Agenda Item 6.1

Catch at length, age length key, and catch at age of chub mackerels *Scomber japonicus* caught in the northwestern Pacific Ocean by China, Japan, and Russia

NPFC 2024 TWG CMSA8 WP15

AKIHIRO MANABE , RYUJI YUKAMI , MOMOKO ICHINOKAWA (JPN), HENG ZHENG (CHN), IGOR CHERINENKO, EMILIYA(RUS), CHERINENKO(RUS)

JAN 22 2024, NIIGATA, JAPAN

PRIOR to the meeting…

NOV 15, 2023 – TWG CMSA 2023 Int 03

Discussion and comparison of the submitted data for

- Catch at length (CAL)
- Age length key (ALK)
- Catch at age (CAA)
- Weight at age (WAA)
- Maturity at age (MAA)

from China and Japan

REMAINING works to this meeting

CAA

- Standardization of age determination method (future)
- Prepare fishing year-based data for 2014 to 2017
- Convert submitted data to fishing year-based data

WAA

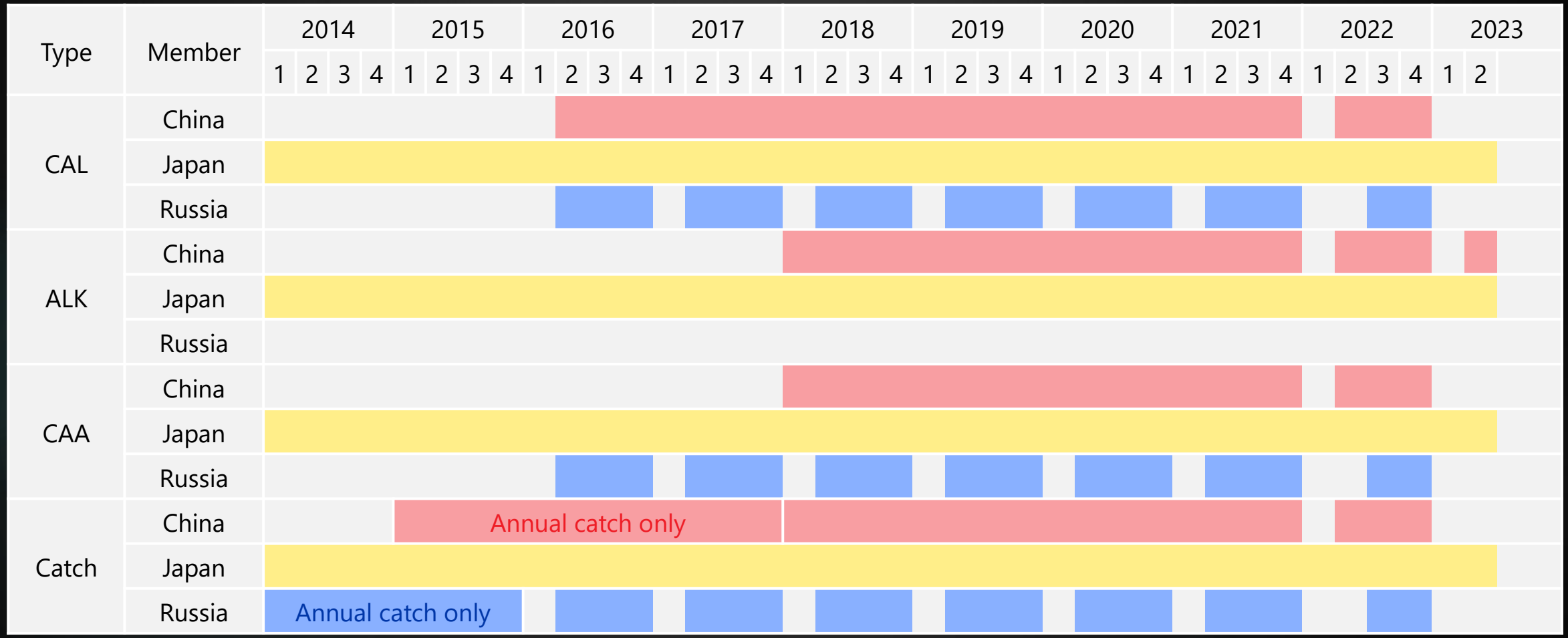
- Conversion of Chinese quarterly WAA into fishing year-basis
- How to define WAA representing stock in SAM

MAA

- How do we fill gaps among members -> mechanism solved
- How do we set MAA in SAM -> mechanism solved

SUBMITTED data for TWG CMSA08

- China, Japan, and Russia submitted data to collaboration site

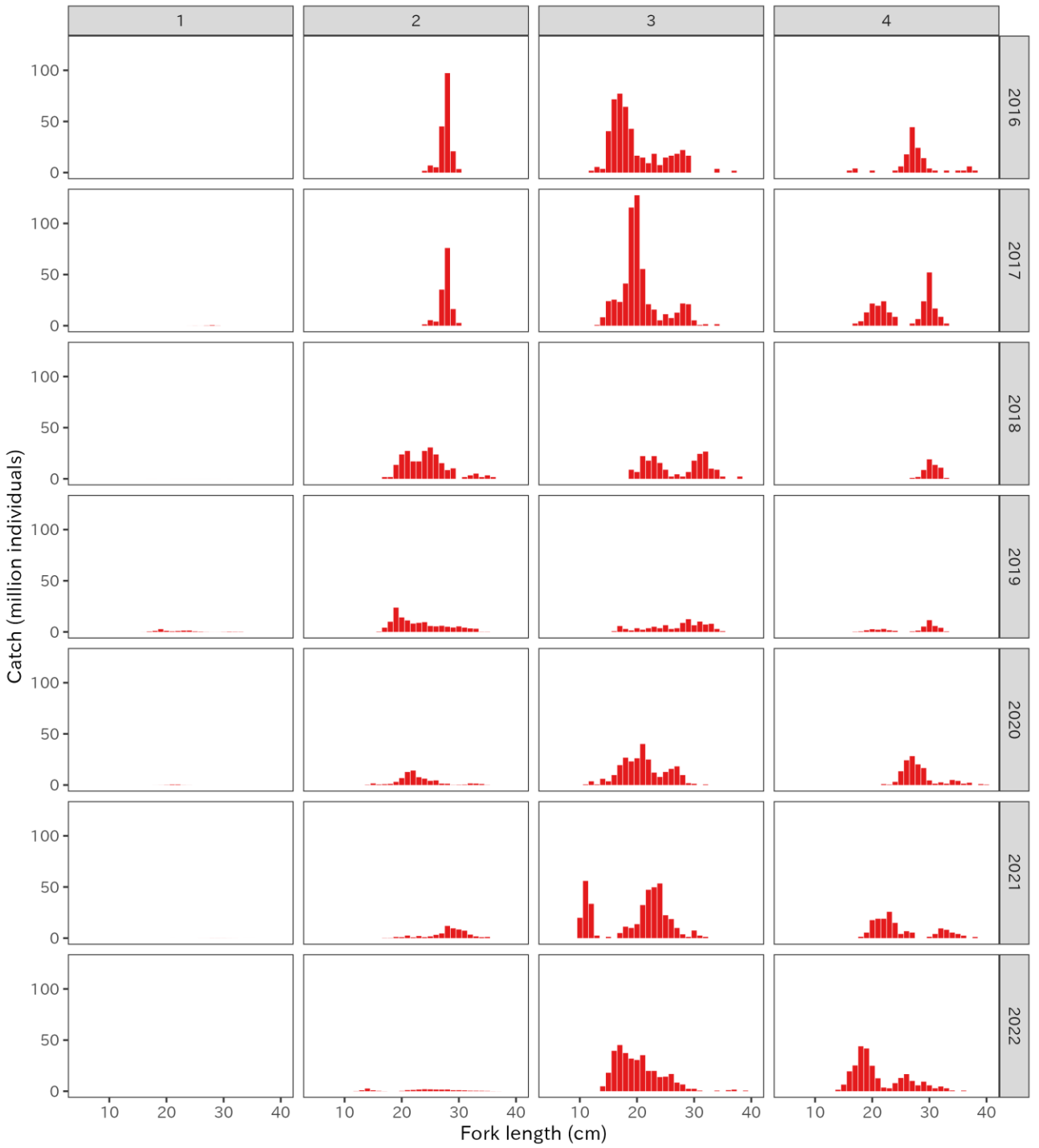


DATA from Japan

- Japanese data is collected by the major landing ports along the Pacific coast of Japan with variety of fishing gears
- Data are calculated by two regions
  - **Eastern Japan** – East from Shizuoka prefecture, migrating population
  - **Western Japan** – West of Shizuoka prefecture, local population

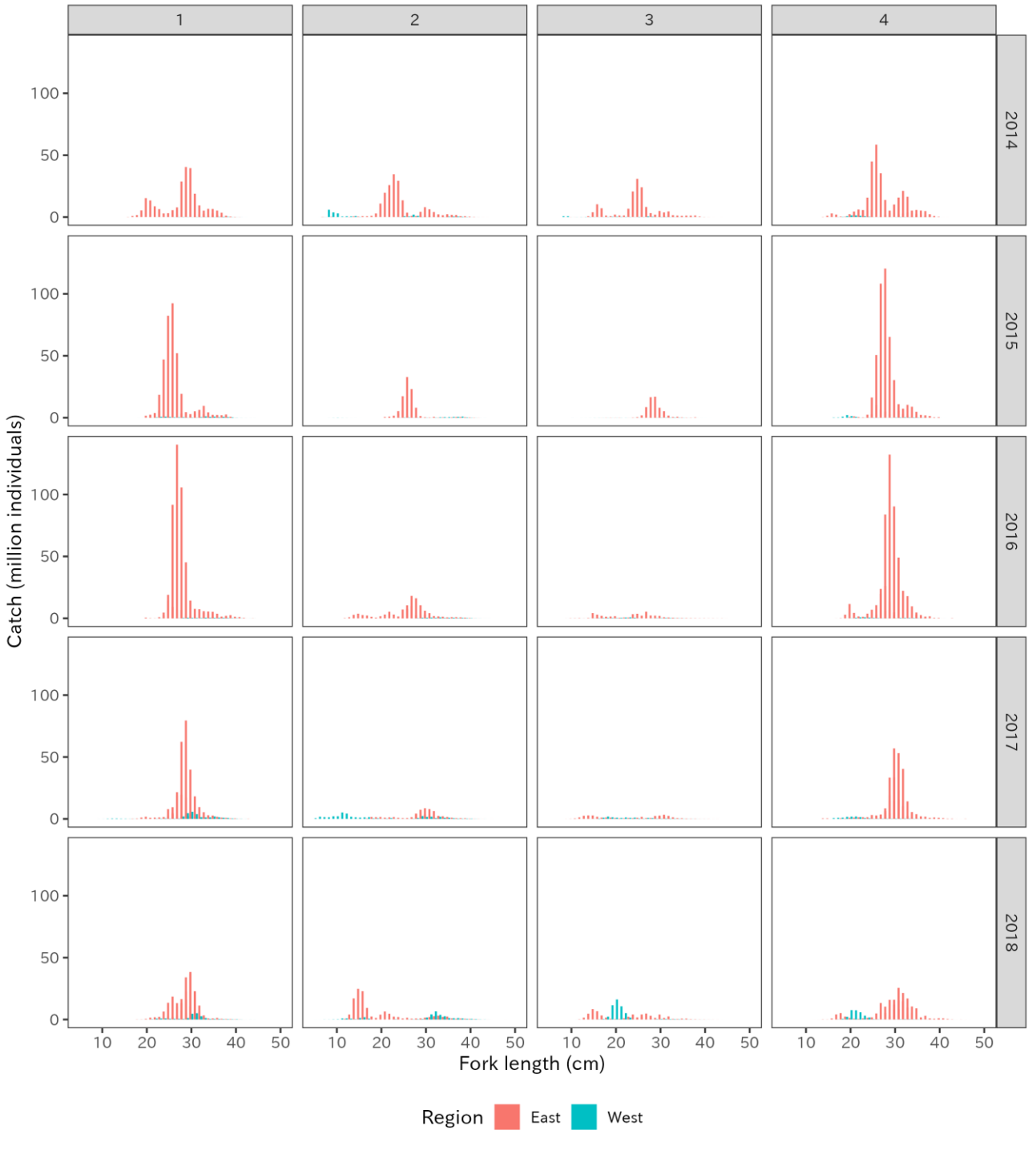
CAL - CHINA

- Quarterly CAL data from 2016
- Data collected by subsampling of the catch @ where?
- Mostly Q2-Q4
- Notable peak in <20cm in Q3
- Bimodal in Q4



