

WORKING GROUP TO REVIEW STOCK ASSESSMENTS

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**Estimation of ratio of fin weight to body weight of sharks
in the eastern Pacific Ocean in 2006.**

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NFRDI conducted a circle hook experiment to compare the catch rates of target and bycatch species between J hook and circle hooks in the tuna longline fishery of the eastern Pacific Ocean between 9°13'S-1°36'N and 126°00' ~138°21'W from September 20 to October 23 (Fig. 1). In this survey we collected the sharks data to attain the ratio of fin weight to body weight of sharks. The catches of sharks taken on 62,464 hooks were 413 in number and 11,093kg in weight of 9 species of shark. The ratio of wetted fin weight to body round weight of sharks by species ranged from 4.1 to 8.1% and mean was 5.08%. The total ratio of wetted fin weight to dried fin weight of sharks and the ratio ranged 0.38 to 0.70 and mean value was 0.53. we can calculate the round weight of the shark from dried sharks fin weight as follows;

$$BW = DFW / [(\text{Ratio of wetted fin weight to body round weight}) \times (\text{Ratio of wetted fin weight to dried fin weight})]$$

in where BW is round weight of sharks and DFW is dried fin weight

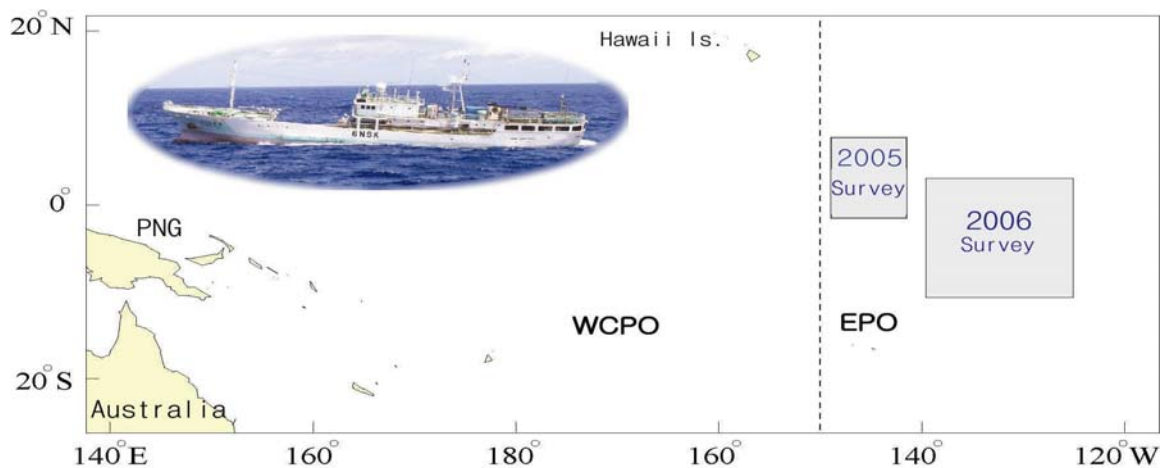


Figure 1. The survey area for circle hook experiment in the eastern Pacific

Catch composition by species

The catches of sharks taken on 62,464 hooks were 413 in number and 11,093kg in weight of 9 species of shark. Crocodile shark was the dominant species in number

accounting for 142 fish (34.4% of the sharks total), followed by bigeye thresher shark at 83 fish (20.1%) (Table 1).

Table 1. Catch and species composition of shark species caught during the Circle hook experimental survey.

Shark species		Number	(%)	Weight (kg)	(%)
Scientific name	English name				
<i>Alopias superciliosus</i>	Bigeye thresher shark	83	20.1	3,151	28.4
<i>Lamna ditropis</i>	Salmon shark	59	14.3	2,048	18.5
<i>Prionace glauca</i>	Blue shark	43	10.4	2,442	22.0
<i>Isurus oxyrinchus</i>	Mako shark	3	0.7	470	4.2
<i>Carcharhinus longimanus</i>	Oceanic white-tip shark	48	11.6	883	8.0
<i>Sphyrna zygaena</i>	Smooth hammerhead	7	1.7	494	4.5
<i>Sphyrna lewini</i>	Scalloped hammerhead	14	3.47	888	8.0
<i>Pseudocarcharias kamoharai</i>	Crocodile shark	142	34.4	669	6.0
<i>Scymnodon sqamulosus</i>	Smallmouth velvet dogfish	14	3.4	48	0.4
Total		413	100	11,093	100

Catch rate by bait

The baits used were consist of 5 different kind of species : chub mackerel, sardine, squid, jack mackerel and milkfish. The number of hooks used in whole set for chub mackerel, sardine and squid were 15,616, and 7,808 for jack mackerel and milkfish, respectively. The catch rate by bait type except milk fish ranged 2.0-2.8 fish/1,000 hooks and did not show the differences by bait type (Table 2)

Table 2. Catch per unit effort(CPUE, No./1,000hooks) by bait.

