

Preliminary Report on Banks around Yap, the Federated States of Micronesia

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Detailed topographies were surveyed of four banks around Yap; Friendship Bank (with minimum depth of 262 m), Hunter Bank (26 m), Yochollopelo Bank (31 m), and Yocholmol Bank (22 m). The biggest among them is Yochollopelo, with the area shallower than 100 m deep exceeding 40 km². This bank has a wide basin on its top; the marginal parts are higher than the central part by about 70 m. We could not find Labodmal Bank within 5 nautical miles around the position indicated on the chart (Chart no. 81002, U.S. Defense Mapping Agency).

The surface water temperature was 29°C+, while that at 450 m depth was 7~8°C, with a marked thermocline at 60~100 m layer. The bottom water temperature in the basin of Yochollopelo Bank was 4~5°C higher for its depth.

A constant current of 0.29 knot in the direction of 248° was observed on Yocholmol Bank.

Among the fishes caught with line and hook, dominant were trevallies, pig-faces, and groupers.

Key words : Yap, Bank, topography, water temperature, fishes

More than ten banks are known in the territorial waters of the Federated States of Micronesia. However, most of them have been merely reported to be existing, with the details such as the area and topography remaining unreported.

We had the chances to carry out surveys of banks around Yap jointly with the Yap State Government on board the Training Ship Kakuyo-maru of Nagasaki University in October and November of 1986 and 1987. As we have an intention to continue similar surveys in future, this is a preliminary report of the surveys.

Banks surveyed and survey methods

Training Ship Kakuyo-maru visited five banks around Yap shown in Table 1 and Fig. 1.

Ship's positions were determined by Loran C (9970 chain). Bottom topography of the respective bank was recorded with an echo-sounder (SIMRAD EK-38S) along lines set at intervals of 0.5 miles and parallel to the latitudinal and longitudinal lines, respectively.

The water temperatures from the surface to the depth of 450 m were recorded with X-BTs (Tsurumi Seiki) at 24 stations shown in Figs. 2~5. On Yocholmol Bank (at st. F-2, Fig. 5), the tidal current was also observed with a current meter (Furuno CI-30) for 24 hours.

Experimental fishing was made on Yochollopelo and Yocholmol Banks (at st. F-1~F-3, Figs. 4 and 5) and in Ulthi Atoll (Fig. 1) with hand-lines and cage-traps. The cage-trap was 70×117×55 cm in size, with funnels of 10×10 cm

on both sides; baited with scomber meat. In identification of fishes we mainly followed Sato (1978) for lethriniids, Gushiken (1983) for carangids, and Allen (1985) for lutjanids.

Gloerfelt-Tarp and Kailola (1984?), Masuda, et al. (eds., 1984) and Grant (1987) were also consulted with.

Table 1. The banks around Yap surveyed by Training Ship Kakuyo-maru

Name of bank	Location of the center		First reported in*	Date of survey by T/S Kakuyo-maru
	Lat. N	Long. E		
Friendship**	08°-52.0'	137°-47.3'	1945	Oct. 28, 1986
Hunter	09°-56.5'	138°-15.0'	(since long ago)	Nov. 1, 1986
Yochollopelo	10°-28.5'	140°-08.0'	1945	Nov. 3, 1986
Yocholmol	11°-18.9'	139°-20.2'	1963	Oct. 30, 1986
Labodmal	10°-08.7'	140°-43.7'***	1945	Nov. 1, 1987

* Chart no. 81002 by U.S. Defense Mapping Agency Hydrographic Center (1980).

** As no name has been given before, we named temporarily.

*** Location shown in the above-cited chart.

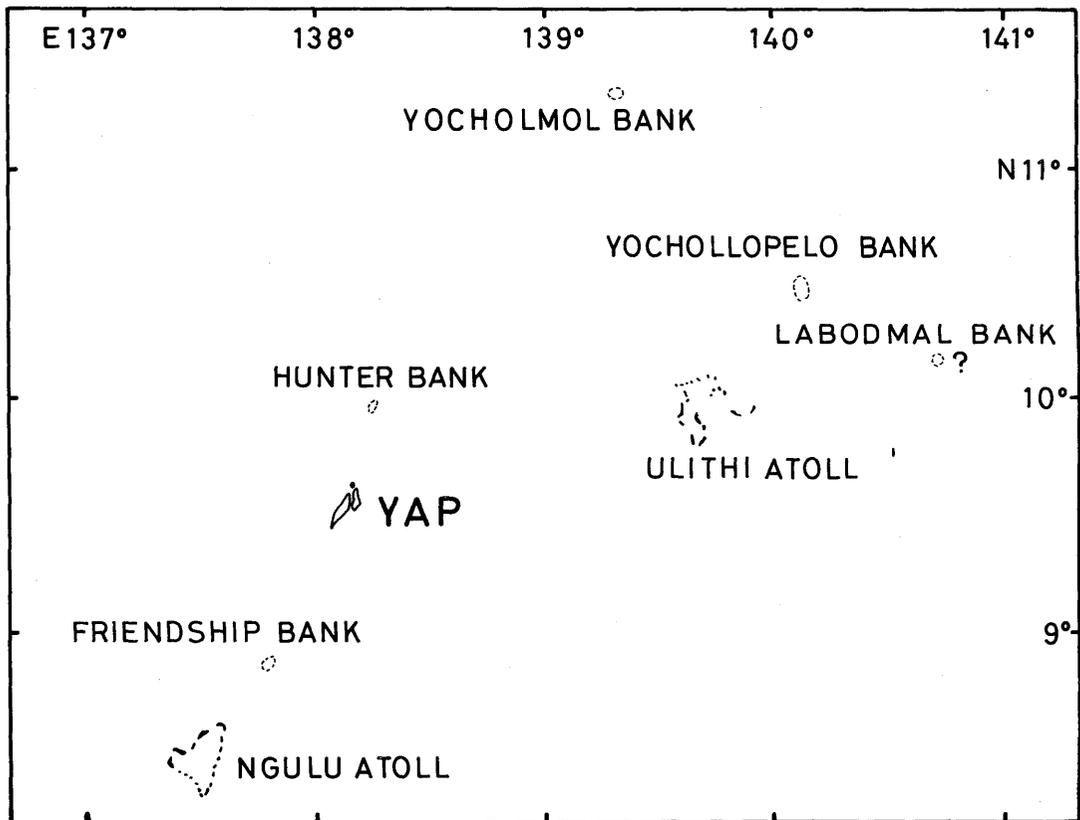


Fig. 1. A chart showing locations of the banks around Yap which were surveyed by us in 1986 and 1987.