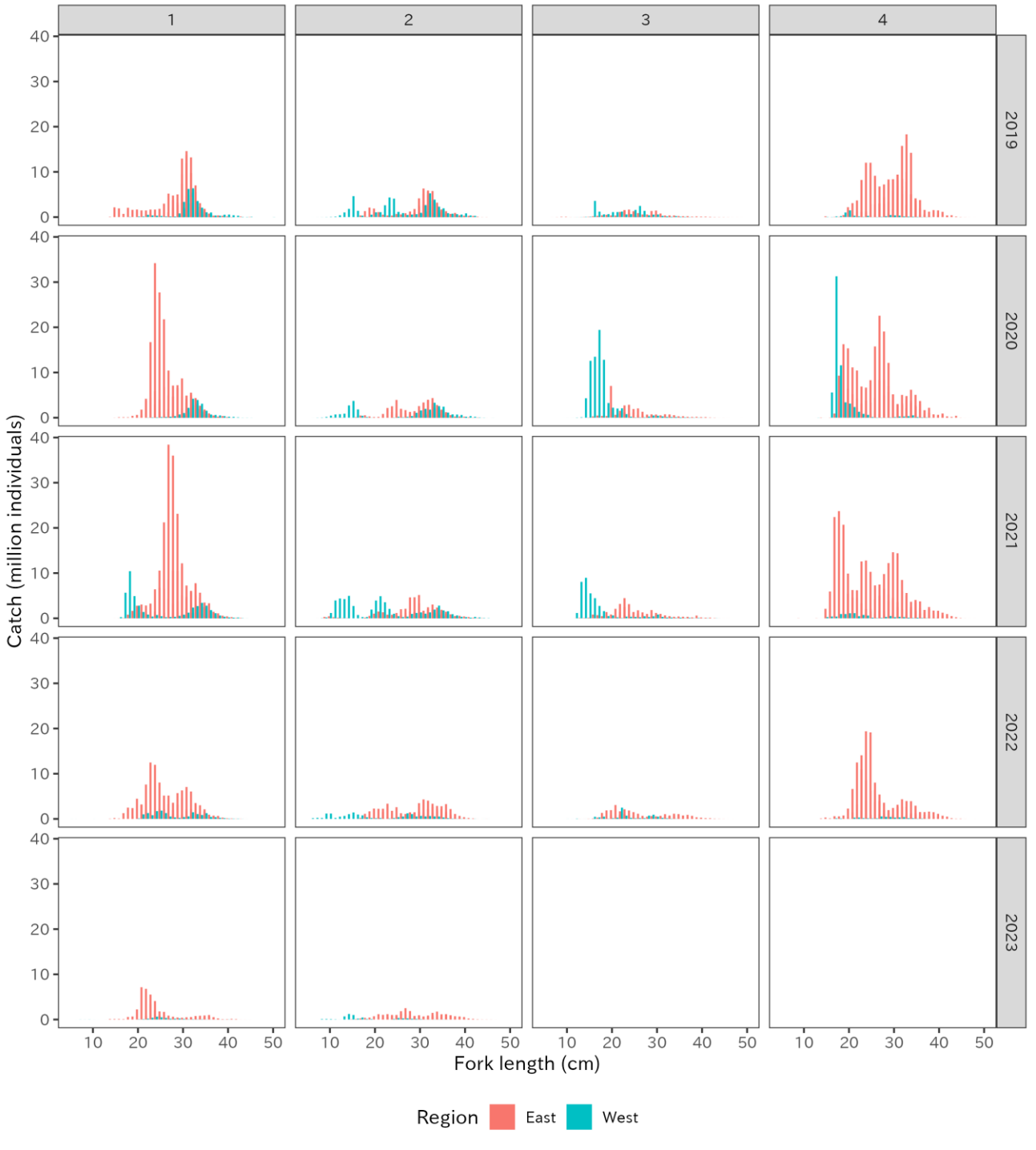
CAL – Japan

- 2014-2018
- Y-axis scale up to 150 million indiv.
- Distinct difference in catch number between Eastern/Western
- Catch peaks are in Q1 and Q4
  - Consecutively from Q4 to Q1
- Significant peak sizes (approx.)
  - Q1/Q4 28-32cm FL
  - Q2/Q3 15cm FL, 25cm FL



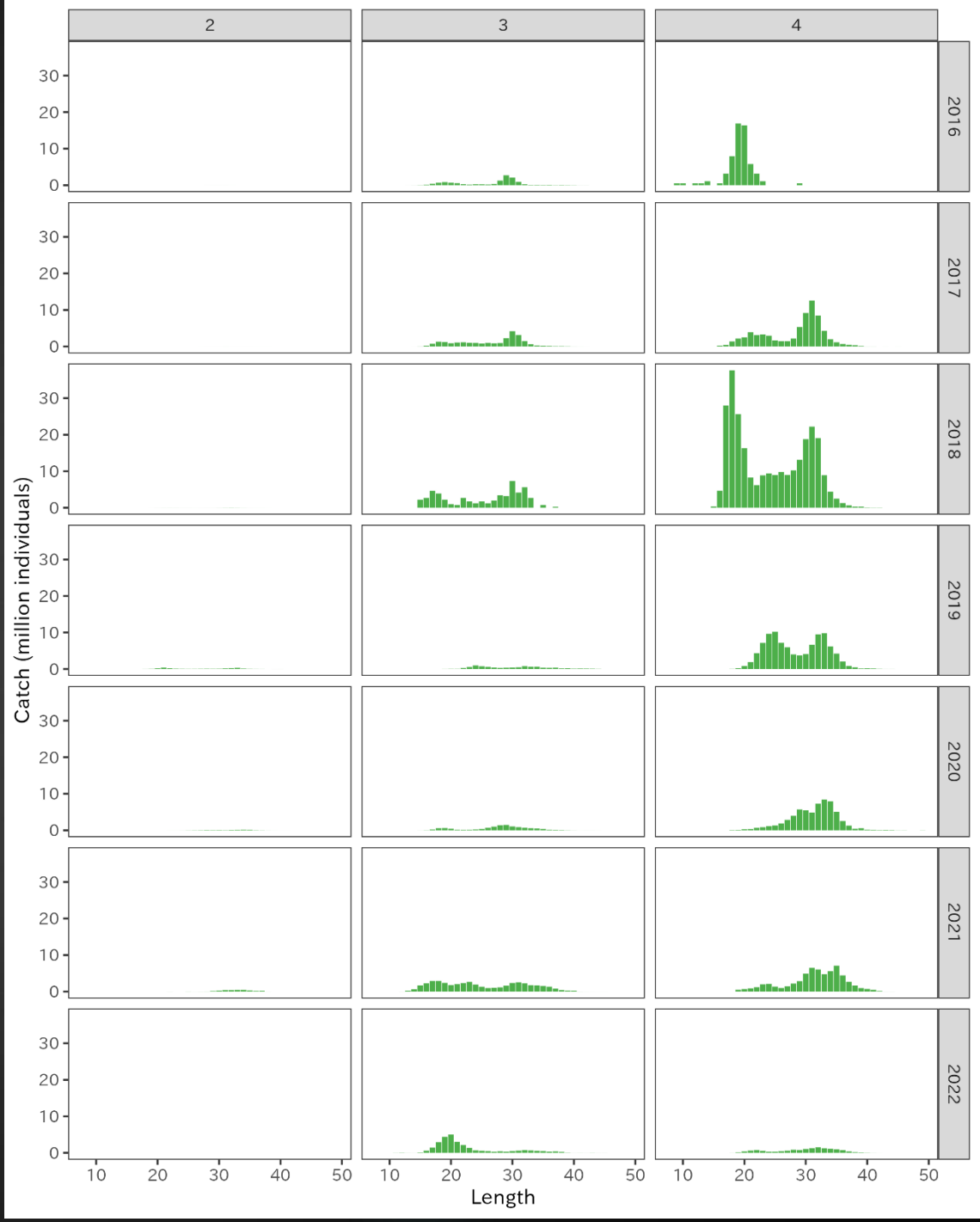
CAL – Japan

- 2019-2023
- Y-axis scale up to 40 million indiv.
- Reduced catch in Q1 and Q4
- Significant peak sizes (approx.)
  - Q1 25-32cm FL
  - Q2/Q3 < 20cm FL
  - Q4 bimodal with <25cm FL