Species(number)	CPUE by bait (no./1,000 hooks)				
	Chub mackerel	Sardine	Squid	Jack mackerel	Milk fish
Large-sized sharks(257)	2.4	2.8	2.6	2.0	0.6
Small-sized sharks(156)	2.6	2.6	2.8	2.2	1.4
Total(413)	5.1	5.4	5.4	4.2	2.0

Fish condition at landing

The 413 of shark in 9 species was observed to monitor the fish condition at landing. Scalloped hammerhead sharks was dead in 100% and survival rate of the other 7 species ranged from 50.0 to 90.6 % and mean was 77.5%. No predation was found (Table 3).

Table 3. Fish condition at landing

Species	Number of individuals observed	Fish condition at landing(%)		
		Alive	Dead	Predation
Bigeye thresher shark	83	77.1	22.9	-
Salmon shark	17	70.6	29.4	-
Blue shark	29	72.4	27.6	-
Mako shark	3	66.6	33.4	-
Oceanic white-tip shark	11	63.6	36.4	-
Smooth hammerhead shark	2	50.0	50.0	-
Scalloped hammerhead shark	2	0.0	100.0	-
Crocodile shark	139	90.6	9.4	-
Smallmouth velvet dogfish shark	14	71.4	28.6	-
Total	413	77.5	22.5	-

Disposal of sharks trunk and sharks fins

The discard rate of sharks in 413 in 9 species was observed. Disposal state of the shark was classified as 4 cases; a. released alive, b. discard carcass, c. retain the trunk after finning, d. discard trunk after fining. Of the them we considered as discard in case of a, b, and d. The trunks of bigeye thresher shark, blue shark and mako shark were mostly discarded after finning while those of most of small sized sharks (crocodile shark, smallmouth velvet dogfish shark) were discarded as it was. The other large sized sharks trunks of salmon shark, oceanic white-tip shark, smooth hammerhead shark and mako shark were mainly retained after finning. The trunks of salmon shark were retained after finning about 76 % and 86 % for smooth hammerhead shark (Table 4).

Table 4. Disposal of sharks trunk.

Species	Number of individuals measured	Disposal rate (%)			
		Release alive	Discard	Retain trunk after finning	Discard trunk after finning
Bigeye thresher shark	83	0.0	10.8	0.0	89.2
Salmon shark	59	1.7	13.6	76.3	8.4
Blue shark	43	0.0	9.3	0.0	90.7
Mako shark	3				100.0
Oceanic white-tip shark	48	0.0	16.7	12.5	70.8
Smooth hammerhead shark	7	0.0	0.0	85.7	14.3
Scalloped hammerhead shark	14	0.0	21.4	64.3	14.3
Crocodile shark	142	0.7	97.9	1.4	0.0
Smallmouth velvet dogfish	14	14.3	85.7	0.0	0.0

After the landing on board every sharks except small sized sharks (crocodile shark, smallmouth velvet dogfish shark) were finned. All kind of fins, dorsal, pectoral, pelvic, anal and caudal fins were finned but bigeye thresher shark did not fin the caudal fin (Table 5).

Table 5. Disposal of sharks fin by fin type after fining (○: Retain, ×: Discard). LS: large-sized shark, SS: small-sized shark.

Species	Fin type					Trunk	Comment
	Dorsal	Pectoral	Pelvic	Anal	Caudal		
Salmon shark	○	○	○	○	○	Retain	LS
Oceanic white-tip shark	○	○	○	○	○	''	''
Smooth hammerhead sharks	○	○	○	○	○	''	''
Mako shark	○	○	○	○	○	''	''
Blue shark	○	○	○	○	○	Discard	''
Bigeye thresher shark	○	○	○	○	×	''	''
Crocodile shark*	×	×	×	×	×	''	SS

Smallmouth velvet dogfish	x	x	x	x	x	"	"
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* 2 fishes larger than 1 meter were finned.

Ratio of wetted fin weight to body round weight of sharks by species

The ratio of wetted fin weight to body round weight of sharks by species were calculated targeted on 163 individuals of 9 species. The ratio ranged from 4.1 to 8.1 and mean was 5.08. However the value of bigeye thresher shark was excluded in this range because it did not fin the caudal fin (Table 6).