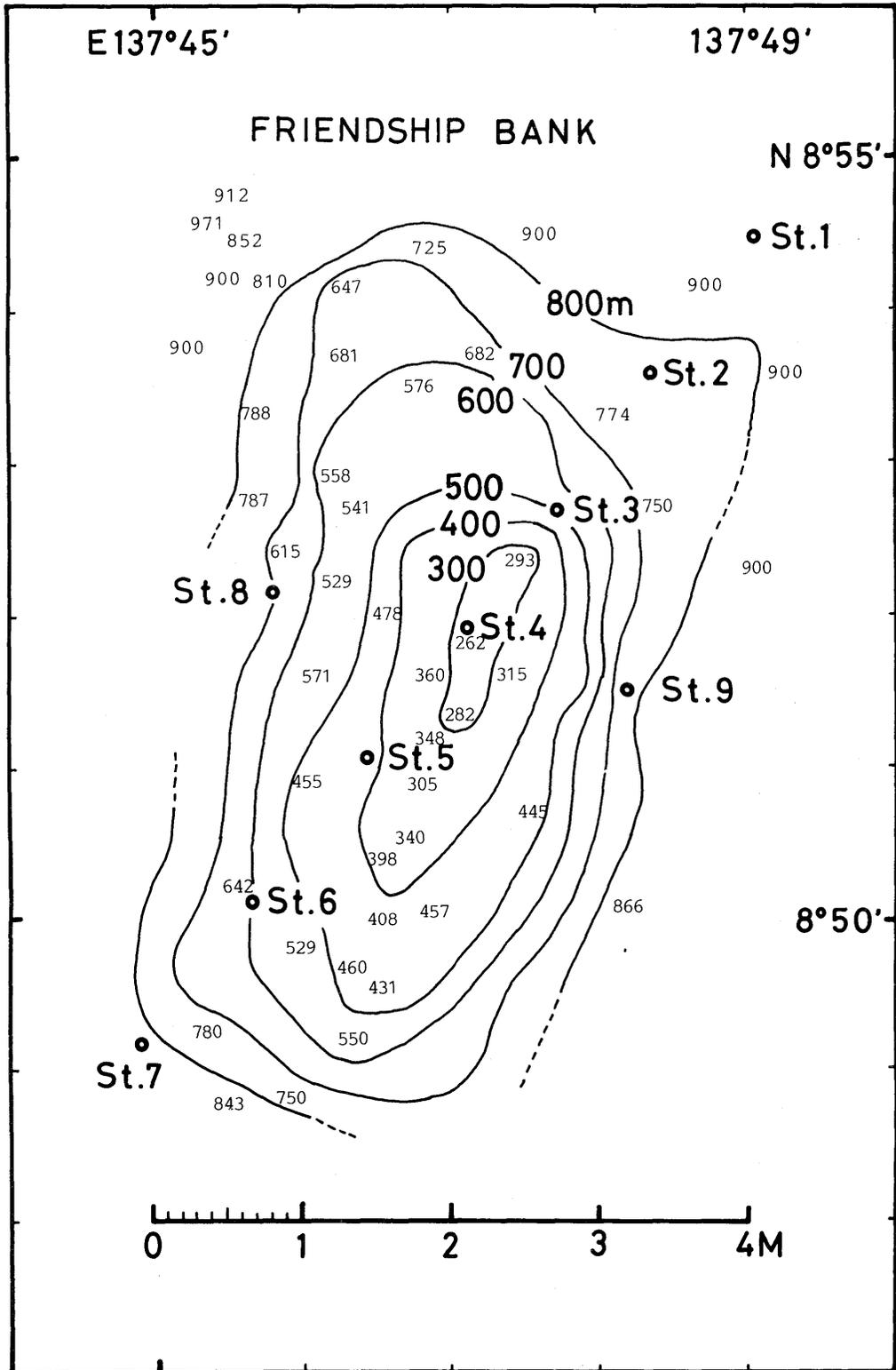


Fig. 2. Detailed topography of Friendship Bank. Vertical distribution of the water temperatures were monitored by X-BT at stations 1 to 9.

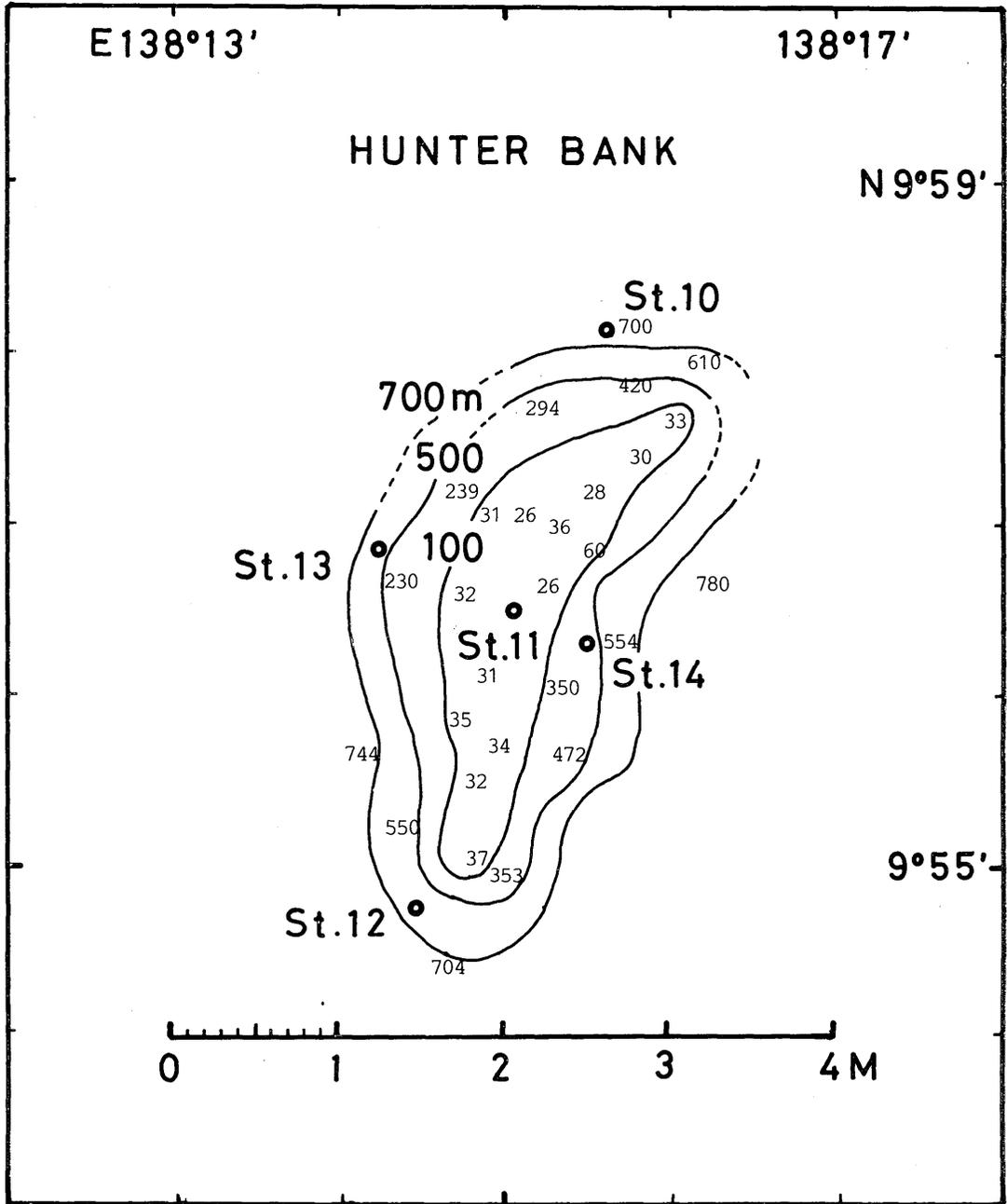


Fig. 3. Detailed topography of Hunter Bank. Sts 10 to 14 are X-BT stations.

