

## Results of feasibility experiment for tagging in the eastern Indian Ocean by Japan using No.2 Taikei-Maru

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### Abstract

Japanese feasibility study on the tag and release for tunas and skipjack was conducted from 13<sup>th</sup> Feb. to 19<sup>th</sup> Mar. in the eastern Indian Ocean using No.2 Taikei-Maru. Fishing gear used for catch fishes to be tagged were trolling, pole and line, jigging and hand-line. Milk fish (*Chanos chanos*) was used as live bait for pole and line and hand-line fishing.

A total of 51 fishes (26 skipjack, 10 yellowfin and 15 bigeye) and 555 fishes (546 skipjack, 1 yellowfin and 8 bigeye) were tagged and released in Leg 1 and Leg 2, respectively. Although it might be possible to catch and release 1500-3000 skipjacks in 1 month cruise (about 20 days of fishing days) using well trained pole and line fishing vessel which equipped a bird radar, the number of bigeye and yellowfin release would be 20-50 individuals if the fishing is made mainly on the free swimming school. If the FAD which has aggregated enough fish school is constantly available, it would be possible to release 100-200 individuals of bigeye and yellowfin with 500-1000 skipjacks in 1 month cruise using jigging and hand line with live bait.

### 1. Introduction

As Japanese contribution to the IOTTP (Indian Ocean Tuna Tagging Program), feasibility tagging research using No.2 Taikei-Maru was conducted by Japan from February to March, 2004 in the eastern Indian Ocean. The purpose of this research is to seek the possibility of successful tagging research by trying several fishing methods for the eastern Indian Ocean where little tagging have been made. In this paper, the results of the feasibility study are reviewed and possible tagging research in this Ocean is suggested.



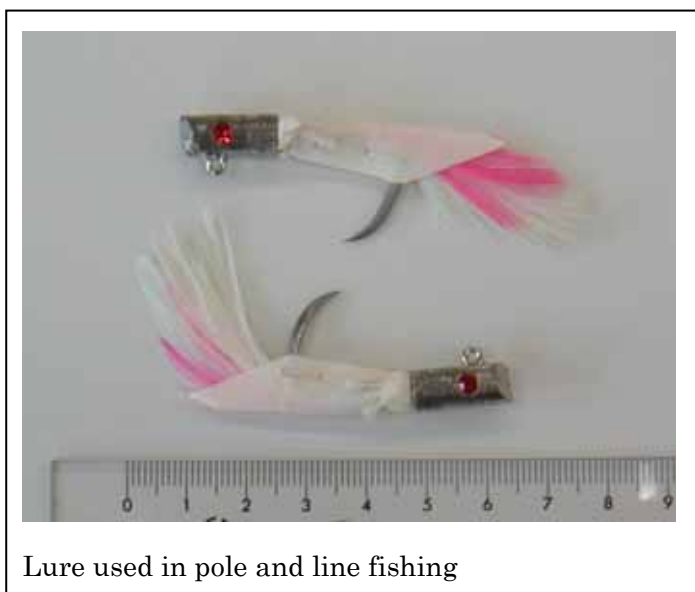
### 2. Outline of the research

This tagging research consisted of two legs, 1<sup>st</sup> leg (13<sup>th</sup> February – 1<sup>st</sup> March) and 2<sup>nd</sup> leg (3<sup>rd</sup> March – 19<sup>th</sup> March), both of which started and finished at Bena Port, Indonesia. Noon position and general meteorological information are listed in Table 1, and noon positions are shown in Fig.

1 with the track lines. In both legs, fishing including search for fish school and floating objects had been tried in daytime during cruise as far as No. 2 Taikei-Maru was out of the Indonesian and Australian EEZ. Fishing gears which were used to catch the fish to be tagged were Pole and line, Trolling, Jigging with metal jig lure and Hand line.



