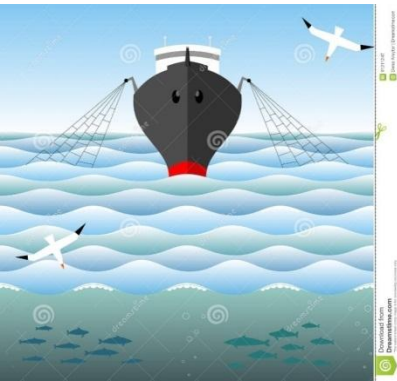**NPFC, 2024，NPFC-2024-TWG CMSA09**

Review of chub mackerel fishery in China and research activities

China

Heng Zhang, Yongchuang Shi
17-20 July 2024
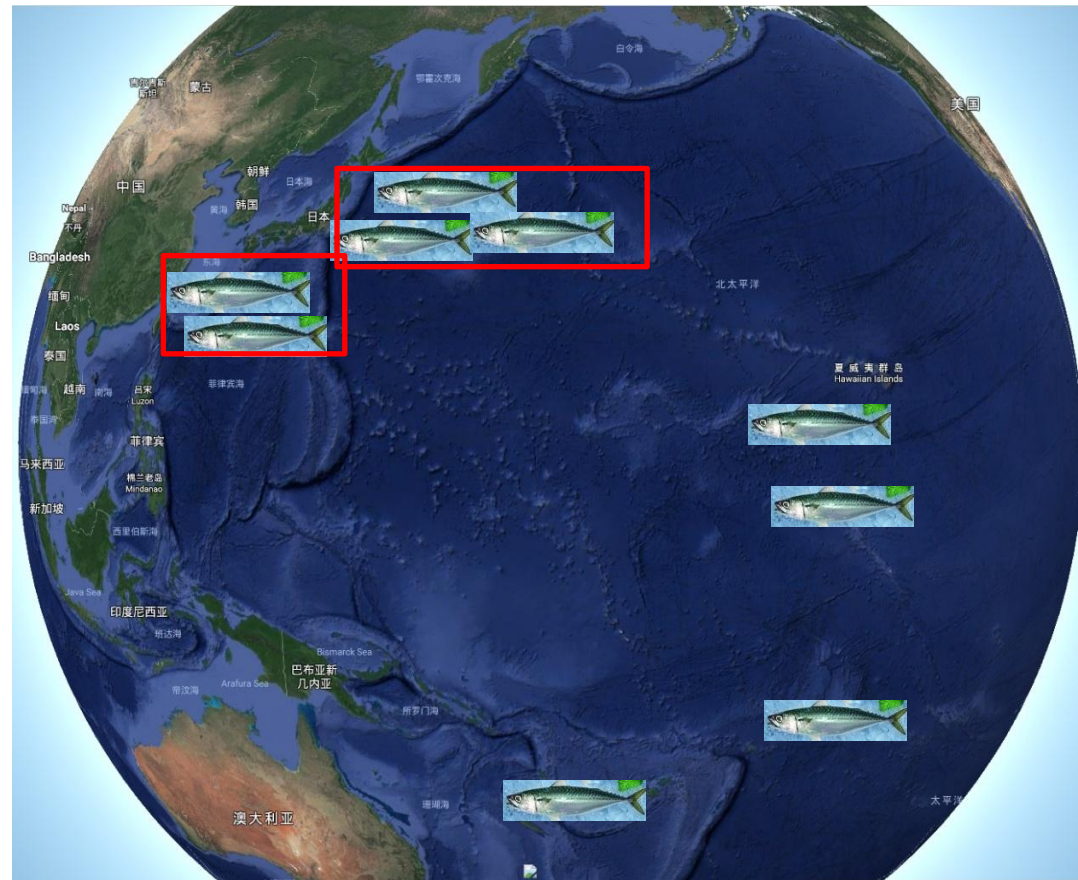Yokohama, Japan

Contents

1. Introduction

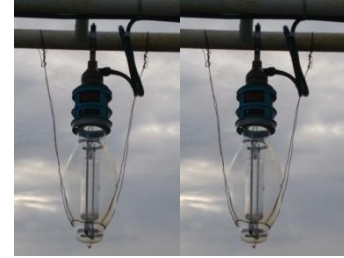**Chub mackerel (*Scomber japonicus*) widely distributes in the Pacific Ocean.**

Specially, the North Pacific Ocean and East China Sea are both important fishing ground areas for this population.

Recently，the CPUE of the species is decreasing.

light-purse seine
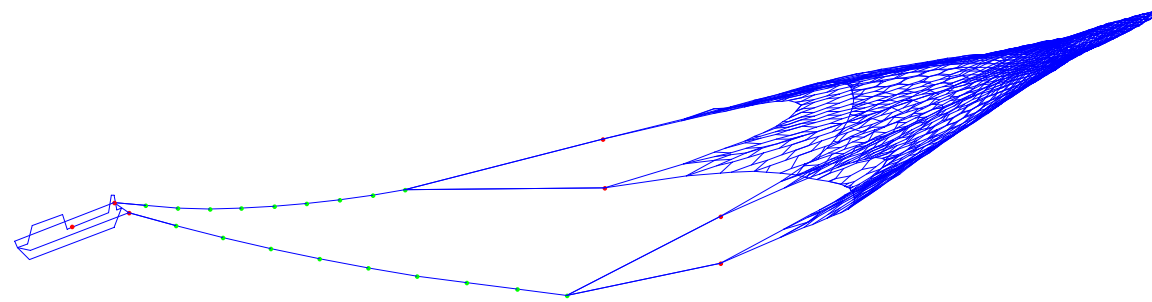
In 2023 year, China has two types of fishing nets operated in this fishery including the light-purse seine nets(>96%) and pelagic trawl nets(<4%).

