V. LARVAL SURVEY

1) Distribution of Larvae

A large number of clupeord occurred in the larva net collection. Figure 4 shows the stations where larva net towing was done and where stolophrus larvae occurred (black circles). The place of hauling larva net and the place of bait fish observation are shown by serial number.

Circles attached with single number of bait station indicate times of towing a larva net at that night. Other towing was done in the day time.

1.4 M conical net is made of nylon NIP (mesh size: 0.5 mm for front 2/3 of the larva net and 0.4 mm for rear 1/3 of the net). In inside water, there contain many floats including sea weed. In order to avoid to stick on the floats with the net, time was limited to only 5 minutes for surface holizontal towing.

According to figure 4, larvae of stolephrus occurred at various places of the island. It also occurred at the open sea off barrier reef in west. Bait fish station outside of barrier reef is located 1-2 mile off from the barrier reef.

In consideration of this close distance as well as barrier reef which sinks into water when tide comes in, species of larvae outside barrier reef may be the same as larvae in the island. That is, barrier reef does not act as a complete barrier or obstacle to the distribution of larvae.

Condirering the distribution of larvae both off island and in island, times are more important factors rather than places or seasons. To show this, sampling water is divided as follows:-

A. Western Open Lagoon
B. Western Coast, Main I.
C. Outside Western Outer Reefs

D. Malakal Hb. area

E. Barrier Reef in South-East

F. East Coast, Main I.

G. Eastern Open Lagoon

Table 4 shows occurrence of stolephorus larvae by night-time and day-time towing in August/September and in December. Number of towing near bait fish station was 32 times and out of 32 times, larvae occurred 31 times. Number of towing in the daytime reached 77 times and larvae occurred only 5 times. The ratio of occurrence to number of towing is 96.9% at night and 6.5% in case of daytime. Total catch at night was 1,557 fish while 61 fish in the daytime. Catch per one towing was 48.7 fish at night while 0.8 fish in the daytime.

Larvae have nature to come up to and drift on the surface at night. Therefore, there is a big gap in survey results between at night and daytime. It is naturally expected that the larvae is much widely distributed compared with the quantity of stations where larvae was observed (Fig. 4).

Table 5 shows number of catch at ech station. Results of towing at stations 24, 29 and 31 show those at daytime. Others are the results obtained at night. Eggs and occurred larvae might have been carried by currents in inner barrier reef so that the place of catch of larvae does not mean the place of spawning. The area of distribution of larvae is still important as a place for reproduction. The stations that much larvae were caught are located in Malakal water (stations 2 and 4), Iwayama (station 6), and just outside barrier reef (stations 36, 42, 53 and 65). Not much larvae were seen in both east and west coasts of main island and in inner water of barrier reef in east. The importance of the Iwayama area and open water in west is apparent judging from the distribution of larvae.

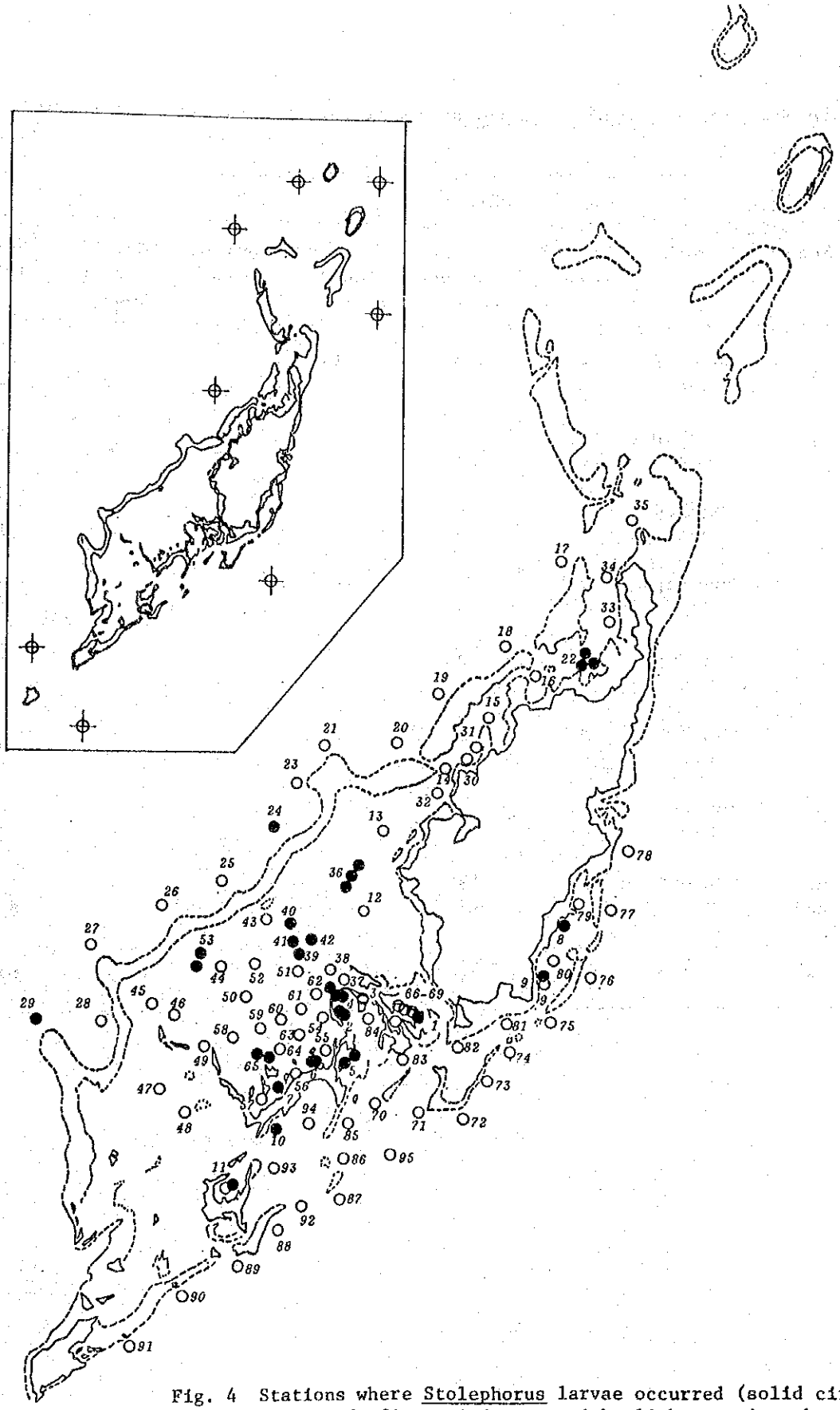


Fig. 4 Stations where Stolephorus larvae occurred (solid circles). Upper left figure indicates night light stations by the training vessel Tenyo Maru.

Table 4 Occurrence of Stolephorus larvae by night-time and day-time tows.

		Night			Day		
Area	Month	No. of tows	No. of success-tows	No. of larvae	No. of tows	No. of success-tows	No. of larvae
A	Aug-Sep	4	4	115	-	-	-
	Dec	9	9	698	26	2	3
B	Aug-Sep	-	-	-	-	-	-
	Dec	4	4	44	9	1	1
C	Aug-Sep	-	-	-	-	-	-
	Dec	-	-	-	12	2	58
D	Aug-Sep	9	9	571	-	-	-
	Dec	-	-	-	5	0	0
E	Aug-Sep	3	3	60	-	-	-
	Dec	-	-	-	-	-	-
F	Aug-Sep	3	2	69	-	-	-
	Dec	-	-	-	5	0	0
G	Aug-Sep	-	-	-	-	-	-
	Dec	-	-	-	18	0	0
Mon. total	Aug-Sep	19	18	815	-	-	-
	Dec	13	13	742	77	5	61
Total		32	31	1557	77	5	61

Table 5 Length composition of Stolephorus larvae collected by larval net (Total length in mm.)

St.No.	Date	No. taken	No. measured	≦5.0	5.1 -10.0	10.1 -15.0	15.1 -20.0	20.1 -25.0	25.1 -30.0	30.1≦
1	8/25	6	6	5	1					
2(1)	8/26	133	133	4	100	29				
2(2)	"	24	24	2	19	3				
3	8/27	46	45		10	30	5			
4(1)	8/28	293	293	1	130	145	17			
4(2)	"	18	18			8	7	2		
4(3)	"	24	22		8	4	9	1		
5(1)	8/29	3	3		3					
5(2)	"	24	24	1	7	15	1			
6(1)	8/30	11	10		9	1				
6(2)	"	39	39		7	21	11			
6(3)	"	24	23	2	14	7				
7	9/1	41	41		28	13				
8	9/3	8	8	1	7					
9(2)	9/4	61	60				22	34	2	2
10	9/5	39	39			13	26			
11(1)	9/6	1	0							
11(2)	"	20	19		4	14	1			
22(1)	12/2	16	16		10	6				
22(2)	"	17	17		2	7	8			
22(3)	"	8	8		7	1				
24	12/3	4	4			4				
29	"	54	54		1	38	15			
30	"	3	3			1			2	
31	12/4	1	1		1					

St.No.	Date	No. taken	No. measured	≦5.0	5.1 -10.0	10.1 -15.0	15.1 -20.0	20.1 -25.0	25.1 -30.0	30.1≦
36(1)	12/4	26	26		22	3	1			
36(2)	"	183	183	15	167	1				
36(3)	"	58	56	4	50	1	1			
39	12/8	2	2		2					
40	"	1	1			1				
41	"	35	34		7	11	5	10	1	
42	"	3	3		1	1		1		
53(1)	12/9	113	113	1	18	57	27	10		
53(2)	"	21	20		1	12	5	2		
65(1)	12/10	170	169	44	120	3	2	1		
65(2)	"	89	89	31	57		1			

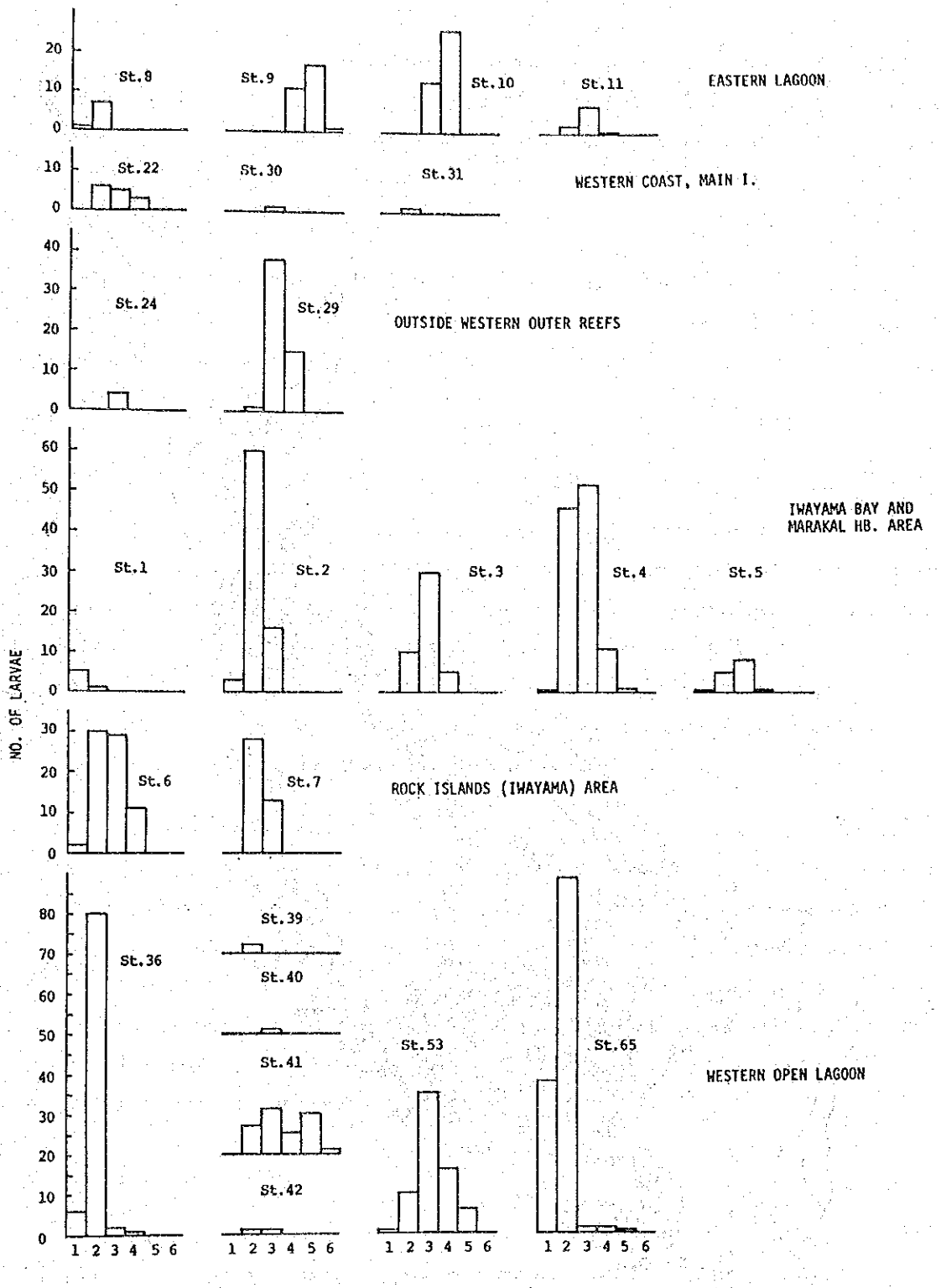


Fig. 5 Length composition of Stolephorus larvae. Where two or three successful tows were made at single station, length composition represents average catch per tow.

Fig. 6 Stations where Stolephorus eggs occurred (solid circles).

2) Size of Larvae

Most of larvae caught by a larva net have total length of less than 30 mm. Fig. 5 shows the contents of table 5 in a diagram format. Occurrence of larvae by area is shown. At live bait stations, 2-3 tows were made. Still length of larvae was calculated by catch per one tow.

Most of larvae have length of 5-15 mm. Therefore, a diagram of length compositon always has its peak between 5 mm and 15 mm. The length of larvae is shorter (less than 10 mm) at stations 2, 36 and 65. This is in contrast with the case in other areas.

3) Information on Larvae from Outside of the Island

On May 31, 1980, 3 skipjack were caught 30 miles southeast of Koror Island by a pole-and-line fishing boat and then stomach contents were studied. Then, 496 larvae with 20-40 mm length were found in their stomachs. According to Mr. Ida of Kitazato University, there is a possibility that those are larvae of Stolephorus buccaneeri. If this is correct, those are different species from telai (Stolephorus heterolobus) that is dominant in the island.

At the beginning of June, the training vessel, Tentaka Maru, visited at Koror and assisted JICA Project to make gathering tests at 8 stations around Palau Islands (Fig. 4). However, it was reported that the catch by a landing net was small. Perhaps the occurence of telai or other Stolephorus might not be expected. Later the training vessel caught 4 mackerel tuna and 3 bigeye tuna outside the western barrier reef of Palau and their stomach contents were surveyed. Stolephorus was not seen as their contents.

4) Distribution of Eggs

Fig. 6 shows stations where stolephorus eggs occurred. (Solid circles). It is notable that occurrence of eggs is seen along the eastern reef as well as in lagoon, particularly, in the velocity of Marakal Harbor water and just outside barrier reef. No eggs occurred outside reefs in south. No eggs are seen outside the western reef where the occurrence of larvae was seen.

Like the case of larvae study, occurence of eggs is studied by region and time (Table 6). Occurrence of eggs in a larval net at night was only at one tow out of 32 tows. While, in the daytime, 17 occurrenoe out of 77 tows. In contrast with the case of larva, eggs were mainly collected in the daytime. The ratio of occurrence was 3.1% at night and 33.1% at the daytime. The catch per one tow was 0.06 at night and 4.5 at the daytime. The occurrence was more often in the daytime than at night in terms of the number of occurrence itself and number of catch. Table 7 shows the distribution of eggs (different locality).

Among 109 stations where eggs were surveyed, 92 stations were recorded in the daytime. Almost all of the surveys were done at the daytime. Wider distribution at location other than stations where eggs were observed may not be expected in contrast with the case of larva. Occurence in the daytime is considered to have similar pattern to the real distribution of eggs. If this might be true, the locality of eggs may be the Iwayama Bay (Muller 1976 ms) and the western open lagoon. A considerable volume of spawned eggs may be expected at the Iwayama Bay. The distribution of eggs at the Marakal Harbor was not observed because the survey was almost done at night.

Besides telai, following stolephorus species is a known in the island. Namely, S. bataviensis and S. indicus occurred, during our survey, in the inner reef of the eastern lagoon at the east coast of the island. In open lagoon, S. buccaneeri is expected to exist. (This will be referred to later.)

Table 6 Occurrence of Stolephorus eggs by night-time and day-time tows.

Area	Month	Night			Day		
		No. of tows	No. of success-tows	No. of eggs	No. of tows	No. of success-tows	No. of eggs
A	Aug-Sep	4	0	0	-	-	-
	Dec	9	0	0	26	6	185
B	Aug-Sep	-	-	-	-	-	-
	Dec	4	0	0	9	1	3
C	Aug-Sep	-	-	-	-	-	-
	Dec	-	-	-	12	0	0
D	Aug-Sep	9	1	2	-	-	-
	Dec	-	-	-	5	1	4
E	Aug-Sep	3	0	0	-	-	-
	Dec	-	-	-	2	0	0
F	Aug-Sep	3	0	0	-	-	-
	Dec	-	-	-	5	1	2
G	Aug-Sep	-	-	-	-	-	-
	Dec	-	-	-	18	8	153
Mon. total	Aug-Sep	19	1	2	-	-	-
	Dec	13	0	0	77	17	347
Total		32	1	2	77	17	347

Table 7 No. of Stolephorus eggs collected by larval net tows.

St. No.	Date	No. of eggs taken	Locality
1	Aug. 25	2	Iwayama Bay
12	Dec. 2	98	Western open lagoon
13	"	3	"
46	Dec. 9	32	"
49	"	12	"
52	"	22	"
54	Dec. 10	16	"
60	"	4	"
62	"	1	"
66	Dec. 11	4	Iwayama Bay
71	Dec. 15	10	Outside reefs of eastern lagoon
72	"	4	"
73	"	40	"
74	"	32	"
75	"	21	"
76	"	29	"
77	"	15	"
78	"	2	"
81	"	2	Inside reefs of eastern lagoon

VI. FISH FINDER RECORDS

A survey of a school of fish was done: (1) survey of a school of fish at station (2) survey of the distribution of live bait fish in the daytime while sailing the boat.

Fig. 7 shows part of fish finder records obtained by a portable Furuno fish finder. The record was covered by 0-40 m range and analysis of the pictures was not applied.

1) Conditions of Gathering at Stations

Results of 2nd gathering test between at the end of August and the beginning of September were poor. However, results of 3rd gathering test were excellent (except station 22). The record shown in this report came from the test at the beginning of December.

Fig. 7-1 a and b respectively show telai gathering at station 30 and station 39. c shows telai remaining after the putting off of the light at station 65 and d shows telai vanishing with dawn.

2) Daytime Record of Fish

In 3rd survey, continuous recording was done in the daytime while sailing to survey larva. In the western open lagoon, a fish school occurred continuously or vanished totally. A notable fish school was not seen outside reefs of both the eastern and western lagoon. In inner reefs of lagoon, wide distribution of Sprattelloides delicatulus, Herklotsichthings punctatus and hardyhead is seen. They are regarded as live bait fish like telai swimming near surface/middle depth of water.

According to fishermen, Sprattelloides delicatulus often swims near surface to form a good bait ground. We came across such a bait ground several times where sea birds gathered, but the species of fish was unknown.

Fig. 7-1 e-i shows daytime records obtained while sailing. Both e and f are similar to d (telai) in fish image. Still, species of fish is unknown.

Fig. 7-1 Fish finder records.

