The Snellius-II Expedition

Progress Report

Royal Netherlands Academy of Arts and Sciences

Indonesian Institute of Sciences

Theme I
Geology and Geophysics of the Banda Arc and adjacent Areas

Cruise G 5

Flores, Timor, Banda and Arafuru Sea

May 3 - May 27, 1985

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and shipboard crew
March 1986

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Summary

Apart from losing the Sealion, Cruise G5 went fine and was highly successful. One hundred and seventy six cores were collected from the seafloor, covering the volcanic arc - forearc basin (including the wondrous Weber Deep) - forearc - trench - downgoing continental margin at three transects across the Banda Arc ranging in waterdepth from 40 to 6840 meters. The number of piston cores (34, one no recovery) and boxcores (142, four no recovery) that has been brought on deck largely exceeds the total number of cores ever taken in Eastern Indonesia. Piston core recovery averaged more than 7 meter, the longest measuring 15.50 meter and the shortest yielding just a small handfull of pebbles. Box core recovery averaged 29cm, more than needed for the actuomicropaleontologic purpose and at several occasions sufficient to reveal unconformaties. We expect that truncation can be determined using geotechnical test results obtained on box- and piston cores (bulk density, water content and shear strength). A total of 1270 geotechnical tests has been performed on board while the program continuous onshore. Already, the tests revealed not only de-watered sediment but also the unexpected presence of exceptionally sensitive (quick) sediments. Further study is expected to show the relation between the physical properties of the sediment and their geologic-geophysical setting.

Also, 137 plankton and 121 water pump, net and bottle samples were collected from the seawater. We recovered 930 miles of magnetic and 2150 of acoustic (3.5 kHz) profiles. The ship's crew filtered air to collect palynomorphs, and living organisms encountered in the boxcores were collected and preserved in alcohol.

We made four island stops: BANDA to disembark Fugro Sealion specialists; ADI and DAMAR for R&R and ROTI for a geologic reconnaissance trip.

The research strategy, of systematically sampling transects that follow profiles of prior acoustic surveys, has been proven valid. Note, though, that the ship's crew, technicians and indonesian + dutch scientists performed in cheerful harmony, without which it would not have been possible to cope with problems of wind and current drift, positioning, human + machine fatigue that formed a constant threat on the quality and quantity of the sample and information gathering.

1. Introduction

1.1. General scope

The Snellius II Expedition's Cruise G5 adresses, together with its landprogram and Cruise G3, the

GEOLOGY AND GEOPHYSICS OF THE BANDA ARC

East-Indonesia is an area where "mountain building" occurs this very day. Australia and New Guinea form a continent that is in the process of colliding with the Banda Sea Plate, which is bounded by the Banda Arc. Snellius-II aims at learning more about the mechanisms and magnitudes of this process. By employing several research vessels to map an area geophysically, sedimentologically and ecologically, the present-day setting will be determined. In this way a model can be made for each of the different environments which makes their identification in the geological record possible. This knowledge will be used to interpret the rocks collected during the onshore campaigns to reconstruct the geologic history. If successfull this will contribute towards understanding processes involved in plate collision in general and to more accurate estimates on the east indonesian hydrocarbon potential.

The Banda Sea is bounded by a peculiarly shaped composite island arc: an inner arc of active volcanoes and an outer arc of islands consisting of deformed sedimentary rocks. Being the site of active collision between the Australia - Irian Jaya continental mass and other crustal plates, the area is a most interesting place to study mountain building where it occurs today.

This unique setting has recently been the topic of international marine geological and geophysical research. Although the large amount of new information substantially improved our geologic understanding, our knowledge still is far from conclusive as is portrayed by the variety of published opinions explaining the tectonics of the area.

The geological and geophysical group of the Snellius-II Expedition did carry out surveys with the aims of testing existing hypotheses on the origin of the Banda Sea, filling in data gaps left by previous expeditions and learning more about the mechanics and magnitudes of the tectonic and sedimentary processes.

To be more precise, what we would like to know about the Banda Arc is the
- age and origin of its components; and the
- rates and magnitudes of their horizontal and vertical movements.

Specific objectives to achieve these goals:

1. a. Geologic structure, sea floor morphology, present tectonic activity, sedimentation processes, actuo-facies and Mesozoic to Recent geohistory of the southern segment of the Banda Arc.
   b. Same as a., of the eastern segment of the Arc.
   c. Same as a., of the northern segment of the Arc.

2. Constraints on age of North Banda Basin.

3. Nature and history of Banda Arc volcanism and tephra facies distribution.

   To attain objectives 1-2 it is needed:

4. To establish a broad Mesozoic-Early Cenozoic, and a detailed Late Cenozoic stratigraphic reference scheme and numeric time-scale with fossil atlas.

   The collected material can also be used in:

5. reconstructing Late Cenozoic paleoceanography and paleoclimate.

6. Defining East Indonesian extant tectofacies, and

7. Calibrating and subsequently mapping echo- and seismic-record character.

During the execution of the scientific programme full attention has been paid to techniques which can be applied in exploration geology. The paleontologic and stratigraphic results for instance will be of use in oil exploration throughout southeast Asia. Prediction of the chances of locating natural resources will undoubtedly improve. Ecological data may likewise be used to enhance the insight concerning the influence of human activity on the marine environment. Integrated participation of Indonesian researchers, students and technicians makes the exchange of know-how and experience particularly meaningful, because of the above mentioned aspects.

1.2. Cruise G5 objectives

G5 has as its specific objective to collect data and samples systematically to

- characterize Banda Arc depositional environments, i.e. bio-, litho-, geochemical and petrofysical actuofacies;
- make a quantitative and qualitative actuo-micropaleontologic analysis of the trench - forearc - forearc basin - backarc system to establish regional paleobathymetric criteria;
- determine Late Quaternary history of vertical movements;
- characterize the extant pelagic environment and water masses;
- reconstruct Late Quaternary paleoceanography.

Seafloor sampling stations have been located on seismic profiles on Cruise G3 transects 1, 2 and 3 and their heatflow station no. 2. The selection of plankton sampling stations/intervals was based on experience gained during the earlier Snellius II Theme 2 cruise, net and CTD station selection being limited by weather conditions.
"En principe" boxcores have been systematically placed along the transects from the volcanic arc to the outer slope of the trench at the following depths (in meters): 30, 70, 100, 150, 200, 300, 400, 500, 700, 900, 1100, 1300, 1500, 1800, 2000, 2300, 2600, 3000, 3500, 4000, 4500, 5000, 6000, 7000.

1.3. Cruise G5 methods

- Seafloor sampling with a 60/30/20cm boxcorer and a piston corer. Piston core options are 110, 96 and 63mm diameter and 6, 9, 12, 18 and 21 meter length.

- In situ penetrometer ("Sea Lion") determination of seafloor physical properties.

- Water sampling with
  open and closing plankton nets,
  CTD rosette sampler,
  seawater pump filtering through plankton net and modified Willekes nannofilter.

- Air sampling with RUU palyno-filter.

- 3.5 kHz acoustic image of seafloor, continuous.

- Magnetometry on longer sailing stretches only.

- Shipboard analysis of cores includes macroscopic description photography (2 camera's), radiography, geotechnical tests and sampling (see chapter of Procedures).

- Shipboard treatment of samples includes alcohol preservation and Bengal Rose coloring of living material.

- Shore based analysis will involve microfauna (planktic and benthic forams, ostracods, possibly radiolarians), microfacies, microflora (palynomorphs, coccolithophorids), sediment composition (grain size, $CaCO_3$ content, organic C, petrography of larger components), sedimentary structures and textures, petrophysics, and, if suitable, determinations of radiometric age and paleomagnetic polarity. Stable isotope analysis (O, C) of carbonate and water.

1.4. Cruise G5 schedule

Cruise G5 has been subdivided in 7 Legs (see figure 1).

Leg 1. Ujung Pandang - Banda Naira, May 3 - 6.
This Leg incorporates a "training station" and coring + probing at Heatflow Station No. 2 of G3 transect 4.

Leg 2. Banda Naira - Irian Jaya, May 6 - 12.
This leg sampled G3-transect 3 covering the outside of the volcanic arc, the "too deep" Weber Deep forearc basin, the accretionary wedge or outer arc, the trench and the outer trench wall of the downgoing Australian Continental Margin.

Leg 3. Irian Jaya - Aru Basin - Arafura Sea, May 12 - 13.
This leg connects Transects 2 and 3 of G3 and sampled a key site in the Aru Basin and some back-barrier sites on the platform SW of the Aru Islands.

Leg 4. Arafura Sea - Banda Sea, May 13 - 18.
This leg sampled Transect 2 of Cruise G3: the down-going "Australian" margin, the trench, the outer arc high (accretionary wedge), the surprising Weber Deep, and the outer and inner slope of the volcanic arc.

Leg 5. Banda Sea, May 18 - 20.
Leg 5 connects G3 Transect 2 and 1 and sampled the Banda Sea at a "normal, quiet" site for physical properties and Late Quaternary history. Also includes a R&R stop on Damar Island.

Leg 6. Banda Sea - Timor Sea, May 20 - 25.
This leg sampled Transect 1 of Cruise G3: the inner and outer slopes of the volcanic arc, the forearc basin, the accretionary wedge, the inner trench wall, trench and outer trench wall and the Australian Margin.

Leg 7. Timor Sea - Kupang, May 25 - 27.
Sailing with 3.5 kHz echosounder recording.

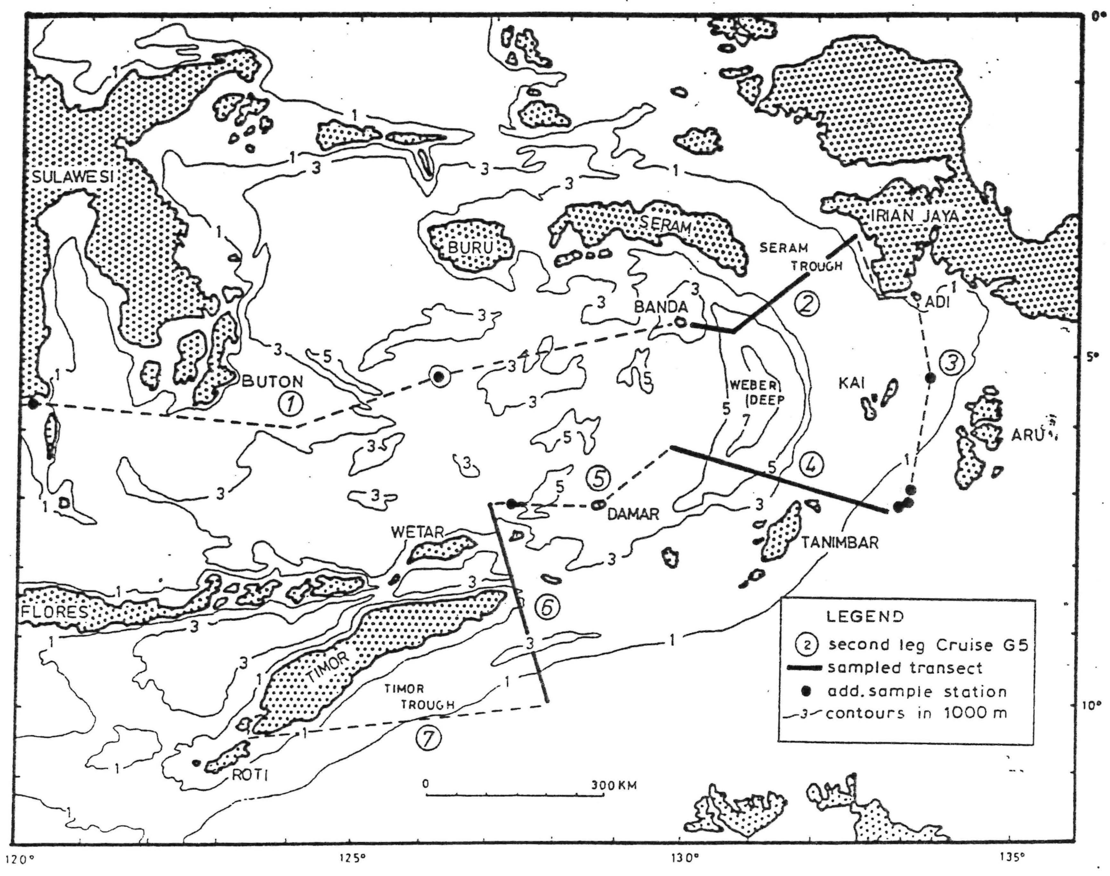


FIGURE 1. Map showing general physiography of Banda Sea and R.V. Tyro track of Snellius II Cruise G5.

1 - 7, seven legs between Ujung Pandang (Sulawesi) and Kupang (Timor). Legs 2, 4 and 6 are Transects 3, 2 and 1 respectively of Cruise G3. These legs have been seafloor sampled systematically. Dots on legs 1, 3 and 5 indicate areas of additional bottom sampling. Encircled dot of leg 1 indicates Sealion test location.

2. Procedures

2.1. Station and sample identification

The notation hierarchy of the Snellius II identification and labelling is:

Cruise (G5)
Leg (1-7)
Station

Stations are numbered consecutively for Cruise G5, and not per leg.

A station number refers to one or more coring or other activities at one navigated ship position. It is understood that in many cases the ship has not been stationary during station occupation or after re-occupation. Re-occupation may be opted for in case the ship drifted a significant distance during the time between taking a box-core and taking a piston-core.

A station exists when a site has been occupied and the sampling tool reached its destination (box-core hits bottom, nets are out etc.) regardless whether the tool functioned or not.

Station numbers are followed by a letter code identifying the sampling devices used at the station:

- **B** - for box-core
- **P** - for piston core
- **N** - for plankton net
- **W** - for watersampler (bottle),C its coccolith filter

For instance, the station notation 29BP signifies that one or more box-cores and piston cores were taken at location 29.

Occasionally more than one core of its kind has been taken at a station. The first one takes the normal notation, while a letter suffix distinguishes each additional collection of that kind. For example, the first piston core at station 29 is referred to as 29P, the second as 29PA, the third as 29PB etc. As a consequence of the above it may so happen that the coordinates on the "data inventory forms" for Station 29 are not all identical.

Box-core samples are identified by their level below the seafloor. A top sample, for instance, will be identified as 29B, 0/1cm, a bulk sample from the middle of a box-core with 40cm recovery will be 29B, 18/24cm.

Piston core samples are identified according to the system used at NIOZ and RGD. We do not consider this to be an optimal system but use it for the sake of consistency. A six meter core is subdived in 4 sections of 150cm each and numbered 1 - 4 from the bottom to the top. Samples are identified by giving their level below the top of a section in cm. If the core catcher contains any sample it is marked as cc, while material from the tripcore is identified like done for the box-cores adding the word TRIP.

Full identification of piston core samples have:

Cruise
Leg
Station P
Section number / cc / TRIP
x/y cm below top of section or TRIP. (See fig. 2.)

Plankton + water pump samples are identified by Cruise, Leg and consecutive station numbers with the letter prefixes

F (foraminifera)
C (coccoliths)
W (water)

For example, full identification of a coccolith pump filter sample could be

G5-3-C27

Such samples are taken during occupation of a core station or during a stretch of sailing for which the coordinates are given on the data inventory form. In the former case the core station number is given under "remarks".

Plankton net and water (bottle) samples are identified by the Cruise, Leg and consecutive station numbers followed by the waterdepths in meters. For example, full identification of a net sample could be

G5-2-N3, 150 - 100m

Like during all other cruises of the Snellius II expedition the air is sampled once every four days for palynomorphs. The sampling is done by the ship's crew and its registration is not of immediate concern to our team.

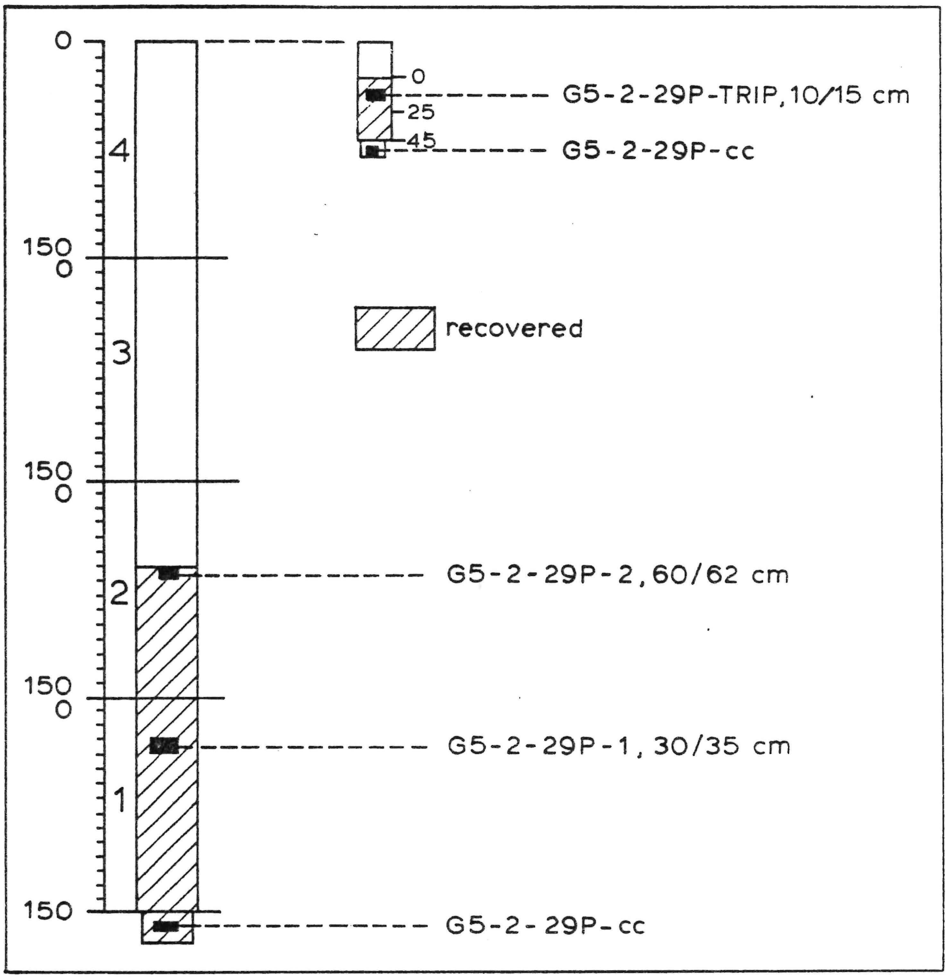


FIGURE 2. Diagram showing G5 procedures in cutting a 6m pistoncore in 150cm sections numbered 1 - 4, and illustrating the convention used in labeling samples. The core has been taken at Station 29 of leg 2 of Cruise G5 of the Snellius II expedition. As core penetration is unknown the top of this recovered section can be anywhere between 0cm and 360cm below the mudline.

2.2. Sampling procedures

a. BOX-CORES

on deck

1. Drain water through 63 or 200 micron sieve; transfer material to labeled Petri dish; when dry store in plastic bag.

on deck or in wet lab container (depending on weather)

2. Photographs top- and side view (both with two cameras)
3. Sedimentologic description; complete data forms: station coordinates, depth, cable length etc..
4. Larger benthic organisms in jars on alcohol.
5. Possibly smear slides.
6. Collect top 1-2cm of sediment in bottle with ethanol (96%) and Rose Bengal (foram/ostracod sample).
7. Insert three PVC pipes at back of core (left, centre, right). Label one for Indonesia, one for micropal. and one for sedimentology/phys. prop..
8. Take slabs for x-ray photography over total sediment column. Remove, label and store.
9. Apply physical properties tests on vertical face of core.
10. Divide core in lithologic units and sample each for micropal. per 1cm layer and if applicable rest-bulk layers. Split each slice in two, one part for Indonesia one part for Holland. Store in labeled bags. Meanwhile apply physical properties tests on suitable horizontal surfaces.
11. Remove PVC tubes, seal and label, mark top. Store in separate coolers for Indonesia and the Netherlands.
12. Clean and reassemble box.

b. PISTON CORES

1. Siphon water from trip core top, see 1. boxcores. Collect and label trip core and its core catcher sample.
2. Collect core catcher sample of main core.
3. Cut core in 150cm segments if purely stratigraphical core, in 75cm segments if stratigraphical with physical properties routine core and in 50cm segments if core has been specifically taken for determination of physical properties, mark top and label each segment properly.
4. Determine physical properties on core segment tops.
5. Seal and store in cooler.

c. PLANKTON + WATERPUMP SAMPLES

Sampling interval depends on productivity and lasts 4, 8 or 12 hours.

1. Clean out bump and hose system by letting water run freely for 10 minutes prior to sampling.
2. Read water meter (m^3).
3. Take 10 liter water sample for nanno's.
4. Place 75 micron net through porthole on stern deck leaving net opening and cod end on deck.
5. Renew cod end.
6. Place hose into net and let water run through for 4, 8 or 12 hours.
7. Bring old cod end and 10 liter water sample to container-lab.
8. Determine water temperatures.
9. Take two 100ml samples, one for salinity measurement and one for oxygen and carbon stable isotope analysis; add 3 dopplets HJ to the latter.
10. Filter the 10 liter water sample through the modified Willekes-nannofilter.
11. Reduce water content of cod end sample to 1/3 of 250 or 500ml, place it in plastic bottle of that size and fill up the remaining 2/3 with 96% alcohol.
12. Label and administrate the water-, nanno- and planktonsamples.

d. VERTICAL NETS + WATER SAMPLES

1. Prepare CTD-rosette sampler and put it overboard.
2. With CTD under water emplace 202 micron net on cable.
3. Descend wire 5 meter and emplace 75 micron net.
4. Repeat after 100m cable: 202 micron net and 5 meter higher a 75 micron net.
5. Repeat after another 100m cable step 4.
6. Release another 100 meter of cable.
7. First messenger release: nets open at 100, 200 and 300m.
8. Hoist cable 100 meter.
9. Second messenger release: nets close at 0, 100 and 200 meter waterdepth.
10. Hoist cable with nets.
11. Underway take 30 liter rosette water samples at 300, 200, 100, 50 and 0 meter waterdepth.
12. Hoist CTD, collect water samples in 30 meter bottles.
13. Same procedures as under c. for preservation, filtering and administration of samples.

e. AIR SAMPLES

During Cruise G5 air was permanently let through two filters to collect palynomorphs. One filter (B) has been replaced and filed every four days, the other (A) every four days. The filters also have been replaced 20 miles prior to and 20 miles after each port call. The First Officer took care of this sampling.

