

PART 1

INTRODUCTION

MATERIAL AND METHODS

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INTRODUCTION

The CORINDON (Coriolis-Indonesia) -IV cruise was a France-Indonesia joint oceanographic cruise and was carried out in the Bay of Ambon, the northern part of the Banda Sea and the Bay of Piru from the 3rd to 16th April 1981. Preceding the CORINDON-IV cruise there had already been three other CORINDON, namely, the CORINDON -I,II in October 1980 working on geology and biology in the Strait of Makassar, the CORINDON-III in March 1981 working on geophysics in the Banda Sea. All the CORINDON cruises used the Research Vessel CORIOLIS from France.

As the previous cruises, the CORINDON-IV cruise was organized within the framework of the bilateral cooperation on oceanology between the Governments of France and Indonesia. This cruise was planned and attended jointly by the scientists from the both countries. The scientists participating in the cruise came from ORSTOM in Noumea, Center of Oceanology in Brest, and from the National Institute of Oceanology in Jakarta and Ambon.

The main objective of the CORINDON-IV cruise was to obtain additional oceanographic data in the Bay of Ambon and the near-by seas, and it was expected that the results of the cruise would be complementary to the results of the previous work carried out by the Ambon Oceanographic Field Station. Knowledge and technological exchanges between the scientists from both countries participating in the cruise and increasing capabilities of methods and data processing were also the aims of this venture. In regards to the importance of the study in the Bay of Ambon, at least two reasons are worth being mentioned. Firstly, the Bay of Ambon is well known as a potential ground for life bait that plays an important role in tuna fisheries in the area. Secondly, the effects of the rapid development of the city of Ambon and ever increasing activities along the coastal areas of the bay, may in the near future result in an unexpected impact or even deteriorate the conditions of the ecosystem of this bay. Knowledge on the oceanographic as well as biological processes of the bay will certainly contribute to the formulation of a sound policy for the future utilization, development and management of it.

In accordance with the objective of the cruise CORINDON-IV in April 1981 three areas of activity were covered, namely :

- The bay of Ambon with main activities on oceanography and pollution study,
- Northern part of the Banda Sea with the main activity on oceanography, and
- The bay of Piru with the main activity on biosystematic studies of benthic fauna.

The results of the pollution and the biosystematic studies will be prepared by another group of scientists and will appear in separate report.

Itinerary

The cruise started on April 5 and after the mooring of two current-meters, the first two days were devoted to the study of the inner and outer bay where 19 hydrocasts were achieved. From April 7 to 9 two transects were done in the Banda sea, between Ambon and Buru and southward of the Ambon bay. This part of itinerary is described in figure 1 and figure 2. On the 10,11 and 12th April, productivity studies were achieved on three fixed points (see location on fig.1), together with additional measurements of thermal structure and currents. On the 13th, sediments and sea-water samples were taken in the inner bay for pollution studies. From the 14th to the 16th April, 8 trawlings were done in the Piru and Ambon bay on transects described in figure 1.

Participants

The following french and indonesian scientists participated to the different parts of the cruise.

First name	Name	Quality	Laboratory	Cruise		
				1	2	3
Jean Paul	REBERT	Scientist	ORSTOM	+	+	+
Alain	MORLIERE	"	"	+		
Yves	DANDONNEAU	"	"	+		
Lionel	LEMASSON	"	"	+	+	
Alain	DESSIER	"	"	+	+	+
Henri	FERRER	Assistant	"	+	+	+
Jean Louis	MARTIN	Scientist	CNEXO-COB		+	
Sujatno	BIROWO	"	LON	+		
A.B.	SUTOMO	"	LON	+		+
Luc	WENNO	"	LON	+		
Kasim	MOOSA	"	LON			+
Sofian	RANY	Liaison officer		+	+	+
	BURHANUDIN	Scientist	LON			+
Agus	TUPAMAHU	Student	Un. Patti.			+
Sam	WOUTHUYZEN	Assistant	LON			+
	THAYEB	Scientist	LON		+	
	HAMIDAH	"	LON		+	
Horace	HUTAGALUNG	Assistant	LON		+	
Surti	PANTI	Scientist	Batan		+	
Joko	SANTOSO	Assistant	LON		+	
	ANGEL	Expert	Un. Patti.		+	
B.	WENNO	Enseignant	Un. Patti.		+	

MATERIAL AND METHODS

A total of 32 hydrological stations were occupied during the CORINDON-IV cruise in April 1981. They consisted of 23 stations in the Bay of Ambon and 9 stations in the northern part of the Banda Sea. The area of activities/studies and the positions of stations are shown in figures 1 and 2.