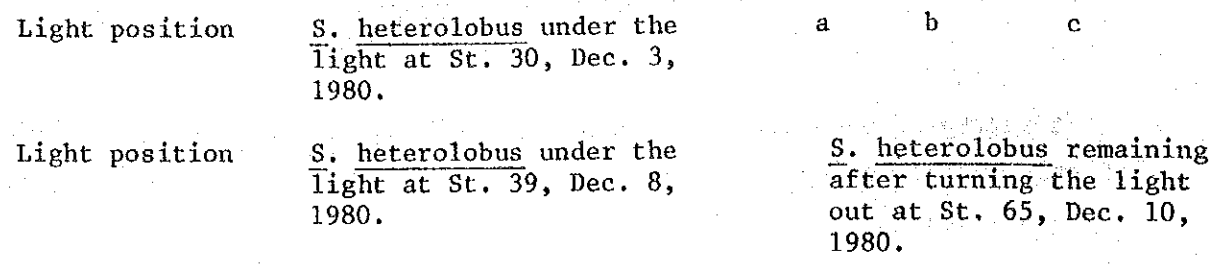


Fig. 7-2 Fish finder records.

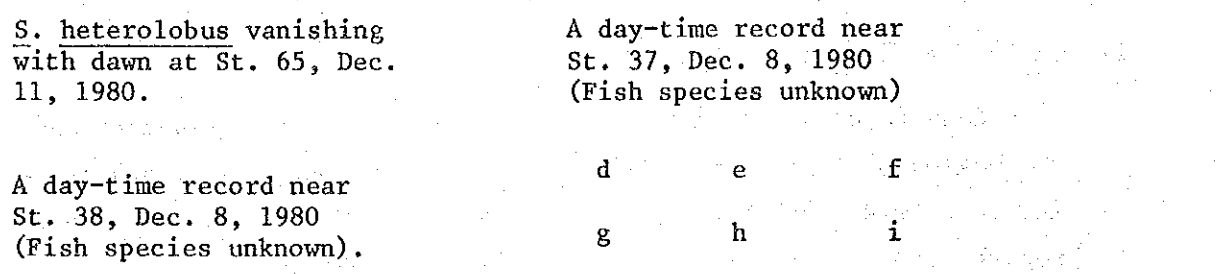
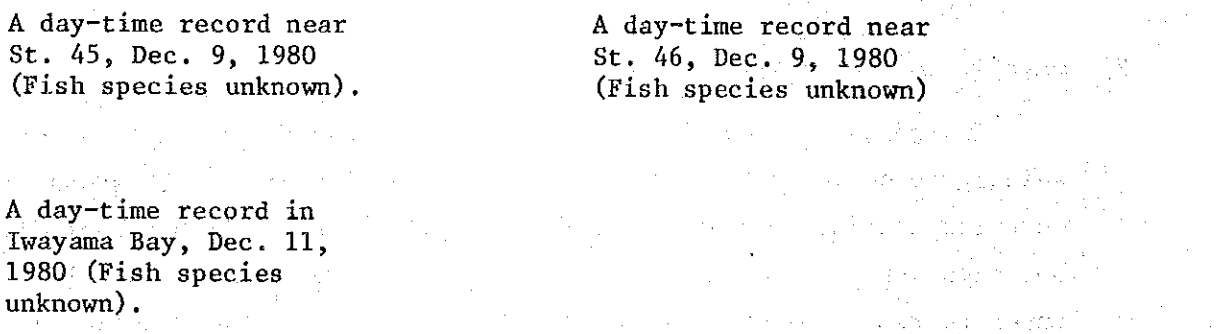
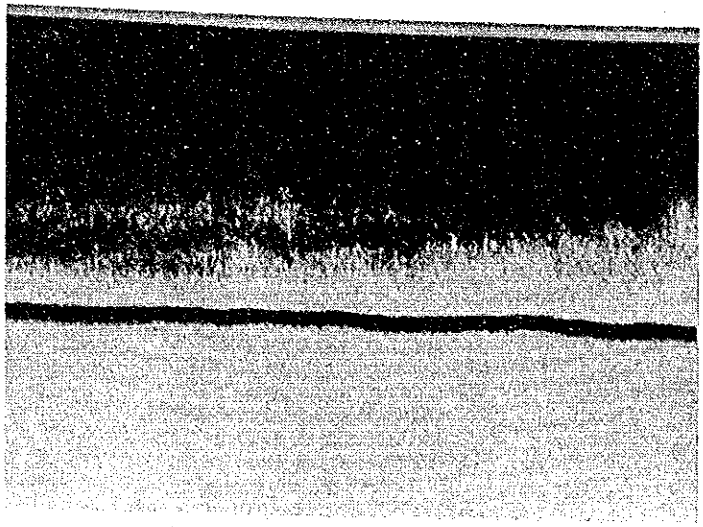


Fig. 7-3 Fish finder records

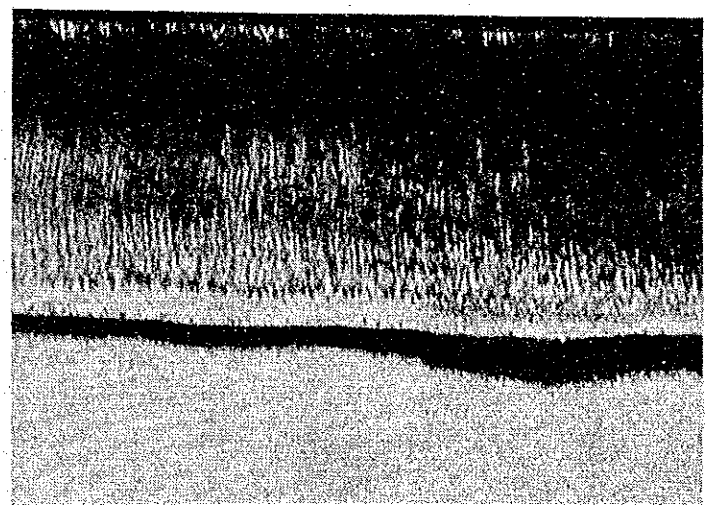




← Light position

S. heterolobus under the light at St.30, Dec. 3, 1980.

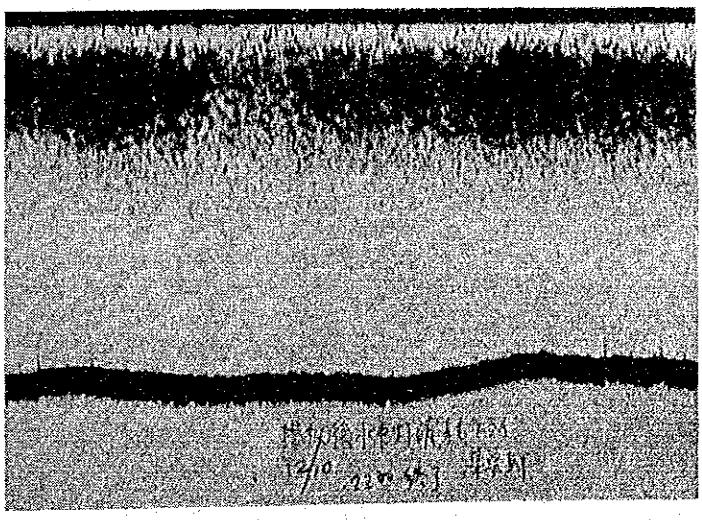
a



← Light position

S. heterolobus under the light at St.39, Dec. 8, 1980.

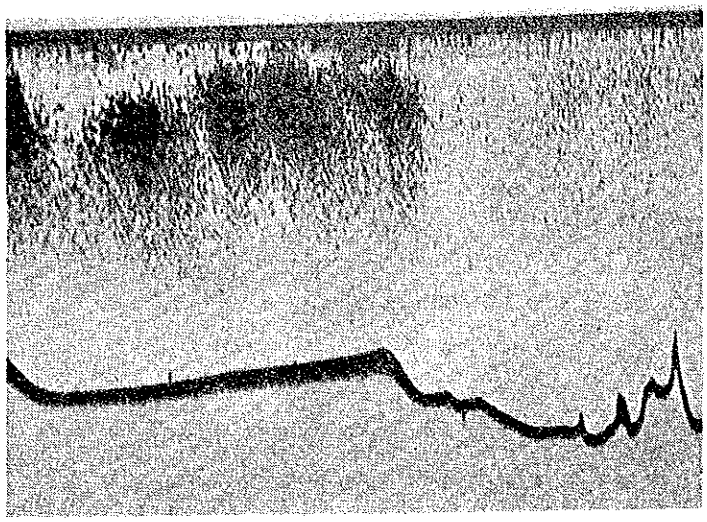
b



S. heterolobus remaining after turning the light out at St.65, Dec.10, 1980.

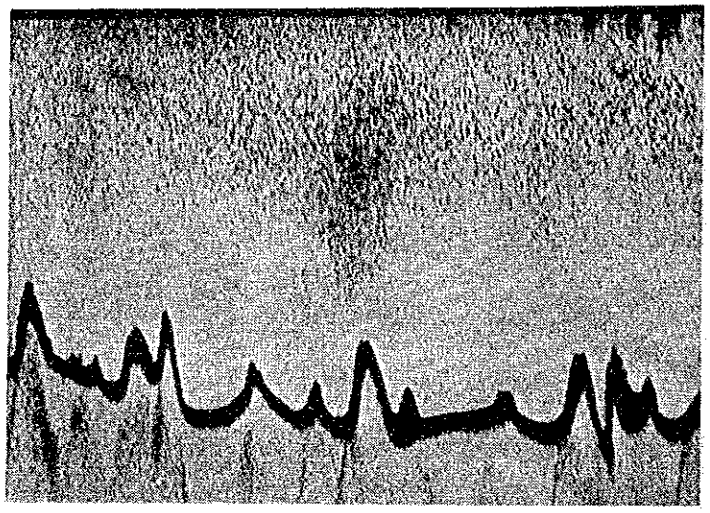
c

Fig.7-1 Fish finder records.



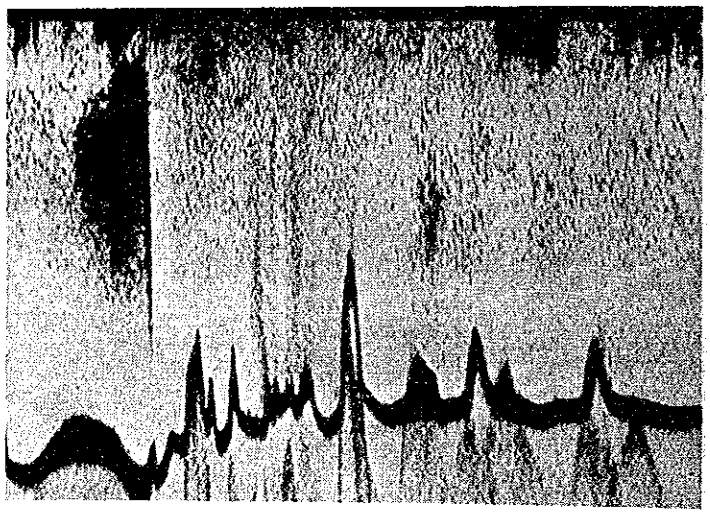
d

S. heterolobus vanishing with dawn at St.65, Dec. 11, 1980.



e

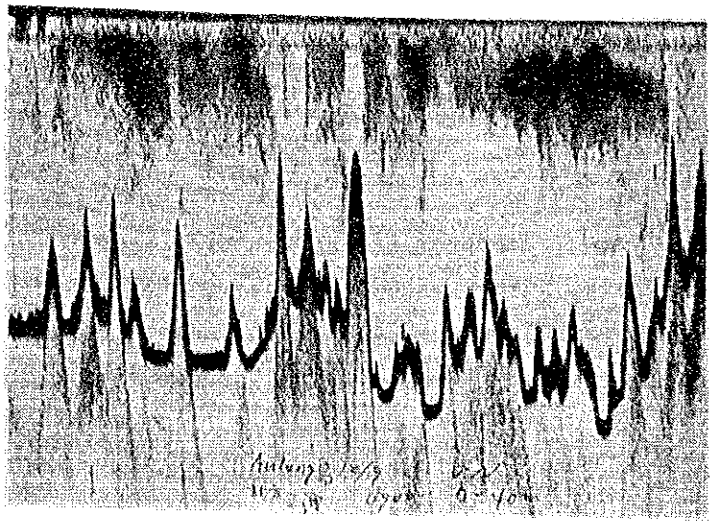
A day-time record near St. 37, Dec. 8, 1980 (Fish species unknown)



f

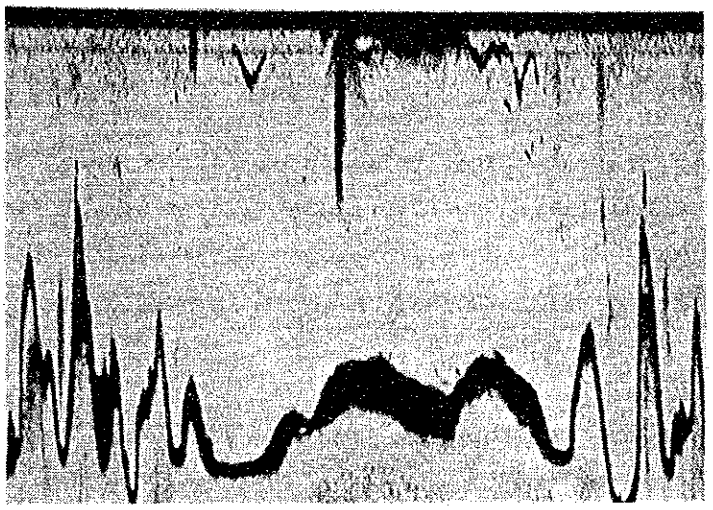
A day-time record near St. 38, Dec. 8, 1980 (Fish species unknown).

Fig. 7—2 Fish finder records.



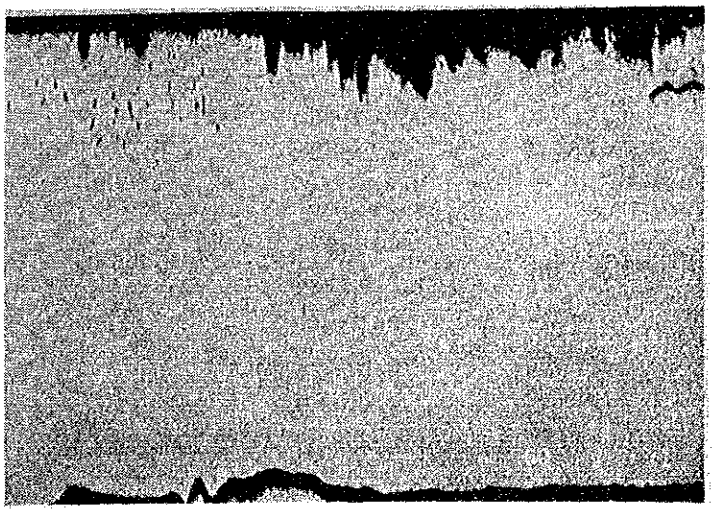
A day-time record near St.45, Dec. 9, 1980 (Fish species unknown).

g



A day-time record near St.46, Dec. 9, 1980 (Fish species unknown)

h



A day-time record in Iwayama Bay, Dec.11, 1980 (Fish species unknown).

i

Fig. 7–3 Fish finder records

VII. MEASUREMENT AND OBSERVATION OF TELAI

The survey this time produced data on fish body (total length, distinction of sex, degree of maturity, weight, gonad etc.). However, there was limitation in scope of survey in terms of seasonal and local change. Relevant data is attached at the end of this report as appendix (Table 5-9).

1) Relation of Total Length, Fork Length and Standard Length

Unless otherwise specified, "length" means total length although there are data on standard length and fork length. Advantage of using total length is that it is applicable in measuring fish ranging from small whitebait to adult.

Except shirasu or larval stage, relation of telai's total length to standard length, total length to fork length share the same formula: $Y = A + BX$ Accordingly, if A and B are given, conversion of length is easy. In this concern, Table 8 shows A and B in some cases.

Table 8 Relation of total length, fork length and standard length of Stolephorus heterolobus by $Y = A + BX$.

X	Y	A	B	r
TL	FL	-0.06040	0.91740	0.99841
FL	TL	0.28919	1.08658	
TL	SL	-2.21366	0.88921	0.99854
SL	TL	2.68706	1.12132	
FL	SL	-2.05684	0.96776	0.99856
SL	FL	2.30472	1.03035	

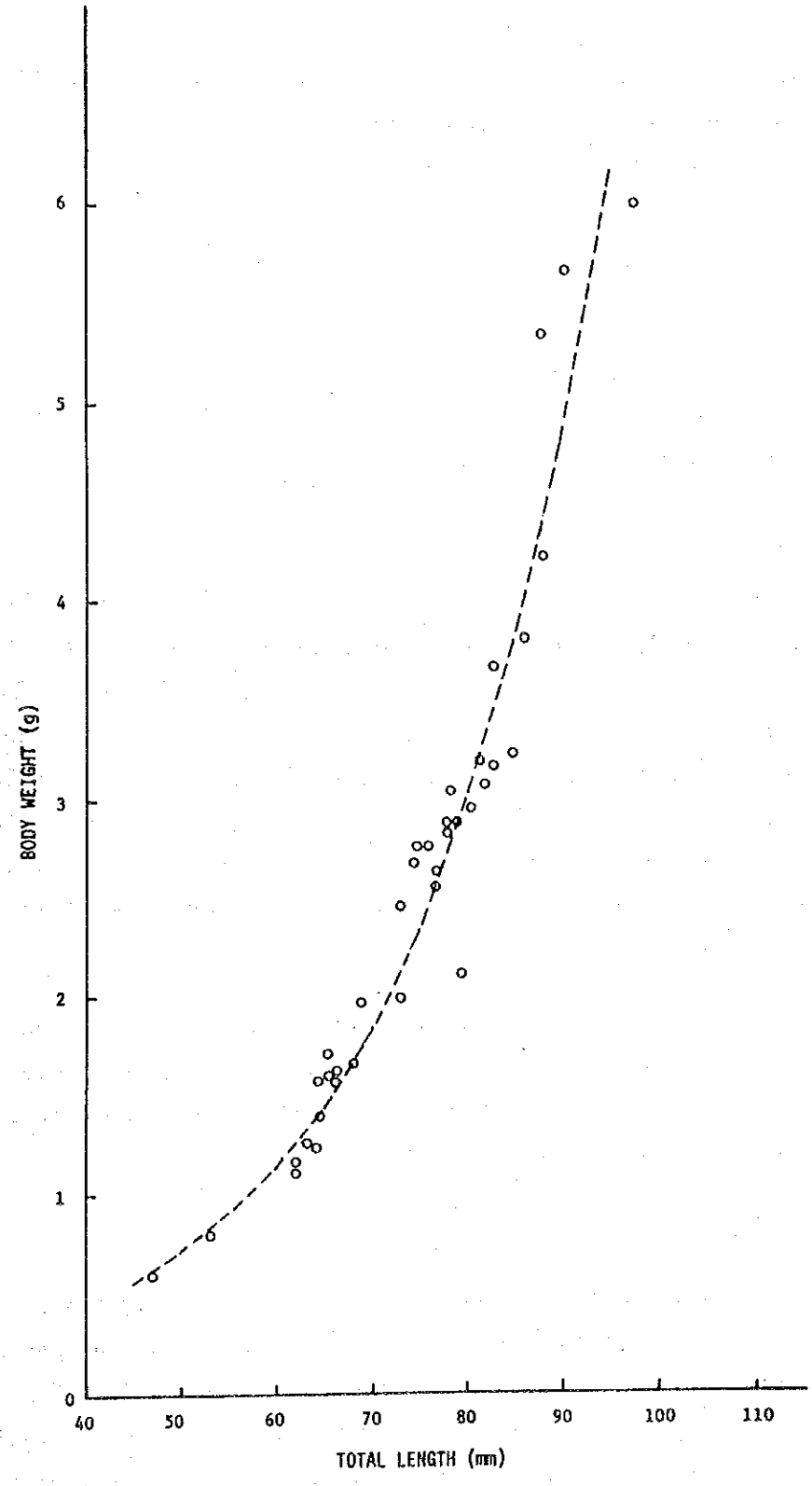


Fig. 8 Body weight/total length plots for Stolephorus heterolobus.

