were considerably large amount of small fishes which might have escaped through mesh of the net (as the stretched mesh size was 90 mm).

Large sized valuable fishes were caught considerably at the area situated near the edge of the continental shelf, the depth of which was shallower than 200 metres. Especially good catch was encountered at Area D.

The catch per 30 minutes trawling are shown as under :

Area		No. of hauls	Catch per 30 min. haul in ton.
East China Sea	A	3	0.11
	B	2	0.09
	C	2	0.06
	Total	7	0.09
South China Sea	D (deep)	9	0.07
	D (shallow)	4	0
	E (d)	6	0.06
	E (s)	1	0.34
	F (s)	5	0.06
	Sub total (d)	20	0.11
	" (s)	5	0.07
	Total	25	0.10

The fishing efficiency of the R/V Kaiyo-maru was rather low compared to the Japanese commercial pair trawlers, as shown below: the value of catch per 80 minuts' trawling which is the standard trawling duration of pair trawlers.

	Commercial pair trawler				Kaiyo-maru	
	May 1970		June 1970			
Area	H	CPH	H	CPH	H	CPH
		ton		ton		ton
A	1156	0.30	463	0.30	3	0.26
B	4156	0.32	1853	0.44	2	0.25
C	16	0.37	7	0.32	2	0.15

H, number of hauls; CPH, catch per 80 minutes' trawling.

THE FISHERIES OCEANOGRAPHY

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Fishing Condition and its Oceanographic Interpretation in Bottom Long Line Fishing Grounds

by
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Abstract

During the experimental bottom long line fishing conducted in June and September, 1972, near the Gulf of Thiland and off Kuching, Sarawak respectively, simultaneous oceanographic surveys were also carried out. The analysis of the data suggested possible relation between oceanographic and fishing conditions. Throughout the two trips it was a common feature that good catches were often obtained near the boundary between the nearshore warm water and the deeper cold water.

Through oceanographical consideration of the data obtained, the following conclusion was deduced. There is a possibility that good fishing grounds are located along the canyon off Kuching throughout all seasons. However, their locations may be altered with the change of oceanographic conditions. In the area off the Gulf of Thailand, good fishing grounds may be formed only in certain specific seasons.

INTRODUCTION

Studies on the feasibility of bottom long lining in the South China Sea were conducted by the research vessels CHANGI in June and September, 1972. One of the two survey cruises was made near the Gulf of Thailand during 17–25 June, and the other off Kuching, Sarawak between 16 and 27 September. Systematic surveys on oceanographic condition were also carried out simultaneously with the experimental bottom long line fishing.

The purpose of these studies was to investigate the existence of possible relationship between oceanographic and fishing conditions.

SURVEYS

During the June trip, the experimental bottom long linings were made at six different locations within the area enclosed by 6°20'N and 8°15'N in latitude, and 102°20'E and 103°45'E in longitude. Except for one operation at the final location, two operations using different types of long line were made repeatedly at each location. The number of units used in each operation ranged from 14 to 21. Twenty oceanographic stations were arranged at almost regular intervals to cover this area, while six other stations outside the area were arranged at intervals of about 30 nautical miles along the east coast of the Malay Peninsula. At each station serial and BT observations were made.

During the trip in September, bottom long line opera-

tiolns were made at six different locations arranged almost along a submarine canyon, off Kuching. In most cases one operation was made at each location, but at some locations two operations were made using the same type of long line. The number of units used in each time was in the range of 15–50. Twenty-six serial and BT observation stations, together with some additional BT stations, were arranged to cover the whole area bounded by 3°30′N and 2°10′N, and 110°50′E and 109° 45°E.

RESULTS

Area Off the Gulf of Thailand

The bottom configuration around this area is very irregular and shows some interesting features (Fig. 1). The sill of the Gulf of Thailand runs along a line connecting the border of Thailand and Malaysia with the tip of Cape Ca Mau. While it is about 55–60 m. deep the two troughs near the sill, one approaching from the Gulf of Thailand, and the other from the open ocean, are deeper than 70 m. A wide bank off Cape Ca Mau extends towards the bay head along the east coast of the Gulf. While from the opposite side, a submarine ridge shallower than 50 m. projecting from the border of Thailand and Malaysia to the midpoint of the sill towards Cape Ca Mau.