Trawl nets — **Pelagic trawling**

From one to three trawl vessels were operated in NPFC areas, every year. In 2023, Three vessels seasonally catch the chub mackerel fishery in the NPFC areas which mainly within September-December.

2. Description of chub mackerel fishery in China in North Pacific ocean

Fishing effort and catch

Annual Report Summary Table - Chub mackerel + Spotted mackerel

Catch in metric ton

Year	China				Japan				Russia						
	Total	Purse seine	Pelagic trawl		Total	Purse seine	Bottom trawl	Others	Total	Bottom trawl	Purse seine	Mid-water trawl		Other	
		CA	NW	CA		NW	CA	NW		NW	NW	NW	CA	NW	CA
2023	48,850	47,244	0	1,606	113,650	48,663	0	64,987	15,540	0	90	13,606	0	1,844	1
2022	110,856	108,241	0	2,615	171,939	88,578	0	83,361	49,894	32	255	48,840	4	763	0
2021	108,266	95,621	0	12,645	302,434	214,347	1	88,086	87,388	361	525	83,806	1,188	1,502	7
2020	92,456	85,122	0	7,334	286,398	218,659	0	67,739	81,384	120	31	80,047	57	1,128	2
2019	64,446	53,210	0	11,236	334,058	256,442	0	77,616	86,592	1	127	85,396	507	560	0.5
2018	130,447	121,472	0	8,975	338,747	293,210	0	45,537	98,812	7	49	98,740	0	5	11
2017	155,574	145,529	0	10,045	346,057	308,544	48	37,465	53,792		369	53,115	247	37	25
2016	142,994	119,641	0	23,353	403,558	354,690	9	48,859	9,242	26	2	9,110	91	14	
2015	139,961	127,193	5,114	7,654	393,212	331,963	15	61,234	466			266	197	4	

Number of vessels

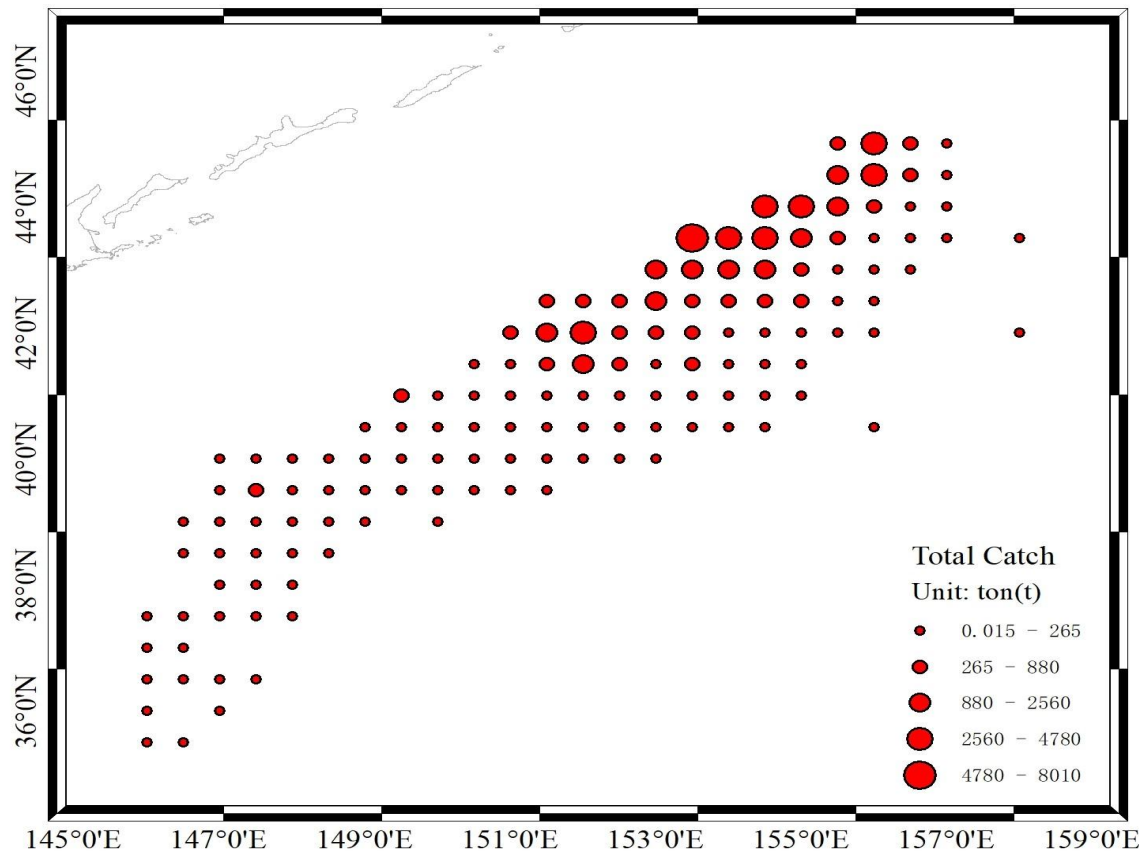| Year	China		Japan		Russia				
	Purse seine	Pelagic trawl	Purse seine	Other	Purse seine	Mid-water trawl		Other	
	CA	CA	NW	NW	NW	NW	CA	NW	CA
2023	90	3	57		4	48	0	17	1
2022	105	2	58		3	32	1	11	
2021	105	3	57		4	46	3	13	1
2020	51	2	60		2	68	3	21	1
2019	29	3	58		2	52	0	2	2
2018	62	3	57		2	50	0	4	1
2017	75	2	57		2	26	1	5	3
2016			53		2	12	2	5	
2015			52			1	2	1	

