Answers to questions made by reviewers regarding Japanese amberjack (**JA**) stock assessment

Pater & Steve, thank you for reviewing the stock assessment report on Japanese amberjack.

The JA stock assessment has been supported by tremendous cooperation and contribution made by lots scientists from prefectural scientific body.

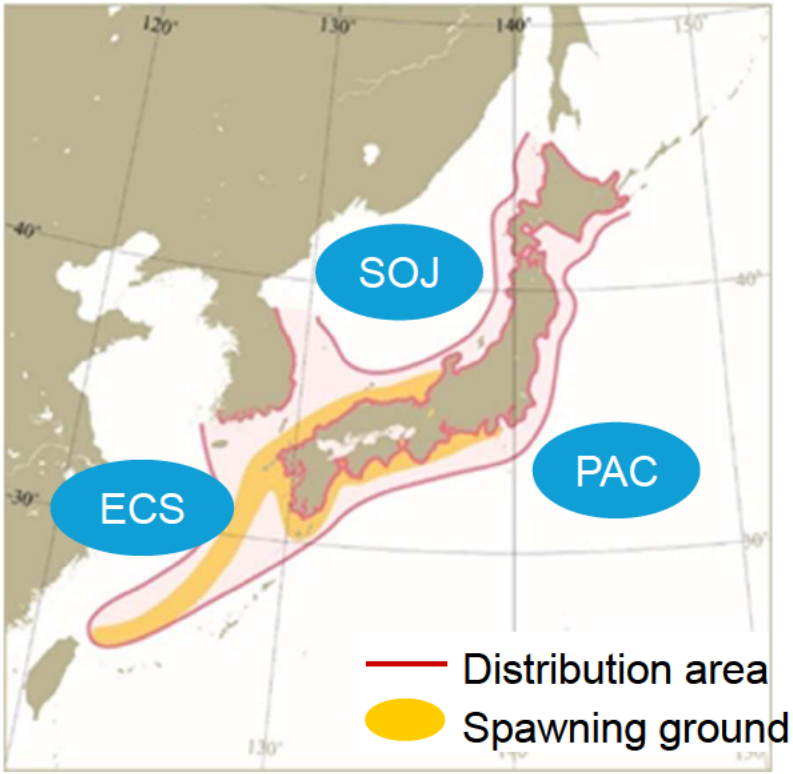
This review meeting will produce fruitful achievement which will improve this stock assessment in future.

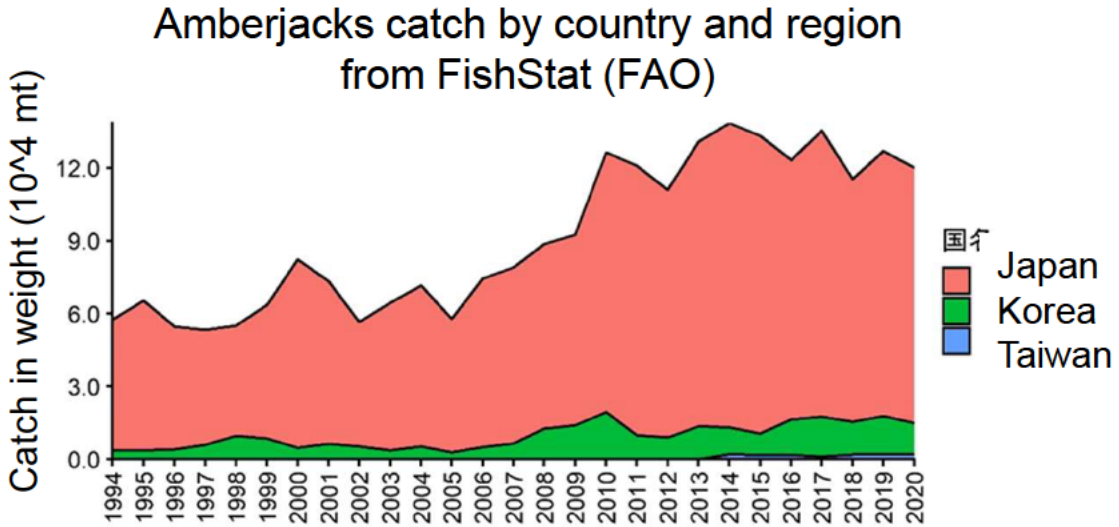
Overview of questions & comments from reviewers