Metal jig gears used in jigging fishing



Lure used in pole and line fishing

Leg 1: After departed from Benoa Port in 13<sup>th</sup> Feb., No.2 Taikei-Maru sailed heading SW or SSW until she reached to 15°S, 105°E where she turned the course and sailed heading NW at narrow high sea area between Christmas Island and Cocos Islands. In 21<sup>st</sup> Feb., she arrived at one of the FADs released by Nippon-Marui, and fishing and tagging were conducted around the FAD until 24<sup>th</sup> Feb. After then, she sailed eastward and arrived at Benoa Port in 1<sup>st</sup> March. Actual fishing days were 11 days in this leg. In the course of the leg, four FADs constructed onboard were released at the position listed in Table 2.

Leg 2: Track of the 2<sup>nd</sup> Leg which started in 3<sup>rd</sup> Mar. was similar to that of 1<sup>st</sup> Leg because the possible research field was quite limited by the EEZ of Indonesia and Australia, and four FADs released in the former Leg had to be retrieved in this Leg. However, No.2 FAD was not retrieved as a result because it had been drifted far south. Fishing and tagging were made around 7°-10°S, and 95°-100°E using mainly pole and line and trolling gears. She entered into EEZ of Christmas Island in 14<sup>th</sup> Mar. when all research was ended, and arrived at Benoa Port in 19<sup>th</sup> Mar. Actual fishing days were 10 days in this leg.

### 3. Results of tag and release

#### 1) Live bait

At Benoa Port, live milkfish (*Chanos chanos*) were loaded in 11<sup>th</sup> Feb. and 2<sup>nd</sup> Mar. In the first loading for the Leg 1, about 100 thousand fishes, total length (TL) were about 5cm, were contained into two fish tanks (50 thousand per one tank) equipped under the front deck. The volume of the No.1 and No.2 tanks were 17.88 m<sup>3</sup> and 17.54 m<sup>3</sup>, respectively. About 80% of fishes contained in the tanks died during 12 hours after loading probably because of the rapid deteriorate of water quality caused by their excrement and dead body which had increased in the blind corner of ceiling of the tanks. In the second loading in 2<sup>nd</sup> Mar, 60 thousand small fishes (TL: 5cm) were contained into two tanks and additional five thousand of large fishes (TL: about 15cm) were also contained into No.1 tank. In this Leg, the water circulation method was improved, and few fish had died before the start of 2<sup>nd</sup> Leg.

## 2) Fishing and tagging

The number of fish school found and fished, fishing gear, and the number of fish tagged and released were summarized in Table 3. During the research on spawning area of southern bluefin tuna using No.2 Taikei-Maru which preceded this feasibility cruise, nine yellowfin tunas caught by longline operations were also tagged and released using the same IOTTP tag. The information for the tagging of these yellowfins was listed in the Table 4.

All information of tag and release (species, size, released date, time and position) has already been reported to IOTC.

**Leg 1:** Distribution of the number of released fish was shown by species in Fig. 2. Although 21 free swimming schools were found in this leg, most schools could not be attracted to the vessel using live bait to fish by pole and line. As a result, the number of fish released on free swimming schools was 26, 5 and 3 for skipjack, yellowfin and bigeye, respectively, most of which were caught by the trolling (Table 3). Quite few natural floating objects were found in the course of the leg. Even though fishing was tried on two natural floating objects, neither skipjack nor tunas were caught. After we arrived at the FAD released by Nippon-Maru, fishing and tagging were tried around the FAD at three dawns and three dusks from 21<sup>st</sup> May to 24<sup>th</sup> May, and four yellowfins and five bigeyes were released by trolling and seven bigeyes were released by jiggling.

**Leg 2:** Distribution of the number of released fish was shown by species in Fig. 3. In this Leg, all released fishes were caught by trolling and pole and line gear on free swimming school except 1 yellowfin caught by hand line gear with live bait on natural floating object. A total of 390 skipjacks and 6 bigeyes were released by pole and line gear, and 155 skipjacks and 2 bigeyes were released by trolling (Table 3). In the 36 free swimming schools, 17 schools could be attracted to vessel, and pole and gear was effective to catch fish on 7 schools of them, especially for skipjack. Although FAD of Nippon-Maru was originally planed to be used also in this Leg, the position of the available FAD was too far from vessel to use.