Figure Distribution on the catch (tons) of chub mackerel in China in 2022

In 2023, the distribution on the chub mackerel is likely with 2022 year, butMove further towards the northeast direction. Maybe it's because the water temperature is getting warmer

Distribution on the monthly catch of chub mackerel in China in 2022

The data for 2023 is currently being organized
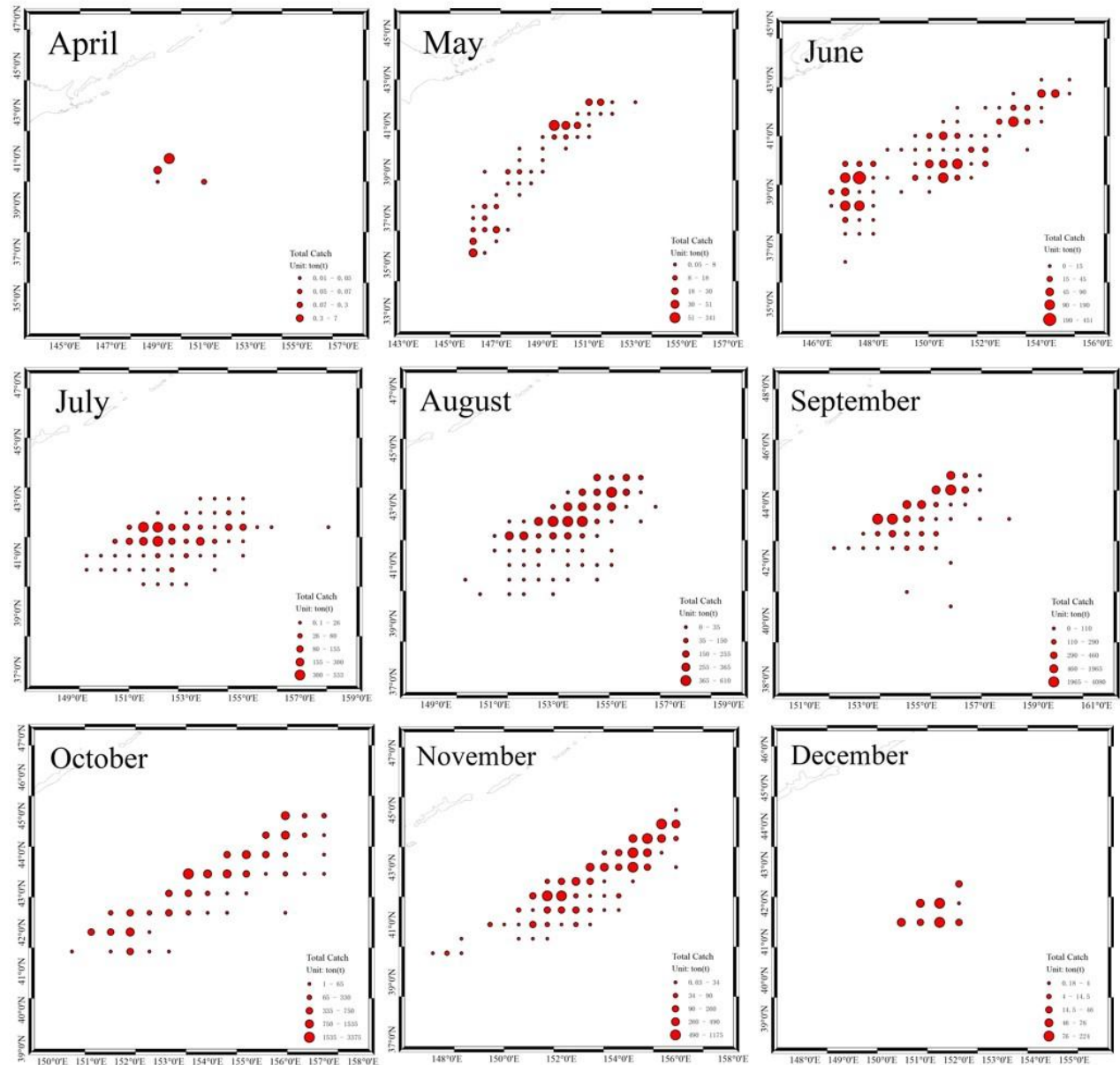
3. Fisheries data collection and research activities

- Population biology

In 2022, the average length was 221.1mm. It can be seen that the average fork length presents a trend of gradual increase to stability in 2016-2021. In 2023, the average length was 231.1mm, which a little larger than that in 2022.

