a CTD/O2-probe, net opening: 1m², 9 nets with 335µm and small 50µm liner, 1 or 2 hauls depending on water depth, towed at 3kn)
- IKMT (1000µm, 6 m² Isaac Kidd Midwater Trawl for sampling macroplankton and micronekton, 2 to 3 hauls, towed at 3kn)
- KOMBITRAWL (854 mesh, 10mm cod end, 1 or 2 hauls, towed at 3kn)

Vertically resolved water samples for chemical analysis of nutrient concentrations and primary production were obtained by Frederikke Sørensen with a water bottle rosette mounted to the CTD profiler.

Size fractionated plankton samples were obtained from a combination of water samples taken at the depth of the chlorophyll-a maximum and one vertically integrating WP-2 net haul. The samples were filtered and preserved in liquid nitrogen for later analysis of lipid composition.

Sampling with the BIOMOC was carried out on almost all stations sampled before the 23.11.01 resolving the entire water column vertically in intervals of 5 to 10 m. The samples will allow a determination of ambient environmental conditions, i.e. temperature and salinities, which can be directly related to the distribution of early life fish and macroplankton. The results will, furthermore, resolve the importance of variations in the water stratification in the prior regions of hydrographic fronts. In addition to the vertical resolving plankton sampling with the BIOMOC sampling of larger fish larvae and young of the year was carried out with an IKMT 6. As the IKMT 6 has no opening closing mechanism 2 to 3 hauls according to the stratification of the water masses were carried out on each station in order to resolve the distribution of target species in relation to the prevailing hydrography. From the IKMT 6 samples euphausiid subsamples were sorted and deep-frozen in liquid nitrogen for later biochemical and dietary analyses.

During this cruise an Engel Kombitrawl equipped with a 10 mm cod end was used for catching of pelagic and demersal fish. Subsets from all catches were preserved by either deep freezing or formalin to be utilized in stomach content analysis in Lowestoft, Kiel and Hamburg labs. On Sunday the 18.11.01 one Kombitrawl was damaged during its deployment at station T1S1 and had to be replaced by the spare Kombitrawl.

In total, the activities at 10 stations can be summarised as follows:

- 3 IPR - Hydroacoustic profiles
- 10 CTD casts
- 10 Apstein Net hauls
- 11 WP-2 hauls
- 11 BIOMOC hauls
- 24 IKMT 6 hauls
- 13 MULTINET hauls
- 19 KOMBITRAWL hauls

A detailed compilation of station data is summarised in the station list in the annex.

After completion of the station work a number of short fishery hauls were conducted in order to obtain live fish for consumption rate experiments in the laboratories of the IHF, Hamburg University.

Time schedule:

We 14.11.01

13:30 Departure from Bremerhaven. Steaming to Transect No. 1

Th 15.11.01

Wind speed 17 – 23 m*s⁻¹ , continued steaming at 2knots towards T1

Fr 16.11.01

12:00 First IPR haul at T1 from position 57°15.00N / 08° 40.00E to position 57° 45.00 N / 08° 40.00E

18:00 T1 S5 Fisheries (2 hauls)

22:00 T1 S5 Plankton sampling
(CTD, Waterbottles, Apstein, WP-2, 2xBIOMOC, 3x IKMT)

Sa 17.11.01

07:00 T1S3 Plankton sampling
(CTD, Waterbottles, Apstein, WP-2)

Heavy weather conditions (wind speed 17 - 20 m*s⁻¹) do not permit continuing the scientific work.

14:00 The wind has calmed down to 14 - 16 m*s⁻¹ which permits fishing at T1S3 (2 hauls)

18:00 The wind has increased again and does not permit continuing the scientific work.