## 3) Size of released fishes

As the size distribution for each species was not different between Leg 1 and Leg 2, size data of both Legs were pooled and shown in Fig. 4. Fork length of skipjacks ranged from 41 to 70cm with the mode in 46-48cm, in which all fishes larger than 60cm were caught by trolling. The size of majority skipjack caught, 45-50cm, are supposed to be little younger than 1.5 years old estimating by the growth curve derived from otolith daily increments of skipjack sampled simultneously. Range of fork length was 48-81cm for bigeye (23 individuals) and 49-99 cm for yellowfin (11 individuals).

## 4. Feasibility of tag and release in the eastern Indian Ocean judging from the results

1) Milk fish was confirmed to be available and useful species as the live bait because of its stable supply, its extreme euryhalin (0–158 ‰) and toughness for high temperature (favourable temperature is from 20 to 33 °C) and for low dissolved oxygen. However, change in the water quality after loaded should be carefully checked.

2) In the eastern Indian Ocean, natural floating objects were very few to find and therefore can not be effective for tagging tuna.

3) It would be hard to expect on the newly released FAD to aggregate fishes in a few weeks.

4) The fish, especially skipjack, caught by trolling often suffer damage by strongly dragged on the sea surface until vessel speed went down. Therefore their survival rate after release might not be high.

5) In this feasibility research, fairly a large number of bird associated free swimming schools were found even by the vessel without school searching devices nor experienced searching crews, and the schools were likely to be attracted to the vessel by the live bait. It would be possible to release 1500-3000 skipjacks in 1 month cruise (about 20 days of fishing days) using well trained pole and line fishing vessel which equipped a bird radar etc. However, if the fishing is made mainly on the free swimming school in the high sea of the eastern Indian Ocean, the possible number of bigeye and yellowfin release would not be so many, probably 20-50 individuals.

6) If the FADs with enough fish school are constantly available, it would be possible to release 100-200 individuals of bigeye and yellowfin with 500-1000 skipjacks in 1 month cruise using jigging and hand line with live bait. The feasibility of pole and line gear around FAD for catching bigeye and yellowfin could not be tested enough in this study.

##### **5. Other information**

Nippon-maru (Research vessel of Fisheries Research Agency) is the only one Japanese purse sainer operating in the Indian Ocean at present. As one of its original research activity, Nippon-Maruru has conducted tagging on skipjack, yellowfin and bigeye tunas in this Ocean. The number of tagged fish in 2002 were 116, 162 and 222 individuals for skipjack, yellowfin and bigeye, respectively, through the 107 operations (125, 220 and 275 individuals in 2003). From the middle of 2004, Nippon-Maruru will start tagging using IOTC tag as a contribution to the IOTTP.