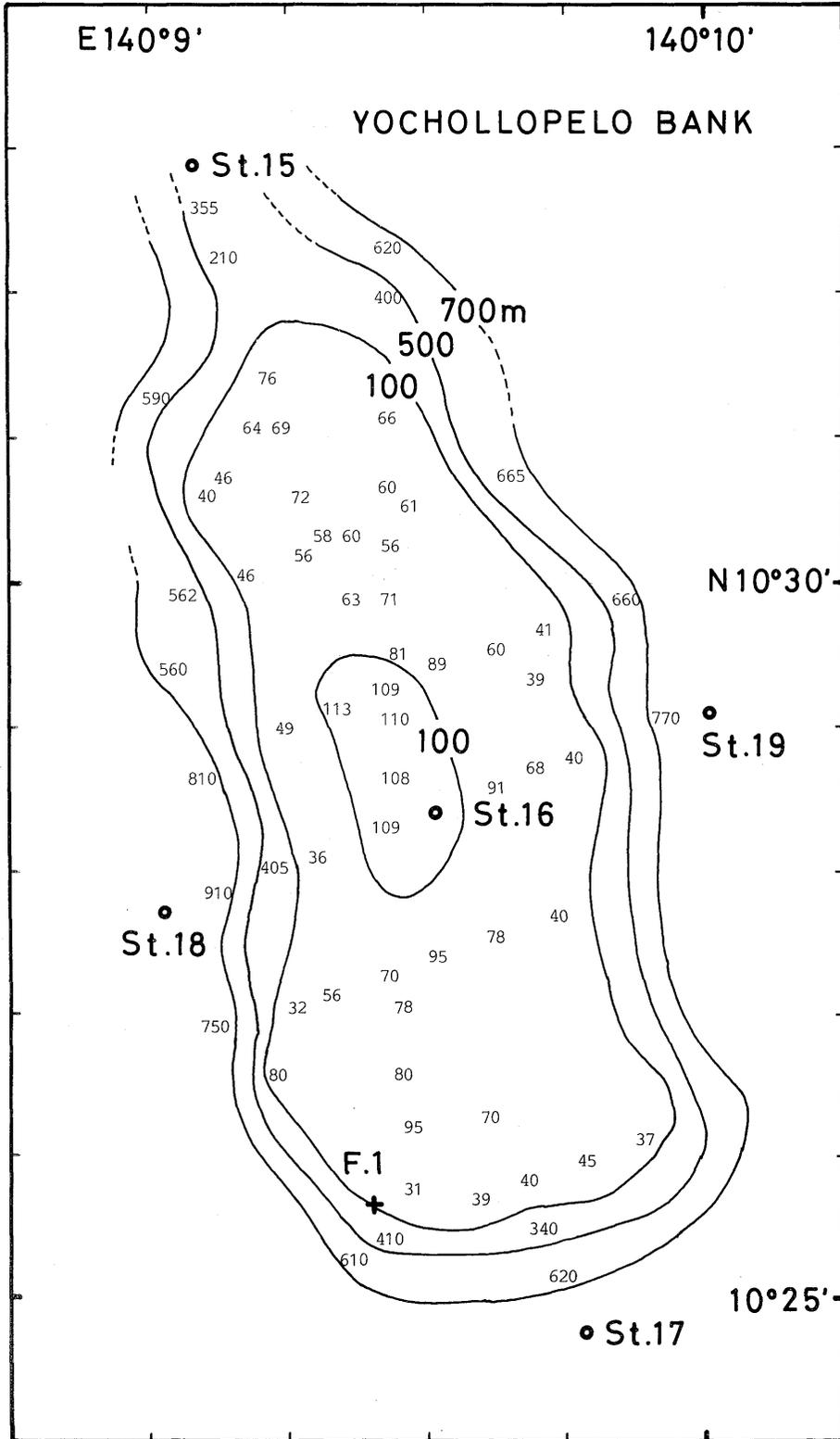


Fig. 4. Detailed topography of Yochollopelelo Bank. Sts 15 to 19 are X-BT stations. At st. F-1 we caught fish with line and hook.

