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Progress report of the research survey for 2024 by Chinese fishery research vessel "Song Hang" in the WCPFC area

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Summary

China as a member country has been conducting a five-year scientific survey program using its fishery research vessel "Song Hang" with longline as the main gear in the WCPFC convention area from 2021 to 2025. The survey has collected fundamental data and biological tissue samples to improve the commission's scientific research to support better management advice. The main objectives of our cruises are to improve the understanding of the stock structure and investigate the mechanisms of moving and aggregating by incorporating environmental factors for target and bycatch species. The survey covered the area in the high sea from 130°12′E to 135°59′E and 10°59′ N to 17°00′N between August to September 2024. A total of 20 sets (7762 hooks) were released, and a total of 16 species were recorded in this survey. Preliminary result shows that harvest consists of blue shark (27.74%) and Longnose lancetfish (21.89%). Bigeye tuna is the majority catch of commercial tuna. A total of 10 tags with satellites were released, and tissues sample of 97 individuals from 15 species were collected during the cruises.

Introduction

According to WCPFC Convention principles "on the need to collect and share data, including information from national research programs"(Article 5) and "The function of promoting the conduct of relevant scientific research and disseminating the results thereof is one of the functions of the Commission" (Article 10), China as a member country of WCPFC has conducted a five-year scientific survey program using its fishery research vessel "Song Hang" with longline as main gear in the WCPFC convention area. This series of research surveys are supported by the Ministry of Agriculture and Rural Affairs (MARA) of China and conducted by Shanghai Ocean University, focusing on the tuna and bycatch resource in the WCPFC convention area. Through this project, we look forward to providing essential information to supplement the current scientific database of the commission. We also hope that the survey will be a joint project with participants from SPC and other member scientists in the future.

The main objective of this project is based on various CMMs and recommendations raised by SC, including support and encouragement for CCMs to undertake scientific research to understand fisheries and species covered by the Convention. The survey will be conducted to collect fundamental data and conduct experiments to improve the commission's scientific research and support better management advice. Five tasks

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would be included in this project, which are as below:

a) Collecting fishery-independent data, including catch and effort, length-frequency, length-weight data (to estimate various conversion factors), and biological sampling (larvae survey, growth, stomach content, etc.).
b) Investigating stock structure (tissue bank) and spatial distribution of longline target and bycatch species.
c) Investigating the influence of different types of longline hooks and baits on fishing selectivity, catchability, and survival rate onboard.
d) Collecting environment data for ecosystem model, including temperature, salinity, transparency, dissolved oxygen, pH, nitrogen, et al.
e) Tagging and releasing experiments for sharks, marine mammals, and turtles if possible. The project would also be used to monitor bycatch migration and releasing mortality.

Methods and materials

Given the capacity and schedule of the "Song hang" research vessel, we surveyed from Aug to Sep of 2024. This survey covered the area from 130°12′E to 135°59′E and 10°59′ N to 17°00′N on the high sea. This survey includes 75 survey stations, but half of them are only for the environment survey without fishing behavior. A total of 25 fishing sets (5 for trawl net and 20 for longline) were included in this survey, and a total of 7762 hooks were released in the WCPO (Table 1). For more details about spatial distribution, please refer to Figure 1.

For the requirement of environment data for the ecosystem model, we will collect data on temperature, salinity, transparency, dissolved oxygen, pH, nitrogen, etc. Conductivity Temperature Depth (CTD 9-11Plus, Sea-Bird) and its MOUNTED SBE43 probe will be used to collect 0-300m vertical hydrological data of the above information at each station. Water samples were collected in layers of 25m, 50m, 75m, 100m, 200m, and 300m, and 12 bottles *250ml/ bottle per station.

This project has conducted tagging and releasing programs for sharks, marine mammals, and turtles. These programs will be used to monitor migration, habits, and releasing mortality. This voyage will include one type of label, as shown in Table 2.

