Catch of Experimental Longline, Purse Seine and Handline in the South China Sea, Area III: Western Philippines

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ABSTRACT

This paper presents the tuna longline fishing operation conducted in western Philippine waters as well as the port sampling conducted in Zambales.

The longline fishing operation was not successful in catching tuna but caught the deep swimming species such as sharks, lancet fish and opah. The undefined and shallow thermocline might have contributed to the unsuccessful fishing operations. Another reason might be the spatial distribution of tunas brought about by the El Niño event, which causes the spreading of the warm water mass from the western Pacific Ocean to the eastern Pacific Ocean allowing the yellowfin tunas to have a wider space to move.

Yellowfin tuna stock in the western Philippine waters belongs to the juvenile and sub-adult population while the skipjack tunas belong to the adult population as most of the catch observed during port sampling were mature. The juvenile and sub-adult stages of yellowfin tunas were not the proper size for the longline fishery, which may explain in part why no tuna was caught during the research cruise. These sizes are available principally to the purse seine fishery as observed in the port sampling survey.

Keywords: tuna resources, western Philippine waters

Introduction

The South China Sea is one of the major fishing grounds for tunas in the Philippines. However, major fishing activities are limited to the first half of each year because of the change of weather during the rest of the year. A fishing fleet is composed of one mother boat or the purse seine boat, one light boat, one skiff boat and two carrier boats that alternately transport the catch from the mother boat to the landing center. Normally the large fishing companies deploy their mother boat in the South China Sea from the first five to six months and have to move their payaos or Fish Aggregating Device (FAD) to other fishing grounds of the country when the sea becomes rough. Fishing boat operators who are based in the provinces facing South China Sea can do limited fishing during the second half of the year on a daily basis. Their payaos are located close to shore and the mother boat can fish during calm weather at least once a day. Handline fishing boat also fish when the weather permits them to operate in the South China Sea, also on a daily fishing operation.

The tunas are caught the whole year round in western Philippine waters. However, the magnitude of catches depend on the competence of the fishermen to fish during the second half of the year brought about by the rough sea condition. Tunas particularly yellowfin, bigeye and skipjack are the main catch and the targeted species of the fishing companies operating in South China Sea. Roundscad is the major by-catch, while rainbow runner, dolphinfish, trigger fish are

also caught by purse seine in deeper waters while other small pelagics are caught in shallower waters, like, big-eyed scads and mackerels. Large companies normally catch tunas for the canning factories while the catch of the smaller fishing boat operators go to the local market and are sold fresh or chilled.

The major fishing gears used in South China Sea are purse seine and handline. Almost all fishing operations by the purse seines are done using payaos. Handline fishing are also done within the vicinity of payaos. Payaos are an important accessory in tuna fishing in the country. It is widely used not only for tuna fishing but also for fishing small pelagics. Fish schools are first aggregated around payao by using a light boat that starts lighting a payao after sunset until fishing operation starts which is normally done early in the morning at around four o'clock.

This report cover fishing operations using a longline gear conducted on board MV SEAFDEC along the western Philippine waters as well as activities conducted during port sampling in Masinloc, Zambales. Port sampling data was used in this report due to the absence of data from the SEAFDEC Cooperative Research Cruise III for the proposed study on the biology of tuna in South China Sea.

Materials and Methods

Experimental longline fishing

A total of ten (10) longline fishing operations were conducted by the MV SEAFDEC (Figure 1). The ten fishing operations were conducted in pre-selected oceanographic stations. Data on fishing operations were recorded using a prepared fishing log form (appendix 1). The longline fishing operations is discussed in a separate paper included in the report of the SEAFDEC Collaborative Research Cruise III (Dickson et. al., this vol.).

Port Sampling

Data on port sampling conducted in Masinloc, Zambales during the months of April and May 1998 was used in this report. The data were collected in two landing sites in Masinloc, Zambales (Fig. 1). These data were utilized to supplement the results of the longline fishing made during the SEAFDEC Collaborative Research Cruise III.