Mean frok length（mm）
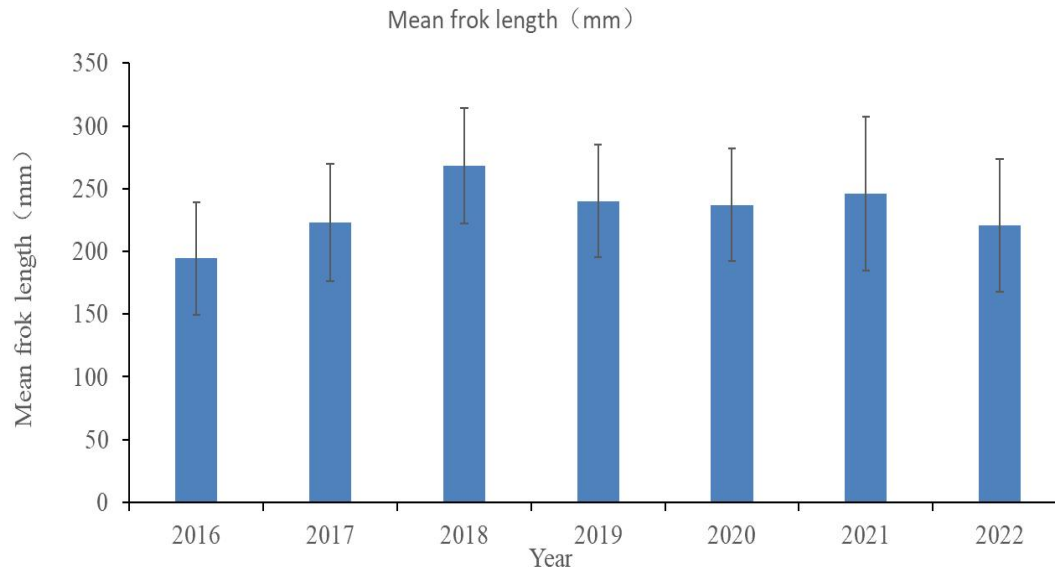
- # Relation between weight and fork length

Length-weight relationship of China' chub mackerel in 2022

Samples size-random sampling in boats or ports

Table 1 Sample sizes of length measurements

Year	month	samples	individuals
2016	August to November	8	254
2017	May to November	15	842
2018	April to October	14	345
2019	April to November	16	869
2020	April to December	18	1263
2021	April to November	23	795
2022	April to December	25	1483
2023	April to December	25	889

Table 2 Sample sizes of age determination

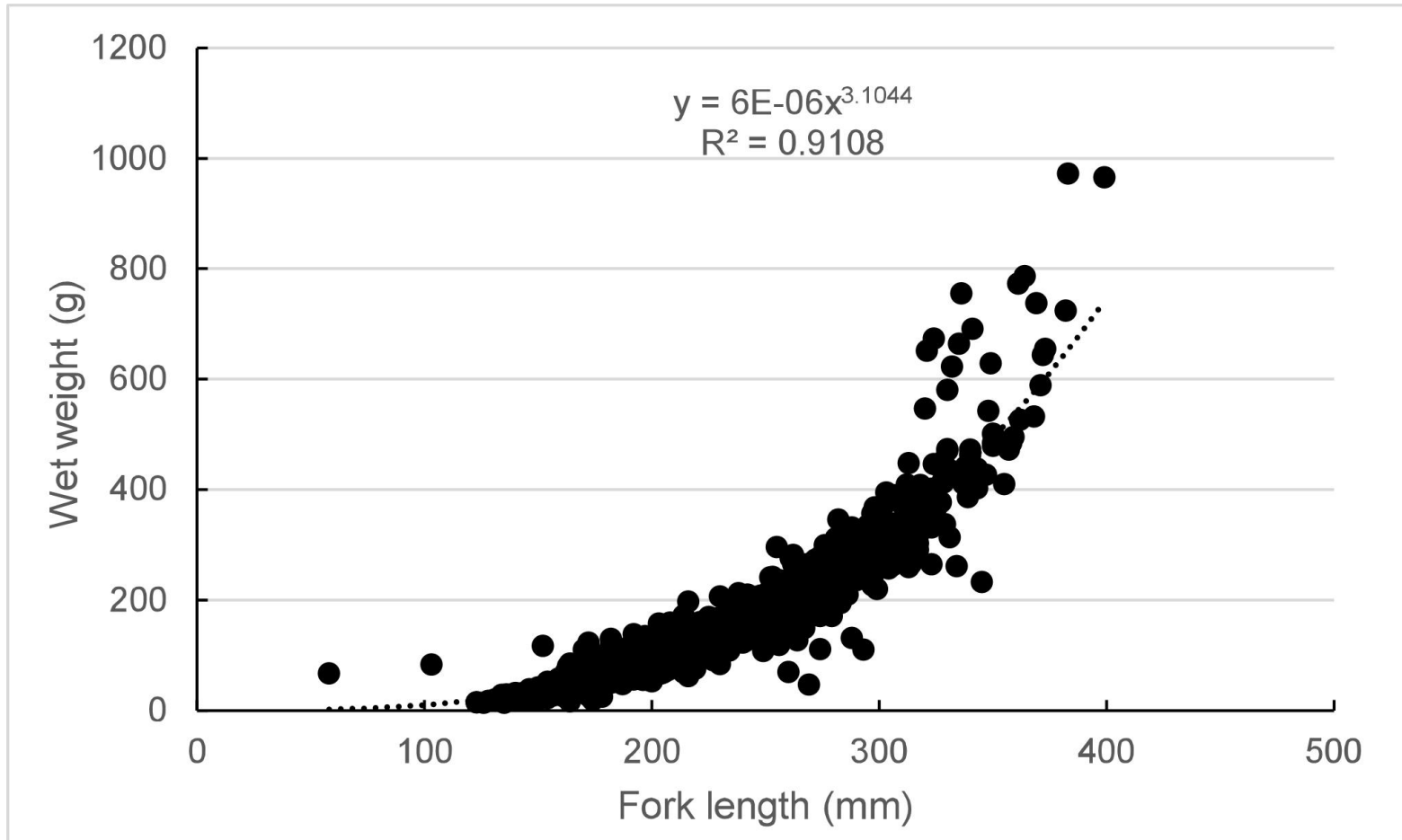| Year	month	samples	individuals
2017	December	2	40
2018	April to October	14	260
2019	April to November	16	469
2020	April to December	18	322
2021	April to November	23	255
2022	April to December	25	235
2023	April to December	25	489