2) Relation of Total Length and Weight

Figure 8 shows plots concerning relation of length to weight. The figures came out from the measurement of 37 bodies. Formula usually used is $W = Ae^{BX}$. Therefore, the relation is:-

$$W = 65.70796e^{0.04785X} \qquad (r = 0.097904)$$

W = mg./Weight, X = mm/Total length.
Measurement of weight was taken after fixed in 10% formalin solution for two months.

3) Plots of Gonad Index to Total Length

Gonad index (GI) is shown as $GW \times 10^4/BW$. GW is gonad weight (mgs.) and BW is body weight (mgs.). Attached table 5 shows the figures of this. Measurement of individual body was taken during June 1980-December 1980. Fig. 9 shows a diagram of GI plotted for total length while making distinction of sex. Measurement of total length of less than 60 mm was few. See a diagram of female first. Fish having total length of 60 mm or more has heavy ovary, which suggests physical maturity. Exactly speaking, total length of 65 mm or more shows this maturity.

Male fish having total length of 60 mm or more often has heavy spermary. Both male and female telai seem to be mature when total length reaches 65 mm. According to table 8, the size of fork length is 59.6 mm and that of standard length 55.6 mm.

4) GI Distribution by Degree of Maturity

Judgement of maturity was made through eyes. Observation of length, distinction of sex, and maturity of telai was made at the same time with some exception. The degree of maturity ranges from "very immature" (I) to "very mature" (IV), with 4 degrees in between including unknown sex of whitebait. As for ovary, very mature (IV) means that transparent eggs come out when a body is pushed or little bit less than this degree.

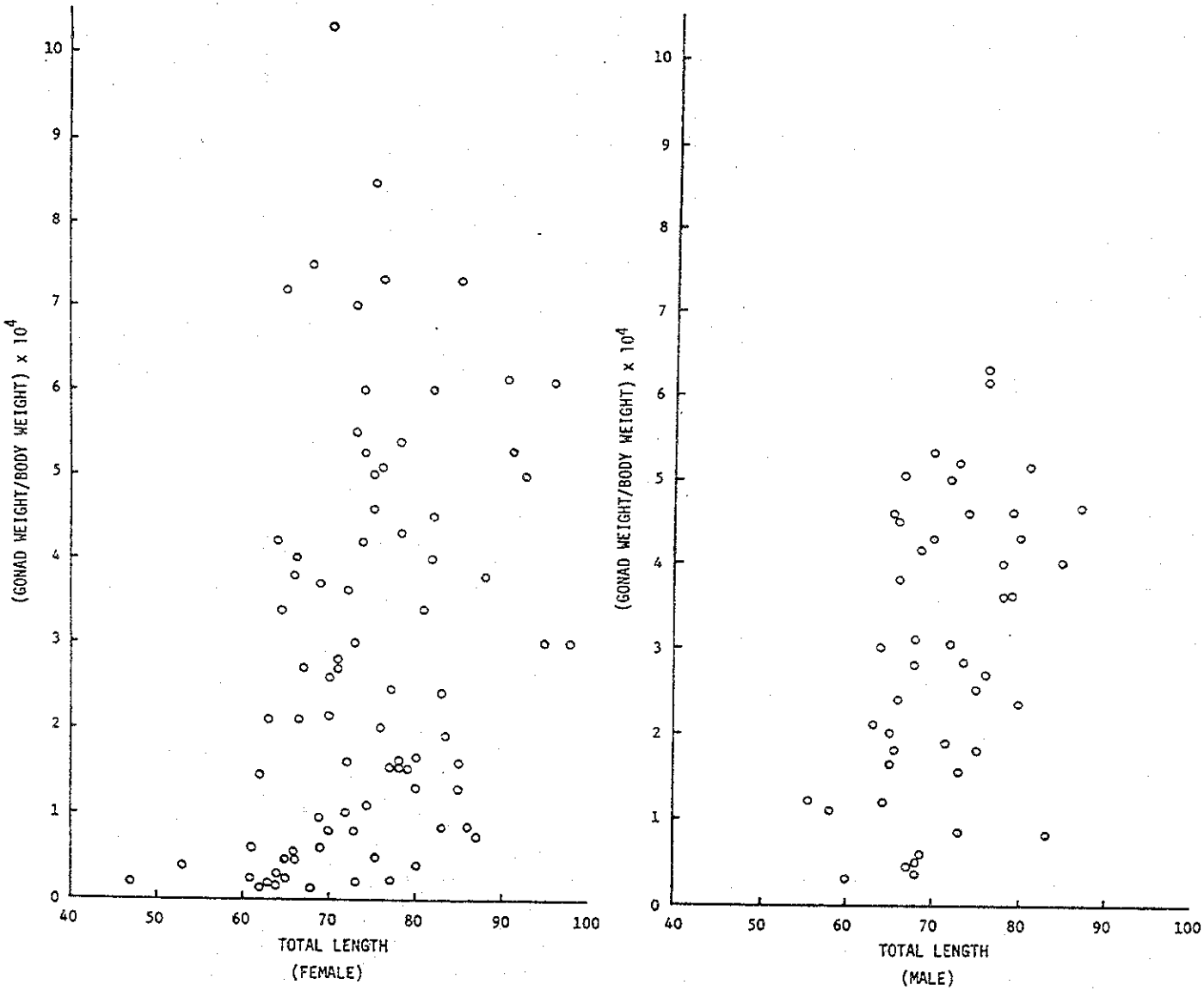


Fig. 9 Scatter diagram of GI plotted against total length of Stolephorus heterolobus.

Table 9 GI distribution by degree of maturity

	Female				Male			
GI	I	II	III	IV	I	II	III	IV
Under 5.0	16				1	3		
5.1-10.0		9			1	2		
10.1-15.0		3			1	2		
15.1-20.0		2	6			3	3	
20.1-25.0		1	5			1	2	
25.1-30.0		2	3				3	1
30.1-35.0			2	2			1	2
35.1-40.0			4	2			1	2
40.1-45.0			1	5				5
45.1-50.0				4				5
50.1-55.0				4			1	4
55.1-60.0				3				
60.1-65.0				2				2
65.1-70.0								
70.1-75.0				3				
75.1-80.0				1				
80.1-85.0				1				
85.1-90.0								
90.1-95.0								
95.1-100.0								
100.1-105.0				1				

Table 9 shows a diagram of GI plotted for total length by distinction of sex. Judging from the Table, relation of both seems to be reasonable.

5) Length Composition and Maturity of Telai from Different Localities

There are two in samples of telai observed during the Project term. One is telai coming from gathering tests at stations and another is telai coming from the Iwayama area which is known as a bait ground among fishing boats of the island. The latter consists of telai coming from test preserve (Ikesu) of JICA and telai coming from bait catch by boats of the island. These are regrded as one system. In case of the former, species is does not have "S" (attached Table 8). In case of the latter, species no. has "S" (attached Table 9). First figure of the species no. shows station no. when species no. is 1,000-9,999. When it is 10,000 or over, two figures coming first shows station no. The degree of maturity is also shown from 1 to 4 (4 degrees).

According to the samples of gathering test, length composition is shown and is divided into 6 by different localities as follows: Iwayama Bay (August 25), Malakal Hb. (August 26, 27, 28), Eastern coast of main island (September 3, 4), Eil Malk Is. (September 6), Western coast of main island (December 3, 4) and Western open lagoon (December 8, 9, 10) adjacent to the Iwayama area. Fig. 11 is based on samples from bait ground (from June to November except July). According to Fig. 10, approx. 65 mm length's mature telai occurred in the Iwayama Bay, Malakal Harbor, western coast of main island and open lagoon. When length composition is divided according to maturity, it is generally said that length is proportional to maturity. In the eastern coast of the main island, only small and immature fish occurred.

In the bait ground of the Iwayama area, as shown in Fig. 11, a lot of small (immature) fish occurred, particularly in June. During August/September, fish gets mature and big fish enters a spawning season. In October, catch of whitebait and larva was seen. It is not certain whether or not such a seasonal change is seen every year. The distribution of whitebait prevails over inner lagoon in August/September and in December. The distribution of whitebait in other

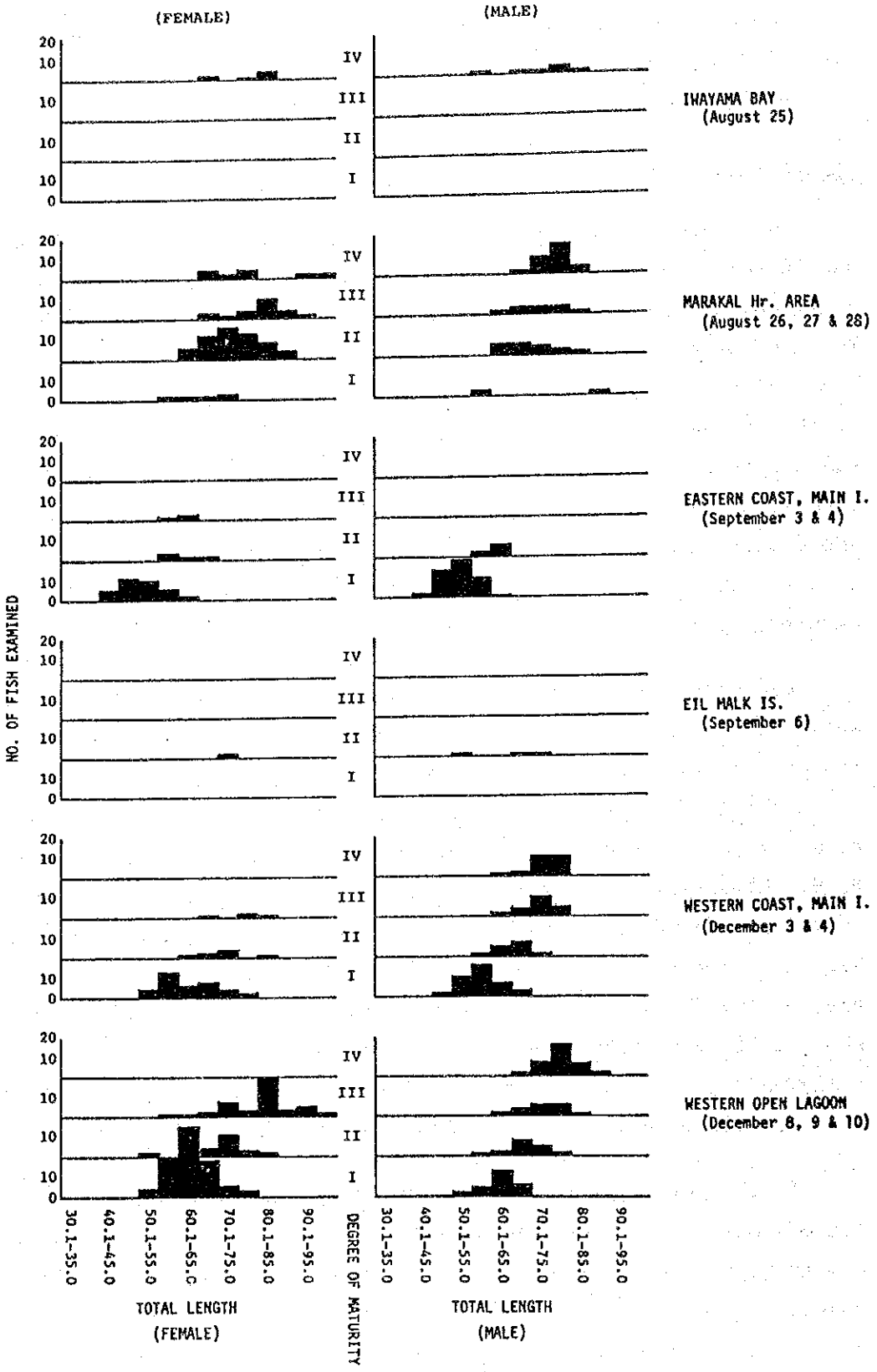


Fig. 10 Length composition of Stolephorus heterolobus by degree of maturity From different localities.

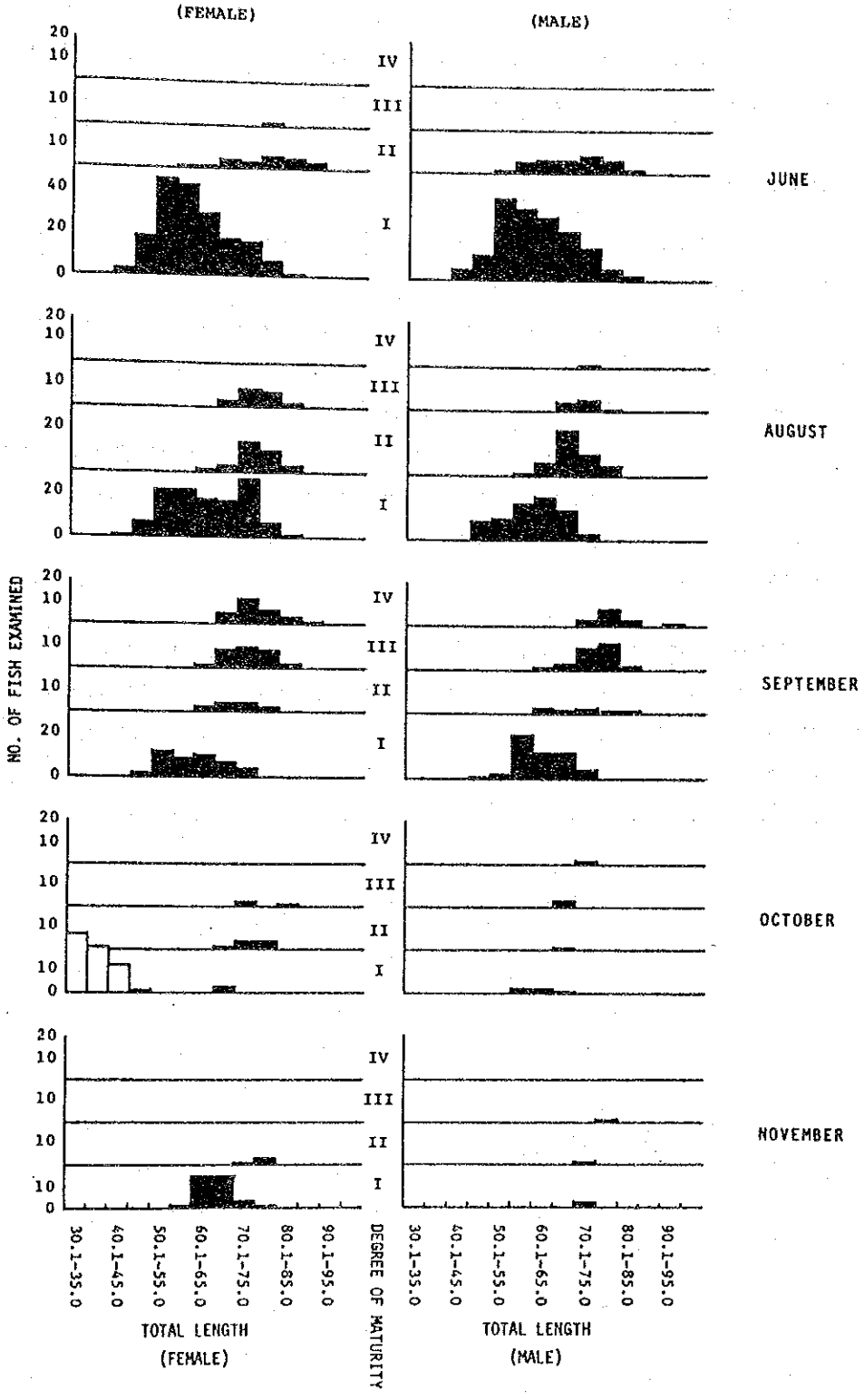


Fig. 11 Length composition of Stolephorus heterolobus by degree of maturity from Rock Islands (Iwayama) area.
Sex unknown is shown blank.

months will probably be seen. Consequently, large-scale and continuous survey concerning time of occurrence and change of volume is necessary at the stage of whitebait or larva.

6) Stomach Contents

Surveyed fish were 12, each 3 from stations 1-4. Table 10 shows the results. Most of the stomach contents were crustacean. They are shrimps, crab larvae, and lucifer. One had anchovy larva in the stomach. To eat larva was not often, but it showed gluttony. Copepoda was involved also but the volume and quantity of it was small compared with other large floating crustacean. Stomach contents are very simple compared with plankton groups which occurred at the same four stations. Stomach contents surveyed were those that came up due to a fish light at night.

While vertical towing of a plankton net was made in the twilight just after sun-set. It is not certain whether or not stomach contents of telai swimming up to the fish light show usual conditions. In spite of this, it is certain that telai deeply depends upon floating crustacean compared with copepoda. Laevae may be important.

Table 10 Stomach contents of Stolephorus heterolobus.

Groups	St.1			St.2			St.3			St.4		
	TL (mm)			TL (mm)			TL (mm)			TL (mm)		
	81.9	73.5	83.0	73.6	72.2	72.8	73.0	71.1	72.3	86.9	76.8	88.7
COPEPODA												
Undinula												R
Centropages		R										
Pseudodiaptomus					R							
Temora		R		R		R	+			R	+	R
Acartia										R		
Euterpina								R				
Macrosetella								R				
Others												
Ostracoda				R		R		CC	+	C	+	R
Amphipoda					R					+	R	CC
Lucifer		R	+		R			R	+		R	R
Macrura larvae	+		+		C	+	R	C	+	+	+	R
Mysidacea larvae	R	CC	C	R			+				R	R
Brachyura larvae	C	R	C	+	+	C	R			+	+	R
Squilla larvae	R										R	
Bivalvia larvae								R				
Anchovy larvae										R		

CC: Over 70 % in number.
C: 69-40 %
+: 39-11 %
R: Under 10 %

VIII. DISTRIBUTION AND RESOURCES OF TELAI IN PALAU ISLANDS

1) Outline of Distribution of Telai in Micronesia

Micronesia which is located in the western tropical Pacific belongs to the geographical ranges of Gen. Stolepphorus. Here more than 2,200 islands (big and small) are scattered and the total land area reaches only 1,700 km^2, which is very small compared with the micronesian water (7,500,000 km^2). Consequently, if distribution of telai is limited to the coasts along the islands, the area of distribution is not expected so much. Judging from this view point, maximum distribution depends on inner water between each island and reef. Atoll and barrier reef enclose inner water and such inner water has been chosen for tests of gathering in these years.

Outline of the location of atoll and barrier reef is, according to Tayama's survey in 1934, as follows: Most of micronesian islands are atolls, followed by table reef and shoal reef. Fringing reef, barrier reef and intermediate are rarely seen.

A lot of lagoons and shoal reefs exist in the eastern islands (Caroline islands & Marshall Islands). In the western islands (Mariana Islands & Palau Islands), a lot of elevated coral reefs and table reefs exist. Most of Marshal Islands are atolls. Although the number of islands is smaller than that of Caroline Islands, it has the feature that it almost exclusively consists of atolls (including big atolls). Although the number of lagoon is abundant (67 including attached atoll), standard barrier reefs are only in Palau and Ponape. In the above-mentioned barrier reefs, almost atolls and atolls. What is the distribution of telai is as follows according to the gathering tests in the past. Its distribution in Palau is mentioned later.

Ponape, having a representative barrier reef, forms an extinct volcano, and the barrier reef surrounds the Island. Development of outer reef is seen from north to south, where lagoon is relatively wide. Average depth of lake is 40 m and the deepest point reaches 80 m. Marukawa's survey (1940) reported the existence of telai in Ponape Island (According to Marukawa's survey, it was Engraulis

heterolobus Rueppel). This fish is rarely seen so that this is valuable bait for Ponape people. P. Wilson (1977) reported that few telai occurred in gathering test. However, this does not simply mean a negative distribution of telai, in terms of the availability of different season and different place. Distribution of a large amount of telai was discovered in lake of reef in Ponape by the survey of Japan Marine Fishery Resource Research Center in 1974-1976.

Confirmed were S.heterolobus (telai) and S.indicus. The latter was few. Test by a stick-held net was done for three years and catch of telai was always more than that of other species of fish. And catch of telai occupied more than 50% in later two years.

Truk also forms an extinct volcano, known as almost atoll, decreasing both height and area of the central island. The fact has brought increasement of lagoon.

