Review of chub mackerel fishery in China and research activities

China

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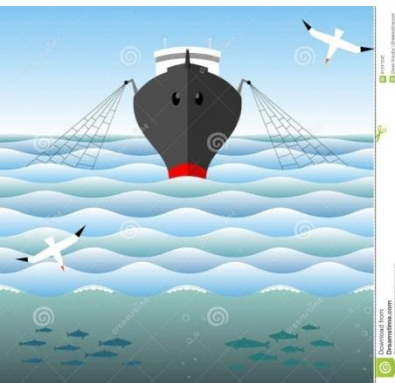
Contents

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

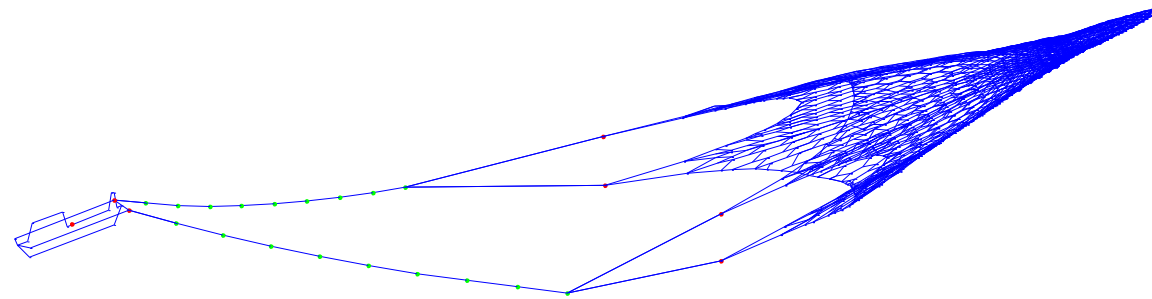In 2023 year, China has two types of fishing nets operated in this fishery including the light-purse seine nets(>96%) and pelagic trawl nets(<3%).

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

	A	B	C	D
1	Year	Total Catch (tons)	Purse seine catch (tons)	Trawl fleet catch(tons)
2	2015	125,965	114473.7	11491.2
3	2016	125,835	105284.08	20550.64
4	2017	146,240		9442.3
5	2018	113,489		7808.25
6	2019	57,284		9927.06
7	2020	78,403		6219.232
8	2021	101,770		11886.3
9	2022	83,142		1961.25

2023 Estimate about 71,000 tons for mackerels

Number of vessels

Year	China		
	Purse seine	Pelagic trawl	
	CA	NW	CA
2022	105	0	2
2021	105	0	3
2020	51	0	2
2019	29	0	3
2018	62	0	3
2017	75	0	3
2016	82	0	7
2015	78	3	2

