Report of Feasibility Study 1977 on Skipjack pole-and-line Fisheries in the Micronesian Waters

(The Palau Islands and the Marshall Islands)

Japan Marine Fishery Resource Research Center

June 1978

FOREWORD

Fishery scientists of the world generally agree that skipjack resources are widely distributed in tropical and warm waters, still under exploited, and capable of further expansion of fishing.

The present under-exploitation of the abundant skipjack resources could be attributed to several factors, i.e. exology of skipjack has not yet been clarified; there is a need for improvement of gears such as purse seine and gill-net; it has often been difficult to ensure supply of live bait-fishes which are indispensable to skipjack pole-and-line fishing. If these problems are solved, expansion of skipjack fishing can be expected.

The Japan Marine Fishery Resource Research Center, since its establishment in 1971, has been conducting surveys on baitfish resources as well as skipjack pole-and-line exploratory fishing in tropical waters around the Islands of New Calędonia, New Hebrides, Tonga, Palau, Truk, Ponape, etc. The present survey, the fourth one in the series of the surveys, covered the waters around the Palau Islands and the Marshall Islands.

As surveys on baitfishes have to be carried out in Lagoon areas of the Islands, understanding and agreement of the coastal countries concerned are necessary. Again this year, we are grateful to the High Commissioner's Office of Saipan, the Local governments and inhabitants of the Islands for their understanding and assistance which were instrumental to the successful completion of the present survey which indicated a good possibility of baitfish supply in the areas.

During the survey, at the request of the local governments, trainees were received on board the survey vessel for the purpose of aquainting them to the practices of pole-and-line fishing, preservation of baitfishes in live fish net cages, oceanographic observations and biological studies. It is hoped that such a cooperation will strengthen mutual understanding and contribute to the fishery development in the Micronesian area.

We wish to express our gratitude to Fishery Agency, Far Seas Fishery Research Laboratory, Tohoku Regional Fishery Research Laboratory, Ichthyological Department of the Tokyo University of Fisheries, Federation of Japan Tuna Fisheries Cooperative Associations and Hokoku Suisan Company, owner of the survey vessel, for their cooperation and assistance. Our sincere thanks are expressed also to the captain and crew of the survey vessel, the Hatsutori-Maru No. 3.

Last but not least, we are most grateful to the local governments and citizens of the Palau Islands and the Marshall Islands for their kind cooperation.

Kohki Fujimura
President
Japan Marine Fishery
Resource Research Center

June 1978

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Table 4. Preservation tests of baitfishes in live net cages

Area and test No. Site	Palau No. 1 Arumonogui	Palau No. 2 Arumonogui	Remarks Palau No. 3	very good response Palau No. 4	Marshall No. 1 Majuro
No. of days tested	7	6	7	7	7
No. of bucketfuls (3 kg)	90	167	132	130	44
Main baitfishes tested (%)					
Stolephorus spp.	82	88	83	58.6	
Spratelloides delicatunus		10.8	13.3	2.4	31.4
Allanetta spp.					23.9
Harengula spp.	18		3.7	9.4	43.0
Others				29.6 (Caesionidae)	1.8
Survival rate (%)	86.6	44.9	83.3	89.6	75.0
Main surviving baitfishes	Stolephorus spp. Harengula spp.	Stolephorus spp. Harengula spp.	Stolephorus spp. Harengula spp.	Stolephorus spp. Caesionidae	Harengula spp. Allanetta spp. Spratelluides delicaturus
Remarks	Fed on 2nd day, very good response	Leiogthidae and Squid diminated with gill net and spear resulting in improred Survival rate.	"	Caesionidae responded to feeding for 12 hours after commencement of the test.	25% of Spratelluide delicaturus and Allanetta spp. escaped through meshes because of their small size.

1. Waters Around the Palau Islands

The present survey in these waters is the 3rd one following those in the previous years.
This year the survey was made on baitfishes and skipjack pole-and-line exploratory fishing over the period of 2 months and half from 20 July to 5 October 1977.
Special emphasis of the survey was placed on preservation tests of baitfishes in live fish net cages, and in this connection the Marine Resources Department of the local government kindly contributed a motorized launch and 2 divers.

(1) Conditions of the fishing grounds:

(a) Weather:

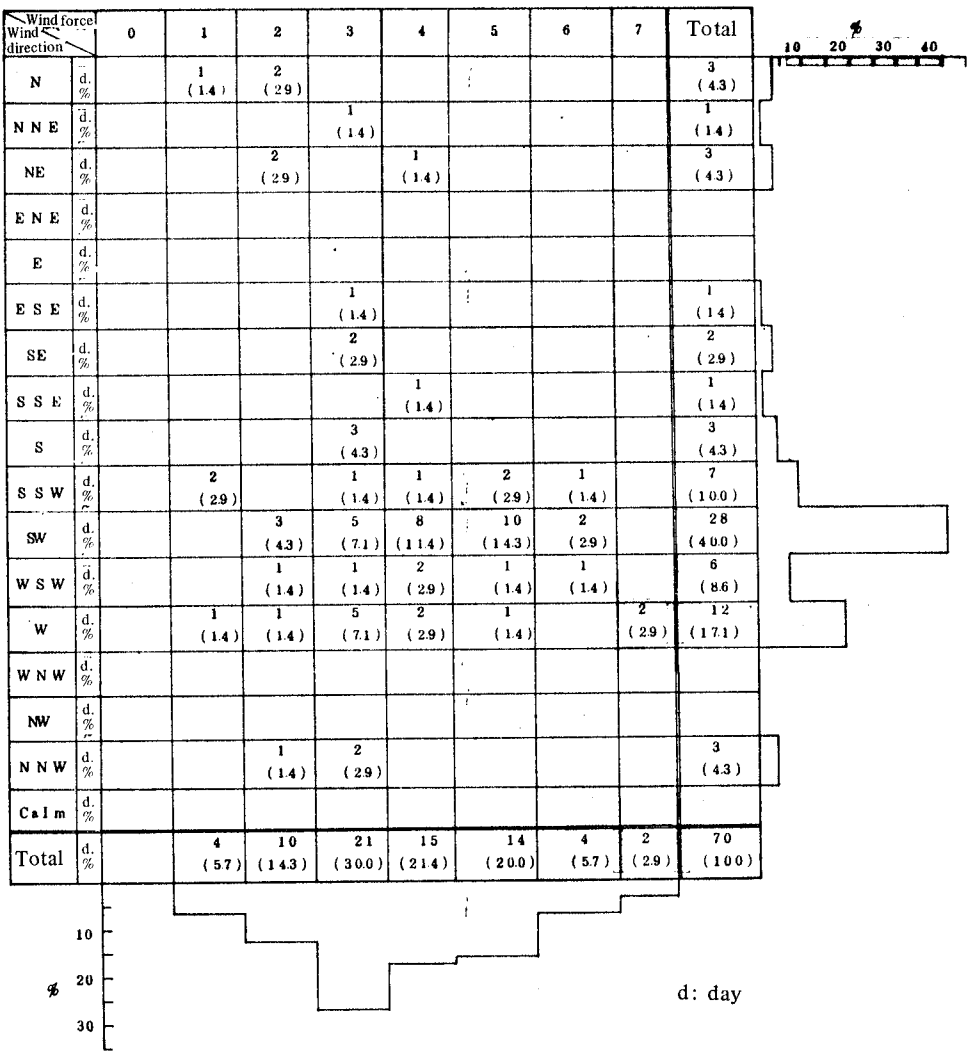
The weather was bad with strong wind when the tropical cyclones were generated at the north of Ponape and the Truk Islands and moved westward towards the Palau Islands.

Table 5 shows wind direction and force observed at noon time during the survey period except for the days when the survey vessel anchored at the port. South-western wind with force 3 was prevalent, which was also the case in the last year's survey during the 2 months from 9 June to 7 August.

Figure 5 presents a typical weather chart of a fine day in the Micronesian area. The high atmospheric pressure in the Pacific extends to the south down to the equator, the pressure around the Palau Islands being 1,008 mb.

Table 5. Wind direction and force in the waters around the Palau Islands
(20 July ~ 5 October, 1977, excluding the days in port)

Wind direction \ Wind force		0	1	2	3	4	5	6	7	Total
N	d.		1	2						3
	%		(1.4)	(2.9)						(4.3)
NNE	d.				1					1
	%				(1.4)					(1.4)
NE	d.			2		1				3
	%			(2.9)		(1.4)				(4.3)
ENE	d.									
	%									
E	d.									
	%									
ESE	d.				1					1
	%				(1.4)					(1.4)
SE	d.				2					2
	%				(2.9)					(2.9)
SSE	d.					1				1
	%					(1.4)				(1.4)
S	d.				3					3
	%				(4.3)					(4.3)
SSW	d.		2		1	1	2	1		7
	%		(2.9)		(1.4)	(1.4)	(2.9)	(1.4)		(10.0)
SW	d.			3	5	8	10	2		28
	%			(4.3)	(7.1)	(11.4)	(14.3)	(2.9)		(40.0)
WSW	d.			1	1	2	1	1		6
	%			(1.4)	(1.4)	(2.9)	(1.4)	(1.4)		(8.6)
W	d.		1	1	5	2	1		2	12
	%		(1.4)	(1.4)	(7.1)	(2.9)	(1.4)		(2.9)	(17.1)
WNW	d.									
	%									
NW	d.									
	%									
NNW	d.			1	2					3
	%			(1.4)	(2.9)					(4.3)
Calm	d.									
	%									
Total	d.		4	10	21	15	14	4	2	70
	%		(5.7)	(14.3)	(30.0)	(21.4)	(20.0)	(5.7)	(2.9)	(100)



Examples of the bad weather are shown in Figures 6-(1) to 6-(4). The weather deteriorates when small tropical cyclones are formed around the area 10 ~ 15°N north of Ponape Island or the Truk Islands. In many cases, these tropical cyclones gradually develop to typhoons, as they move westwards.

In the tropical areas, strong winds often preveil, even though atmospheric pressure gradient is not great.

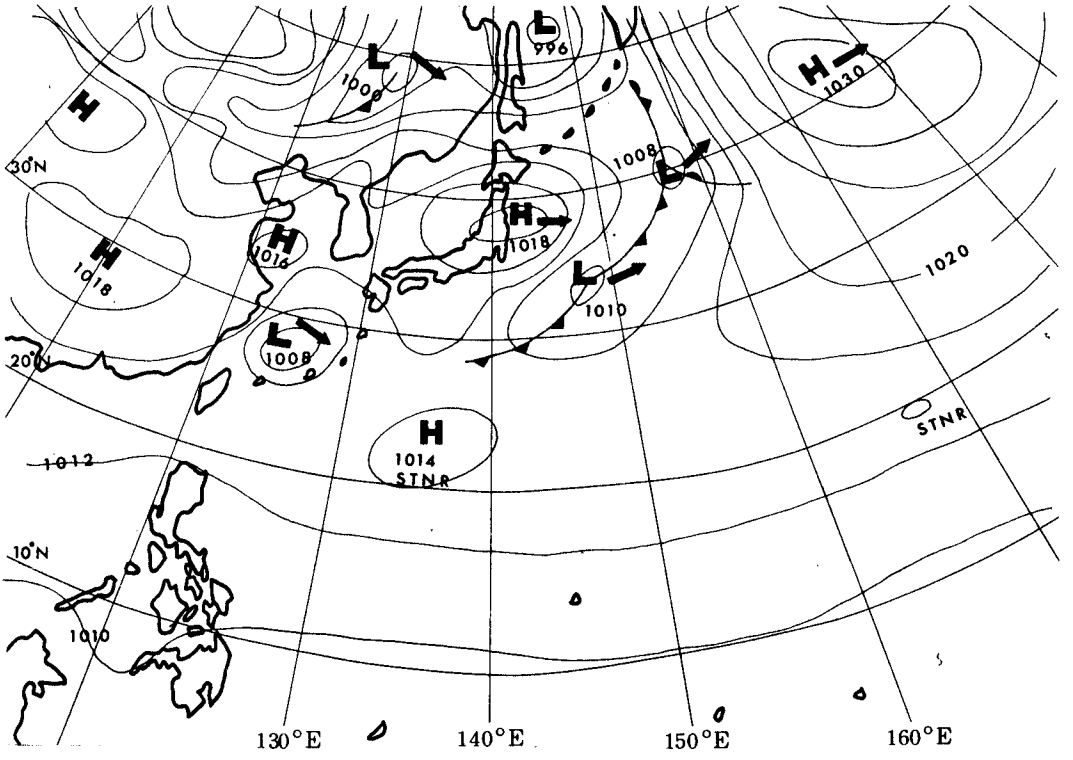


Figure 5. Typical weather map of good weather in Micronesian waters (Sept., 28 1977)