JAMRC surveyed in 1975 and again in 1976 and the distribution of S.buccaneeri and S.indicus was confirmed besides S.heterolobus. However, most of the catch by a stick-held net was Spratelloides delicatulus and the volume of telai and other Stolephorus species was negligible. Consequently, distribution of telai in Truk seems to be few.

There are examples of survey by JAMRC and American groups with regard to atolls that exist in Micronesia. They are: gathering tests in Heren reef of Palau Islands, in Kapingamarangi Atoll in Ponepe area and in big atolls of east Marshall Islands. Distribution of telai is, in a word, very few in spite of wide area. All of the surveys agree on this. Most of the catch by a stick-held dip net in Heren reef water by JAMRC was Spratelloides delicatulus: no catch of telai. As long as this test concerns, no distribution of telai or Stolephorus was confirmed. The Helen reef is an atoll with a length of 25 kms. (south-north), located south-west of Palau. It is geographically to West Irian of Indonesia and located in south western end of the vast Micronesian water.

Kapingamarangi Atoll located 730 kms. southwest of Panape Island has a slightly smaller area compared with the Helen reef. Inhabitants are Polinesian. When NMFS survey vessel of America surveyed in 1977, no occurrence of a big school of Stelophorus species and Spratelloides species was reported (P. Wilson 1977). Although this does not mean no distribution of telai.

JAMRC surveyed widely in 1978 in Marshall Islands' water this is located east of Micronesia. The survey convered 9 atolls including Majuro Island of the Ratak chain and two test stations at Ailinglapalap and Jaluit of the Ratak chain. Catch of Stolephorus species was very few and Spratellioides delicatulus was dominant. However, this does not mean a negative result of distribution of Stolephorus in this water. Distribution of telai has been confirmed in Arno Atoll of the Ratak chain. Distribution of telai in another atoll is probably possible but its volume is not expected so much.

The above-mentioned is an outline of the survey by JAMRC. According to the survey, considerable distribution of telai is seen in barrier reefs of a few extinct volcanos or elevated coral reefs. As for both east and west waters of Micronesia, distribution of telai is none or few in atolls of coral islands. Distribution of telai cannot be expected, judging from examples of atoll, in Truk with similar outward to atoll. Gathering test in some places in Papua New Guinea was made (Kikawa survey 1977) and no occurrence of Stolephorus species was seen.

Reason why there is difference in telai's distribution among inner water of islands is not certain. However, a case of coral island not having land water and origin of water differs from a case of atoll where there are some rivers and rain fall becomes underground water and flows out into lagoons. Land water affects much the distribution of telai.

Relation between telai distribution and land water is not mentioned here: it is another main subject in fish ecology. Here it is safe and enough to say that potential of telai resources in barrier reefs that widely surround a reef lake and that have longer coastal line

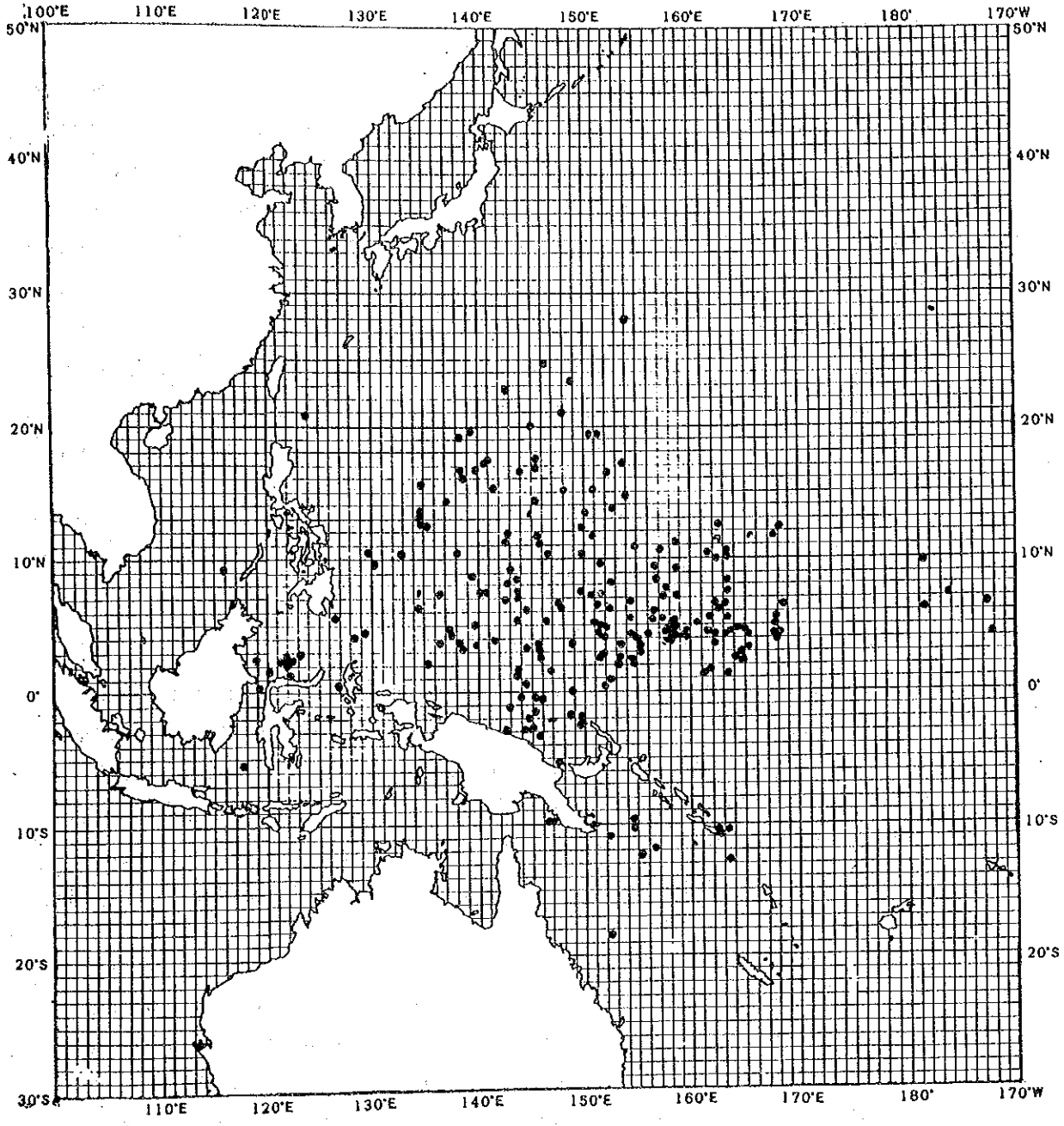


Fig. 12 Distribution of larval and juvenule Stolephorus buccaneeri from ichthyo-plankton surveys (From Okiyama's unpublished data).

is bigger compared with that of telai resources in water not having these conditions.

Distribution of Stolephorus species in Micronesia is not always limited to coastal areas. For example, though this is only one example, in case of Stolephorus buccanneri, occurrence of its large schools of 30 mm length's larvae is often in tropical Pacific ocean. Catch of larvae by a larva net is so often that its distribution may cover mainly Micronesian water with high density (Fig. 12). Ozawa's survey in 1973 shows details of the occurrence of larvae in this water and suggests the distribution in wide area through live cycle. According to the data of JAMRC, S.buccaneeri was found in the stomach of skipjack caught near Marshall Islands. The writer experienced the same so that its wide spread distribution in the Pacific Ocean is presumed.

2) Telai Resources in Palau Islands

(A) Biggest fishing ground in Micronesia

Main island of Palau islands is Babelthap Island except Guam Island. The area of a reef lake reaches 1,238 km^2 about 7 times bigger compared with a reef lake of Ponape (178.2 km^2). But, area of the reef lake is not big as that of Marshall islands or Caroline islands. However, the reason why Palau has a biggest fishing ground in Micronesia is that Palau Islands have a barrier reef.

Palau Islands belong to a tropical rain forest belt (rain rall reaches 3,600 mm). It is also located at east end of Asian monsoon zone so that change of seasonal wind is seen. However, gap between dry season and rainy season is not very sharp and rain fall of each month is about even. The Islands are covered by tropic trees. Most of calcic islands do not have sand beach, but have cliffs. The criffs are deeply carved by erosion. Effect of much rain fall on salinity in inner reef water, compared with its effect on salinity in the open sea where the tropical surface water dominates, is not observed clearly.

(B) Area of stock

According to the results of egg survey during the follow-up period, there may be no need to limit the distribution of telai's egg and larvae in inner reefs. This can be explained from the shape of the outer reef surrounding a reef lake. In the east coast of Palau, development of a barrier reef is poor and only a fringing reef is seen. In south of the main island, the outer reef forms a complex structure having wide and shallow water open to the high sea. Under this condition, there is almost no obstacle to the exchange of inner water and the high sea water. Well-developed outer reef surrounding a wide reef lake is located northwest of the main island and only a few channels connect it with the open sea. The outer reef is covered by sea water at high tide. In north of the main island, a few well-developed separate barrier reefs exist. Judging from this shape of barrier reefs, following away of eggs or learva floating near the surface of water is natural. S.buccaneeri has a stock in the open sea and the catch of eggs or larva therein is reproductive. However, this is not applicable to the case of telai. A question whether or not eggs or larva in the outer reef are telai is remained. The followings are still important: (1) No occurrence of S.heterolobus in the open sea of Micronesia. (2) Distribution of telai is deeply influenced by land water. Judging from (2), similarity of distribution of S.heterolobus and S.buccaeeri is not expected. Telai's stock of Palau is the stock that flowed away from the reef lake to outer open sea.

(C) Today's fishery of Palau compared with pre-war

History of telai as live bait of skipjack fishing in Palau has been extended for half century including War time. A fish lamp invented in 1931 made possible the use of telai as live bait. This way has been used up to now.

Main catch by a fish lamp was, besides telai species, Spratelloids delicatulus, Herklotsichthys, Atherinidae species and so on.

TABTE 11. Skipjack tuna catch in metric tons landed in the former Japanese mandated islands, 1922--41 (From Matsumoto, 1975)

	Saipan	Yap	Palau	Truk	Ponape	Jaluit
1922	2	-	-	4	4	-
1923	3	1	-	3	-	-
1924	9	2	2	5	<1	-
1925	15	2	9	6	5	-
1926	45	2	42	3	<1	-
1927	28	<1	15	8	2	<1
1928	26	1	/131	5	<1	-
1929	25	<1	229	215	<1	-
1930	258	<1	157	913	6	-
1931	564	<1	548	1,097	525	81
1932	1,310	-	1,592	810	534	615
1933	1,762	-	2,144	1,883	927	172
1934	2,516	4	3,779	1,200	1,202	255
1935	1,786	-	5,391	3,002	1,313	230
1936	1,696	-	3,836	5,870	2,696	168
1937	2,697	-	13,775	12,434	4,064	91
1938	2,392	149	3,420	5,295	1,496	7
1939	2,087	36	3,549	7,640	3,708	-
1940	3,379	4	6,047	7,217	1,586	<1
1941	1,295	5	3,301	4,337	2,419	169

TABLE 12. The Annual Utilization Rate of Baitfish in the Palau Skipjack Tuna Pole-and-line Fishery

Year	Tuna Catch(kg)	Bait Catch(Buckets)	Tuna Catch/ Bucket Bait(kg/bucke
1964	1,210,941	10,886	111.2
1965	2,730,735	53,358	51.1
1966	2,941,600	62,760	46.8
1967	3,403,501	73,620	46.2
1968	5,272,320	82,082	64.2
1969	6,199,208	111,103	55.7
1970	8,534,095	96,462	88.4
1971	2,348,152	48,674	48.2
1972	2,243,651	80,630	27.8
1973	4,659,536	67,811	68.7
1974	7,374,930	115,202	64.0
1975	7,515,867	165,487	45.4
1976	4,318,807	125,778	34.3

Note:
One Bucket is @ 2.5 kg.

Courtesy of mr. R. Rechebei

Table 13 Comparison of recent bait catch to the estimated bait catch in pre-war fishery

Pre-War Fishery		Recent Fishery	
Year	Bait Catch (Buckets)	Year	Bait Catch (Buckets)
1928	2,400	1964	10,900
1929	4,100	1965	53,400
1930	2,800	1966	62,800
1931	9,800	1967	73,600
1932	28,600	1968	82,100
1933	38,500	1969	111,100
1934	67,800	1970	96,500
1935	96,800	1971	48,700
1936	68,900	1972	80,600
1937	247,300	1973	67,800
1938	61,400	1974	115,200
1939	63,700	1975	165,500
1940	108,600	1976	125,800
1941	59,300		
Mean for 1932–1941 (Except for 1937)	65,956	Mean for 1965–1976 (Except for 1975)	83,418

According to Murakawa's survey, Spratelloids delicatulus was a important bait, next to telai. Herklotsichthys punctatus and Atherinidae species were rarely used.

Peak time of skipjack fishing by using live bait reached 3,000-6,000-ton catch with an extremly high record of 13,000 ton in 1937. There was no record in Palau for skipjack fishing. However, roughly estimated catch of live bait at that time may be guessed (Table 11).

Table 12 shows annual skipjack catch, bait catch and ratio of skipjack catch to live bait. What is the results in case that skipjack catch and live bait catch were applied to the skipjack fishing at that time? In 1937, according to Marukawa's survey, 45 skipjack fishing boats were registered. Today main skipjack fishing boat is around 25-ton and is operated in much wider area compared with pre war. However, its fishing efficiency is not improved remarkably. Then, annual catch of live bait at that time was guessed based on Table 12.

Average skipjack catch per bucket today is 55.7 kgs. (Causes in 1964 and 1972 are excluded because of their extreme figures.) Table 13 is a comparison between recent bait catch and the estimated catch in pre war fishery. In recent years, annual catch of live bait reached 50,000-130,000 buckets except an extreme case. It is estimated that catch of live bait at peak time in pre war reached 30,000-110,000 buckets. In 1965-1976, average catch was 83,000 buckets (except 1975). Average catch of pre war peak time (1932-41 except 1937) was 66,000 buckets.

The estimated recent catch exceeds slightly the catch at pre war peak time. Generally speaking, today, in an age of rapid change, it should be noted that the gap of today's catch and catch in pre war is small.

The limitation of fishing ground brings a slow down the increase of bait catch. It may be difficult to accept a much larger number of boats compared with pre war age. The way of fishing remains unchanged compared with pre war age including bait preserve.

For a fishing boat of the Island, telai is used because the catch is stable. In addition, (1) bait ground is located near landing facilities (2) it is protected from wind weather (3) no shallows which may obstruct boat's sailing.

Only a bait ground that meets the above conditions guaranteed and will gurantee most stable catch records to bait fishing boats of the Island in the past and today. Consequently, distribution of telai in outer reefs of the reef lake does not mean that a bait ground is newly added. This slows down the increasement of bait catch but, in a sense, it is an effective way to protect telai resources.

Table 1

ATTACHED TABLES

BIOLOGICAL DATA OF TELAI CAUGHT 1

Sample No.	Standard length mm	Head length mm	○ ○ No.	Upper teeth	SL/HL
1002	58.1	14.9	22 + 26	—	3.89
1007	47.0	12.0	21 + 26	—	3.91
1018	55.2	14.0	21 + 26	—	3.94
1032	56.2	13.9	23 + 27	—	4.04
2015	66.0	15.9	22 + 25	+	4.15
2041	86.0	20.0	21 + 26	+	4.30
2042	66.1	17.1	20 + 24	—	3.86
2046	72.2	16.2	22 + 25	—	4.45
2048	65.0	16.8	21 + 24	+	3.86
2056	61.0	16.0	22 + 24	+	3.81
4016	79.0	17.8	23 + 27	—	4.43
6002	64.0	15.1	22 + 26	+	4.23
6042	66.5	16.2	23 + 26	—	4.10
6053	61.8	15.1	22 + 26	—	4.09
6060	55.0	14.2	20 + 24	—	3.87
30001	62.0	16.2	22 + 25	+	3.82
30009	50.5	12.5	21 + 25	—	4.04
30011	67.0	16.0	22 + 26	—	4.18
30029	61.8	15.2	22 + 25	—	4.06
30031	57.2	14.0	21 + 26	—	4.08
30098	53.3	13.1	22 + 25	—	4.06
36005	61.0	14.2	22 + 25	—	4.29
36018	52.9	13.2	22 + 25	—	4.00
36021	65.5	15.7	22 + 25	—	4.17
36025	70.0	16.1	22 + 25	—	4.34
36030	58.0	14.0	23 + 28	—	4.14
36031	79.8	18.0	21 + 26	—	4.43
36042	61.2	14.5	22 + 26	—	4.22
36043	53.5	13.2	21 + 26	—	4.05
36049	51.8	12.4	22 + 26	—	4.17
36051	65.1	16.1	22 + 25	—	4.34
36063	60.0	14.9	22 + 25	—	4.02
36064	53.5	14.1	22 + 26	—	3.79
36071	55.1	13.8	21 + 26	—	3.99
39018	76.2	18.0	21 + 26	—	4.23
39025	80.5	18.0	23 + 26	—	4.47

Sample No.	Standard length mm	Head length mm	○ ○ No.	Upper teeth	SL/HL
39035	59.1	14.9	22 + 25	—	3.96
39060	63.1	16.1	22 + 26	—	3.91
39065	67.9	16.1	19 + 25	—	4.21
39074	58.8	14.2	21 + 27	—	4.14
53048	60.9	14.0	22 + 26	—	4.35
2049 — S	74.0	17.2	21 + 26	+	4.30
2051 — S	64.7	15.8	24 + 26	+	4.09
2067 — S	51.5	13.0	22 + 25	—	3.96
2098 — S	42.0	11.6	21 + 25	—	3.62
3063 — S	64.0	15.9	24 + 26	—	4.02
4029 — S	67.1	16.0	22 + 25	+	4.19
6003 — S	64.5	15.1	23 + 28	—	4.27
6088 — S	65.7	16.1	23 + 27	—	4.08
7015 — S	62.8	15.8	21 + 25	—	3.97
7049 — S	69.1	17.0	23 + 28	—	4.06
7070 — S	63.8	16.0	22 + 26	—	3.98
9005 — S	58.2	13.9	23 + 26	—	4.18
10005 — S	60.0	15.0	22 + 24	—	4.00
10006 — S	61.2	15.0	21 + 26	—	4.08
12007 — S	62.1	15.1	22 + 25	—	4.11
12013 — S	57.8	14.1	21 + 25	—	4.09
13006 — S	71.5	18.1	23 + 27	—	3.95
14006 — S	68.1	16.1	23 + 25	—	4.22
14010 — S	63.2	15.5	21 + 25	—	3.96

Measured by Prof. OZAWA,
Kagoshima University

Table 2

TEST OF GATHERING OF LIVE BAIT FISH

Place where surveyed	St. 1	St. 2	St. 3	St. 4	St. 5
Date	8/25/80	8/26/80	8/27/80	8/28/80	8/29/80
Place	Iwayama Bay	Marakal Hb.	Marakal Hb.	Marakal Hb.	Marakal Hb.
Depth	35 m	32 m	26 m	33 m	15 m
Quality of sea-bed	-	-	-	-	-
Age of the moon	14.2	15.2	16.2	17.2	18.2
Weather	BC	C	O	O	BC
Wind direction/Power	SW1	W2	W1	W1	Caln
Waves	None				None
Temperature	27.9 °C	27.7 °C	27.6 °C	27.9 °C	27.9 °C
Water temperature	30.1 °C	28.8 °C	29.2 °C	28.9 °C	28.9 °C
Fishing method	Bagan net	ditto	ditto	ditto	ditto
Electric power of a under water lamp	1.5 KW/H	ditto	ditto	ditto	ditto
Time when a lamp was put on	1830	1840	1840	1830	1830
Depth of under water lamps	9 m	9 m	6 m	8 m	6 m
Duration of gathering	3 h 20 m	2 h 30 m	2 h 30 m	2 h 30 m	2 h 30 m
Catch (buckets)	1	1	3	10	3