2023year, about 95

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

The distribution on the chub mackerel is likely with 2022 year
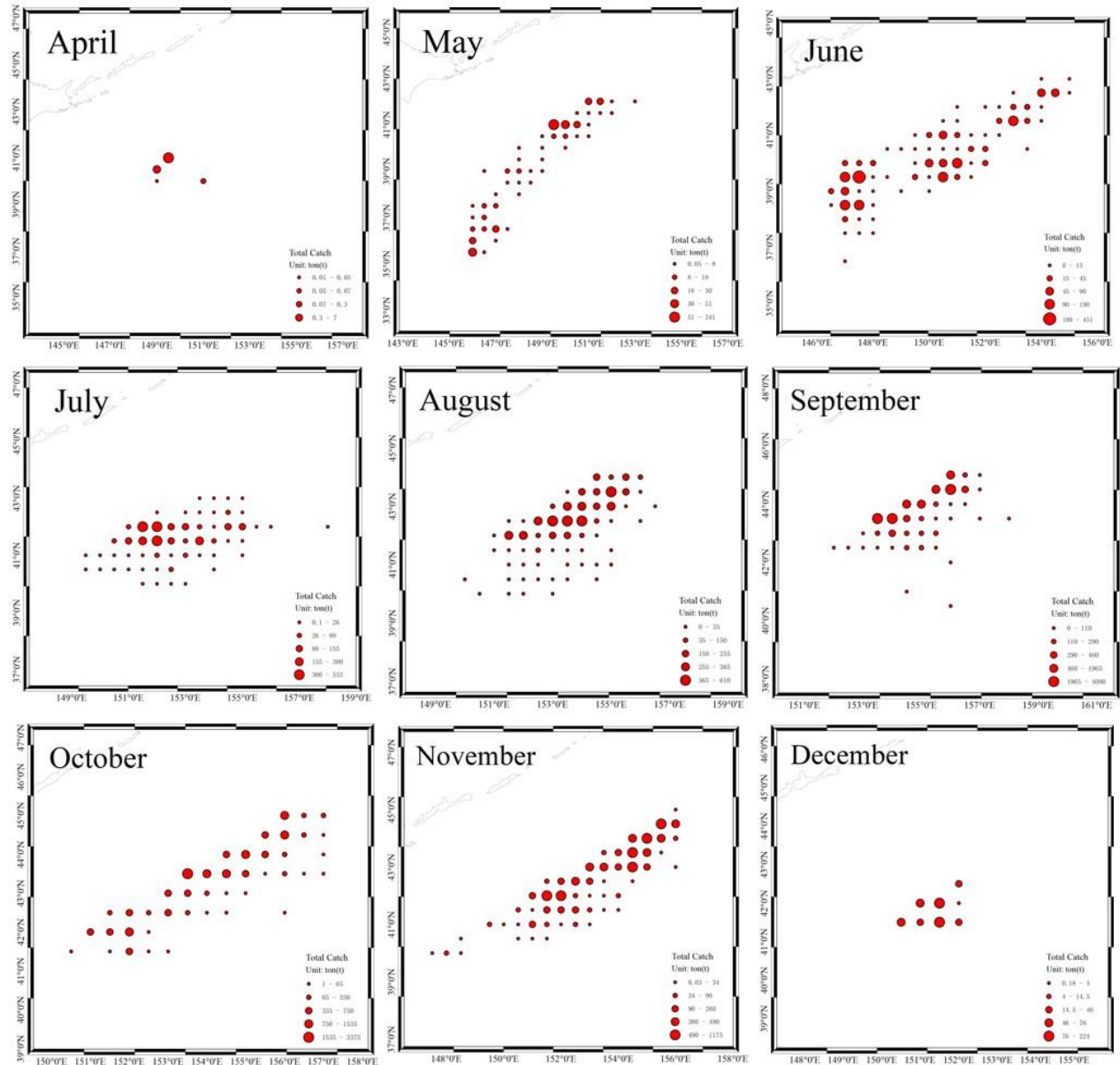
Distribution on the monthly catch of chub mackerel in China in 2022