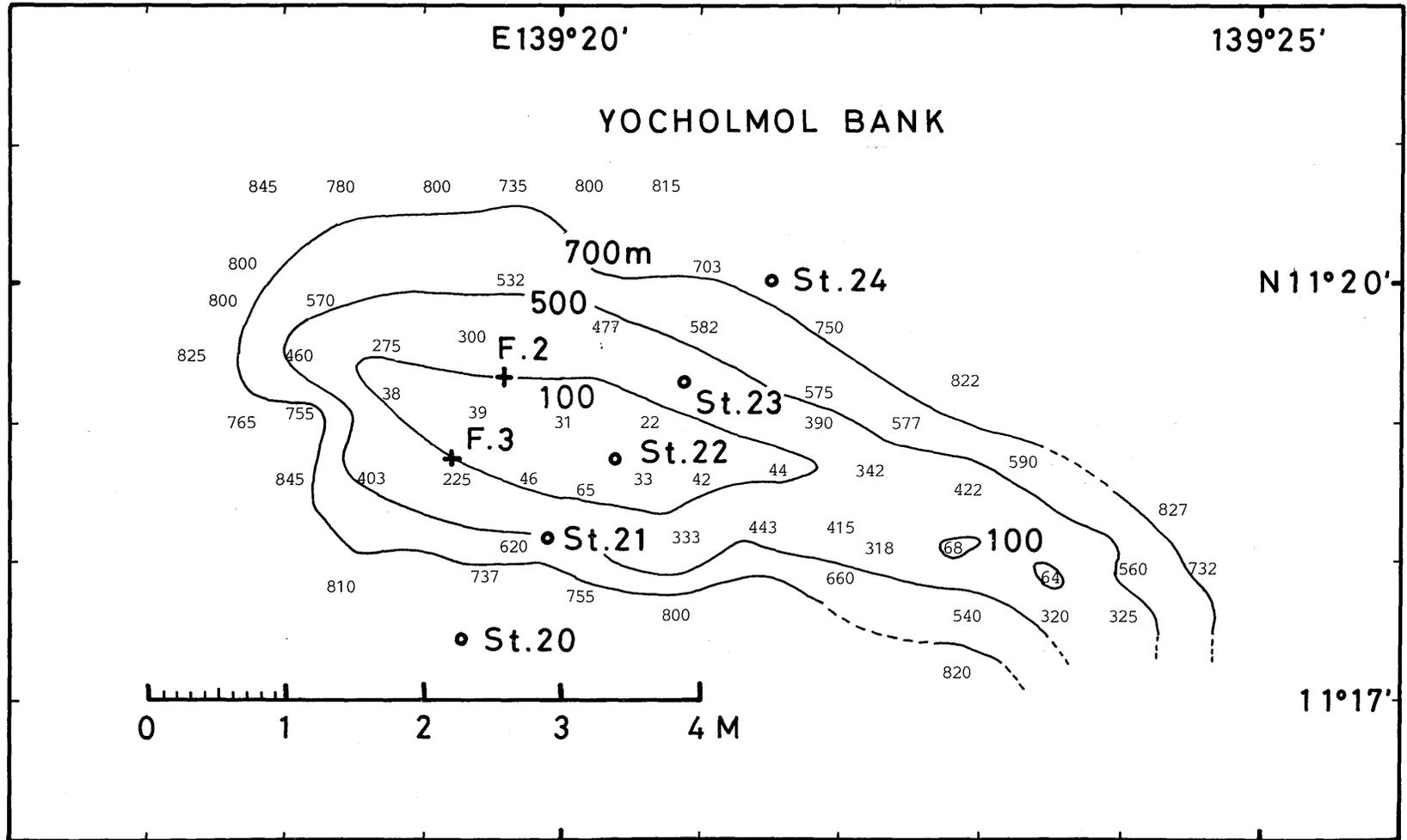


Fig. 5. Detailed topography of Yocholmol Bank. Sts. 20 to 24 are X-BT stations. At sts. F-2 and F-3 we caught fish with line and hook, and trap.

Results and remarks

1. Location and topography

We failed to detect Labodmal Bank within 5 nautical miles around the place indicated on the above-mentioned chart (Fig. 1).

The bank at Lat. $08^{\circ}52.0' N$, Long. $137^{\circ}47.3' E$ which has not been named so far is

temporarily named as Friendship Bank to symbolize the friendship between the Federated States of Micronesia and Nagasaki University.

Friendship Bank is rather deep, a larger part of its top being about 270 m deep, while the other banks have considerably wide areas shallower than 100 m with the minimum depth of 22 ~31 m (Table 2, Figs. 2~5).

Table 2. The minimum depths and sizes of the banks around Yap observed by T/S Kakuyo-maru*

Name of bank	Minimum depth recorded	Location of the same		Size of bank**	
		Lat. N	Long. E	Dimension	Area
Friendship	262 m	$08^{\circ}51.8'$	$137^{\circ}47.1'$	2.5×0.7 km	1.7 km ²
Hunter	26	$09^{\circ}57.1'$	$138^{\circ}15.1'$	5.8×1.3	5.5
Yochollopelo	31	$10^{\circ}30.8'$	$140^{\circ}07.9'$	14.0×4.7	40.1
Yochoimol	22	$11^{\circ}19.0'$	$139^{\circ}20.6'$	1.7×6.3	6.4

* We failed to detect Labodmal Bank within 5 nautical miles around the position indicated on Chart no. 81002 by U.S. Defense Mapping Agency.

** Expressed as the size of the part shallower than 300 m for Friendship Bank and 100 m for the other banks.

Yochollopelo Bank is the largest among the banks surveyed, with the area shallower than 100 m deep being about 40 km². This bank has a wide basin on its top; the central part is about 70 m deeper than the marginal parts.

Yochoimol Bank extends east and west, contrasting with the others which lie north and

south.

The sides of all the banks are very steep, falling into the depth of more than 1,000 m of the surrounding waters.

2. Vertical distribution of temperature.

All the banks surveyed are washed by the North Equatorial Current⁷⁾ and showed little

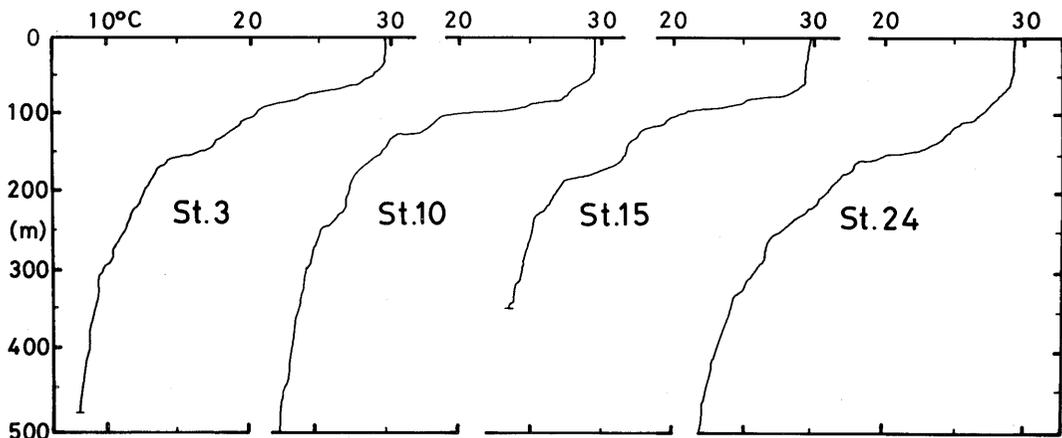


Fig. 6. The X-BT records at north of each bank to show vertical profile of the water temperatures. For the position of each station, see Figs. 2~5.

difference in the surface water temperatures over them, ranging from 29.3 to 29.9°C.

Fig. 6 shows some examples of X-BT records to illustrate the vertical distribution of temperatures around the banks. The temperatures did not change by depths in upper 50 m layers, and at the depth of 450 m similar temperatures of 7 to 8°C were recorded for all the banks. A prominent thermocline was usually observed at the depth of 60 to 100 m, with a less prominent one

at about 150 m layer.

The temperature of the bottom layer in the basin on Yochollopelo Bank was about 5°C higher than at the same depth of the surrounding waters. For the other banks, the temperature on the top was almost the same as those at the same depth of the surrounding waters (Figs. 7~10). Annual fluctuations in the vertical distribution of water temperature were suggested by the fact that the temperature, at 100 m layer for

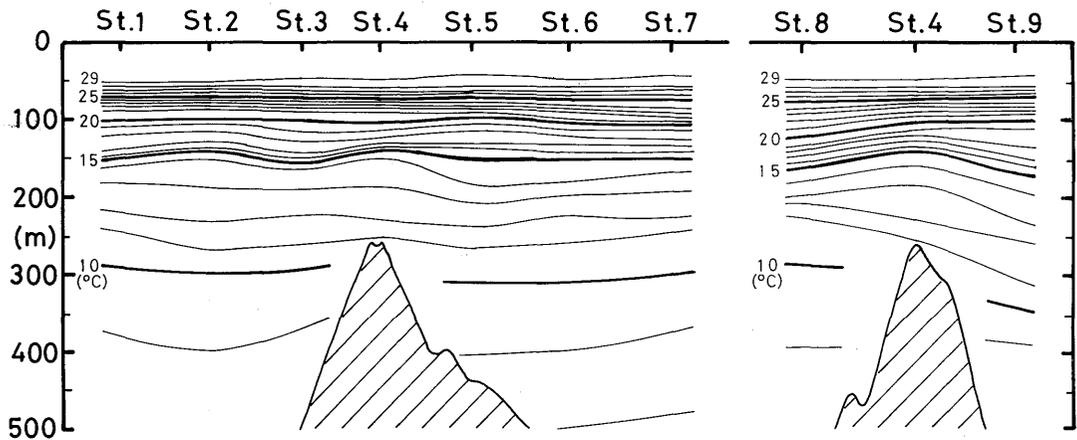


Fig. 7. Cross section of Friendship Bank and vertical distribution of the water temperatures.