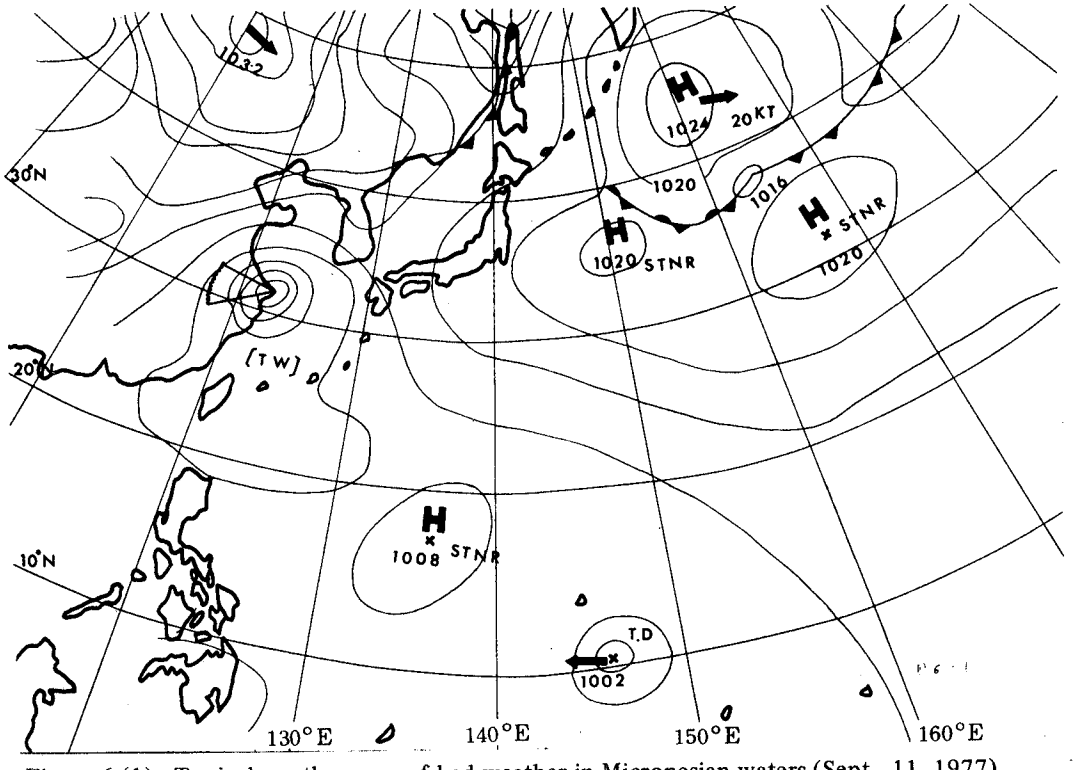


Figure 6-(1) Typical weather map of bad weather in Micronesian waters (Sept., 11, 1977)

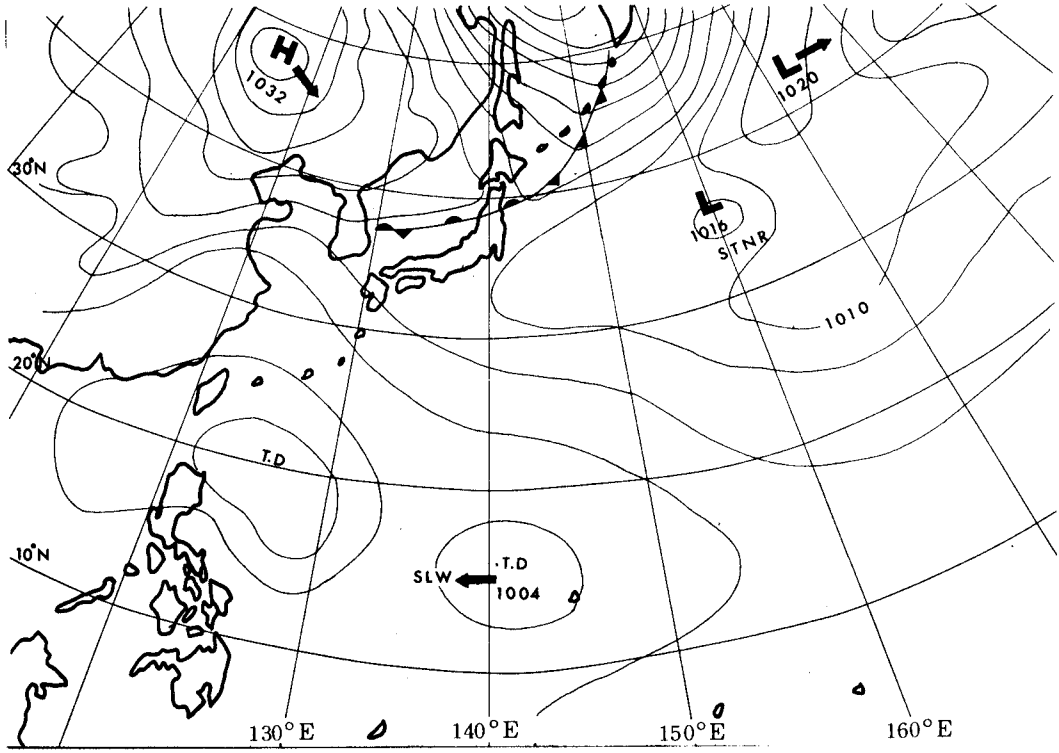


Figure 6-(2) Typical weather map of bad weather in Micronesian waters (Sept., 12, 1977)

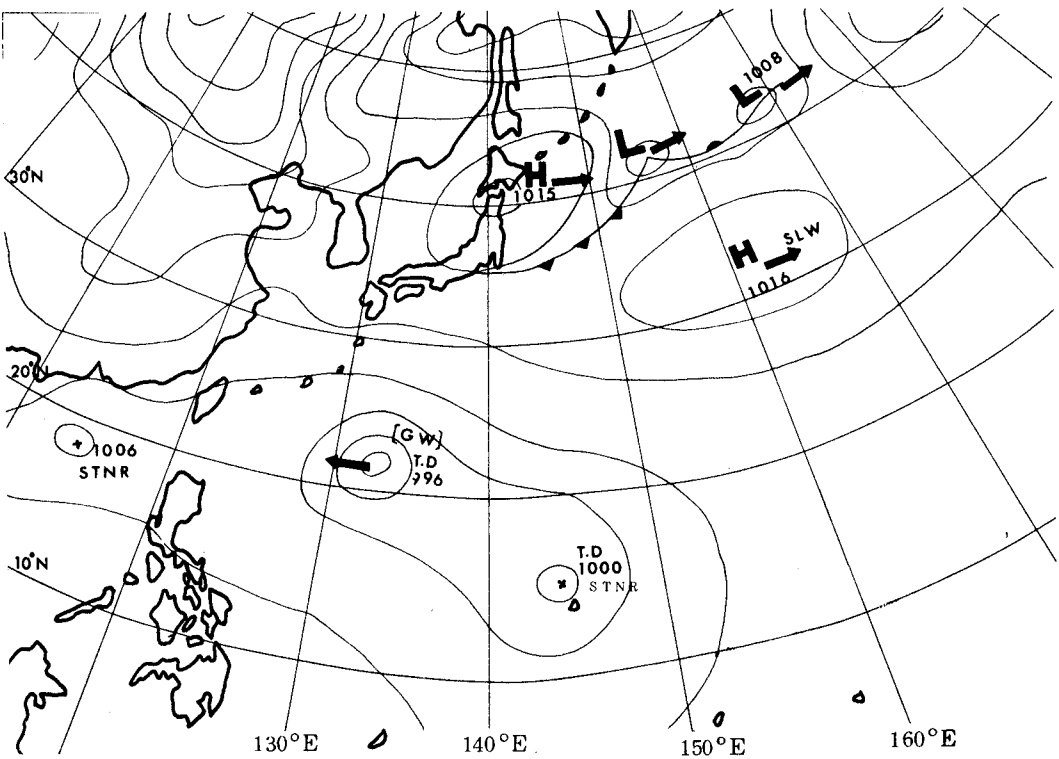


Figure 6-(3) Typical weather map of bad weather in Micronesian waters (Sept., 14, 1977)

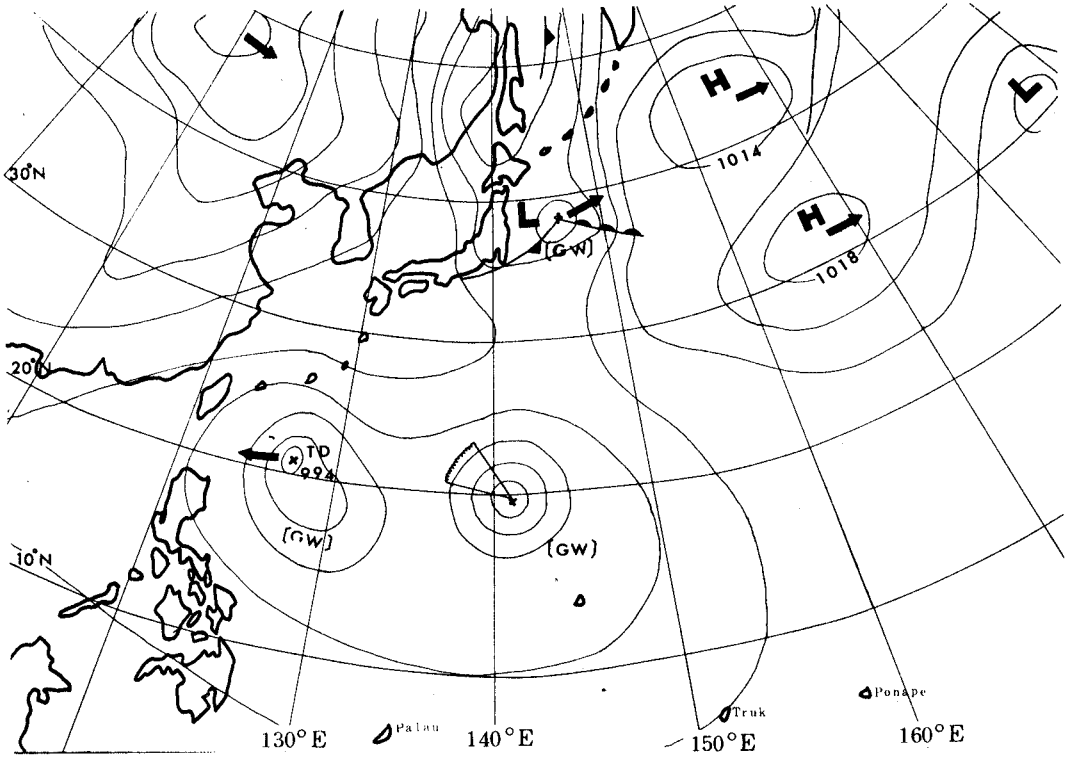


Figure 6-(4) Typical weather map of bad weather in Micronesian waters (Sept., 15, 1977)

(b) Oceanographic conditions:

Figures 7-(1) to 7-(4) show vertical distribution of water temperatures measured by B.T. in the waters around Palau Main Island and Helen Reef as well as along the

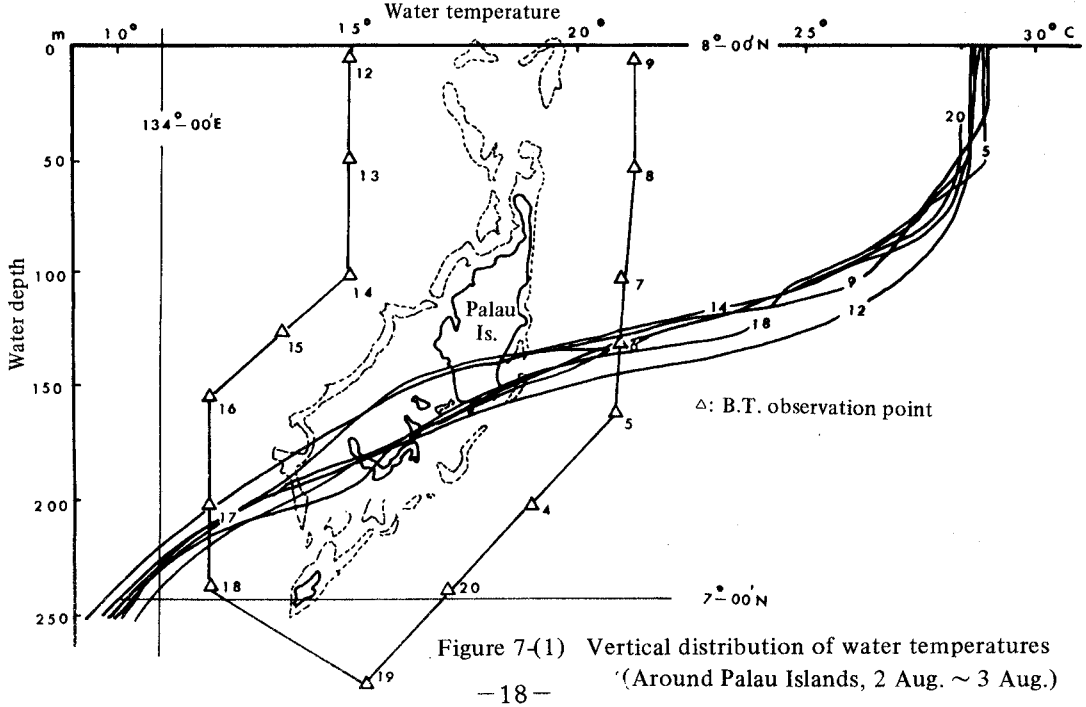


Figure 7-(1) Vertical distribution of water temperatures (Around Palau Islands, 2 Aug. ~ 3 Aug.)