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）
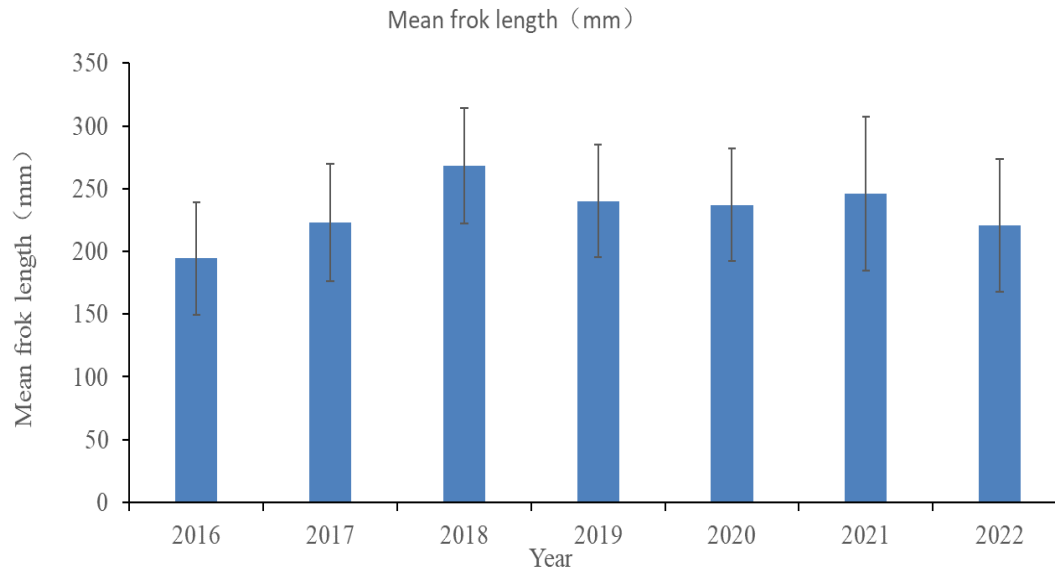
- Relation between weight and fork length
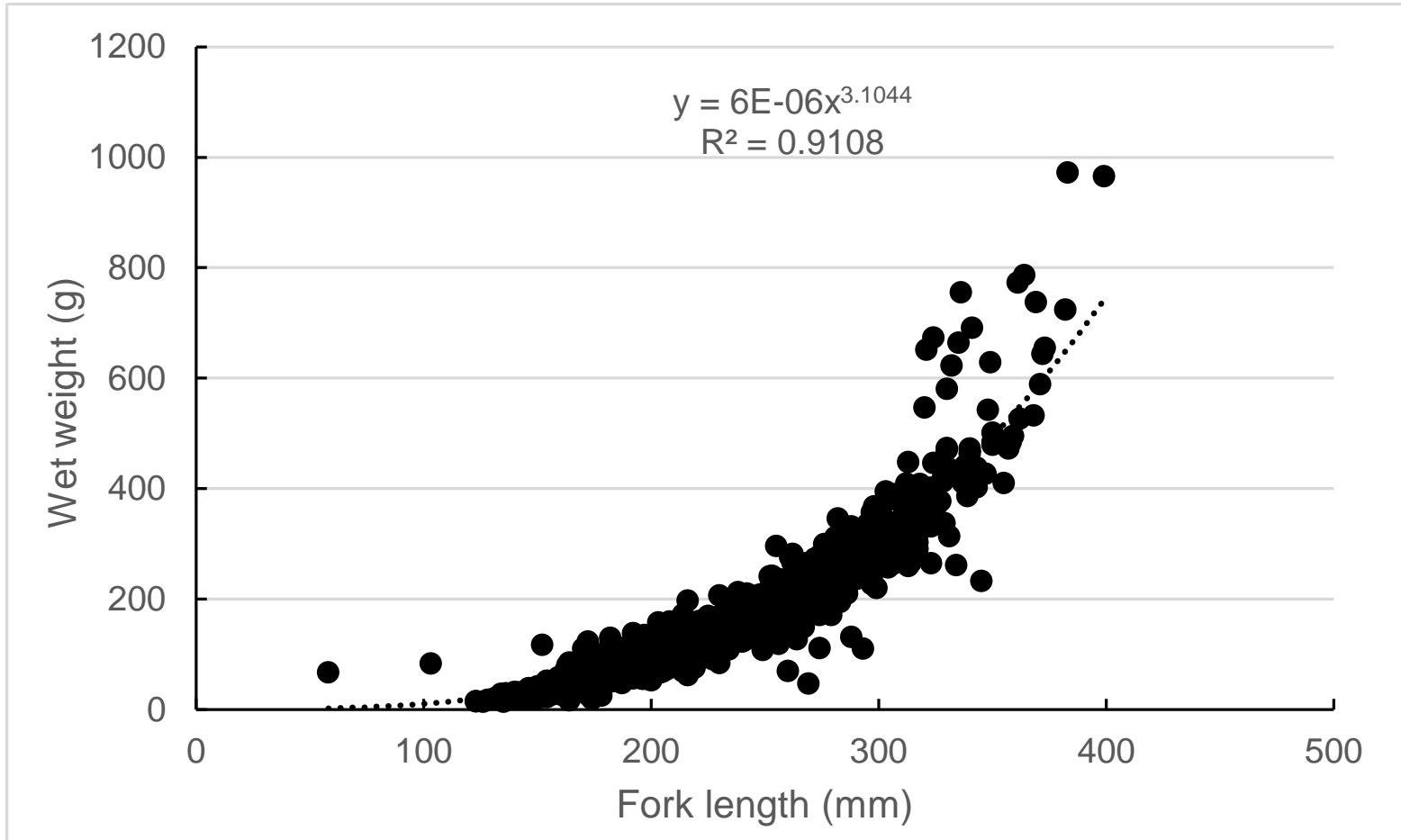
Length-weight relationship of China' chub mackerel in 2022