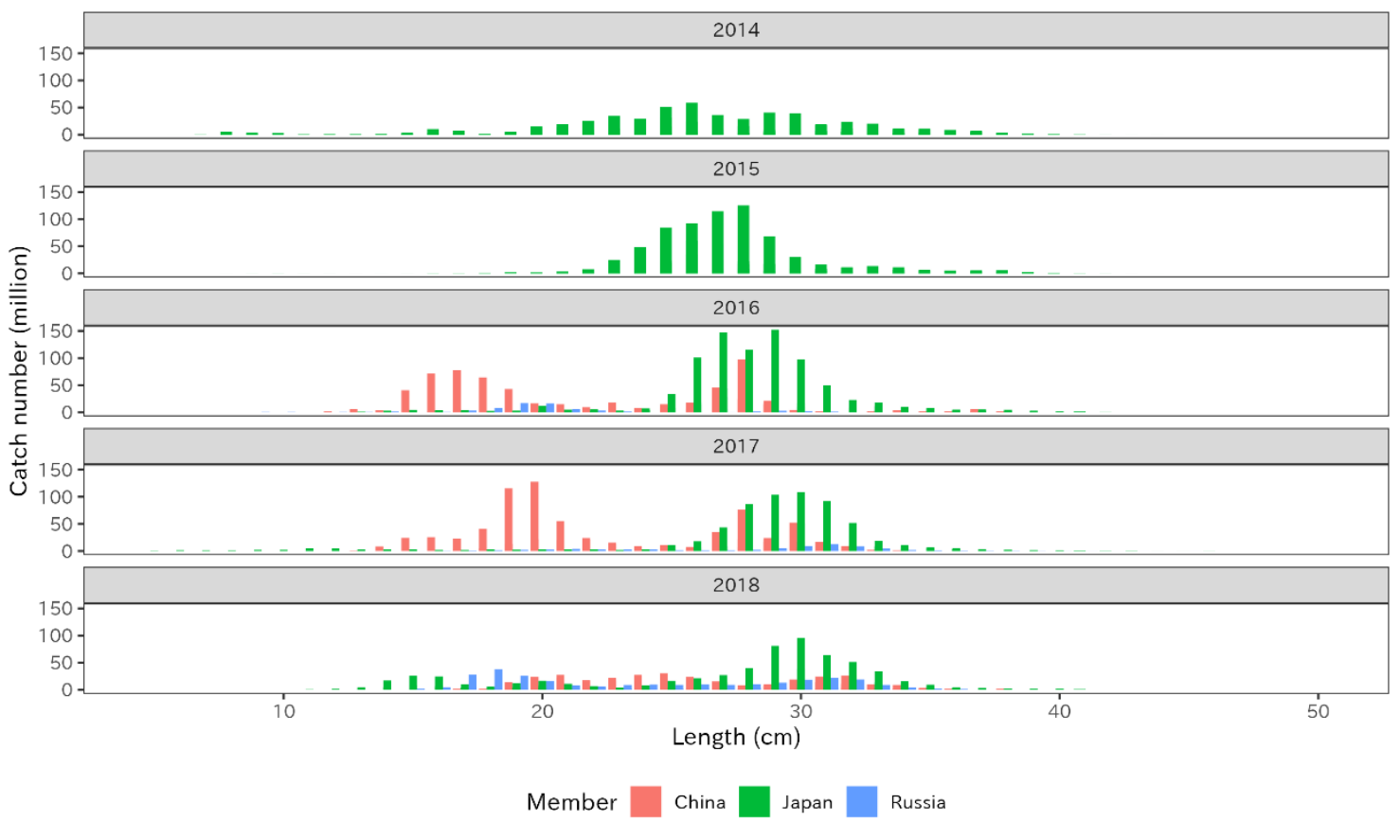


CAL – Russia

- 2016-2022
- No data (catch) in Q1
- Very little catch in Q2
- Catching larger individuals (>35cm FL) in Q4
- Catch is mainly in Q4

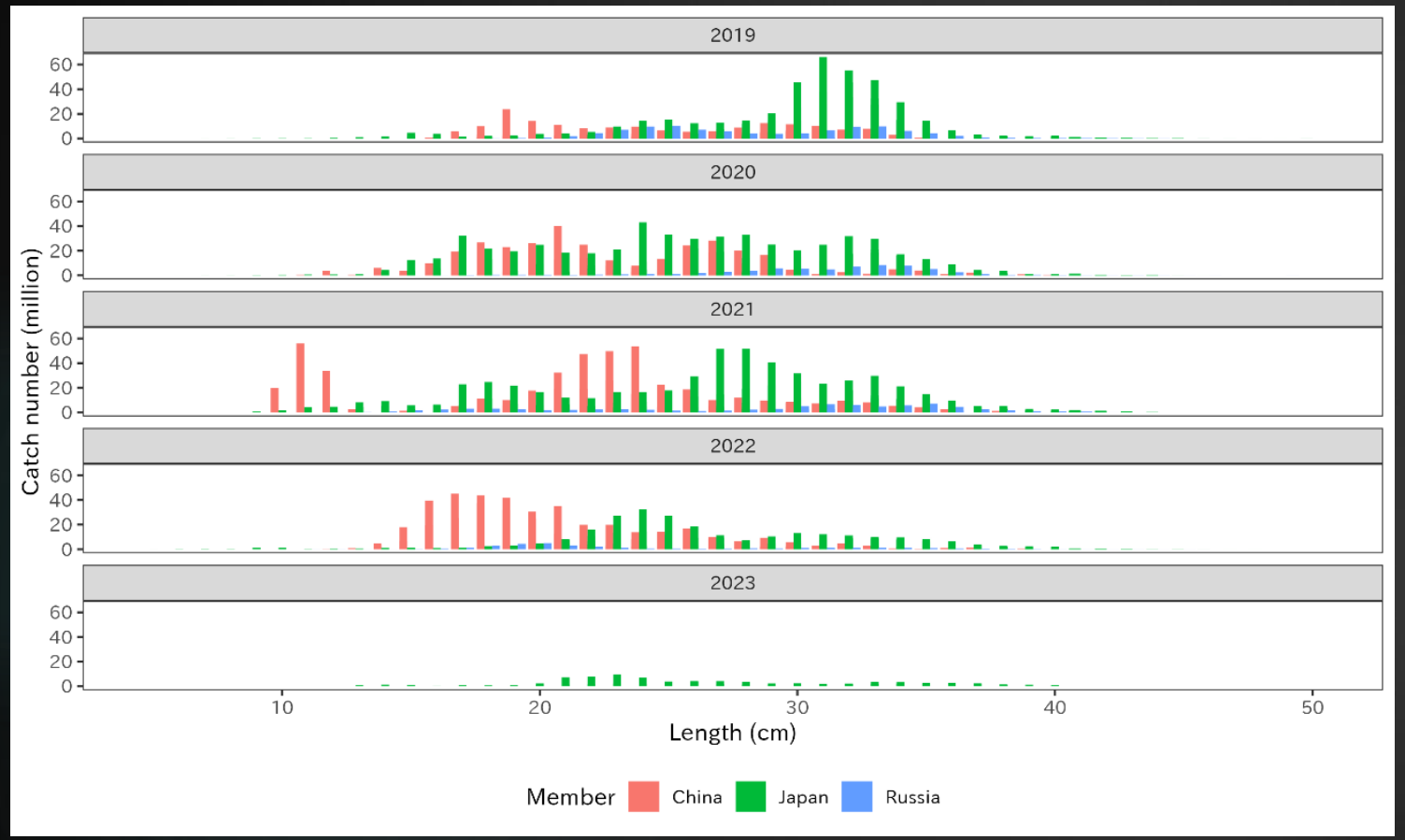


CAL comparison (2014-2018)



- Distinct difference in size composition
- Japanese catches shift to larger as the growth of 2013 year class
- Chinese catches have another distinct peak in small size
- Russian catch is similar to Japanese pattern but also catches small size

CAL comparison (2019-2023)



- Still difference in size composition between China and Japan
- Size composition is different because the main fishing season and location are different
  - China catches in CA, catching fishes during feeding migration
  - Japan catches in EEZ, spawning and wintering population

Next -> Age Length Key

Age determination

	CHINA	JAPAN
Age determination	Increments in otolith	Increments on scale, few use otolith
Samples	By commercial vessels	By major landing harbors of each prefecture
Date of age incrementation (1st day age is added by 1)	January 1st	July 1st
		

Age length key

- Number of aged data for ALK
- When aged data at length is absent
  - Chinese data used NA
  - Japanese data used “default-ALK”, averaged age composition at length to supplement the missing data

Year	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Total
2018	64	102	49	45	260
2019	39	61	53	39	192
2020	29	88	78	82	277
2021	67	114	108	45	334
2022	0	78	65	70	213
2023	0	96	-	-	96

Year	Region	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Total
2014	East	745	845	242	539	2371
	West	104	143	31	32	310
2015	East	746	1051	504	540	2841
	West	52	70	31	59	212
2016	East	464	248	127	278	1117
	West	248	103	45	51	447
2017	East	755	601	205	502	2063
	West	204	249	152	72	677
2018	East	845	670	87	189	1791
	West	317	399	299	135	1150
2019	East	813	488	342	646	2289
	West	764	572	129	307	1772
2020	East	1213	601	411	861	3086
	West	667	145	31	42	885
2021	East	1015	822	649	847	3333
	West	30	31	86	92	239
2022	East	842	628	513	855	2838
	West	86	83	211	90	470
2023	East	727	553	0	0	1280
	West	285	174	0	0	459

Age Length Keys

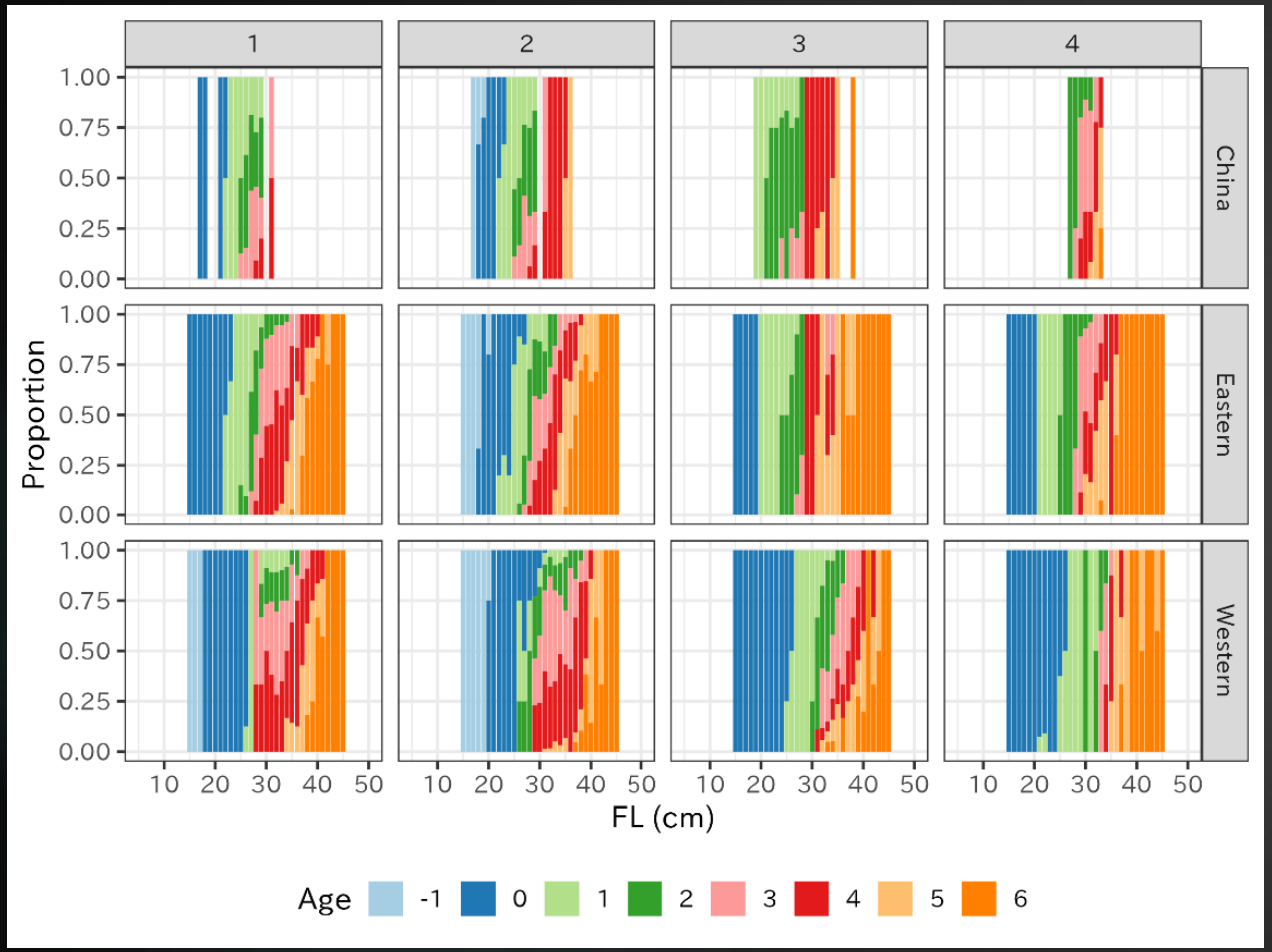
- China and Japan had submitted ALK
- Japanese ALK data are composed into two regions Eastern/Western
- Russia does not develop ALK and uses Eastern Japanese ALK due to similarity in catch composition
- > 45 cm FL are considered as age-6+
- < 15 cm FL are considered as age-0