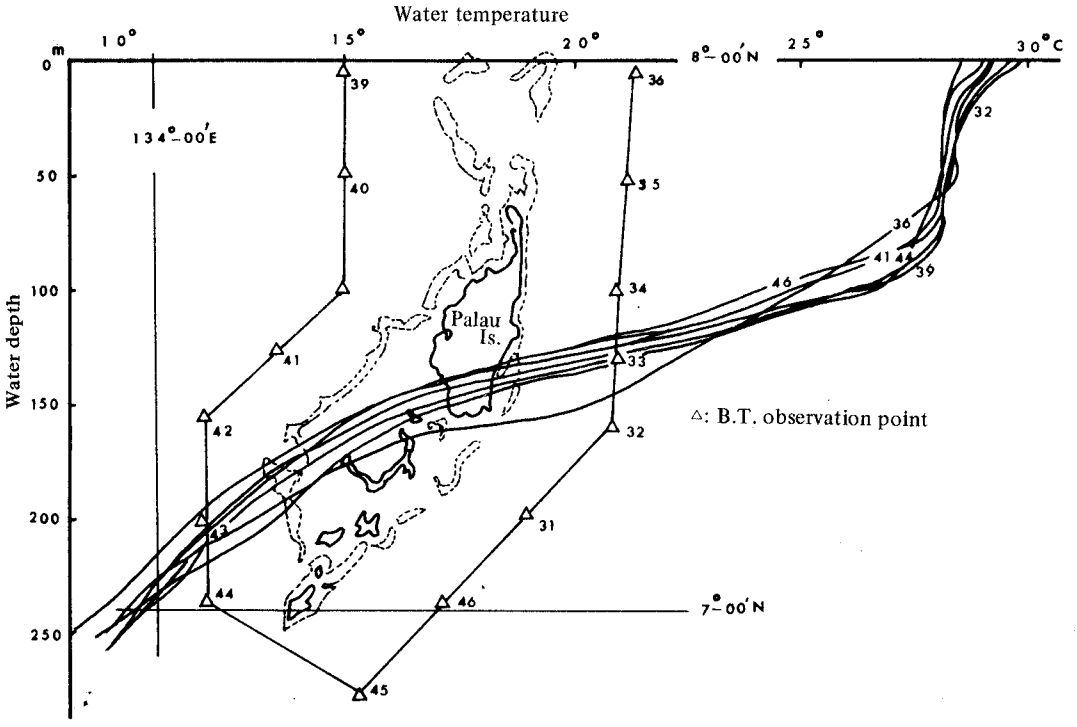


Figure 7-(2) Vertical distribution of water temperatures (Around Palau Is. 27 ~ 29 Sept.))

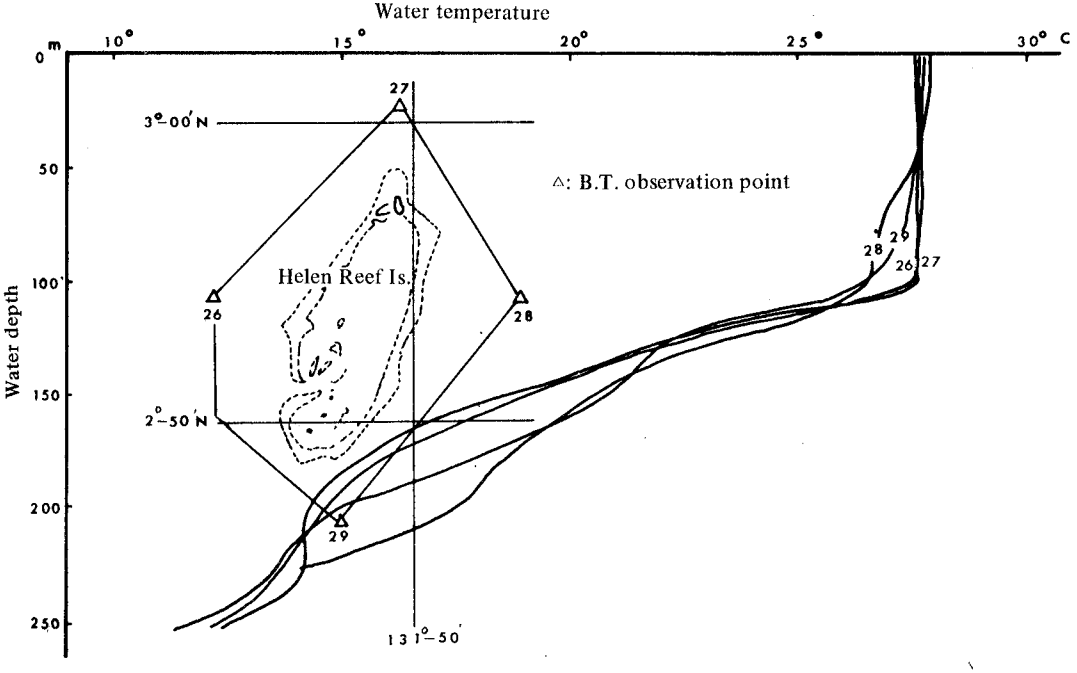


Figure 7-(3) Vertical distribution of water temperatures (Around Helen Reef, Palau Is. 31 Aug.)

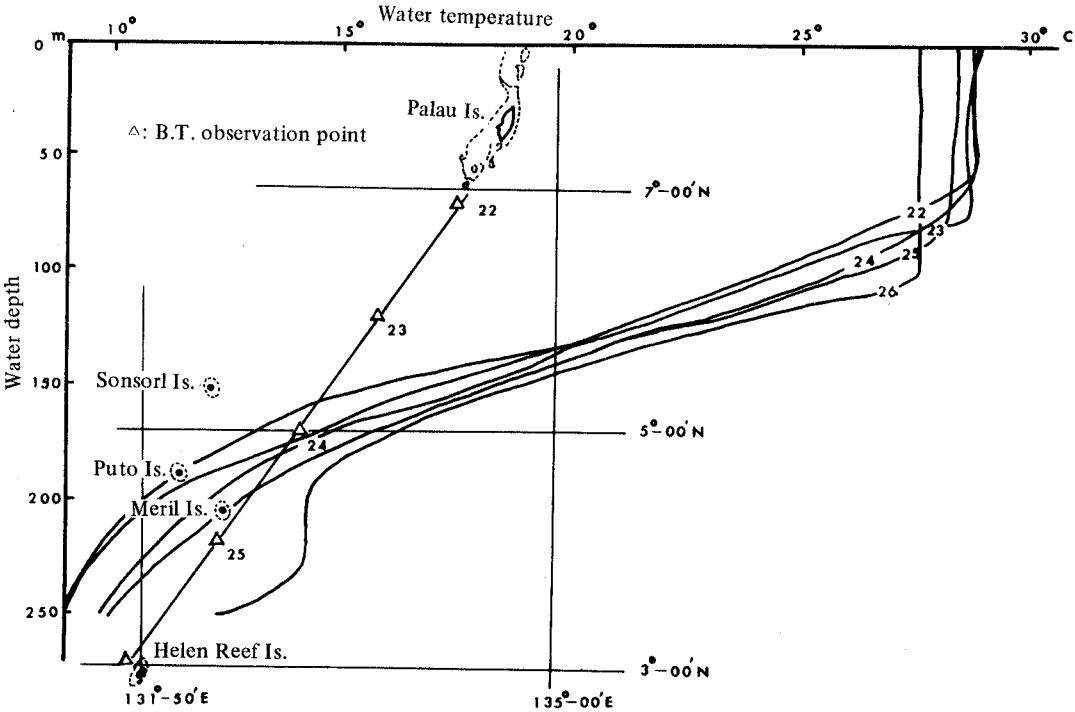


Figure 7-(4) Vertical distribution of water temperatures (Helen Reef, Palau Is. 26 – 31 Aug.)

route from Palau Main Island to Helen Reef.

i) Waters around Palau Main Island:
Water surface temperatures recorded 28° ~ 29°C, the temperatures in the waters off east coast was about 1°C higher than those in the west coast waters. Thermocline was located at the depth of around 80 m, which was about 30 m deeper than last year.

ii) Waters around Helen Reef:
Water surface temperatures were about 27.5°C, being about 1°C lower than last year.
Thermocline was found at the depth of around 100 m, as was the case last year.

iii) Waters ranging from Palau Main Island to Helen Reef:
The nearer to Helen Reef, the lower were the water surface temperatures and also the more to the south, the deeper were the thermoclines. The thermoclines around Helen Reef were located about 25 m deeper compared with those around Palau Main Island.

(2) Exploratory pole-and-line fishing for skipjack:
Table 6 shows the occurrences of skipjack schools in the waters around the Palau Islands.

(a) Distribution and conditions of the skipjack schools:

i) Palau Main Island:
Mainly skipjack schools were found in the area ranging from the west of the Western Pass to 20 ~ 40 miles off the northwestern coasts, good fishing grounds

being located at almost same areas as last year.
Many small skipjack (body length, 25 ~ 35 cm) were caught in the area around the Western Pass.

ii) Son Sol Island, Merir Island and Helen Reef:
A number of bird-associate skipjack schools were found around these Islands. 10% of the schools also contained yellowfin tuna. The farther from the Island the less the schools were found.

Table 6. Occurance of skipjack schools

Area	No.of days at fishing grounds	Character of school	No. of schools sighted (A)	Catch				No. of operations (D)	D/B
				Yes (B)	B/D×100	No (C)	C/D×100		
Waters around Palau Islands	40	Simple school	0						
		Bird-associated	192	35	53.8	29	44.6	64	1.8
		Log-associated	1	1	1.6			1	1.0
		Dolphine or Shark - associated	0						
		Whale - associated	1						
Total	40		194	36	55.4		44.6	65	1.8

(19 schools had also Yellow fin tuna
3 schools had also Rainbow runner
2 schools had also Little tuna)

(b) Operation and catch:
The season for skipjack pole-and-line fishing in the area is normally from June to September. According to the information obtained from fishing vessels belonging to Van Camp Company, although skipjack fishing this year around the Palau Islands raised a good catch until the beginning of July, the catch was poor after Mid-July, as the schools did not occur in the waters close enough for the vessels to fish in their one-day fishing trips. The survey vessel, however, was able to obtain catches in several-days fishing trips to the area around Son Sol Island and Merir Island, which were made possible by using acclimatized baitfishes as a result of live fish net cage preservation. Table 7 presents the results of the fishing operations. Average catch per day amounted to 1,745 kg, which was twice as much as that in last year (976 kg). However, the catch included many small fishes, the average body weight being 2.3 kg, which was about half that of the last year's catch (average body weight 4.5 kg).