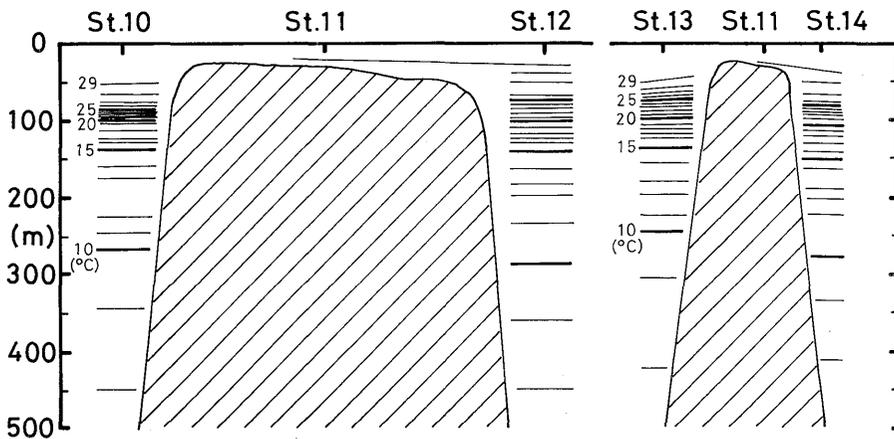


Fig. 8. Cross sections of Hunter Bank and vertical distribution of the water temperatures.

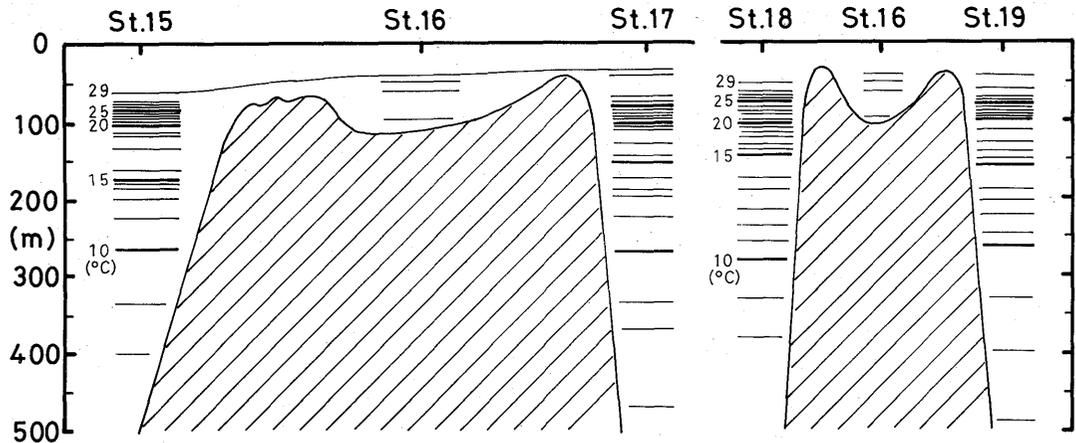


Fig. 9. Cross sections of Yochollopelo Bank and vertical distribution of the water temperatures.

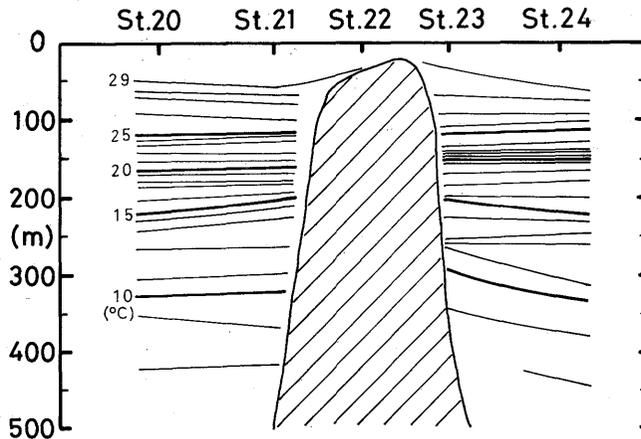


Fig. 10. Cross sections of Yocholmol Bank and vertical distribution of the water temperatures.

example, around Yocholmol Bank observed in October 1987 was about 6°C higher than those observed around the other banks visited in the same month of the preceding year.

3. Tidal current.

The results of the 24-hour measurement and harmonic analysis of tidal current at F-2 on Yocholmol Bank are summarized as the current vectors and the current ellipses in Fig. 11.

The maximum observed velocity of tidal current was 0.9 knot in the direction of 260° . The constant current was found to flow to 248° at

0.29 knot. The maximum velocity of the semi-diurnal tide (272° , 0.26 knot) was much larger than that of the diurnal tide (310° , 0.20 knot), being little less than that of the constant current.

As this observation was made on the day of the neap tide (the age of the moon was 8.0), stronger tidal currents are expected during the spring tides.

4. Fishes.

We caught 23 species of fishes belonging to 10 families (Table 3, Plates I~III). Most abundant among them was the black trevally, of which

the size and weight frequency histograms are shown in Fig. 12.

We had made similar experimental anglings on New Year Bank (Lat. $10^{\circ}32.0' S$, Long. $159^{\circ}39.0' E$) near Guadalcanal in the Solomon Sea in November 1978 and caught 30 species of

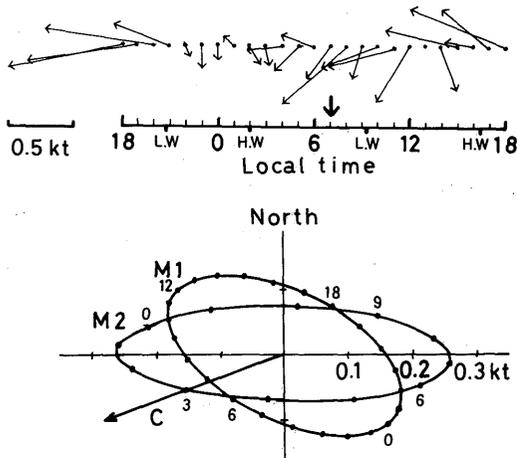


Fig. 11. Current vectors and current ellipses based on the observation made at st. F-2 on Yocholmol Bank from 1800 h Oct. 30 to 1800 h Oct. 31, 1987 (the age of the moon, 8.0).

0700 h Oct. 31 in the local time indicated by an arrow correspond to 0000 h in lunar time; one lunar hour equals to about 62 minutes in solar time. C shows the constant current. The two current ellipses, M 1 and M 2, represent the diurnal and semi-diurnal tide, respectively. Figures around each ellipse show lunar times.