A total of ten sampling days per month were made for the two-month period for both purse seine and handline fishing vessels. Data collected included the following: total landed catch by fishing boat/gear, number of fishing boat unloading that day, length and weight measurements of fish.

Results and Discussion

The ten longline experimental fishing operations did not yield any catch of tuna. However, other fish species were caught such as lancet fish which dominated the catch, sharks and opah. A total of 36 pieces of lancet fish were caught. In addition two unidentified sharks, one tiger shark, one short fin mako shark, two small tooth thresher shark and one opah were caught (Table 1). Only one of the ten fishing operations did not yield any catch.

Large adult tunas are known to swim just above the thermocline. However, during the research cruise, the thermocline depths were not clearly defined and observed to be shallow ranging from about 25 m to 60 m. In the Philippines the thermocline is at depths between the surface and 100 m with a mean temperature decrease of only 0.03ºC/m (Selga, 1931b, CSK 1974, 1980). Wyrtki (1961) showed that there was evidence of a thermocline between 100 and

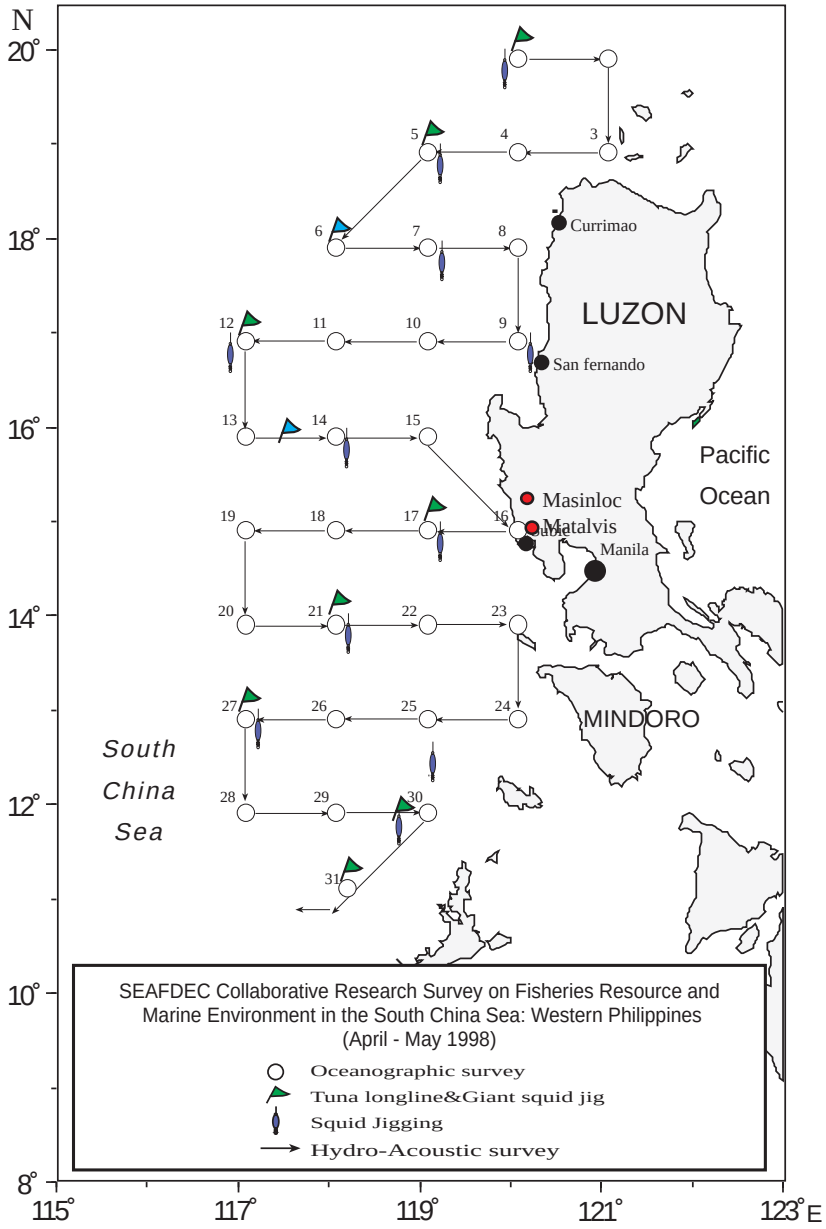

Fig. 1. The ten tuna longline fishing stations off Western Philippines.