Table 7. Results of skipjack pole-and-line fishing

Area (period)	Operation		Average catch (kg)		Total catch (kg)		Average weight (kg)		Total catch (kg)
	No. of days	No. of operations	per day	per operation	Skipjack	Yellowfin	Skipjack	Yellowfin	
Palau Islands (20 July–4 Oct. 1977)	17	36	1.745	824	26.261	3.397	2.3	2.7	29.658
Marshall Islands (20 Oct.–25 Nov. 1977)	17	20	966	821	15.332	1.089	4.1	3.8	16.420
Total	34	56	1.355	823	41.593	4.485	2.7	2.9	46.078

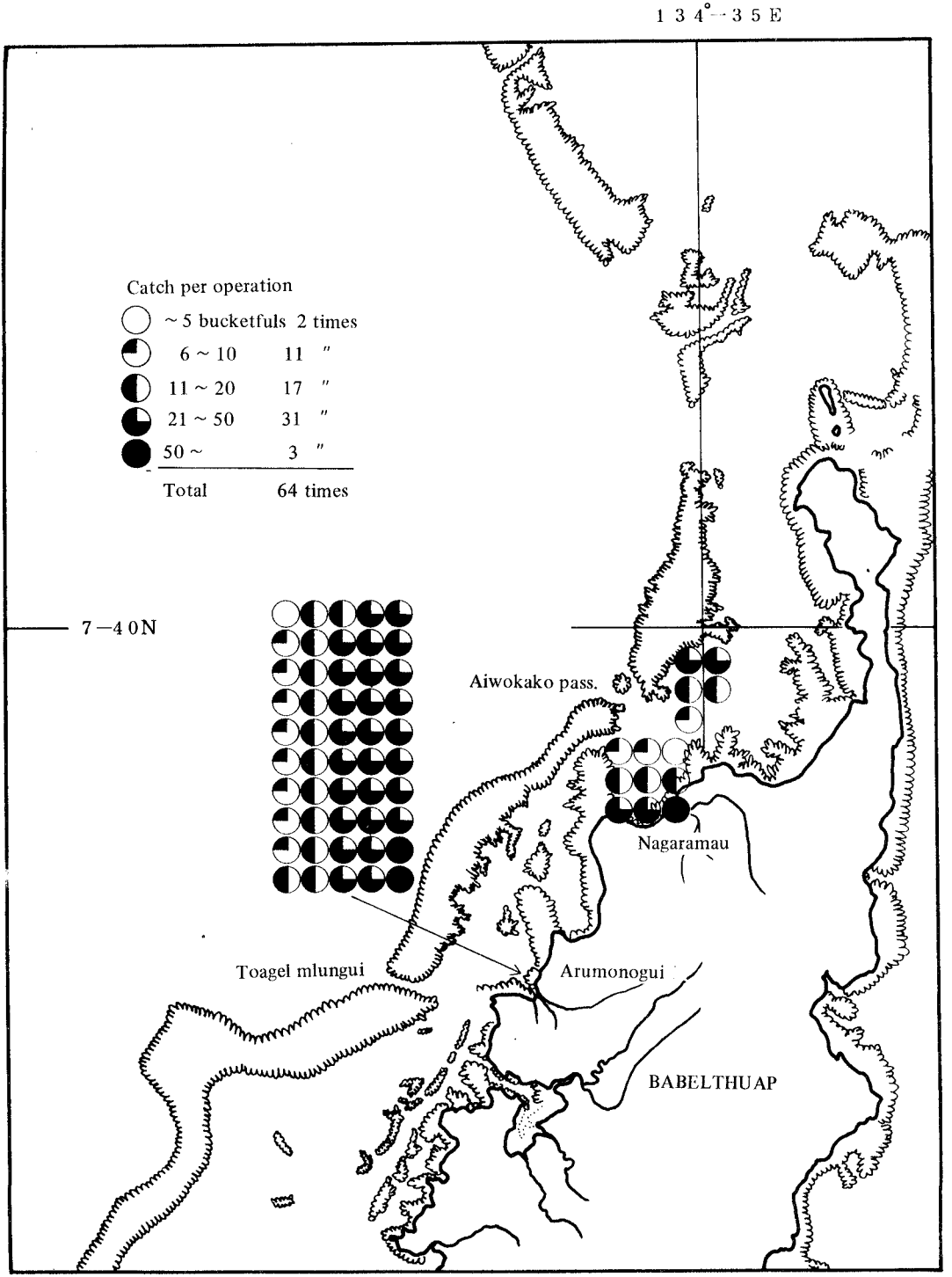


Figure 8-(1) Sites of operations of stick-held dip-net (Palau Main Is.)

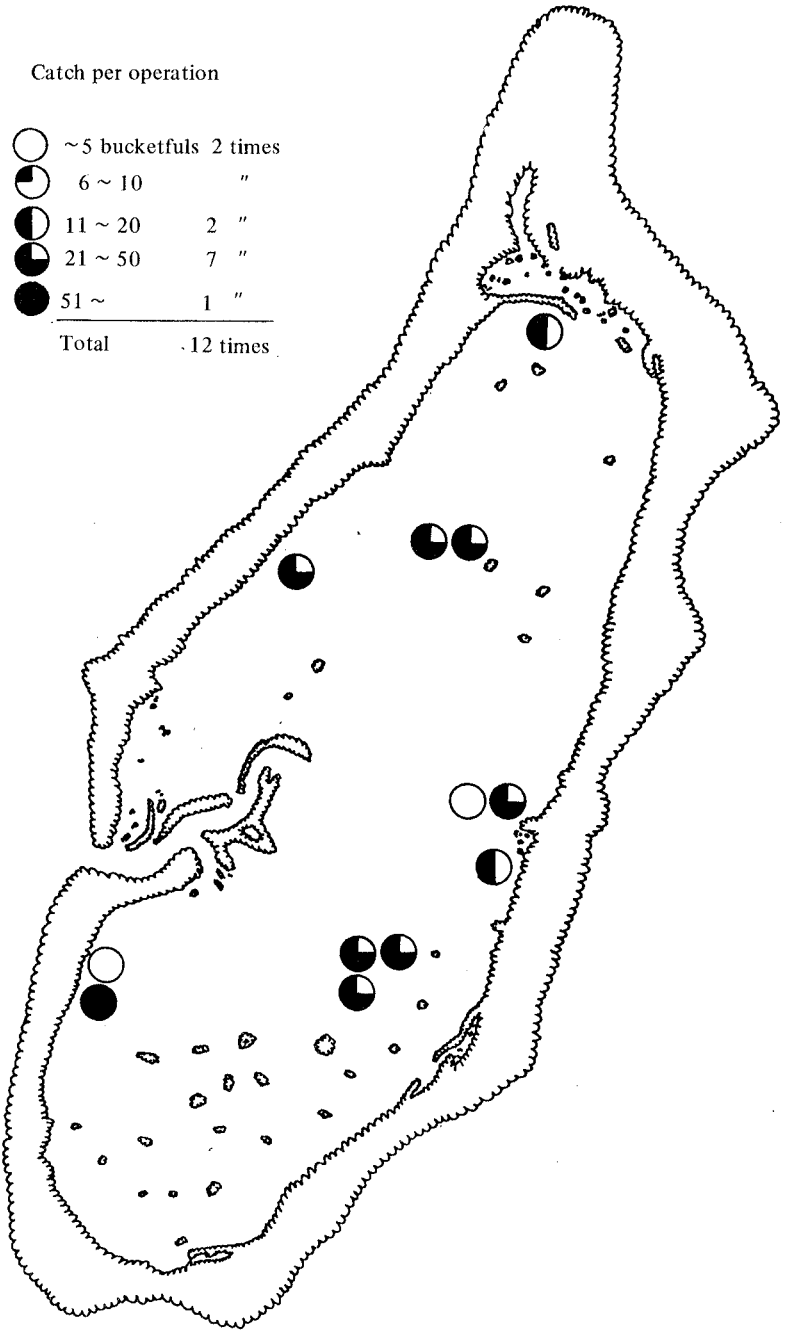


Figure 8-(2) Sites of operations of stick-held dip-net (Helen Reef)

Table 8-(1) Records of preservation test of bait fishes (1 bucketful: 3 kg)

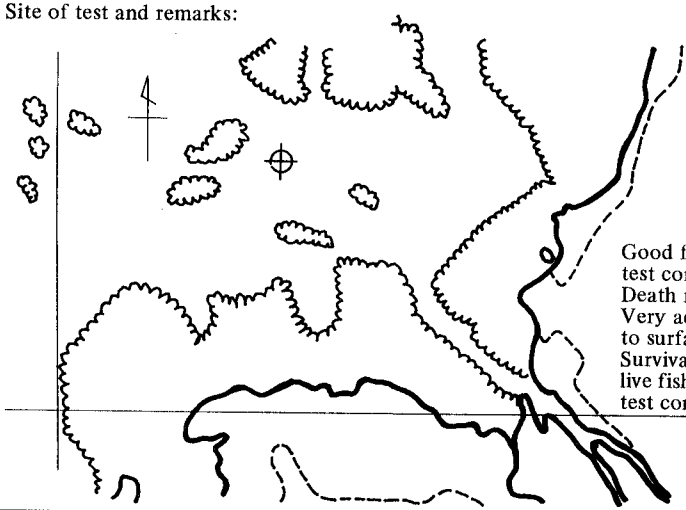
Operation No.	No. 7 No. 8 No. 9 No. 10 No. 11
Fishing ground	Arumonogui
Date of catching	1977.7.23 (22:40・05:00) 1977.7.24 (22:45・02:35・05:20)
Site of keeping test Distance from shore・Depth	7 32.7 N 134 31.0 E ・740m・33m
Date taken on board	1977.7.31 12:00

Quantity of bait fishes for keeping test

Species	Ratio	Quantity	Remarks
		Bkts	
Stolephorus spp.	82 (%)		
Harengula ovalis	18	16.5	
Total		90.1	

Date	Hour	Remarks	Received		Died Bkts	Died %	Survived Bkts	Survived %	Species	W. temp.
							Ratio of survival			
1977.7.23	22:40 ~ 05:00	Operations No. 7 and No. 8	About Bkts						Stolephorus spp. 90%, Harengula ovalis 10%	°C
24	12:00	Dead fish collected			(1.0)		44		Mainly stolephorus spp. died	28.9
24	22:45	Operation No. 9							09:00 Feeding started (2 kg)	30.3
25	~ 05:20	Operations No. 10, No. 11	(45)				89		Stolephorus spp. 90% Harengula ovalis 10%	29.3
25	12:00	Dead fish collected			(5.4)		83.6		Mainly stolephorus spp. died	29.7
25	17:00	〃			(1.5)		82.1		〃	28.0
26	08:00	〃			(1.3)		80.8		Feeding actively	29.0
26	12:00	〃			(0.5)		80.3		〃	29.6
26	17:00	〃			(1.0)		79.3		〃	28.9
27	06:00				(1.4)		77.9		Active, fish swim up to surface water	29.0
	15:00	Bad weather, dead fish collection impossible								29.4
28	08:00	Dead fish collected			0					28.3
29	17:00	Bad weather, dead fish collection impossible							Feeding actively	29.1
30	08:00	Dead fish collected			0				〃	28.4
	16:00	〃			0				〃	27.9
31	08:00	〃			0				〃	
	12:00	Taken to live fish tanks on board About			(12.1)	13.4	(78)	866		
Total			(90)							

Site of test and remarks:



Good feeding response after one day from test commenced.
Death rate decreased after 2 days.
Very active feeding response, fish swim up to surface water.
Survival rate 86.6%, when fish taken to live fish tanks on board after 7 days from test commenced

Table 8-(2) Records of preservation test of bait fishes (1 bucketful: 3 kg)

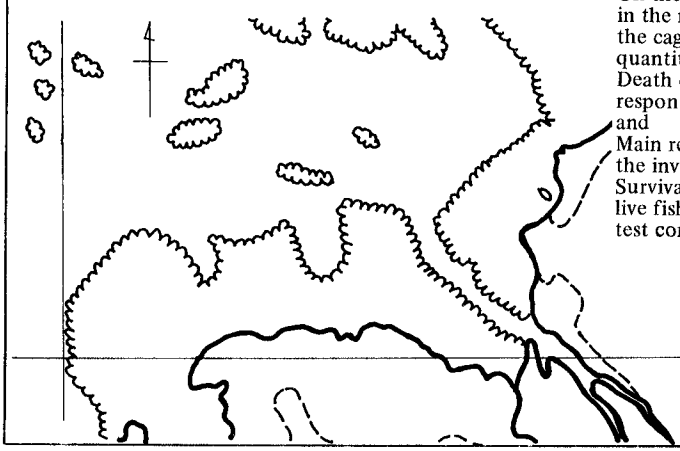
Operation No.	No. 17 No. 18 No. 19 No. 20 No. 21 No. 22
Fishing ground	Arumonogui
Date of catching	77.8.3 , 4.5.
Site of keeping test Distance from shore・Depth	7 32.7 N, 134 31.1 E, 700m. 30m
Date taken on board	77.8.9 20:00