Sea water sampling for hydrological analysis and temperature measurements using Nansen Bottle equipped with reversing thermometers were carried out at standard depths at each station. Data collected during the cruise include temperature, salinity, oxygen, phosphate, nitrate, nitrite, silicate and chlorophyll. One mooring current observation in the inner Bay of Ambon and two current profilings in the outer Bay of Ambon were also carried out during the cruise. In the Banda Sea one current profiling down to 600 m depth was executed at every hydrological station. Geoelectrokinetograph (GEK) recordings for surface currents were also run along the tracks Buru-Ambon and Ambon-South.

- *Temperature* -

Temperature at every standard depth was measured by Reversing Thermometers and expressed in °C. Continuous vertical temperature recording down to 300 m depth at every station using a bathythermograph (BT) was also carried out.

- *Salinity* -

Salinity was determined by an inductive couple salinometer (Model 601, Mark III) and it was expressed in ‰.

- *Oxygen* -

The free soluble dissolved oxygen in sea water was determined by titration following WINKLER method. The titration was done by Metrohm Herisau-Multi Dosima E415 coupled with a pH meter E512. The oxygen content is expressed in ml/l.

- *Nutrients* -

These nutrients contents were all determined by Technicon Auto Analyzer II and expressed in $\mu\text{mol/l}$.

- *Chlorophyll* -

Chlorophyll measurement was carried out from the surface down to 200 m depth. It was determined by a fluorometer Turner model 110 and

expressed in $\mu\text{g/l}$ or mg/m^3 . In vivo fluorescence was calibrated at each station with a measurement of chlorophyll concentration of the surface water according to the method of HOLM-HANSEN et al. (1965).

B.O.D.

An attempt to determine the BOD was done at some stations in the bay. As no special device was available on board, the BOD has been determined according to the following method : at each station two surface samples were taken and the O_2 content of the first one immediately analysed. The second bottle was put at dark in the air-conditioned lower laboratory during five days. The room temperature was about 21°C . After five days the O_2 content was analysed and the oxygen demand was determined by subtracting the result from the first one.

Currents

Three different kinds of direct current measurements were achieved during the cruise.

1. - Moorings

Two Aanderaa RCM4 current-meters were moored between the inner and outer Bay.

The mooring was located near the navigation buoy indicating the entrance of the inner Bays i.e. in the west side of the channel. The depth was about 17 meters. The depths of the current-meters were 7 and 14 meters. To minimize the noise in current measurements the mooring was of subsurface type, the line of current-meters being lightened by subsurface floats ensuring a positive buoyancy to the current-meters line.

2. - Current profiles

From stations 20 to 30 in the Banda sea after each hydrocast vertical profiles of velocity, salinity and temperature were made using a diving profiling current-meter. This instrument consists of an Aanderaa RCM3 recording current-meter mounted in a cylindrical hull manufactured by Tareq. The hull was ballasted to sink slowly along the hydrographic wire at a mean speed of 10 cm/s . With a sampling time rate of 30 s the vertical resolution is therefore of about 3 meters.

To get relative currents the ship drifting with wind and surface currents, the ship motion is deduced from the measurements of a second RCM4 current-meter hanging at the end of the wire at a depth of 600 meters, and sampling at the same rate. The currents at 600 m are then vector-subtracted from the currents measured at each depth at the same time, thus giving the current profile relative to the 600 meters layer. This method has proved to give better results than the method consisting of subtracting a constant drift when the surface drift of the vessel is irregular and the weather is calm, which was the main case during this cruise. When the sea is rough the ship's movements introduce too much noise in the bottom current-meter measurements and the resulting profile may be strongly biased.

All the data processing and mapping was performed on board, using an Anderaa decoder directly linked to a HP 85 micro-computer, and software developed in the ORSTOM Center of Nouméa. Unfortunately mechanical malfunction of the bottom current-meter appeared after station 23. All the following profiles of resulting currents were therefore computed using a constant drift referenced to the average velocity in the last 30 meters of the profile.

3. - G.E.K.

On the two legs in the Banda sea the surface current was measured during the way back to station 20 from stations 25 and 28. The instrument used was a RINKEN model, with electrodes manufactured at ORSTOM Nouméa.

Plankton

At each station two vertical WP2 zooplankton net tows have been made between 200 m and the surface or from the bottom to the surface when the depth was less than 200 m.

Productivity

The material, method and results are described together in the part 3.