Table 1. Noon positions and general meteorological information. mbar?? hPa

Date	Latitude			Longitude			Co.	Weather	Wind	Pressure (mbar)	SST (°C)	Note
	Deg.	Min.	N/S	Deg.	Min.	E/W						
20040213	8	47.2	S	115	15.4	E		bc		1010.5	28.3	11:00 Departed from Benoa port. Start of Leg 1.
20040214	10	41.4	S	113	45.8	E	149	c	WSW 6	1008.0	28.9	
20040215	12	54.6	S	111	39.1	E	285	c	W 3	1007.9	28.5	
20040216	13	53.9	S	108	33.6	E	252	bc	SSW 3	1008.8	28.1	
20040217	14	40.5	S	104	38.5	E	315	b	SW 3	1008.0	29.5	Released FAD No.1 and No.2.
20040218	11	40.0	S	101	32.5	E	314	b	W 2	1008.0	28.7	
20040219	8	46.5	S	98	31.9	E	310	b	SW 1	1009.4	29.7	
20040220	6	27.5	S	95	9.1	E	306	b	WSW 2	1011.7	29.6	Released FAD No.3 and No.4.
20040221	4	50.8	S	92	50.5	E	Drifting	c	W 5	1012.0	29.0	
20040222	4	31.2	S	92	49.0	E	230	bc	SW 2	1012.0	29.1	
20040223	3	57.1	S	92	48.9	E	230	c	SW 4	1011.5	29.2	
20040224	3	42.6	S	93	5.4	E	108	bc	W 1	1012.0	29.9	
20040225	5	7.2	S	97	23.3	E	108	b	W 1	1013.0	30.1	
20040226	6	36.4	S	101	45.0	E	108	r	N 3	1011.0	29.5	
20040227	7	50.2	S	106	18.0	E	92	o	W 2	1011.5	29.2	
20040228	8	32.0	S	111	9.0	E	98	bc	SW 2	1011.0	29.4	
20040229	8	46.2	S	115	14.0	E		bc	W 2	1009.7	28.8	
20040301	8	44.8	S	115	12.6	E		bc	W 1	1010.0	29.7	08:52 Arrived at Benoa port. Finish of Leg 1.
20040303	8	51.4	S	115	14.7	E	238	c	N 2	1009.0	29.9	11:00 Departed from Benoa port. Start of Leg 2.
20040304	11	6.0	S	111	36.6	E	225	b	SW 2	1010.0	29.6	
20040305	13	25.5	S	108	0.1	E	240	b	SE 4	1011.5	28.6	
20040306	15	26.0	S	104	10.2	E	235	bc	SE 4	1011.4	28.8	Retrieve FAD No.1
20040307	12	52.5	S	101	42.1	E	325	c	SE 3	1011.1	28.8	
20040308	9	37.2	S	99	23.3	E	318	bc	SW 2	1011.5	29.5	
20040309	7	36.2	S	96	23.5	E	290	bc	NW 5	1011.0	29.5	
20040310	8	1.5	S	95	14.5	E	60	bc	NW 3	1010.6	29.6	Retrieve FAD No.3
20040311	7	2.8	S	97	50.1	E	138	bc	SSE 3	1011.0	29.9	Retrieve FAD No.4
20040312	8	0.9	S	98	45.8	E	138	o	WNW 3	1011.0	29.4	
20040313	8	33.3	S	99	38.8	E	143	c	NW 4	1010.6	29.2	
20040314	9	50.8	S	100	38.1	E	143	c	NNW 2	1011.5	29.2	
20040315	10	4.9	S	104	3.7	E	74	b	W 2	1012.0	29.1	
20040316	9	27.5	S	107	54.6	E	85	c	W 2	1011.0	29.5	
20040317	9	11.2	S	111	54.2	E	85	bc	NW 2	1010.4	29.5	
20040318	8	46.3	S	115	14.5	E		bc	NE 2	1009.3	29.2	
20040319												09:00 Arrived at Benoa port. Finish of Leg 2.

Table 2. Released and retrieved date and positions for four FADs of No.2 Taikei-Marui.

No.	Released				Retrieved				Distance (nautical mile)	Direction (degree)
	Date	Time (JST)	Latitude	Longitude	Date	Time (JST)	Latitude	Longitude		
FAD No.1	2004.02.17	8:57	15°00.0'S	105°00.0'E	2004.03.06	15:20	15°48.0'S	103°47.1'E	89.5	207
FAD No.2	2004.02.17	9:58	14°53.0'S	104°52.5'E						
FAD No.3	2004.02.20	12:00	06°27.5'S	095°09.1'E	2004.03.10	8:30	08°16.4'S	094°51.4'E	102.0	174
FAD No.4	2004.02.20	19:05	05°45.8'S	094°09.7'E	2004.03.11	8:40	06°44.8'S	097°25.1'E	213.7	106

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Table 3. Summary table of tag and release for each species and gear.

<i>1st Leg</i>								
School Type	No. school found	No. school with catch	Species	The number of individuals released (retained) by gear				
				P. L.	Troll	Jigging	Other	Total
Free	21	13	SKJ	1 (1)	25 (2)	0 (0)	0 (0)	26 (3)
			YFT	0 (0)	5 (0)	0 (0)	0 (0)	5 (0)
			BET	0 (0)	3 (0)	0 (0)	0 (0)	3 (0)
Floating object	2	0	SKJ	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
			YFT	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
			BET	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
FAD	1	1	SKJ	0 (0)	0 (0)	0 (1)	0 (0)	0 (1)
			YFT	0 (0)	4 (0)	1 (0)	0 (0)	5 (0)
			BET	0 (0)	5 (1)	7 (1)	0 (0)	12 (2)
Total			SKJ	1 (1)	25 (2)	0 (1)	0 (0)	26 (4)
			YFT	0 (0)	9 (0)	1 (0)	0 (0)	10 (0)
			BET	0 (0)	8 (1)	7 (1)	0 (0)	15 (2)