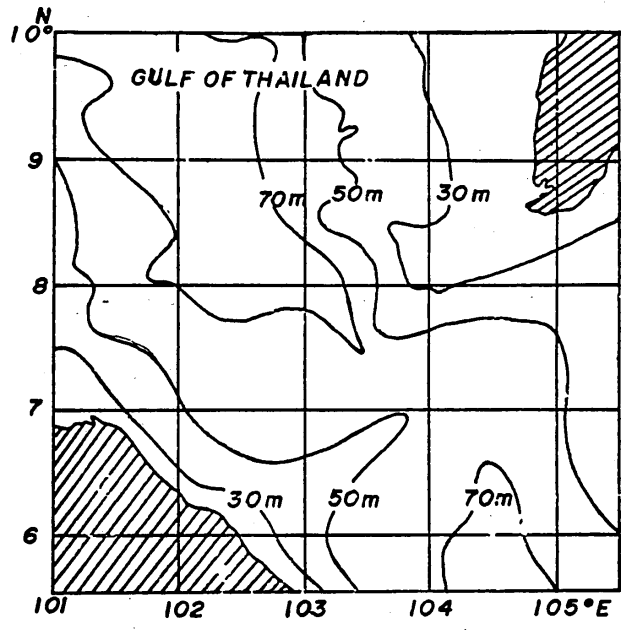

Fig. 1 Bottom configuration near the Gulf of Thailand. Depths in meters. (After Robinson, (1963).

Using the data collected, the distribution pattern of temperature was analysed three-dimensionally. The result showed that during the period there was an intense intrusion of cold water mass from the offshore area into the warm water area in the Gulf. The intrusion of the offshore water could be clearly seen even from the distribution pattern of surface temperature (Fig. 2). The most conspicuous feature of intrusion, however, was observed in deeper layers as illustrated in Fig. 3. The cold water mass lower than 25°C creeps up along the trough

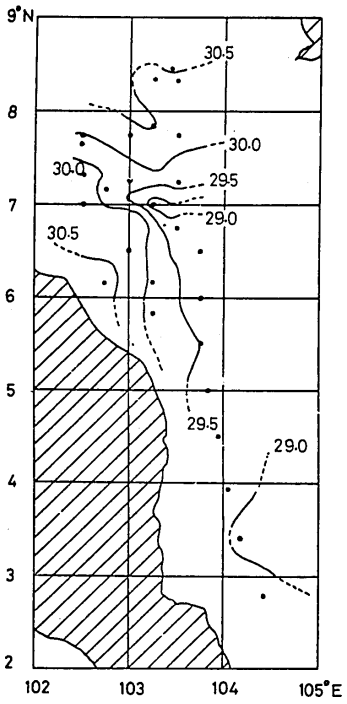

Fig. 2 Distribution pattern of surface temperature near the Gulf of Thailand, June, 1972. Temperature in °C.

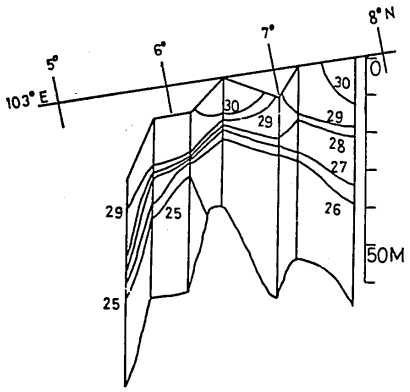

Fig. 3 Vertical section of temperature along the course of intrusion of offshore water.

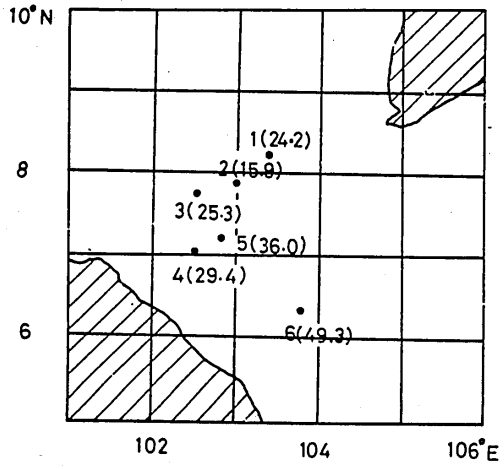

Fig. 4 Location chart of experimental bottom long linings off the Gulf of Thailand.

from the open ocean and reaches to the top of the submarine ridge projecting from the Malay Peninsula. The advance of this water mass seems to be interrupted by the ridge. The water mass higher than 25°C crosses over the ridge and enters into the Gulf through the other trough.

Fig. 4 shows the location chart of bottom long line fishing grounds, and the catch in kg. per 10 units of gear. As seen in the figure a good catch was obtained at the final fishing ground which was located near the top of the ridge where the isothermal surface of 25°C came to meet the bottom. While the other grounds were inside the Gulf and in most of these grounds the temperature at the bottom was 27°C.