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

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

Chub mackerel

The first dorsal fin has 9-10 fin spines

Almost no spots

Chub mackerel

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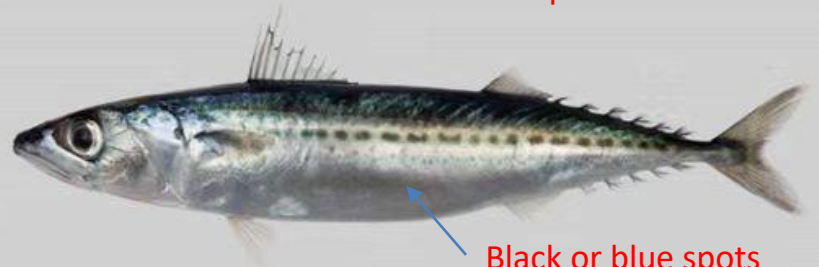
Black or blue spots

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 $I\text{-}V$ 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. <u>The naked eye can clearly see that the ovaries are filled with opaque slightly white or light yellow egg granules</u>.

- 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 500+

ALK table

Spreadsheet — sheet tab "2022" (other tabs: 2023, 2021, 2020, 2019, 2018)

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	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
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	0	1	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

age	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
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	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	0	16	0.246
2	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	0	19	0.292
3	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	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	1	1	0	0	0	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	2	1	0	0	0	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	1	1	1	0	0	0	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	3	4	6	5	7	4	5	5	3	3	2	2	2	2	1	0	2	2	1	1	0	0	0	0	0	0	0	0	0	65	

Oct-Dec

age	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
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	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	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	0	2	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	2	2	3	2	0	0	0	0	0	0	0	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	0	0	2	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	

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

Catch at length

Catch number on Length class (1cm)