Result

A total of 16 species (137 individuals) were recorded in this survey. Preliminary result shows that harvest (including escape and released species) consists of blue shark (27.74%) and Longnose lancetfish (21.89%). For commercial tuna, Bigeye tuna is the majority caught in this WCPO survey. More details can be found in Table 3. Hook

position information for several major catches is recorded in Table 4. A total of 97 individuals have been sampled on board, and biological tissues include vertebra, gonad, stomach, heart, muscles, and so on (Table 5). The total catch of tuna and tuna-like species in the survey was 756.9 kg (Table 6). Biological characteristics of several species with high catches were recorded (Table 7). Figures 2-5 depicted the spatial distribution relationships between blue shark catches and several major marine environmental factors (temperature, salinity, Chlorophyll, and seawater turbidity), respectively. Currently, our project is still in the process to collect the data and materials, therefore we only provide a brief description of our survey and sampling here.

Table 1. Hooks were released in the WCPO survey

Date	Set	Hooks	Hooks per day
August	9	3423	380
September	11	4339	394

Table 2 Tags were used in the WCPO survey

Name of tags	number
MiniPAT w/Attached, Dart, Domeier Medium, No Dacron	10

Table 3 Harvest composition in the WCPO survey

English name	Scientific name	Individuals(num)	Proportion (%)
Sickle pomfret	*Taractichthys steindachneri*	11	8.03
blue shark	*Prionace glauca*	38	27.74
Bigeye tuna	*Thunnus obesus*	5	3.64
Bigeye thresher	*Alopias superciliosus*	3	2.18
Longnose lancetfish	*Alepisaurus ferox*	30	21.89
Swordfish	*Xiphias gladius*	2	1.47
Oilfish	*Ruvettus pretiosus*	2	1.47
Snake mackerel	*Gempylus serpens*	18	13.14
Escolar	*Lepidocybium flavobrunneum*	11	8.02
Albacore	*Thunaus alalunga*	4	2.92
Driftfish	*Cubiceps gracilis*	1	0.73
Pelagic stingray	*Dasyatrs vrolacea*	2	1.47
Ocean sunfish	*Mola mola*	1	0.73
Blue marlin	*Makaira nigricans*	7	5.11
Mahi mahi	*Coryphaena hippurus*	1	0.73
Wahoo	*Acanthocybium solandr*	1	0.73

Sum	137	100.00

Table 4 Hook position information for several major catches

Species	Hook positon															
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Blue shark	1	1	3	4	4	2	3	3	3	3	3	2	2	3	1	0
Bigeye tuna	0	0	0	0	1	0	0	0	0	0	2	0	1	0	1	0
Snake Mackerel	0	1	0	3	4	3	0	3	0	1	0	2	0	0	1	0
Blue marlin	0	0	1	1	1	0	2	0	0	0	0	0	0	0	1	0
Sickle Pomfret	0	3	1	2	1	0	2	0	0	1	1	0	0	0	0	0
Longnose lancetfish	0	1	2	1	4	5	2	6	3	1	2	1	1	1	0	0
Escolar	0	2	0	1	0	1	3	0	1	0	1	0	0	0	0	0

Table 5 Sampling tissues and their numbers for each species of catch

English name	Sampling tissue	Individuals (num)
Sickle pomfret	Eyeballs, teeth, white muscles, liver, heart, spine, stomach, spleen, kidneys, intestines	9
Blue shark	Blood, eyeballs, teeth, white muscle, liver, gonads, heart, spine, stomach, spleen, kidneys, intestines, brain	13
Bigeye tuna	Eyeballs, teeth, white muscles, liver, gonads, heart, spine, stomach, spleen, kidneys, intestines, fin spines, pyloric caeca	5
Bigeye thresher	Blood, eyeballs, teeth, white muscle, liver, gonads, heart, spleen, kidneys, intestines, brain	2
Longnose lancetfish	Eyeballs, teeth, white muscle, liver, gonads, heart, spine, stomach, spleen, kidneys, intestines, fin spines	28
Swordfish	Eyeballs, teeth, white muscles, liver, gonads, heart, spine, stomach	1
Escolar	Eyes, muscles, spine, stomach, intestines, liver, gonads, kidneys, gallbladder, pancreas, pyloric caeca, heart	8