Area Off Kuching, Sarawak

The bottom configuration in this area is characterized by a submarine canyon whose head originates near the mouth of Lupar River, as shown in Fig. 5. This canyon can clearly be traced to a depth of about 80 m. It is about 20 km. in width and the depth exceeds 100 m. in the deepest portion. The canyon extends almost linearly from the head towards the northwest and then turns towards the north at 2°30'N, 110° 15'E. On both sides of the canyon, the bottom slopes gently towards the offshore region.

The distribution of water masses is not so complicated in this area (Fig. 6). On both sides of the canyon, water is almost spatially homogeneous and is about 29°C. The water mass below 28°C is seen only along the canyon. Cod water below 23°C is observed near the mouth of the canyon while the bottom temperature at the bend is below 25°C.

In Fig. 7 the locations of fishing grounds are shown together with the catch obtained. The first four fishing grounds were located between the mouth and the bend of the canyon, and the last two grounds were between the bend and the head. Good catches were obtained at the last two locations and these fishing grounds were close to the east upper edge of the slope of the canyon where the isothermal surface of 26.5°C came to meet the bottom. The other fishing grounds were inside the water mass whose temperature was below 25°C.

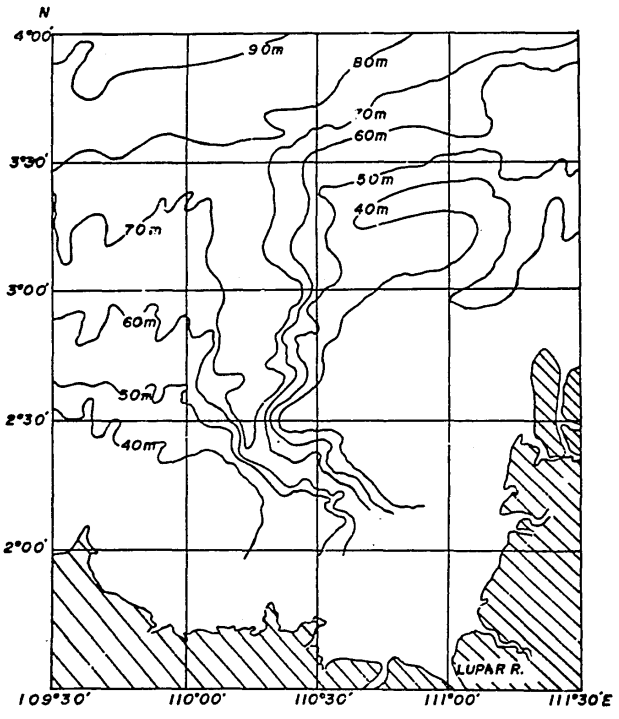

Fig. 5 Bottom configuration off Kuching, Sarawak. Depths in meters. (Source: original chart prepared by Faculty of Fish., Hokkaido Univ.)

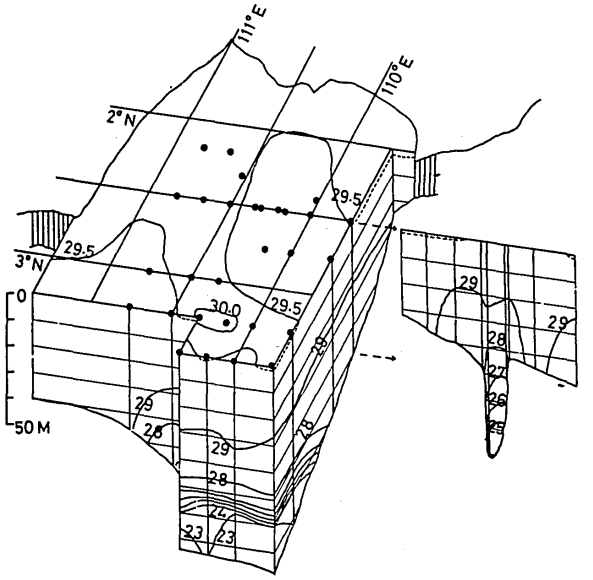

Fig. 6 Composite surface and vertical sections of temperature off Kuching, September, 1972. Temperature in °C.