Place where surveyed	St. 6	St. 7	St. 8	St. 9	St. 10
Date	8/30/80	9/1/80	9/3/80	9/4/80	9/5/80
Place	Inside of Iwayama	Inside of Iwayama	East-coast of main island	East-coast of main island	
Depth	33 m	27 m	24 m	40 m	30 m
Quality of sea-bed	-	-	Mud sand	Reel	Coral sand
Age of the moon	19.2	21.2	23.2	24.2	25.2
Weather	BC	C	C	R	R
Wind direction/Power	Calm	SW3	WSW4	W4	W3
Waves	None	2	3	3	2
Temperature	26.6 °C	28.6 °C	27.5 °C	26.1 °C	26.8 °C
Water temperature	29.5 °C	29.0 °C	28.9 °C	28.3 °C	27.9 °C
Fishing method	Bagan net	ditto	ditto	ditto	ditto
Electric power of a under water lamp	1.5 KW/H	ditto	ditto	ditto	ditto
Time when a lamp was put on	1830	1830	1830	1830	1830
Depth of under water lamps	7 m	7 m	7 m	9 m	7 m
Duration of gathering	2 h 30 m	2 h 30 m	2 h 30 m	2 h 00 m	2 h 40 m
Catch (buckets)	60	5	5	23	20

Place where surveyed	St. 11	St. 22	St. 30	St. 36	St. 39
Date	9/6/80	12/2/80	12/3/80	12/4/80	12/8/80
Place	El Mock Islands	North west of main island	Western channel	Northern open water	Middle open water
Depth	25 m	28 m	26 m	32 m	32 m
Quality of sea-bed	Coral sand	Mud sand	Clay sand	-	Reel
Age of the moon	26.2	24.1	25.1	26.1	0.4
Weather	C	BC	C	C	B
Wind direction/Power	W4	NE2	N1	E3	Calm
Waves	3	1	1	2	None
Temperature	28.6 °C	28.9 °C	28.7 °C	30.0 °C	32.0 °C
Water temperature	28.3 °C	30.1 °C	29.3 °C	29.8 °C	30.1 °C
Fishing method	Bagan net	Stick-held dip net	ditto	ditto	ditto
Electric power of a under water lamp	1.5 KW/H	ditto	ditto	ditto	ditto
Time when a lamp was put on	1830	1800	1800	1800	1800
Depth of under water lamps	10 m	7 m	6 m	4 m	7 m
Duration of gathering	2 h 00 m	3 h 00 m	4 h 00 m	3 h 30 m	2 h 00 m
Catch (buckets)	10	0	100	50	100

Place where surveyed	St. 53	St. 65
Date	12/9/80	12/10/80
Place	Outer open water	Outside of Iwayama
Depth	27 m	25 m
Quality of sea-bed	Coral sand	-
Age of the moon	1.4	2.4
Weather	B	BC
Wind direction/Power	SE1	E1
Waves	1	1
Temperature	31.0 °C	29.0 °C
Water temperature	30.3 °C	30.5 °C
Fishing method	Stick-held dip net	ditto
Electric power of a under water lamp	1.5 KW/H	ditto
Time when a lamp was put on	1800	1800
Depth of under water lamps	5 m	5 m
Duration of gathering	2 h 30 m	2 h 30 m
Catch (buckets)	100	120

Table 3

RESULTS OF SURVEY ON WATER TEMPERATURE (t °C) AND SALINITY (S ‰) AT BAIT GROUND

Station No.	Date	Time	Depth (m)	Weather	Wind direction & Power	Temperature °C		Observed layers					
								0 m	2 m	5 m	10 m	20 m	30 m
1	8/25	1815	35	BC	SW1	27.9	t	30.1	30.7	30.8	30.5	30.1	29.7
							s	31.56	32.34	32.59	33.76	33.00	33.09
2	8/26	1800	32	C	W1	27.7	t	28.8	29.0	29.1	29.0	28.8	28.9
							s	33.45	33.44	33.42	33.46	33.53	33.59
3	8/27	1735	26	O	W1	27.6	t	29.2	29.2	29.1	29.1	29.0	
							s	33.14	33.27	33.30	33.37	33.43	
4	8/28	1715	33	O	W1	27.9	t	28.9	28.8	28.7	28.7	28.7	28.7
							s	33.47	33.48	33.51	33.51	33.53	33.51
5	8/29	1750	15	BC	Calm	27.9	t	28.9	28.9	28.6	28.5		
							s	33.66	33.66	33.64	33.69		
6	8/30	1730	33	BC	Calm	26.6	t	29.5	29.2	29.0	28.9	28.7	28.9
							s	33.26	33.42	33.54	33.55	33.55	33.52
7	9/ 1	1725	27	C	SW3	28.6	t	29.0	29.1	29.1	29.1	28.9	
							s	33.16	33.32	33.48	33.62	33.66	
8	9/ 3	1800	24	C	WSW4	27.5	t	28.9	28.8	28.8	28.7	28.8	
							s	<31.00	33.56	33.69	33.73	33.59	
9	9/ 4	1600	40	R	W4	26.1	t	28.3	28.2	28.4	28.4	28.3	28.4
							s	33.71	33.73	33.72	33.72	33.74	33.74
10	9/ 5	1840	30	R	W3	26.8	t	27.9	28.2	28.3	28.3	28.3	
							s	33.42	33.44	33.50	33.55	33.56	
11	9/ 6	1700	25	C	W4	28.6	t	28.3	28.3	28.3	28.3	28.2	
							s	33.51	33.51	33.51	33.51	33.51	
22	12/ 2	1620	28	BC	NE2	28.9	t	30.1	30.0	29.7	29.5	29.4	
							s	33.66	33.63	33.64	33.66	33.68	
30	12/ 3	1700	26	C	E1	28.7	t	29.3	29.4	29.4	29.3	29.3	
							s	33.33	33.38	33.56	33.57	33.51	
36	12/ 4	1600	32	C	E3	30.0	t	29.8	29.8	29.8	29.8	29.6	29.1
							s	33.48	33.42	33.42	33.42	33.51	33.65
39	12/ 8	1750	26	B	Calm	32.0	t	30.1	30.0	29.8	29.8	29.5	
							s	33.36	33.36	33.36	33.41	33.50	
53	12/ 9	1720	27	B	SE1	31.0	t	30.3	30.4	30.3	30.1	29.9	
							s	33.40	33.41	33.40	33.40	33.51	
65	12/10	1700	25	BC	E1	29.0	t	30.5	30.1	30.0	29.9	29.8	
							s	33.00	33.40	33.41	33.42	33.53	

Table 4

RESULTS OF GATHERING OF LARVA

OF ENGRAULIS HETEROLOBUS

Station No.	Date	Time	Area	Outer or inner reef	Larva	Egg	Depth	Water temperature	Salinity
							m	℃	‰
1	8／25	1908	D	Inner reef	6	2	35	30.1	31.56
2(1)	8／26	1842	〃	〃	133	0	32	28.8	33.45
2(2)	〃	1857	〃	〃	24	0			
3	8／27	1840	〃	〃	46	0	26	29.2	33.14
4(1)	8／28	1830	〃	〃	293	0	33	28.9	32.47
4(2)	〃	1850	〃	〃	18	0			
4(3)	〃	1920	〃	〃	24	0			
5(1)	8／29	1835	〃	〃	3	0	15	28.9	33.66
5(2)	〃	2055	〃	〃	24	0			
6(1)	8／30	1835	A	〃	11	0			
6(2)	〃	1905	〃	〃	39	0	33	29.5	33.26
6(3)	〃	2100	〃	〃	24	0			
7	9／1	1935	〃	〃	41	0	27	29.0	33.16
8	9／3	1835	F	〃	8	0	24	28.9	
9(1)	9／4	1830	〃	〃	0	0	40	28.8	33.71
9(2)	〃	2043	〃	〃	61	0			
10	9／5	1905	E	〃	39	0	30	27.9	33.42
11(1)	9／6	1840	〃	〃	1	0	25	28.8	33.51
11(2)	〃	1855	〃	〃	20	0			
12	12／2	0650	A	〃	0	98	40	29.7	33.49
13	〃	0725	B	〃	0	3	50	29.8	33.47
14	〃	0800	〃	〃	0	0	50	29.4	33.80
15	〃	0835	〃	〃	0	0	36	29.5	33.51
16	〃	0910	〃	〃	0	0	10	29.5	33.61
17	〃	0955	C	Outer reef	0	0	25	29.3	33.74
18	〃	1030	〃	〃	0	0		29.8	33.78
19	〃	1105	〃	〃	0	0	100	29.9	33.80
20	〃	1140	〃	〃	0	0		29.9	33.75
21	〃	1215	〃	〃	0	0		29.7	33.72
22(1)	〃	1820	B	Inner reef	16	0	28	30.1	33.66
22(2)	〃	1831	〃	〃	17	0			
22(3)	〃	1844	〃	〃	8	0			
23	12／3	0835	C	Outer reef	0	0		29.2	33.75
24	〃	0910	〃	〃	4	0		29.1	33.64
25	〃	0945	〃	〃	0	0		29.2	33.70
26	〃	1020	〃	〃	0	0		29.2	33.62

Station No.	Date	Time	Area	Outer or inner reef	Larva	Egg	Depth	Water temperature	Salinity
							m	℃	‰
27	12／ 3	1055	C	Outer reef	0	0		29.1	33.58
28	〃	1130	〃	〃	0	0		29.5	33.43
29	〃	1210	〃	〃	54	0	80	29.4	33.42
30	〃	1835	B	Inner reef	3	0	26	29.3	33.33
31	12／ 4	0705	〃	〃	1	0	35	28.9	33.22
32	〃	0740	〃	〃	0	0	36	29.0	33.36
33	〃	0915	〃	〃	0	0	40	29.3	33.49
34	〃	0945	〃	〃	0	0	50	29.4	33.64
35	〃	1025	〃	〃	0	0	40	29.1	33.47
36(1)	〃	1823	A	〃	26	0	32	29.8	33.48
36(2)	〃	1838	〃	〃	183	0			
36(3)	〃	1856	〃	〃	58	0			
37	12／ 8	1450	〃	〃	0	0	40	31.5	33.39
38	〃	1505	〃	〃	0	0	30	31.4	33.40
39	〃	1613	〃	〃	2	0	30	31.2	33.36
40	〃	1630	〃	〃	1	0	33	31.5	33.39
41	〃	1848	〃	〃	35	0			
42	〃	1906	〃	〃	3	0			
43	12／ 9	0750	〃	〃	0	0	15	29.2	33.39
44	〃	0825	〃	〃	0	0	25	30.1	33.39
45	〃	0855	〃	〃	0	0	20	29.9	33.41
46	〃	0925	〃	〃	0	32	20	28.9	33.11 ※
47	〃	1000	〃	〃	0	0	23	29.1	33.19 ※
48	〃	1030	〃	〃	0	0	34	30.3	33.17 ※
49	〃	1100	〃	〃	0	12	40	30.1	33.16 ※
50	〃	1125	〃	〃	0	0	40	30.3	33.17 ※
51	〃	1200	〃	〃	0	0	47	30.3	33.16 ※
52	〃	1230	〃	〃	0	22	30	30.2	33.17 ※
53(1)	〃	1835	〃	〃	113	0	27		
53(2)	〃	1848	〃	〃	21	0			
54	12／10	0820	〃	〃	0	16	40	30.0	33.37
55	〃	0840	〃	〃	0	0	37	30.3	33.40
56	〃	0905	〃	〃	0	0	31	30.3	33.42
57	〃	0930	〃	〃	0	0	34	30.3	33.48
58	〃	1000	〃	〃	0	0	38	30.2	33.46
59	〃	1020	〃	〃	0	0	36	30.4	33.44
60	〃	1035	〃	〃	0	4	35	30.5	33.44
61	〃	1050	〃	〃	0	0	38	30.4	33.37
62	〃	1100	〃	〃	0	1	40	30.0	33.34

Station No.	Date	Time	Area	Outer or inner reef	Larva	Egg	Depth	Water temperature	Salinity
							m	℃	‰
63	12／10	1130	A	Inner reef	0	0	40	30.0	33.19
64	〃	1155	〃	〃	0	0	35	30.5	33.39
65(1)	〃	1825	〃	〃	170	0		30.5	33.00
65(2)	〃	1838	〃	〃	89	0			
66	12／11	0707	D	〃	0	4	31	30.5	32.80
67	〃	0720	〃	〃	0	0	35	30.7	32.76
68	〃	0734	〃	〃	0	0	25	30.6	32.77
69	〃	0748	〃	〃	0	0	40	30.7	33.86
70	12／15	0603	G	Outer reef	0	0		29.1	33.45
71	〃	0630	〃	〃	0	10		29.1	33.44
72	〃	0655	〃	〃	0	4		29.2	33.51
73	〃	0720	〃	〃	0	40		29.2	33.55
74	〃	0745	〃	〃	0	32		29.3	33.53
75	〃	0815	〃	〃	0	21		29.2	33.50
76	〃	0850	〃	〃	0	29		29.2	33.44
77	〃	0920	〃	〃	0	15		29.3	33.46
78	〃	0950	〃	〃	0	2		29.2	33.51
79	〃	1015	F	Inner reef	0	0	54	29.4	33.50
80	〃	1045	〃	〃	0	0	34	29.2	33.26
81	〃	1135	〃	〃	0	2	24	29.4	33.87
82	〃	1205	〃	〃	0	0	60	29.4	33.11
83	〃	1235	〃	〃	0	0	43	29.7	33.24
84	〃	1305	D	〃	0	0	24	29.5	33.40
85	12／16	0600	G	Outer reef	0	0	50	29.4	33.41
86	〃	0625	〃	〃	0	0	25	29.1	33.45
87	〃	0700	〃	〃	0	0	50	29.2	33.53
88	〃	0735	〃	〃	0	0	200	29.2	33.55
89	〃	0810	〃	〃	0	0		29.2	33.55
90	〃	0850	〃	〃	0	0		29.2	33.56
91	〃	0925	〃	〃	0	0	280	29.3	33.57
92	〃	1110	〃	〃	0	0	200	29.6	33.57
93	〃	1125	E	Inner reef	0	0	35	29.7	33.56
94	〃	1155	〃	〃	0	0	25	29.6	33.55
95	〃	1235	G	Outer reef	0	0		29.4	33.55

Table 5

TOTAL LENGTH, WEIGHT, WEIGHT
OF GENITAL GLAND (S.heterolobus)

Stolephorus

Sample No.	Total length T (mm)	Weight W (mg)	Sex	Maturity	Weight of genital gland G (mg)	G. I. G/W × 10^3	Date	Place
2049—S	87.8	4220.7	♀	2	31.0	7.34	6/11	
2050—S	83.3	3188.3	♀	2	27.0	8.47	〃	
2051—S	76.7	2647.2	♀	3	40.6	15.40	〃	
2064—S	72.8	2015.6	♀	1	4.7	2.33	〃	
2067—S	62.8	1256.4	♀	1	2.2	1.75	〃	
2071—S	46.7	593.0	♀	1	1.1	1.85	〃	
2079—S	67.8	1665.9	♀	1	2.5	1.50	〃	
2091—S	63.9	1235.9	♀	1	2.1	1.70	〃	
2093—S	52.8	790.0	♀	1	3.2	4.05	〃	
2095—S	62.2	1107.6	♀	1	1.6	1.44	〃	
3010—S	71.5	2080.1	♂	2	39.6	19.04	6/12	
3021—S	73.0	2214.8	♂	2	34.4	15.53	〃	
3047—S	43.9	516.3	♂	1	—	—	〃	
3050—S	86.1	3842.3	♀	2	32.5	8.46	〃	
3063—S	76.7	2584.3	♀	1	5.9	2.28	〃	
3075—S	64.5	1386.2	♀	1	3.8	2.74	〃	
3085—S	65.6	1607.7	♀	1	7.9	4.91	〃	
3086—S	61.7	1150.5	♀	2	16.6	14.43	〃	
4004—S	82.6	3926.9	♂	2	32.8	8.35	6/13	
4029—S	80.4	2984.2	♀	1	11.6	3.89	〃	
4079—S	76.1	1591.4	♀	2	8.7	5.47	〃	
5018—S	75.5	1606.2	♂	2	29.1	18.12	6/26	
5039—S	55.6	912.4	♂	1	11.2	12.28	〃	
6003—S	76.1	2620.3	♂	3	71.6	27.33	8/ 6	
6088—S	79.4	2908.4	♀	3	44.5	15.30	〃	
7015—S	74.7	2509.5	♂	3	45.7	18.21	〃	
7026—S	72.0	2321.1	♂	3	70.8	30.50	〃	
7049—S	83.0	3690.0	♀	3	89.7	24.31	〃	
7070—S	77.9	2850.1	♀	3	45.2	15.86	〃	
9001—S	71.3	2414.4	♀	3	64.6	26.76	9/18	
9005—S	68.7	2063.5	♀	3	76.3	36.98	9/16	
9006—S	75.8	2723.8	♀	3	55.2	20.27	〃	
10004—S	74.1	2660.7	♀	4	112.0	42.09	9/17	
10005—S	73.3	2626.1	♀	4	184.0	70.07	〃	
10006—S	74.5	2741.5	♀	4	136.9	49.94	〃	
10012—S	73.4	2832.0	♂	3	146.9	51.87	〃	

Table 6

Sample No.	Total length T (mm)	Weight W (mg)	Sex	Maturity	Weight of genital gland G (mg)	G. I. $G/W \times 10^3$	Date	Place
10015—S	66.4	1950.5	♂	3	37.3	37.58	9/17	
10016—S	68.5	1924.5	♂	4	97.2	50.51	〃	
11001—S	67.6	2122.8	♀	4	159.7	75.23	9/18	
12006—S	65.7	1780.6	♀	4	71.6	40.21	〃	
12007—S	74.7	2775.7	♀	4	128.5	46.29	〃	
12009—S	70.4	2154.8	♀	2	16.9	7.84	〃	
12010—S	65.2	1618.7	♀	1	7.6	4.70	〃	
12013—S	70.1	2170.7	♂	4	115.8	53.35	〃	
13006—S	85.1	4277.3	♀	4	314.1	73.43	9/23	
14006—S	82.2	3479.0	♀	4	208.1	59.82	9/24	
14010—S	76.4	2774.3	♂	4	176.0	63.44	〃	
14014—S	68.5	1921.6	♂	4	80.0	41.63	〃	
15006—S	76.7	2985.6	♀	2	33.7	24.69	10/16	

Table 7

Sample No.	Total length T (mm)	Weight W (mg)	Sex	Maturity	Weight of genital gland G (mg)	G. I. $G/W \times 10^3$	Date	Place
1002	79.2	2059.6	♂	4	95.2	46.22	8/25	1
1007	65.4	1045.1	♂	4	48.3	46.22	〃	〃
1009	81.7	3101.8	♀	4	139.1	44.84	〃	〃
1011	81.6	3227.9	♀	4	129.1	40.00	〃	〃
1013	76.2	1629.8	♀	4	61.8	37.92	〃	〃
1014	75.3	1732.4	♀	4	72.4	41.79	〃	〃
2015	86.3	2808.3	♂	4	172.8	61.53	8/26	2
2041	97.6	6046.0	♀	4	183.3	30.32	〃	〃
2042	78.2	2908.7	♀	4 R	157.8	54.25	〃	〃
2046	84.9	3244.7	♀	5	42.5	13.10	〃	〃
2048	75.2	2768.4	♀	4 R	233.8	84.45	〃	〃
2053	76.1	2773.3	♀	4 R	204.0	73.56	〃	〃
2056	74.4	2695.9	♀	4 R	161.3	59.83	〃	〃
4003	88.1	5376.3	♀	3	205.1	38.15	8/28	4
4016	90.5	5715.1	♀	4	301.7	52.79	〃	〃
6060	70.1	2085.4	♀	4	214.7	102.95	8/29	5
6002	74.0	2872.0	♂	4	131.7	45.86	8/30	6
6006	73.5	2551.3	♂	3	72.3	28.34	〃	〃
6042	78.5	3059.5	♀	3	130.8	42.75	〃	〃
6053	73.3	2477.6	♀	3	75.0	30.27	〃	〃
6058	69.3	1975.6	♀	1	18.7	9.47	〃	〃
6059	79.5	2131.0	♀	2	27.7	13.00	〃	〃
8062	64.5	1584.7	♀	3	54.1	34.14	9/ 3	8
30001	78.2	3237.6	♀	3	59.9	18.50	12/ 3	
30005	80.9	3341.8	♀	4	115.0	34.41	〃	
30006	74.5	2479.8	♀	4	130.4	52.58	〃	
30009	60.6	1334.0	♀	1	3.4	2.55	〃	
30011	79.6	3235.5	♂	3	76.0	23.49	〃	
30014	68.1	1714.1	♂	2	7.7	4.49	〃	
30025	80.2	3306.1	♂	4	142.8	43.19	〃	
30029	73.4	2592.7	♂	2	22.3	8.60	〃	
30030	78.1	2946.0	♂	4	118.3	40.16	〃	
30031	68.3	1972.8	♂	2	7.1	3.60	〃	
30032	68.5	1813.3	♂	1	11.4	6.29	〃	
30098	62.9	1518.2	♀	3	31.9	21.01	〃	
36002	71.8	2273.3	♀	2	22.8	10.03	12/ 4	
36005	72.0	2245.6	♀	2	35.8	15.94	〃	
36016	66.5	1855.3	♀	3	38.8	20.91	〃	