Category of topics	Number of questions and comments
JA stock assessment	
1. Stock structure and distributions	3
2. Data – total catch	10
3. Data – catch-at-age	13
4. Data – tuning indices	5
5. Biology	5
6. Model and diagnostics	2
7. Stock-recruitment	1
8. Projections	1
9. Others	4
10. General comments	6
Total	50

1. Stock structure and distribution

S-1. I was surprised by the distribution map in Fig 2-1. I had thought the species extended into the waters of China and Taiwan. I know that amberjacks are caught by China and Taiwan but I am not sure about the exact species. Are there no catches of Japanese amberjack around the coast of China and Taiwan?
S-2. Is the stock assessment an assessment of the species throughout its entire range or of a specific Japanese/Korean stock? Please provide evidence to support.
P-15. Are the Fig. 2-1 distribution boundaries are determined by data or biology?





- Low amberjacks catch in Taiwan compared with Japan and Korea
- No catch of amberjacks from Russia in the NP
- No catch record on amberjacks from China and North Korea.

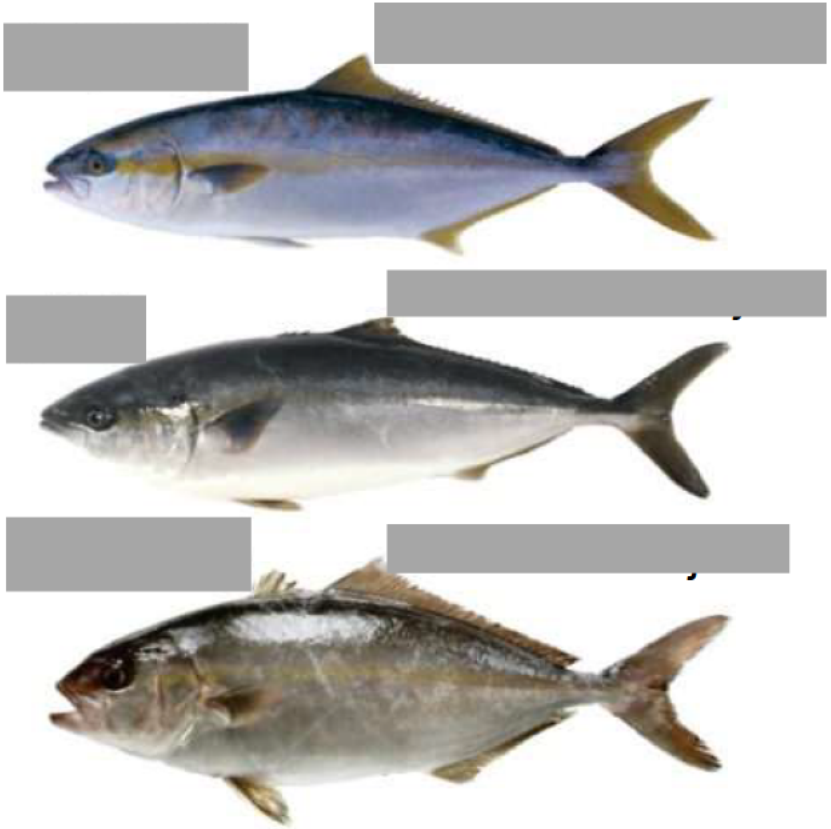
2. Data – Total catch

S-3. The “amberjacks” catch statistics from ASFAP include 3 species. Given that there is enough data to estimate the catches of the other 2 species (Appendix 9) in some years, why assume that 100% of the amberjacks catch is of Japanese amberjack, instead of doing alternative scenarios (e.g., 90%) based on available data?