<i>2nd Leg</i>								
School Type	No. school found	No. school with catch	Species	The number of individuals released (retained) by gear				
				P. L.	Troll	Jigging	Other	Total
Free	36	17	SKJ	390 (121)	155 (12)	1 (2)	0 (0)	546 (135)
			YFT	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
			BET	6 (0)	2 (0)	0 (0)	0 (0)	8 (0)
Floating object	1	1	SKJ	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
			YFT	0 (0)	0 (0)	0 (0)	1 (0)	1 (0)
			BET	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
FAD	3	0	SKJ	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
			YFT	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
			BET	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total			SKJ	390 (121)	155 (12)	1 (2)	0 (0)	546 (135)
			YFT	0 (0)	0 (0)	0 (0)	1 (0)	1 (0)
			BET	6 (0)	2 (0)	0 (0)	0 (0)	8 (0)

Table 4. Information of yellowfin tuna caught by longline operation and released in the research on reproduction of southern bluefin tuna which was conducted just before this feasibility study.

Date	Time (JST)	Latitude	Longitude	SST(°C)	Gear	Species	F.L. (cm)
2004.01.02	21:15	16°12.0'S	111°15.0'E	27.2	LL	YFT	80.0
2004.01.03	19:02	16°18.1'S	111°05.1'E	27.2	LL	YFT	80.0
2004.01.04	19:07	15°45.1'S	111°34.6'E	26.6	LL	YFT	95.0
2004.01.05	20:46	15°18.0'S	111°12.1'E	26.3	LL	YFT	82.0
2004.01.23	18:39	18°14.4'S	115°12.5'E	29.3	LL	YFT	60.0
2004.01.23	18:39	18°14.4'S	115°12.5'E	29.3	LL	YFT	54.0
2004.01.23	18:40	18°14.4'S	115°12.5'E	29.3	LL	YFT	50.0
2004.01.23	19:44	18°19.3'S	115°10.9'E	29.4	LL	YFT	81.0
2004.01.29	19:28	16°33.3'S	116°28.4'E	30.4	LL	YFT	108.0