2.3. Data inventory and core description

Data inventory is made using different forms:

- the underway geophysical information: 3.5 kHz and magnetic profiles on form no. 3 of Book II;

- the core stations: a form similar to form no. 1 of Book II giving location, recovery, subsamples etc. (see figure 3a).

Note. Form no. 1 proved not to suite our purpose (see Procedures) because the water sample, the three subcores and the X-ray slabs cannot be registered and because we only took unsplit sub-samples, one for Indonesia and one for NL. Onshore these samples will be split for
   a. microfacies + forams + ostracods,
   b. calcareous nannofossils,
   c. siliceous microfossils,
   d. palynomorphs,
   e. grain size analysis,
   f. analysis of CaCO3 content,
   g. organic geochemistry,
   h. anorganic geochemistry,
   i. ash analysis (if applicable).

- the core description: a form designed by the shipboard party and discussed below (see figure 3b);

- the petrophysical test results: a form designed by the shipboard party and discussed in the chapter on geotechnical research;

- the plankton pump samples: a form designed by the shipboard party because existing forms would not allow to register more than one station per sheet;

- the net and water samples for plankton and stable isotope analysis: form no. 4 of Book II and for the adjoint CTD registration form no. 2 of Book II;

- the air samples for palynomorphs: samples collected by the First Officer who used a form designed by palynologists onshore.

Form 1

INDONESIAN-DUTCH SNELLIUS II EXPEDITION

1984 - 1985

THEME 1 R.V. TYRO CRUISE G5

~~LEG~~ . . . . STATION : . . . . DATE : . . . . LOCAL TIME : . . . . G.M.T. : . . . . POSITION :	CORE TYPE : . . . . CORE NUMBER: . . . . WATCH : . . . . REMARKS:

Cable length	:	m.	Pulling force P.C.	:	kg.
Sounder depth	:	m.	Penetration	:	m.
Bottom topography:			Recovered	:	m.

Trip core. Length ......cm.

Corecatcher.

PISTON CORES

Section no.	Length	From..to	Storage

BOX CORES

subcores	Dest.	Storage

FIGURE 3a. Cruise G5 core data inventory form 1.

INDONESIAN-DUTCH SNELLIUS II EXPEDITION

CRUISE G 5

Form 2

BOX CORE length:........cm.

SURFACE DESCRIPTION:

BOX CORE NR:

SAMPLE POSITIONS

		CORE DESCRIPTION						
DEPTH CM.	GR. size	Lith.	Prim.Str	Lithologic description	colour	MICRO. PAL.	SEDIM.	
0								
10								
20								
30								
40								
50								

FIGURE 3b. Cruise G5 core data inventory form 2.

Core description made use of form 2 given in Figure 3b. The appropriate columns for depth, grain size, lithology, structures, facies description, color and sample position should be used. It was asked to NOT use columns for purpose other than indicated. For the "lithology" column the symbols given in Figure 4a are applicable to our material.

To save time the second column from the left (grain size) is not based on smear slides but on macroscopic estimates. Figure 4b.

Under "lithologic description" (facies) distinction has been made between calcareous and non-calcareous; bio-siliceous and non-siliceous; foraminiferal and non-foraminiferal; sand and silt; gravel components and matrix (clay, silt, sand); presence and composition of concretions. For sand, the components should be specified: quartz, volcanic debris, other rock fragments, planktic forams, shell hash.

The fourth column from the left illustrates sedimentary structures, using the symbols of figure 5. In addition a natural drawing of slumps, scouring and graded bedding has been made in the "lithologic description" column if scale allows.

Shipboard scientists did not make a stratigraphic subdivision of the cores in lithologic units (based on color, grain size, composition etc.). This should be done in the onshore description of piston cores and box-subcores.

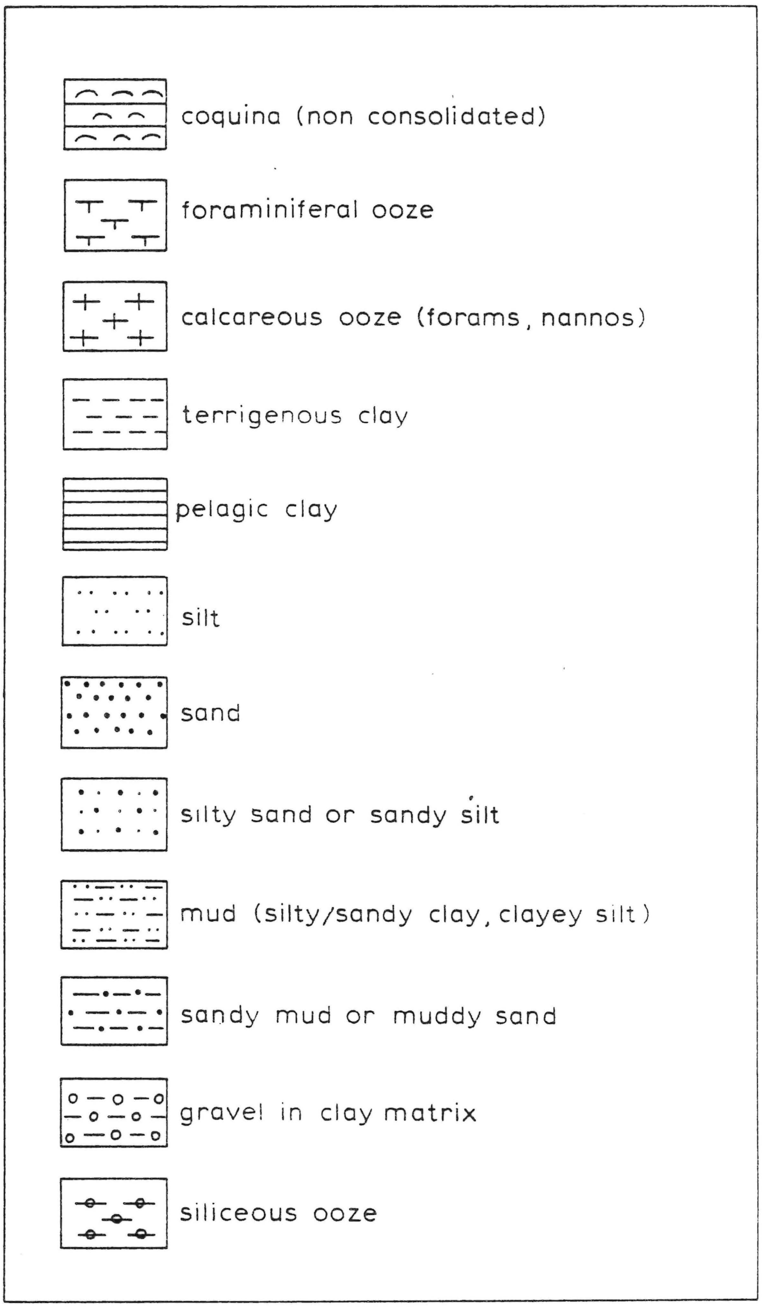
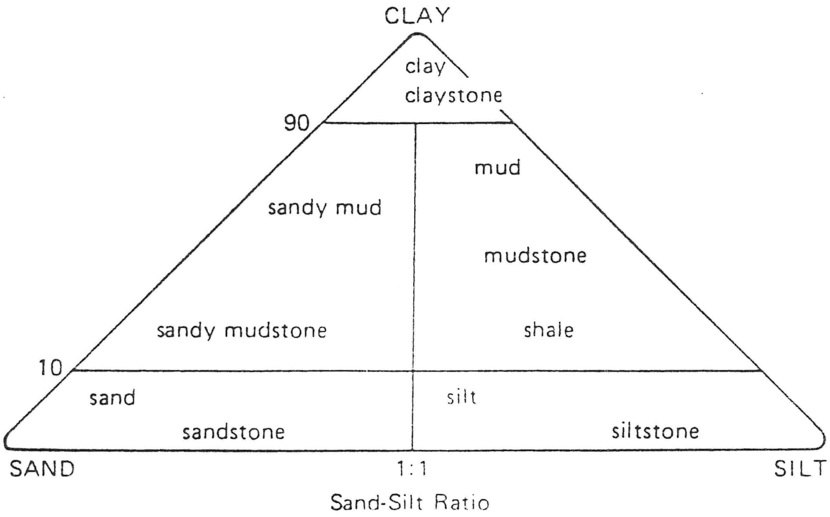


Figure 4a. Legend for "Lithology" column on Cruise G5 core description

	Millimeters		Phi (ϕ) units	Wentworth size class
	2.00	2	1.0	Granule
SAND	1.68		0.75	
	1.41		0.5	Very coarse sand
	1.19		0.25	
	1.00	1	0.0	
	0.84		0.25	
	0.71		0.5	Coarse sand
	0.59		0.75	
	0.50	1/2	1.0	
	0.42		1.25	
	0.35		1.5	Medium sand
	0.30		1.75	
	0.25	1/4	2.0	
	0.210		2.25	
	0.177		2.5	Fine sand
	0.149		2.75	
	0.125	1/8	3.0	
	0.105		3.25	
	0.088		3.5	Very fine sand
	0.074		3.75	
	0.0625	1/16	4.0	
SILT	0.053		4.25	
	0.044		4.5	Coarse silt
	0.037		4.75	
	0.031	1/32	5.0	
	0.0155	1/64	6.0	Medium silt
	0.0078	1/128	7.0	Fine silt
	0.0039	1/256	8.0	Very fine silt
MUD	0.0020		9.0	
	0.00098		10.0	Clay
	0.00049		11.0	
	0.00024		12.0	
	0.00012		13.0	
	0.00006		14.0	

Grade scales for terrigenous sediments.



Class boundaries for terrigenous sediments.

FIGURE 4b. Grade scales and lithology classification after Ross et al., 1978.

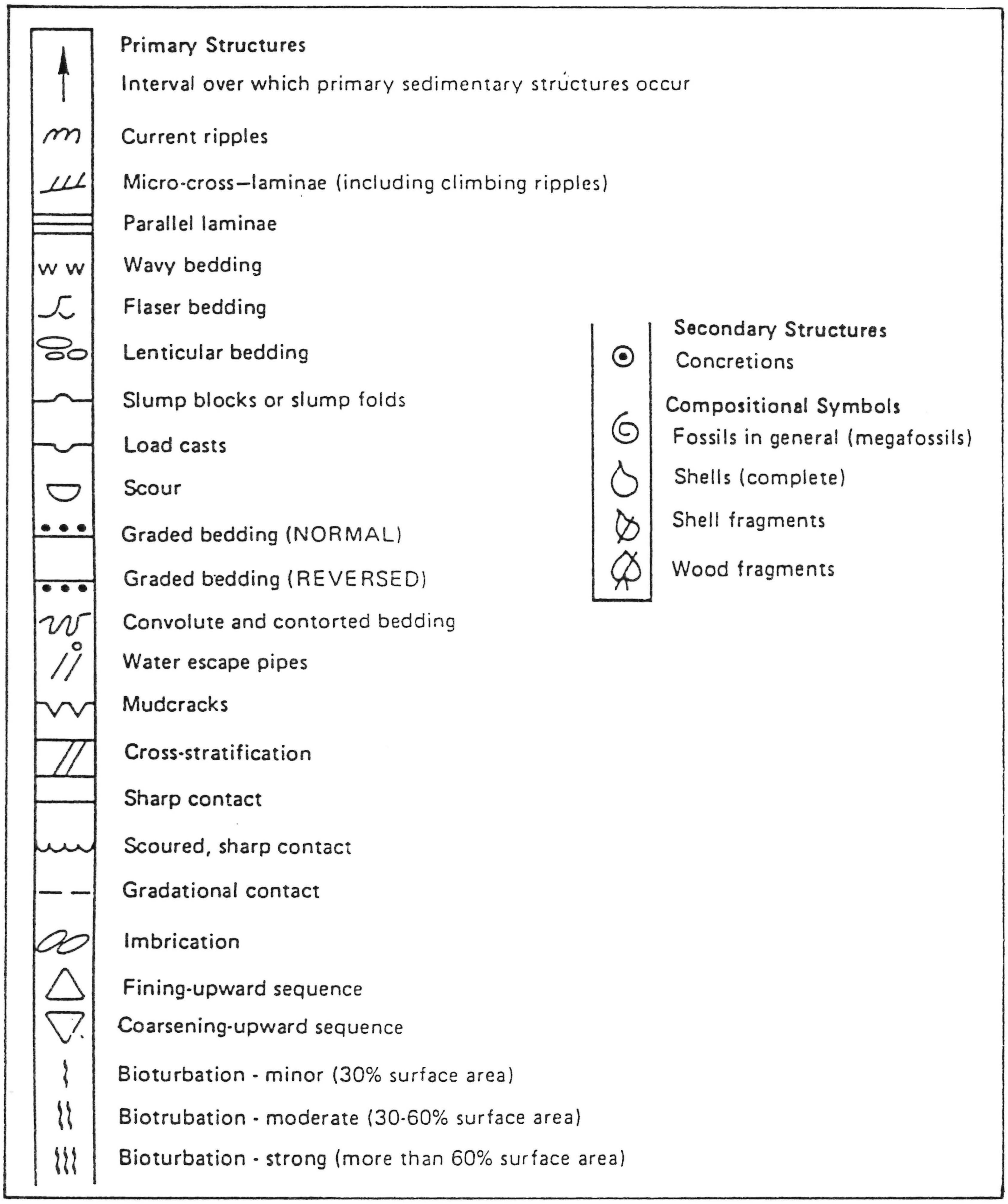


FIGURE 5. Structure symbol code for sediments after de Vries Klein, G. & Kobayerski, K., 1978

3. Chronological report

APRIL 28, Sunday.

We were to assemble the crew on Ambon for Tyro departure on the 29th. Then we learned that the Tyro had to go to Ujung Pandang to pick up the Sealion which cannot be flown into Ambon. We searched the island for our Indonesian counter parts. The purchase of tickets for next day's flight to Sulawesi was not easy at such a short notice and high costs.

One Indonesian counterpart and the navy officer were found, the others were stuck on Sulawesi because Ambon was fogged in. Attempts to reach them to tell to stay in Ujung Pandang, failed. Also Loeber's attempt to explain to Garuda airlines to stop them as well as the technicians from leaving Ujung Pandang failed. Messages left at the hotel desk in Ambon for the technicians and the film crew never were passed on, neither did the hotel inform us that the technicians had called from U.P. etc..

APRIL 29.

Travel Ambon to Ujung Pandang, and for the technicians and some of the Indonesian counterparts it was travel from Ujung Pandang to Ambon and back to Ujung Pandang.

Meet with Loeber, to discuss delayed transport of sealion.

APRIL 30.

G5 crew boards ship. Departure post-poned because Sealion is to "arrive with the next flight from Jakarta" but then doesn't. Containers are prepared for our purposes. Science meeting to make preliminary watch schedule and discuss general matters concerning ship life.

MAY 1.

Situation unchanged. After nothing arrived with the afternoon flight we did set a deadline: cancel transport if Sealion is not to arrive with first flight next morning. We will depart at noon without Sealion and without instruments for geotechnical tests.

MAY 2.

Sealion arrives, is assembled (partly on quai) and Tyro is adjusted for its use. Technicians are admired at work.

MAY 3-6. LEG 1. UJUNG PANDANG - BANDA.

MAY 3.

0015h the R.V. Tyro departs from Ujung Pandang.
We took the shortest route to Heatflow Station HF2 of Cruise G3 which was our second coring station. The rest of Transect 4 of G3 had been cancelled because of our delay.

0926h Station 1, en route a test and training boxcore has been taken in 475m of waterdepth. Also the first seawater pump plankton (forams and nannos) samples and a seawater pump palyno sample were taken. The latter has not been done routinely for the rest of the cruise. The training boxcore proved to be most useful; the sampling and descriptive procedures were improved, tasks could be better assigned and it was apparent that three teams would do a more efficient job than two larger teams thus allowing us to set up a 4 hours on - 8 hours off watch schedule.

1400h. Between Sulawesi and Salayer the magnetometer was put out. It stayed on except during sampling transects.

MAY 4.

1000h. Co-chiefs meeting. It was decided to have a 7-Leg program, to definitely omit Cruise G3 Transect 4, to give priority to G3 Transects 3, 2 and 1 (our legs 2, 4 and 6 respectively), to add one core station in the Aru Basin and work on the near Savu Basin transects only if time allows. Also it was decided to rearrange the cabin occupation after Dr. Richards were to disembark in Banda and to mix Indonesian and Dutch participants to enhance communication. Three teams were composed to cover the three watches.

1530h. Science meeting during which the above was proposed and the results of the training core were discussed together with other trivial matters.

1700h. The magnetometer is pulled in and we stop at a waterdepth of 2100m for a try-out of lancing the Sealion at sea and to test performance of its pinger. Bringing the Sealion up on deck and out in the water proved to be a delicate task that only can be safely done at a quiet sea. The procedures were improved. The pinger and the sonde did not work properly and the Fugro people went back to work on it. At 1800h the Sealion was back on deck and the ship went back on course with the magnetometer out.

2200h. Discovered slight location problem. HF2, our target, had been located from the G3 track chart and logbook to be at their 1030h location of 10/4/85 (see our sailing game plan in chapter RESULTS). However, the G3 chrono-report places HF2 at 0400h at a different location and data sheet. Confusion of local time and GMT? Course changed to $5^{o}20.00'S$ $126^{o}11.00'E$.

MAY 5.

Occupation of Station 2. The location turns out to be in a small (about 0.5 mile wide) graben at 4270m sounder depth.

0323h. Boxcorer overboard, hits bottom at 0428h and at that moment we received a satellite fix. Phantastic. Corrected waterdepth is 4282 meter, but the cable length 4257 meter. Cable apparently stretches and/or the recorder on the winch does not work properly.

0523h boxcorer on deck. The boxcore had 30cm of soft clay. 0555h piston corer overboard. Echosounder shows that we drift away from graben; ship is adjusted which is a delicate job because it has to be avoided that the cable is touched. Piston corer hits bottom at 0655h and is on deck at 0740h. Recovery of the 6m core is 3.50 meter, the 70cm tripcorer is full. Lithology apparently is well suited for a sealion probe, so we proceed. We place the ship up-drift of the graben location in order to arrive at the right spot while the Sealion is on its way down.

0930h the Sealion overboard. Handling of the large machine goes smoothly now. Everybody is at attention, the captain himself is at the bridge, all four technicians assist (Jack Schilling at the winch) and the scientific crew and ships crew watch, take pictures and applaud when the Sealion smoothly goes under, its yellow floaters disappearing out of sight. The cable is carefully released up to 40m/minute and later 50m/minute.

1105h (0405 GMT) the Sealion hits bottom at 4271m echosounder depth, 4284 meter corrected depth and 4253m cable length. The pull is taken off the cable so the machine stands firmly on the bottom and at 1115h the first penetration is completed. Then the Sealion is lifted, replaced on bottom and at 1120h a second penetration is performed. I offered time for a third reading, but Richards wisely did not want "to stretch his luck". No change in waterdepth between the two probes.

At 1132h we start pulling the cable which after a while runs at 60m/minute. We decided to have a short survey (zig-zag) around the site to map the direction of the graben. I go up to the bridge to discuss this change in the course with the captain and to set the most efficient track for departure.

At 1235h (0535 GMT) the yellow floaters of the Sealion surface after the winch slowed down. We go back to the map table with a happy smile; no point watching the pull-on board because we attended that procedure the day before at the try-out and now have more important things to do in setting the course so the ship can steam off when the Sealion is safe on deck. Then comes the message "Sealion lost". A practical joke, not true? In reconstruction we think that the following happened (see fig. 6).

The magnetic tape, with the record of the probing experiment, was built in the machine so it went down with it and we do not know how successful the recording system was. We gained experience in building the Sealion, handling it etc. and that is all that is left.

