North Pacific Fisheries Commission

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Abundance and Distribution Estimation for Chub Mackerel and Blue mackerel in the Northwest Pacific Based on Scientific Research Surveys

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Summary

This document tends to provide some information based on fishery independent survey in the convention area for Chub mackerel and its bycatch species, Blue mackerel. Based on the Chinese survey data during 2021~2023, the results of this study indicating that there are obvious temporal and spatial variations for the catch and abundance of mackerels. The catch, density and relative biomass estimates were much lower in 2022 and 2023 than those in 2021. Generally, the catch of BM is covering about 17% of mackerels catch in 2023. This document provides preliminary but important information for understanding the population dynamics of Chub mackerel in the high sea, with some uncertainties due to data only covering limit years and area.

Introduction

China has been conducting a research survey in the convention area of NPFC since 2021. Following Japanese sardine, Chub mackerel (CM) is another main collected species by this survey, including its bycatch species, Blue mackerel (BM). During the study and management for Chub mackerel in NPFC, the main data source is fishery dependent survey, especially for adult individuals in the high sea. This Chinese survey could collect much fishery independent data for CM and BM to improve our understanding. This study provides some preliminary estimates for the temporal and spatial distribution, relative biomass, for these two mackerel species and their proportion in the Northwest Pacific Ocean.

Data and Methods

This Chinese scientific resource survey in the Northwest Pacific has been conducted since 2021, annually from June to August, covering the area from 148°E to 165°E and from 35°N to 45°N. This research only used the data collected by trawling, with different stations among years (Table 1). In 2021 and 2022, Chub mackerel and Blue mackerel were not separated on board.

The relative biomass was estimated by the swept-area method, in which the catchability of mid-level trawl for pelagic fish, is assumed to be 0.179. And the inverse distance weighted interpolation analysis was used to understand the situation in non-trawling area.

Results and Discussions

The mackerel catch shows significant variations among these three years (Table 1). In 2021, the total catch of mackerels was 1796 kg, with higher values in the northern stations. The catch per unit area among stations was 1119 kg/km² and 7407 ind/km². There is a relative even distribution in 2022 with only 10 stations caught mackerels.

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The total catch for 2022 was approximately 1/9 of that in 2021, reaching 204 kg, with the average density of 106 kg/km² and 3227 ind/km².

In 2023, the total catch recovered to be 800 kg, but still less than 2021, while the average density was 131 kg/km² and 1000 ind/km². Specifically, the average catch per unit area for Chub mackerel was 109 kg/km² and 708 ind/km², while Blue mackerel had an average catch per unit area of 22 kg/km² and 293 ind/km². The catch weight of Chub mackerel is approximately 5 times that of Blue mackerel, and BM tends to be in smaller size. However, in some stations, the catch of BM is higher than CM, e.g. the stations T10 and T15 (Table 2).

In terms of spatial distribution, both species showed relatively high catch in the northeastern region, with some overlap in their distribution (Figure 1 and Figure 2). Given the catch data is only available for limit stations, the inverse distance weighting interpolation analysis was used to provide preliminary estimates for the whole surveying area (Figures 3 and 4). Both temporal and spatial variations of distribution were revealed for two species, with some uncertainties due to data only covering limit years and area.

In conclusion, there are obvious variations during 2021~2023 indicating for the catch and abundance of mackerels in the convention area of NPFC. The catch, density and relative biomass estimates were much lower in 2022 and 2023 than those in 2021. Generally, the catch of BM is covering about 17% of mackerels catch in 2023.

Acknowledgement

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Table 1 Catch and relative biomass estimates for mackerel in 2021-2023

Year	Range	Number of trawling stations	Species	Catch/kg	Relative biomass/ million tons
2021	35°N—42°N 148°E—165°E	42	mackerel	1796	10.92
2022	35°N—45°N 148°E—164°E	36	mackerel	204	0.78
2023	35°N—45°N 148°E—164°E	39	Chub mackerel	697	1.13
			Blue mackerel	107	0.23

Table 2 Catch of Chub mackerel and Blue mackerel in 2023 Chinese survey

Station	Chub mackerel			Blue mackerel		
	Catch Number	Catch weight (kg)	Percentage in total catch	Catch Number	Catch weight (kg)	Percentage in total catch
T10	11	1.53	3.45	316	42.88	96.53
T11	26	3.47	1.01	0	0	0
T12	7	0.95	1.65	0	0	0
T13	12	0.16	20.58	0	0	0
T14	61	1.15	77.74	8	0.30	20.21
T15	6	0.19	3.74	18	0.79	15.25
T17	219	7.45	18.34	92	5.19	12.77
T21	1577	307.34	22.96	361	22.09	1.65
T22	180	22.68	2.64	0	0	0
T27	655	81.67	85.88	228	13.43	14.12
T30	37	2.08	7.15	73	0.73	2.51
T31	27	1.73	46.29	20	1.17	31.35
T32	125	12.82	1.72	8	0.79	0.11
T35	530	100.00	9.11	92	7.36	0.67
T37	1071	153.60	23.78	145	12.04	1.86
T39	0	0	0	3	0.23	0.71