Conversion of ages to fishing year based

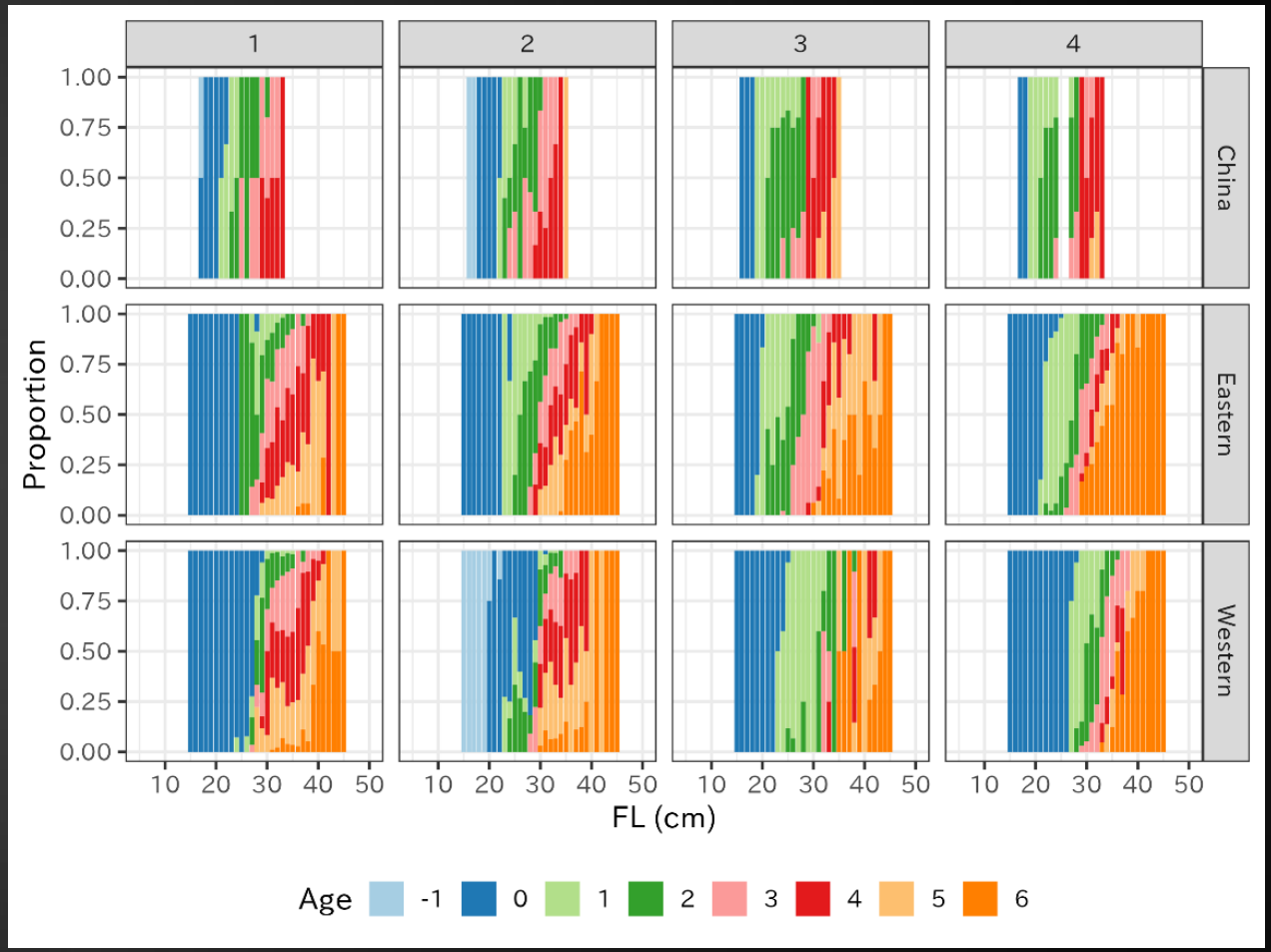
- NPFC2023TWG CMSA7 had agreed to use 7/1 as the day of age incrementation
- Ages need to be converted to fishing year-based
- Age in Q1 and Q2
  - Age are subtracted by 1
- Age in Q3 and Q4
  - Remains as is
- Japanese age data include age-0 (newly born) fish in Q1 and Q2, due to occurrence of early spawning event
  - Converted to age-minus1. Added to Age-0 in the following fishing year for catch at age calculation

ALK (2018-2019)

2018



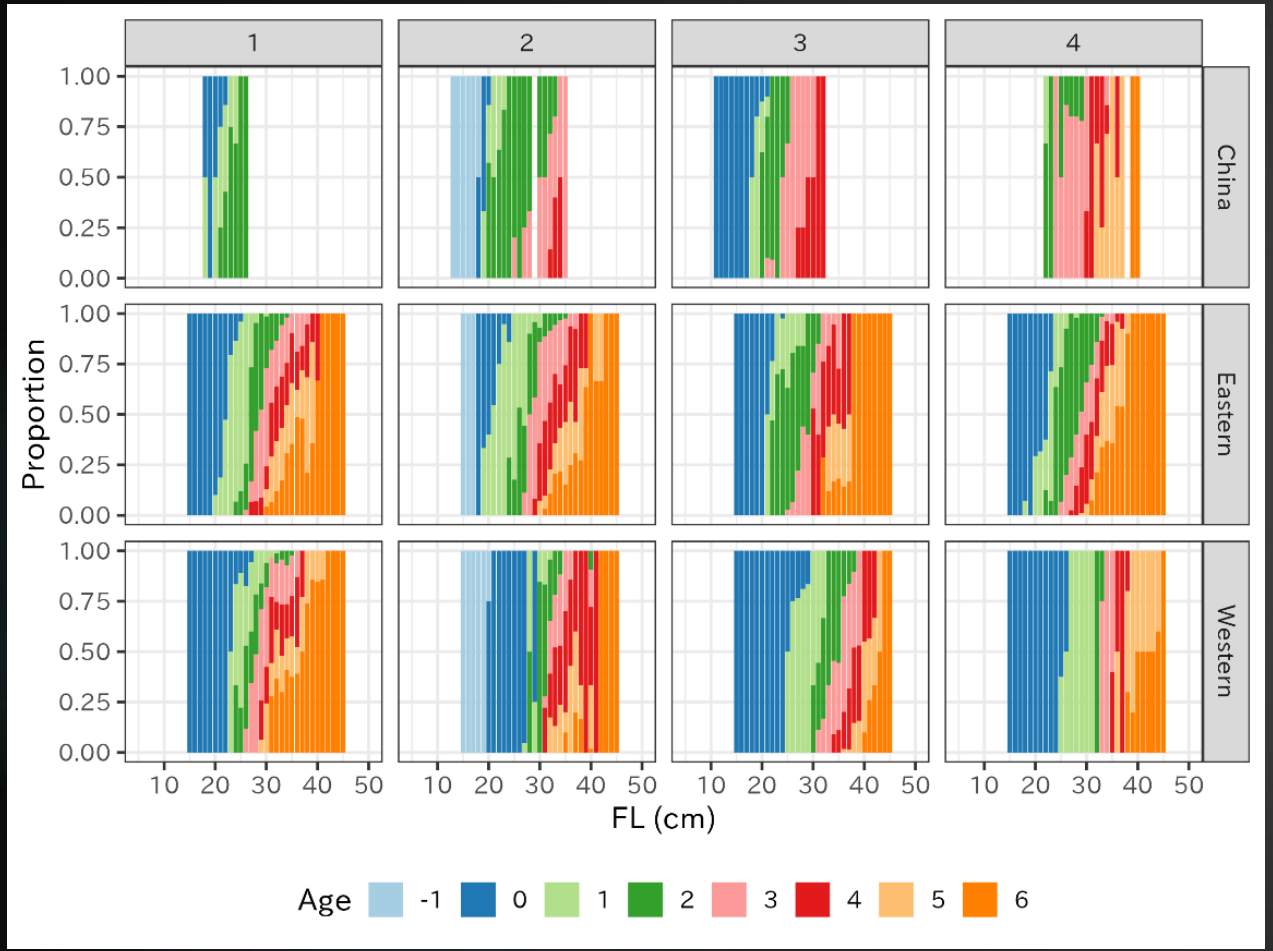
2019



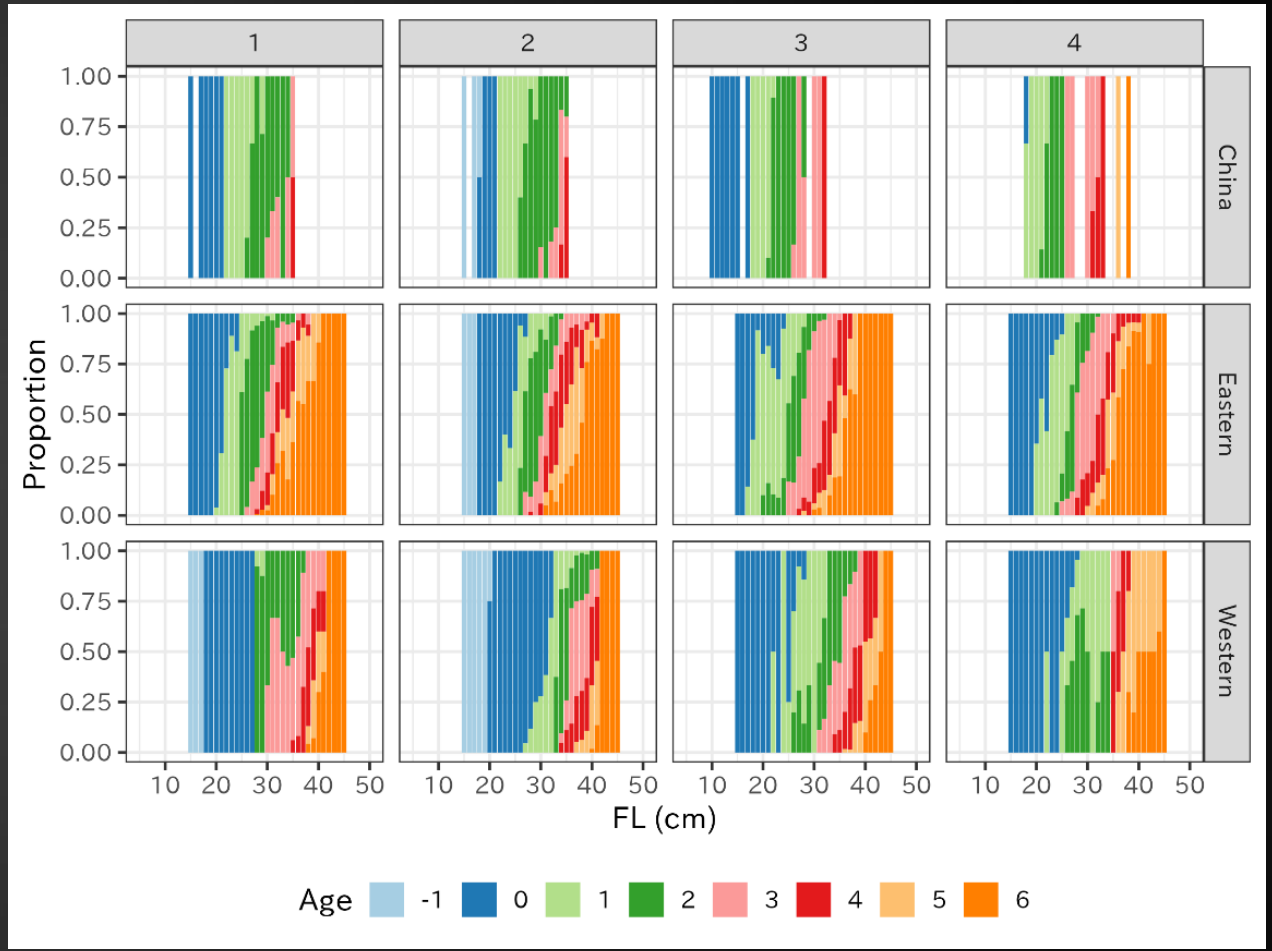
- Appearance of stronger 2018-year class can be observed
- Chinese and Japanese Eastern ALKs exhibit similar pattern