Quantity of bait fishes for keeping test

Species	Ratio	Quantity	Remarks
Stolephorus spp.	88.0 %	Bkts	
Harengula ovalis	10.8	18	
Leiognathidae	1.2	2	
Total		167	

Date	Hour	Remarks	Received		Died		Survived	Ratio of survival		Species	W.temp.
					%	Bkts		%			
1977.8. 3	23:40 ~ 05:10	Operations No. 17 and No. 18	Bkts								29.4
4	22:50 ~ 05:10	Operations No. 19 and No. 20	About								28.4
5	08:00	Dead fish collected			(2.1)					Engraulidae 100%	28.4
5	17:00	〃			(10)						
5	22:40 ~ 04:50	Operations No. 21 and No. 22	About								
6	08:00	Dead fish collected			(5.0)					Mainly Engraulidae	28.3
	17:00	〃			(19.3)						29.2
7	08:00	〃			(44.0)					Mainly Engraulidae (12~15cm), Several large squid invaded net cage	
7	17:00	〃			(3.0)					2 large squid removed	29.2
8	08:00	〃			(15.0)					Some Leiognathidae invaded net cage	29.2
8	08:00	Gill net placed in net cage			(1.0)					Good feeding response	29.0
9	17:00				(1.0)					224 Leiognathidae and 12 Dussmieridae caught with gill net	28.5
9	19:00	〃			(0.2)					Good feeding response	29.5
9		Taken to live fish tanks on board						(75)			
Total					(91.6)		55.1	(75)		449	( ): indicate actual measurement

Site of test and remarks:



On the 2nd day after baitfishes were placed in the net cage, several large squid invaded the cage resulting in the death of a large quantity of the baitfish.
Death of baitfish decreased and feeding response increased after removal of squid and with gill net.
Main reason for the low survival rate is the invasion of squid.
Survival rate 44.9%, when fish taken to live fish tanks on board after 4 days from test commencement.

Table 8-(3) Records of preservation test of bait fishes (1 bucketful: 3 kg)

Operation No.	No. 25 No. 26 No. 27 No. 28
Fishing ground	Arumonogui
Date of catching	1977.8. 9(23:30 - 05:30) 1977.8.10(23:50 - 04:30)
Site of keeping test Distance from shore · Depth	7 - 32.7 N, 134 - 30.7 E, 1,300m, 30m
Date taken on board	1977.8.17 13:30

Quantity of bait fishes for keeping test

Species	Ratio	Quantity	Remarks
Stolephorus spp.	83.0 (%)		
Harengula ovalis	3.7	4.4	
Spratelloides delicaturus	13.3	18.0	
Total		132.0	

( ) show actual calculation

Date	Hour	Remarks	Received	Died	Survived	Ratio of survival	Species	W.temp.
				Bkts (%)		Bkts (%)		
1977.8. 9	23:30 ~ 05:30	Operations No. 25, No. 26	About Bkts					
10	12:00	Dead fish collected		2.0			Stolephorus spp. 50% Leiognothidae 50%	28.7
10	23:50 ~ 04:30	Operations No. 27, No. 28	About					28.1
11	08:00	Dead fish collected		1.7			Stolephorus spp. 100%	
11	17:00	〃		2.3			Stolephorus spp. 80% Leiognothidae 20%	
12	08:00	〃		1.7			Stolephorus spp. 100%	28.5
	18:00	Gill net placed		5.0			Stolephorus spp. 100%	
13	08:00	Gill net hauled		3.3			2 Squid (14~17cm) and 94 Leiognothidae (7~10cm)	28.2
	17:00	〃		2.7			Stolephorus 100%	28.8
14	08:00	〃		1.7			Weather worsened	28.5
	17:00	〃					〃	
15	08:00	〃		0.7			Stolephorus 100%	
	17:00	〃		0.3			Bad weather	
16	08:00	Feeding					〃	
17	08:00	No feeding						28.7
	13:00	Taken to live fish tanks on board						
Total				(21.4)	16.2	(110) 83.3		

Site of test and remarks:

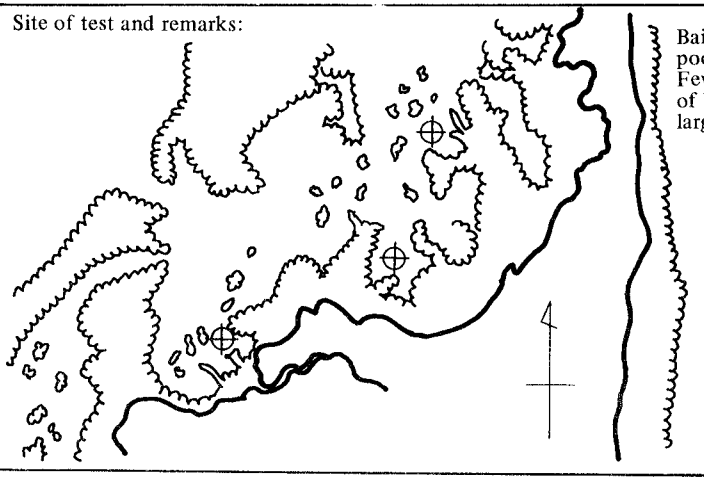
Death rate of baitfishes very high, when squid as well as Leignothidae invade the net cage.
Gill net in the net cage should cover the surface to bottom, to catch all predaters.
Survival rate was 83.3% in 7 days after the commenced of the test.

Table 8-(4) Records of preservation test of bait fishes (1 bucketful: 3 kg)

Operation No.	No. 29 No. 30	Quantity of bait fishes for keeping test	Species	Ratio	Quantity	Remarks
Fishing ground	Garasumao A		Stolephorus spp.	11.1 (%)		
Date of catching	1977.8.17 · 23:20 ~ 05:00		Harengula ovalis	33.3	15.0	
Site of keeping test Distance from shore · Depth	7 – 37.6 N 134 – 35.7 E · 1,300 m . 30 m		Atherinidae	33.3	15.0	
			Spratelloides delicaturus	22.3	10.0	
Date taken on board	1977.8.24 12:30		Total		45.0	

Date	Hour	Remarks	Received		Died	Survived	Ratio of survival		Species	W.temp.
1977.8.17	23:20 ~ 05:00	Operations No. 29 and No. 30	About Bkts		Bkts	(%)	Bkts	(%)		28.1
18	17:00	Dead fish collected			0.7				Engraulidae: 100% No response to feeding	29.4
19	08:00	〃			0				Response to feeding	29.1
19	17:00	〃			0				〃	
20	08:00	No. changes							〃	28.6
	17:00	Dead fish collected			0				〃	29.2
21	08:00	〃			0				〃	28.5
	17:00	〃			0				〃	28.7
22	08:00	〃			0					28.6
	17:00	〃			0					
23	08:00	〃			0.7					29.6
24	13:00	Taken to live fish tanks on board			(1.4)	3.3	(42)	96.7		
Total									( ): indicate actual measurement	

Site of test and remarks:



Baitfish supplied only once due to poor catch.
Few fish died due to small quantity of baitfishes and no invasion of large fish.

Table 8-(5) Records of preservation test of bait fishes (1 bucketful: 3 kg)

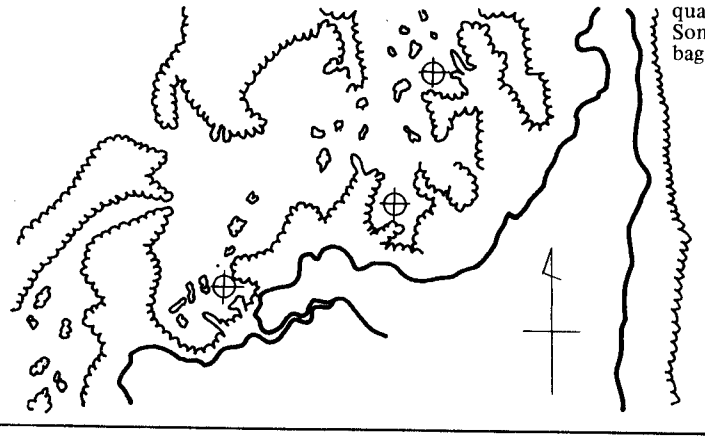
Operation No.	No. 31 No. 32
Fishing ground	Garasumao B
Date of catching	1977.8.18・22:00 ~ 05:00
Site of keeping test Distance from shore・Depth	7 - 36.8 N 134 - 33.7 E・1,300m・37m
Date taken on board	1977.8.24 14:00

Quantity of bait fishes for keeping test

Species	Ratio	Quantity	Remarks
Stolephorus spp.	12.5 (%)	Bkts	
Harengula ovalis	50.0	10.0	
Atherinidae	17.5	3.5	
Spratelloides delicaturus	20.0	4.0	
Total		20	

Date	Hour	Remarks	Received	Died Bkts	Died %	Survived Bkts	Survived %	Species	W.temp
1977.8.18	20:00 ~ 05:00	Operations No. 31 and No. 32	About					Mainly Harengula ovalis	29.4
19	08:00	Dead fish collected		0				〃	29.1
19	17:00	〃		0				No response to feeding	
20	08:00	Feeding						〃	28.6
	17:00							Response to feeding not ascertained	29.2
21	08:00							Some response to feeding	28.5
	17:00	Dead fish colected		0.7				Several Remora invaded	28.7
22	08:00			0				5 Remora removed	28.6
23	08:00			0				Response to feeding not ascertained	
24	08:00			0				〃	
	14:00	Taken to live fish tanks on board	About	(0.7)	4.5	(15)	95.5	Mainly Harengula ovalis With some Engraulidae and Atherinidae	29.6
Total								( ): indicate actual measurement	

Site of test and remarks:



Very few baitfish died due to small quantity of the test fishes.
Some remoa invaded breaking the bag net.

Table 8-(6) Records of preservation test of bait fishes (1 bucketful: 3 kg)

Operation No.	No. 49 No. 50 No. 51 No. 52 No. 53
Fishing ground	Arumonogui
Date of catching	1977.9. 9(23:00 ~ 05:20) 1977.9.10(23:20 ~ 05:20)
Site of keeping test Distance from shore·Depth	7 − 32.8 N 134 − 30.7 E · 1,400 m . 37 m
Date taken on board	1977.9.17 17:00

Quantity of bait fishes for keeping test

Species	Ratio	Quantity	Remarks
Stolephorus spp.	58.6 %	Bkts	
Harengula ovalis	9. 4	12.0	
Spratelloides delicaturus	2. 4	3.0	
Caesionidae	2 9 6	37.7	
Total			

( ) show actual calculation

Date	Hour	Remarks	Received		Died Survived		Ratio of survival		Species	W.temp.
					Bkts	%	Bkts	%		
1977.9. 9	23:00 ~ 05:20	Operations No. 49~No. 51								
10	16:00	Dead fish collected			3.2				Good feeding response (caesionidae)	
10	23:20 ~ 05:20	Operations No. 52~No. 53	40						〃	
11	08:00	Dead fish collected			3.5				Stolephorus spp. 100%	
	16:00	〃			0.9				One remora removed Stolephorus spp. 100%	
12	08:00	Feeding							Good feeding response	
	17:00	Dead fish collected			3.0				Mainly stolephorus spp. some Harengula ovalis	
13	17:00	〃			2.0				Very good feeding response	
14	08:00	Feeding							17 remoa (60~80cm) removed	
	17:00	Dead fish collected			0.2				Very good feeding	
15	17:00	〃			0.2				Stolephorus spp. 100%	
16	08:00	Feeding								
	17:00	Dead fish collected			0.2				Stolephorus spp. 100%	
17	08:00	〃			0.3				Stolephorus spp. 100%	
	17:00	Taken to live fish tanks on board	127 (129.5)		(13.5)	10.4	(116)	89.6		
Total										

Site of test and remarks:

Caesionidae responsed to feeding in 12 hours after catch.
Mainly Stolephorus spp. died.
Remoa invaded the cage breaking the bottom, but was removed with speas.
Caesionidae was resistant and hardly died.