Su 18.11.01

04:00 The wind has calmed down to 11-13 m*s⁻¹ which allows completion of plankton sampling at T1S3 (2xBIOMOC, 3x IKMT)

10:00 T1S1 Plankton sampling
(CTD, Waterbottles, Apstein, WP-2, 1xBIOMOC, 2x IKMT)

13:30 T1 S1 Fisheries; Damaging of the Kombitrawl

16:00 End of station work at T1; steaming to transect T4

23:15 Arrival at T4
Second IPR haul at T4 from position 56° 50.00N / 006° 40.00E to position 57° 30.00N / 006° 40.00E

Mo 19.11.01

09:00 Start of station work at T4 at the northernmost station T4S6
T4 S6 Plankton sampling
(CTD, Waterbottles, Apstein, WP-2, 2x Multinet, 2xBIOMOC, 3x IKMT)

13:00 During the IKMT hauls the signal transmission via the 11mm cable of winch no.4 fails. The winch no. 4 holds the only 11m cable, all other cable diameter are smaller. Thus, the further deployment of the IKMT and the BIOMOC has to wait until the winch no. 4 is working properly again. This uncertain situation again required immense flexibility of the RV Heincke`s crew.
T4 S6 Plankton sampling

14:00 T4S6 Fisheries (2 hauls)

17:00 T4S6 Continuation of plankton sampling (3xIKMT)

20:00 T4S8 Plankton sampling
(CTD, Waterbottles, Apstein, WP-2, 2xMultinet, 2xBIOMOC, 3x IKMT)

Tu 20.11.01

01:00 T4S8 Fisheries (2 hauls)

07:00 T4S10 Plankton sampling
(CTD, Waterbottles, Apstein, WP-2, 2xMultinet, 1xBIOMOC, 2x IKMT)

11:00 T4S10 Fisheries (2 hauls)

13:30 Completion of station work at transect T4.
Steaming towards transect T9

18:00 Arrival at T9
Third IPR haul from position 55° 40.00N / 006° 50.00E to position 55° 40.00N / 005° 40.00 E.

We 21.11.01

04:00 Completion of the IPR haul

Wind speed of 17-19m*s⁻¹ and wave heights of 3-4m did not allow any scientific field work.

Th 22.11.01

Wind speed of up to 30m*s⁻¹ and wave heights of 5-6m did not allow any scientific field work.

Fr 23.11.01

18:00 Wind speed decreased to 10 m*s⁻¹
Continuation of station work

T9S15 Plankton sampling
(CTD, Waterbottles, Apstein, WP-2, 2xMultinet)

- 19:30 T9S15 Fisheries (2 hauls)
- 22:00 Wind speed decreased to 6-8 m*s-1
Continuation of plankton sampling at T9S15

1x BIOMOC; Loss of the gear
- 23:30 Reparation of the W4 cable completed, continuing of plankton sampling at T9S15 (2x IKMT, 2xBongo)

Sa 24.11.01

- 03:00 T9S14 Plankton sampling
(CTD, Waterbottles, Apstein, WP-2, 2xMultinet, Bongo, 2xIKMT)
- 05:00 T9S14 Fisheries (2 hauls)
- 03:00 T9S14 Plankton sampling
(CTD, Waterbottles, Apstein, WP-2, 2xMultinet, Bongo, 2xIKMT)
- 10:00 T9S13 Plankton sampling
(CTD, Waterbottles, Apstein, WP-2, 2xMultinet, Bongo, 2xIKMT)
- 12:00 T9S14 Fisheries (2 hauls)
- 17:00 T9S12 Plankton sampling
(CTD, Waterbottles, Apstein, WP-2, 1xMultinet, Bongo, 2xIKMT)
- 19:00 T9S12 Fisheries (2 hauls)
- 21:00 End of station work on Transect No.9.
- 22:00 Steaming westward to the Schlickgrund, searching for fish

Su 25.11.01

12 Fishery hauls to obtain live fish for experiments.
End of station work on RV Heincke cruise no. 161.

Mo 26.11.01

Arrival in Bremerhaven after 1291,6 miles at sea.