Relevant research activities

Samples size-random sampling in boats or ports

Samlping

Transport

Laboratory biological measurements

5.1. Distinguishing between Chub Mackerel and Blue Mackerel

<u>Review of methodology of species identification</u>

No updates from the last year

Chub mackerel

Longer than 12% of FL

No spots in the downside of body

Blue mackerel

Shorter than 12% of FL

Many spots in the downside of body

Search for Japanese Fishes, 3rd ed. (2013)
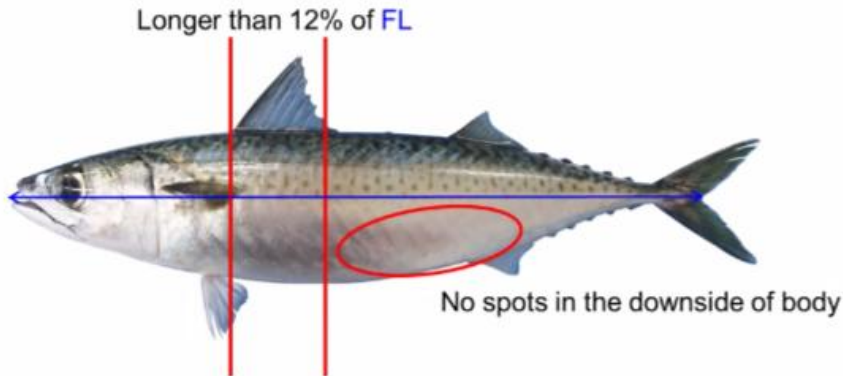
Chub mackerel

① No small black spots in the downside of body

② Basal length between 1st and 9th spines of dorsal fins is equal to or longer than 12% of fork length

Blue mackerel

① Many small black spots in the downside of body

② Basal length between first and ninth spines of dorsal fins is shorter than 12% of fork length

Chub mackerel

The first dorsal fin has 9-10 fin spines

Almost no spots

The first dorsal fin has 10-13 fin spines
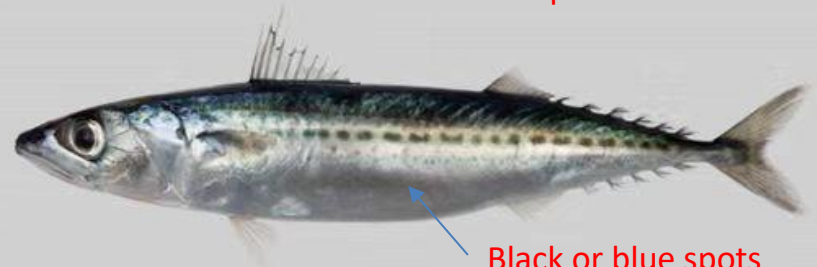
Black or blue spots

Chub mackerel

Blue mackerel

How to Identify Chub Mackerel and Blue Mackerel ?

Biological and Aging method

- Fork length (mm), weight(g)

- Maturity: The maturity of gonads is divided into I-V Phase by visual observations. Phase III as a sign of maturity. Phase III: Individuals whose gonads are maturing. The gonads are already well-developed, and the ovarian volume increases, accounting for 1/3-1/2 of the entire abdominal cavity. The naked eye can clearly see that the ovaries are filled with opaque slightly white or light yellow egg granules.

- Maturity at age: 0-1+age individuals are not maturity, 2+ age individuals at least 30~40% have matured, 3+ age individuals are almost matured, larger than 4 age are 100% maturity. The situation varies every year.

Aging- otolith age rings reading method

Table 4 Sample sizes of age determination

Year	month	samples	individuals
2017	December	2	40
2018	April to October	14	260
2019	April to November	16	469
2020	April to December	18	322
2021	April to November	23	255
2022	April to December	25	235

In 2023, we increased the number of otolith measurements to 489 individuals.