Note: only for Chub mackerel

less smaller size samples

no more larger size samples

Year	Quarter	9	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
2016	4	0	0	0	0	0	0	0	2E+06	4E+06	0	0	2E+06	0	0	0	2E+06	6E+06	2E+07	4E+07	2E+07	1E+07	4E+06	2E+06	0	2E+06	0	2E+06	2E+06	6E+06	2E+06	0	0
2017	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23092	68769	22922	206303	527202	137524	0	0	0	0	0	0	0	0	0	0	0
2017	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1E+06	5E+06	4E+06	4E+07	8E+07	2E+07	3E+06	0	0	0	0	0	0	0	0	0	0
2017	3	0	0	0	0	750144	8E+06	24004612	3E+07	2E+07	4E+07	1E+08	1E+08	6E+07	2E+07	2E+07	5E+06	1E+07	8E+06	1E+07	2E+07	2E+07	5E+06	8E+05	2E+06	0	2E+06	0	0	0	0	0	0
2017	4	0	0	0	0	0	0	0	0	2E+06	4E+06	1E+07	2E+07	2E+07	2E+07	1E+07	9E+06	0	0	2E+06	7E+06	2E+07	5E+07	2E+07	9E+06	2E+06	0	0	0	0	0	0	0
2018	1	0	0	0	0	0	0	0	0	1062.1	1092.3			2119.2	2118.7	4237.4	2118.8	4237.6	7415.1	7415.7	3178.1	5294.3	0	1059	0	0	0	0	0	0	0	0	0
2018	2	0	0	0	0	0	0	0	0	2E+06	2E+06	1E+07	2E+07	3E+07	2E+07	2E+07	3E+07	3E+07	2E+07	2E+07	9E+06	1E+07	0	2E+06	3E+06	5E+06	2E+06	3E+06	2E+06	0	0	0	0
2018	3	0	0	0	0	0	0	0	0	0	0	9E+06	7E+06	2E+07	2E+07	2E+07	2E+07	9E+06	2E+06	4E+06	2E+06	7E+06	2E+07	2E+07	3E+07	1E+07	9E+06	2E+06	0	0	2E+06	0	0
2018	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	906057	2E+06	9E+06	2E+07	1E+07	1E+07	9E+05	0	0	0	0	0	0	0
2019	1	0	0	0	0	0	0	0	35420	472315	1E+06	3E+06	1E+06	598838	885584	1E+06	1E+06	531413	318880	106295	35453	35450	1E+05	3E+05	2E+05	2E+05	0	0	0	0	0	0	0
2019	2	0	0	0	0	0	0	0	362555	4E+06	1E+07	2E+07	1E+07	1E+07	8E+06	9E+06	1E+07	6E+06	5E+06	6E+06	5E+06	4E+06	5E+06	4E+06	3E+06	3E+06	2E+05	2E+05	2E+05	0	0	0	0
2019	3	0	0	0	0	0	0	0	723561	6E+06	3E+06	1E+06	4E+06	2E+06	4E+06	5E+06	4E+06	7E+06	3E+06	4E+06	9E+06	1E+07	7E+06	1E+07	7E+06	8E+06	3E+06	7E+05	0	0	0	0	0
2019	4	0	0	0	0	0	0	0	0	264462	529400	2E+06	3E+06	2E+06	3E+06	2E+06	1E+06	0	0	529908	1E+06	5E+06	1E+07	6E+06	4E+06	5E+05	0	0	0	0	0	0	0
2020	1	0	0	0	0	0	0	0	0	0	18720	45499	168495	496100	496095	84238	35649	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	2	0	0	0	0	0	3E+05	1558791	566867	850904	1E+06	3E+06	7E+06	1E+07	1E+07	8E+06	6E+06	4E+06	5E+06	1E+06	1E+06	141938	3E+05	4E+05	2E+06	1E+06	1E+06	1E+05	0	0	0	0	0
2020	3	0	608112	4E+06	608112	6E+06	3650069	1E+06	2E+07	3E+07	2E+07	3E+07	4E+07	2E+07	1E+07	8E+06	1E+07	2E+07	2E+07	1E+07	2E+06	1E+06	0	6E+05	0	0	0	0	0	0	0		
2020	4	0	0	0	0	0	0	0	0	0	0	0	896701	448351	3E+06	1E+07	2E+07	3E+07	2E+07	2E+07	5E+06	1E+06	3E+06	1E+06	5E+06	4E+06	1E+06	2E+06	0	9E+05	4E+05		
2021	1	0	0	0	0	0	0	0	0	0	0	1609	1426.5	3026.5	0	0	0	13615	15135	49044	52966	45517	27238	16646	1513	3027	3027	0	0	0	0	0	
2021	2	0	0	0	0	0	0	0	0	192197	192197	1E+06	960983	2E+06	768813	2E+06	961042	2E+06	3E+06	5E+06	1E+07	1E+07	8E+06	7E+06	3E+06	2E+06	1E+06	1E+06	0	0	0	0	0
2021	3	0	2E+07	6E+07	3E+07	2486277	0	1243138	0	5E+06	1E+07	1E+07	1E+07	3E+07	5E+07	5E+07	5E+07	2E+07	1E+07	4E+06	1E+06	7E+06	2E+06	1E+06	0	0	0	0	0	0	0	0	0
2021	4	0	0	0	0	0	0	0	0	0	1E+06	5E+06	2E+07	2E+07	2E+07	3E+07	1E+07	4E+06	7E+06	5E+06	0	0	1E+06	4E+06	9E+06	8E+06	5E+06	4E+06	2E+06	0	1E+06	0	0
2022	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	0	0	0
2022	2	0	0	0	174636	917020	3E+06	916975.6	349246	87197	0	0	309616	1E+06	1E+06	2E+06	2E+06	2E+06	2E+06	2E+06	2E+06	985848	1E+06	8E+05	5E+05	5E+05	4E+05	3E+05	87318	43659	0	0	0
2022	3	0	0	0	0	0	5E+06	18059461	4E+07	5E+07	4E+07	3E+07	3E+07	2E+07	2E+07	2E+07	1E+07	1E+07	2E+07	8E+06	7E+06	2E+06	2E+06	6E+05	0	0	6E+05	0	1E+06	2E+06	0	6E+05	0
2022	4	0	0	0	0	0	1E+06	6485109	2E+07	3E+07	4E+07	4E+07	2E+07	1E+07	4E+06	3E+06	8E+06	1E+07	2E+07	6E+06	9E+06	6E+06	3E+06	5E+06	3E+06	7E+06	0	6E+05	0	0	0	0	0
2023	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	0	0	0
2023	2																																