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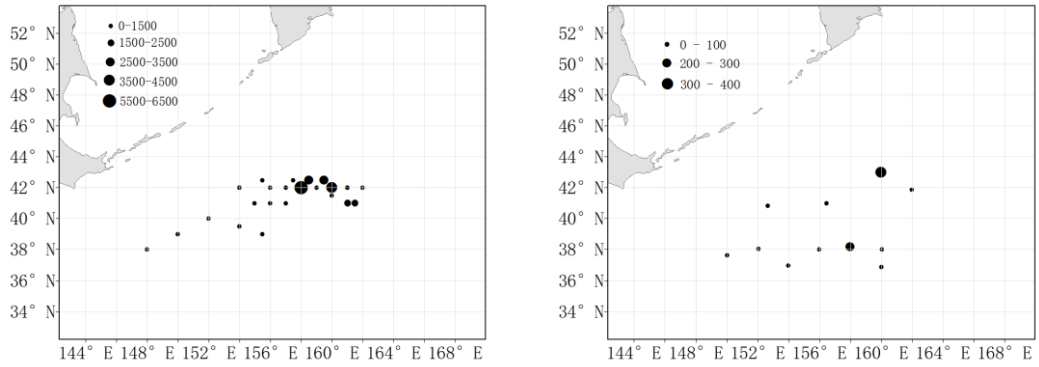

Figure 1 Catch (kg/km^2) distribution of Mackerel in 2021 (left) and 2022 (right)

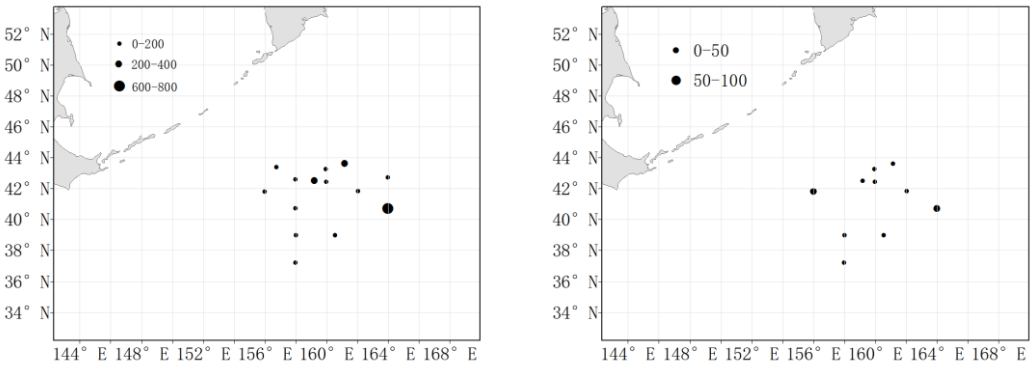

Figure 2 Catch (kg/km^2) distribution of Chub mackerel (left) and Blue mackerel (right) in 2023

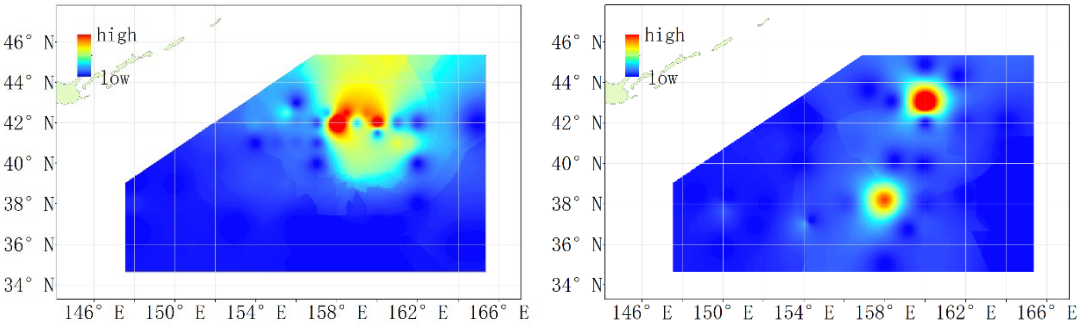

Figure 3 Density distribution of Mackerel in 2021 (left) and 2022 (right)

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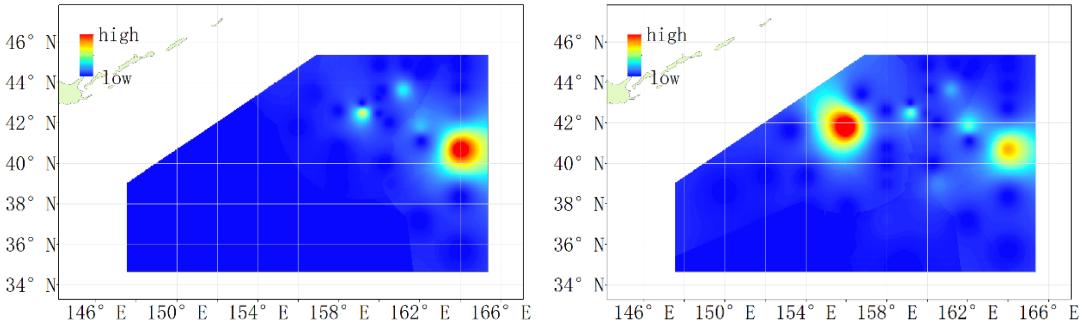

Figure 4 Density distribution of Chub mackerel (left) and Blue mackerel (right) in 2023

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