ALK table

2022	Age and quantity of otoliths in each fork length group																																					

Jan-Mar FL(cm)	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	sum	ratio
sum																																						
Apr-Jun																																						
age																																						
0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0.064
1	0	0	0	0	0	0	0	0	0	0	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0.064
2	0	0	0	0	0	0	0	0	0	0	0	0	1	3	5	8	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0.282
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	6	9	5	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0.359
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5	6	1	0	0	0	0	0	0	0	0	0	0	14	0.179
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	3	0.038
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0.013
7+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sum	0	1	1	1	0	1	1	0	0	0	1	3	2	3	5	8	8	7	9	5	3	1	2	5	6	2	2	1	0	0	0	0	0	0	0	0	78	1
Jul-Sep																																					0	
age																																					0	
0	0	0	0	0	2	2	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0.123
1	0	0	0	0	0	0	0	0	1	3	6	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0.246
2	0	0	0	0	0	0	0	0	0	0	0	0	6	4	5	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0.292
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	3	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0.215
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0.031
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	3	0.046
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	3	0.046
7+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sum	0	0	0	0	2	2	1	2	2	3	6	5	7	4	5	5	3	3	2	2	2	2	0	0	1	0	2	2	1	1	0	0	0	0	0	0	65	
Oct-Dec																																					0	
age																																					0	
0	0	0	0	0	1	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0.086
1	0	0	0	0	0	0	0	0	2	3	3	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0.214
2	0	0	0	0	0	0	0	0	0	0	0	1	1	3	3	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0.2
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	7	2	5	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0.343
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3	0	2	0	0	0	0	0	0	0	0	0	9	0.129
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.029
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sum	0	0	0	0	1	1	1	2	3	3	3	6	3	3	3	6	5	7	2	5	3	2	4	3	2	0	2	0	0	0	0	0	0	0	0	0	70	

Sheet tabs: 2023 | **2022** | 2021 | 2020 | 2019 | 2018

1-3 years old is the dominant age group, FL 19~34cm is the dominant length group.

Catch at length

Maturity at age

0-1+age individuals are not maturity, 2 + age individuals at least 30~40% have matured, 3 + age individuals are almost matured, larger than 4 age are 100% maturity. The situation varies every year.
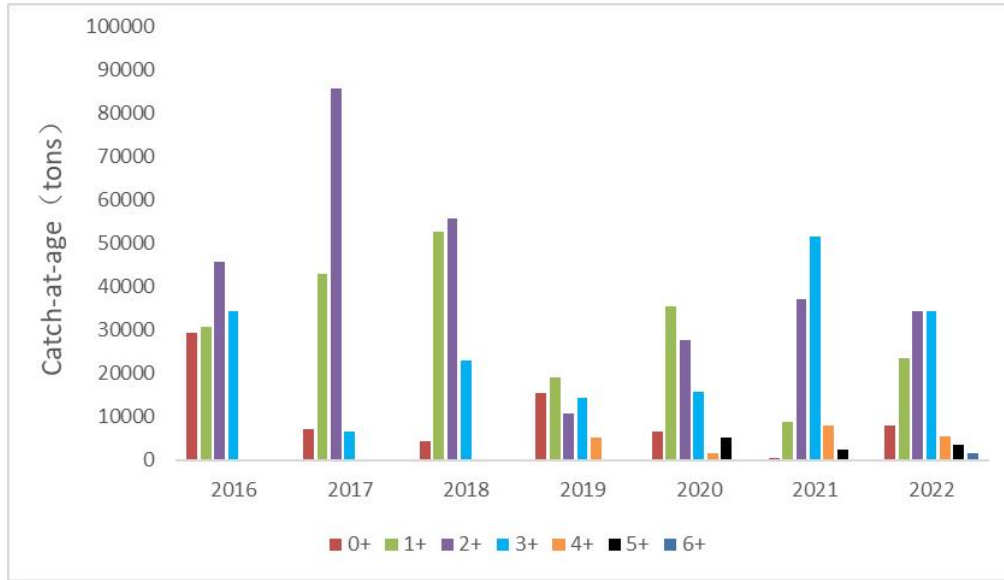
	Year	Quarter/Y	Age0+	Age1+	Age2+	Age3+	Age4+	Age5+	Age6+	Age7+	
1	Year	Quarter/Y	Age0+	Age1+	Age2+	Age3+	Age4+	Age5+	Age6+	Age7+	
2	2015	/	/	/	/	/	/	/	/	/	
3	2016	/	/	/	/	/	/	/	/	/	
4	2017	/	/	/	/	/	/	/	/	/	
5	2018	whole yea	0	0.1	0.4	0.9	1.0	1	1	1	
6	2018	1st quarte	0	0.2	0.4	0.9	1.0	1	1	1	
7	2018	2nd quart	0	0.0	0.4	0.9	1.0	1	1	1	
8	2018	3rd quarte	0	0.0	0.4	0.9	1.0	1	1	1	
9	2018	4th quarte	0	0.2	0.5	1.0	1.0	1	1	1	
10	2019	whole yea	0	0.0	0.3	0.8	1.0	1	1	1	
11	2019	1st quarte	0	0.0	0.3	0.5	1.0	1	1	1	
12	2019	2nd quart	0	0.0	0.2	0.7	1.0	1	1	1	
13	2019	3rd quarte	0	0.0	0.3	0.8	1.0	1	1	1	
14	2019	4th quarte	0	0.0	0.4	1.0	1.0	1	1	1	
15	2020	whole yea	0	0.0	0.3	0.8	1.0	1	1	1	
16	2020	1st quarte	0	0.0	0.3	0.9	1.0	1	1	1	
17	2020	2nd quart	0	0.0	0.2	0.7	1.0	1	1	1	
18	2020	3rd quarte	0	0.0	0.3	0.7	1.0	1	1	1	
19	2020	4th quarte	0	0.0	0.4	1.0	1.0	1	1	1	
20	2021	whole yea	0	0.0	0.5	0.9	1.0	1	1	1	
21	2021	1st quarte	0	/	/	/	/	/	/	/	
22	2021	2nd quart	0	0.0	0.5	0.8	1.0	1	1	1	
23	2021	3rd quarte	0	0.0	0.5	0.8	1.0	1	1	1	
24	2021	4th quarte	0	0.0	0.6	1.0	1.0	1	1	1	
25	2022	whole yea	0	0.0	0.4	0.8	1.0	1	1	1	
26	2022	1st quarte	/	/	/	/	/	/	/	/	
27	2022	2nd quart	0	0.0	0.3	0.7	1.0	1	1	1	
28	2022	3rd quarte	0	0.0	0.2	0.9	1.0	1	1	1	
29	2022	4th quarte	0	0.0	0.8	0.9	1.0	1	1	1	