Catch at length (China)

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+	
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

| 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								

Fewer samples from the older age group

In 2022, weight at age become larger than early years

Catch or number at age
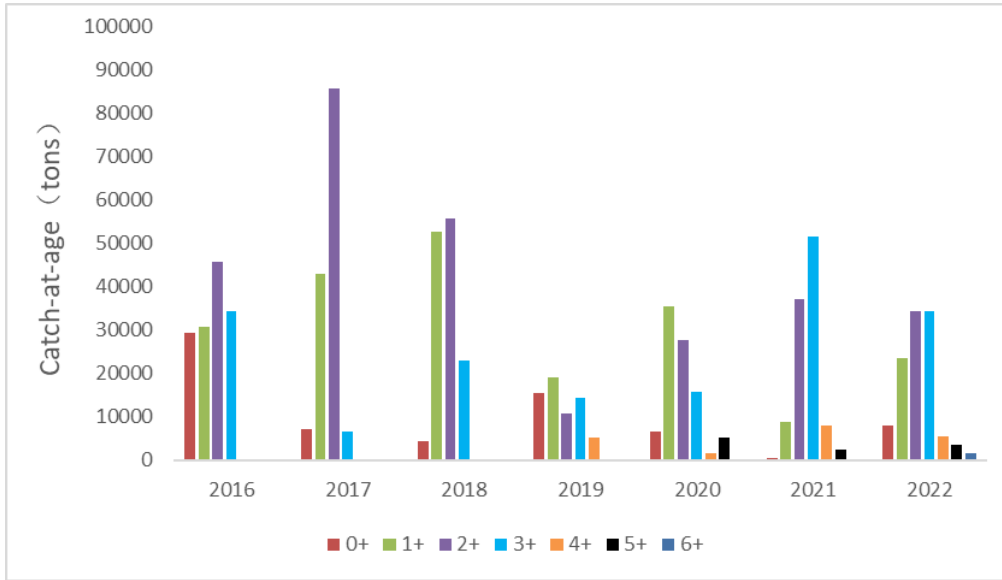
In 2022，the main individuals at age range from 1+ to 3+
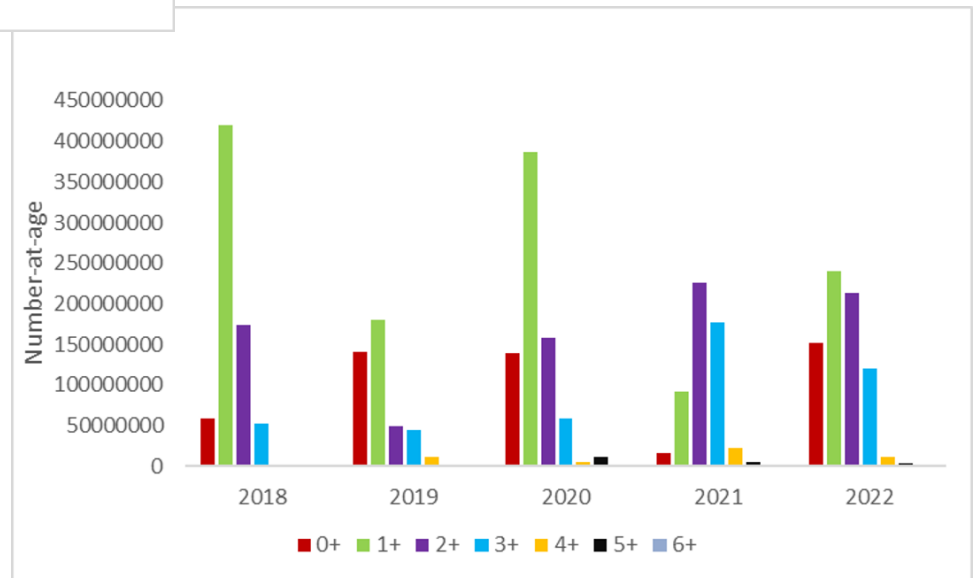
Research activities and training

◆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 difference. 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.

- Thank you very much!