300 m where the temperature declines swiftly to 12-15ºC. Magnusson (1970) also reported the thermocline in Sulu Sea and Northern Palawan to be between 100 and 150 m. The report also showed that the thermocline can change in depth and thickness rapidly over a short period of time and that this would have an important effect for pelagic fishes. The effect of El Niño might have contributed to the shallow thermocline level as in the western Pacific where the thermocline become shallower during El Niño events (TOGA).

Relative to the longline fishing done, setting might not have been properly payed out at the sustained level of thermocline, which may be one of the reasons why there was no tuna caught. Due to the spreading of the warm water mass from the western Pacific to the eastern Pacific waters during El Niño events, the tunas may have moved out of the South China Sea and are spatially dispersed. Instead deep swimming marine species were caught as shown in table 1.

The result of the port sampling is presented in tables 2 to 10. Skipjack was the dominant catch of purse seine contributing 39% of the total catch in April followed by yellowfin tuna

(37%) and frigate tuna (15%). The rest of the catch was contributed by the other fish species. In May, roundscad pre-dominated the catch of purse seine contributing 30% followed by yellowfin tuna (25%), skipjack tuna (19%) and frigate tuna (13%). Other species included in the total catch are shown in table 2.

Yellowfin tuna was the major catch of handline in April and May contributing 91% and 93% respectively. Bigeye tuna was recorded second in April with a total landed catch of 344 kg while skipjack tuna was the second dominant catch of handline in May recorded at 140 kg (Table 3).

Handline catch of yellowfin was mostly between the 22 to 46 cm size class with a few large yellowfin between 114-140 cm recorded during the 2-month survey. In the case of purse seine, the smallest and biggest yellowfin tuna caught was 10 cm and 65 cm both observed in May. Majority of the purse seine catch were from 24 to 28 cm and relatively larger size observed were between 40 to 50 cm. The number and size of yellowfin observed in April and May during the port sampling may also indicate that large yellowfin tuna which is the target of longline fishing operation might not be in the vicinity of South China Sea and may be in other bodies of water. Simpson, *et. al*. (1976) reported that the tunas from the Moro Gulf moved to Sulu Sea as

Table 1. Species and number of catch during the tuna longline fishing operation in western Philippine waters. See also Fig. 1.

Date	Fishing Station No.	Species	Number	Remarks
April 18, 1998	*1*	*Lancet Fish (Alepisaurus ferox)*	*4*	
April 20, 1998	*2*	*Lancet Fish (Alepisaurus ferox)* *Shark (unidentified)*	*5* *1*	
April 21, 1998	*3*	*Lancet Fish (Alepisaurus ferox)* *Shark (unidentified)*	*1* *1*	
April 26, 1998	*4*	*Lancet Fish (Alepisaurus ferox)*	*3*	
April 27, 1998	*5*	*Lancet Fish (Alepisaurus ferox)*	*1*	
April 29, 1998	*6*	*Lancet Fish (Alepisaurus ferox)* *Tiger shark (Galeocerdo cuvier)*	*5* *1*	
May 1, 1998	*7*	*Lancet Fish (Alepisaurus ferox)*	*5*	
May 6, 1998	*8*	-	-	*No catch*
May 8, 1998	*9*	*Lancet Fish (Alepisaurus ferox)*	*6*	
May 9, 1998	*10*	*Lancet Fish (Alepisaurus ferox)* *Short fin mako shark (Isurus oxyrinchus)* *Small tooth thresher shark (Alopias pelagicus)* *Opah (Lampris gutatus)*	*6* *1* *2* *1*	

Table 2. Species composition of purse seine catch (in kg) landed in April and May 1998 at Masinloc and Matalvis, Zambales.