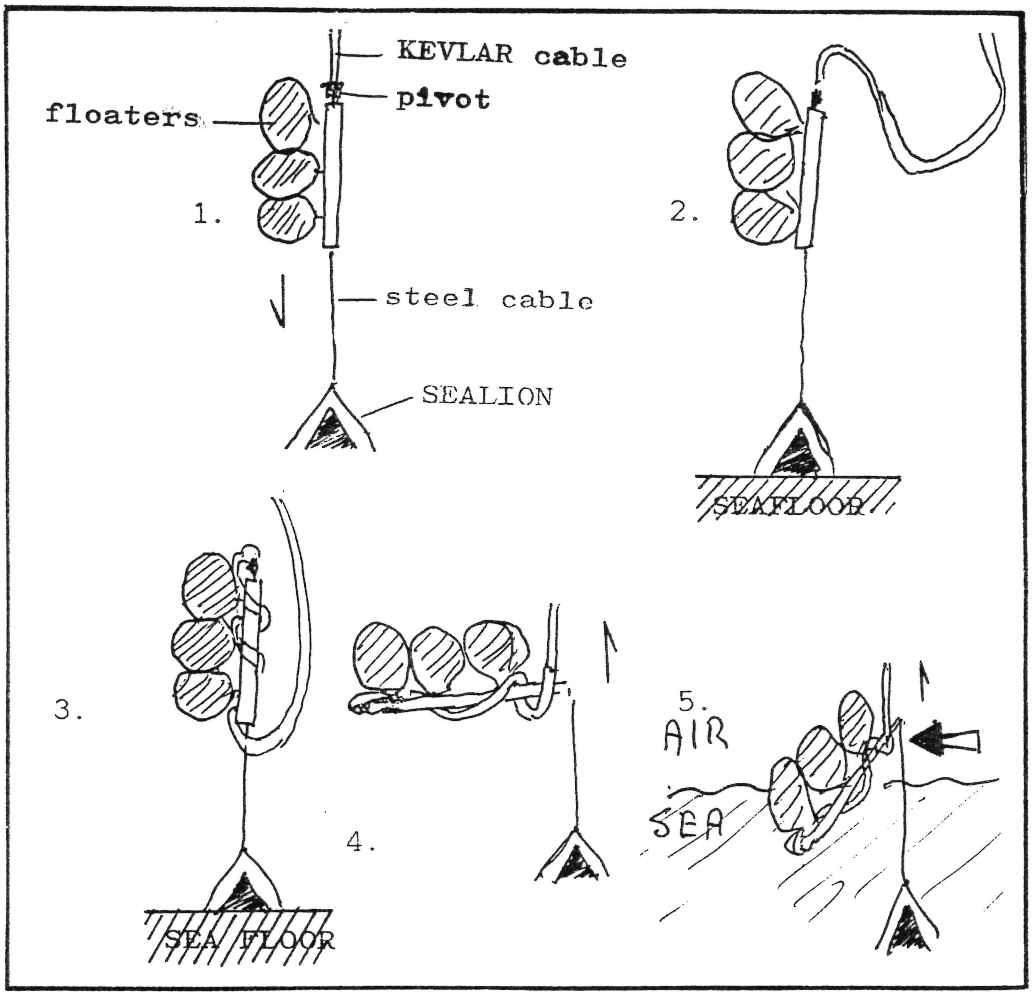


FIGURE 6. Sketch of reconstruction SEALION mishap.

1. Normal setting on its way up or down.
2. Normal setting with SEALION on seafloor, the Kevlar cable floats
3. Light Kevlar cable did not float as expected but wrinkled around the floater like we later saw it wrinkle and jump on deck when the end portion was removed.
4. The situation while the sealion was being pulled up: no problem. This way the floaters surfaced.
5. Only when the floaters and their iron bar were pulled above water they gained weight, the bar hang down and the Kevlar cable was cut between the bar and the steel cable.

Richards request to spend one day dredging for the Sealion was turned down. In our opinion chances to find it in one day (or ever, for that matter) were practically nil for the following reasons: 1) our positioning had a large slop, there constantly was an unknown amount of drift, 2) the waterdepth of 4284 meter reduced the Sealion to a microneedle in a haystack, and 3) we had no good dredge on board. [The captain's experience with dredging for an instrument is that they dredged for more than one day for a boxcorer of which the locaton was precisely known in 50 meters waterdepth. The dredge may have touched the corer once (although he doubts it) and never brought it up].

MAY 6.

1430h. Arrival Banda Island. Richards disembarks as planned. The Fugro technician who were to take care of the Sealion is no longer needed on board ship and also disembarks. Crew gets an opportunity to stroll over the island for a couple of hours. The excursion boosts moral. At 1730h the Tyro leaves Banda on its way to Leg 2, which is G3 Transect 3.

MAY 6-27. LEG 2-7.

In the following report general notes are recorded only, as for each leg a game plan has been made prior to the beginning of the leg. On this plan the actually cored stations are marked and timing is indicated. For further chronologic report the reader therefore is refered to the "game plans" in the chapter "RESULTS".

MAY 6 - 12 Leg 2. Banda - Irian Jaya. (=Transect 3 of Cruise G3).

During Leg 2 it became apparent that the technique of sampling a particular pre-determined location can become too time consuming. While some samples could only be taken at a second or third approach others had to be omitted. The difficulties were primarily caused by the mountainous sea-floor topography. A slight drift of the ship above steep slopes results in significant changes in waterdepth. The drift, of upto several miles per hour, could often not be accounted for in navigation because velocity and direction of the drift (resultant of tides and wind) varied in an unpredictable manner. Also, we had problems with the echosounder suffering from the ships engine noice and not giving a clear signal while drifting over the steepest slopes at great waterdepth. For this kind of work a SECOND, HIGH FREQUENCY ECHOSOUNDER is imperative to attain a good bottom signal and hence a reliable waterdepth. In addition, we had severe positioning problems during Leg 2 due to the scarcety of satellite passages, the inaccuracies of existing maps of the islands and (for part of the leg) because of a plotting error for waypoints 4 and 5.

Most exciting during Leg 2 were the recovery of large pebbles at many sites and the penetration of unconformities (Recent on Pliocene) at at least two locations. Our preliminary conclusion is that the northern extension of the Weber Deep is an erosional feature originating and functoning as a feeder canyon. We expect that analysis of the pebbles will show material from as far as from Ceram, although from macroscopic shipboard determinations most seem to be locally derived from the volcanic islands.

MAY 12 - 13 Leg 3. Irian Jaya (R&R stop Adi) - Arafura Sea with one site in Aru Basin.

The Aru Basin station had been added to the program on requests by Sumantri and Huson (to calibrate the seismic of Cruise G3 and to determine sediment type) and by Ganssen (to sample for paleoceanography).

Because of a misunderstanding we did not sample the "back-reef" at the end of Leg 2. To compensate, this shallow water setting has been sampled more extensively than planned just prior to Leg 4.

MAY 13 - 18 Leg 4. Arafura Sea - Banda Sea. (=Transect 2 of Cruise G3).

Drift and current problems were severe during Leg 4 at the south end of the Weber Deep. At one location (Station 108) at 6770m waterdepth we had more than 9500m of cable out and the boxcorer never touched bottom. Apparently drift plus undercurrent were strong enough to let the corer fly like a kite. We took a piston core instead at that location. Nevertheless we ended up with a representative set of samples over the transect. After laboratory study, Cruise G3 and Cruise G5, data combined will tell us much about the nature and young history of the huge feature and will allow for the selection of Weber Deep sites for study by deep diving SUBMERSIBLE.

Most important, our systematic transects and spot samples will allow to determine the lysocline and CCD depths for a large portion of the Banda Sea. The transects crossed the CCD at several points which was immediately obvious because pistoncore penetration was more effective in calcareous muds than below the CCD.

During Leg 4 the "yellow winch" got tired and had to be repaired. Fortunately, the engine of a second (grey) winch could be used and the technicians solved the problems with a minimum of delay for the program.

MAY 18 - 20 Leg 5. Banda Sea, connecting Transects 3 and 1 of Cruise G3.

After an R&R stop on Damar Island we added one pistoncore station for geotechnical tests.

MAY 20 - 25 Leg 6. Banda Sea - Timor Sea. (=Transect 1 of Cruise G3).

Despite the strong SE monsoon and drift problems, Leg 6 went smoothly with both indonesian and dutch members of the work teams capably performing their tasks and keeping up morale despite the fact that the sample collecting did become a routine matter. Routine, because the limited analytical means on board did not allow for further analysis of the collected materials.

MAY 25 - 27 Leg 7. Timor Sea - Kupang.

After a geologic reconnaissance and R&R stop at Roti Island, we arrived in Kupang according to schedule at 0900h on May 27.

A technical problem, that caused short delays at occasions since the beginning of Cruise G5, was the necessity to cut portions (of up to several hundreds of meters) of the Kevlar cable because of the spontaneous generation of torsions that made the cable difficult to handle. On our way to Roti Island (May 25) we made a stop to preventively repair the cable at about 2000m from its end.

GENERAL

We took more piston cores than originally thought feasable in order to obtain a representative collection for geotechnical analysis. When the cores will be cut and sampled onshore for a number of them priority will be given to geotechnical analysis. In this manner the physical properties program gained in importance to compensate at least a little for the loss of our ability to do in situ measurements.

Plankton net + CTD sampling had to be less frequent than we had wished because of adverse weather conditions.

We found, attached to pebbles or in the sediment, invertebrates such as corals, bryzoans and worms and one small fish. Some organisms probably are displaced from shallow water, demonstrating recent mass transport. All larger organisms have been carefully collected and preserved in plastic viles or jars on alcohol for study by biologists.

We had two health problems during Cruise G5. Neither did seriously jeopardize the propram. One member of the scientific party turned out to be over-worked and a second had an infected foot that needed (and got) proper attention. Both had to be given "easy watches" during part of the Cruise.

Prior to each sampling leg a "science meeting" was held to discuss descriptive procedures, plans, the watch schedule and other practical matters as well as the results of previous legs. Technical staff and the captain always received copy of the "game plan" for each leg. Their comments allowed for practical judgements of the programm. A final meeting after the last leg discussed reporting responsibilities, fellowships and "subject claims".

A mid-cruise party was held on may 16 after completion of Station 100B. Ten days later we did celibrate the end of the cruise while on anchor in front of Roti Island. Both parties were attended by scientists, technicians and crew officers and certificates of merit and nonsense have been awarded.

4. Underway geophysics

4.1. GENERAL

Underway geophysical recording was limited to geomagnetic profiling on sailing stretches (Legs 1, 3 and 5; see map figure 7) and continuous 3.5 kHz echosounding. Locally the echosounder record shows tens of meters penetration into the sediment column and can be highly useful in geologic extrapolation of the sampled stratigraphy as well as in interpreting depositional and tectonic facies.

The echosounder and magnetic records have been copied in Amsterdam and were distributed at the June joint PCOM meeting.

4.2. ECHOSOUNDING

During cruise G5, sailing as well as coring, waterdepth was recorded with a 3.5 kHz transceiver, providing an analog paper record on an EPC 3200S recorder. On station we obtained a penetration of 40 to 100 meter, with a resolution of about 4 meters.

4.3. MAGNETICS

Apart from 3.5 kHz echosounder profiling, a magnetometer was deployed during the transects between sample legs (fig.7).
A GEOMETRICS G801 proton magnetometer was used, providing an analog paper record of the total magnetic field strength. The bottle used was towed 150 meter behind the R.V. Tyro. Although the distance from the vessel should have been at least three times the length of the vessel (i.e. 250 meter), this was impossible due to cable failure. However, the results using a shorter cable proved to be sensible.
Shown in this report are 1) the transects from station #1, south of Sulawesi, to station #2, in the Lucipara basin, from station #2 to Banda Island (fig. 8, A-A' and B-B'), 2) the transect from Adi Island, via station #69, to station #70, south of the Kai and Aru Islands (fig. 9, C-C') and the 3) transect from station station #118, via Damar Island to station #119 (fig. 10, D-D'). More detailed maps of the "Sealion Basin" and "Aru Basin" are in figures 11 and 12.

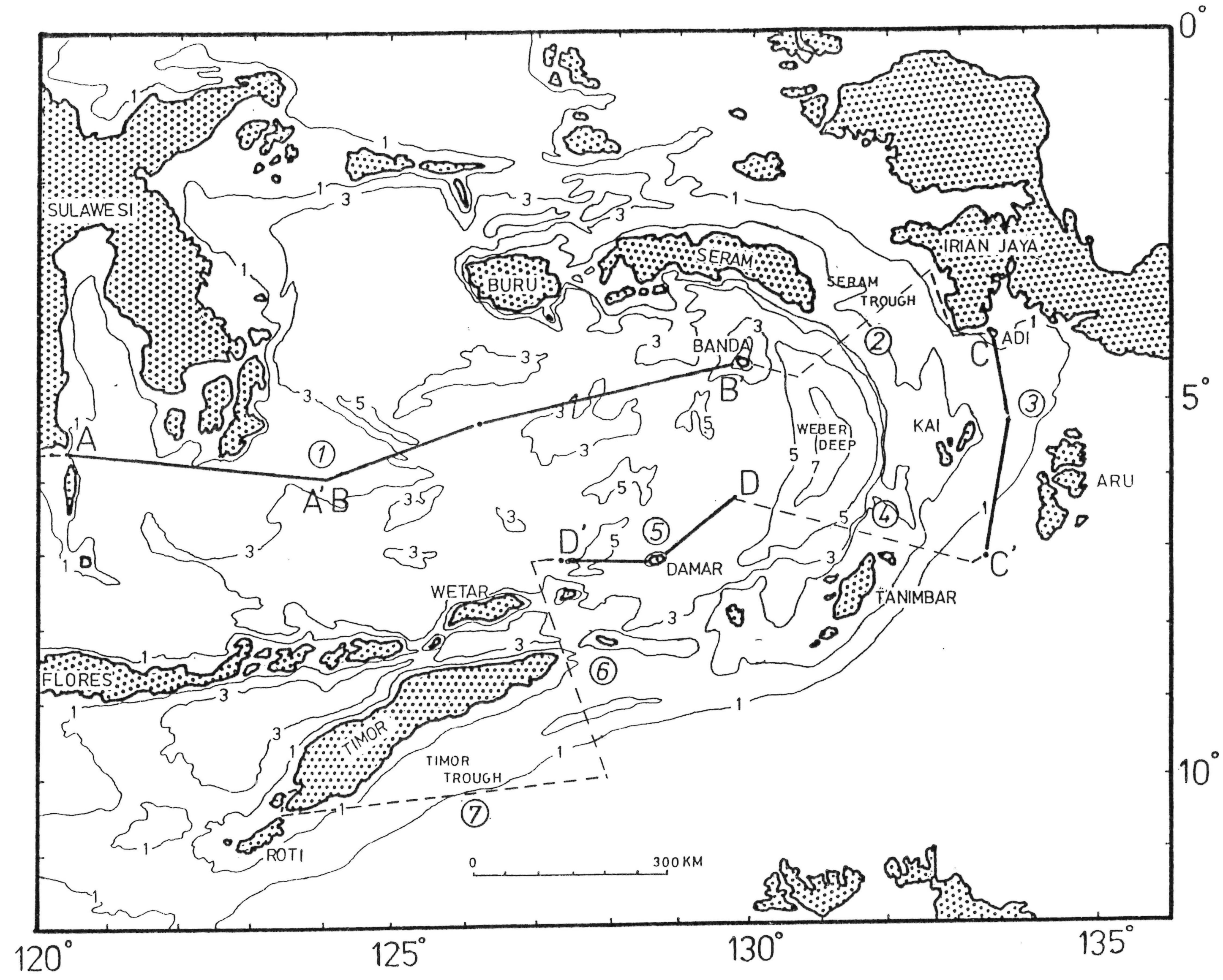


FIGURE 7. Map showing general location of Snellius II, Theme I, Cruise G5 magnetic record. Profiles A-A[1], B-B[1], C-C[1] and D-D[1] are shown in figures 8a, 8b, 9 and 10 respectively.

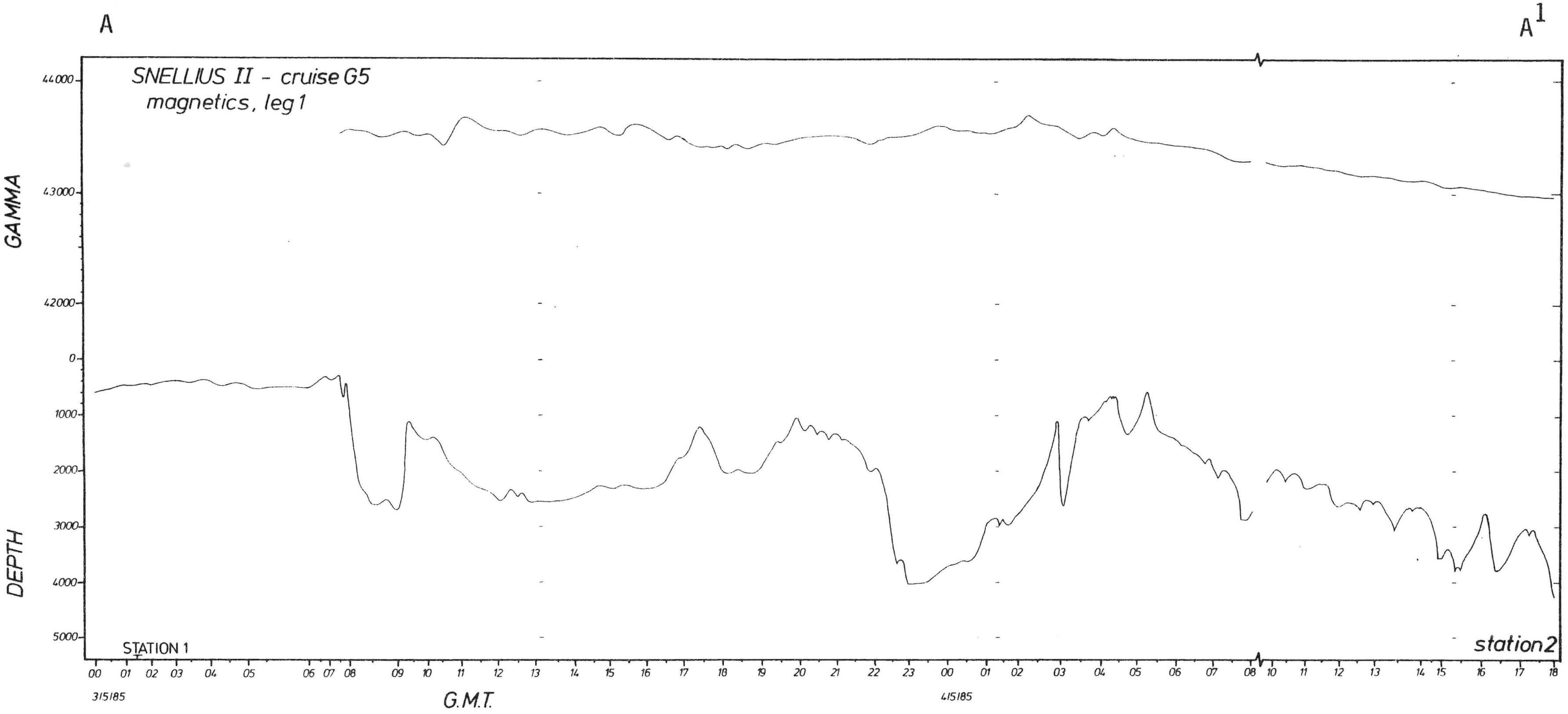


FIGURE 8a Profiles A-A[1] and B-B[1] showing magnetic record and bathymetry (3.5 kHz echosounder) along Leg 1 of Snellius II Cruise G5. Also shown are projected nearby boxcore (B) and piston core (P) stations. See figure 7 for location of profiles, and figure 11 for detailed track around "Sealion Basin".

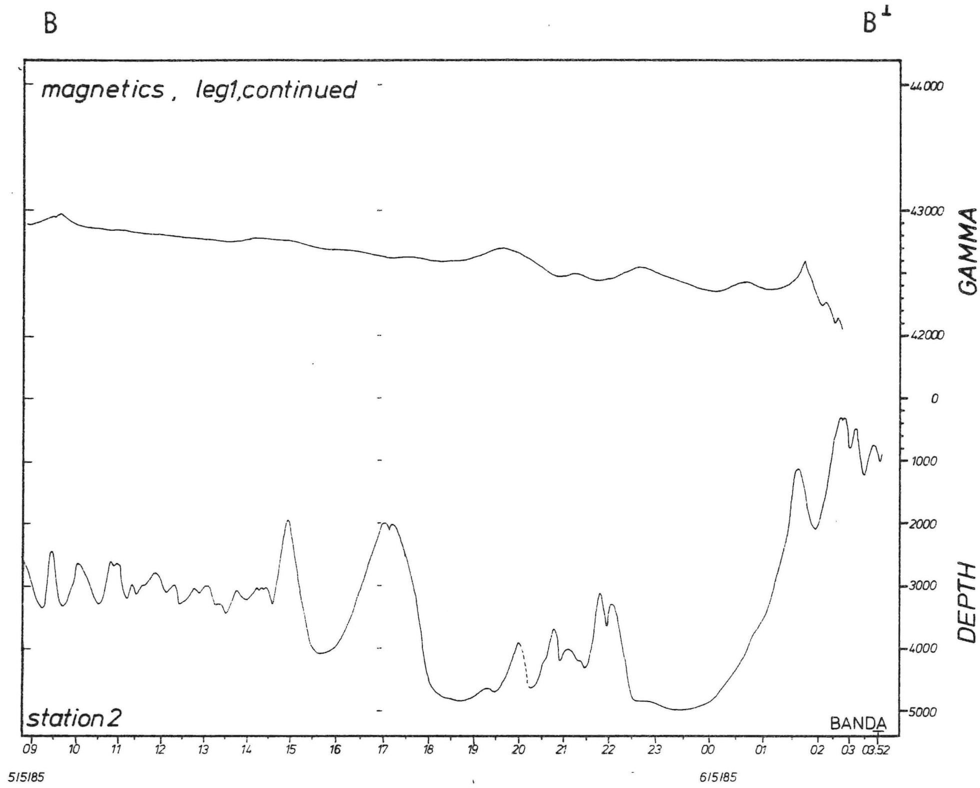


FIGURE 8b see page 31,magnetics Leg 1, continued.