Table 8-(7) Records of preservation test of bait fishes (1 bucketful: 3 kg)

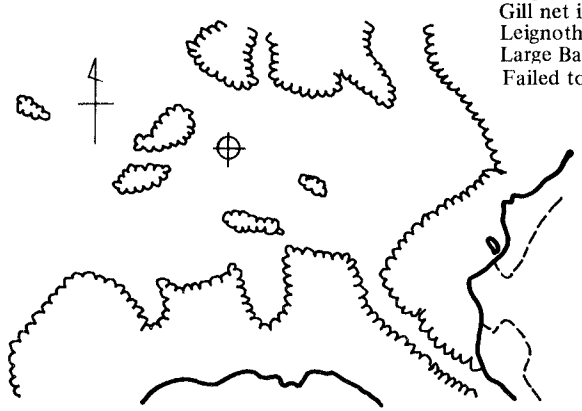
Operation No.	No. 63 No. 64 No. 65 No. 66
Fishing ground	Arumonogui
Date of catching	1977.9.23(23:30 ~ 05:15) 1977.9.24(23:20 ~ 05:00)
Site of keeping test Distance from shore・Depth	7 — 32.7 N 134 — 30.4 E・1,450 m・27 m
Date taken on board	1977.10.4 17:30

Quantity of bait fishes for keeping test

Species	Ratio	Quantity	Remarks
Stolephorus spp.	7.8 (%)		
Harengula ovalis	75.3	58.0	
Atherinidae	8.4	6.5	
Spratelloides delicaturus	8.4	6.5	
Total		77.0	

Date	Hour	Remarks	Received	Died Survived		Ratio of survival		Species	
				Bkts	(%)	Bkts	(%)		
1977.9.23	23:30 ~ 05:15	Operations No. 63 and No. 64	About 8kts					Some Liognathidae mingled	28.3
24	17:00	Dead fish collected		1.0				No response to feeding	
	23:20 ~ 05:00	Operations No 65 and No. 66	(49)					Some Dussmieriidae mingled (15~18cm)	28.4
25	12:00	Dead fish collected		3.0				Gill net placed in net cage	28.4
26	08:00	Large fish removed with gill net		10.0				Leiognathidae 7~13cm, 30% Clupeidae 13~18cm 70%	
	17:00	Dead fish collected		3.2				Some Harengula ovalis and Dussmieriidae mingled	29.5
27	17:00			1.0				Mainly Engraulidae	29.8
28	12:00			1.7				Mainly Dussmieriidae and Engraulidae	29.6
29	08:00	Feeding		0				Good response to feeding	
	16:00	Dead fish collected		0.3				Engraulidae 100%	
30	08:00							Good response to feeding	28.8
	16:00	Feeding		0				〃	
10. 1	07:00	Dead fish collected						〃	28.7
	16:00	Feeding		0				〃	29.8
2	16:00	Dead fish collected		0				〃	29.7
3	17:30	Taken to live fish tanks on board				(23) 20		Harengula ovalis and Leiognathidae Culpeidae (large)	
Total			(77)	(20.2)		43		( ): indicate actual measurement	

Site of test and remarks:



Large sized (15~18cm) mingled in test fishes.
Gill net in the net cage caught at its upper part and Leignothidae at its lower part.
Large Barracuda (1.4m) invaded the net cage.
Failed to catch with spear. Broke the net and escaped.

Table 8-(8) Records of preservation test of bait fishes (1 bucketful: 3 kg)

Operation No.	No. 67 No. 68
Fishing ground	Garasumao B
Date of catching	1977.9.25(23:50 ~ 05:10)
Site of keeping test Distance from shore・Depth	7 - 36.6 N 134 — 33.8 E・930 m・38 m
Date taken on board	1977.10.3 14:00

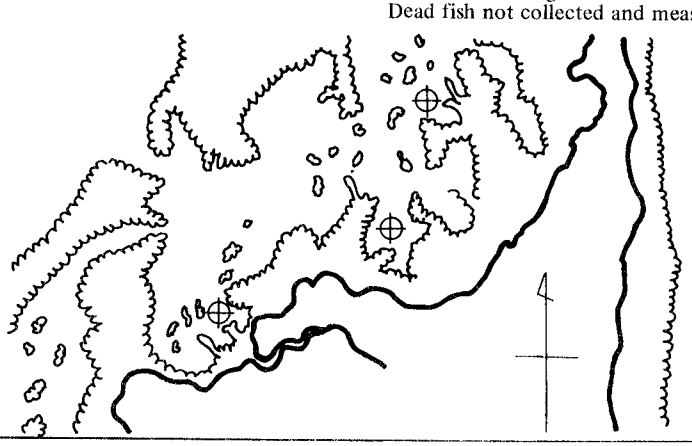
Quantity of bait fishes for keeping test

Species	Ratio	Quantity	Remarks
Stolephorus spp.	Bkts		
Atherinidae		2.4	
Sprotelloides delicaturus		2.0	
Caesionidae		0.4	
Total		4 7	

Date	Hour	Remarks	Received		Died	Survived	Ratio of survival		Species	W. temp.
			Bkts		Bkts	%	Bkts	%		
1977.9.25	23:30 ~ 05:10	Operations No. 67, No. 68							Mainly stolephorus spp., good condition	28.6
26	17:00	Dead fish collected			(1.0)				Stolephorus spp. 100%	
27	06:50	Dead fish removed			2.0				Sunker to the bottom	27.9
	16:00	Feeding							Good feeding response	
28	16:00	Dead fish collected			(1.7)				Mainly stolephorus spp.	
29	08:00	Feeding							Good feeding response	
	16:00	Dead fish collected			(0.3)				Mainly stolephorus spp.	
30	08:00	Feeding							Good feeding response	
	16:00	Dead fish collected			0				Mainly stolephorus spp.	
10. 1	08:00	Feeding							Good feeding response	
	16:00	Dead fish collected			0				Good feeding response	
2	08:00	Feeding							Good feeding response	
	14:00	Taken to live fish tanks on board			5.0		(38)			30.0
Total			47		5.0		(38)		( ) show actual calculation	

Site of test and remarks:

Tested Baitfishes consisted mainly of Stolephorus spp.
Conditions were good with no large fishes mingled incidentally.
Dead fish not collected and measured on 25 Sept.



(3) Baitfishes:

(a) Operations and catches:

Annex 8 presents the records of exploratory fishing for baitfishes with stick-held dip-nets. Figures 8-(1) and 8-(2) show the sites of the operations. Table 1 also presents the results of the operations including catch by species.

i) Palau Main Island:

Maximum catch per night amounted to 115 bucketfuls of which Engraulidae were prevalent. Maximum catch per operation was 75 bucketfuls.

Average catch per night was 43.2 bucketfuls, which were 10 bucketfuls less than last year (53.1 bucketfuls). Engraulidae accounted for 50.8% in the catch at the fishing grounds off Arumonogui in the west coast of Palau Main Island, which was less than 58.0% in the last year's operation.

ii) Helen Reef:

Main species in the catch was *Spratelloides japonicus* (Houttuyn) accounting for 91.2% of the catch. Maximum catch per night recorded 67 bucketfuls and maximum for one operation was 35 bucketfuls which was much less than last year's record, i.e. 240 bucketfuls.

The poor catch can be attributed mainly to the fact that *Spratolloides* were unmatured and small-sized (made of body length: 35 mm). No *Spratelloides* had been caught in the exploratory catching of baitfishes conducted in the Micronesian waters in the last 4 years, except in the Helen Reef area.

(b) Baitfish preservation tests:

i) Preservation tests in live fish net cages:

The tests were carried out at the sites off Arumonogui (7° 32'N, 134° 31'E, 30 m water depth and muddy bottom) and Garasumao (7° 37'N, 134° 34'E, 40 m water depth and muddy bottom). Main results of the tests are shown in Table 4, and detailed records of the tests are shown in Tables 8-(1) to 8-(8). Survival rate of the baitfishes amounted to about 90% after one week's preservation, under favorable conditions where no predators such as large fishes, squids and Leiognathidae invaded the net cages.

ii) Preservation tests in live fish tanks on board the survey boat:

Baitfishes which had survived the preservation tests (Table 4) were transferred to the live fish tanks (mechanical water circulation)on board the survey vessel and used as bait during the 6 fishing trips (each lasting for several days) to the waters around Yap Island, Son Sol Island and Merir Island. The baitfishes were well acclimatized within several days after they were accommodated in the live fish tanks on board and showed very active response to feeding with strong appetite. The response appeared very similar to that of Engraulidae caught in Japanese waters. Mortality of these baitfishes was also very small. The tests confirmed that locally preserved and acclimatized baitfishes could survive fishing trips over several days.

(4) Biological studies:

(a) Skipjack:

i) Waters around the Palau Islands:

Figure 9 shows body length distribution of the skipjack caught in the waters around Palau Main Island and Helen Reef. The Modes of the body length were located at 47 cm and 58 cm.

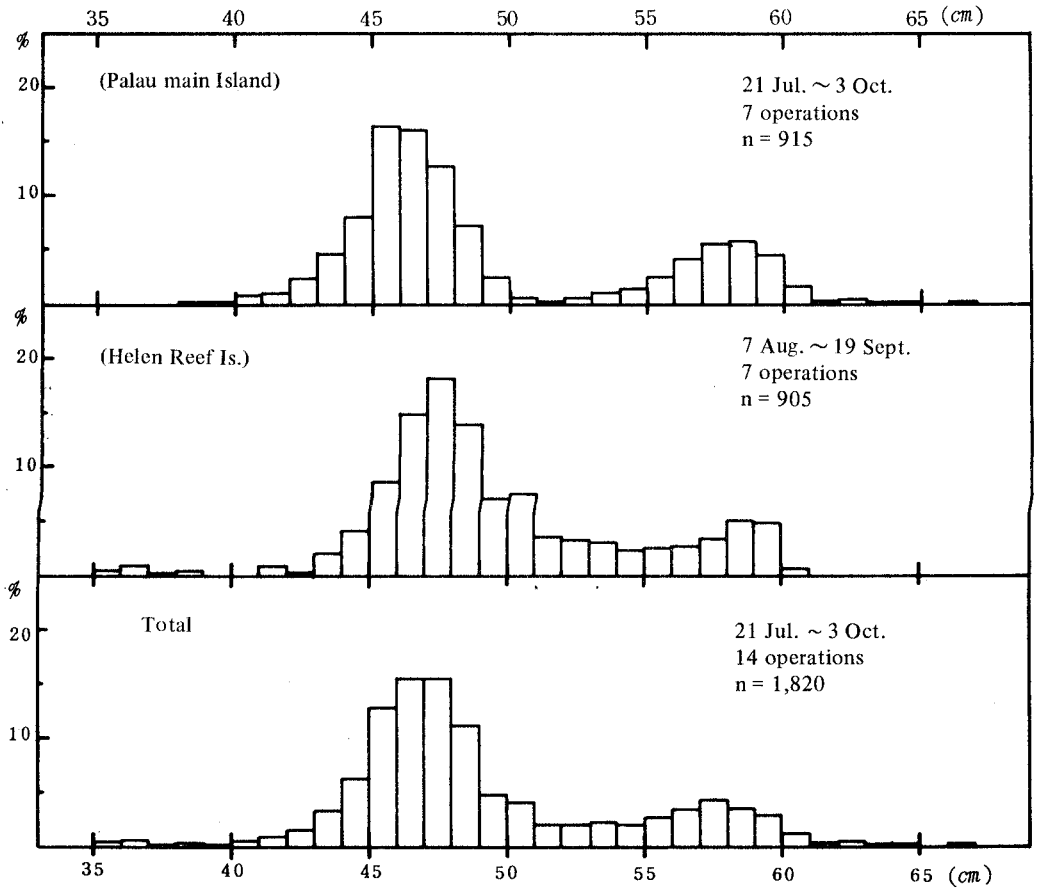


Figure 9. Body length distribution of skipjack (Palau Is.)

ii) Biological examination of skipjack (Operations No. 1 ~ No. 36):
Palau Main Island (Examined 7 times)
Sex: Number of fish examined: 70
Male 65.7% and female 34.3%
Maturation of sexual gonad: Number of fish examined: 70
unmatured 17.1%, maturing 35.7% and matured 50.0%
Stomach contents: Number of fish examined: 70
Vacant 44.3%, half-full 35.7% and full 20.0%
One school was found fed fully on pelagic species of Engraulidae.