Table 6. Ratio of wetted fin weight to body round weight of sharks by species

Species	Number of individuals measured	Round weight (kg)(A)	Wetted Fin weight (kg)(B)	Ratio of B/A(%)	Comments
Bigeye thresher shark	81	3,122	116.3	3.7	Excluded caudal fin
Salmon shark	48	1,826	94.2	5.2	Included caudal fin
Blue shark	45	2,593	114.3	4.4	"
Mako shark	3	470	19.4	4.1	"
Salmon shark	48	1,826	94.2	5.2	"
Oceanic white-tip shark	45	841	59.4	7.1	"
Smooth hammerhead shark	7	494	24.9	5.0	"
Scalloped hammerhead	13	839	45.0	5.4	"
Crocodile shark	2	52	4.2	8.1	"
Total	163	7,115	361.4	5.08	Excluded bigeye thresher shark

When the sharks fins were dried it is hard to identify the species and it was hard to dry the sharks fins on board. And then we calculated the mean total ratio of wetted fin weight to dried fin weight of sharks and the ratio ranged 0.38 to 0.70 and mean value was 0.53 (Table 7).

From the ratio upper mentioned we can calculate the round weight of the shark from dried sharks fin weight as follows;

$$BW = DFW / [(\text{Ratio of wetted fin weight to body round weight}) \times (\text{Ratio of wetted fin weight to dried fin weight})]$$

in where BW is round weight of sharks, DFW is dried fin weight

Table 7 . Ratio of wetted fin weight to dried fin weight of sharks

Order	St. no.	Number of individuals measured	Wetted fin weight(kg)	Dried fin weight(kg)	Ratio (Dried/Wetted)	Number by species
1	12	12	22.4	12.2	0.54	BS 2, BT 10
2	13	10	17.5	10.5	0.60	BT 7, OW 1, SH 2
3	14	23	24.8	11.5	0.46	BT 18, SS 3, OW 2
4	15	6	11.7	7.0	0.60	BT 2, BS 1, SS 1, OW 2
5	16	10	20.9	12.4	0.59	BT 1, BS 3, SH 1, OW 4, CS 1
6	17	7	14.8	10.3	0.70	BS 5, OW 1, SS 1
7	18	2	6.4	2.5	0.40	BS 1, MS 1
8	19	3	8.8	3.5	0.41	OW 1, SH 1, SS 1
9	20	4	8.7	3.3	0.38	BS 3, BT 1
10	21	6	11.3	6.7	0.59	BS 4, OW 1, SS 1
11	22	6	19.4	11.0	0.57	OW 1, BS 2, SH 3
12	23	12	28.4	13.0	0.49	BT 6, SH 1, SS 1, BS 3
13	24	2	5.5	2.5	0.45	BS 1, BT 1
Total		102	200.6	106.4	0.53	BT 46, BS 25, SS 8, OW 13, SH 8, CS 1, MS 1

※ BS: Blue shark, BT: Bigeye thresher shark, OW: Oceanic white-tip shark, SH: Smooth hammerhead shark, SS: Salmon shark, CS: Crocodile shark, MS: mako shark,

Sex ratio and length distribution of sharks by species

The sex ratio and length distribution data also collected and were shown in tables 8

and 9.

Table 8. Sex ratio of shark by species

Species	Number of individuals measured	Sex ratio (%)		
		Female	Male	Unidentified
Bigeye thresher shark	84	58.3	31.0	10.7
Salmon shark	58	65.5	32.8	1.7
Blue shark	47	42.6	51.1	6.4
Mako shark	3	100.0	0.0	0.0
Oceanic white-tip shark	47	68.1	29.8	2.1
Smooth hammerhead shark	7	42.9	57.1	0.0
Scalloped hammerhead shark	14	64.3	35.7	0.0
Crocodile shark	142	47.9	40.8	11.3
Smallmouth velvet dogfish shark	14	78.6	14.3	7.1

Table 9 . Length distribution of sharks by species

Species	Number of individuals measured	mean length (cm)	Range (cm)
Bigeye thresher shark	84	138	99~196
Salmon shark	60	140	44~186
Blue shark	43	191	138~230
Mako shark	3	246.3	196~330
Oceanic white-tip shark	48	110	40~173

Smooth hammerhead shark	7	186.9	144~211
Scalloped hammerhead shark	14	182.3	140~212
Crocodile shark	142	82	53~175
Smallmouth velvet dogfish shark	14	74.4	64~83