Acknowledgements

We are greatly indebted to Mr. Petrus Tun, the Governor of Yap, Mr. John A. Mangefel, Ex-Governor, and Mr. Hilary Tacheliyol, Ex-Lt. Govenor, for their generous understanding and encouragement for this project. The staff of Yap Fishing Authority and Yap Marine Resources Division, the crew of T/S Kakuyo-maru and the cadets of Nagasaki University assisted us in many ways. We express our heartfelt

fishes⁹. Only nine species were common in the catch from New Year Bank and that from the banks around Yap. We did not catch trevallies on New Year Bank, while seven species of balistids were caught there.

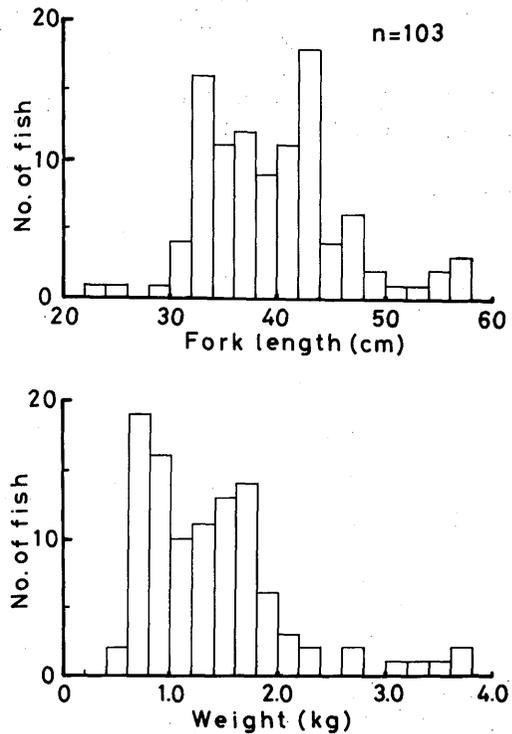


Fig. 12. Histograms showing fork length and body weight compositions of black trevally caught with line and hook on Yocholmol Bank on Oct. 30 and Oct. 31, 1987.

thanks to them.

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Table 3. List of fishes caught on Yochollopelo and Yocholmol Banks and in Ulthi Atoll, October 1987.
Fishes which we also caught on New Year Bank in 1978 are shown by an asterisk.

Scientific name	Local name	Japanese name	English name	Number of fish caught					
				Yochollopelo		Yocholmol		Ulthi	
				L & H		L & H	Trap	L & H	Trap
Family Sphyraenidae									
<i>Sphyraena forsteri</i> Cuvier*	—	Ohme-kamasu	Bigeye barracuda						1
Family Carangidae									
<i>Carangoides orthogrammus</i> (Jordan et Gilbert)	Yolong	Nanyo-kaiwari	Straight-lined trevally						1
<i>Caranx lugubris</i> Poey	Arong	Kappore	Black trevally			103			
<i>Caranx sexfasciatus</i> Quoy et Gaimard	—	Gingame-aji	Six-banded trevally						4
<i>Elagatis bipinnulata</i> Quoy et Gaimard*	Fofu	Tsumuburi	Rainbow runner			1			
Family Serranidae									
<i>Variola louti</i> (Forsskål)	Ble	Bara-hata	Coronation trout			1			
<i>Epinephelus fasciatus</i> (Forsskål)	Mtel	Aka-hata	Black-tipped grouper	6		22	11		
Family Lethrinidae									
<i>Lethrinus semicinctus</i> Valenciennes	—	Ami-fuefuki	Half-banded pigface			1	2		
<i>Lethrinus rubrioperculatus</i> Sato	Rogrog	Hooaka-kuchibi	Red-cheeked pigface	10		1		27	20
<i>Lethrinus amboinensis</i> Bleeker	Nguru	Yokoshima-fuefuki	Amboina porgy	2					
<i>Gnathodentex aurolineatus</i> (Lacepède)*	—	Nokogiridai	Gold-lined sea-bream			1			
Family Lutjanidae									
<i>Lutjanus kasmira</i> (Forsskål)*	Tat	Yosuji-fuedai	Blue-and-yellow snapper			4			16
<i>Lutjanus bohar</i> (Forsskål)*	Goychaf	Bara-fuedai	Twinspot snapper			10			
<i>Lutjanus gibbus</i> (Forsskål)*	Gadaw	Hime-fuedai	Humpback snapper	3		4			
<i>Lutjanus lemniscatus</i> (Valenciennes)	—	Fujiro-fuedai	Ribbon snapper			2			
<i>Aphareus furcatus</i> (Lacepède)	Mrab	Ishi-fuedai	Olive jobfish			1			
<i>Aprion virescens</i> Valenciennes*	Chlboth	Ao-chibiki	Green jobfish			6			
<i>Paracaesio xanthurus</i> (Bleeker)	Limariong	Umeiro	Yellowtail fusilier			1			
Family Holocentridae									
<i>Myripristis berndti</i> Jordan et Evermann	Ngun	Akamatsukasa	Crimson squirrelfish			2			
Family Mullidae									
<i>Parupeneus multifasciatus</i> (Quoy et Gaimard)*	Songsong	Soromon-himeji	Multi-banded goatfish					3	
Family Pomacentridae									
<i>Dascyllus trimaculatus</i> (Rüppell)	—	Mitsuboshi-kuro-suzumedai	White-spotted puller					3	
Family Chaetodontidae									
<i>Chaetodon kleinii</i> Bloch	—	Mizore-chochouo	White-spotted butterflyfish				6		
Family Scombridae									
<i>Gymnosarda unicolor</i> (Rüppell)*	—	Iso-maguro	Dogtooth tuna			1			

L & H : Line and hook

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ヤップ島周辺バンクの調査 (予報)

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森井 康宏, 阿部 茂夫, 千田 哲資

本学部練習船鶴洋丸は、1986年10月～11月および1987年10月～11月に、ヤップ島周辺に存在するバンクの海底地形、水温および生息魚類などについて、ミクロネシア連邦ヤップ州政府と共同調査を行った。

1) Friendship Bank は、最浅水深が262mと他のバンクと較べて深く、水深300mより浅い海域の面積は1.7km²であった。また Hunter Bank は、最浅水深26m、水深100m以浅の面積は5.5km²であり、さらに Yochollopelo Bank は、それぞれ31mおよび40.1km²で、その面積では最も大きい。Yocholmol Bank は、最浅水深22m、面積6.4km²で、その東側1.5マイルにも水深100m以浅の所が2ヶ所あった。

2) Labodmal Bank は、Lat 10°-08.7' N, Long 140°-43.7' E に存在すると報告されていたが、これを中心とする5マイル四方には存在しなかった。

3) 以上のバンクでは水温20-25°C間で顕著な躍層が見られた。1986年に調査した Hunter Bank と Yochollopelo Bank では、躍層は水深60-100m付近にあるのに対し、1987年に調査した Yocholmol Bank では水深100-150m付近にあった。