Maturity at age

Weight at age

There are somewhat differences in weight among different age groups

In 2022, weight at age become larger than early years

Fewer samples from the older age group

Year	Quarter/age	0	1	2	3	4	5	6	7+
2018	1	/	76.9	178.6	225.3	361.4	461.2	/	/
2018	2	58	71.1	176.8	222.4	320.5	458.1	479.7	/
2018	3	/	77.4	179.9	239.5	371.3	423.9	777.4	/
2018	4	/	85.2	182.8	269.1	369.5	456.7	/	/
2019	1	45	55.9	181.7	222.2	330.1	404	/	/
2019	2	43.303	56.17	182.235	220.9196	304.9	349.524	486	/
2019	3	45.8	56.83667	181.8	260.2433	367.1	535	/	/
2019	4	/	56.39222	184.883	230.0723	339.024	368.513	/	/
2020	1	/	65	141	218.2	/	/	/	/
2020	2	35.571	69.9	140	221.025	347	410.8	/	/
2020	3	45	71.8	182.6	272.7	390.6	/	/	/
2020	4	/	98	199.4	232.4	450.2	481.2	817.1	830
2021	1	/	112.2	188.9	242.5	357.3	430.6	/	/
2021	2	30.1	113.7	185.3	255.5	339.3	423.8	/	/
2021	3	40	109.5	198.5	238.8	305.2	/	/	/
2021	4	86	118.1	164.2	241.8	440.1	447	637	/
2022	1	/	/	/	/	/	/	/	/
2022	2	25.4	101.1	166.3	252.7	414.6	525.2	588.8	/
2022	3	41.6	105.1	166.8	270.5	375.8	762.2	747.4	/
2022	4	49.6	99.7	164.2	275.9	440.1	773.3	/	/
2023	1	/	/	/	/	/	/	/	/
2023	2	58.6	116.9	236	349	413	/	/	/
2023	3								
2023	4								