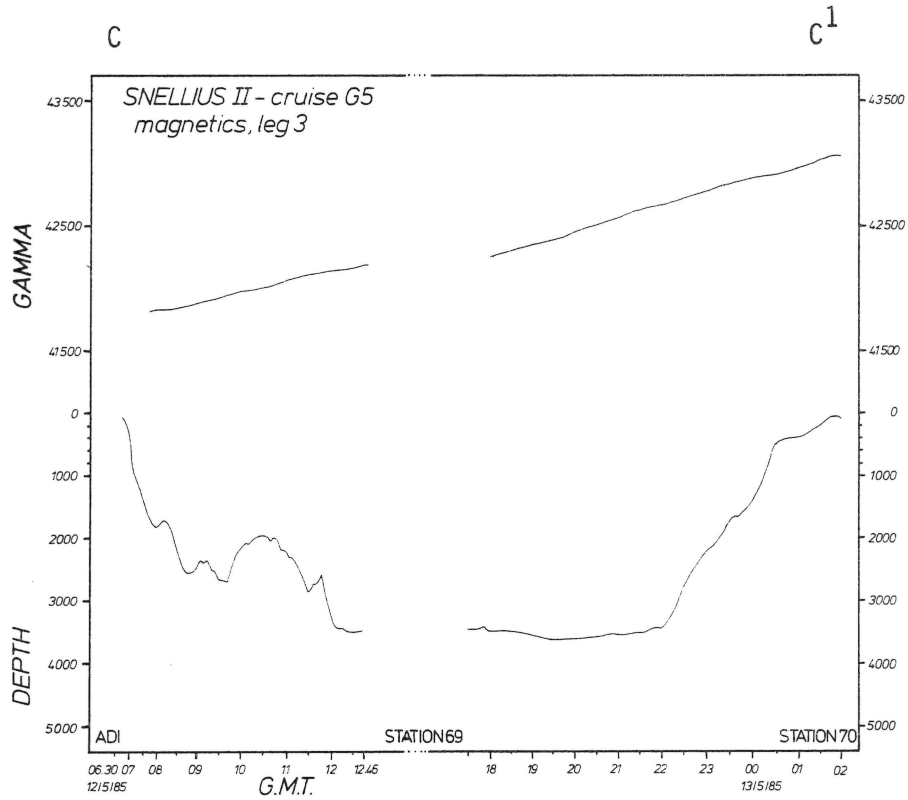


FIGURE 9. Profile C-C^{I} showing magnbetic record and bathymetry (3.5 kHz echosounding) along Leg 3 of Snellius II cruise G5. Also shown are projected nearby boxcore (B) and piston core (P) stations. For location see figure 7.

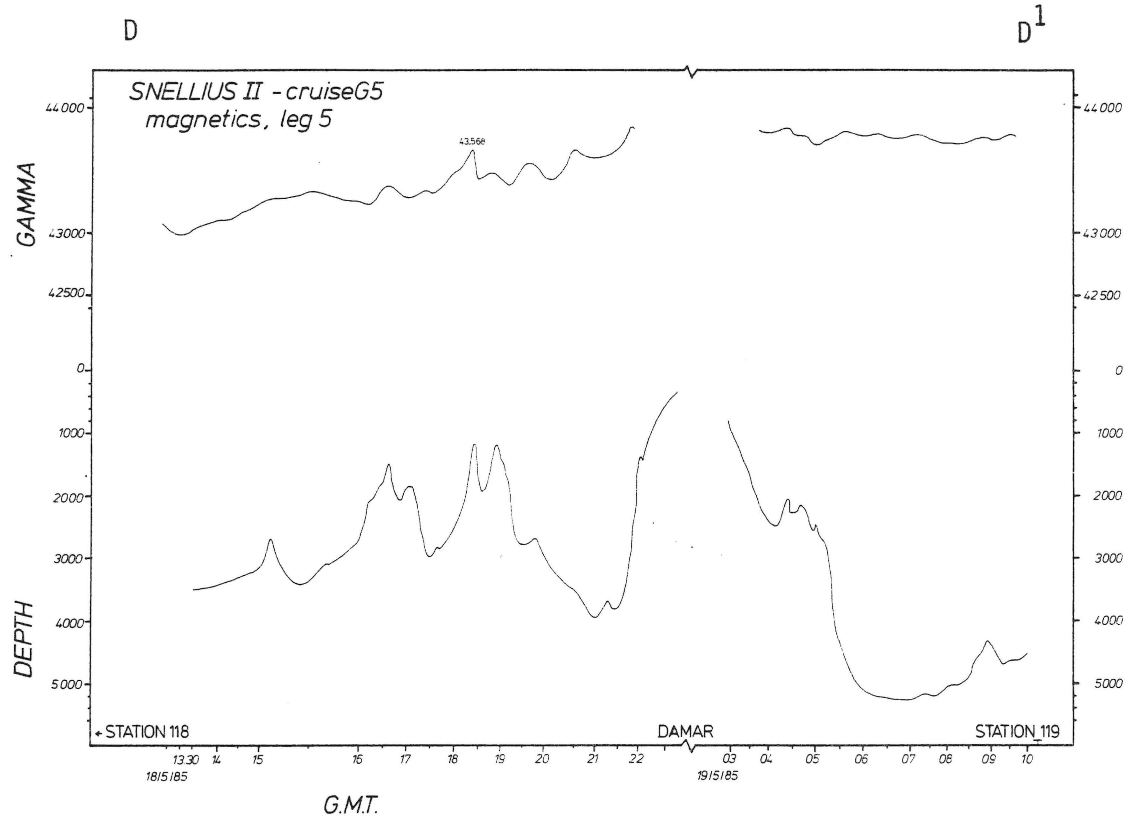


FIGURE 10. Profile D-D^{I} showing magnetic record and bathymetry (3.5 kHz echosounding) along Leg 5 of Snellius II cruise G5. Also shown are projected nearby boxcore (B) and piston core (P) stations. For location see figure 7.

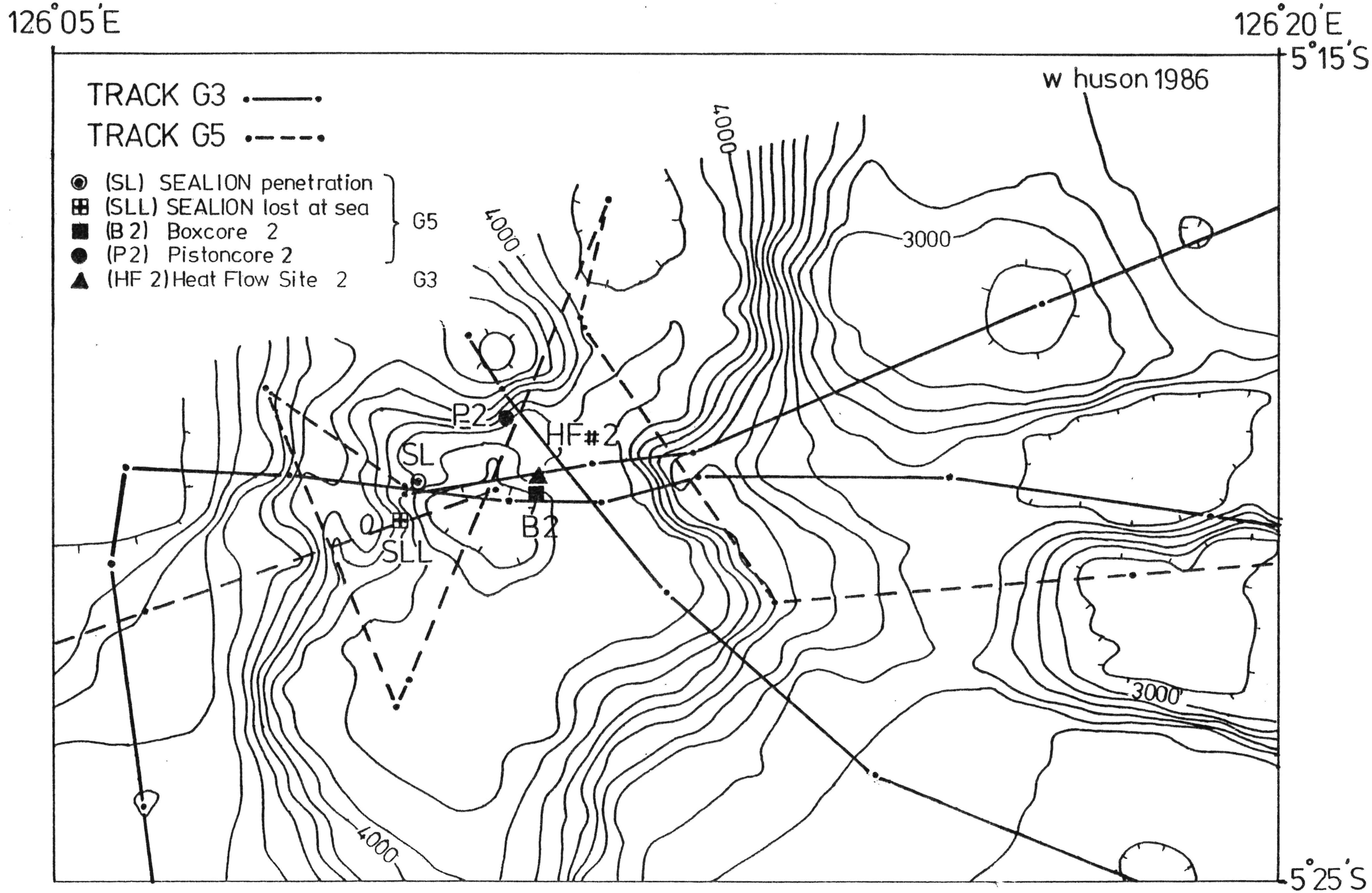


FIGURE 11. Map showing track of R.V. Tyro, during Snellius II Cruises G3 and G5 in area of "Sealion Basin", heavy line with and light line without magnetometry. Also shown are the location of G3 heat flow station HF2 and the location of the G5 Sealion probe and core stations (B - boxcore, P - piston core). Bathymetry shown in 100 m intervals based on 3.5 kHz echosounder data of Cruises G3 and G5. For location see figure 14.

Figure 12 is in preparation at time of completion of this report. It will represent the following information.

FIGURE 12. Map showing track of R.V. Tyro, during Snellius II Cruises G3 and G5 in area of "Aru Basin"; heavy line with and light line without magnetometry. Also shown are boxcore (B) and piston core (P) stations. Bathymetry shown in X m intervals based on 3.5 kHz echosounder data of Cruises G3 and G5 and on published information (..., ..., ...). For location see figure 14.

5. Geotechnical research

5.1. OBJECTIVES

A. Relate the engineering consolidation process to geology and sedimentology:
   1. Determine sediment compressibility and calculate permeability, compression index, consolidation ratio.
   2. Evaluate the quality and quantity of consolidation for selected localities.
   3. Assess if tectonically-induced horizontal forces cause consolidation in the Banda Arc.

B. Evaluate slope instability with regard to down-slope sediment transport. If there is evidence for sediment instability from subbottom profiling:
   1. Determine the types of sediment failure and the force(s) causing failure.
   2. Assess the quality and quantity of slope instability.

C. Evaluate the role of shear strength in the physical processes of diagenesis:
   1. Determine *in situ* shear strength and excess pore pressure.
   2. Measure relevant physical properties from cores.
   3. Evaluate the influence of shear strength in diagenesis.

D. Assess the disturbance caused by sampling and raising cores from great depths to the surface:
   1. Measure and compare the shear strength *in situ* , immediately on board the R.V. Tyro and later onshore to evaluate sampling disturbance.
   2. Evaluate relaxation forces and their influences on the sediments.
   3. Use results to evaluate disturbance of piston cores.

Special equipment for this investigation.

- *In situ:* piezocone-penetrometer: Fugro Sea Lion (measurement of cone resistance and probe-insertion excess pore pressure)
- On board: microprocessed, automated triaxial apparatus: Fugro Tricon (measurement of undrained shear strength)
- On board: Fugro-instrumented Wykham Farrance motor lab. vane (measurement of undrained shear strength)

5.2. GENERAL

The geotechnical crew consisted of Kris Budiono, Cok van Bergen Henegouw and Jan van der Wal who did alternate in 4 hours-on 8 hours-off shifts. Fugro employees Adrian Richards and Hage Hoogedoorn assisted in setting up the laboratory facilities. They disembarked on Banda Island on May 6 1985.

The motorlab vane and the automated Tricon have been developed by Fugro and are now owned by the NRZ, installed at MAC (Marine Earth Science Center, Free University, Amsterdam) and are available for future expeditions.

5.3. METHODS

The in situ measuring tool, the Sealion, was lost in the first sea trial on our second sailing day. During the rest of the program tests and measurements were executed on box- and piston cores and no in situ probes could be made.

Measurements on strength and density/water content were taken every 75cm on 28 piston cores and every 50cm on 6 piston cores. Where possible, measurements were taken on boxcores.

Three basic geotechnical parameters have been determined:
BULK DENSITY, WATER CONTENT and SHEAR STRENGTH. See figure 13 for testing plan per core and Table 1 for distribution of tested cores and nature of tests.

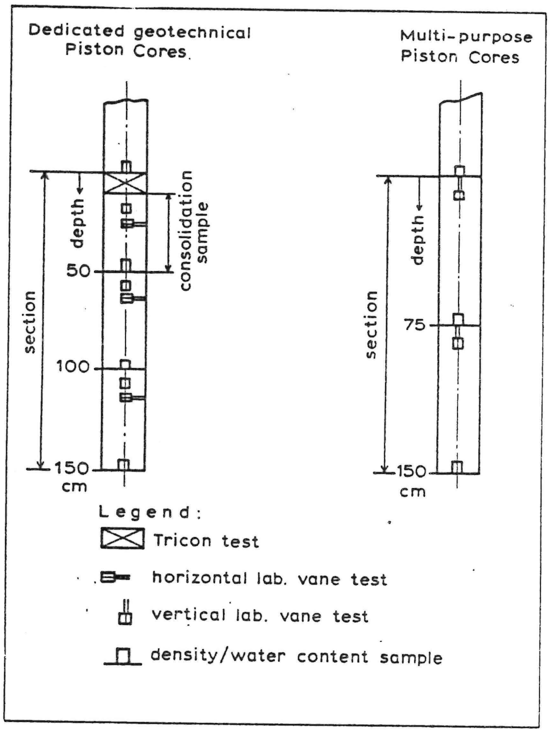


FIGURE 13a.

Schematic geotechnical testing plan.

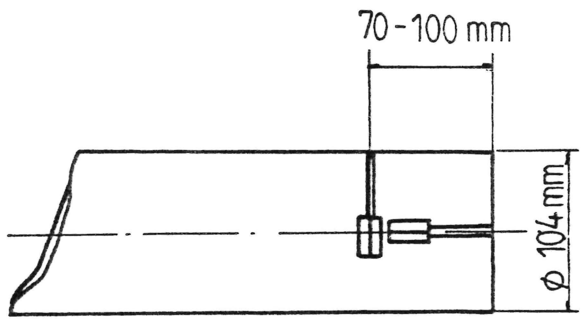


FIGURE 13b.

Vane configuration for testing the geotechnical piston cores.

The number of boxcores and piston cores tested during the different G5 legs and the number of tests per test type are given in the table 1. The actual numeric test results fill many pages and are not reproduced; they are available on request and are given in tabulated form and as plots.

In total, 142 box and 34 piston cores were sampled. The average height of the box cores was 29 cm, with four box corers having no recovery. The average length of the piston cores was 7.5 m, with a maximum of 15.2 m, and one in which no core was recovered (see Table 5).

G5 LEG	Nr.of BOXCORES	Nr.of PISTONCORES	TOR VANE TESTS	BULK DENSITY AND WATER CONTENT DETERMINATIONS	VERTICAL LAB VANE TESTS	HORIZONTAL LAB VANE TESTS	TRICON TESTS	
1	2	1	3	8	4	—	—	
2	60	10	197	176	89	51	16	
3	1	1	3	8	5	—	—	
4	39	10	113	130	70	—	—	
5	—	1	—	14	13	10	4	
6	40	11	116	144	92	—	5	
TOTAL	142	34	432	480	273	61	25	1271

TABLE 1. Numerical overview of geotechnical determinations made during Cruise G5.

It was impossible to measure the shear strength of the material in the box corer by the motorized laboratory vane because the box corers were dismantled and sampled on deck. The Torvane was found to be a suitable alternative for these measurements.

The piston core tubes were tested in a specially equipped geotechnical laboratory. Strength testing (fig. 13) could be executed by using: (1) the motorized laboratory vane tester for horizontal and vertical strength testing, (2) microprocessed triaxial testing (Tricon) and (3) Torvane measurements for correlation purposes. Five piston cores were specially recovered for intense geotechnical research. These piston core tubes were cut into lengths of 50 cm, which were tested for horizontal strength, perpendicular to the piston core axis, and vertical strength also by means of the Tricon tester. The other, multi-purpose, piston cores were cut in lengths of 75 cm. These were tested less rigorously.

Samples were taken for consolidation tests in the laboratory at Fugro B.V.. These samples are pieces of piston core and were cut from the 50 cm or 75 cm tube lengths. The pieces from the geotechnical piston core were taken at regular intervals through the core (fig. 13), and the pieces from the multi-purpose cores were chosen on the basis of the development of the shear strength, water content and bulk density vs. depth. The pieces were sealed with paraffin and stored in the refrigerator. The available pieces are tabulated in Table 2.

TABLE 2. Available consolidation samples.

Piston core Leg	No.	Section (cm) / Corr. water Depth (m)	I	II	III	IV	V
2	53	1991	0-50	0-50	0-50	0-50	0-50
2	55	2119	60-100	60-100	60-100	60-100	-
2	57	1966	60-100	0-40	60-100	110-150	95-145
2	59	1989	50-90	50-90	0-50	0-50	-
4	85	1802	75-90	-	-	-	-
4	89	947	0-15	-	0-15	-	-
4	93	390	-	75-90	-	-	0-15
4	109	6577	-	-	-	75-90	-
5	119	4417	50-90	50-90	50-90	50-90	-
6	149	688	50-90	50-90	50-90	50-90	50-90

Bulk density and water content.

These two parameters were determined by taking a sample of known volume, measuring its weight, drying the sample and measuring its weight again.

$$\text{bulk density} = \frac{\text{wet sample weight}}{\text{sample volume}}$$

$$\text{water content} = \frac{\text{wet weight - dry weight}}{\text{dry weight}} \times 100\%$$

A fixed-volume sample is obtained by inserting a cylindrical tube in the core, removing the tube filled with sediment and carefully cutting the extruding sediment from its ends. Extrude the sample and weigh it on a triple beam balance, then dry it for at least 24 hours at 105 - 110 ^{o}C and weigh the dried sample.

A triple beam balance performed quite well in smooth seas. The accuracy was found to be ± 0.1 of readings in grams. In rough seas the weighing process took quite some time, but the accuracy dropped no further than ± 0.3 of readings in grams.

The working of the constant temperature, air circulating oven in the laboratory proved to be successful. The temperature was very stable and equal at different levels within the oven as determined by measurements. The drying temperature was held between 105-110 degrees Celsius for at least 24 hours. Immediately after cooling of the specimens, they were weighed. It was found that when the specimen were outside the oven after drying for more than three hours, the weight increase was significant because of hygroscopic water intake from the air in the laboratory.

Shear strength.

Shear strength is defined as the maximum resistance of a soil to shearing stresses. Three techniques have been used to determine the shear strength of the sediments: tor vane, lab vane and tricon tests.

TOR VANE.

This simple vane is pushed 8mm into a sediment surface and turned by hand untill failure occurs. A dial on the head of the instrument allows an instant reading of the shear strength of the sediment. Most boxcores have been tested with this device. The Torvane was mostly used with an accessory low-strength adapter, because of the relatively soft material of the box cores. The tests were performed as prescribed in the instruction manual. Comparison of the Torvane measurements with the laboratory vane measurements showed an acceptable deviation of 5 to 10% to the low side of the laboratory vane results. Aberations probably included imperfect sample preparation and differences in the rotation speed of the Torvane. On three occasions the spring in the device broke loose and testing had to be stopped for a short time. Other than this mechanical problem, the Torvane worked very well.

LAB VANE.
An instrumented motor laboratory vane, with a strain-gauged torque sensor, was used with a 0.5 x 1.0 inch (1.77 x 2.54 cm) vane and a rotation speed of approximately 60 degrees/minute. This follows the recommendations contained in a draft standard issued by the American Society for Testing and Materials. No technical problems occurred.

The display showed a very stable zero adjustment on the torque sensor signal conditioner after one hour of warming up of the equipment. Reading the numerical values on the unit proved to be simple and accurate.

The performance of the strip-chart recorder was not good. Since the strength of the tested sediments alternated between very soft to stiff, the desirable recording scale moved from 100 mV to 1000 mV. The zero adjustment and reliability of the recorded plot differed between these two scales. Furthermore, the recorder pen showed a significant delay in plotting the fast changes produced by the incoming signal, especially on the 1000 mV scale. The maximum shear strength could often not be registered very accurately, as compared with the reading on the conditioner. After readjustment of the recorder, the device showed a small improvement in performance, but was still not satisfactory. Whenever possible this problem was avoided by taking data from the digital display rather than from the chart recorder.

Special clamps were developed aboard the ship for fastening the core tubes on the laboratory vane tester stand, both for the different diameters and for holding the tubes vertical or horizontal. Vertical tests were performed in the centre of the core approximately 25 mm below the top of each tube. The maximum failure strength and "residual strength" were recorded from the signal conditioner readings. The tested core most often showed a residual strength minimum after 90 to 150 degrees of vane rotation. Remolded strength was recorded after totally disturbing the strength of the material. This strength was found to be minimal after fast vane rotation by hand with at least three complete turns. Fast vane rotation was performed by turning the vane shaft between two fingers. Hand rotation by the handle on the machine resulted in a relatively lower rotation speed and in significantly higher remolded strength values. The values of maximum shear strength, residual and remolded strength were recorded directly from the signal conditioner readings onto a seperate testing sheet for every piston core except a noted below.

Vane test recordings during legs four to seven suffered sometimes from ship vibrations caused by heavy seas. Eliminating, or at least decreasing, the influence of the vibrations on the tested core was very difficult. Because the readings of the conditioner varied rapidly, measurements were made by reading from a smooth curve that was drawn through the disturbed curve on the recorder.

The horizontal vane tests were done through a hole carefully drilled in the core liner. The hole had a diameter of 20 mm, and was dilled using a specially designed stand to minimize disturbance of the piston core. The distance from the hole to the top of the tube varied between 70 and 100 mm. It was considered to be important to measure the horizontal shear strength as close as possible to the location of the measurement of vertical shear strength without mutual disturbance (fig. 13), and to minimize the chance of having lithological differences.