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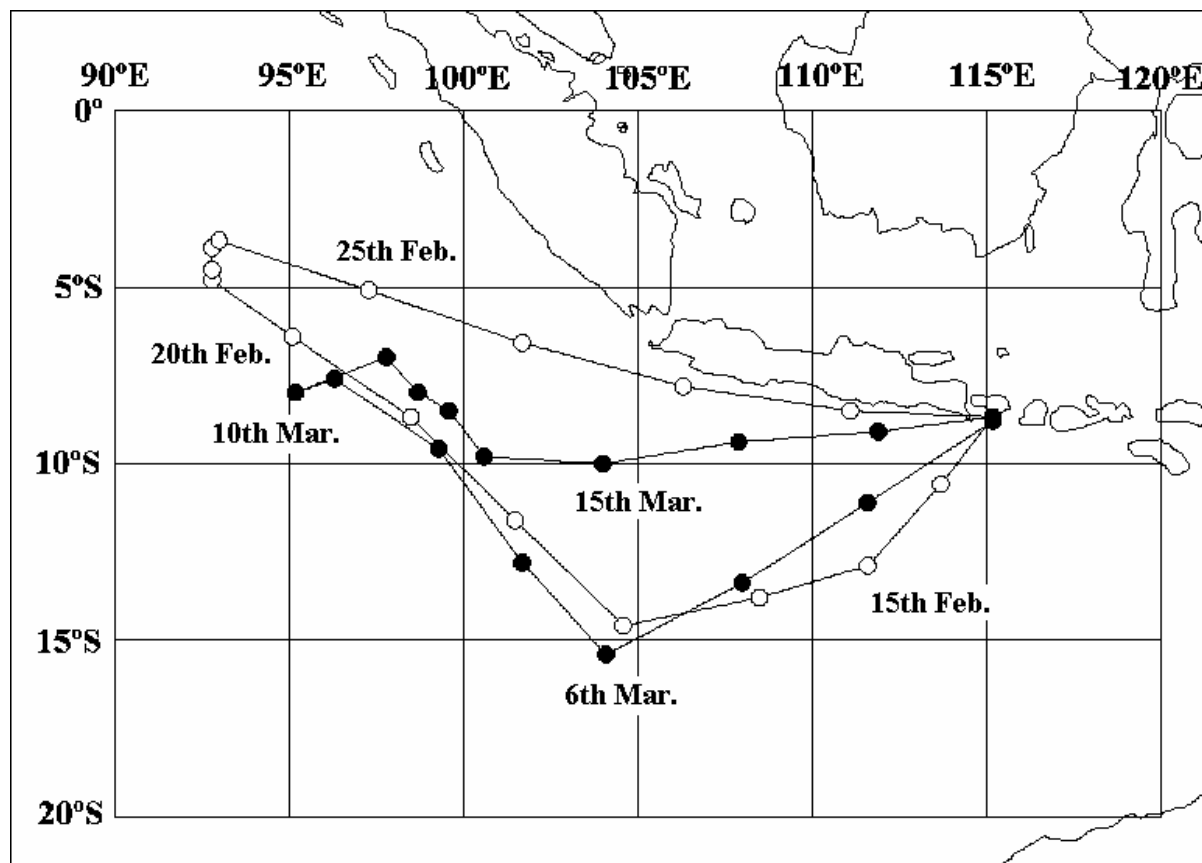


Fig. 1. Noon (12:00 in Japanese standard time) position of each Leg, Leg1 (open circles) and Leg 2 (dots).

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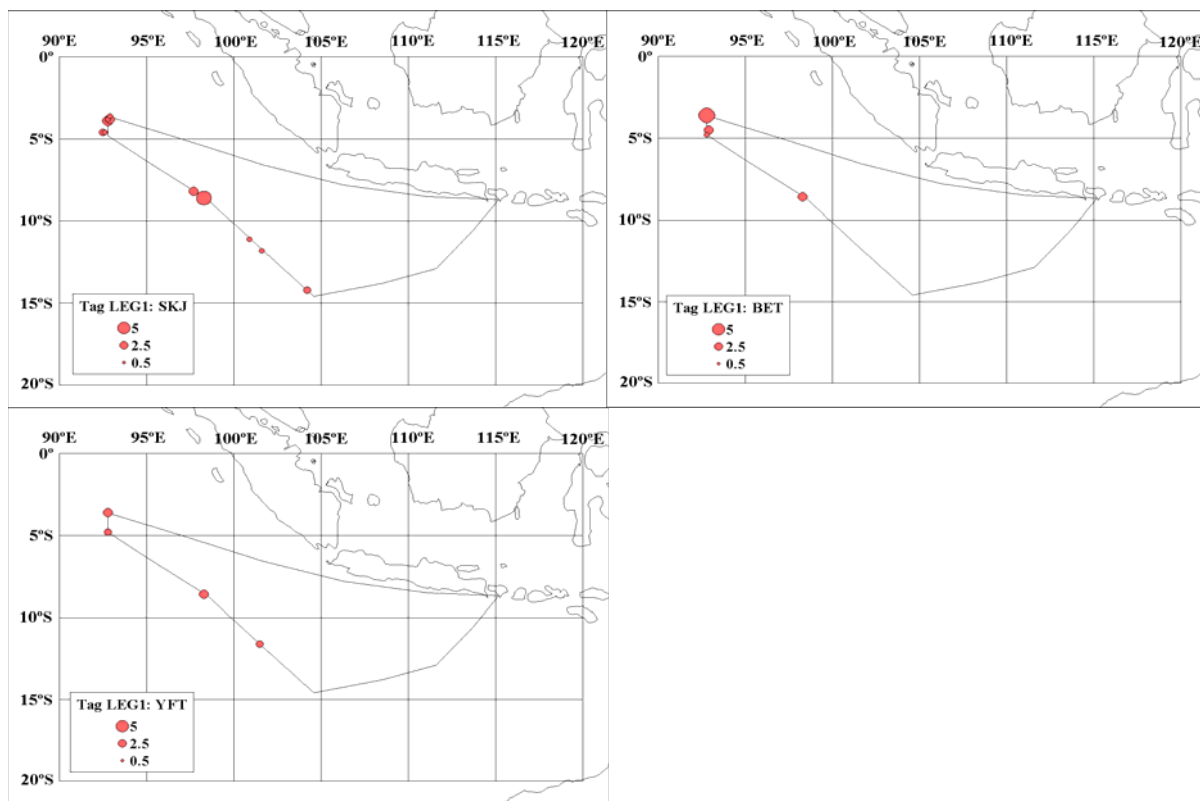