Snake mackerel	Otoliths, eyeballs, teeth, white muscle, liver, gonads, heart, spine, stomach, spleen, kidneys, intestines, fin spines	18
Albacore	Eyes, otoliths, muscles, spine, stomach, liver, gonads, gallbladder, heart	3
Pelagic stingray	Blood, eyeballs, white muscle, liver, gonads, heart, spleen, kidneys	1
Wahoo	Eyeballs, spine, teeth, stomach, white muscle, liver, gonads, heart, spleen, kidneys, intestines, brain, gallbladder	1
Blue marlin	Otoliths, eyeballs, teeth, white muscle, liver, gonads, heart, spine, stomach, spleen, kidneys, intestines, blood, gallbladder	7
Oilfish	Eyeballs, white muscles, liver, gonads, heart, spine, stomach, spleen, kidneys, intestines	1
Sum		97

Table 6 Tuna and tuna-like species were caught in the WCPO survey

Species	**Albacore tuna**	**Blue marlin**	**Bigeye tuna**	**Swordfish**
Weight(kg)	74.8	290.2	164.4	227.5
Individual(num)	4	7	5	2

Table 7 Biological characteristics of the main economic fish species and bycatch species

Species	**Average length or width(cm)**	**Standard deviation of length**	**Minimum length (cm)**	**Maximum length (cm)**
Bigeye tuna	124.4	79.66	103	155
Albacore	103.75	80.06	96	110
Swordfish	291.5	81.79	208	375
Blue marlin	215.1	81.6	92	374

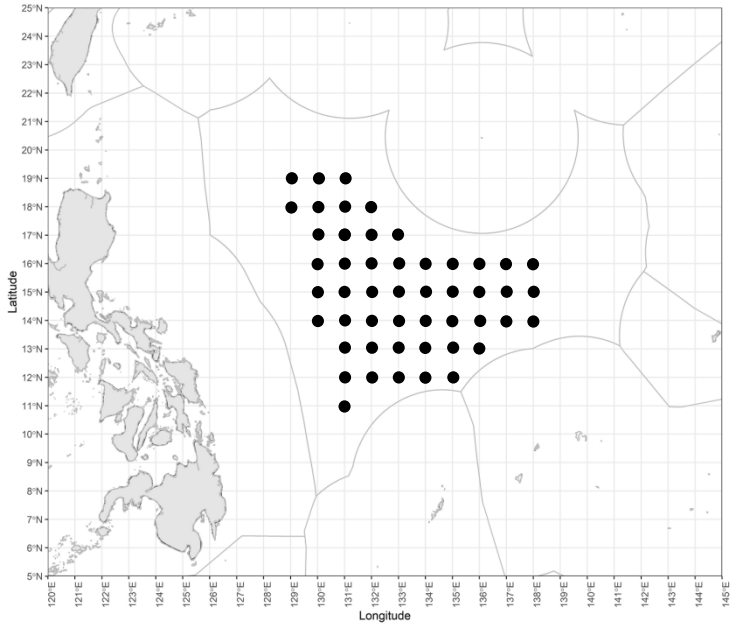

Figure 1 Spatial distribution for the scientific survey in WCPO.