ALK (2020-2021)

2020



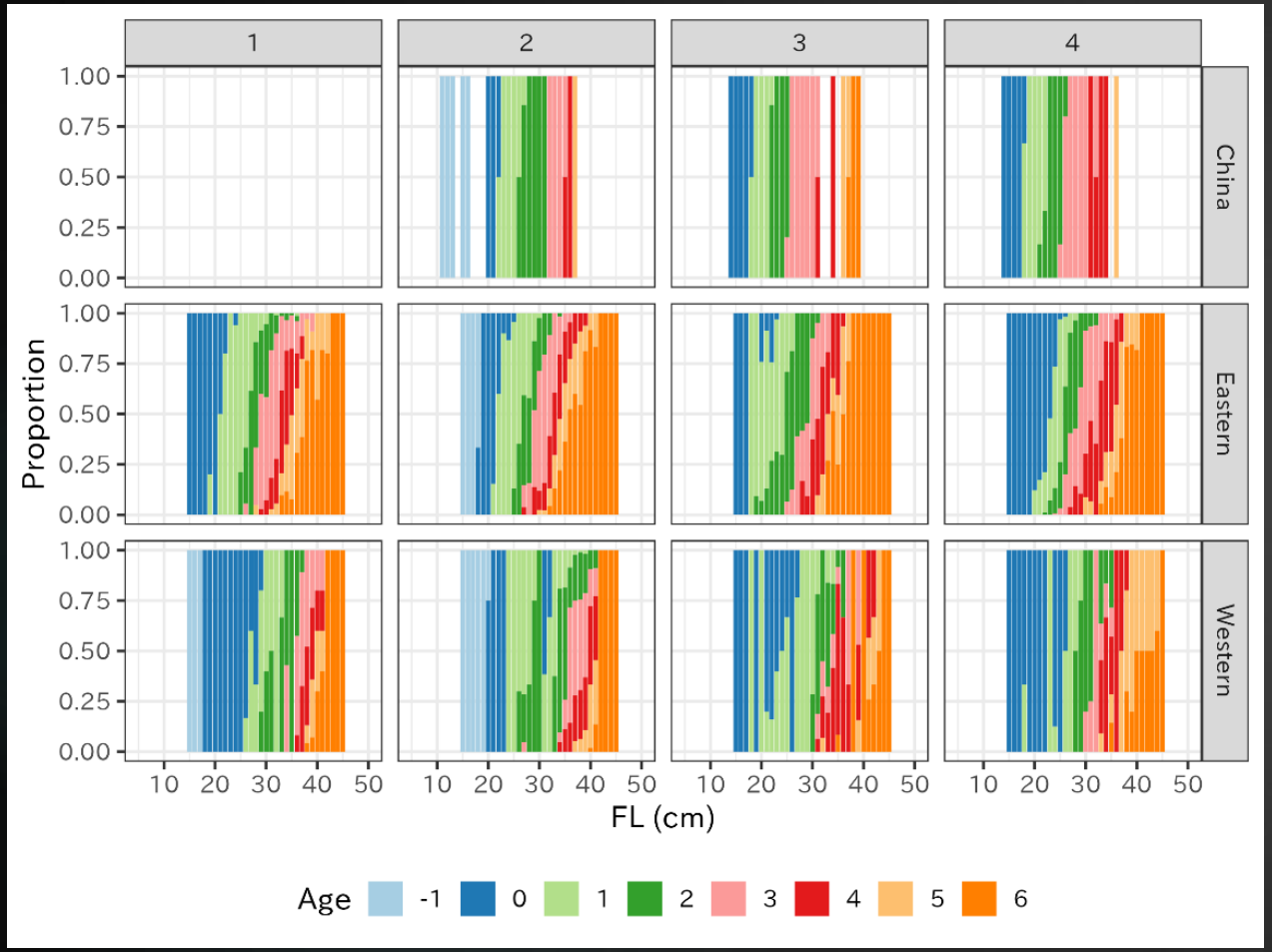
2021



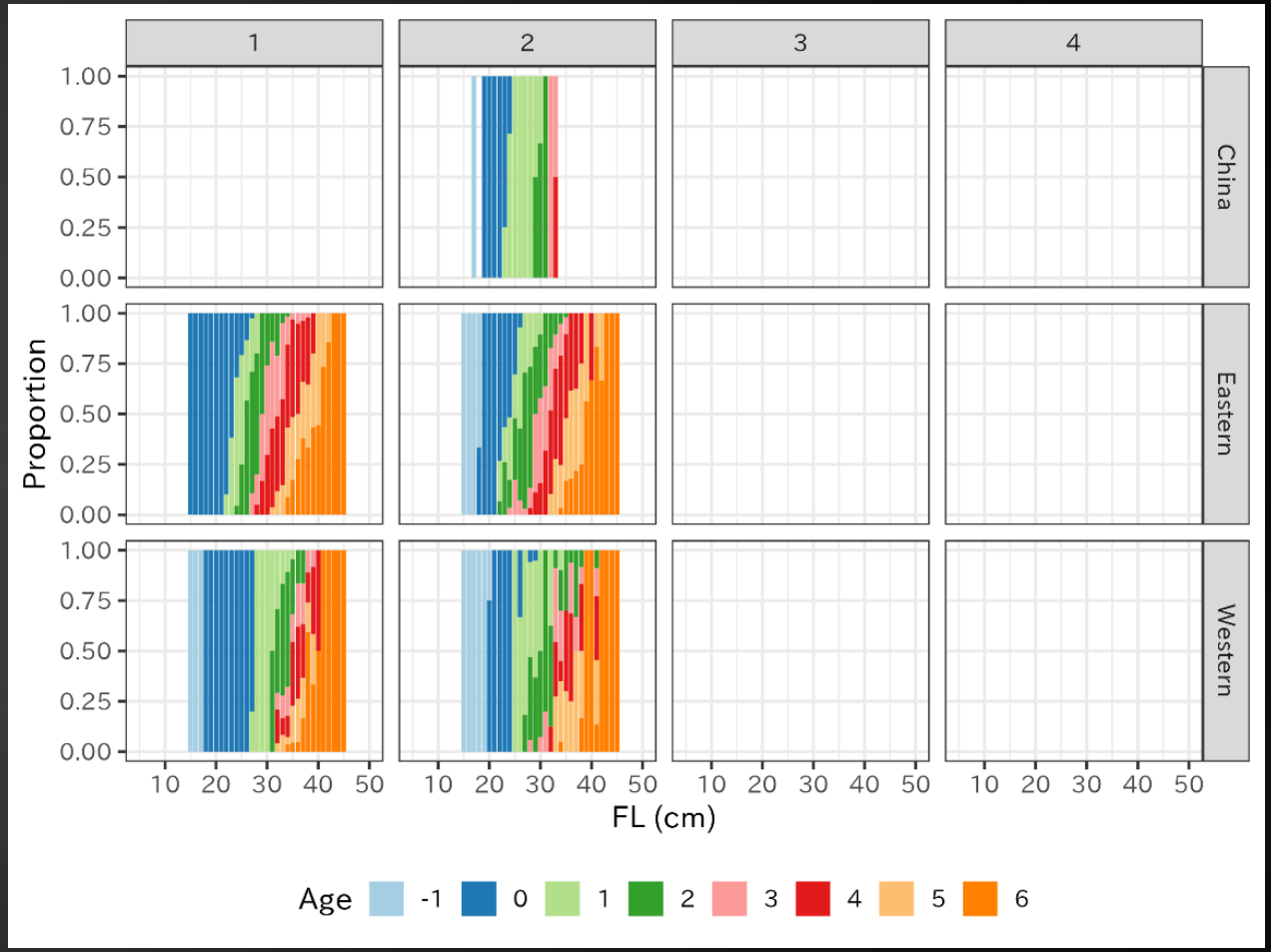
- Japanese Eastern/Western exhibit different pattern, with eastern being older age at the same size.

ALK (2022-2023)

2022



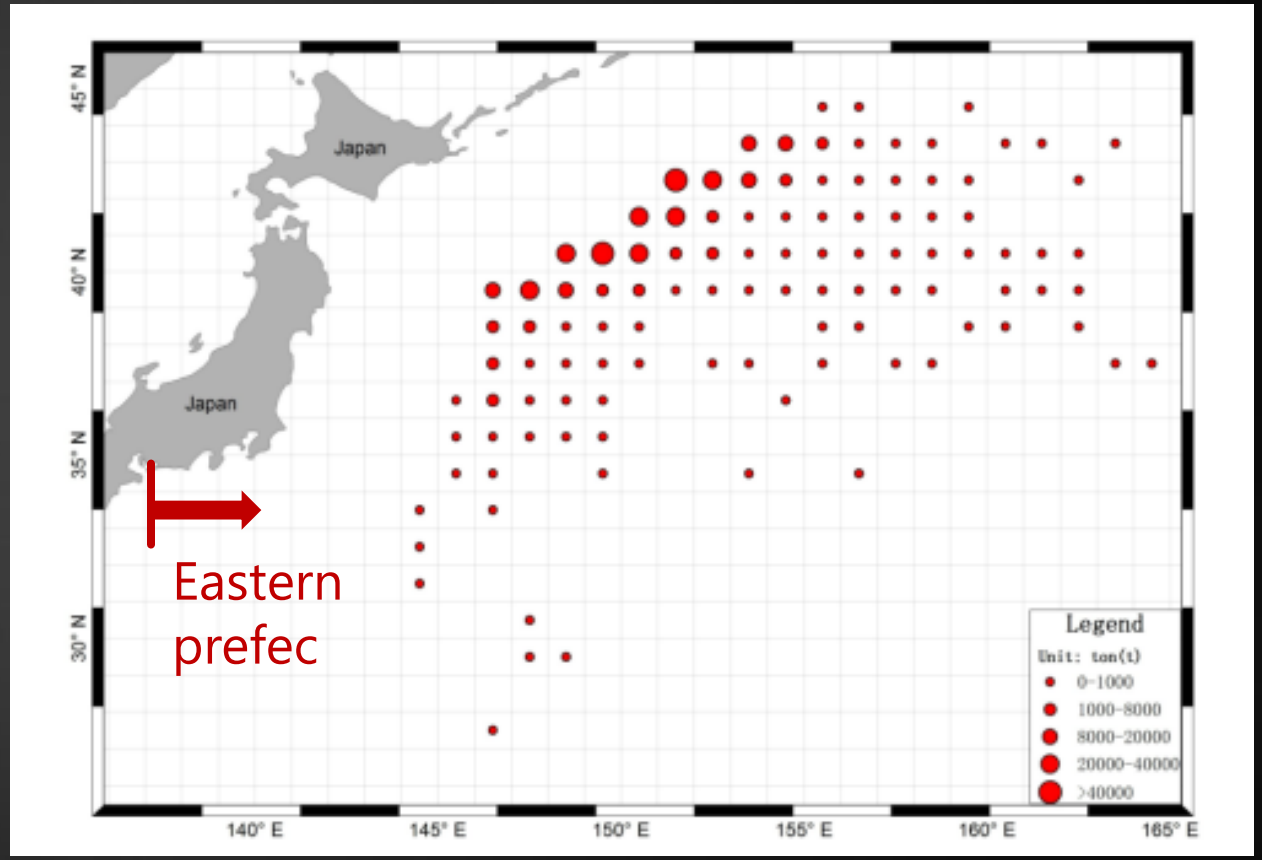
2023



- Generally, Chinese and Eastern Japanese ALK are alike
- Western Japanese ALKs show younger age at length than others