BAGAN NET
AUG.25
ST.1

Table 8 Data on Measurement of S. heterolobus

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
1001	78.7	♂	4								
2	79.2	〃	4								
3	78.5	〃	4								
4	71.4	〃	4								
5	81.3	〃	4								
6	89.2	〃	4								
7	65.4	〃	4								
8	56.0	〃	4								
9	81.7	♀	4								
1010	83.3	〃	4								
11	81.6	〃	4								
12	75.0	〃	4								
13	66.2	〃	4								
14	65.3	〃	4								

BAGAN NET
AUG.26
ST.2

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
2001	62.2	♂	3	35	69.6	♂	4				
2	74.5	〃	3	36	77.7	〃	3				
3	73.9	〃	4	37	75.7	〃	4				
4	80.3	〃	4	38	78.0	〃	4				
5	72.5	〃	4	39	70.7	〃	3				
6	76.8	〃	4	2040	69.0	〃	4				
7	71.6	〃	4	41	97.6	♀	4				
8	76.2	〃	4	42	78.2	〃	4R				
9	81.4	〃	4	43	82.1	〃	3				
2010	73.2	〃	4	44	75.5	〃	3				
11	70.6	〃	4	45	69.0	〃	4R				
12	69.3	〃	4	46	84.9	〃	5				
13	74.5	〃	4	47	66.1	〃	4R				
14	76.8	〃	4	48	75.2	〃	4R				
15	76.3	〃	4	49	68.3	〃	3				
16	77.8	〃	4	2050	66.6	〃	3				
17	80.6	〃	4	51	67.1	〃	2				
18	77.5	〃	3	52	78.0	〃	4R				
19	75.3	〃	4	53	76.1	〃	4R				
2020	61.7	〃	3	54	65.8	〃	4R				
21	77.5	〃	4	55	69.2	〃	5				
22	66.5	〃	3	56	74.4	〃	4R				
23	76.9	〃	4	57	79.0	〃	5				
24	77.8	〃	4	58	68.2	〃	5				
25	75.6	〃	4	59	72.7	〃	4R				
26	76.5	〃	4	2060	67.3	〃	4R				
27	68.3	〃	2								
28	72.7	〃	4								
29	65.6	〃	3								
2030	70.9	〃	4								
31	77.2	〃	4								
32	65.5	〃	3								
33	74.5	〃	4								
34	77.5	〃	4								

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SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
3001	71.0	♂	2								
2	66.2	〃	2								
3	69.8	〃	2								
4	64.1	〃	2								
5	58.9	〃	1								
6	67.1	〃	2								
7	71.5	〃	3								
8	68.7	〃	2								
9	64.5	〃	2								
3010	67.0	〃	2								
11	70.3	〃	2								
12	71.3	〃	2								
13	71.0	〃	2								
14	66.3	〃	2								
15	69.2	♀	2								
16	65.8	〃	2								
17	68.8	〃	2								
18	61.1	〃	2								
19	68.6	〃	2								
3020	73.3	〃	2								
21	73.0	〃	2								
22	59.5	〃	1								
23	71.7	〃	2								
24	70.5	〃	3								
25	62.7	〃	2								
26	70.4	〃	2								
27	65.4	〃	2								
28	52.4	〃	2								

BAGAN NET
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ST.4

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
4001	85.4	♀	1	35	67.6	♀	2	69	80.6	♂	4
2	70.0	〃	2	36	77.7	〃	3	4070	81.6	〃	2
3	88.1	〃	2	37	75.1	〃	2	71	77.5	〃	3
4	82.3	〃	2	38	81.2	〃	2	72	70.3	〃	3
5	85.6	〃	3	39	69.9	〃	2	73	76.1	〃	2
6	81.8	〃	2	4040	64.1	〃	2	74	73.7	〃	2
7	79.7	〃	2	41	63.6	〃	1	75	75.9	〃	2
8	83.9	〃	3	42	64.5	〃	2	76	62.5	〃	2
9	85.2	〃	2	43	76.6	〃	2	77	62.0	〃	2
4010	72.2	〃	2	44	81.0	〃	2	78	63.4	〃	2
11	79.5	〃	2	45	83.7	〃	2	79	56.8	〃	1
12	79.3	〃	2	46	91.1	〃	3	4080			
13	61.6	〃	2	47	89.1	〃	3				
14	75.3	〃	2	48	82.0	〃	3				
15	69.3	〃	2	49	85.0	〃	3				
16	90.5	〃	4	4050	82.6	〃	2				
17	87.2	〃	2	51	67.7	〃	2				
18	85.7	〃	2	52	84.6	〃	3				
19	86.9	〃	3	53	75.7	〃	3				
4020	84.1	〃	3	54	80.0	〃	2				
21	74.9	〃	2	55	76.5	〃	2				
22	75.7	〃	2	56	84.0	〃	3				
23	75.0	〃	2	57	80.5	〃	2				
24	77.5	〃	2	58	73.9	〃	2				
25	71.8	〃	2	59	75.0	〃	2				
26	74.1	〃	2	4060	78.6	〃	2				
27	73.3	〃	2	61	70.2	〃	2				
28	80.1	〃	2	62	84.0	〃	2				
29	71.6	〃	1	63	81.0	〃	3				
4030	80.5	〃	3	64	76.5	〃	2				
31	72.9	〃	1	65	68.3	〃	1				
32	79.3	〃	2	66	65.0	〃	2				
33	70.5	〃	2	67	68.6	〃	2				
34	74.8	〃	2	68	82.4	♂	3				

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SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
6001	68.9	♂	3	35	61.4	♂	1	69	49.8	♀	1
2	74.0	〃	4	36	48.2	〃	1	6070	46.4	〃	1
3	69.5	〃	3	37	49.6	〃	1	71	50.6	〃	1
4	58.0	〃	1	38	52.2	〃	1	72	52.0	〃	1
5	67.9	〃	2	39	52.7	〃	1	73	68.7	〃	1
6	73.5	〃	3	6040	48.0	〃	1	74	53.8	〃	1
7	64.7	〃	1	41	46.5	〃	1	75	51.4	〃	1
8	64.1	〃	2	42	78.5	♀	3	76	73.0	〃	1
9	66.4	〃	3	43	71.7	〃	2	77	75.6	〃	1
6010	64.3	〃	2	44	70.5	〃	2	78	63.4	〃	1
11	62.2	〃	2	45	71.5	〃	3	79	67.0	〃	1
12	68.6	〃	1	46	60.0	〃	1	6080	79.1	〃	1
13	65.4	〃	1	47	66.7	〃	2	81	79.1	〃	2
14	63.3	〃	1	48	65.2	〃	1	82	59.0	〃	1
15	61.3	〃	1	49	68.1	〃	3	83	64.0	〃	1
16	57.8	〃	1	6050	64.1	〃	2	84	54.2	〃	1
17	59.8	〃	2	51	74.0	〃	3	85	52.9	〃	1
18	62.7	〃	2	52	67.6	〃	3	86	52.8	〃	1
19	59.1	〃	1	53	73.3	〃	3	87	54.0	〃	1
6020	60.4	〃	1	54	70.6	〃	2	88	55.7	〃	1
21	52.8	〃	1	55	65.3	〃	1	89	55.1	〃	1
22	50.6	〃	1	56	80.5	〃	3	6090	57.5	〃	1
23	58.6	〃	1	57	63.4	〃	1	91	49.5	〃	1
24	55.6	〃	1	58	69.3	〃	1	92	53.0	〃	1
25	58.0	〃	1	59	79.5	〃	2	93	51.0	〃	1
26	48.5	〃	1	6060	70.1	〃	1	94	52.4	〃	1
27	51.1	〃	1	61	67.6	〃	2	95	58.0	〃	1
28	49.5	〃	1	62	62.3	〃	1	96	58.8	〃	1
29	57.3	〃	1	63	53.4	〃	1	97	52.5	〃	1
6030	53.9	〃	1	64	54.3	〃	1	98	50.0	〃	1
31	48.1	〃	1	65	54.0	〃	1	99	45.5	〃	1
32	49.0	〃	1	66	52.8	〃	1	6100	46.5	〃	1
33	55.9	〃	1	67	55.1	〃	1				
34	51.9	〃	1	68	55.8	〃	1				

BAGAN NET
SEPT.1
ST.7

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
7001	68.9	♂	1	35	51.0	♂	1	69	68.8	♀	1
2	67.7	〃	2	36	51.0	〃	1	7070	52.7	〃	1
3	59.1	〃	1	37	53.5	〃	1	71	59.0	〃	1
4	61.7	〃	1	38	51.0	〃	1	72	69.3	〃	2
5	63.6	〃	1	39	53.0	〃	1	73	66.5	〃	1
6	66.3	〃	1	7040	44.8	〃	1	74	66.5	〃	1
7	62.5	〃	1	41	54.2	〃	1	75	61.3	〃	1
8	61.6	〃	1	42	54.9	〃	1	76	54.5	〃	1
9	65.3	〃	1	43	48.8	〃	1	77	52.5	〃	1
7010	62.5	〃	1	44	53.8	〃	1	78	60.3	〃	1
11	71.2	〃	2	45	52.5	〃	1	79	55.8	〃	1
12	64.3	〃	1	46	56.6	〃	1	7080	56.9	〃	1
13	63.9	〃	1	47	54.3	〃	1	81	52.6	〃	1
14	64.1	〃	1	48	51.3	〃	1	82	54.2	〃	1
15	62.5	〃	1	49	50.5	〃	1	83	57.0	〃	1
16	61.3	〃	1	7050	74.6	♀	1	84	51.5	〃	1
17	55.1	〃	1	51	72.6	〃	1	85	54.1	〃	1
18	57.7	〃	1	52	68.6	〃	1	86	47.5	〃	1
19	60.4	〃	1	53	72.5	〃	1	87	54.9	〃	1
7020	59.7	〃	1	54	64.1	〃	1	88	51.0	〃	1
21	55.7	〃	1	55	65.3	〃	1	89	46.9	〃	1
22	56.9	〃	1	56	59.6	〃	1	7090	51.7	〃	1
23	56.5	〃	1	57	64.1	〃	2	91	53.2	〃	1
24	53.1	〃	1	58	63.0	〃	1	92	42.5	?	1
25	56.2	〃	1	59	59.7	〃	1	93	38.1	〃	1
26	55.4	〃	1	7060	67.0	〃	1	94	38.9	〃	1
27	57.3	〃	1	61	60.5	〃	1	95	36.0	〃	1
28	52.9	〃	1	62	63.9	〃	1	96			
29	52.8	〃	1	63	57.1	〃	1	97			
7030	51.7	〃	1	64	75.0	〃	2	98			
31	52.0	〃	1	65	61.2	〃	1	99			
32	46.0	〃	1	66	74.5	〃	1	7100			
33	52.2	〃	1	67	62.0	〃	1				
34	52.2	〃	1	68	63.8	〃	1				

BAGAN NET
SEPT.3
ST.8

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
8001	55.2	♂	1	35	56.9	♂	1	69	62.0	♀	3
2	51.1	〃	1	36	56.4	〃	1	8070	68.0	〃	2
3	54.6	〃	1	37	55.0	〃	1	71	59.3	〃	1
4	55.5	〃	1	38	43.6	〃	1	72	55.1	〃	1
5	59.0	〃	1	39	51.7	〃	1	73	59.3	〃	2
6	47.1	〃	1	8040	51.4	〃	1	74	59.1	〃	1
7	58.2	〃	1	41	53.2	〃	1	75	57.4	〃	1
8	43.6	〃	1	42	49.1	〃	1	76	57.5	〃	1
9	50.9	〃	1	43	52.9	〃	1	77	51.7	〃	1
8010	58.3	〃	1	44	48.6	〃	1	78	58.7	〃	3
11	49.5	〃	1	45	49.0	〃	1	79	52.7	〃	1
12	50.5	〃	1	46	49.5	〃	1	8080	48.3	〃	1
13	61.5	〃	2	47	50.7	〃	1	81	50.9	〃	1
14	63.4	〃	2	48	51.9	〃	1	82	48.3	〃	1
15	56.9	〃	1	49	54.0	〃	1	83	46.4	〃	1
16	62.2	〃	2	8050	46.0	〃	1	84	46.7	〃	1
17	63.9	〃	2	51	53.7	〃	1	85	44.1	〃	1
18	58.0	〃	2	52	47.6	〃	1	86	53.4	〃	1
19	49.5	〃	1	53	51.7	〃	1	87	47.8	〃	1
8020	63.3	〃	1	54	62.2	♀	1	88	46.5	〃	1
21	49.7	〃	1	55	53.1	〃	1	89	50.7	〃	1
22	55.0	〃	1	56	60.3	〃	2	8090	45.2	〃	1
23	60.1	〃	2	57	57.2	〃	2	91	51.3	〃	1
24	47.9	〃	1	58	53.7	〃	1	92	47.5	〃	1
25	54.6	〃	1	59	57.9	〃	1	93	48.0	〃	1
26	48.0	〃	1	8060	55.0	〃	1	94	44.0	〃	1
27	61.6	〃	2	61	43.7	〃	1	95	42.6	〃	1
28	59.5	〃	2	62	64.5	〃	3	96	37.7	?	1
29	54.3	〃	1	63	62.0	〃	2	97	49.0	♂	1
8030	58.5	〃	1	64	50.5	〃	1	98	53.3	〃	1
31	57.6	〃	1	65	49.2	〃	1	99	50.5	〃	1
32	49.0	〃	1	66	47.4	〃	1	8100	58.3	♀	2
33	59.9	〃	1	67	60.5	〃	1				
34	52.2	〃	1	68	42.7	〃	1				

BAGAN NET
SEPT.4
ST.9

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
9001	37.0	?	1	35	28.6	?	1	69	32.0	?	1
2	30.3	〃	1	36	34.5	〃	1	9070	30.0	〃	1
3	35.4	〃	1	37	20.3	〃	1	71	35.0	〃	1
4	26.6	〃	1	38	16.5	〃	1	72	26.5	〃	1
5	40.1	〃	1	39	46.7	〃	1	73	25.4	〃	1
6	36.7	〃	1	9040	34.0	〃	1	74	26.0	〃	1
7	39.0	〃	1	41	35.5	〃	1	75	25.0	〃	1
8	42.2	〃	1	42	35.7	〃	1	76	32.0	〃	1
9	33.9	〃	1	43	47.2	〃	1	77	25.0	〃	1
9010	30.9	〃	1	44	37.7	〃	1	78	37.0	〃	1
11	33.3	〃	1	45	33.9	〃	1	79	35.0	〃	1
12	25.2	〃	1	46	28.8	〃	1	9080	31.3	〃	1
13	35.9	〃	1	47	31.7	〃	1	81	27.7	〃	1
14	30.2	〃	1	48	30.2	〃	1	82	30.9	〃	1
15	34.6	〃	1	49	32.7	〃	1	83	27.3	〃	1
16	26.7	〃	1	9050	25.7	〃	1	84	28.8	〃	1
17	30.5	〃	1	51	25.4	〃	1	85	24.1	〃	1
18	29.0	〃	1	52	26.2	〃	1	86	26.0	〃	1
19	31.7	〃	1	53	22.5	〃	1	87	25.4	〃	1
9020	24.5	〃	1	54	24.6	〃	1	88	25.1	〃	1
21	28.8	〃	1	55	22.0	〃	1	89	24.8	〃	1
22	27.6	〃	1	56	19.0	〃	1	9090	29.1	〃	1
23	24.9	〃	1	57	29.8	〃	1	91	30.8	〃	1
24	23.5	〃	1	58	30.2	〃	1	92	24.0	〃	1
25	28.5	〃	1	59	29.1	〃	1	93	24.0	〃	1
26	17.7	〃	1	9060	27.0	〃	1	94	32.3	〃	1
27	23.3	〃	1	61	32.1	〃	1	95	27.5	〃	1
28	38.7	〃	1	62	37.2	〃	1	96	25.0	〃	1
29	37.8	〃	1	63	32.5	〃	1	97	23.2	〃	1
9030	43.7	〃	1	64	42.3	〃	1	98	21.9	〃	1
31	40.5	〃	1	65	41.2	〃	1	99	23.1	〃	1
32	46.1	〃	1	66	31.2	〃	1	9100	21.5	〃	1
33	40.7	〃	1	67	33.8	〃	1				
34	32.8	〃	1	68	44.2	〃	1				

BAGAN NET
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ST.11

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
11001	72.0	♂	2								
2	69.6	〃	2								
3	53.5	〃	1								
4	71.7	♀	2								
5	71.3	〃	2								
6	35.5	?	1								
7	36.2	〃	1								
8	38.6	〃	1								
9	39.7	〃	1								
11010	37.5	〃	1								
11	46.2	〃	1								
12	44.1	〃	1								
13	42.1	〃	1								
14	37.5	〃	1								
15	30.4	〃	1								
16	35.4	〃	1								
17	34.5	〃	1								
18	36.8	〃	1								
19	48.3	〃	1								
11020	37.5	〃	1								
21	36.6	〃	1								
22	33.3	〃	1								

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ST.30

SP. NO.	Total length	Sex	Maturity	SP. NO.	Total length	Sex	Maturity	SP. NO.	Total length	Sex	Maturity
30001	78.2	♀	3	35	57.6	?	1	69	51.4	♀	1
2	62.5	〃	1	36	59.1	♂	1	30070	47.9	〃	1
3	57.0	〃	1	37	56.0	〃	1	71	65.3	〃	1
4	80.0	〃	3	38	58.4	〃	1	72	43.1	?	1
5	80.9	〃	4	39	55.7	〃	1	73	34.7	〃	1
6	74.5	〃	4	30040	56.1	〃	1	74	40.4	〃	1
7	64.8	〃	1	41	60.1	〃	1	75	50.1	〃	1
8	64.2	〃	1	42	54.8	〃	1	76	52.2	〃	1
9	60.6	〃	1	43	64.1	〃	1	77	56.7	〃	1
30010	57.5	〃	1	44	53.5	〃	1	78	46.8	〃	1
11	79.6	♂	4	45	59.0	〃	1	79	43.7	〃	1
12	67.0	〃	1	46	56.5	〃	1	30080	42.7	〃	1
13	72.1	〃	3	47	59.2	〃	1	81	49.7	〃	1
14	68.1	〃	2	48	50.9	〃	1	82	43.0	〃	1
15	72.6	〃	3	49	57.3	〃	1	83	41.5	〃	1
16	58.6	♀	1	30050	51.5	〃	1	84	38.7	〃	1
17	72.0	♂	3	51	53.6	〃	1	85	37.0	〃	1
18	63.5	〃	1	52	48.2	〃	1	86	39.7	〃	1
19	72.6	〃	3	53	52.2	〃	1	87	34.0	〃	1
30020	63.2	♀	1	54	50.5	〃	1	88			
21	76.6	♂	3	55				89	36.4	〃	1
22	62.0	〃	1	56	51.4	〃	1	30090	38.0	〃	1
23	64.7	〃	2	57	51.0	〃	1	91	44.5	〃	1
24	73.5	〃	4	58	48.0	〃	1	92	48.7	〃	1
25	80.2	〃	4	59	52.3	♀	1	93	45.0	〃	1
26	68.9	〃	2	30060	48.2	〃	1	94	43.2	〃	1
27	76.3	♂	4	61	60.6	〃	1	95	43.8	〃	1
28	68.7	〃	1	62	54.1	〃	1	96	36.3	〃	1
29	73.4	〃	2	63	56.3	〃	1	97	74.7	♂	4
30030	78.1	〃	4	64	60.8	〃	1	98	62.9	♀	3
31	68.3	〃	2	65	50.4	〃	1	99	76.1	♂	3
32	68.5	〃	1	66	55.9	〃	1	30100	72.2	〃	3
33	72.1	〃	2	67	45.8	〃	1				
34	58.3	♀	1	68	54.1	〃	1				