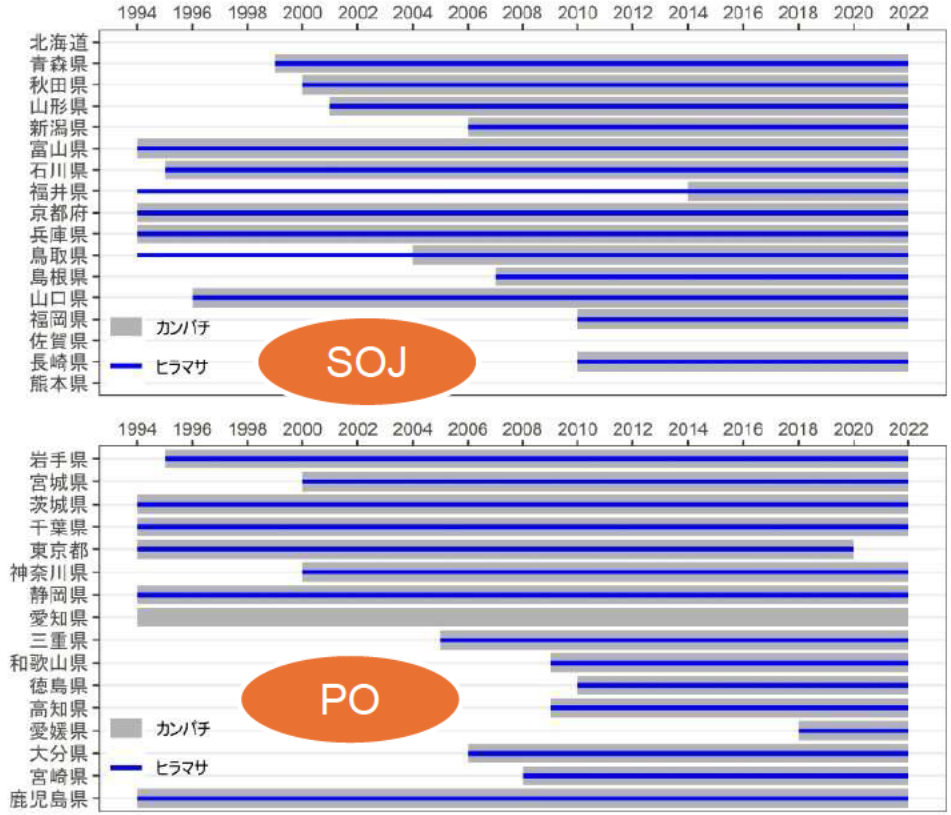
P-3. If the catch data are available in Appendix 9, shouldn’t they be applied to the catch data in the VPA?

P-12. All the amberjack catches are assumed to be from Japanese amberjack. I think this becomes a difficult issue if the catch of other species can span many older ages. Please include a little more detail of the life history for the other species included in the category if available.

a. Would it be possible to run a sensitivity on the catch data assuming different percentages of the “amberjack” catch are specifically Japanese amberjack?