(b) Baitfishes:

i) Body length distribution:
Figures 10-(1) and 10-(2) present body length distribution of main baitfishes caught in the waters of the Palau Islands (Arumonogui, Garasumao, Helen Reef). Regarding Engraulidae which accounted for the main part of the catch, the mode of the body length was 70 mm which proved 15 mm larger than last year.

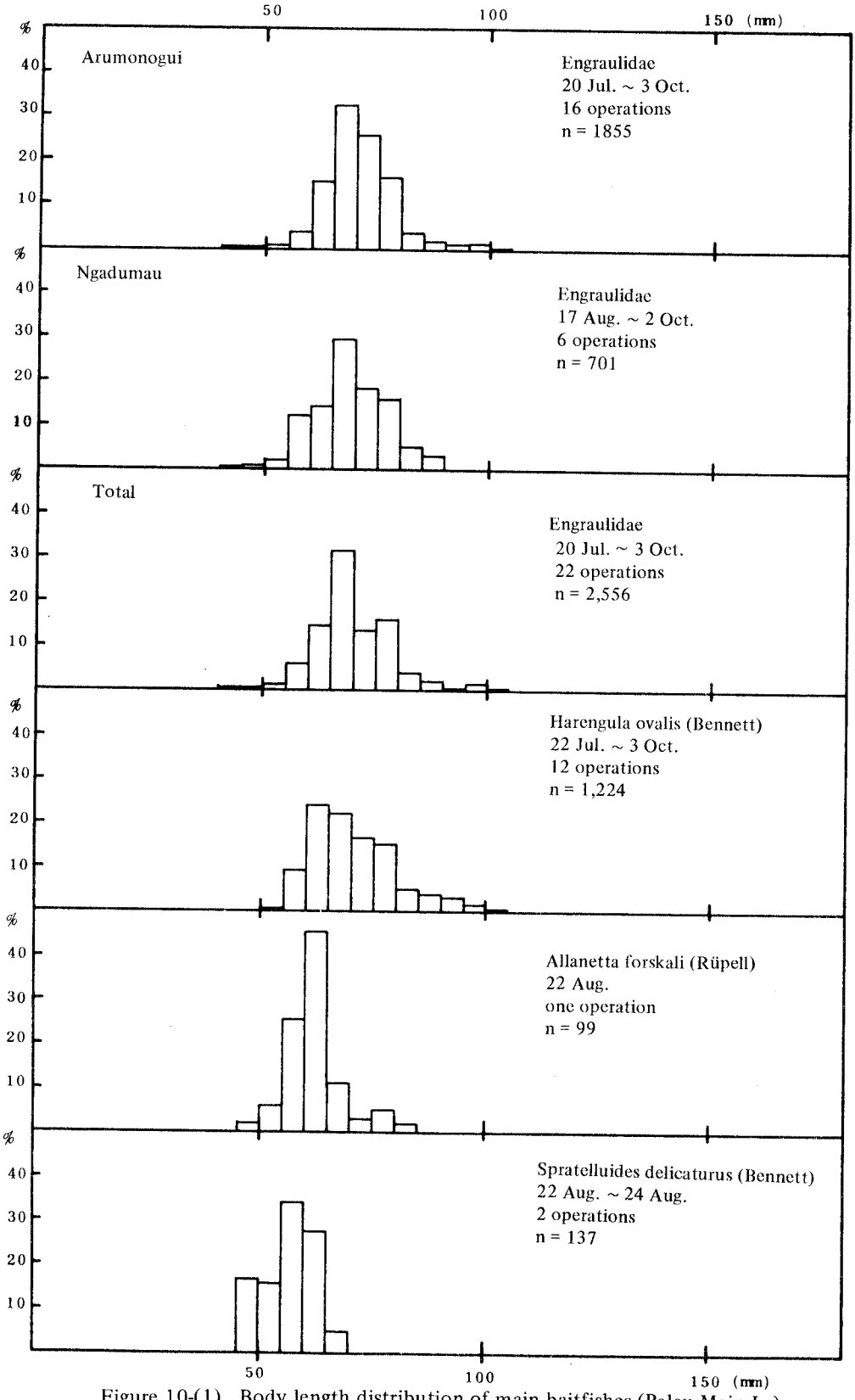


Figure 10-(1) Body length distribution of main baitfishes (Palau Main Is.)

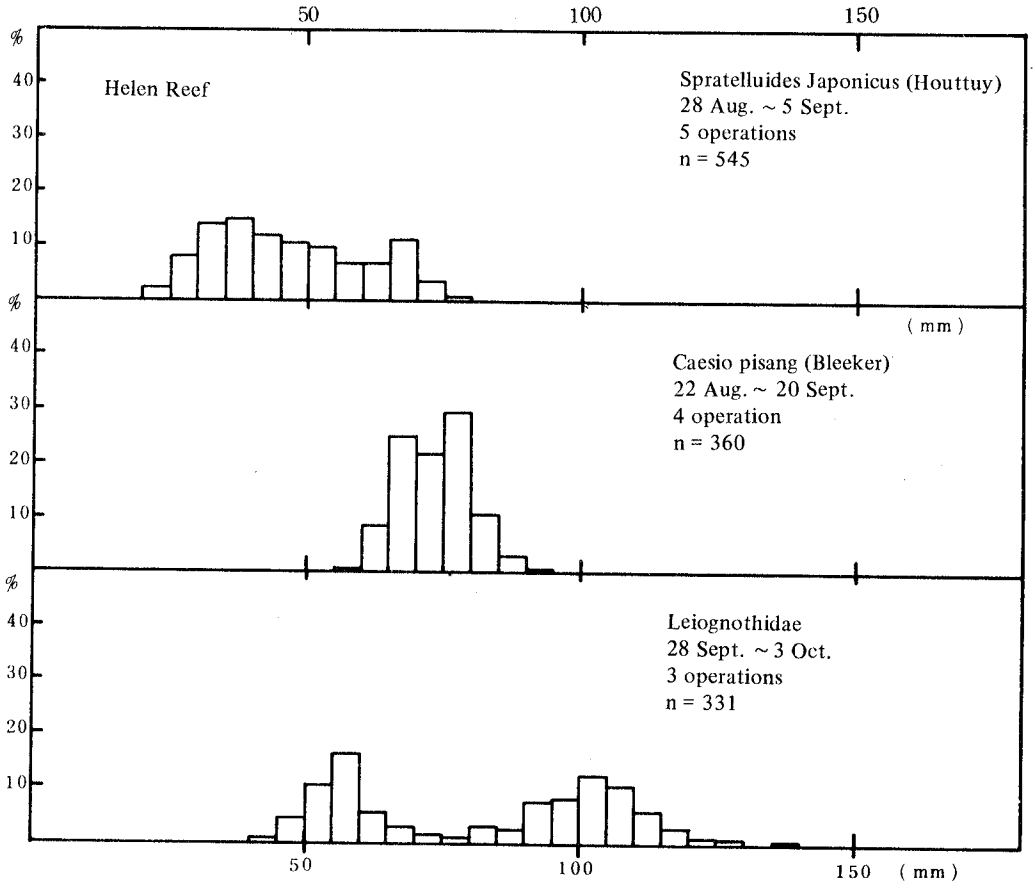


Figure 10-(2) Body length distribution of main baitfishes (Palau Main Is.)

Both *Allanetta forskali* (Rüppell) and *Spratelloides delicatulus* (Bennett) were also found bigger by 10 to 15 mm compared with last year. The biggest and the smallest of the *Spratelloides japonicus* caught at Helen Reef measured 25 ~ 80 mm, respectively, the mode being at 40 mm. The bigger ones were caught at the central and deeper part of the lagoon (depth 40 ~ 45 m, bottom sandy and coral) and the small and young ones were found in the shallower waters (depth 20 ~ 35 m, bottom sandy and coral) close to the outer reef.

Leiognathidae were caught incidentally in the areas off Arumonogui and Garasumao.

The body length ranged from 40 mm to 140 mm, the modes being at 60 mm and 105 mm. Great damages were made to baitfishes, whenever Leiognathidae happened to be placed in the net cages together with other baitfishes.

Annex table 2.

Results of oceanographic observetions

No.	Date	Hour	Position		Water temperature (°C)										Weather	Wind direction	Wind force	Temp. (°C)	Pressure (mb)	Wave	Trans-parency (m)	Remarks
			Lat. (N)	Long. (E))	0 m	25	50	75	100	125	150	175	200	225	250								
1	77. 7.21	11:50	8 —07	134 —09	29.2	28.8	28.6	27.5	25.4	21.5	16.5	14.8	12.6	11.4	10.5	c	SSW	3	29.0	10095	3	41	
2	〃	13:15	7 —50	134 —21	29.5	28.8	28.4	27.2	24.6	23.3	20.0	16.4	13.3	11.6	10.7	c	SSW	2	29.0	10088	2	32	
3	8. 1	16:45	7 —10	134 —39	28.9	29.0	28.9	27.7	26.6	23.7	18.2	15.0	13.0	11.0	10.0	o	SW	4	29.0	1007.5	4	35	
4	〃	16:55	7 —10	134 —39	28.9	28.9	28.7	27.6	26.6	23.6	18.0	15.0	13.2	11.2	9.9	o	SW	4	29.0	1007.5	4	35	
5	〃	18:15	7 —20	134 —48	28.9	28.9	28.9	27.2	25.3	21.7	18.0	16.2	12.8	11.2	9.8	o	WSW	4	27.8	1007.9	4	24	
6	〃	19:40	7 —30	134 —49	28.9	28.9	28.7	27.3	25.5	22.4	18.5	15.3	12.3	11.0	9.5	b c	WSW	4	28.5	10088	4		
7	〃	20:50	7 —40	134 —49	28.8	28.8	28.8	27.6	25.6	22.2	18.3	15.2	12.8	11.4	9.9	b c	WSW	4	28.2	10092	4		
8	〃	22:10	7 —50	134 —50	28.9	28.9	28.9	27.5	26.8	22.7	18.9	16.2	13.2	11.2	10.0	b c	WSW	4	28.2	10092	4		
9	〃	23:20	8 —00	134 —51	29.0	29.0	28.3	27.5	26.4	21.7	19.3	17.3	13.5	11.3	10.0	b c	WSW	4	28.2	10090	4		
10	8. 2	7:00	8 —10	134 —51	28.8	28.8	28.8	28.3	26.8	23.7	20.5	16.2	13.8	11.4	10.4	b c	SW	5	28.8	10083	5	33	
11	〃	10:50	8 —10	134 —20	28.8	28.8	28.8	28.0	27.7	25.4	19.5	15.6	12.6	11.2	10.3	c	W	5	29.0	10090	5	31	
12	〃	11:50	8 —00	134 —20	28.8	28.7	28.7	27.7	27.2	25.0	19.2	16.2	13.7	11.5	10.4	o	W	5	29.2	10090	5	34	
13	〃	13:10	7 —50	134 —20	28.8	28.8	28.8	28.7	26.2	22.2	17.6	14.0	12.4	11.2	9.8	o	WSW	5	29.0	10085	5	31	
14	〃	14:15	7 —40	134 —20	28.7	28.7	28.6	28.0	24.8	22.0	16.2	14.0	12.2	10.5	9.3	o	WSW	4	28.5	10080	5	30	
15	〃	15:45	7 —30	134 —12	28.8	28.7	28.8	27.5	24.7	22.0	17.2	14.2	12.7	10.8	9.6	r	WSW	5	24.0	10080	5	29	
16	〃	17:25	7 —20	134 —04	28.5	28.5	28.5	27.5	24.8	21.6	16.2	14.2	13.0	10.5	9.8	r	SW	4	25.1	10080	5		
17	〃	18:40	7 —10	134 —04	29.0	29.0	29.0	28.7	26.2	23.2	19.5	16.2	13.5	11.3	10.3	r	SW	4	25.2	10090	6		
18	〃	19:55	7 —00	134 —04	28.6	28.6	28.6	27.8	25.2	23.8	18.0	16.0	14.8	11.2	9.7	o	SW	4	26.0	10096	6		
19	8. 3	8:10	6 —51	134 —20	28.6	28.6	28.7	27.7	25.0	22.0	19.5	15.4	13.2	11.5	10.2	o	SE	5	25.2	10120	5	29	
20	〃	9:50	7 —00	134 —29	28.4	28.4	28.5	27.5	25.0	21.0	16.0	14.5	13.2	11.0	10.0	o	SE	3	25.3	10105	4	31	
21	8.26	18:20	7 —00	134 —29	29.0	29.0	28.9	26.0	23.5	20.5	16.5	13.5	11.7	10.6	9.6	c	SW	3	28.6	10100	3	28	
22	〃	19:50	6 —51	134 —20	28.9	28.7	28.9	27.0	24.3	21.0	18.3	14.2	12.2	10.8	9.8	o	SW	3	28.2	10110	3		
23	8.27	2:40	6 —00	133 —40	28.7	28.7	28.7	27.8	24.5	21.3	15.5	12.8	10.7	9.6	9.0	b c	NW	4	28.0	10100	3		
24	〃	10:45	5 —00	132 —57	28.7	28.8	28.8	27.2	25.6	22.0	16.7	14.0	11.0	9.7	9.0	o	WSW	3	27.6	10115	3	40	
25	〃	20:30	4 —00	132 —13	28.4	28.4	28.3	28.2	26.0	21.6	18.0	15.2	12.9	11.2	9.9	o	SW	3	27.5	10108	3		
26	8.31	7:05	2 —55	131 —41	27.6	27.6	27.6	27.6	27.6	22.5	18.5	15.7	14.3	14.3	12.3	o	SW	4	27.7	10108	4	28	
27	〃	8:45	3 —04	131 —49	27.7	27.7	27.7	27.7	27.6	22.2	19.2	16.2	14.5	13.8	12.2	o	SW	4	28.3	10114	4	24	
28	〃	10:00	2 —55	131 —53	27.9	27.9	27.5	26.8	26.5	22.2	21.0	18.5	14.5	13.7	11.4	o	SSW	4	28.5	10112	4	23	