Jens Floeter

Bremerhaven, 26 November 2001

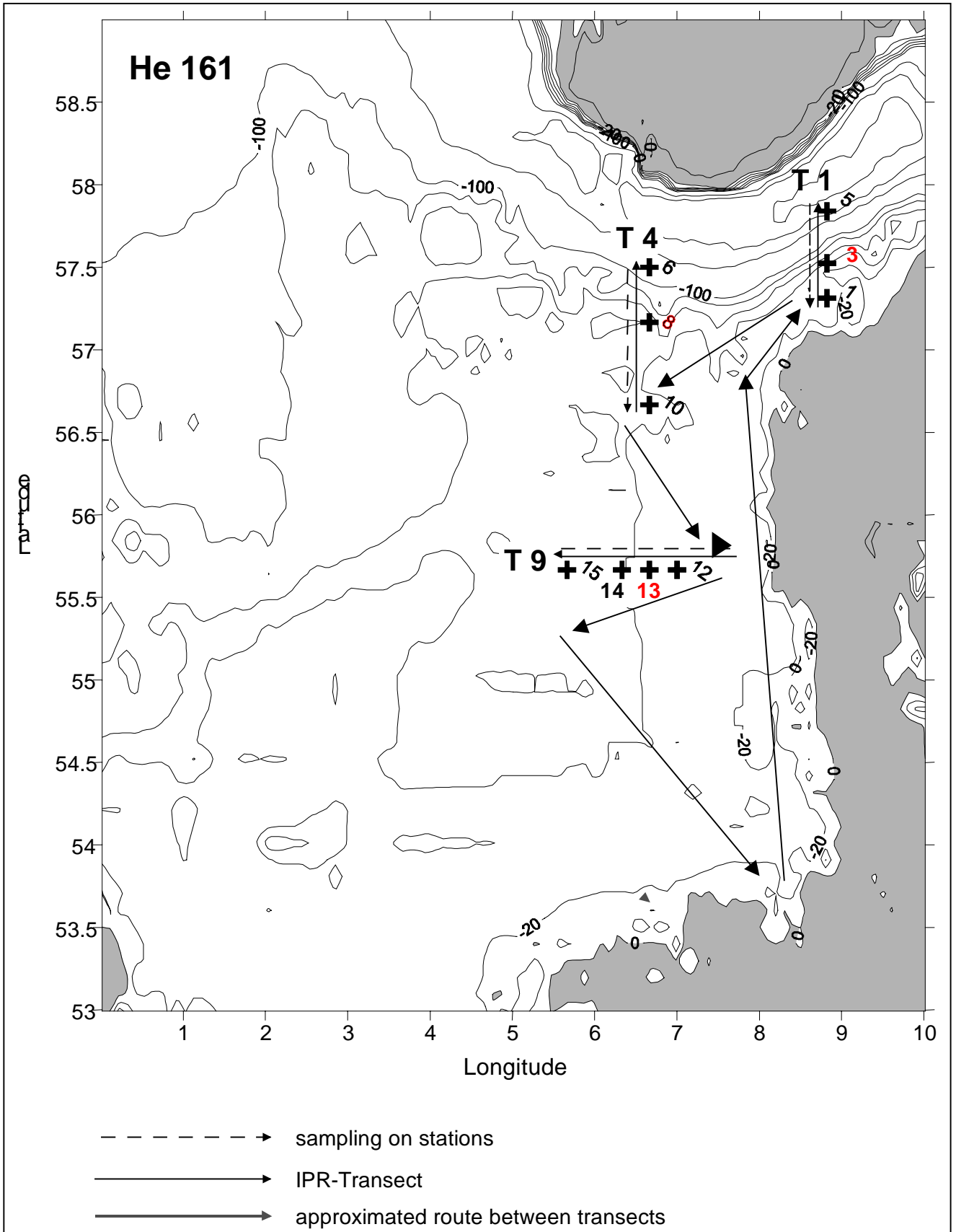


Fig. 1. Sampling area and position of station transects. For further explanations see text.