4) Yochollopelo Bank は、中央付近がその縁辺よりも70m程度深く、中央部(水深105m)の水温は、周囲の水温よりも4-5°C高かった。

5) Yocholmol Bank における、1987年10月30日と31日(月令8.0, 小潮)の24時間にわたる潮流観測と調和分解の結果、観測最大潮流は、260°, 0.9ノットであり、半日周潮(長軸方向272°, 最大流速0.26ノット)は、日周潮(130°, 0.20ノット)より大きく、恒流(248°, 0.29ノット)とほぼ同じであった。

6) 一本釣りで漁獲された主な有用魚は、カッポレ、アカハタ、パラフエダイ、アオチビキ、ホオアカクチビ、イソマグロおよび、ツムブリなどである。

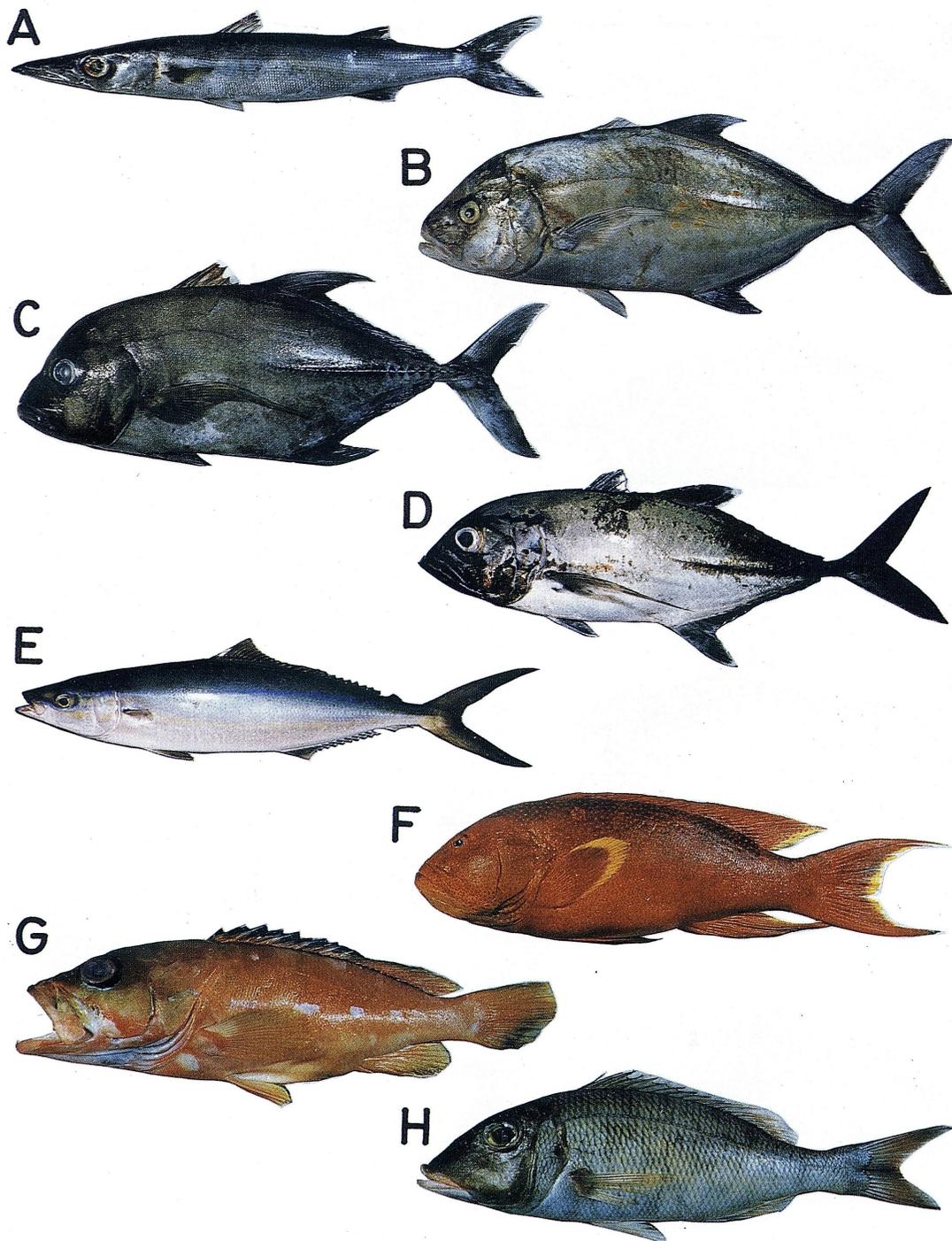


Plate I. Fishes from Yochollopelo and Yocholmol Banks (1).

A	<i>Sphyaena forsteri</i>	42 cm SL	B	<i>Carangoides orthogrammus</i>	49 cm FL
C	<i>Caranx lugubris</i>	43 cm FL	D	<i>Caranx sexfasciatus</i>	43 cm FL
E	<i>Elagatis bipinnulatus</i>	43 cm FL	F	<i>Variola louti</i>	32 cm SL
G	<i>Epinephelus fasciatus</i>	21 cm SL	H	<i>Lethrinus semicinctus</i>	17 cm SL