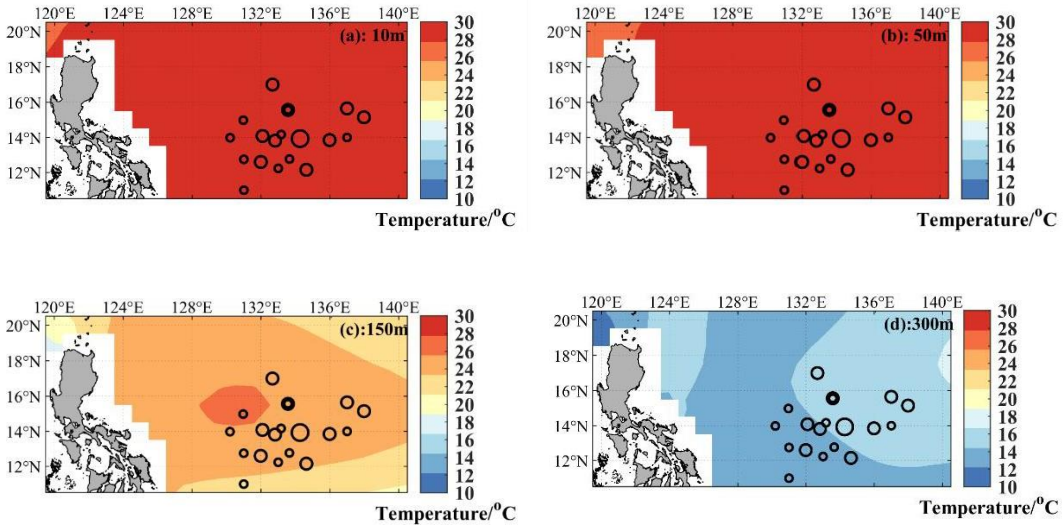

Figure 2 Spatial distribution of temperature in relation to blue shark catch in the Western and Central Pacific survey area in September 2024.

(a) : 10m; (b):50m; (c):100m; (d):150m

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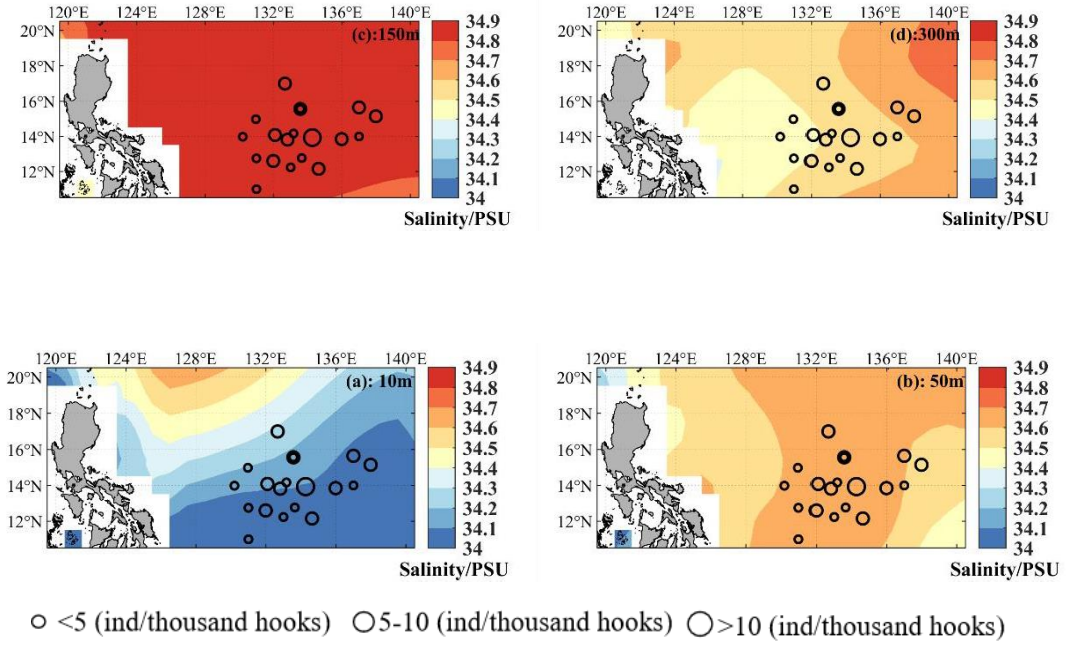

Figure 3 Spatial distribution of salinity in relation to blue shark catch in the Western and Central Pacific survey area in September 2024.