Species	April (kg)	May (kg)
Yellowfin tuna (Thunnus albacares)	41,837	54,896
Bigeye tuna (Thunnus obesus)	2,597	6,135
Skipjack tuna (Katsuwonus pelamis)	44,185	41,605
Frigate tuna (Auxis thazard)	16,878	27,972
Bullet tuna (Auxis rochei)	2,516	-
Roundscad (Decapterus spp.)	3,288	66,893
Rainbowrunner (Elagatis bipinnulatus)	-	17,824
Trigger fish (Balistidae)	1,830	2,863
Dolphinfish (Coryphaena hippurus)	-	3,374

Table 3. Species composition of handline catch (in kg) landed in April and May 1998 at Masinloc and Matalvis, Zambales.

Species	April (kg)	May (kg)
Yellowfin tuna (Thunnus albacares)	6,156	5,014
Bigeye tuna (Thunnus obesus)	344	94
Skipjack tuna (Katsuwonus pelamis)	34	140
Eastern little tuna (Euthynnus affinis)	4	-
Rainbow runner (Elagatis bipinnulatus)	48	-
Blue marlin (Makaira mazara)	75	104
Dolphinfish (Coryphaena hippurus)	76	53
Big-eyed scad (Selar crumenophthalmus)	10	-

tunas in Sulu Sea are a year older than the tunas in Moro Gulf. They also reported that Moro Gulf and Sulu Sea are probably nursery areas for both skipjack and yellowfin tunas as most of the these tunas are 1, 2 and 3 years old. Some tunas from Sulu Sea probably move further to South China Sea and eventually move out of South China Sea to Northern Philippine Waters then to the Pacific Ocean. This port sampling observation will also tell us that probably the yellowfin tuna stock during April and May in the western Philippine waters belongs to the juvenile and sub-adult population. This may be the main reason why no large tunas were caught during the longline fishing operation during SEAFDEC cruise III.

Table 4. Length frequency data of yellowfin tuna caught by handline off western Philippines waters.

Length Class	Number	
(cm)	April	May
20	3	-
21	-	-
22	-	-
23	1	1
24	2	6
25	15	12
26	-	-
27	-	-
28	13	12
29	-	-
30	13	10
31	-	-
32	-	-
33	-	-
34	3	-
35	10	5
36	1	-
37	2	-
38	11	1
39	-	-
40	2	20
41	-	-
42	5	-
43	4	5
44	-	-
45	25	8
46	2	2
47	15	3
48	21	3
49	-	-
50	-	-
=	=	=
95	-	-
96	-	-
97	1	-
98	-	-
99	-	-
100	-	-
101	-	-
102	-	-
103	-	-
104	-	-
105	-	1
106	-	-
107	-	-

Length Class	Number	
(cm)	April	May
108	-	1
109	-	-
110	-	-
111	-	-
112	-	-
113	2	-
114	-	-
115	1	1
116	3	1
117	-	4
118	1	3
119	-	1
120	-	-
121	-	-
122	2	-
123	-	-
124	-	-
125	3	1
126	2	-
127	-	-
128	1	2
129	-	-
130	1	3
131	-	-
132	-	-
133	-	1
134	3	-
135	2	-
136	1	1
137	3	-
138	2	1
139	-	-
140	-	1
141	-	-
142	1	-
143	-	-
144	1	-
145	-	-
146	-	-
147	-	-
148	-	-
149	-	-
150	1	-
Total	179	110

Table 5. Length frequency data of yellowfin tuna caught by purse seine off western Philippines waters