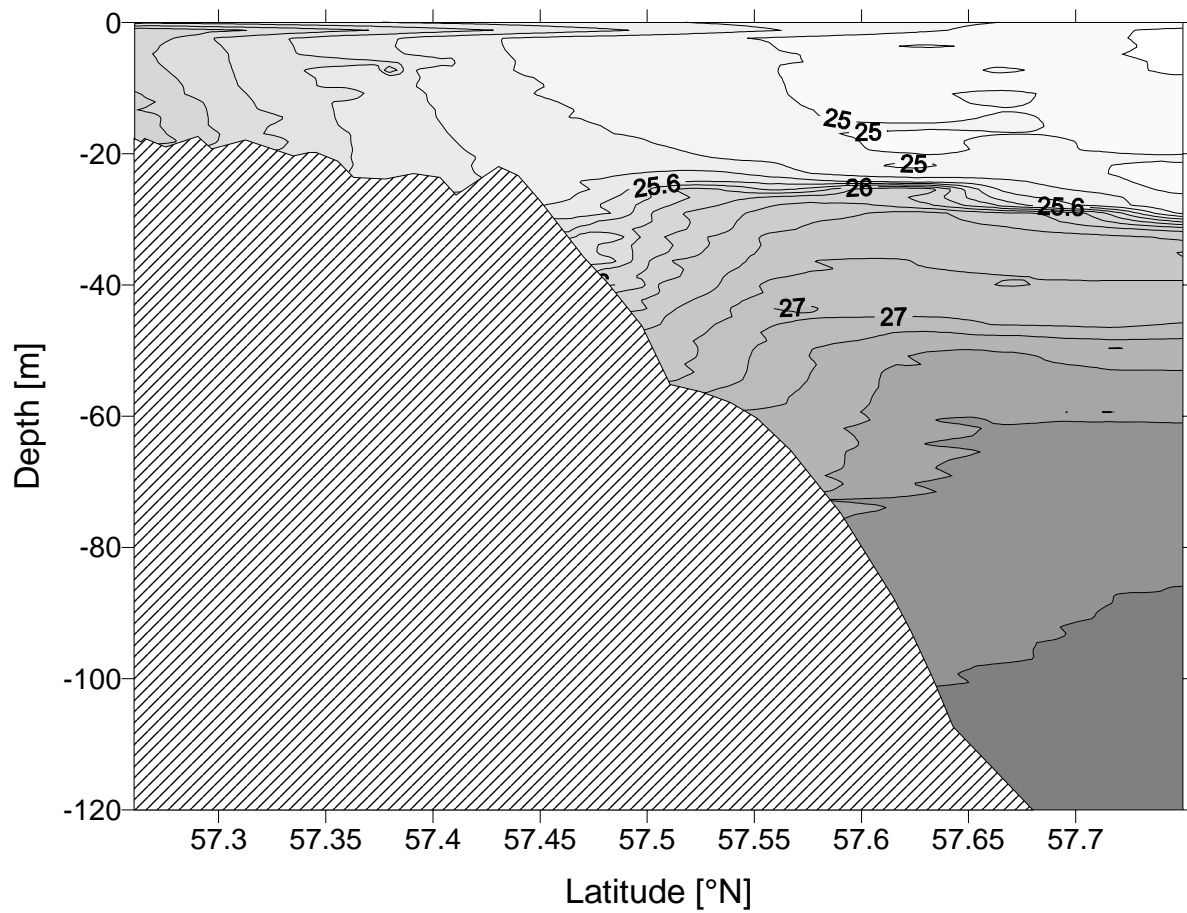


Fig. 2. IPR density profile: Transect 1 from position 57°15.00N / 08° 40.00E to position 57° 45.00 N / 08° 40.00E.