TRICON TEST.
Special strength determinations have been made on 6 piston cores using a triaxial loading cell. A specially prepared 38x76 mm sample is loaded until failure or 20% strain. The loading is performed by a fully automated strain controled "Tricon". These data have been stored on diskettes and are ready to be processed on a microcomputer.

The mechanical part of the microprocessed Furgro Tricon performed very satisfactory. The electronic system worked well except for the disk storage system. Five out of the twentyfive Tricon tests were not stored on a disk because of "disk faults". Inserting a used disk sometimes revealed this shortcoming immediately, while a new disk only showed the same problem after one or two tests had been performed.

To prepare the specimen, an undisturbed core piece 10 cm of length was extruded and carefully trimmed to a 28 mm width and a 76 mm heigth. A thin rubber membrane was placed over the specimen bounded by bottom and top plates, to insure that cell water could not intrude into the specimen. A cell pressure of 600 kPa was applied to the specimen. Afterwards, the specimen was loaded until 20% strain was reached. The specimen was put into a plastic bag after testing, together with the remnants of the trimmed sample, and stored in a refigerator.

5.4. RESULTS

The sedimentology data obtained from a description of the box cores provide the general sediment type suitable for use in the geotechnical studies. Sediments from shallow water contained coarse-grained coral and/or volcanoclastic gravels, sand or silts. Sediments from deeper water were mainly clays that were soft to stiff, often blue, green or grey of color, and occasionally intercalated with silty and sandy layers or pockets. The geotechnical properties were measured only on the clays. A thorough examination of the data sets remains to be done. For location of cores see figures 14-21 and Table 5.

Box cores

Geotechnical measurements on the box cores were taken within the depth range of 0 to 50 cm below the seabed. A trend was observed when looking at the average water content and bulk densities of data obtained along the different legs (tables 3 and 4) identified in figure 1.

The water content and bulk density values from specimens taken on Legs 2 and 6 are about the same, while those taken on Leg 4 are significantly different.

TABLE 3 Bulk density ranges from specimens taken on box cores.

Bulk density (Mg/m3)	Leg 2 (88 values)	Leg 4 (55 values)	Leg 6 (55 values)
Highest	1.66	1.80	1.61
Lowest	1.17	1.13	1.24
Average	1.37	1.45	1.38
Standard deviation	0.12	0.12	0.08

TABLE 4 Water content ranges from specimens taken on box cores.

Water Content (% dry wt.)	Leg 2 (88 values)	Leg 4 (56 values)	Leg 6 (57 values)
Highest	287	248	217
Lowest	34	47	44
Average	140	111	140
Standard deviation	54	41	36

More remarks on the results from the tests of more box cores can be made. The following section will handle them in order of the Legs:

CRUISE G5 - LEG 2:

- Sediments with relatively high shear strength, compared to the other transects, outcrop in the deepest part of the Weber Deep (box cores 22, 23).
- The sediments in the trench, especially the deepest parts just opposite the deformation front, have a very high water content (box cores 50 to 61).
- Some parts of the accretionary wedge contain sediments with high shear strengths (box cores 37, 40,43).
- The shear strengths of the sediments, in pKa, are:
  soft clay 0 to 6
  moderatly stiff clay 9 to 19
  sandy clay 2 to 9

CRUISE G5 - LEG 4:

- The average water contents are much lower than those of Legs 2 and 6, while the bulk densities are much higher.
- Very high water contents are present in the centre of the Weber Deep (box cores 106, 110).
- Moderately high water contents were found in the sediments in the deepest part of the trench (box cores 83, 84, 86, 87).
- Sediments with high shear strengths outcrop in the accretionary wedge, which is the eastern slope of the Weber Deep (box core 91).
- Very high bulk densities in relation to the water contents assumed the presence of heavy minerals at the very eastern part of Leg 4 (box core 71).
- The shear strengths of the sediments, in pKa, are:

soft clay	0 to 6
moderately stiff clay	9 to 25
sandy clay	2 to 14

CRUISE G5 - LEG 6:

- Slightly higher water contents are found at the north side of the volcanic ridge, and at the north trench slope (accretionary wedge).
- the shear strengths of the sediments, in kPa, are:

soft clay	0 to 5
sandy clay	2 to 10

The significance of some of these results will be discussed subsequently.

Piston cores

Each piston core exhibits a unique depth relationship with water content, bulk density and shear strength. The usual profile is increase of bulk density with increasing depth in the core and a decrease of water content. This relationship occurs in the following piston cores or in parts of these cores: 29, 48, 51, 53. In most cores, other relationships in the water content vs. depth are found. In several instances, the water content increases with depth (cores 25, 57, 93, 107 to 109, 113). Core 93 and probably 89, 108, 109 and 113 contain sediments with high shear strengths, suggesting that the degree of consolidation in the deepest parts of the Weber Deep (Leg 4 with cores 107, 108, 109) is higher than elsewhere.

Shear strength profiles are usual, increasing with depth, or unusual, decreasing with depth (cores 107, 130). In several instances, the shear strength does not increase or decrease but remains approximately unchanged throughout the core or parts of the core (cores 69, 79, 129, 142, 145). Cores that have comparable shear strengths are: 53, 55, 57, 59, and 119. The overall shear strength range lies within 0 to 90 kPa, but can be approximately divided into common sediments having a 0 to 20 kPa range and sediments having shear strengths, ranging from 10 to 90 kPa.

The sensitivity, the maximum shear strength divided by the remolded shear strength, of the average core samples lies within the range of four to nine. These sediments were found to loose 75 to 89 % of their undisturbed strength when remolded. The geotechnical description of these sediments would be "very sensitive" (strength loss of 75 to 87.5 % when remolded). These sediments would be susceptible to gravitational movements if located on slopes subjected to disturbing forces, such as earthquakes. Some sensitivities greater than 15 were found. This means that these "slightly quick" to "medium quick" sediments would loose 87.5 to 97 % of their undisturbed strength when remolded. This large strength loss indicates that when disturbed the sediments will behave more like fluids than solids. Sediments having sensitivities greater that about eight are quite uncommon in ocean basins, as reported in numerous published sources. The discovery of high sensitivities in the sediments of the Banda Sea is exciting, and future study will be directed towards evaluating the significance of the findings.

TABLE 5a.
General description of geotechnical seafloor samples from piston and trip cores.

SAMPLE NUMBER	LOCATION LAT. S	LOCATION LONG. E	RECOVERY (cm)	WATER DEPTH (m)	SEDIMENT TYPE AND REMARK
1.002P	5°20.44	126°11.104	364.3	4282	Scaly clay alternating with diatomitic ooze/clay; test of core.
002T			70		Brown clay on silty scaly clay.
2.021P	4°45.490	130°35.118	no rec.	6535	Failed to sampling.
021T			no rec.		
3.025P	4°34.3	130°58.2	660	4690	Clay and silty clay intercalated with turbidity sand, bioturbated.
025T			30		
4.029P	4°24.6	131°13.6	668.7	3120	Foram clay to silty clay, mottled.
029T			44		Calc. silty clay, mottled.
5.048P	3°54.2	131°51.8	740.5	1813	Calc. clay, homogenous, sparsed forams and bioturbated.
048T			69		Oxidized layer on calc. clay.
6.051P	3°37.362	132°06.854	347	1974	Fugro BV +
051T			73		
7.053P	3°35.911	132°09.811	785	1991	Fugro BV +
053T			65		
8.055P	3°35.490	132°12.202	757	2119	Fugro BV +
055T			78		
9.056P	3°34.569	132°10.589	801.5	2113	Clay and silty clay, calc.
056T			43		Oxidized layer on calc. clay
10.057P	3°29.0	132°17.2	780	1966	Fugro BV +
057T			?		
11.059P	3°30.0	132°15.7	750	1989	Fugro BV +
059T			42		
12.069P	5°10.892	133°47.386	966	3444	Volc. muds and sands in alternating layers (tephra layers?).
069T			21.5		Volc. muds and sands.
13.079P	7°04.027	132°47.135	520.5		Foram ooze/clay on homogenous calc. clay.
079T			no rec.		—
14.085P	6°58.432	132°36.583	385.5	1802	Foram ooze and foram clay on homogenous clay.
085T			39		Foram ooze and foram clay.
15.089P	6°57.800	132°28.951	560	947	Foram ooze and foram rich clay.
089T			no rec.		—
16.093P	6°49.0	132°07.07	960	390	Foram ooze and homogenous silty clay in interbedded layers.
093T			no rec.		—
17.096P	6°40.520	131°45.324	150	590	
096T			no rec.		
18.105P	6°31.5	131°20.0	no rec.	5443	-
105T			84		Clay on siliceous clay.
19.107P	6°23.616	130°53.970	856	6656	Alternating of volc. mud and sand.
107T			76		Clay to silty clay.
20.108P	6°18.255	130°40.025	753	6840	Alternating layers of silty clay and volc. silty sand.
108T			60		Oxidized layer on silty clay.
21.109P	6°16.489	130°33.536	745	6577	Alternating layers of volc. mud&sand.
109T			75		Laminated silt and silty clay.
22.113P	6°09.5	130°19.0	676	2928	Foram ooze and sandy foram clay on tuffaceous volc. sandy gravel.
113T			42.5		Oxidized layer on volc. sand.
23.119P	6°58.3	127°22.5	724	4417	Fugro BV +
119T			85		
24.120P	7°7.8	127°2.1	150	4468	Bioturbated clay on foram clay.
120T			74		oxidized layer on bioturbated clay.
25.129P	7°44.5	127°14.3	1043	1807	Foram clay and foram mud.
129T			50		
26.130P	7°56.9	127°19.1	1106	2735	Foram ooze and biogenic sand on homogenous clay/silty clay.
130T			51		Calc. foram clay.
27.131P	8°04.788	127°24.00	722	2471	Clayey foram ooze and foram ooze.
131T			72		Mottled foram clay.
28.132P	8°10.00	127°24.00	810	3059	Sandy and clayey foram ooze.
132T			44		Sandy and clayey foram ooze.
29.139P	8°42.2	127°37.8	887	1583	Foram ooze and foram clay/silty clay.
139T			27		Foram ooze.
30.142P	9°01.8	127°43.0	887	2479	Clay, calc., homogenous.
142T			no rec.		—
31.145P	9°10.14	127°29.70	968	3267	Calc. clay with some foram.
145T			75		Calc. clay and laminated silty clay.
32.149P	9°21.1	127°49.3	825	1688	Fugro BV +
149T			75		
33.149P2	9°22.0	127°49.8	1539.5	1699	Homogenous clay with foram.
149T2			18		Clay with foram.
34.164P	9°33.5	127°53.2	157	885	Calc. siliceous silty clay.
164T			40		Calc. clay, at top is foram ooze.

Note : + The cores will be tested by Fugro BV for geotechnical purposes,
mod.= moderately, volc.=volcanic, calc.= calcareous,
P=piston core, T= Trip core, no rec.= no recovery, foram= foraminifera

TABLE 5b.
General description of geotechnical seafloor samples from box cores.

CORE No.	LOCATION	RECOVERY (cm)	WATER DEPTH (m)	SEDIMENT TYPE AND REMARK
001B	5°53.8S 119°31.8E	18-20	475	Foram ooze rich in pteropods and burrows. This core is outside research area.
002B	5°20.44S 126°11.104E	29-30	4282	Terrigenous mud (silty clay).
003B	5°30.070S 129°54.428E	-	85	No recovery.
004B	5°30.070S 129°54.428E	10-14	139	Volc. sand (200-1000μ) mixing with shells and coral fragments.
005B	4°30.192S 129°56.173E	11	337.5	Volc. sand and gravel mixing with shells and coral fragments,p.s., fining upward sequence.
006B +	4°30.192S 129°56.287E	16	170	Volc. sand and gravel, do.
007B ++	4°30.911S 129°57.610E	16	660	Volc. sand with some reef debris.
008B	4°31.709S 129°58.975E	10	986	Volc. sand and gravel.
009B ++	4°31.740S 129°58.885E	19	1145	Volc. pebbly sand on volc. sand.
010B ++	4°30.990S 130°00.857E	20.5	1454	Volc. pebbly sand on volc. gravel.
011B	4°34.752S 130°06.286E	27	1820	Terrigenous mud ?.
012B	4°35.054S 130°08.646E	7-9	2000	Volc. sand and gravel.
013B	4°40.741S 130°15.978E	24	2456	Foram ooze, benthic forams are dominant, at top brown sandy silt and oxydized.
014B ++	4°41.689S 130°17.488E	24	2940	Foram clay, homogenous, at top full of burrows.
015B ++	4°43.412S 130°19.043E	26	3410	Foram clay, homogenous, burrowed, one volc.pebble at the base.
016B	4°48.203S 130°28.430E	4.5	4090	Washed-out clay with volc. debris, at top containing Rhabdomina fauna.
017B ++	4°48.880S 130.30.200E	20.5	4561	Clay with Rhabdomina on volc. sand and clay.
018B	4°46.366S 130°30.584E	?	5230	Some surface remains containing brown mud + very fine sand.
019B	4°50.189S 130°30.986E	28	4300	Sandy clay, bioturbated, homogenous; on indurated clay containing pebble.
020B	4°46.706S 130°33.22E	23	5334	Clay containing volc. pebbles at top coarse sand with Rhabdomina.
021B	4°46.412S 130°34.50E	-	6524	No recovery.
021AB	4°46.682S 130°35.050E	1-2	6503	Clay with volc. grains on clay containing forams.
022B	4°41.295S 130°46.262E	12	6023	Stiff clay mix with volc. pebble and cobble and calc. algae fragments.
023B +++	4°39 S 130°40E	30.5-32.5	5578	Clay with rare gray mottlings.
024B +++	4°36.758S 130°52.068E	37	5056	Clay, homogenous and burrowed.
026B	4°29.865S 131°07.403E	34-38	4068	Clay, homogenous, scattered forams.
027B +++	4°24.875S 131°08.785E	38	3351	Clay containing foram; top is burrowed clay with volc. pebble and foram.
028B	4°26.198S 131°07.516E	38	3600	Clay and silty clay with plank.foram; at top Rhabdomina is sticking.
030B	4°23.7S 131°15.7E	36.9-39	2994	Clay, homogenous, burrows; content of foram decreasing downcore.
031B +++	4°22.155S 131°27.618E	41	2401	Foram clay, homogenous,burrows.
032B	4°22.380S 131°17.208E	39	1960	Foram ooze; at top is brown foram clay.
033B	4°20.002S 131°19.036E	40	1723	Foram ooze; at top is foram clay.

TABLE 5b. continued.

CORE No.	LOCATION	RECOVERY (cm)	WATER DEPTH (m)	SEDIMENT TYPE AND REMARK
034B +++	4°19.634S 131°20.848E	36	1399	Foram ooze,homogenous; burrows and pteropods also present.
035B ++	4°19.090S 131°20.848E	26	1091	Sandy clay to sandy foram clay. At top is foram ooze.
036B +	4°17.7S 131°21.3E	28	671	Foram ooze, at top sandy clay with some shell hashes.
037B	4°17.5S 131°23E	24	505	Sand of med./fine size.
038B	4°16.6S 131°25.1E	11	372	Silty and sandy clay. At top sandy clay with biomorpha, surpulites and sea star.
039B	4°15.7S 131°26.4E	wash-out	398	Cobbles and pebbles of various rocks: volc., metamorphic, coral etc.
040B +	4°14.8S 131°28.3E	22	618	Sand with shell hash; at top silty sand containing pteropods.
041B	4°14.1S 131°29.4E	18.5-21	830	Foram ooze with some pteropods; foram mostly of planktonic species.
042B	4°13 S 131°31.0E	26	627	Foram ooze containing some pteropods and gastropods.
043B	4°12.091S 131°33.120E	24-25	823	Foram ooze on homogenous foram clay. Broken shells and pteropods are scarce.
044B +++	4°09.742S 131°36.513S	35	991	Foram-nanno ooze, homogenous; at top is foram ooze.
045B +++	4°05.568S 131°40.074E	35	874	Foram ooze.
046B +++	4°00.275S 131°45.238E	37	1107	Foram ooze, homogenous, bioturbated.
047B +++	3°56.4S 131°49.898E	40	1476	Silty/sandy clay, very unconsolidated.
048B	3°56.2S 131°49.6E	42	1813	Foram ooze. At surface clay with Rhabdómina.
049B	3°47.964S 131°57.218E	35-35.6	1349	Foram ooze on homogenous foram clay.
050B +++	3°38.956S 132°04.966E	44	1659	Foram clay, homogenous, some burrows with faecal pellets.
052B	3°36.631S 132°06.887E	50	1967	The logsheet lost; however on remarks it indicates of very unconsolidated sediment
054B	3°35.490S 132°18.8E	43	2119	Clay with some forams; at top brown foram clay.
058B +	3°28.71S 132°18.8E	48	1846	Silty/sandy clay; at top brownish foram ooze.
060B +++	3°24.478S 132°20.942E	43	1564	Foram clay, homogenous and burrowed.
061B +++	3°24.416S 132°20.788E	43	1402	Foram clay, homogenous and burrowed.
062B	3°23.5S 132°22.3E	41	1097	Foram clay.
063B +++	3°22.74S 132°22.888E	34	919	Clay with some forams, vertical burrow is very common.
064B	3°17.8S 132°25.0E	24-29	684	Foram clay, some glauconites and pteropods.
065B +++	3°17.0S 132°26.4E	36-39	486	Clay with some foram, also glauconite and glass volc.
066B +	3°17.9S 132°25.6	13.2	160	Coquina(shell hash) with silty clay patches.
067B	3°17.8S 132°25.4E	9	40	Coarse carbonaceous sand and coral pieces.
068B	3°15.9S 132°25.7E	41	350	Foram clay.
069B	5°09.394S 133°47.243E	34	3455	Clay with black lenses of volc. ash ?; at surface is sandy clay.

TABLE 5b. continued.

CORE No.	LOCATION	RECOVERY (cm)	WATER DEPTH (m)	SEDIMENT TYPE AND REMARK
070B ++	6°43.452S 133°31.205	22	87	Shell sand.
071B ++	7°06.795S 133°18.389E	24.5-25	78	Bioclastic sand consisting of shell hash, forams, glass volc. and black grains.
072B	7°08.194S 133°06.453E	18	59	Sand of shell debris and foram.
073B	7°07.918S 133°01.509E	0 - 2	88	Calc. sand with shell fragments.
074B ++	7°07.4S 132°58.9E	24	141	Sand, ill sorted with volc. grains. At surface calc.sand with abundant volc.grain.
075B +	7°07.2S 132°57.4E	19	245	Coarse shelly sand on volc. sand containing fine shell debris.
076B	7°06.90S 132°56.0E	35	346	Clay with some foram. At surface coarse calc. volc. sand.
077B ++	7°05.5S 132°53.2E	31	498	Clay with sandy burrows; at top foram sand.
078B ++	7°04.690S 132°49.019E	25	713	Foram sand on burrowed foram sand on clay -silt sediment.
080B ++	7°03.729S 132°47.498E	36	903	Foram sand with brown clay which strongly bioturbated.
081B ++	7°01.782S 132°43.372E	37.5-39	1077	Foram ooze containing mostly plank. foram, glauconite and biotite/limonite ?.
082B +++	7°04.420S 132°43.859E	36-37.5	1288	Clay, homogenous and burrows. At surface is foram ooze.
083B ++	6°59.672S 132°30.187E	39	1654	Foram-nanno ooze; at top foram ooze.
086B ++	6°56.703S 132°31.787E	39	1391	Foram sand mixed with clay.
087B +++	6°58.178S 132°30.331E	37	1171	Foram sand mixed with clay, downward more clayey.
088B +++	6°58.4S 132°30.504E	35-36.5	1023	Clay with some foram and pteropods; at surface is foram ooze.
090B ++	6°57.0S 132°26.5E	25	780	Biogenic sand; at top is coarser.
091B ++	6°55.5S 132°16.7E	32	591	Foram sand, homogenous with some dark volc. grains. At surface found pteropods.
092B +	6°50.509S 132°09.584E	19	478	Clay with few foram, scattered volc. pebble and cobble on surface.
094B ++	6°47.362S 132°01.837E	27	460	Foram sand, at bottom found coral spine.
095B +++	6°42.014S 131°E	37-38	681	Foram ooze of sand size and it is coarsen upward.
097B	6°37.7S 131°34.1	7-12	582	Foram sand, the base is coarser containing granules and pebbles.
098B	6°36.0S 131°33.5E	2	1082	Foram sand with some angular ill sorted gravels and also pteropods.
099B +++	6°35.6S 131°32.5E	40	2140	Nanno-foram ooze, homogenous and very soft.
100B	6°35.443S 131°31.653E	-	2576	No recovery.
101B	6°36.00S 131°32.10E	5	2701	Foram silty sand containing some living worms at surface and one basaltic chip.
102B	6°35.007S 131°29.5E	33-39	3272	Clay with foram and homogenous; creamy pocket filled by foram at the base.
103B	6°34.8S 131°27.6E	2	3865	Polymict gravels consist of sedimentary and metamorphic clasts.
104B +++	6°31.9S 131°23.4E	38	4941	Clay, overlying by sandy clay containing volc. sand and foram; FU sequence.
106B ++	6°36.00S 131°32.10E	34	6241	Oxidized clay on mottled silty clay on laminated clay on brittle clay.
110B	6°13.1S 130°33.3E	35.5-36.5	6251	Clay on laminated clay on brittle and greasy clay, all not calc.
111B +	6°08.86S 130°26.559E	18	5199	Sandy mud with abundant volc. clastics, homogenous; also found sparse tuff pellets.
112B	6°07.963S 130°22.337E	1	3855	Soft clay pebbles.
114B +	6°06.00S 130°11.497E	16-20	3241	Sandy clay containing foram and volc. sand , at base volc. gravel.
115B ++	6°04.439S 130°09.119E	23-26	3657	Muddy/tuffaceous sand with few *Globorotalia*; at base volc. sand.
116B +++	6°03.29S 130°06.42E	32	3886	Clayey silt to fine sand on silty mud on volc. sand.
117B ++	6°03.7S 130°09.1E	27	3181	Sandy mud of volc. debris on volc. sand; at the base sandy mud.