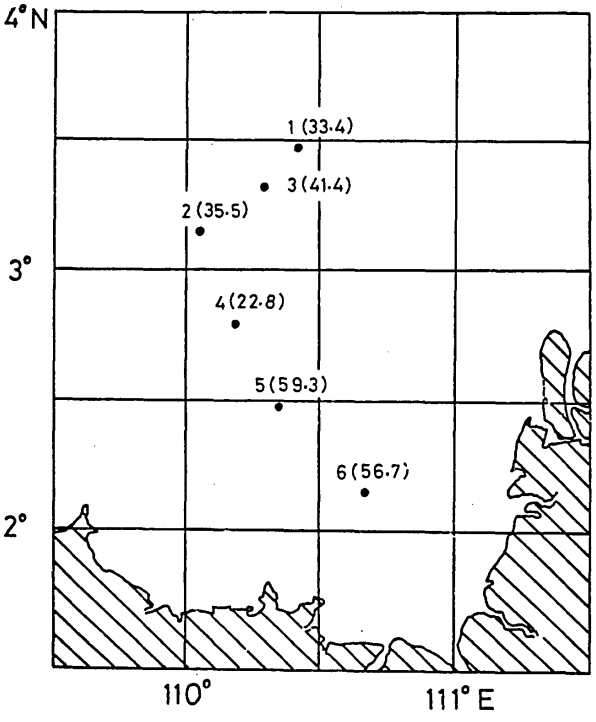

Fig. 7 Location chart of experimental bottom long linings off Kuching.

DISCUSSION

The common feature of the June and September trips is that good catches were obtained near the boundary between the nearshore warm water and the cold water from deeper layers. It is presumed that cold water could be observed at other places such as the canyon off Kuching in which the boundary of cold and warm water masses could be formed. However, such boundary surfaces are considered as unstable. Near the Gulf of Thailand, the intense intrusion of deep-layer water, as observed in June, 1972, is considered to occur only in certain specific seasons.

CONCLUSION

There is a possibility that good fishing grounds along the canyon off Kuching can be formed throughout all seasons. However, the locations of good fishing grounds may be changed according to the change in oceanographic conditions. Near the Gulf of Thailand, good fishing grounds may be formed only in some seasons.

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Behaviour of the Warm-Water Mass Along the East Coast of the Malay Peninsula

by
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Abstract

A preliminary study was made on oceanographic conditions in the South China Sea, using the data collected over two monsoon seasons. In the northeast monsoon and the subsequent stagnant season, a narrow belt-like water mass of high temperature and low salinity was observed along the east coast of the Malay Peninsula. While in the southwest monsoon season, the existence of this water mass was not clear.

The presence of this narrow belt of water mass suggest the existence of a southward-flowing current which may play a role in transporting the water from the Gulf of Thailand to the coastal area of the Peninsula.

INTRODUCTION

Along the east coast of the Malay Peninsula a narrow belt-like water mass of high temperature and low salinity, extending from the Gulf of Thailand to the vicinity of Singapore, was observed by the research vessel CHANGI in April, 1971. On the other hand, during a joint trawl survey by Thailand, Malaysia and Germany conducted in this area between March and April, 1967, a southward-flowing current of about one knot was observed in the nearshore area. The above two facts seem to suggest that the southward-flowing current in this season plays a role in transporting the water from the Gulf of Thailand to the coastal area of the Peninsula.

Using the data from CHANGI together with some other data, analysis was made to clarify the behaviour of this water mass in more detail. When considering the geostrophic balance of water masses, the above belt of water is concluded to flow in a southerly direcition. The results are described here.

OBSERVATIONS

Between October, 1970 and June, 1971, four research trips were made by CHANGI to the area off the east coast of the Malay Peninsula. These are as follows:

Period	Number of Stations
17 – 22, Oct., 1970	6
17 – 23, Nov., 1970	7
13 – 26, Apr., 1971	21
31 May – 12 June 1971	16

The first two cruises were carried out during the northeast monsoon season, and observation stations were arranged at irregular intervals of 40 to 100 nautical miles along the coast. The third cruise was made in the spring intermonsoon season. The stations were arranged to form meshes at relatively regular intervals of about 60 nautical miles off the east coast of the Peninsula and this cruise covered the widest area among the four cruises. The fourth cruise was carried out at the beginning of the southwest monsoon, and stations were arranged at regular intervals of 60 nautical miles.

At each station serial observation was made, and in addition BT observation was made during the last two trips.

OCEANOGRAPHIC CONDITION OFF EAST COAST OF MALAY PENINSULA

Analysis of the data was made three-dimensionally to get synoptic information. Fig. 1 shows the composite surface and vertical sections of temperature in the spring intermonsoon season, 1971. The interesting feature is a narrow belt of warm water mass along the east coast of