No.	Date	Hour	Position		Water temperature						
			Lat. (N)	Long. (E)	0 m	25	50	75	100	125	150
29	77. 8.31	11:30	2 —45	131 —45	27.8	27.8	27.7	27.4	26.5	23.0	20.6
30	9.27	8:30	7 —40	134 —20	28.9	28.2	28.1	28.0	26.5	20.8	17.3
31	〃	15:10	7 —10	134 —39	30.1	28.4	28.3	27.5	23.5	20.0	16.0
32	〃	17:20	7 —20	134 —48	29.9	28.5	28.3	28.2	26.1	22.5	17.9
33	〃	19:15	7 —30	134 —49	28.9	28.5	28.3	28.2	26.6	23.0	17.7
34	〃	20:20	7 —40	134 —495	28.8	28.5	28.4	27.5	26.6	27.0	18.0
35	〃	21:30	7 —50	134 —50	28.7	28.5	28.5	28.5	26.2	23.1	19.6
36	〃	22:45	8 —00	134 —51	29.2	28.5	28.5	27.0	25.2	22.7	20.5
37	〃	24:00	8 —10	134 —51	28.9	28.5	28.4	28.2	25.5	22.0	18.2
38	9.28	3:20	8 —10	134 —20	29.1	28.4	28.3	28.0	24.5	21.6	17.8
39	〃	4:45	8 —00	134 —20	28.6	28.2	28.2	28.2	26.5	22.3	16.8
40	〃	5:50	7 —50	134 —20	28.6	28.2	28.2	28.2	27.0	23.0	18.5
41	9.29	7:35	7 —30	134 —12	29.1	28.2	28.2	27.8	24.5	21.0	15.6
42	〃	8:55	7 —20	134 —04	29.2	28.2	28.1	26.5	24.7	22.7	20.0
43	〃	10:07	7 —10	134 —04	29.5	28.2	28.2	27.5	24.8	21.0	18.2
44	〃	11:12	7 —00	134 —04	29.2	28.3	28.2	27.7	27.0	20.7	15.6
45	〃	13:08	6 —51	134 —20	30.3	28.7	28.3	28.0	24.5	21.5	17.2
46	〃	14:50	7 —00	134 —29	29.7	28.7	28.3	28.0	24.2	20.5	17.2
47	10.16	15:00	7 —00	165 —00	29.5	29.5	29.3	27.3	23.5	19.0	15.0
48	〃	22:20	7 —00	166 —00	29.4	29.4	28.9	28.0	25.0	20.5	16.5
49	10.17	5:05	7 —00	167 —00	29.4	29.3	29.3	28.3	26.5	19.0	15.0
50	〃	9:25	7 —00	168 —00	29.1	29.1	29.1	27.0	23.5	15.5	13.0
51	〃	15:15	7 —00	169 —00	29.6	29.6	29.5	28.0	25.5	18.5	15.0
52	〃	20:45	7 —00	170 —00	29.8	29.8	29.8	28.6	26.0	19.8	16.0
53	10.18	3:35	7 —00	171 —00	29.7	29.7	29.6	28.7	26.5	21.0	14.5
54	10.23	10:50	6 —14	169 —59	30.4	29.7	29.4	28.7	27.0	22.5	18.0
55	〃	13:05	5 —57	169 —44	30.7	29.5	28.7	27.6	26.3	19.0	17.5
56	10.26	9:05	6 —00	169 —485	29.6	29.7	29.4	28.2	24.5	21.2	18.0

(°C)				Weather	Wind direction	Wind force	Temp. (°C)	Pressure (mb)	Wave	Trans-parency (m)	Remarks
175	200	225	250								
18.7	17.7	14.0	13.6	o	SW	5	28.0	10108	5	21	
12.7	11.2	10.0	9.5	b c	S SW	1	27.0	10122	1	37	
19.1	16.6	10.7	9.5	b c	SW	1	29.8	10095	1	43	
13.5	12.0	10.5	9.7	b c	SW	1	30.0	10100	1	42	
14.6	12.7	11.4	10.3	q	E	1	29.0	10112	1		
15.7	14.5	12.2	10.8	b c		Calm	28.3	10120	0		
16.0	13.7	11.7	10.5	b c		Calm	28.8	10125	0		
15.0	13.0	11.0	10.8	b c		Calm	28.8	10126	0		
15.8	14.0	11.3	9.8	b c	SW	1	28.5	10127	1		
15.5	12.5	11.0	9.9	b c		Calm	28.2	10110	0		
14.3	12.5	11.3	9.8	b c		Calm	28.1	10112	0		
14.0	12.2	11.0	9.3	b c	S	1	28.1	10113	1	39	
14.2	12.2	11.0	9.4	b c	NNE	2	29.1	10115	2	43	
15.5	13.3	11.6	10.0	b c	NNE	2	31.8	10120	2	46	
16.2	13.0	11.0	10.0	b c	NE	2	31.5	10118	2	46	
13.3	11.6	10.5	9.0	b c	NE	2	29.0	10118	2	46	
15.0	12.5	10.7	9.5	b c	NE	1	29.1	10104	2	44	
15.0	13.7	11.3	9.8	q	NNE	2	24.9	10101	2	15	
12.3	10.8	10.3	9.8	c	SE	5	28.8	10076	4	30	
12.5	11.0	10.0	9.3	b c	SE	4	28.2	10118	4		
11.3	10.5	9.8	9.4	c	ESE	3	29.3	10100	3		
11.2	10.2	9.8	9.5	o	ENE	4	27.4	10128	4	40	
12.6	11.2	10.6	9.8	b c	ENE	3	29.2	10090	3	35	
12.3	11.0	10.3	9.8	b c	ENE	3	29.0	10115	3		
12.0	10.8	10.3	9.8	b c	ENE	2	28.5	10098	2		
15.6	11.7	10.7	10.0	b c	ESE	1	31.0	10110	1	40	
14.5	11.4	10.2	9.8	b c	NNE	1	29.8	10098	1	46	
15.0	11.5	10.6	9.6	b c	NE	2	28.0	10120	2	46	

No.	Date	Hour	Position		Water temperature						
			Lat. (N)	Long. (E)	0 m	25	50	75	100	125	150
57	77.10.26	11:50	5 —42	169 —37	30.0	29.6	29.7	28.2	26.0	21.0	19.5
58	〃	14:40	6 —00	169 —21	30.2	29.8	29.7	29.0	26.6	21.0	18.4
59	10.28	0:15	6 —00	171 —00	29.6	29.6	29.6	29.1	27.5	24.2	19.9
60	〃	9:15	6 —53	171 —45	29.6	29.6	29.6	29.0	28.6	20.0	15.5
61	〃	10:58	7 —00	171 —58	29.5	29.5	29.2	28.7	26.0	20.5	15.0
62	〃	12:00	7 —07	172 —01	29.7	29.7	29.4	29.0	27.5	21.5	15.8
63	10.29	8:25	7 —23	171 —40	29.6	29.4	29.2	28.2	26.0	20.0	14.3
64	11. 2	12:30	8 —00	171 —00	29.4	29.5	29.4	27.5	25.5	19.2	15.5
65	11. 3	7:10	8 —07	171 —05	28.9	29.3	29.3	27.5	23.5	19.0	13.9
66	〃	12:00	8 —15	171 —14	29.8	29.2	28.9	27.3	20.5	16.6	13.5
67	〃	13:55	8 —26	171 —05	29.9	29.2	29.2	26.0	20.5	16.3	13.0
68	11. 4	8:50	8 —15	170 —56	29.3	29.3	29.3	27.5	21.7	15.8	13.0
69	11. 5	11:20	8 —30	171 —00	29.6	29.2	29.0	27.0	24.5	19.0	14.7
70	11. 6	7:30	8 —45	170 —48	29.3	29.3	29.2	27.7	21.5	16.0	13.0
71	〃	14:30	9 —10	170 —10	29.5	29.5	29.2	25.5	19.5	15.5	13.2
72	11. 7	10:50	9 —28	169 —44	29.5	29.4	29.4	26.5	20.5	16.6	13.2
73	〃	13:10	9 —36	170 —00	29.3	28.8	28.0	24.9	21.5	17.3	14.6
74	〃	15:30	9 —28	170 —18	29.5	29.0	29.0	25.3	21.7	15.8	13.0
75	11. 8	7:25	9 —18	170 —00	29.2	29.1	28.6	27.0	21.5	14.8	12.5
76	〃	8:50	9 —10	169 —51	29.4	29.4	29.4	28.0	26.7	15.5	12.6
77	11.11	6:30	9 —00	170 —00	29.2	29.2	29.2	27.5	22.4	16.7	14.8
78	〃	13:35	9 —00	171 —00	29.5	29.3	28.5	26.0	24.8	18.5	15.8

(°C)				Weather	Wind direction	Wind force	Temp. (°C)	Pressure (mb)	Wave	Trans-parency (m)	Remarks
175	200	225	250								
15.2	13.0	10.4	9.8	b c	ENE	2	29.1	10115	2	42	
13.5	11.5	10.8	10.0	b c	NE	2	29.6	10099	2	45	
17.5	11.5	10.8	10.2	b c	NE	4	28.7	10099	4		
13.5	11.8	10.8	10.2	b c	NE	4	29.6	10108	4	41	
13.2	12.3	10.8	10.3	b c	NE	4	27.5	10108	3	35	
14.3	11.5	10.6	9.5	c	NE	4	29.0	10100	4	32	
12.8	11.6	10.7	9.3	b c	NE	2	29.2	10100	2	41	
12.0	10.8	10.3	9.8	c	ENE	3	28.5	10096	3	34	
11.7	10.8	10.2	9.7	c	NE	2	27.0	10105	2	42	
12.3	10.7	10.6	10.0	b c	E	1	29.8	10100	1	50	
11.8	10.8	10.3	9.9	c	NE	1	29.6	10086	1	45	
11.0	10.8	10.3	10.0	b c	E	1	29.4	10097	1	42	
13.3	11.3	10.6	9.7	c	W	1	27.1	10099	1	53	
11.2	10.8	10.5	10.0	c	ENE	4	27.0	10111	4	37	
12.0	11.1	10.3	9.7	c	E	4	28.5	10079	4	35	
12.2	10.5	10.2	9.6	b c	ESE	2	28.5	10120	2	36	
12.8	11.6	10.5	9.8	b c	E	2	28.6	10108	2	39	
11.5	11.0	10.6	9.7	b c	E	2	29.0	10092	2	42	
11.6	10.6	10.2	9.9	b	E	3	29.2	10120	3	43	
10.2	10.0	9.6	9.2	b	E	3	29.0	10125	3	40	
12.6	11.0	10.4	9.8	b c	E	3	29.0	10094	3	34	
14.0	12.3	10.9	10.1	b c	E	3	29.2	10085	3	42	