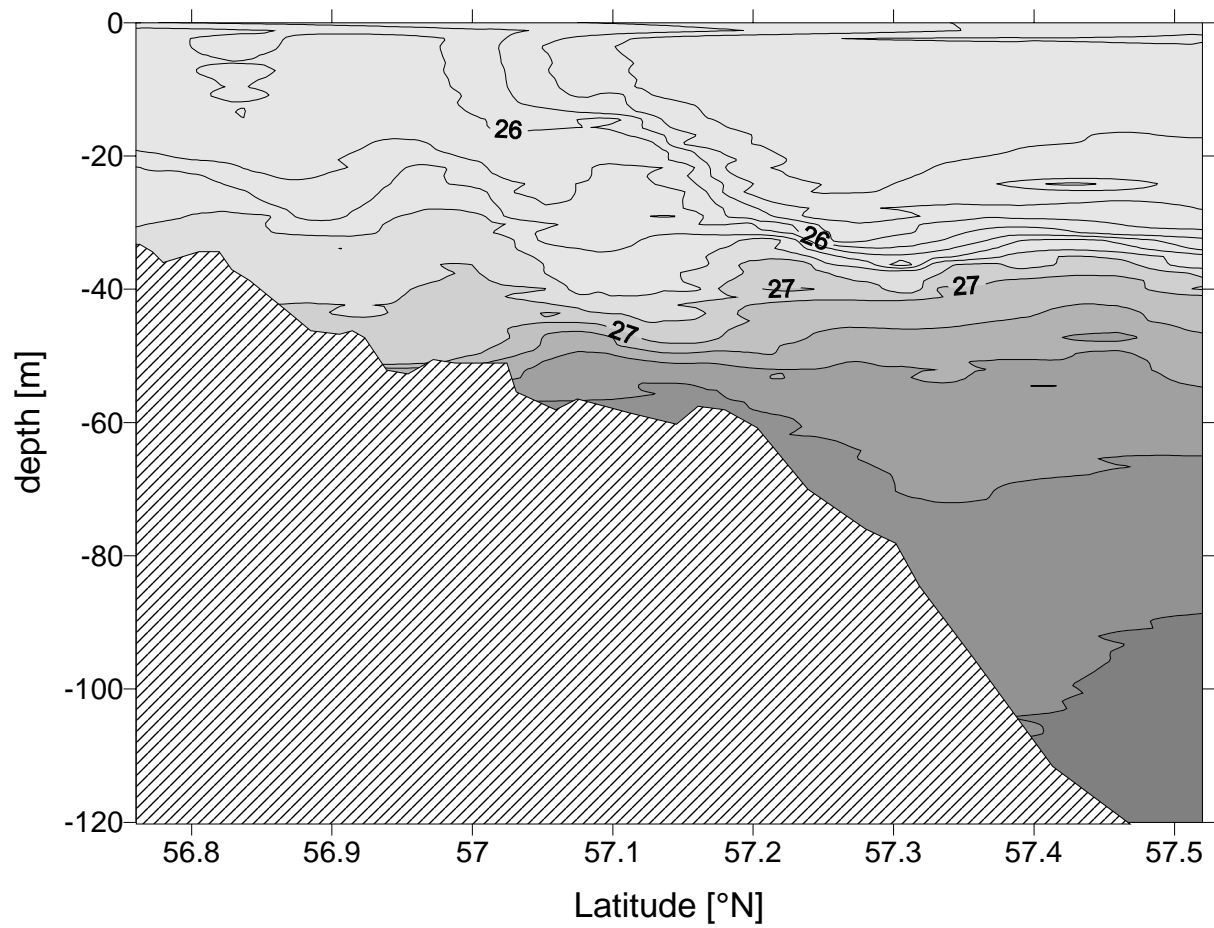


Fig. 3. IPR density profile: Transect 4 from position 56° 50.00N / 006° to position 57° 30.00N / 006° 40.00E