(a) : 10m; (b):50m; (c):100m; (d):150m

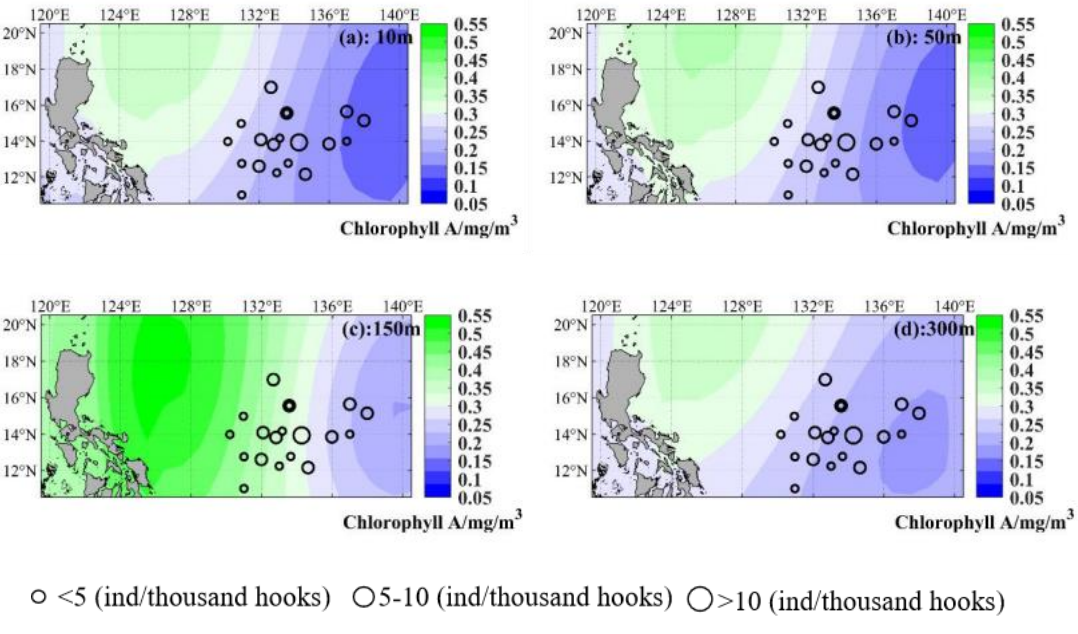

Figure 4 Spatial distribution of Chlorophyll a in relation to blue shark catch in the Western and Central Pacific survey area in September 2024.

(a): 10m; (b):50m; (c):100m; (d):150m

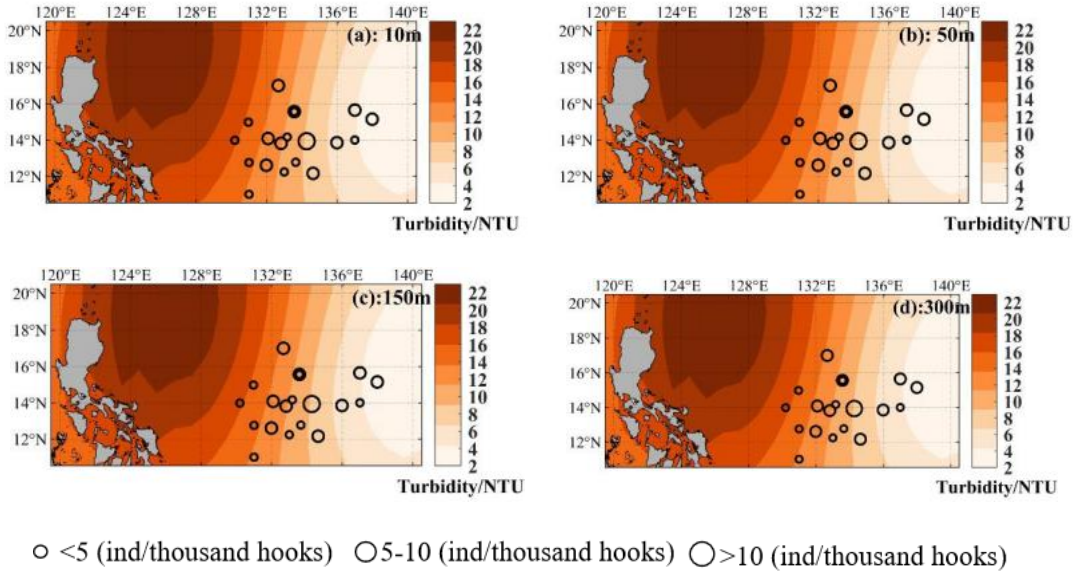

Figure 5 Spatial distribution of seawater turbidity in relation to blue shark catch in the Western and Central Pacific survey area in September 2024.
(a) : 10m; (b):50m; (c):100m; (d):150m