TABLE 5b. continued.

CORE No.	LOCATION	RECOVERY (cm)	WATER DEPTH (m)	SEDIMENT TYPE AND REMARK
118B	6°07.11S 130°13.30E	23	2541	Foram ooze, Menardii species, at the middle some volc. materials.
121B +++	7°13.160S 127°01.408E	35	4059	Clay, homogenous, faecal pellets burrows; also black grains and few foram.
122B	7°18.7 S 127°03.121E	39	4350	Sandy mud, burrowed; at the base volc. sand present.
123B ++	7°18.7S 127°23.8E	23	3988	Soft clay; at the base volc. sand with augite and pumice grains.
124B ++	7°19.372S 127°04.654E	35-36	3667	Bioturbated clay with dispersed plank. foram; at top is mud.
125B +++	7°20.6S 127°04.7E	36	3282	Mottled foram clay; at top foram ooze.
126B ++	7°22.5S 127°07.3E	37	2893	Mottled foram ooze; at top foram-nanno ooze.
127B +	7°21.5E 127°08.03E	10	1911	Muddy foram sand with some dispersed granules and pebbles.
128B ++	7°36.643S 127°11.180E	28	1414	Muddy sand with dispersed black glassy granules.
129B +++	7°45.30 S 127°14.8E	40	1777	Foram ooze, monotonous with floating dark volc. grains ?
130B +++	7°57.8S 127°19.3E	36	2772	Foram bearing muddy silty clay. At top mud with dispersed volc. grains.
132B +++	8°09.6 127°23.8E	35	3070	Foram ooze and foram sand.
133B +++	8°11.0S 127°25.4E	43	2592	Foram clay; at top oxidized foram muddy layer.
134B	8°12.5S 127°26.8E	11	2181	Foram ooze; in between is clay with rich in gravels of metamorphic rocks.
135B	8°14.7S 127°26.0E	1-3	1727	Foram ooze with some metam. granules and pebbles on metam. pebbles and granules.
136B +	8°17.0S 127°27.7E	22	1211	Foram sand with metam. pebbles and cobbles on soft clay rich in pebbles.
137B	8°21.313S 127°29.121E	1.5	691	Foram sand with pebble of terrigenous materials.
138B ++	8°23.30S 127°24.00E	18	1038	Clayey foram sand with terrigenous pebbles.
139B +++	8°42.2S 127°37.5E	34	1570	Foram sand; at surface is foram ooze.
140B +++	8°48.2S 127°36.924E	38-40	1936	Foram mud on calc. clay with some plank. foram.
141B +++	8°59.10S 127°41.70E	40	2294	Calc. ooze with some foram and burrows.
143B +++	9°7.6E 127°4.4S	45.5	2870	Clay containing plank. foram.
144B +++	9°07.867S 127°44.371E	37-39	3151	Soft clay, homogenous and burrows; at top is brown mud.
146B +++	9°10.097S 127°45.212E	44	3000	Foram-nanno ooze, homogenous.
147B +++	9°12.7S 127°46.3	43	2539	Bioturbated clay with no foram.
148B +	9°17.4S 127°47.1E	38-40	1951	Foram clay characterized by vertical burrow.
149B ++	9°22.46S 127°43.62E	20	1673	Foram sand.
150B +++	9°24.5S 127°50.30E	39	1832	Foram-nanno ooze with burrows.
151B +++	9°26.535S 127°50.348E	39-42	1509	Foram clay, homogenous with vertical burrow.
152B	9°27.972S 127°50.838E	38	1286	Foram clay mainly of plank. species; at surface brown mud.
153B +++	9°31.009S 127°52.259E	40	1088	Foram clay; benthonic and plank. species are present.
154B +++	9°32.91S 127°53.61E	40	915	Homogenous foram bearing nanno-ooze.

TABLE 5b. continued.

CORE No.	LOCATION	RECOVERY (cm)	WATER DEPTH (m)	SEDIMENT TYPE AND REMARKS
155B +++	9°34.331S 127°53.980E	40	711	Foram-nanno ooze with pteropods; at surface is foram ooze.
156B +++	9°35.06S 127°53.61E	36	547	Foram ooze, at the base found shell out wash on nanno-foram ooze.
157B +++	9°35.15S 127°54.25E	36	416	Nanno-foram ooze with pathes of forams and pteropods; at surface is foram ooze.
158B ++	9°36.612S 127°54.695E	28	331	Clayey foram ooze of Globigerinoids which strongly bioturbated.
159B +++	9°41.7S 127°55.9E	37.5	210	Fossiliferous sand with small Lamellibranchiata; at surface plank. foram ooze with shell hash.
160B	9°44.9S 127°56.2E	-	150	No data.
161B	9°46.9S 127°56.7E	4	100	Shell debris.
162B +	9°50.73S 127°57.10E	15	90	Granule sized Lamellibranchiata hash; at surface is sand with biomorpha hash.
163B	9°50.725S 127°57.103E	12	71	Biogenic sand and gravel also containing broken shells, molluscs, coral and foram; F.U. in size.

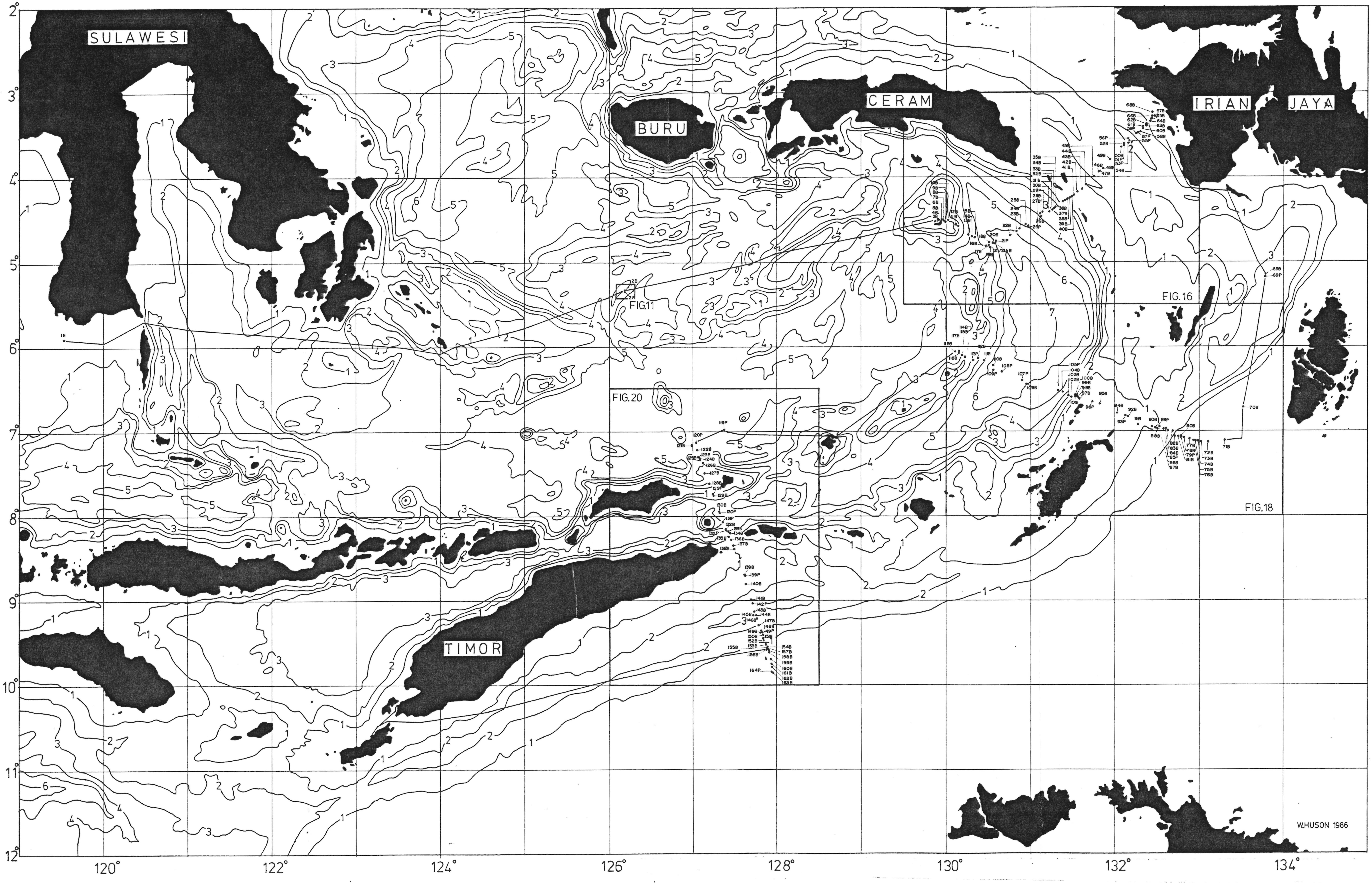
N O T E :

++ = two sediment slabs for x-ray radiography

calc.= calcareous; F.U. seq.= fining upward sequence

volc.= volcanic; med.= medium; p.s.= poorly sorted

metam.= metamorphic; plank.= planktonic; foram = foraminifera



SNELLIUS II,1985 CRUISE G5; TRACKS-CORE STATIONS

FIGURE 14. Physiographic map of Eastern Indonesia showing general track of Snellius II Cruise G5 and locations of bottom samples. Bathymetry after Mammerickx et al. (1976), contour interval 1000 m. Areas of detailed maps figures 11,12,15,16,18 and 20 are indicated.

6. Cruise results

Between May 3 and 24 a total of 176 cores, of which 142 boxcores and 34 piston cores, was taken at 164 stations (an average of 8.1 cores per day) at waterdepths varying between 40 and 6840 meter. See maps and profiles figures 14-21 and Table 6.

The boxcores recovered 39.76m of sediment section, an average of 29cm per core excluding 4 cores that had no recovery at all. With only one exception, all piston cores were successful, recovering a total of 230 meter of section, an average of 6.97m per core. Counting the material recovered by the trip cores and in the core catcher the recovered section averages well over 7.50m per core. Geotechnical measurements (bulk density, water contents, shear strength) were made on all cores amounting to a total of 1271 shipboard tests.

In addition 18 open-close plankton net samples, 13 water bottles of 30 l. (filtered for nannofossils) and two tow net samples were collected while on three stations where also CTD registrations have been made. For locations see figure 22.

Further, 3520 m3 of surface water was pumped and filtered at 53 stations to collect planktic foraminifera, while at the same stations 10 l of water was passed through a modified Willekes Filter to collect 53 coccolith samples. At the same stations 54 watersamples have been collected for salinity and for stable isotope determination. See for location figure 22.

Also, 930 miles of magnetic and 2150 miles of 3.5 kHz profiles were recorded (figures 1, 7-21).

Core station and sample details are given in table 6.
net and pump sample details are given in tables 7 and 8.

Further details are to be found in the captains log book, the cruise log book

LEG 1. Ujung Pandang - Banda Neira, May 3 - 6.

Core stations 1 and 2 (Maps figures 15 and 11, profile figure 8); pumpstations 1-12 (map figure 22).

The objectives of this leg were:
- to familiarize the shipboard party with sampling techniques and procedures and to establish a work routine;
- to sample the sediments and in situ investigate their physical properties at heatflow station no. 2 of Cruise G3;
- to record a magnetic and echosounder profile across the northern Banda Sea;
- to sample the inner slope of the volcanic arc to determine its actuo-facies.

MAY 3. Departure Ujung Pandang 00:01 hour. Heading for Way point 1. En route Pump (plankton, water, pollen) sampling, 3.5 kHz echosounding and magnetic profiling.

E.T.A. station 1 08:30 h, real time 09:30 h. Shallow water station South of Sulawesi to familiarize unexperienced crew members with boxcoring and with sampling routine procedures, team composition etc.
E.T.D. station 1 09.00 h, real station 10.00 h.

WAYPOINT 1, 05°20.00'S 126°11.00'E = Cruise G3 Heatflow Station 2.

E.T.A. station 2 MAY 5, 02:00, real time 03:10 h.
One boxcore , one piston core and 2 sealion tests. See chronological account, Chapter 3.

If ahead of schedule boxcore series approaching Banda from 2000m up: 2000, 1800, 1500, 1300, 1100, 900, 700, 500, 400, 300, 200, 150, 100, 70, 30. Not done because we were behind schedule.

WAYPOINT 2, Banda Naira

E.T.A. May 6, 12:00 h, real time 13:49 h. Richards and Hoogendoorn disembark; sightseeing.
E.T.D. May 6, 15:00 h, real time 17:30 h.

LEG 2. Irian Jaya, May 6 - 12.

Core stations3 - 68 (map figure 16, profiles figures 17 and 23); pump stations 13 - 27 (map figure 22).

The objectives of Leg 2 were to
- systematically sample (boxcore) for actuo-facies along the profile of Transect 3 of Cruise G3, covering the outer wall of the volcanic arc near Banda, the forearc basin (= the Weber Deep), the outer arc or accretionary wedge, the trench and the outer trench wall up to the Australian-Indonesian continental platform;
- piston core possible "outcrops" of older sediment for geohistory analysis;
- piston core young sediment for Late Quaternary paleoceanography;
- acquire 3.5 kHz profiles between and at stations to read seafloor morphology and possibly layering below the mudline, to deduct sedimentary and tectonic setting.
- determine geotechnical properties of deep sea sediments.

The sections recovered by the piston cores are as yet undescribed because the liner has not been opened on board ship. Box cores, however, showed a wide variety of sedimentary facies characterizing different environments. The sediment on the slope of the volcanic arc consists of ooze and hemipelagic mud with a rapidly decreasing calcium carbonate content below 3500m. At some locations volcanic effusiva (pumice) were found and the muds are often mixed with gravitites of volcanic rock debris.

Unconformities, revealed by density contrasts of the mud are not uncommon on the slopes of the Weber Deep, suggesting that this, its northern extension, functions and at least partly originates as its erosional feeder canyon. The channel extends all the way to running westward along the foot of the Ceram slope. Petrologic analysis of the coarse sediment components will test the validity of this suggestion.

The accretionary wedge is largely covered with foraminiferal mud and ooze which is mixed with coarse detritus on the shallower part near the islands of the outer arc. Suspected unconformities also were found in boxcores from the trench slope. The upper part of the slope carries carbonate sand (shell hash) in addition to the ooze and mud.

White specks in the calcareous muds are specimens of <u>Globorotalia menardii.</u> The non-calcareous muds (below CCD) proved rich in arenaceous foraminifera <u>(Rhabdammina-fauna).</u> Occasionally, living vertebrates were recovered by the boxcorer. Small asteroids, crinoids, corals, "worms" and crustaceans have been collected and preserved on alcohol.

Distribution of samples with respect to waterdepth is plotted in figure 23 which shows the regular coverage of the transect.

MAY 6. E.T.D. Banda 17:00 h, real time 17:30 h.
Core stations 3 - 15, total of 13 box cores.

WAY POINT 1, 04°48.0'S 130°29.1'E.

E.T.A. May 7, 16:00 h, real time 11:15 h.
Core stations 16 - 21, total of 7 boxcores and 1 piston core.

WAY POINT 2, 04°43.5'S 130°43.4'E.

E.T.A. May 8, 06:00 h, real time 10:30 h.
Core stations 22-26, total 5 box cores and 1 piston core.

WAY POINT 3, 04°28.915'S 131°06.502'E.

E.T.A. May 9, 02.00 h, real time 15:30 h.
Core stations 27 - 29, total 2 boxcores and 1 piston core.

WAY POINT 4, 04°24.013'S 131°14.147'E.

E.T.A. May 9, 10:00 h, real time 16:30 h.
Core stations 30 - 42, total 13 box cores.

WAY POINT 5, 04°09.72'S 131°35.22'E.

E.T.A. May 10, 03:00 h, real time 07:20 h.
Core stations 43 - 50, total 8 boxcores and 1 piston core.

WAY POINT 6, 03°38.187'S 132°07.194'E.

E.T.A. May 10, 14:00 h, real time 24:00 h.
Core stations 51 - 56, total 2 boxcores and 4 piston cores.

WAY POINT 7, 03°30.39'S 132°15.445'E.

E.T.A. May 11, 01:00 h, real time 12:00 h.
survey at .5 sec sweep to find fault at 2 miles past WP 7.
Core stations 57 - 62, total 4 boxcores and 2 piston cores.

WAY POINT 8, 03°23.4'S 132°22.5'E.

E.T.A. May 11, 13:00 h, real time 21:54 h.
Core stations 63 - 67, total 6 box cores.

WAY POINT 9, 03°15.1'S 132°29.7'E.

E.T.A. May 11, 20.:00 h, real time 02:50 h.
Book II E.T.A.: May 9, 00:01 h, we are 74 h 50 min behind Book II schedule.

LEG 3. Irian Jaya - Arafura Sea, May 12 - 13.

Core stations 69 - 72 (map figures 15 and 12, profile figure 9), pumpstations 28-.. (map figure 22).
The objectives of Leg 3 were to

- record a magnetic and echosounder profile across the Arafura Sea
- sample the Arafura basin
- sample back reef environments we missed at the end of Leg 2.

MAY 12. E.T.D. End Point Leg 2 07:00 h, real time 03:00 h.
25 miles to initial R&R landing point would get us there too early. The R&R stop has been post-poned till ADI ISLAND where we arrived at 12:00 h and set sail again at 15:30 h. From there it was 63.4 miles to Way Point 1.

WAY POINT 1, 5°08.52'S 133°46.0'E.

E.T.A. May 12, 23:30 h, real time 22:00 h.
Core stations 69 - 70, 1 box core and 1 piston core in the Arafura Basin, one box core in back reef setting near Way Point 2.

WAY POINT 2, 07°05.0'S 133°29.0'E.

E.T.A. May 13, 14:30 h, real time 13:00 h.
Core stations 71 and 72, 2 box cores in shallow water.

WAY POINT 3, 07°08.9'S 133°3.3'E.

E.T.A. May 13, 18:00 h, real time 16:30 h.
From here on we followed Transect 2 of Cruise G3.

LEG 4. Arafura Sea - Banda Sea. May 13 - 15.

Core stations 73 - 116 (map figures 15 and 18, profiles figures 19 and 23); pump stations x - y (map figure 22).
The objectives of Leg 4 were the same as for Leg 2, but applied to Transect 2 of Cruise G3.

MAY 13. Departure End Point Leg 3, 16:30 h.
Core stations 73 - 90, total 16 boxcores and 3 piston cores.

WAY POINT 1, 06°54.1'S 132°19.7'E.

E.T.A. May 14, 14:00, real time 15:38 h.
Core stations 91 - 94, 3 box cores and 1 piston core.

WAY POINT 2, 06°49.507'S 132°8.416'E.

E.T.A. May 14, 19:00 h.
Core stations 95 - 96, 1 box core and 1 piston core.

WAY POINT 3, 06°37.5'S 131°36.0'E (off Molu).

E.T.A. May 15, 03:00 h.
Core stations 97 - 105, total 8 boxcores and 1 piston core. One plankton net station.

WAY POINT 4, 06°28.212'S 131°07.335'E.

E.T.A. May 16, 04:00 h.
Core stations 106 - 108, 2 box cores and 1 piston core.

WAY POINT 5, 06°19.5'S 130°47.7'E.

E.T.A. May 16, 17:00.
Core stations 108 - 116, 8 box cores and 3 piston cores.

WAY POINT 6, 06°03.688'S 130°03.690'E. End of Leg 4.

E.T.A. May 18, 05:00 h, real time 21:30 h.

May 18. E.T.D. End Point Leg 4, 21:30 hours.
108 miles sailing to Damar Island, 10 hours.

May 19. E.T.A. Damar Island 07:30 h, real time 08:00 h.
R&R.

LEG 5. Banda Sea. May 18 - 20.

Core station 119. Map figure 7, profile figure 10. Pump stations ....,
map figure 22.
The objectives of Leg 5 were to
- record a magnetic and echosounder profile across the southern edge of the Banda Sea, and
- take a piston core for physical properties measurement on quiet ground well inside the volcanic arc.

May 19. E.T.D. Damar Island 12:00 h.

WAY Point 1, 07°00.0'S 127°23.0'E.

E.T.A. May 19, 19:00 h, real time 18:50 h.
Core station 119, 1 piston core.

This is our Banda Sea core station in a "normal and quiet" area inside the volcanic arc. One piston core for physical properties and one for stratigraphy. If non-calcareous, shallower station were to be selected between waypoints 1 and 2 to be piston cored for Late Quaternary paleoceanography. The core proved to be non-calcareous, but no shallower site was passed for a second core.

Prior to coring at this station a plankton net and water sample series were to be taken, but weather was too rough.

WAY POINT 2. 06°55.0'S 126°57.0'E.

E.T.A. May 20, 04:30 h, real time 00:50 h.

LEG 6. Banda Sea - Timor Sea. May 20 - 24.

Core station 120 - 164, maps figures 15 and 20, profiles figures 21 and 23. Pump stations x - ..., map figure 22.
The objectives of Leg 6 were the same as for Leg 2 and 4 but applied to Transect 1 of Cruise G3 and also covering the inner wall of the volcanic arc.

May 20. Departure end point Leg 5 at 04:30 h real time.

WAY POINT 1, 07°06.6'S 127°01.6 'E.

E.T.A. May 20 at 06:30 h.
Core stations 120 - 129, 9 box cores and 2 piston cores.

WAY POINT 2, 07°44.08'S 127°14.337'E.