Similarity in two ALKs

- Chinese catches were located adjacent to Eastern Japan's EEZ
- Similar pattern in ALKs
- By converting the age based on 7/1-based, Chinese and Eastern Japanese ALKs present similar age composition
- Both age determination method from China and Japan may be comparable by adjusting the date of age incrementation



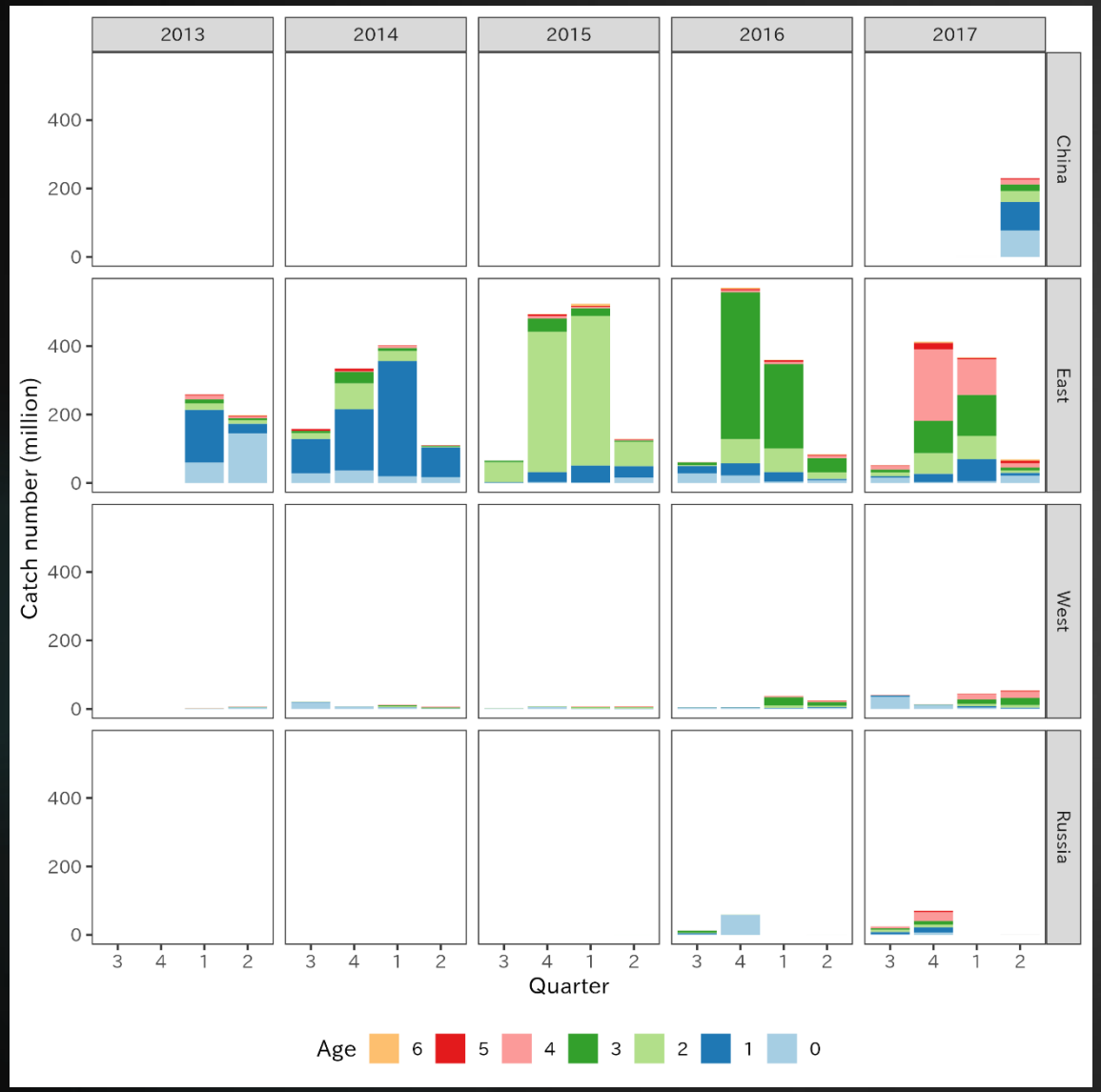
Next -> Catch at age

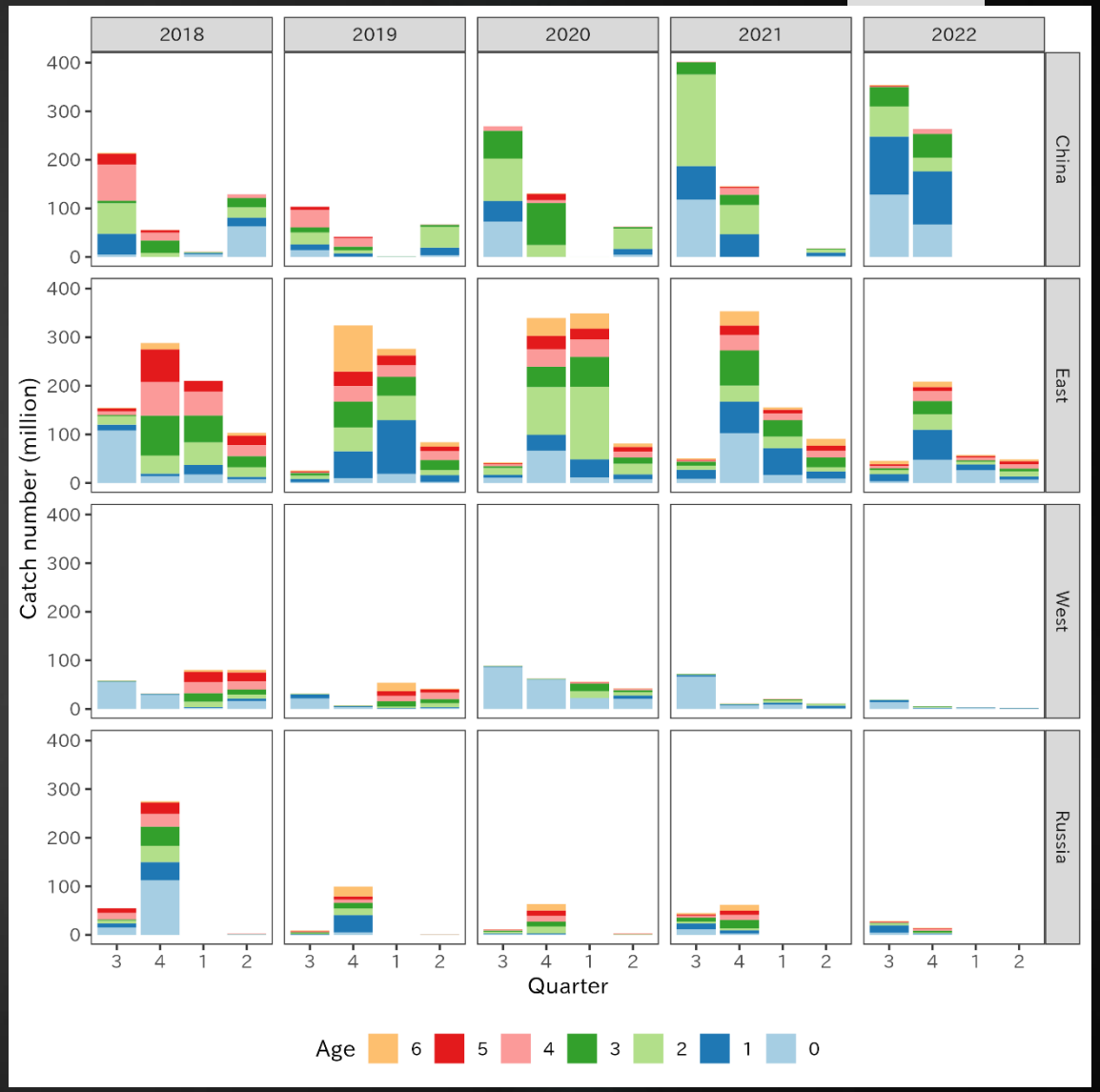
Catch at age

- ALK is applied to CAL data to calculate Catch at age (CAA)
- China, Eastern/Western Japan use own ALK of the equivalent quarter/year
  - Detailed methodologies are described in Manabe et al. (2021) and NPFC (2022).
- Russia applies Eastern Japanese ALK of the equivalent quarter/year