Length Class (cm)	Number	
	April	May
10	2	3
11	-	-
12	-	-
13	-	-
14	-	-
15	-	12
16	-	1
17	-	-
18	-	1
19	-	-
20	-	15
21	-	-
22	-	2
23	-	-
24	30	2
25	80	13
26	5	3
27	5	3
28	96	-
29	1	-
30	11	12
31	-	-
32	-	1
33	-	-
34	-	3
35	6	13
36	-	13
37	-	4
38	1	3
39	-	9
40	5	22
41	-	1
42	3	22
43	13	20
44	1	15
45	33	35
46	11	20
47	33	19
48	23	19
49	1	22
50	-	27
51	-	-
52	-	8
53	-	2
54	-	7
55	-	4
56	-	5
57	-	-
58	-	-
59	-	-
60	-	10
61	-	-
62	-	6
63	-	2
64	-	3
65	-	1
Total	**360**	**383**

Table 6. Length frequency data of bigeye tuna caught by handline off western Philippines waters.

Length Class (cm)	Number	
	April	May
25	April	-
26	3	-
27	-	-
28	-	-
29	2	-
30	-	-
31	1	-
32	-	-
33	-	-
34	-	-
35	1	-
36	1	-
37	-	-
38	-	-
39	2	-
40	-	5
41	-	-
42	-	-
43	-	2
44	-	-
45	-	3
46	4	2
47	-	-
48	-	1
=	2	-
90	-	-
91	1	-
92	-	-
93	-	-
94	1	1
95	-	-
96	3	1
97	-	-
98	1	-
99	-	-
100	-	-
101	-	-
102	-	-
103	-	-
104	-	-
105	-	-
106	-	-
107	-	-
108	-	1
109	-	-
110	-	-
111	-	-
112	-	-
113	-	1
114	-	-
115	-	-
=	1	
137	1	-
Total	**24**	**16**

Table 7. Length frequency data of bigeye tuna caught by purse seine off western Philippines waters.

Length Class (cm)	Number	
	April	May
15	1	-
16	-	-
17	-	-
18	-	-
19	-	-
20	-	-
21	-	-
22	-	-
23	-	-
24	3	-
25	9	-
26	2	-
27	3	-
28	15	-
29	-	-
30	2	-
31	-	-
32	-	-
33	1	-
34	-	-
35	-	-
36	-	-
37	-	-
38	-	-
39	-	1
40	1	3
41	-	-
42	1	3
43	-	1
44	4	-
45	-	12
46	-	2
47	2	-
48	1	3
49	-	-
50	-	2
51	-	-
52	-	1
53	-	-
54	-	-
55	-	-
56	-	1
57	-	-
58	-	-
59	-	-
60	-	1
Total	**45**	**30**

Table 8. Length frequency data of skipjack tuna caught by handline off western Philippines waters.

Length Class (cm)	Number	
	April	May
20	1	-
21	-	-
22	-	-
23	-	1
24	-	1
25	-	2
26	-	-
27	-	-
28	1	10
29	-	-
30	4	2
31	-	-
32	-	-
33	-	-
34	-	-
35	1	-
36	-	-
37	-	-
38	-	-
39	-	-
40	1	1
41	-	-
42	1	-
43	-	4
44	-	-
45	6	-
46	2	1
47	3	-
48	4	2
Total	**24**	**24**

Table 9. Length frequency data of skipajck tuna caught by purse seine off western Philippines waters.

Length Class (cm)	Number	
	April	May
15	2	-
16	-	-
17	-	-
18	1	-
19	-	-
20	6	-
21	-	6
22	-	-
23	2	-
24	7	-
25	53	-
26	1	3
27	2	2
28	43	1
29	-	2
30	18	-
31	-	4
32	-	1
33	1	-
34	1	-
35	10	2
36	1	12
37	-	9
38	2	1
39	-	4
40	11	5
41	-	17
42	8	-
43	5	13
44	-	12
45	18	9
46	3	18
47	-	15
48	7	19
49	-	11
50	-	24
51	-	16
52	-	-
53	-	8
54	-	1
55	-	3
56	-	4
57	-	2
58	-	2
59	-	1
60	-	5
61	-	14
62	-	-
63	-	1
64	-	1
65	-	1
66	-	2
Total	202	251

Table 10. Length frequency data of frigate tuna caught by purse seine off western Philippines waters.