Fig. 2. Distribution of the number of released fish for each species in Leg 1.

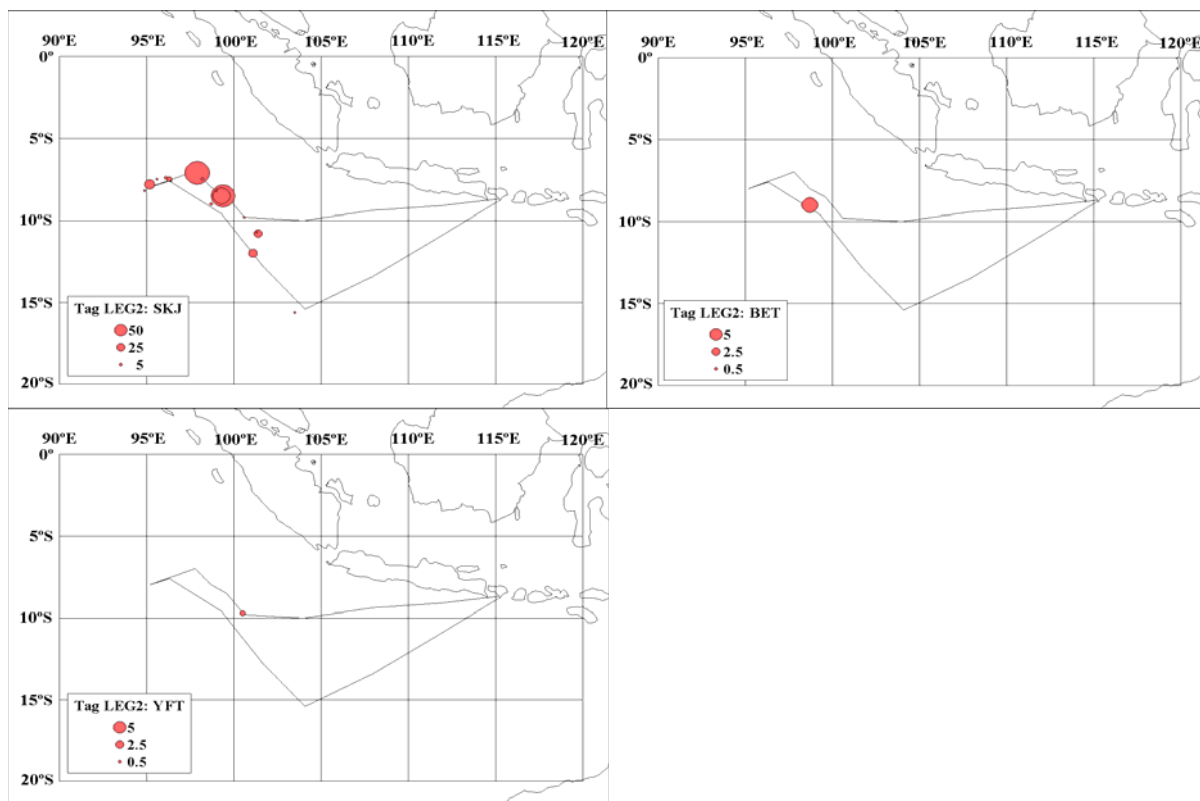


Fig. 3. Distribution of the number of released fish for each species in Leg 2.