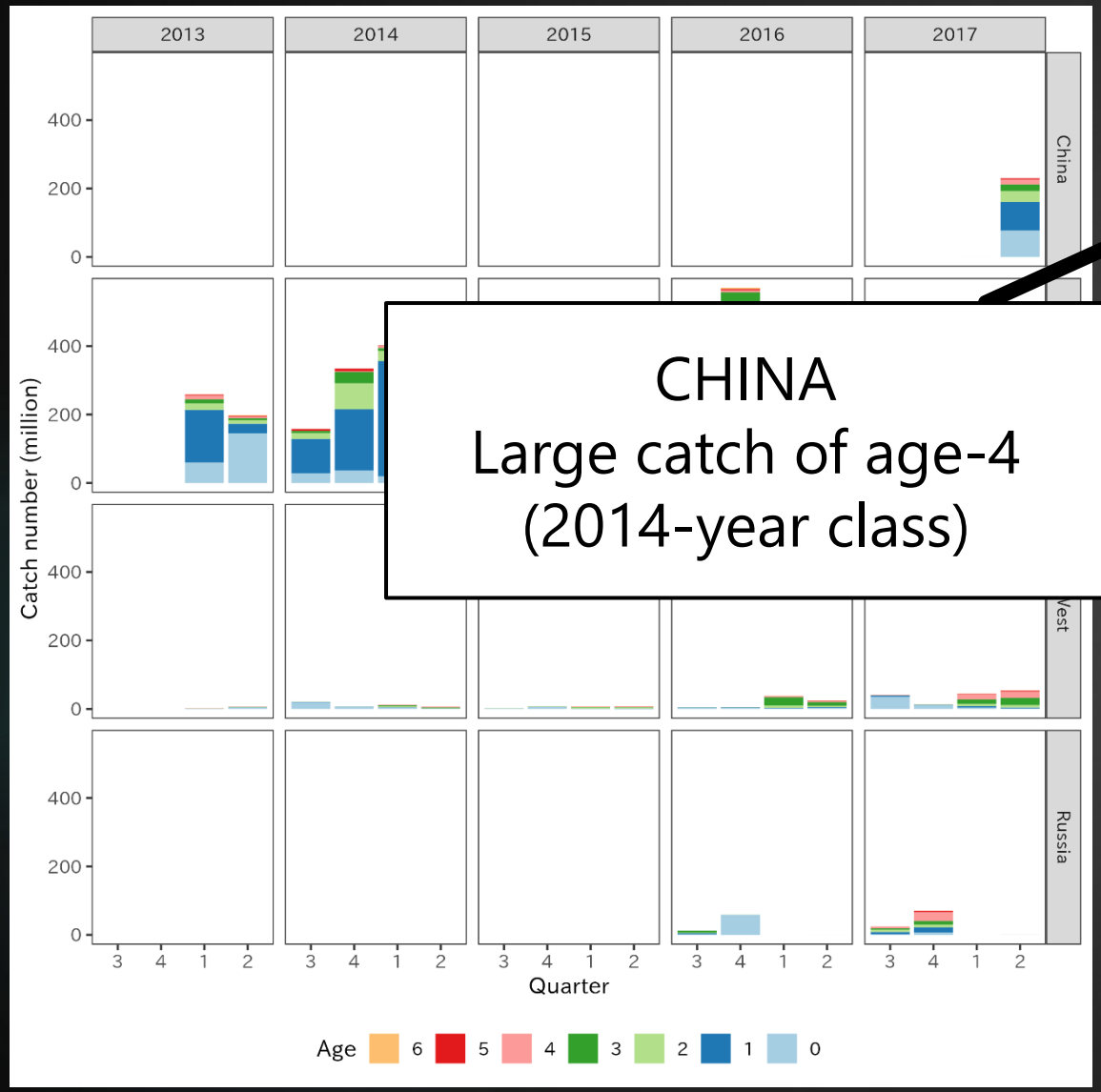
- Catch at age for each quarter is calculated
- For the continuity of ages, years are based on fishing year (starts from Q3)

Quarterly catch at age (fishing year)

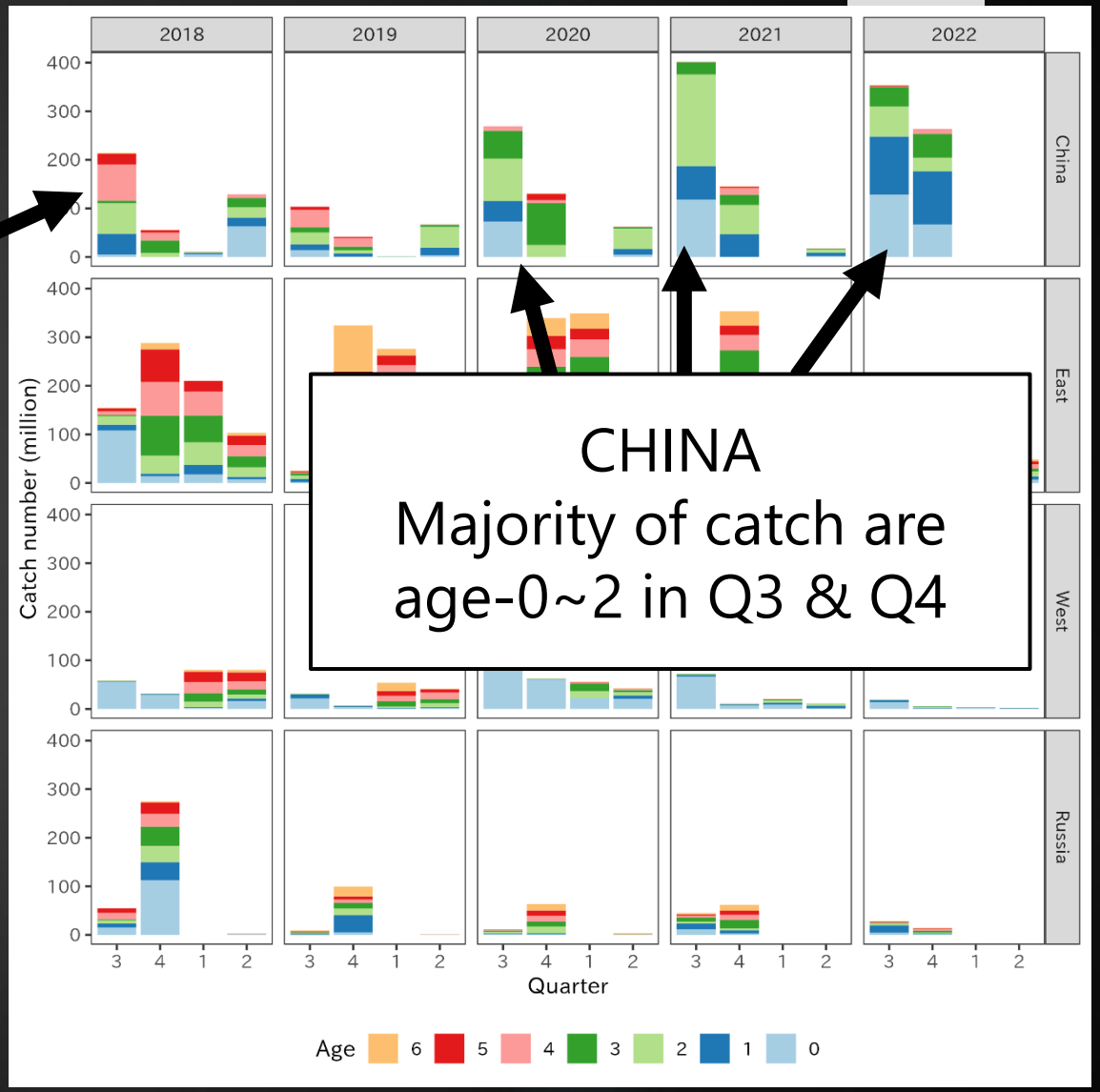




Quarterly catch at age (fishing year)

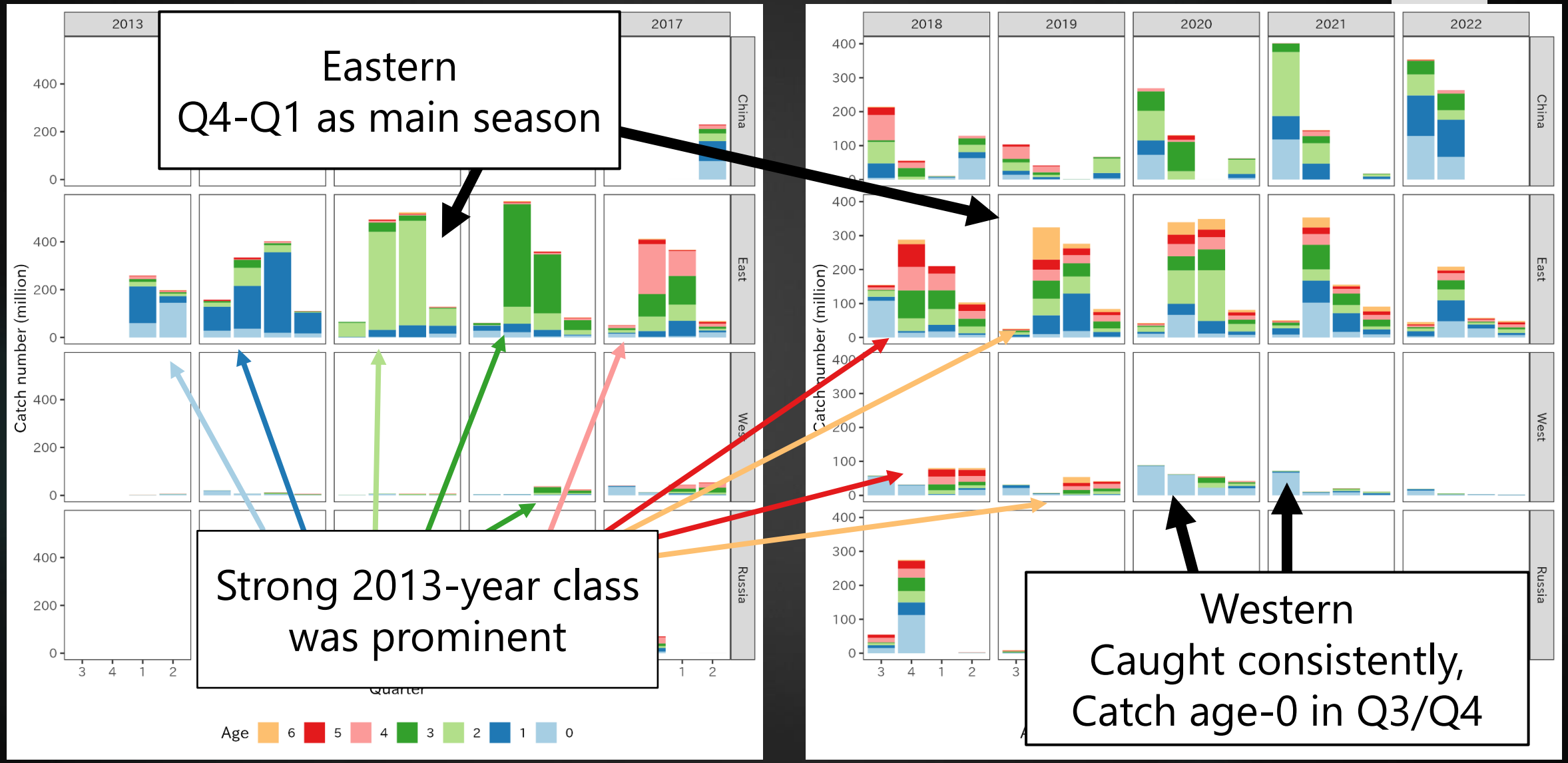


CHINA
Large catch of age-4
(2014-year class)