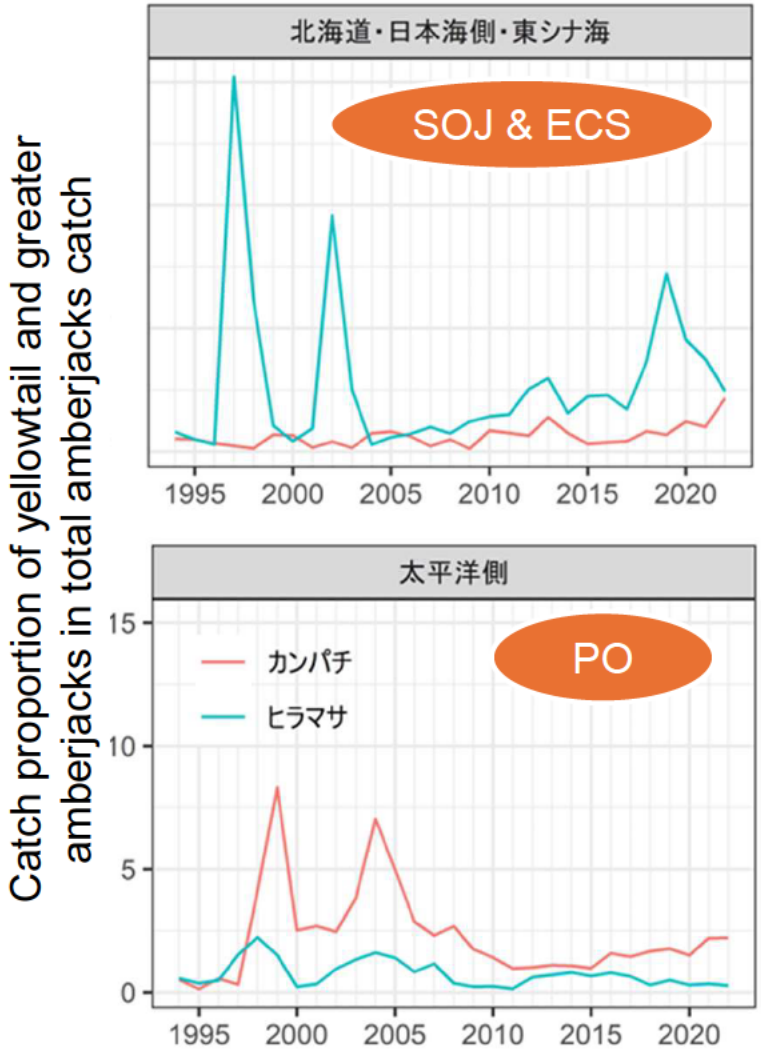


Data availability on amberjack species composition by prefecture



2. Data – Total catch

S-3. The “amberjacks” catch statistics… *Continued*



- The scientist in charge (Kurashima-san) considers future separation of JA catch with a reliable procedure.
  - The current info are provisional.
- Future challenge
  - Consideration on regionality of species composition.
- Application of simple assumption of species composition
  - Just sensitivity runs
    - Resulting in downward shift of biomass level (Similar results to sensitivity run on M)