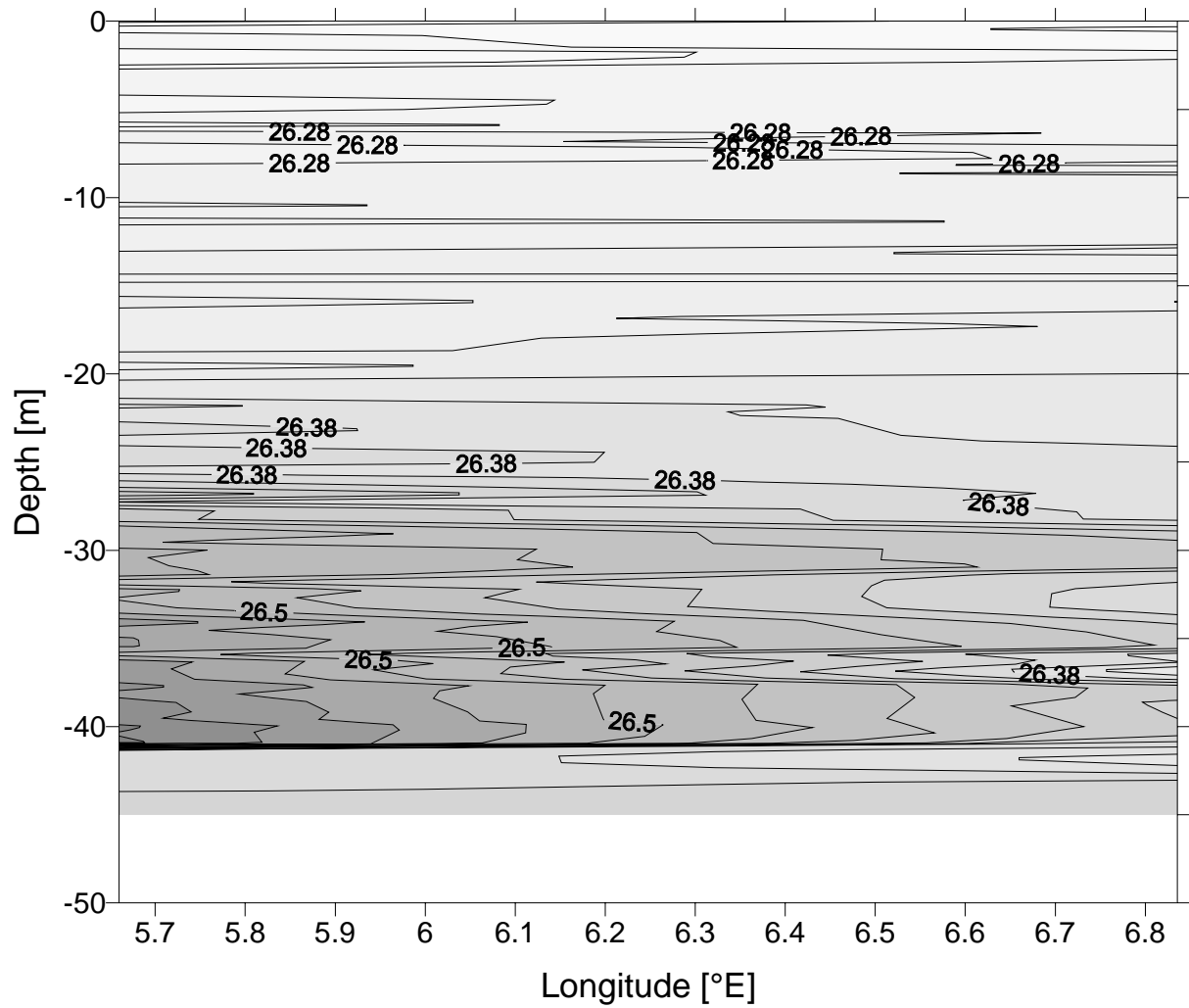


Fig. 4. IPR density profile: Transect 9 from position 55° 40.00N / 006° 50.00E to position 55° 40.00N / 005° 40.00 E.