E.T.A. May 21 at 14:oo, corr. 0:30, real time 12:00 h.
Core stations 130 - 135, total 5 box cores and 3 piston cores.

WAY POINT 3, 08°14.6'S 127°26.9'E.

E.T.A. May 22 at 03:30 h.
Core stations 136 - 138, 3 box cores.

WAY POINT 4, 08°39.9'S 127°36.7'E (DR).

E.T.A. May 22 at 10:30 h.
Core stations 139 - 142, 3 boxcores and 2 piston cores.

WAY POINT 5, 09°03.7'S 127°43.8'E.

E.T.A. May 22 at 21.00 h, real time 04:30 h.
Core stations 143 - 149, total 6 box cores and 3 piston cores.

WAY POINT 6, 09°22.297'S 127°50.132'E.

E.T.A. May 23 at 11:30 h, corr. 19:00 h, real time 21:00 h.
Core stations 150 - 158, total 9 box cores and 1 plankton net station.

WAY POINT 7, 09°39.0'S 127°55.4'E.

E.T.A. May 24 at 00:30 h.
Core stations 159 - 164, total 5 box cores and 1 piston core.

WAY POINT 8, 10°01.25'S 127°58.46'E.

E.T.A. May 24 at 14:00 h.

LEG 7. Timor Sea - Kupang, May 25 - 27.

Departure from End Point Leg 6 on May 25 at 23:00 h. No underway 3.5 kHz profiling and magnetometry.
Repairs winch and cable. Report writing, sample storage and clean-up to prepare ship for next cruise.

Route: From: Station nr 164P to: Baa-Roads (Roti).

Latitude	Longitude	Course	Distance
10°26',5 S.	123°46',8 E.	257,7°	248',7
10°24',4 S.	123°20',4 E.	274,6°	26',1
10°41',2 S.	123°01',2 E.	228,5°	25',2
10°44',1 S.	123°02',6 E.	154,5°	3',2

Arrival Roti Island 23.15 h. Departure Roti Island 10.00 h.

7. References

Mammerickx, J., Fisher, R.L., Emmel, F.J. & Smith S.M., 1976. Bathymetry of the East and Southeast Asian Seas: Geological Society America Map and Chart Series MC-17, scale 1:6.442.194 at equator.

Ross, D.A., Neprochnov, Y.P. & Supko, P.R., 1978. Initial Reports of the Deep Sea Drilling Project, Vol. 42, part 2, 3-15.

8. Enclosures

ENCLOSURE 1. LIST OF PARTICIPANTS

CHIEF SCIENTIST:	Prof. Dr. J.E. van Hinte	Explorationist	VU
CO-CHIEF SCIENTISTS:	Indon.: Dr. Sumantri Tahrir	Marine Geologist	MGI
	Dutch : Drs. S.R. Troelstra	Micropaleontologist	VU
SCIENTISTS:			
Dutch:	Ir. C.N. van Bergen Henegouw	Grad. student	UvA
	Dr. G. Ganssen	Stab. isotopes	VU
	Mr. A.B. Haak	Grad. student	UvA
	Dr. H.K.H. Holst	Sedimentologist	UvA
	Drs. W. Huson	Marine Geologist	VU
	Drs. W.G.Z.M. ten Kate	Sedimentologist	UvA
	Mr. A.J.F. van der Spek	Grad. student	VU
	Drs. J. van der Wal	Petrophysicist	VU
	Drs. L. Witte	Micropaleontologist	UvA
Leg I only	Dr. A. Richards	Geotechnology	FUGRO
Indonesian:	Kris Budiono B.Sc.	Marine Geologist	MGI
	Drs. Helfinalis	Micropaleontologist	LON
	M. Situmorang M.Sc.	Sedimentologist	MGI
	Drs. Sapri Hadiwisaska	Micropaleontologist	LIPI
OBSERVER:	Major Lawrence Tendean		
TECHNICIANS:	Mr. P. Alkema	Marine Technician	NIOZ
	Mr. A. Asjes	Electr. Technician	NIOZ
	Mr. F. Schilling	Marine Technician	NIOZ
	Mr. J. Schilling	Marine Technician	NIOZ
	Mr. J. Wagenaar	Marine Technician	NIOZ
Leg 1 only	Mr. H. Hoogedoorn	Electr. Technician	FUGRO

Scientists did operate in three teams (teamleaders underlined):

FUNCTIONS	TEAM 1	TEAM 2	TEAM 3
meethut	Huson	vd Spek	Haak
sediment.	Situmorang	Holst	ten Kate
sampling	Sumantri	Troelstra	Ganssen
	Witte	Sapri	Helfinalis
phys. prop.	vBergen H.	vd Wal	Budiono

WATCHES	TEAM 1	TEAM 2	TEAM 3
Leg 1,2	4 - 8	8 - 12	12 - 4
Leg 3,4	8 - 12	12 - 4	4 - 8
Leg 5,6,7	12 - 4	4 - 8	8 - 12

At occasion scientists changed function so everybody got the opportunity to be involved in all the different activities on board.

Technicians worked on a 6 hour on - 6 hour off basis. A cruise like G5 should rather have six than four marine technicians so they also can work on normal shifts, or, when piston coring in two teams of three man.

ENCLOSURE 2. FIGURES 15-24

Figures 15, 17, 19 and 21 are in preparation at time of completion of proper report. They will present the following information.

FIGURE 15a-c. Trackcharts of cruise G5, a. Leg 1, b. Leg 3 and c. Leg 5. For location see figure 14.

FIGURE 17. Profile showing bathymetry and acoustic reflections of Transect 3 of Snellius II Cruise G3 and projected locations of seafloor samples taken during Cruise G5. For location see figures 14 and 16.

FIGURE 19. Profile showing bathymetry and acoustic reflectionsof G3 Transect 2 and projected locations of seafloor samples taken during Leg 4 of Cruise G5. For locations see figures 14 and 18.

FIGURE 21. Profile showing bathymetry and acoustic refection pattern of G3 Transect 1 and projected locations of G5 Leg 6 seafloor samples. For location see figures 14 and 18.

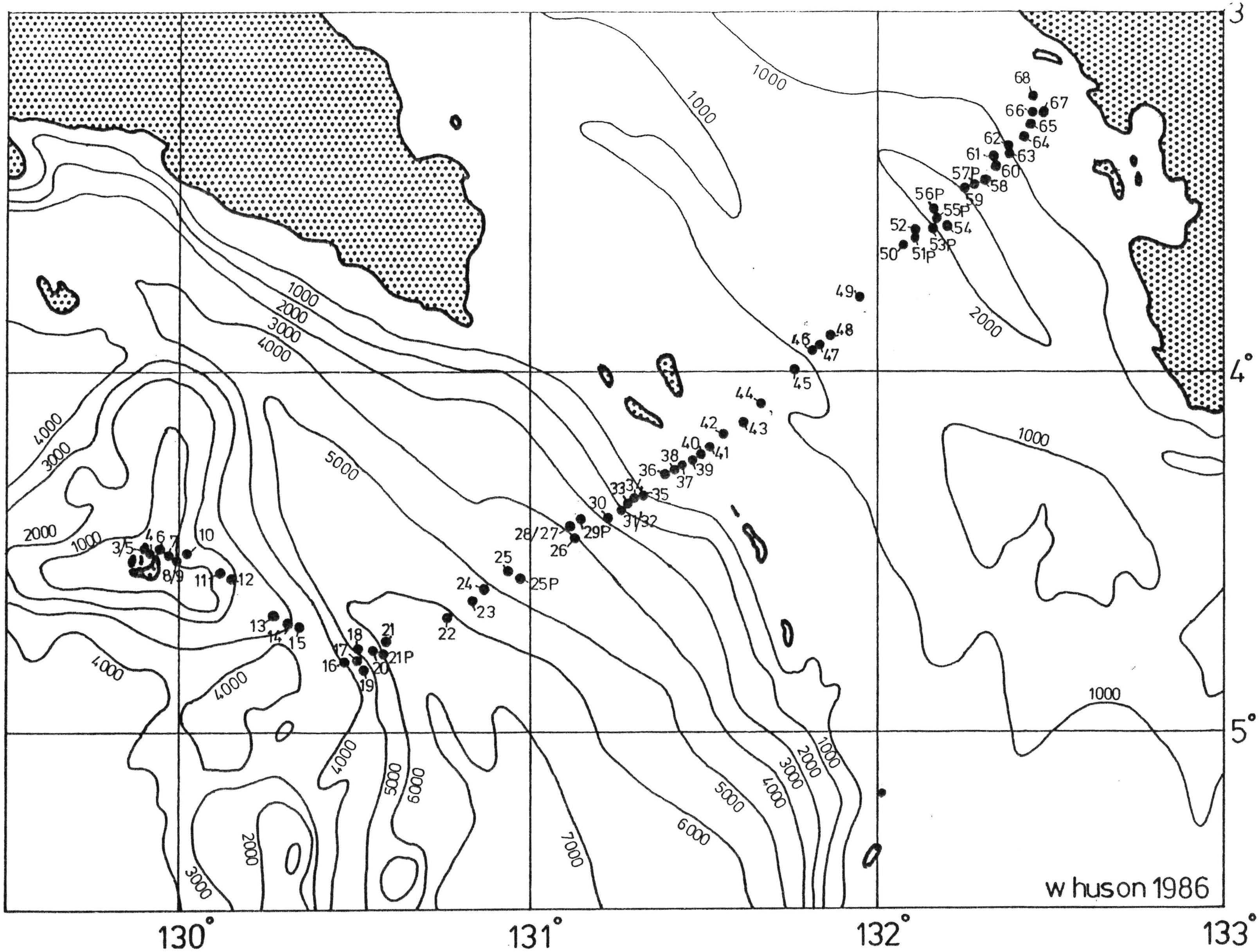


FIGURE 16. Map showing boxcore and piston core (P) sample locations, Cruise G5 Leg 2. Bathymetry after Mammerickx et al. (1976) corrected in accordance with G3 and G5 3.5 kHz echosounder data.

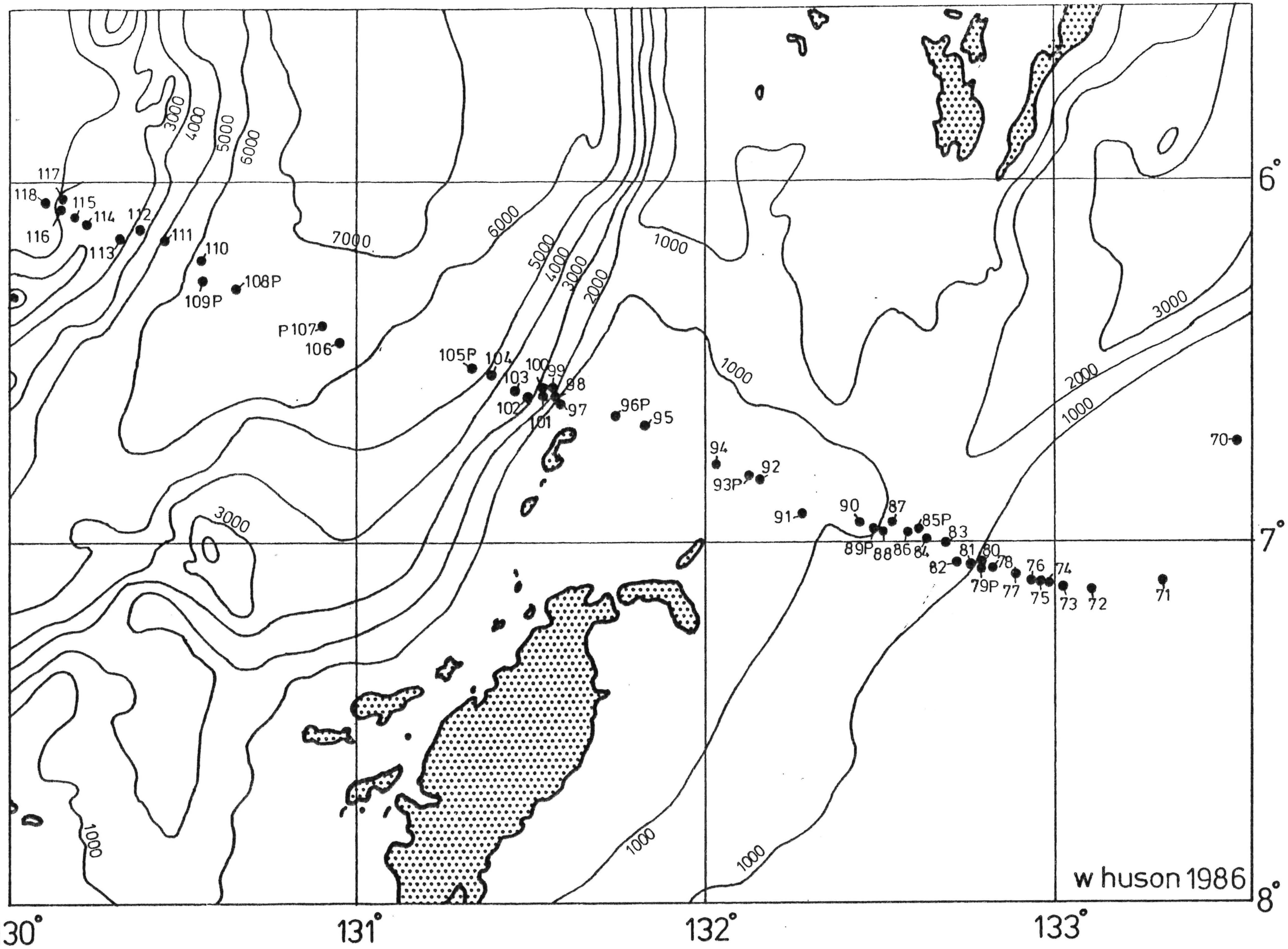


FIGURE 18. Map showing boxcore and Pistoncore (P) sample locations, Cruise G5 Leg 4. Bathymetry after Mammerickx et al. (1976), corrected in accordance with G3 and G5 3.5 kHz echosounder data.

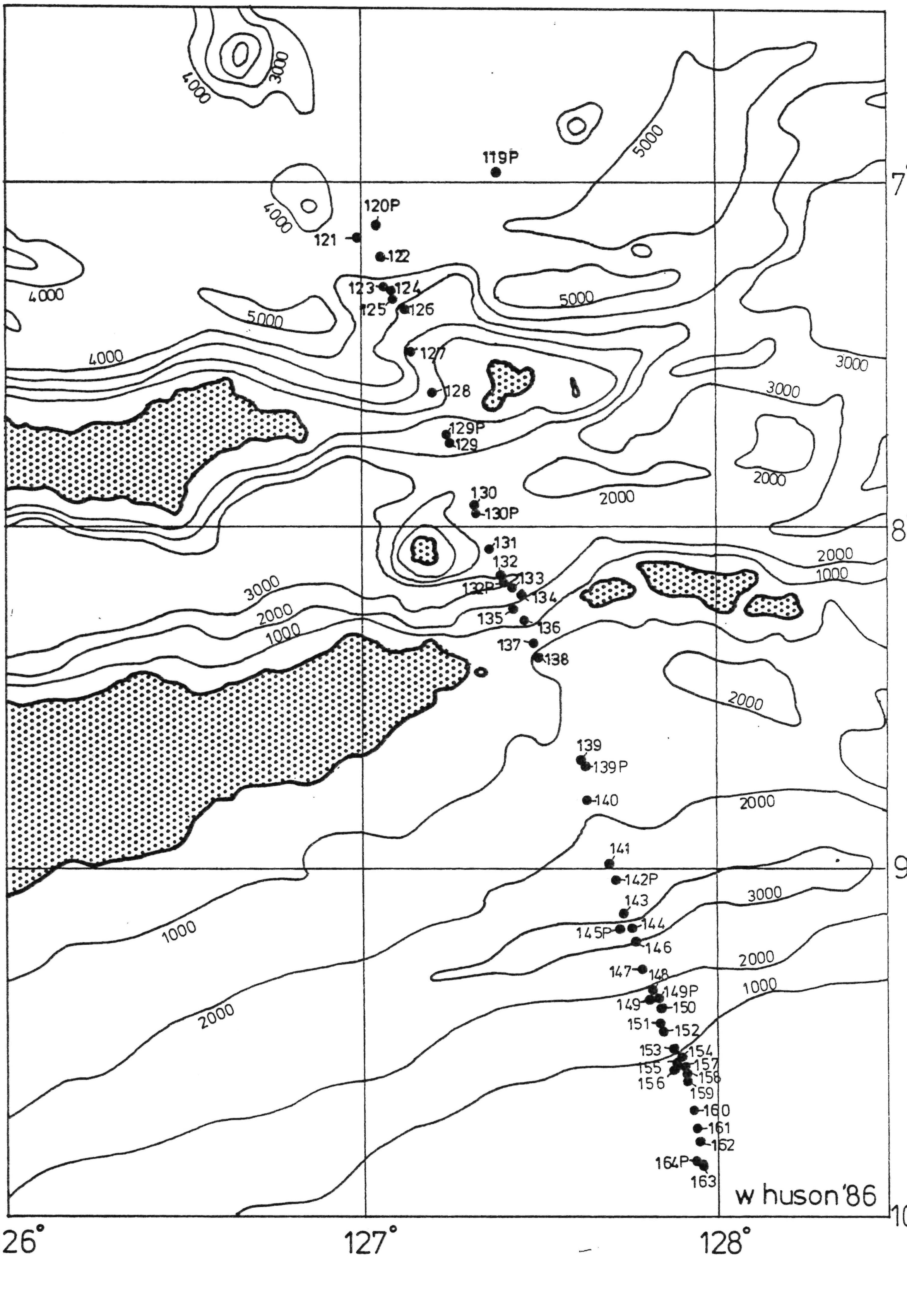


FIGURE 20. Map showing boxcore and piston core (P) locations Cruise G5 Leg 6. Bathymetry after Mammerickx (1976), corrected in accordance with G3 and G5 3.5 kHz echousonder data.

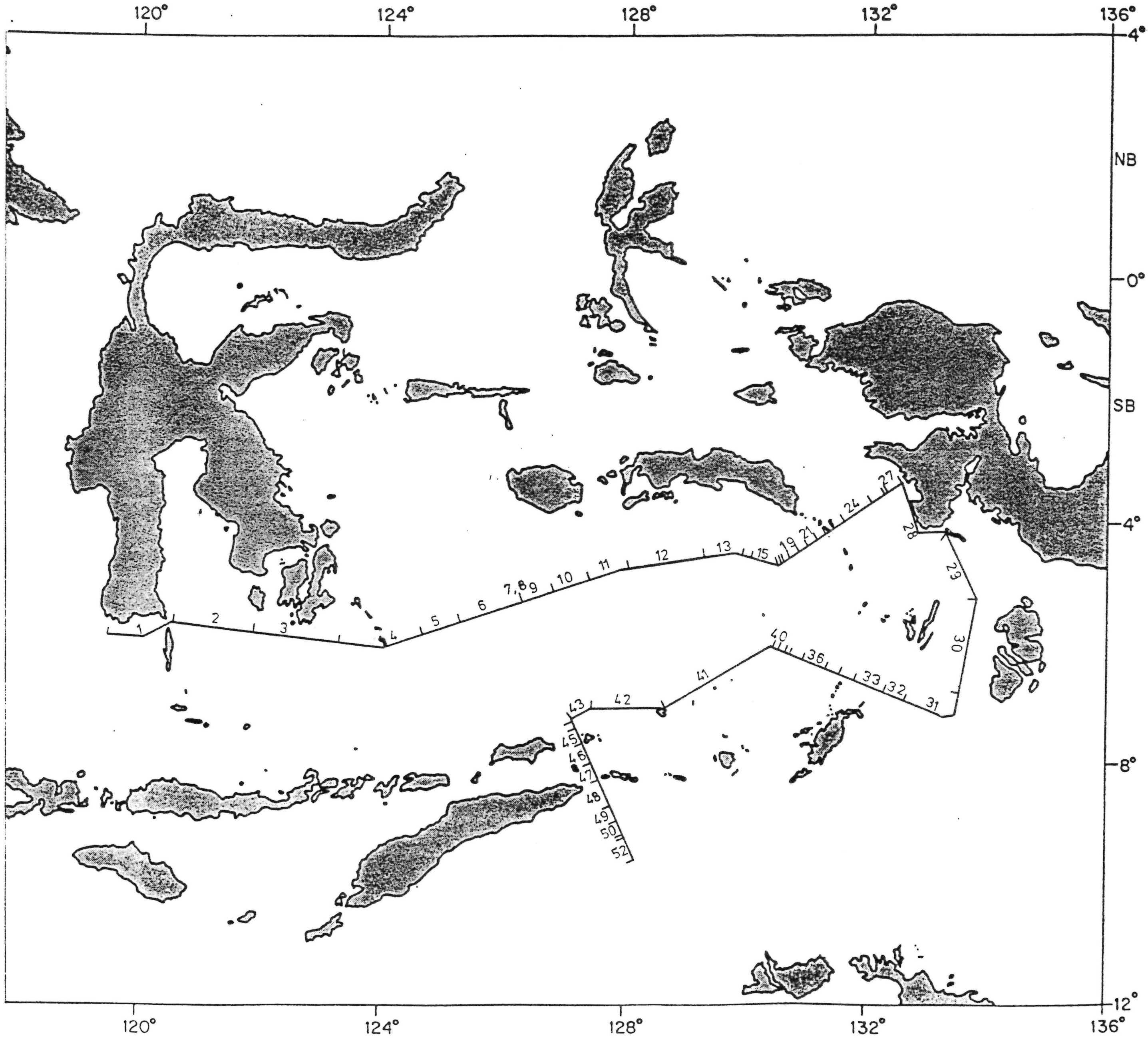


FIGURE 22. Map of Eastern Indonesia showing general track of R.V. Tyro's Snellius II Cruise G5 and location of waterpump, nannoplankton (stripes) and plankton-net (numbered intervals between stripes) samples.