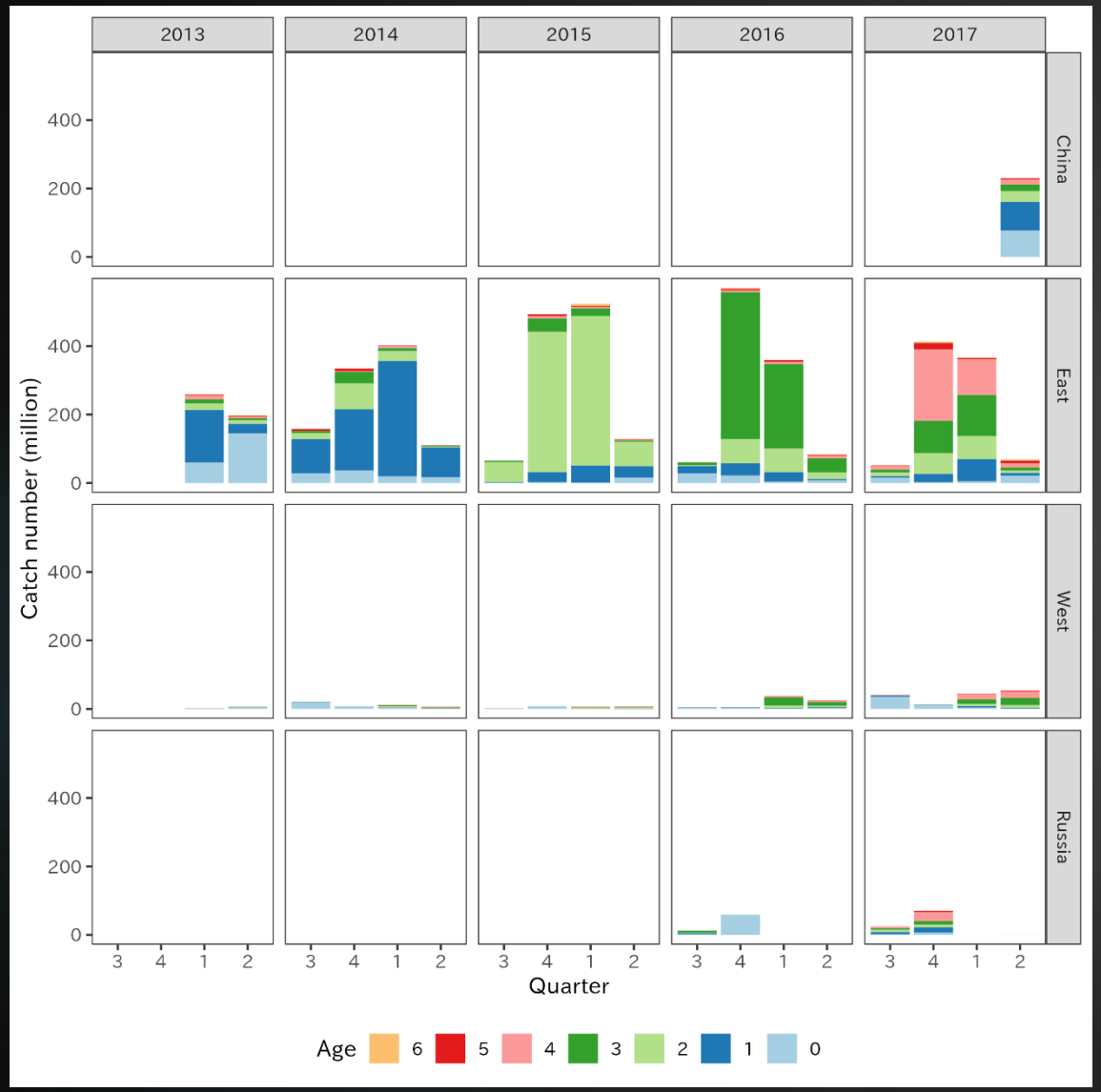


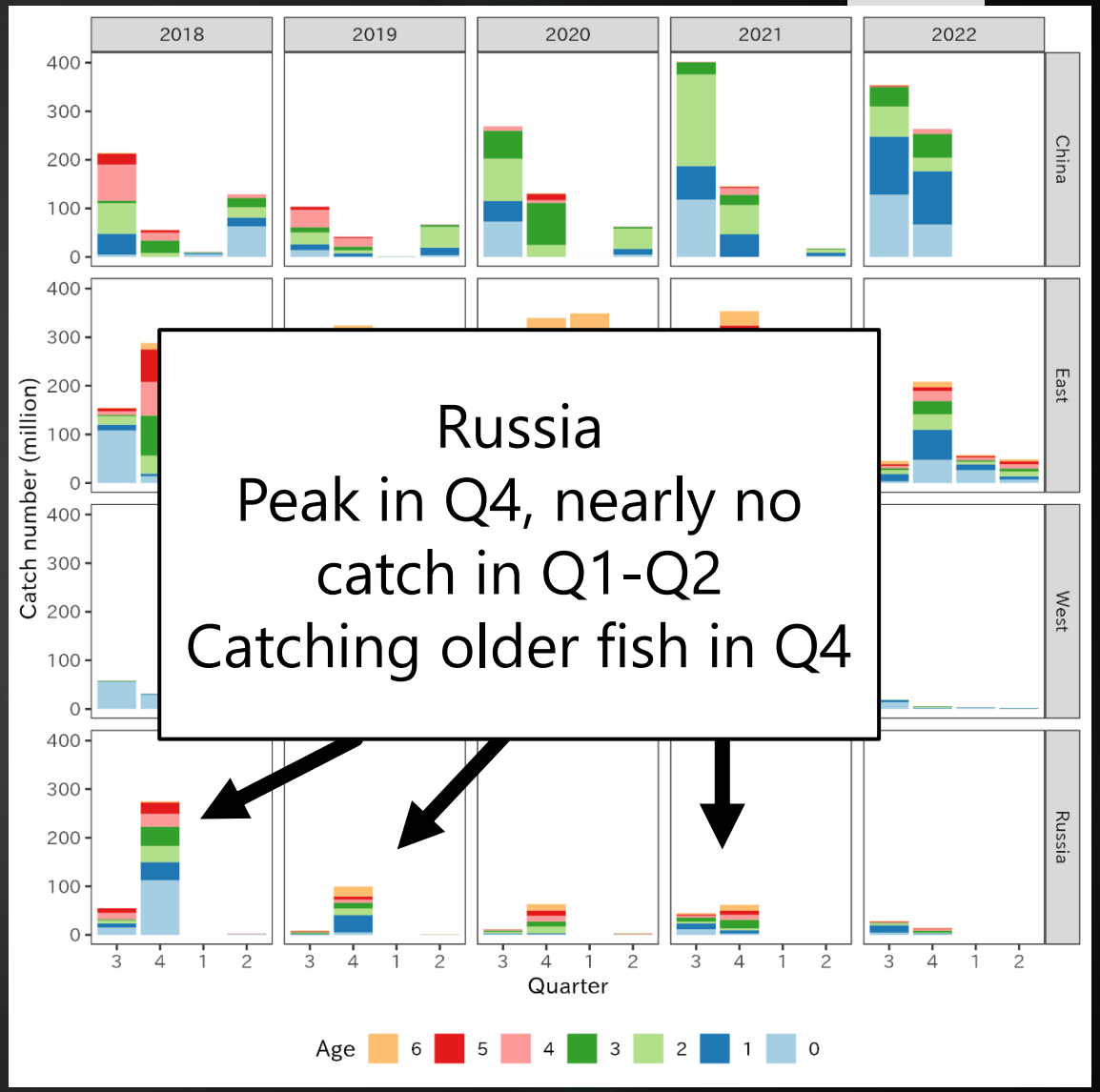
CHINA
Majority of catch are
age-0~2 in Q3 & Q4

Quarterly catch at age (fishing year)



Quarterly catch at age (fishing year)

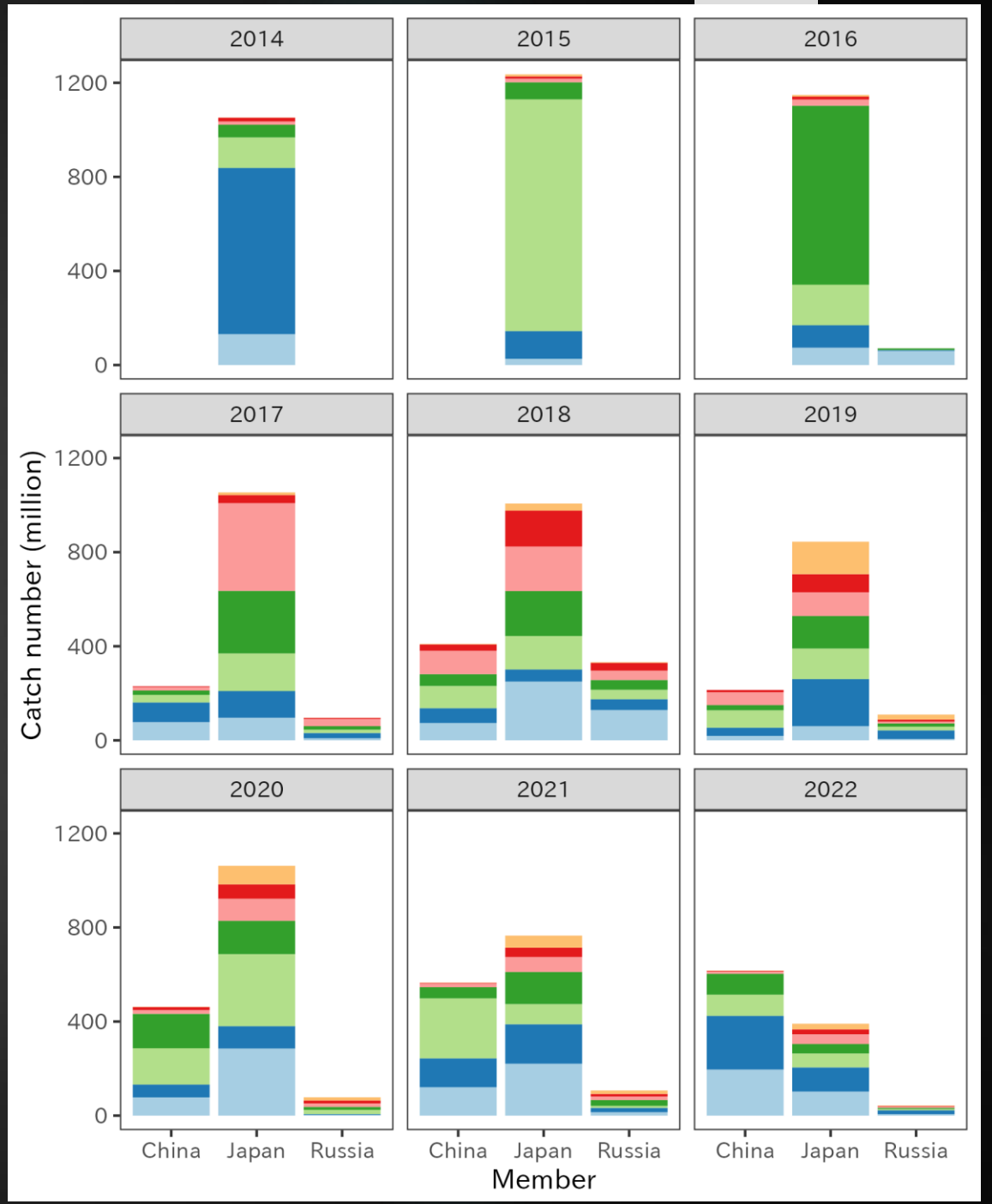




Russia
Peak in Q4, nearly no catch in Q1-Q2
Catching older fish in Q4

Annual catch at age

- Japanese and Russian catch number declined from 2020 to 2022 fishing year
- Chinese catch number remain as above 450 million since 2020
- Annual age compositions show...
  - CHINA: Mainly less than age-3
  - JAPAN: Evenly with greater number of older (age-4+) fish
  - RUSSIA: Substantial ratio of older fish



Conclusion

- Catch at age is prepared using adjusted age and fishing year
- Similarity of ALK-age-composition indicates both Chinese and Japanese age determination is comparable
- Catch at age illustrates different age composition within catch
  - China: Mainly younger fish
  - Japan and Russia: Mainly older fish