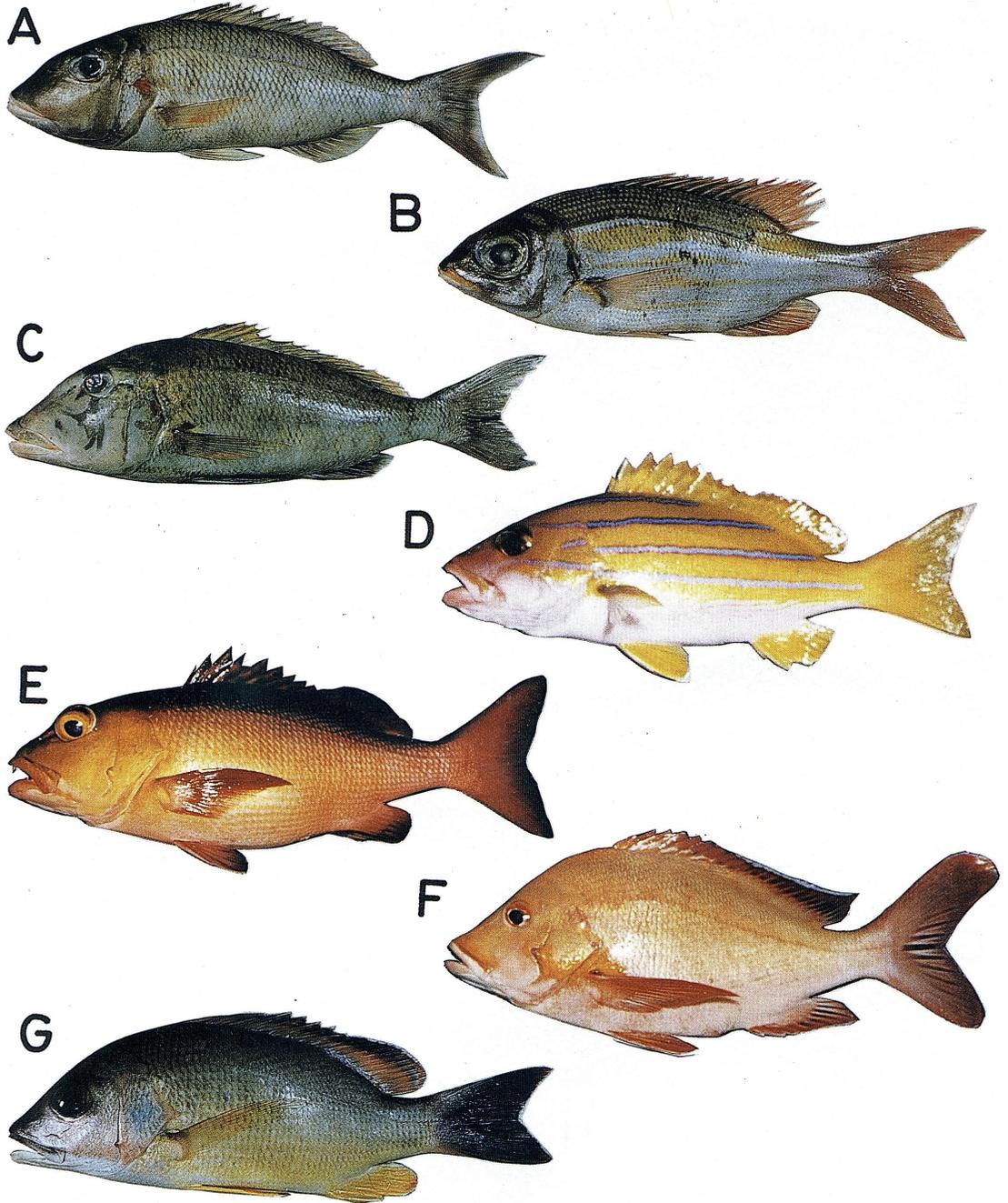


Plate II. Fishes from Yochollopelo and Yocholmol Banks (2).

A	<i>Lethrinus rubrioperculatus</i>	28 cm SL	B	<i>Lethrinus amboinensis</i>	36 cm SL
C	<i>Gnathodentex aurolineatus</i>	16 cm SL	D	<i>Lutjanus kasmira</i>	17 cm SL
E	<i>Lutjanus bohar</i>	46 cm SL	F	<i>Lutjanus gibbus</i>	34 cm SL
G	<i>Lutjanus lemniscatus</i>	15 cm SL			

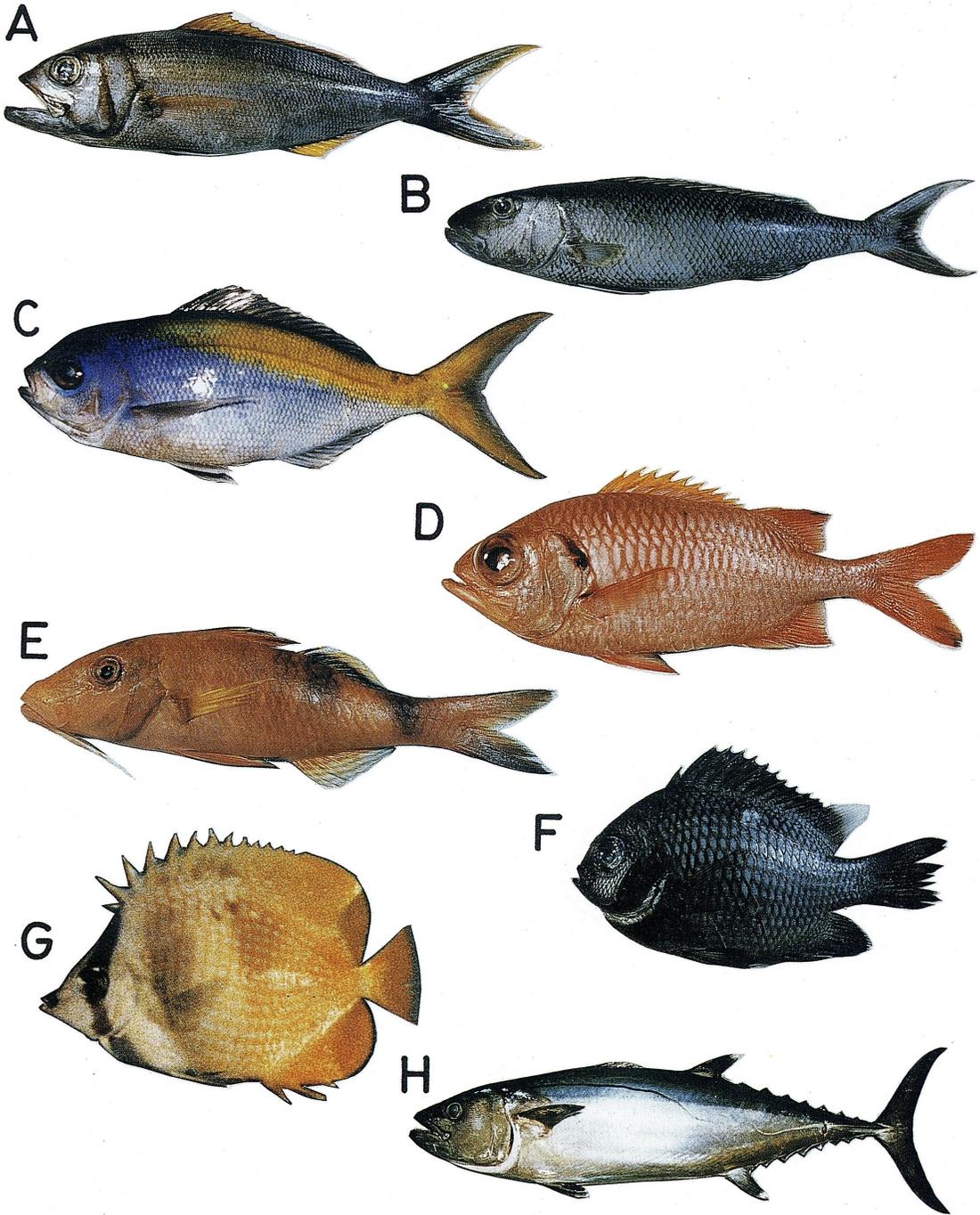


Plate III. Fishes from Yochollopelo and Yocholmol Banks (3).

A	<i>Aphareus furcatus</i>	26 cm SL	B	<i>Aprion virescens</i>	49 cm SL
C	<i>Paracaesio xanthurus</i>	25 cm SL	D	<i>Myripristis berndti</i>	18 cm SL
E	<i>Parupeneus multifasciatus</i>	11 cm SL	F	<i>Dascyllus trimaculatus</i>	8 cm SL
G	<i>Chaetodon kleinii</i>	6 cm SL	H	<i>Gymnosarda unicolor</i>	69 cm FL