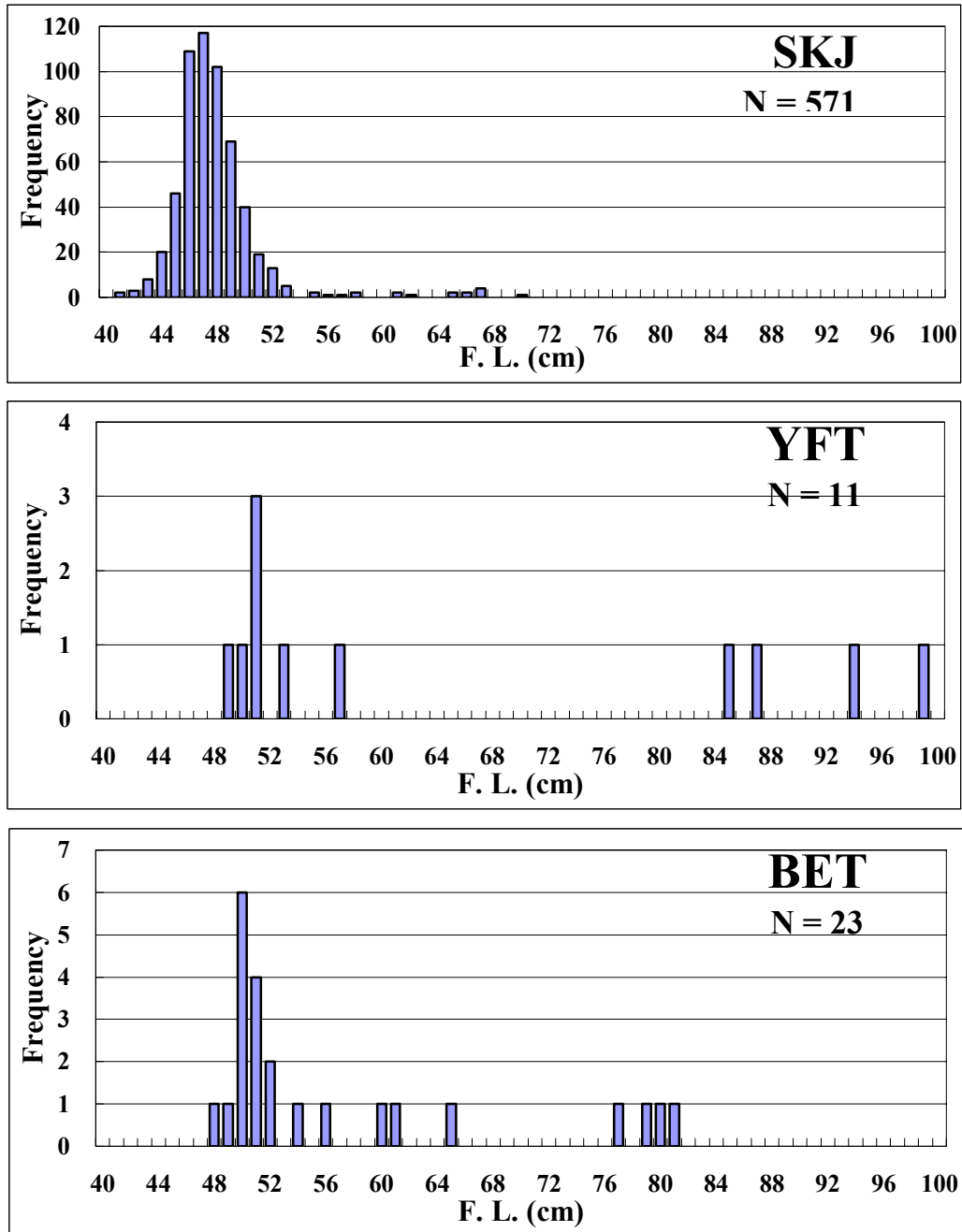


Fig. 4. Size distribution of skipjack (SKJ), yellowfin (YFT) and bigeye (BET) released in this feasibility research cruise.