Length Class (cm)	Number	
	April	May
20	2	-
21	-	-
22	-	-
23	1	-
24	4	-
25	23	-
26	4	-
27	-	-
28	7	-
29	-	-
30	18	-
31	-	-
32	-	-
33	1	-
34	5	-
35	19	-
36	3	-
37	-	-
38	19	-
39	2	7
40	6	12
41	-	-
42	3	7
43	1	1
44	-	-
45	1	-
46	1	-
Total	120	27

Table 11. Length frequency data of bullet tuna caught by purse seine off western Philippines waters.

Length Class (cm)	Number	
	April	May
20	1	-
21	-	-
22	-	-
23	-	-
24	2	-
25	11	-
26	-	-
27	-	-
28	3	-
29	-	-
30	2	-
31	-	-
32	-	-
33	-	-
34	-	-
35	1	-
36	-	-
37	1	-
38	1	-
39	-	-
40	1	-
41	4	-
42	-	-
43	-	-
44	-	-
45	-	-
46	-	-
47	-	-
48	-	-
49	-	-
50	-	-
Total	27	-

Handline caught two-size groups of bigeye tunas, one between 22 cm to 48 cm and the larger group between 90 cm to 115 cm. The same was true for bigeye tuna catches observed landed by purse seine during the port sampling activities which also showed two modes with the first mode between 24 to 30-cm size class and another mode between 40 to 50-cm.

The size range of skipjack caught by handline was from 20 cm to 48 cm with most of the catch in the 40 to 48 cm size range. Purse seine catch of skipjack has a wide range of class interval ranging from 15 cm to 66 cm. In both gears, most of the catch observed was between 40 cm to 50-cm size class. Compared to the southern area of the country, the sizes of the skipjack caught by purse seine in the northern area were relatively larger than the catch of the purse seine operating in Moro Gulf. These sizes also showed that the bulk of the skipjack resources in South China Sea belong to the matured or adult stock as skipjack in Philippine waters are observed to start spawning at length between 40 cm to 44 cm (Ronquillo, 1962; White, 1982).

The frigate tunas caught by purse seine were also bigger in size compared with that of the frigate tunas caught in Moro Gulf. The smallest frigate tuna caught by purse seine in South China Sea was 20 cm and the largest was 46 cm observed in April. In May, most of the catch were larger than that of the catch in April. The smallest frigate tuna observed in the landed catch was 39 cm and the largest was 43 cm .

Bullet tuna was observed only in April with size ranging from 12 cm to 33 cm. Only one size class was recorded for eastern little tuna, which was observed only in April at length 30 cm.

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Appendix 1. Fishing log form for tuna longline

recorded by...

Cruise no. **Station no.** **Date**	**Name of Vessel**		**Air temp.** **Air press.** **Humidity**
Moon age	**Start shooting**	**Finish shooting**	**Water**
Weather condition	Time	Time	Surface temp.
Sea condition	*Lat.*	*Lat.*	Bottom temp.
Wind dir.	*Long.*	*Long.*	Thermocline
Wind speed	**Start hauling**	**Finish hauling**	**Transparency**
Current Condition	Time	Time	**Total basket number**
Depth Speed Direction	*Lat.*	*Lat.*	**No. of hook/basket**
	Long.	*Long.*	**Total catch in number**
	Shooting course/speed		**Total catch in weight**
	Setting distance		**Immersion time**
Memorandum	**Drifting information**		**Type of bait**

No.	Species	Length cm	Weight kg	Remark