Catch or number at age

In 2022，the main individuals at age range from 1+ to 3+
In 2023, the main individuals at age also range from 1+ to 3+, but The proportion of elderly individuals has decreased
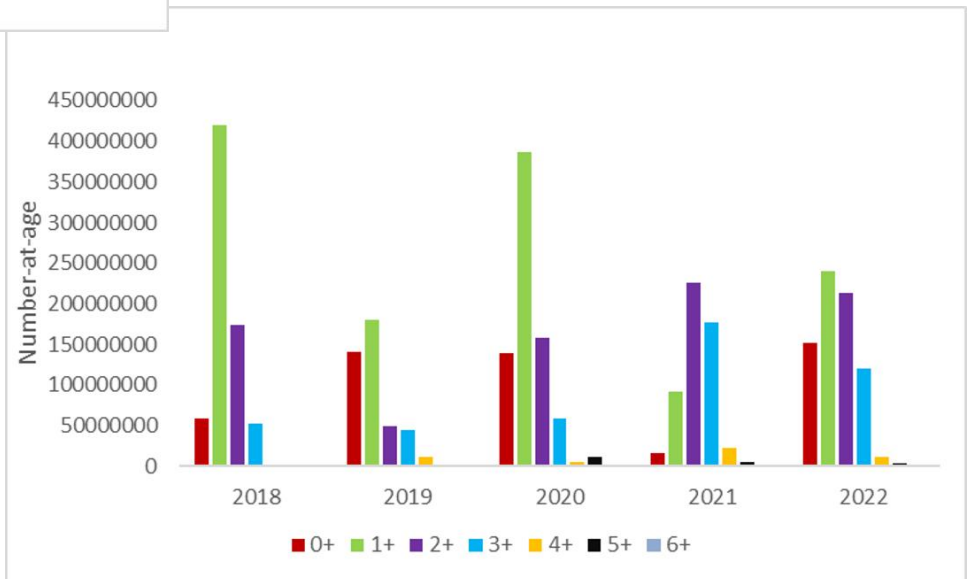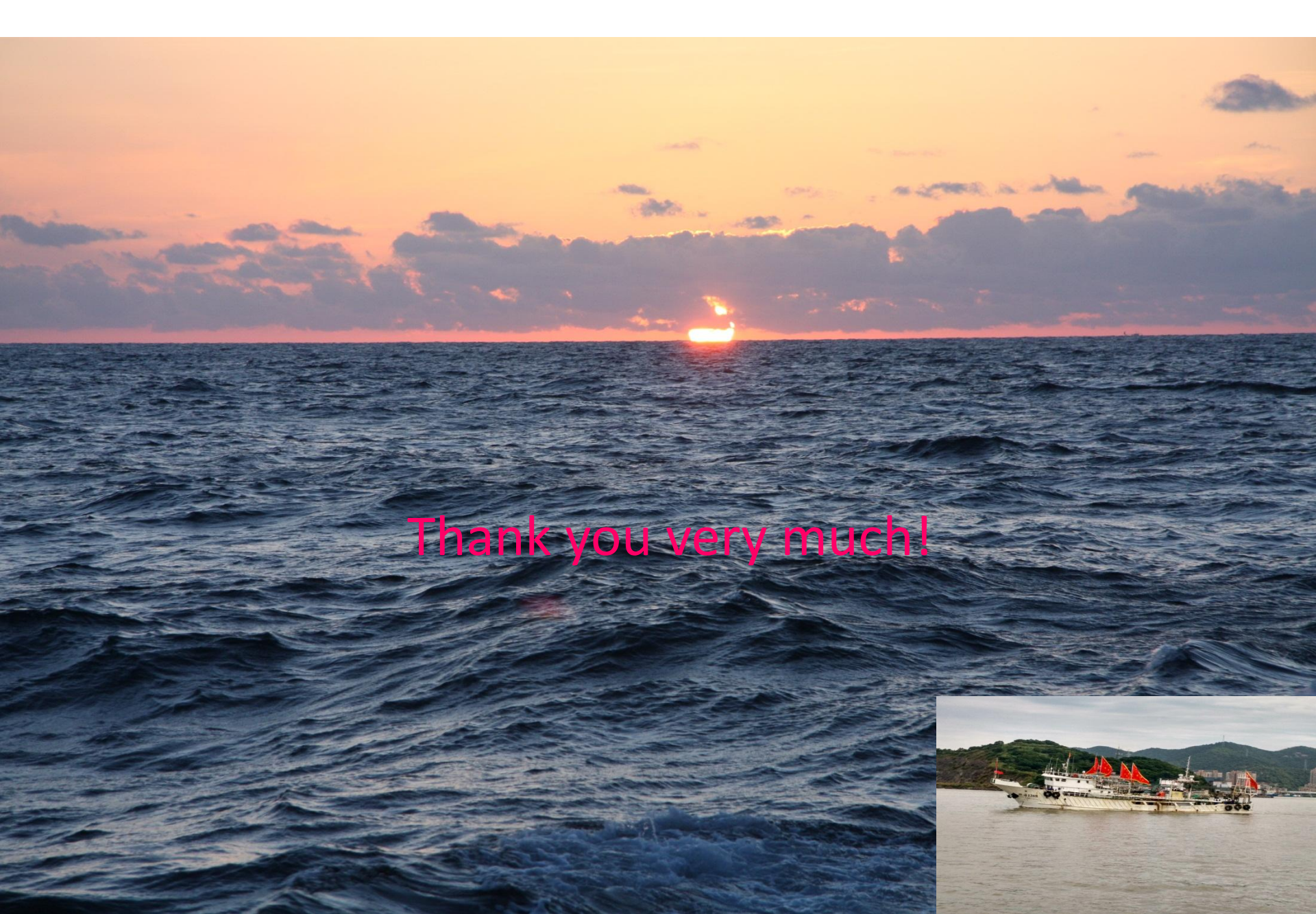
Research activities and training

◆Collection and analysis of all fishing logbooks every year

◆Research Specialist Staff went to fishing vessels or in the ports to collected the samples data

◆Monitor the monthly ratio of chub and blue mackerel catch

◆Biological feature monitoring

- Starting from 2023, we have increased sample collection for large pelagic trawl nets in the North Pacific.

- The fork length frequency in trawl nets is very similar to the purse seine fishery, with very little larger than purse seine causing the larger mesh size. Further analysis is needed.

- It should be noted that chub mackerel and sardine are both target species in China's fisheries. In fact, fishermen prefer to catch chub mackerel because of its slightly higher price.

Suggestions

- Our idea regarding regional observers is that there is sufficient data available for resource assessment of various fish species, currently.

- Each member has their own way of collecting data, which is sufficient to meet the data requirements. Therefore, there is no need establishing regional observers for the mackerels fishery.

Thank you very much!