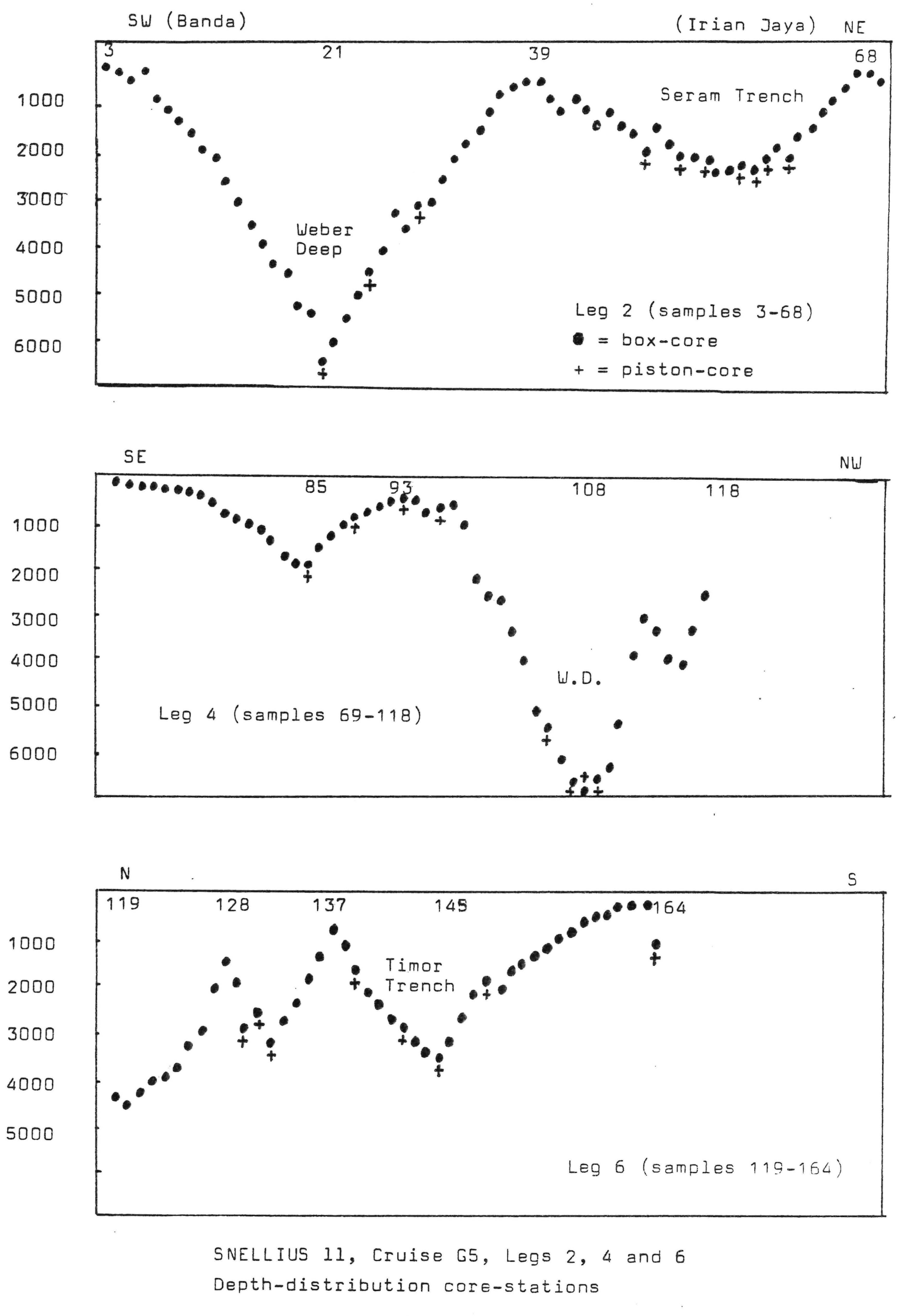


FIGURE 23. Graphs showing depth distribution of seafloor samples taken on legs 2, 4 and 6 of Snellius II Cruise G5. Dots are box cores and crosses are piston cores.

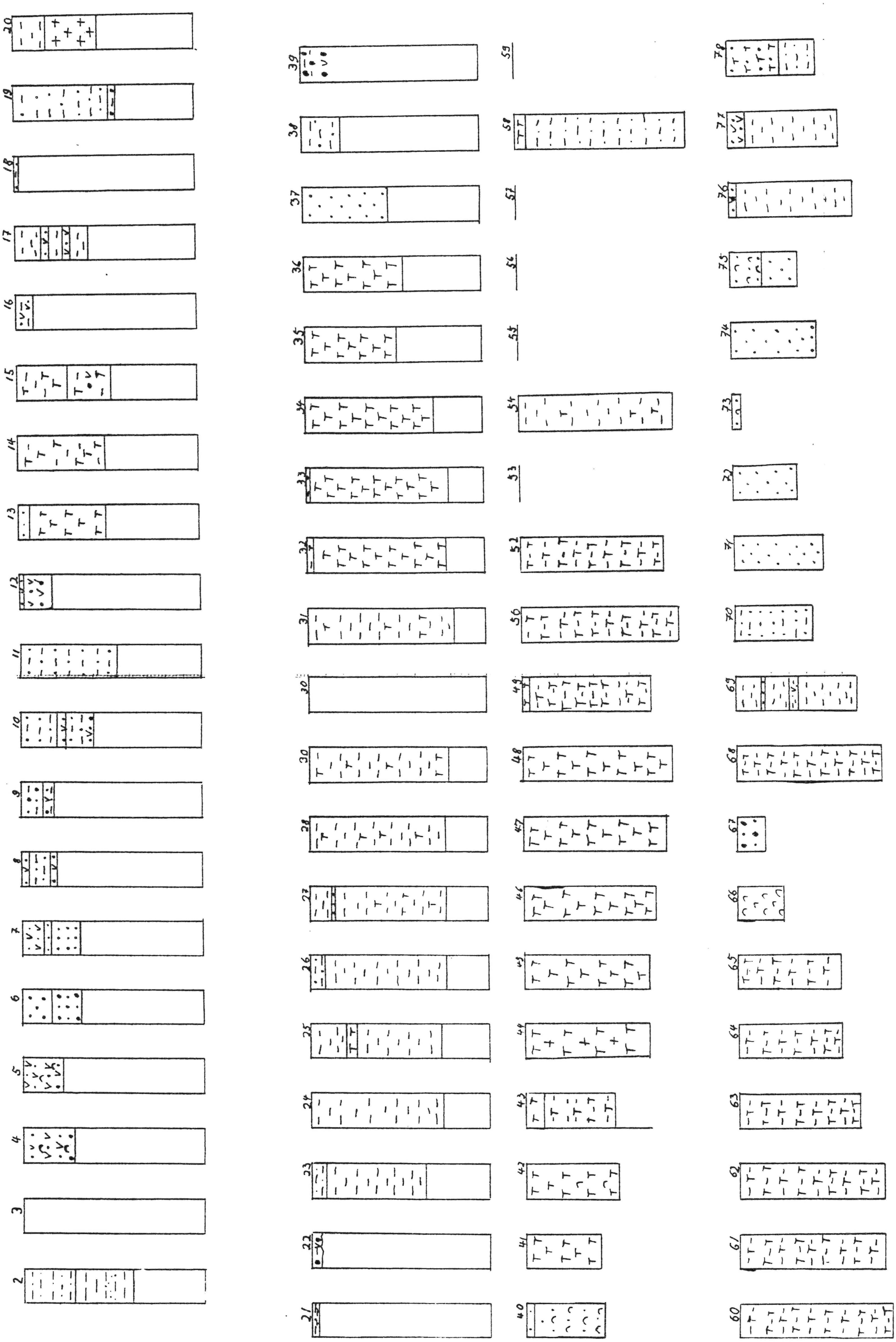


FIGURE 24. Schematic lithology columns of boxcores taken during Cruise G5, legs 2, 4 and 6. For legend see figure 4a.

ENCLOSURE 3. TABLES 6-8

Table 8 is still in preparation as positions have to be derived from sailing times. It will present the following information.

TABLE 8. Tabulation of (a) horizontal plankton net samples, giving sampling intervals and quantities of the filtered water; (b) waterpump samples, giving sampling time and water temperature; (c) nannoplankton samples, giving sampling time and quantities of the filtered water.

TABLE 6.

Table of seafloor samples [boxcores (B) and piston cores (P)] taken during Snellius II, Cruise G5, listing their corrected position (latidude and longitude), waterdepth and vertical recovery, see table 5 for uncorrected positions and sediment description.

core	Latitude	Longitude	Depth (corr) in meters	Recovery in cm.
001-B	S 5° 53.80'	E 119° 31.80'	478	18-20
002-B	S 5 20.61	E 126 10.96	4296	29-30
002-P	S 5 19.37	E 126 10.81	4282	350
003-B	S 4 30.28	E 129 54.05	85	0
004-B	S 4 30.28	E 129 54.05	139	10-14
005-B	S 4 30.19	E 129 56.17	347	11
006-B	S 4 29.72	E 129 56.28	170	16
007-B	S 4 30.91	E 129 57.60	661	16
008-B	S 4 31.71	E 129 58.97	986	10
009-B	S 4 29.90	E 129 53.44	1142	19
010-B	S 4 30.50	E 130 01.00	1454	20.5
011-B	S 4 34.10	E 130 07.10	1820	26.5
012-B	S 4 35.00	E 130 08.60	1991	7-9
013-B	S 4 40.80	E 130 15.70	2456	24
014-B	S 4 42.20	E 130 18.20	2940	24
015-B	S 4 42.83	E 130 19.98	3408	26
016-B	S 4 49.05	E 130 28.27	4000	4.5
017-B	S 4 48.88	E 130 30.20	4561	20.5
018-B	S 4 46.36	E 130 30.58	5230	0
019-B	S 4 50.07	E 130 31.09	4315	28
020-B	S 4 46.73	E 130 33.03	5334	23
021-B	S 4 46.41	E 130 34.15	6524	1-2
021AB	S 4 46.88	E 130 34.69	6503	0
021-P	S 4 45.49	E 130 35.11	6535	0
022-B	S 4 41.43	E 130 45.70	6073	12
023-B	S 4 38.68	E 130 50.00	5578	32
024-B	S 4 36.75	E 130 52.06	5056	37
025-B	S 4 33.67	E 130 56.61	4647	36.5
025-P	S 4 34.80	E 130 58.20	4690	713
026-B	S 4 28.08	E 131 07.90	4068	38
027-B	S 4 24.87	E 131 08.78	3351	38
028-B	S 4 26.13	E 131 07.46	3600	38
029-P	S 4 24.60	E 131 13.60	3120	710
030-B	S 4 23.70	E 131 15.70	2994	39

core	Latitude	Longitude	Depth (corr) in meters	Recovery in cm.
	° '	° '		
031-B	S 4 21.80	E 131 17.80	2401	41
032-B	S 4 22.38	E 131 17.20	1960	39
033-B	S 4 20.00	E 131 19.04	1723	40
034-B	S 4 19.80	E 131 19.50	1399	36
035-B	S 4 19.00	E 131 20.80	1091	26
036-B	S 4 17.70	E 131 21.30	671	28
037-B	S 4 17.60	E 131 23.30	505	24
038-B	S 4 16.60	E 131 25.10	372	11
039-B	S 4 15.70	E 131 26.40	398	0
040-B	S 4 14.80	E 131 28.30	618	22
041-B	S 4 14.10	E 131 29.40	830	21
042-B	S 4 13.00	E 131 31.00	627	26
043-B	S 4 10.80	E 131 33.60	823	25
044-B	S 4 08.50	E 131 37.20	991	35
045-B	S 4 05.59	E 131 39.91	874	35
046-B	S 3 59.80	E 131 45.80	1107	37
047-B	S 3 56.40	E 131 49.10	1476	40
048-B	S 3 56.20	E 131 49.60	1813	42
048-P	S 3 54.20	E 131 51.80	1814	756
049-B	S 3 47.90	E 131 57.07	1349	36.5
050-B	S 3 38.95	E 132 04.96	1659	44
051-P	S 3 37.36	E 132 06.85	1974	347
052-B	S 3 36.61	E 132 06.88	1967	50
053-P	S 3 35.91	E 132 09.81	1991	785
054-B	S 3 35.49	E 132 12.20	2119	43
055-P	S 3 35.56	E 132 12.23	2119	757
056-P	S 3 34.56	E 132 10.58	2113	804
057-P	S 3 29.00	E 132 17.20	1966	780
058-B	S 3 28.70	E 132 18.80	1816	48
059-P	S 3 30.00	E 132 15.70	1989	750
060-B	S 3 24.47	E 132 20.94	1564	43
061-B	S 3 24.41	E 132 20.78	1402	41
062-B	S 3 23.54	E 132 22.34	1097	41
063-B	S 3 22.74	E 132 22.88	919	34
064-B	S 3 17.80	E 132 25.00	684	29
065-B	S 3 17.00	E 132 26.40	486	39
066-B	S 3 16.20	E 132 26.66	150	13
067-B	S 3 16.30	E 132 26.80	40	9
068-B	S 3 15.90	E 132 25.70	350	41
069-B	S 5 09.39	E 133 47.24	3455	34
069-P	S 5 10.91	E 133 47.97	3444	722
070-B	S 6 43.45	E 133 31.20	87	22

core	Latitude	Longitude	Depth (corr) in meters	Recovery in cm.
071-B	S 7° 06.97'	E 133° 18.38'	78	25
072-B	S 7 08.19	E 133 06.45	59	18
073-B	S 7 07.91	E 133 01.50	88	2
074-B	S 7 07.40	E 132 58.90	141	24
075-B	S 7 07.20	E 132 57.40	249	19
076-B	S 7 06.90	E 132 56.00	346	35
077-B	S 7 05.50	E 132 53.20	488	31
078-B	S 7 04.69	E 132 49.01	713	25
079-P	S 7 04.02	E 132 47.13	848	527
080-B	S 7 03.73	E 132 47.50	903	36
081-B	S 7 03.82	E 132 45.28	1077	39
082-B	S 7 03.54	E 132 42.90	1311	37.5
082AB	S 7 00.12	E 132 41.48	1288	0
083-B	S 6 59.67	E 132 38.19	1654	39
084-B	S 6 58.38	E 132 34.81	1749	34
085-P	S 6 58.43	E 132 36.58	1802	422
086-B	S 6 56.70	E 132 31.79	1391	39
087-B	S 6 58.18	E 132 30.33	1171	37
088-B	S 6 58.40	E 132 30.50	1023	36.5
089-P	S 6 57.80	E 132 28.96	947	615
090-B	S 6 57.00	E 132 26.50	780	25
091-B	S 6 55.50	E 132 16.70	592	32
092-B	S 6 49.80	E 132 09.50	481	19
093-P	S 6 49.00	E 132 07.80	390	990
094-B	S 6 47.30	E 132 01.80	460	27
095-B	S 6 40.80	E 131 49.40	681	38
096-P	S 6 39.10	E 131 44.20	590	--
097-B	S 6 36.70	E 131 34.10	582	12
098-B	S 6 36.00	E 131 33.50	1079	2
099-B	S 6 35.00	E 131 32.50	2141	40
100-B	S 6 34.90	E 131 32.10	2576	0
101-B	S 6 36.00	E 131 32.10	2701	5
102-B	S 6 35.70	E 131 29.50	3272	39
103-B	S 6 34.80	E 131 27.60	3870	2
104-B	S 6 31.90	E 131 23.40	4941	38
105-P	S 6 31.00	E 131 20.00	5443	0
106-B	S 6 26.32	E 130 56.80	6241	34
107-P	S 6 23.62	E 130 53.97	6656	856
109-P	S 6 16.49	E 130 33.54	6577	745
110-B	S 6 13.10	E 130 33.30	6251	36.5
111-B	S 6 09.86	E 130 26.56	5199	18
112-B	S 6 07.96	E 130 22.34	3855	1
108-P	S 6 17.61	E 130.39.40	6840	784

core	Latitude	Longitude	Depth (corr) in meters	Recovery in cm.
	° '	° '		
113-P	S 6 09.50	E 130 19.00	2928	725
114-B	S 6 06.00	E 130 11.50	3241	19
115-B	S 6 03.90	E 130 09.10	3657	26
116-B	S 6 03.29	E 130 06.42	3886	32
117-B	S 6 03.20	E 130 09.10	3181	27
118-B	S 6 07.10	E 130 13.30	2541	23
119-P	S 6 58.30	E 127 22.50	4417	724
120-P	S 7 07.80	E 127 02.10	4468	150
121-B	S 7 09.80	E 126 58.80	4059	35
122-B	S 7 13.20	E 127 03.20	4350	40
123-B	S 7 18.70	E 127 03.80	3988	27
124-B	S 7 19.00	E 127 04.80	3667	36
125-B	S 7 20.20	E 127 04.70	3282	36
126-B	S 7 22.50	E 127 07.30	2893	37
127-B	S 7 29.50	E 127 08.30	1911	10
128-B	S 7 37.00	E 127 11.80	1414	28
129-P	S 7 44.56	E 127 14.30	1807	1040
129-B	S 7 45.30	E 127 14.80	1777	40
130-B	S 7 57.80	E 127 19.30	2772	36
130-P	S 7 56.90	E 127 19.10	2735	1102
131-P	S 8 04.50	E 127 21.30	2471	722
132-B	S 8 09.60	E 127 23.80	3070	35
132-P	S 8 10.00	E 127 24.00	3059	810
133-B	S 8 11.00	E 127 25.40	2592	43
134-B	S 8 12.50	E 127 26.80	2181	11
135-B	S 8 14.70	E 127 26.00	1727	3
136-B	S 8 17.00	E 127 27.70	1211	22
137-B	S 8 21.30	E 127 29.20	691	2
138-B	S 8 23.30	E 127 29.70	1038	18
139-B	S 8 42.20	E 127 37.50	1570	34
139-P	S 8 42.20	E 127 37.80	1583	888
140-B	S 8 48.20	E 127 38.00	1936	40
141-B	S 8 59.10	E 127 41.70	2294	40
142-P	S 9 01.80	E 127 43.00	2479	887
143-B	S 9 07.60	E 127 44.00	2870	46
144-B	S 9 07.87	E 127 44.37	3151	39
145-P	S 9 10.14	E 127 43.62	3267	968
146-B	S 9 10.10	E 127 45.21	3000	44
147-B	S 9 12.70	E 127 46.30	2539	42
148-B	S 9 17.40	E 127 47.10	1951	40
149-P	S 9 21.10	E 127 49.30	1688	825
149-B	S 9 22.46	E 127 48.49	1673	20

core	Latitude	Longitude	Depth (corr) in meters	Recovery in cm.
149AP	S 9 22.00	E 127 49.80	1699	1520
150-B	S 9 24.05	E 127 50.49	1832	39
151-B	S 9 26.60	E 127 50.30	1503	42
152-B	S 9 27.97	E 127 50.84	1286	38
153-B	S 9 31.00	E 127 52.30	1088	40
154-B	S 9 32.91	E 127 53.61	915	40
155-B	S 9 34.33	E 127 53.98	711	40
156-B	S 9 35.06	E 127 52.60	547	36
157-B	S 9 35.15	E 127 54.25	416	36
158-B	S 9 36.61	E 127 54.70	331	28
159-B	S 9 41.70	E 127 55.90	210	38
160-B	S 9 44.90	E 127 56.20	150	3
161-B	S 9 46.90	E 127 56.70	100	2
162-B	S 9 50.73	E 127 57.10	90	14
163-B	S 9 50.36	E 127 56.50	71	12
164-P	S 9 33.50	E 127 53.20	885	1200

TABLE 7.

Tabulation of (a) vertical water- and nannoplankton-samples and CTD results and (b) vertical and horizontal plankton net samples.

TABLE 7a.

Vertical water- and nannoplankton (COC)-samples and CTD results.

Cruise: G5
Leg: 2
Station: 59
Date: 11-05-'85 Time: 18.10

Depth	T [^{o}C]	S [^{o}/oo]	sample
0050	27.0	34.20	018/C13/COC
0100	24.8	34.40	018/C13/COC
0200	25.1	33.30	018/C13/COC
0300	25.1	33.00	018/C13/COC

Cruise: G5
Leg: 4
Station: 101
Date: 15-05-'85 Time: 11.30

Depth	T [^{o}C]	S [^{o}/oo]	sample
0050	27.40	33.70	018/C13/COC
0100	22.80	34.40	018/C13/COC
0200	14.35	34.60	018/C13/COC
0300	10.85	34.60	018/C13/COC

Cruise: G5
Leg: 6
Station: 147
Date: 23-05-'85 Time: 18.00

Depth	T [^{o}C]	S [^{o}/oo]	sample
0005	27.2	33.30	018/C13/COC
0050	27.2	33.45	018/C13/COC
0100	24.7	34.35	018/C13/COC
0200	15.5	34.60	018/C13/COC
0300	10.7	34.60	018/C13/COC

TABLE 7b.

Vertical and horizontal plankton net samples.

Cruise	Leg	Station	Date	Time	Depth (from-to)	nettype (v,h)
G5	2	59	11-05-'85	18.10	300-200 200-100 100-000	202 µm, 75 µm (v) 202 µm, 75 µm (v) 202 µm, 75 µm (v)
G5	4	101	15-05-'85	11.30	300-200 200-100 100-000	202 µm, 75 µm (v) 202 µm, 75 µm (v) 202 µm, 75 µm (v)
G5	6	147	23-05-'85	18.00	300-200 200-100 100-000	202 µm, 75 µm (v) 202 µm, 75 µm (v) 202 µm, 75 µm (v)
G5	6	148	24-05-'85		3	75 µm (h)
G5	6	149	25-05-'85		3	75 µm (h)

v-vertical, h-horizontal