BOUKE AMI
DECEMBER.4
ST.36

SP. NO.	Total length	Sex	Maturity	SP. NO.	Total length	Sex	Maturity	SP. NO.	Total length	Sex	Maturity
36001	64.5	♀	1	35	55.5	♀	1	69	73.2	♀	4
2	71.8	〃	2	36	54.7	〃	1	36070	67.6	〃	4
3	68.9	〃	1	37	55.0	〃	1	71	65.2	〃	3
4	64.5	〃	1	38	56.1	〃	1	72	72.6	〃	3
5	72.0	〃	2	39	56.3	〃	1	73	64.2	〃	2
6	55.3	〃	1	36040	58.1	〃	1	74	63.8	〃	4
7	69.7	〃	1	41	57.7	〃	1	75	73.8	〃	4
8	70.3	〃	1	42	72.7	〃	4	76	57.6	〃	1
9	56.8	〃	1	43	63.8	〃	4	77	58.0	〃	2
36010	56.5	〃	1	44	58.3	〃	1	78	64.5	〃	2
11	55.6	〃	1	45	80.3	〃	4	79	66.9	〃	3
12	53.6	〃	1	46	71.6	〃	1	36080	66.5	〃	2
13	55.1	〃	1	47	65.3	〃	1	81	70.3	〃	4
14	64.1	〃	1	48	66.5	〃	1	82	73.1	〃	4
15	66.4	〃	1	49	61.0	〃	2	83	66.7	〃	2
16	66.5	〃	3	36050	55.2	〃	1	84	55.4	〃	1
17	67.8	〃	2	51	77.7	♂	4	85	78.2	〃	4
18	63.8	〃	1	52	72.0	〃	3	86	74.1	〃	3
19	58.0	〃	1	53	53.6	〃	1	87	72.2	〃	3
36020	61.3	〃	1	54	61,9	〃	1	88	72.7	〃	4
21	77.6	〃	1	55	66.2	〃	3	89	71.8	〃	4
22	71.8	〃	2	56	63.7	〃	1	36090	75.0	〃	4
23	67.7	〃	1	57	62.3	〃	2	91	78.9	〃	4
24	80.1	〃	2	58	76.3	〃	4	92	76.2	〃	3
25	83.5	〃	3	59	71.3	〃	3	93	67.9	〃	3
26	74.5	〃	2	36060	77.7	〃	3	94	65.0	〃	3
27	67.7	〃	1	61	59.5	〃	1	95	56.4	〃	1
28	71.3	〃	1	62	59.5	〃	1	96	65.8	〃	2
29	61.4	〃	1	63	72.0	〃	4	97	55.5	?	1
36030	69.6	〃	2	64	65.9	〃	4	98	52.9	〃	1
31	92.5	〃	4	65	64.6	〃	2	99	49.0	〃	1
32	57.3	〃	1	66	57.1	〃	1	36100	49.8	〃	1
33	70.7	〃	1	67	78.0	〃	4				
34	55.0	〃	1	68	79.5	〃	4				

BOUKE AMI
DECEMBER.8
ST.39

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
39001	82.1	♀	3	35	70.6	♀	2	69	74.1	♂	4
2	84.6	〃	3	36	68.1	〃	3	39070	76.9	〃	4
3	85.0	〃	2	37	80.2	〃	3	71	72.3	〃	4
4	65.2	〃	2	38	72.6	〃	2	72	74.4	〃	4
5	84.2	〃	3	39	83.1	〃	3	73	77.3	〃	2
6	72.8	〃	2	39040	67.2	〃	2	74	69.9	〃	4
7	85.2	〃	3	41	81.0	〃	3	75	73.3	〃	4
8	76.5	〃	3	42	64.5	〃	3	76	65.0	〃	3
9	77.7	〃	2	43	80.1	♂	4	77	68.8	〃	2
39010	81.5	〃	3	44	74.7	〃	4	78	66.1	〃	2
11	86.2	〃	3	45	77.4	〃	4	79	68.4	〃	1
12	81.7	〃	3	46	81.5	〃	3	39080	51.6	〃	1
13	90.5	〃	3	47	66.8	〃	3	81	69.0	〃	3
14	82.0	〃	3	48	78.8	〃	4	82	63.4	〃	2
15	71.7	〃	3	49	80.3	〃	4	83	75.0	〃	4
16	69.1	〃	1	39050	76.2	〃	4	84	81.4	〃	4
17	85.2	〃	3	51	74.0	〃	4	85	76.4	〃	4
18	92.5	〃	3	52	79.7	〃	3	86	77.3	〃	4
19	94.8	〃	3	53	76.3	〃	4	87	73.1	〃	3
39020	72.1	〃	2	54	76.2	〃	4	88	68.0	〃	3
21	82.2	〃	3	55	83.0	〃	4	89	63.0	〃	3
22	73.6	〃	2	56	79.5	〃	4	39090	63.2	〃	2
23	84.9	〃	3	57	73.6	〃	2	91	84.5	♀	3
24	81.0	〃	3	58	84.8	〃	4	92	80.4	〃	3
25	96.0	〃	3	59	74.9	〃	4	93	74.5	〃	3
26	78.3	〃	3	39060	99.2	〃	4	94	72.5	〃	3
27	59.5	〃	2	61	67.0	〃	2	95	61.4	〃	1
28	57.1	〃	1	62	59.3	〃	1	96	61.3	〃	1
29	60.2	〃	1	63	86.7	〃	4	97	56.5	〃	1
39030	70.9	〃	2	64	78.7	〃	4	98	57.5	〃	1
31	84.5	〃	3	65	81.1	〃	4	99	55.5	?	1
32	76.3	〃	3	66	76.4	〃	2	39100	55.5	〃	1
33	72.0	〃	3	67	79.7	〃	4				
34	87.5	〃	3	68	73.5	〃	3				

BOUK ANI
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IWAYAMA

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
53001	61.5	♀	1	35	59.5	♀	1	69	79.5	♂	4
2	64.3	〃	1	36	64.4	〃	1	53070	59.9	〃	2
3	67.8	〃	1	37	61.1	〃	1	71	62.0	〃	1
4	58.0	〃	1	38	54.4	〃	1	72	73.7	〃	2
5	68.8	〃	2	39	75.7	〃	1	73	61.4	〃	1
6	72.6	〃	2	53040	67.1	〃	1	74	69.6	〃	2
7	61.8	〃	1	41	69.5	〃	3	75	75.7	〃	3
8	64.3	〃	1	42	69.1	〃	1	76	78.4	〃	4
9	64.3	〃	1	43	84.6	〃	3	77	71.5	〃	2
53010	62.5	〃	1	44	67.3	〃	1	78	72.9	〃	2
11	64.4	〃	1	45	65.4	〃	1	79	69.2	〃	2
12	74.2	〃	2	46	66.5	〃	1	53080	71.7	〃	3
13	62.6	〃	1	47	58.4	〃	1	81	63.5	〃	1
14	58.5	〃	1	48	74.2	〃	2	82	59.7	〃	1
15	72.7	〃	1	49	70.0	〃	1	83	65.3	〃	2
16	70.4	〃	3	53050	62.9	〃	1	84	78.8	〃	4
17	69.4	〃	1	51	63.5	〃	1	85	61.4	〃	1
18	60.5	〃	1	52	84.0	〃	3	86	64.0	〃	1
19	64.4	〃	1	53	72.2	〃	3	87	65.9	〃	1
53020	60.6	〃	1	54	59.4	〃	1	88	69.0	〃	1
21	59.7	〃	1	55	71.0	〃	2	89	84.8	〃	4
22	60.5	〃	1	56	64.9	〃	1	53090	64.6	〃	1
23	73.0	〃	1	57	61.5	〃	1	91	58.5	〃	1
24	62.0	〃	1	58	58.0	〃	1	92	72.8	〃	4
25	63.2	〃	1	59	86.7	〃	3	93	60.5	〃	1
26	65.5	〃	1	53060	62.6	〃	1	94	53.8	〃	1
27	58.0	〃	1	61	67.7	〃	1	95	61.3	〃	1
28	80.3	〃	3	62	55.2	〃	1	96	60.1	〃	1
29	60.0	〃	1	63	78.7	♂	3	97	55.1	?	1
53030	65.4	〃	1	64	62.4	〃	1	98	59.0	〃	1
31	59.4	〃	1	65	57.5	〃	1	99	57.6	〃	1
32	58.4	〃	1	66	79.0	〃	4	53100	43.8	〃	1
33	65.6	〃	1	67	70.5	〃	2				
34	74.9	〃	2	68	59.0	〃	1				

BOUKE AMI
DECEMBER.10
ST.65

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
65001	81.3	♀	2	35	67.4	♂	1	69	51.3	?	1
2	79.9	〃	1	36	69.9	〃	2	65070	52.3	〃	1
3	76.5	〃	1	37	65.0	〃	1	71	57.1	〃	1
4	76.1	〃	2	38	68.5	〃	1	72	58.9	〃	1
5	82.5	〃	3	39	66.8	〃	1	73	53.3	〃	1
6	74.2	〃	1	65040	65.5	〃	2	74	53.1	〃	1
7	70.5	〃	1	41	62.8	〃	1	75	54.1	〃	1
8	65.9	〃	1	42	68.8	〃	1	76	57.5	〃	1
9	70.4	〃	1	43	60.6	?	1	77	53.2	〃	1
65010	73.5	〃	1	44	58.4	〃	1	78	56.3	〃	1
11	74.4	〃	2	45	66.9	〃	1	79	47.1	〃	1
12	67.0	〃	1	46	60.0	〃	1	65080	53.6	〃	1
13	72.4	〃	1	47	48.9	〃	1	81	52.6	〃	1
14	65.6	〃	2	48	55.4	〃	1	82	55.5	〃	1
15	60.6	〃	1	49	62.0	〃	1	83	56.4	〃	1
16	64.8	〃	1	65050	66.0	〃	1	84	53.7	〃	1
17	65.5	〃	1	51	55.6	〃	1	85	51.0	〃	1
18	61.2	〃	1	52	54.9	〃	1	86	55.6	〃	1
19	62.1	〃	1	53	55.6	〃	1	87	53.7	〃	1
65020	67.9	〃	1	54	49.6	〃	1	88	55.3	〃	1
21	61.6	〃	1	55	55.1	〃	1	89	50.5	〃	1
22	61.8	〃	1	56	56.2	〃	1	65090	52.2	〃	1
23	60.6	〃	1	57	51.4	〃	1	91	58.9	〃	1
24	58.5	〃	1	58	49.8	〃	1	92	58.3	〃	1
25	62.8	〃	1	59	60.8	〃	1	93	52.1	〃	1
26	62.3	〃	1	65060	57.2	〃	1	94	57.2	〃	1
27	62.3	〃	1	61	56.8	〃	1	95	52.2	〃	1
28	59.1	〃	1	62	58.9	〃	1	96	52.2	〃	1
29	58.8	〃	1	63	54.1	〃	1	97	54.6	〃	1
65080	62.8	〃	1	64	50.8	〃	1	98	45.9	〃	1
31	59.4	〃	1	65	52.5	〃	1	99	56.1	〃	1
32	78.5	♂	3	66	60.0	〃	1	65100	50.1	〃	1
33	75.4	〃	3	67	55.4	〃	1				
34	73.6	〃	3	68	51.4	〃	1				

BOUKE AMI
JUN.7
IWAYAMA

Table 9 Data on Measurement of S. heterolobus

Iwayama Area

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
1001—S	76.1	♀		35	73.1	♂		69	60.0	♂	
2	77.8	〃		36	72.6	〃		1070—S	61.9	〃	
3	66.3	〃		37	61.9	〃		71	58.4	〃	
4	70.7	〃		38	64.4	〃		72	57.9	〃	
5	82.4	〃		39	64.9	〃		73	54.6	〃	
6	83.8	〃		1040—S	59.1	〃		74	71.7	〃	
7	78.0	〃		41	53.8	〃		75	65.6	〃	
8	75.7	〃		42	65.3	〃		76	64.1	〃	
9	69.7	〃		43	61.8	〃		77	71.8	♀	
1010—S	66.1	〃		44	55.6	〃		78	74.2	〃	
11	79.1	〃		45	68.4	〃		79	57.0	〃	
12	82.0	〃		46	58.8	〃		1080—S	56.7	〃	
13	80.3	〃		47	62.8	〃		81	84.9	〃	
14	73.8	〃		48	65.4	〃		82	82.9	〃	
15	62.6	〃		49	57.4	〃		83	66.2	〃	
16	69.6	〃		1050—S	59.6	〃		84	78.7	〃	
17	64.7	〃		51	69.5	〃		85	71.1	〃	
18	69.1	〃		52	55.7	〃		86	69.5	〃	
19	74.2	〃		53	67.3	〃		87	60.0	〃	
1020—S	54.5	〃		54	68.4	〃		88	65.1	〃	
21	76.8	〃		55	74.1	〃		89	72.5	〃	
22	60.9	〃		56	67.0	〃		1090—S	78.0	〃	
23	70.3	〃		57	71.5	〃		91	65.8	〃	
24	79.9	〃		58	77.9	〃		92	63.3	〃	
25	67.0	〃		59	75.5	〃		93	83.0	〃	
26	69.1	〃		1060—S	71.3	〃		94	68.4	〃	
27	61.4	♂		61	77.8	〃		95	47.2	〃	
28	66.7	〃		62	68.7	〃		96	56.7	〃	
29	73.5	〃		63	59.7	〃		97	60.6	〃	
1030—S	72.2	〃		64	66.8	〃		98	64.2	〃	
31	74.1	〃		65	60.3	〃		99	80.0	〃	
32	75.5	〃		66	66.1	〃		1100—S	68.4	〃	
33	66.7	〃		67	67.8	〃					
34	71.1	〃		68	62.7	〃					

BOUKE AMI
JUN.11
IWAYAMA

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
2001—S	71.3	♂	2	35	53.3	♂	1	69	67.2	♀	1
2	71.8	〃	1	36	57.8	〃	1	2070—S	56.1	〃	1
3	64.9	〃	1	37	53.9	〃	1	71	46.7	〃	1
4	77.0	〃	1	38	53.9	〃	1	72	50.0	〃	1
5	61.8	〃	1	39	53.3	〃	1	73	51.1	〃	1
6	72.8	〃	1	2040—S	50.5	〃	1	74	59.4	〃	1
7	66.2	〃	1	41	53.9	〃	1	75	53.9	〃	1
8	71.1	〃	2	42	56.1	〃	1	76	49.5	〃	1
9	61.0	〃	1	43	51.7	〃	1	77	51.1	〃	1
2010—S	74.0	〃	2	44	50.0	〃	1	78	51.1	〃	1
11	74.1	〃	1	45	48.3	〃	1	79	67.8	〃	1
12	67.0	〃	1	46	52.2	〃	1	2080—S	85.0	〃	1
13	70.0	〃	1	47	50.5	〃	1	81	52.8	〃	1
14	80.3	〃	2	48	47.2	〃	1	82	72.2	〃	1
15	77.1	〃	1	49	87.8	♀	2	83	52.1	〃	1
16	62.8	〃	1	2050—S	83.3	〃	2	84	68.4	〃	1
17	69.0	〃	1	51	76.7	〃	3	85	70.0	〃	1
18	61.4	〃	1	52	75.0	〃	1	86	56.7	〃	1
19	73.9	〃	1	53	72.2	〃	1	87	53.4	〃	1
2020—S	63.1	〃	2	54	60.0	〃	1	88	51.7	〃	1
21	72.6	〃	2	55	62.2	〃	1	89	76.1	〃	1
22	67.7	〃	1	56	68.4	〃	1	2090—S	55.0	〃	1
23	69.8	〃	1	57	54.9	〃	1	91	63.9	〃	1
24	78.1	〃	2	58	67.8	〃	1	92	51.1	〃	1
25	74.9	〃	1	59	61.1	〃	1	93	52.8	〃	1
26	58.6	〃		2060—S	60.6	〃	1	94	64.4	〃	1
27	61.3	〃		61	57.2	〃	1	95	62.2	〃	1
28	52.0	〃	1	62	56.1	〃	1	96	51.7	〃	1
29	46.0	〃	1	63	53.3	〃	1	97	51.7	〃	1
2030—S	65.0	〃	1	64	72.8	〃	1	98	50.0	〃	1
31	55.5	〃	1	65	57.8	〃	1	99	57.2	〃	1
32	62.0	〃	1	66	60.0	〃	1	2100—S	51.0	〃	1
33	54.4	〃	1	67	62.8	〃	1				
34	59.4	〃	1	68	73.9	〃	1				

BOUKE AMI
JUN.12
IWAYAMA

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
3001—S	73.4	♂	1	35	53.5	♂	1	69	71.7	♀	1
2	79.3	〃	1	36	60.0	〃	1	3070—S	72.8	〃	1
3	76.2	〃	2	37	55.6	〃	1	71	78.3	〃	1
4	70.0	〃	2	38	73.4	〃	1	72	67.8	〃	1
5	66.9	〃	1	39	65.0	〃	1	73	67.2	〃	1
6	60.0	〃	1	3040—S	60.0	〃	1	74	63.9	〃	1
7	83.3	〃	1	41	55.0	〃	1	75	64.5	〃	1
8	62.9	〃	1	42	55.0	〃	1	76	58.9	〃	1
9	73.5	〃	1	43	51.1	〃	1	77	68.9	〃	1
3010—S	71.5	〃	2	44	46.1	〃	1	78	58.9	〃	1
11	67.0	〃	1	45	46.1	〃	1	79	56.1	〃	1
12	79.5	〃	2	46	51.7	〃	1	3080—S	55.0	〃	1
13	70.0	〃	1	47	43.9	〃	1	81	63.9	〃	1
14	76.5	〃	1	48	79.5	♀	2	82	54.4	〃	1
15	59.0	〃	1	49	81.1	〃	2	83	50.0	〃	1
16	62.0	〃	1	3050—S	86.1	〃	2	84	63.9	〃	1
17	71.3	〃	1	51	76.6	〃	2	85	65.6	〃	1
18	78.0	〃	2	52	82.2	〃	2	86	61.7	〃	2
19	68.5	〃	1	53	75.0	〃	1	87	61.1	〃	1
3020—S	65.1	〃	1	54	77.8	〃	1	88	56.1	〃	1
21	73.0	〃	2	55	85.6	〃	2	89	55.0	〃	1
22	73.7	〃	1	56	69.5	〃	2	3090—S	55.0	〃	1
23	55.5	〃	1	57	75.0	〃	1	91	48.3	〃	1
24	71.1	〃	1	58	75.0	〃	2	92	64.5	〃	1
25	68.3	〃	1	59	61.1	〃	1	93	55.5	〃	1
26	68.1	〃	1	3060—S	67.8	〃	1	94	49.5	〃	1
27	73.0	〃	1	61	63.9	〃	1	95	43.9	〃	1
28	66.0	〃	1	62	70.6	〃	1	96	59.4	〃	1
29	57.9	〃	1	63	76.7	〃	1	97	51.7	〃	1
3030—S	71.3	〃	1	64	75.5	〃	1	98	53.9	〃	1
31	68.4	〃	1	65	73.4	〃	1	99	51.7	〃	1
32	49.6	〃	1	66	70.0	〃	1	3100—S	53.9	〃	1
33	51.4	〃	1	67	71.1	〃	1				
34	55.5	〃	1	68	67.2	〃	1				

BOUKE AMI
JUN.13
IWAYAMA

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
4001—S	76.0	♂	2	35	57.9	♂	1	69	57.2	♀	1
2	60.5	〃	1	36	78.3	♀	2	4070—S	62.8	〃	1
3	70.0	〃	1	37	67.3	〃	1	71	41.1	〃	1
4	82.6	〃	2	38	61.5	〃	1	72	55.0	〃	1
5	77.1	〃	2	39	52.8	〃	1	73	56.5	〃	1
6	72.4	〃	2	4040—S	66.0	〃	1	74	60.0	〃	1
7	74.5	〃	1	41	65.0	〃	1	75	47.2	〃	1
8	73.3	〃	1	42	64.0	〃	1	76	51.7	〃	1
9	82.7	〃	1	43	67.5	〃	1	77	71.7	♀	2
4010—S	75.6	〃	1	44	54.0	〃	1	78	58.3	〃	1
11	70.5	〃	2	45	58.7	〃	1	79	66.1	〃	2
12	64.8	〃	1	46	58.7	〃	1	4080—S	63.9	〃	1
13	67.7	〃	2	47	52.8	〃	1	81	57.2	〃	1
14	65.3	〃	1	48	62.1	〃	1	82	55.5	〃	1
15	65.0	〃	1	49	49.2	〃	1	83	48.3	〃	1
16	62.5	〃	1	4050—S	55.8	〃	1	84	52.3	〃	1
17	65.5	〃	2	51	54.1	〃	1	85	53.3	〃	1
18	64.9	〃	1	52	78.8	〃	2	86	50.0	〃	1
19	63.2	〃	1	53	55.8	〃	1	87	69.5	〃	1
4020—S	61.7	〃	1	54	52.2	〃	1	88	48.4	〃	1
21	52.6	〃	1	55	78.6	〃	1	89	48.4	〃	1
22	54.0	♀	1	56	56.5	〃	1	4090—S	50.5	〃	1
23	75.0	〃	1	57	63.2	♀	1	91	53.9	〃	1
24	75.8	〃	1	58	55.1	〃	1	92	50.0	〃	1
25	79.5	〃	2	59	68.0	〃	1	93	58.3	〃	1
26	69.5	〃	2	4060—S	49.0	〃	1	94	60.0	〃	1
27	68.8	〃	1	61	56.9	〃	1	95	57.3	〃	1
28	71.6	〃	1	62	51.0	〃	1	96	47.2	〃	1
29	80.4	〃	1	63	50.6	〃	1	97	47.2	〃	1
4030—S	56.8	♂	1	64	53.3	〃	1	98	47.8	〃	1
31	43.6	〃	1	65	57.8	〃	1	99	43.4	〃	1
32	50.5	〃	1	66	60.6	〃	1	4100—S	47.8	♂	1
33	65.1	〃	1	67	55.5	〃	1				
34	57.7	〃	1	68	57.8	〃	1				

BOUKE AMI
JUN. 26
IWAYAMA

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
5001—S	61.7	♂	1	35	56.6	♂	1	69	56.1	♀	1
2	61.1	〃	1	36	65.5	〃	1	5070—S	55.6	〃	1
3	58.3	〃	1	37	58.3	〃	2	71	56.7	〃	1
4	60.6	〃	1	38	53.4	〃	1	72	43.9	〃	1
5	60.0	〃	1	39	55.6	〃	1	73	62.8	〃	1
6	68.9	〃	2	5040—S	64.5	〃	2	74	61.7	〃	1
7	68.3	〃	1	41	62.8	〃	1	75	63.3	〃	1
8	63.3	〃	1	42	52.2	〃	1	76	52.8	〃	1
9	52.2	〃	1	43	57.2	〃	1	77	61.7	〃	1
5010—S	57.2	〃	1	44	54.9	〃	1	78	60.0	〃	1
11	61.1	〃	1	45	60.6	〃	1	79	57.2	〃	1
12	68.9	〃	2	46	53.3	〃	1	5080—S	71.1	〃	1
13	62.2	〃	2	47	54.4	〃	1	81	74.4	〃	1
14	61.1	〃	1	48	44.5	〃	1	82	57.8	〃	1
15	55.0	〃	1	49	57.2	〃	1	83	58.3	〃	1
16	58.3	〃	1	5050—S	57.2	〃	2	84	60.0	〃	1
17	53.3	〃	1	51	53.3	〃	1	85	60.0	〃	1
18	65.5	〃	2	52	57.2	〃	2	86	58.9	〃	1
19	53.3	〃	1	53	46.1	〃	1	87	53.9	〃	1
5020—S	62.8	〃	1	54	44.4	〃	1	88	54.4	〃	1
21	61.7	〃	2	55	82.2	♀	2	89	56.2	〃	1
22	54.5	〃	1	56	76.1	〃	2	5090—S	57.2	〃	1
23	59.5	〃	1	57	70.0	〃	2	91	55.0	〃	1
24	65.5	〃	1	58	62.2	〃	1	92	53.4	〃	1
25	58.9	〃	2	59	68.9	〃	1	93	53.4	〃	1
26	53.8	〃	2	5060—S	61.1	〃	1	94	48.9	〃	1
27	60.0	〃	1	61	58.4	〃	1	95	52.6	〃	1
28	53.4	〃	1	62	57.8	〃	2	96	54.5	〃	1
29	57.2	〃	1	63	58.5	〃	1	97	46.1	〃	1
5030—S	62.8	〃	2	64	58.1	〃	1	98	62.2	〃	1
31	60.0	〃	2	65	53.9	〃	1	99	77.7	〃	2
32	53.9	〃	1	66	55.0	〃	1	5100—S			
33	52.8	〃	1	67	50.0	〃	1				
34	61.1	〃	2	68	57.8	〃	1				

BOUKE AMI
AUG.6
IWAYAMA

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
6001—S	70.0	♂	2	35	70.0	♂	3	69	65.0	♀	1
2	76.7	〃	2	36	59.4	〃	1	6070—S	62.2	〃	1
3	76.1	〃	3	37	63.3	〃	1	71	66.6	〃	1
4	71.1	〃	2	38	53.3	〃	1	72	55.0	〃	1
5	72.2	〃	2	39	53.9	〃	1	73	73.3	〃	1
6	62.2	〃	1	6040—S	78.9	♀	2	74	71.1	〃	1
7	63.9	〃	1	41	72.2	〃	1	75	60.5	〃	1
8	66.6	〃	2	42	80.0	〃	1	76	61.6	〃	1
9	66.7	〃	2	43	80.0	〃	1	77	62.8	〃	1
6010—S	63.9	〃	1	44	78.9	〃	1	78	73.3	〃	1
11	71.7	〃	2	45	58.9	〃	1	79	56.6	〃	1
12	68.9	〃	2	46	67.2	〃	1	6080—S	54.9	〃	1
13	68.3	〃	2	47	70.0	〃	1	81	56.6	〃	1
14	65.5	〃	1	48	65.0	〃	1	82	56.7	〃	1
15	60.0	〃	1	49	58.4	〃	1	83	72.2	〃	1
16	74.5	〃	3	6050—S	61.1	〃	1	84	56.1	〃	1
17	72.2	〃	3	51	65.5	〃	1	85	73.9	〃	1
18	75.5	〃	2	52	47.8	〃	1	86	65.0	〃	1
19	60.6	〃	1	53	52.2	〃	1	87	72.2	〃	1
6020—S	63.8	〃	1	54	77.8	〃	3	88	79.4	〃	3
21	57.8	〃	1	55	75.0	〃	2	89	64.9	〃	1
22	72.2	〃	1	56	71.4	〃	1	6090—S	67.2	〃	1
23	64.5	〃	1	57	65.5	〃	1	91	53.9	〃	1
24	61.1	〃	1	58	67.2	〃	1	92	58.3	〃	1
25	55.6	〃	1	59	60.0	〃	1	93	60.0	〃	1
26	56.7	〃	1	6060—S	58.9	〃	1	94	63.3	〃	3
27	58.5	〃	1	61	59.4	〃	1	95	62.8	〃	1
28	63.3	〃	1	62	75.0	〃	1	96	51.6	〃	1
29	59.5	〃	1	63	72.8	〃	2	97	58.3	〃	1
6030—S	51.1	〃	1	64	77.8	〃	1	98	58.3	〃	1
31	50.0	〃	1	65	68.1	〃	1	99	52.2	〃	1
32	71.7	〃	2	66	75.0	〃	1	6100—S	75.5	〃	1
33	58.4	〃	1	67	74.9	〃	1				
34	68.3	〃	2	68	66.1	〃	1				

BOUKE AMI
AUG.7
IWAYAMA

SP. NO.	Total length	Sex	Maturity	SP. NO.	Total length	Sex	Maturity	SP. NO.	Total length	Sex	Maturity
7001—S	69.8	♂	2	35	70.6	♂	2	69	73.0	♀	1
2	67.8	〃	2	36	65.6	〃	1	7070—S	77.9	〃	3
3	64.5	〃	1	37	70.1	〃	2	71	72.1	〃	2
4	66.5	〃	1	38	66.9	〃	2	72	70.2	〃	1
5	66.7	〃	1	39	64.0	〃	1	73	73.2	〃	1
6	74.5	〃	2	7040—S	61.6	〃	1	74	75.2	〃	2
7	68.6	〃	1	41	61.7	〃	2	75	75.1	〃	2
8	76.6	〃	2	42	67.5	〃	2	76	81.4	〃	1
9	76.1	〃	2	43	67.1	〃	1	77	68.3	〃	3
7010—S	67.7	〃	1	44	61.6	〃	1	78	63.9	〃	1
11	73.7	〃	2	45	73.4	〃	2	79	72.8	〃	1
12	76.5	〃	2	46	68.2	〃	2	7080—S	69.5	〃	2
13	69.9	〃	2	47	63.7	〃	2	81	71.9	〃	1
14	70.0	〃	2	48	80.1	♀	2	82	72.6	〃	3
15	74.7	〃	3	49	83.0	〃	3	83	80.6	〃	2
16	72.6	〃	2	7050—S	75.9	〃	2	84	74.7	〃	2
17	67.2	〃	2	51	75.0	〃	2	85	80.8	〃	2
18	69.0	〃	1	52	76.1	〃	3	86	72.8	〃	2
19	70.4	〃	1	53	73.4	〃	1	87	64.7	〃	1
7020—S	57.0	〃	1	54	78.7	〃	1	88	75.5	〃	2
21	69.2	〃	1	55	77.7	〃	2	89	74.5	〃	3
22	66.3	〃	1	56	71.5	〃	1	7090—S	70.6	〃	2
23	69.5	〃	2	57	74.7	〃	1	91	79.6	〃	3
24	71.5	〃	1	58	45.0	〃	1	92	76.6	〃	2
25	67.3	〃	1	59	75.0	〃	3	93	73.8	〃	3
26	72.0	〃	3	7060—S	69.0	〃	1	94	69.9	〃	1
27	67.9	〃	2	61	79.8	〃	2	95	71.7	〃	1
28	62.5	〃	1	62	72.3	〃	2	96	66.2	〃	1
29	68.2	〃	1	63	70.6	〃	2	97	79.8	〃	3
7030—S	70.0	〃	2	64	73.2	〃	3	98	64.5	〃	1
31	61.5	〃	1	65	72.0	〃	1	99	72.3	〃	1
32	69.8	〃	2	66	72.9	〃	1	7100—S	74.9	〃	2
33	69.7	〃	2	67	72.3	〃	2				
34	65.1	〃	2	68	74.2	〃	1				

BOUKE AMI
SEPTEMBER.16
IWAYAMA

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
9001—S	71.3	♀	3								
2	71.0	♂	3								
3	77.0	♀	3								
4	69.4	〃	2								
5	68.7	〃	3								
6	75.8	〃	3								
7	68.3	〃	3								
8	74.8	〃	3								
9	77.7	〃	3								
9010—S	56.8	〃	1								
11	52.8	〃	1								
12	76.7	〃	2								
13	69.5	〃	3								
14	78.0	〃	3								
15	63.1	♂	3								
16	70.7	〃	4								
17	71.2	〃	3								
18	67.0	〃	2								
19	67.3	〃	1								
9020—S	76.2	♀	3								

BOUKE AMI
SEPTEMBER.17
IWAYAMA

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
10001—S	76.0	♀	3								
2	80.0	〃	3								
3	82.2	〃	3								
4	74.1	〃	4								
5	73.3	〃	4								
6	74.5	〃	4								
7	73.1	〃	3								
8	71.1	〃	2								
9	73.6	♂	3								
10010—S	69.4	♀	3								
11	78.3	〃	2								
12	73.4	♂	3								
13	59.3	〃	2								
14	59.0	〃	2								
15	66.4	〃	3								
16	68.5	〃	4								
17	55.7	♀	1								
18	60.6	〃	1								
19	73.6	♂	3								
10020—S	71.0	♀	3								

BOUKE AMI
SEPTEMBER.18
IWAYAMA

SP. NO.	Total length	Sex	Maturity	SP. NO.	Total length	Sex	Maturity	SP. NO.	Total length	Sex	Maturity
11001—S	67.6	♀	4								
2	79.1	〃	4								
3	72.2	〃	4								
4	70.2	〃	4								
5	74.1	〃	4								
6	71.6	〃	4								
7	72.0	〃	3								
8	65.7	〃	2								
9	76.8	〃	4								
11010—S	73.1	〃	3								
11	64.6	〃	2								
12	75.6	♂	2								
13	72.0	〃	4								
14	71.7	〃	3								
15	74.3	〃	4								
16	75.5	〃	4								
17	66.8	〃	3								
18	76.5	〃	4								
19	64.2	〃	3								
11020—S	52.0	〃	1								

BOUKE AMI
SEPTEMBER.19
IWAYAMA

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
12001—S	82.7	♀	3								
2	71.1	〃	3								
3	69.7	〃	2								
4	63.8	〃	3								
5	73.1	〃	3								
6	65.7	〃	4								
7	74.7	〃	4								
8	67.2	〃	3								
9	70.4	〃	2								
12010—S	65.2	〃	1								
11	67.2	〃	3								
12	60.8	♂	2								
13	70.1	〃	4								
14	69.3	〃	1								
15	67.1	〃	3								
16	67.2	〃	3								
17	55.2	〃	1								
18	71.4	〃	3								
19	64.9	〃	3								
12020—S	64.4	〃	3								

BOUKE AMI
SEPTEMBER.23
IWAYAMA

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
13001—S	75.2	♀	4								
2	80.6	〃	4								
3	75.6	〃	4								
4	68.7	〃	4								
5	69.9	〃	4								
6	85.1	〃	4								
7	76.6	〃	4								
8	68.5	〃	4								
9	71.1	〃	4								
13010—S	70.5	〃	4								
11	71.6	♂	4								
12	81.9	♀	4								
13	76.9	♂	3								
14	72.5	〃	4								
15	86.5	〃	4								
16	68.6	〃	3								
17	69.9	〃	4								
18	66.0	〃	3								
19	72.5	〃	3								
13020—S	70.9	〃	3								

BOUKE AMI
SEPTEMBER.24
IWAYAMA

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
14001—S	79.9	♀	3								
2	74.7	〃	3								
3	71.6	〃	2								
4	75.8	〃	4								
5	70.0	〃	3								
6	82.2	〃	4								
7	69.8	〃	3								
8	73.5	〃	4								
9	72.6	♂	3								
14010—S	76.4	〃	4								
11	71.2	〃	3								
12	58.6	〃	3								
13	66.5	〃	3								
14	68.5	〃	4								
15	72.4	〃	4								
16	71.1	〃	3								
17	69.8	〃	3								
18	75.8	〃	3								
19	67.8	〃	3								
14020—S	71.6	〃	4								

BOUKE AMI
OCTOBER.16
IWAYAMA

SP.NO.	Total length	Sex	Maturity	SP. NO.	Total length	Sex	Maturity	SP. NO.	全長	Sex	Maturity
15001—S	78.1	♀	2	35	29.5	?	1	69	36.7	?	1
2	68.7	♂	3	36	32.5	〃	1	15070—S	43.6	〃	1
3	72.2	♀	2	37	41.4	〃	1	71	35.0	〃	1
4	71.0	〃	2	38	42.7	〃	1	72	39.7	〃	1
5	67.6	〃	2	39	39.8	〃	1	73	32.5	〃	1
6	76.7	〃	2	15040—S	44.5	〃	1	74	32.1	〃	1
7	74.5	〃	3	41	39.5	〃	1	75	38.1	〃	1
8	75.7	〃	2	42	33.0	〃	1	76	34.2	〃	1
9	79.6	〃	3	43	37.7	〃	1	77	34.4	〃	1
15010—S	66.2	〃	1	44	44.3	〃	1	78	22.6	〃	1
11	75.9	〃	2	45	31.8	〃	1	79	23.5	〃	1
12	69.2	〃	1	46	35.0	〃	1	15080—S	39.0	〃	1
13	71.3	〃	2	47	32.9	〃	1	81	35.9	〃	1
14	66.1	〃	1	48	46.6	〃	1	82	42.9	〃	1
15	71.8	〃	2	49	32.6	〃	1	83	31.3	〃	1
16	72.7	〃	3	15050—S	36.3	〃	1	84	34.3	〃	1
17	68.0	♂	3	51	39.4	〃	1	85	35.1	〃	1
18	64.3	〃	1	52	30.3	〃	1	86	34.4	〃	1
19	61.8	〃	1	53	40.3	〃	1	87	27.4	〃	1
15020—S	59.0	〃	1	54	44.2	〃	1	88	44.8	〃	1
21	73.0	〃	4	55	39.8	〃	1	89	28.0	〃	1
22	68.8	〃	3	56	34.8	〃	1	15090—S	23.7	〃	1
23	67.6	〃	2	57	41.0	〃	1	91	37.5	〃	1
24	65.6	〃	1	58	33.0	〃	1	92	36.2	〃	1
25	59.0	〃	1	59	35.0	〃	1	93	28.5	〃	1
26	57.6	?	1	15060—S	37.3	〃	1	94	37.8	〃	1
27	43.2	〃	1	61	40.4	〃	1	95	31.0	〃	1
28	42.8	〃	1	62	41.7	〃	1	96	27.8	〃	1
29	31.4	〃	1	63	27.0	〃	1	97	37.1	〃	1
15030—S	37.0	〃	1	64	31.7	〃	1	98	38.1	〃	1
31	33.6	〃	1	65	35.6	〃	1	99	29.2	〃	1
32	35.3	〃	1	66	32.9	〃	1	15100—S	37.7	〃	1
33	32.4	〃	1	67	30.6	〃	1				
34	39.8	〃	1	68	42.8	〃	1				

BOUKE AMI
NOVEMBER.10
IWAYAMA

SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity	SP. NO.	Total length	Sex	Matu-rity
16001—S	76.3	♀	2	35	64.3	?	1				
2	73.2	〃	2	36	62.7	〃	1				
3	77.5	〃	1	37	65.4	〃	1				
4	75.8	♂	3	38	61.3	〃	1				
5	70.0	♀	1	39	61.0	〃	1				
6	74.5	〃	1	16040—S	62.9	♀	1				
7	67.3	〃	1	41	63.7	〃	1				
8	76.7	〃	2	42	59.2	?	1				
9	66.0	〃	1	43	60.4	♀	1				
16010—S	73.4	〃	1	44	53.1	?	1				
11	74.5	〃	1	45	62.4	〃	1				
12	72.5	♂	1	46	59.8	〃	1				
13	72.3	〃	1	47	54.1	〃	1				
14	71.9	〃	2	48	57.1	♀	1				
15	74.0	〃	1	49	57.5	?	1				
16	66.0	♀	1	16050—S	62.3	♀	1				
17	74.5	?	1								
18	62.1	〃	1								
19	68.3	〃	1								
16020—S	66.0	〃	1								
21	62.9	♀	1								
22	65.2	〃	1								
23	62.5	〃	1								
24	77.5	〃	2								
25	54.8	〃	1								
26	57.5	?	1								
27	60.3	〃	1								
28	57.5	〃	1								
29	59.5	〃	1								
16030—S	53.0	〃	1								
31	50.5	〃	1								
32	67.1	♀	1								
33	61.4	〃	1								
34	49.1	?	1