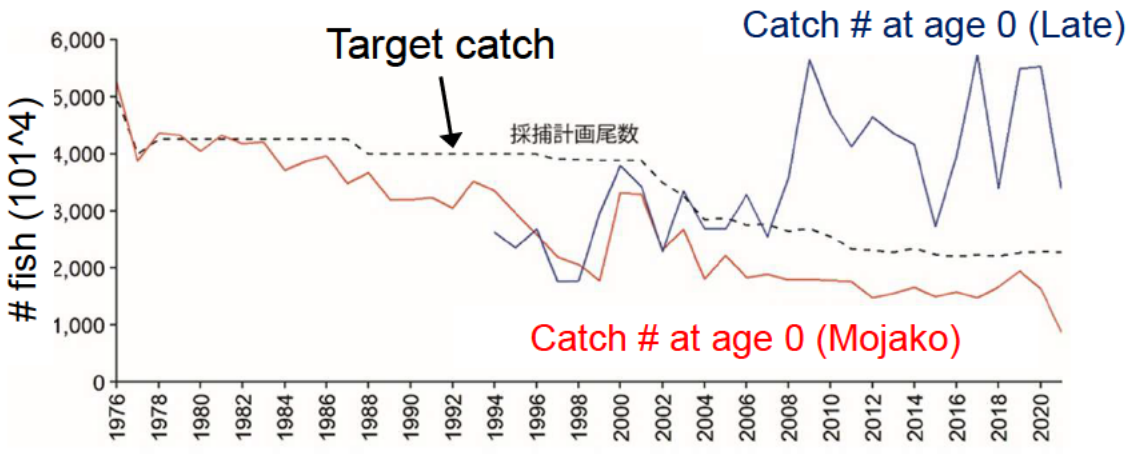
2. Data – Total catch

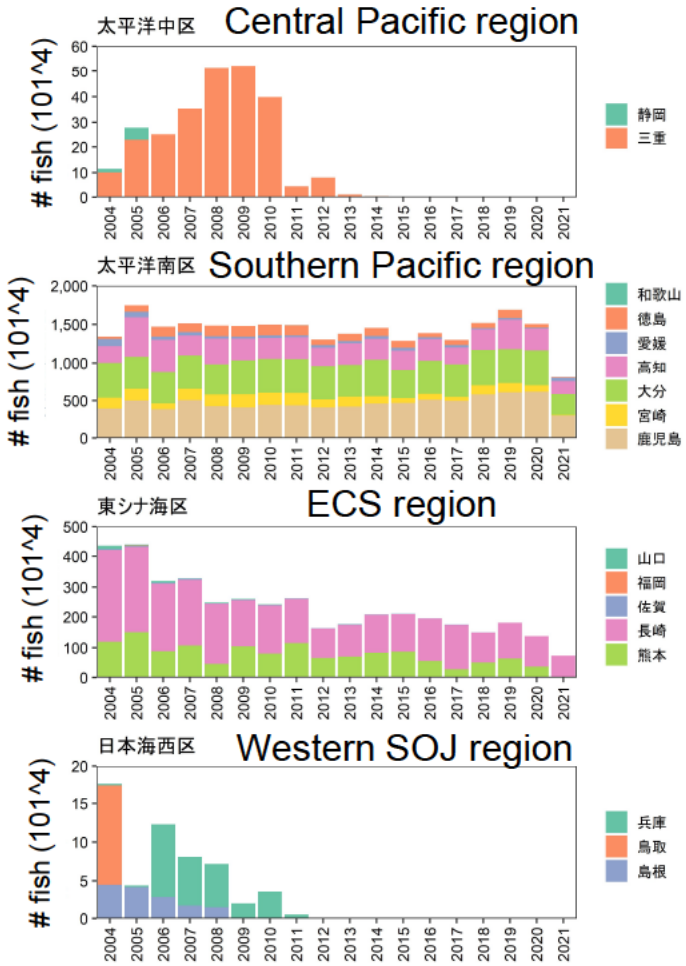
S-4. Are all the aquaculture operations of this species based on mojako catches from the wild or is there full cycle aquaculture of the species? Are there releases of this species from aquaculture operations?

P-7. Mojako are removed from the population correct? They are not reintegrated into the wild as adults?

a. Any idea what caused the decline of Mojako cach starting about 2011 in Central Pacific and Western Sea of Japan (Supp Fig 12-1)?

- Wild mojako are captured as seeds for pen.
  - Accounting for most part of seeds for pen.
- A part of yield is derived from full cycle aquaculture.
  - Less than 10%
- No artificial release of farmed fish.
- There is annual target catch of mojako, which is set according to demand for seeds by fish-farming companies.





2. Data – Total catch

S-5. On page 10, it says “no catch of mojako for seeds has not occurred in recent years”. It is not clear what this means. Assuming it means there is no catch of mojako in recent years, why has this changed from previous years?

Last sentence of 4th paragraph on page 10,

“In addition, no catch of mojako for seeds has not occurred in recent years.”

- It says,
  - No mojako catch occurred **in the central Pacific and the western Sea of Japan regions** in recent year.

2. Data – Total catch

S-6. It is not clear why including mojako into the catches would result in double counting of the age-0 abundance. Please explain the thinking and process to deal with the mojako catches in the assessment.

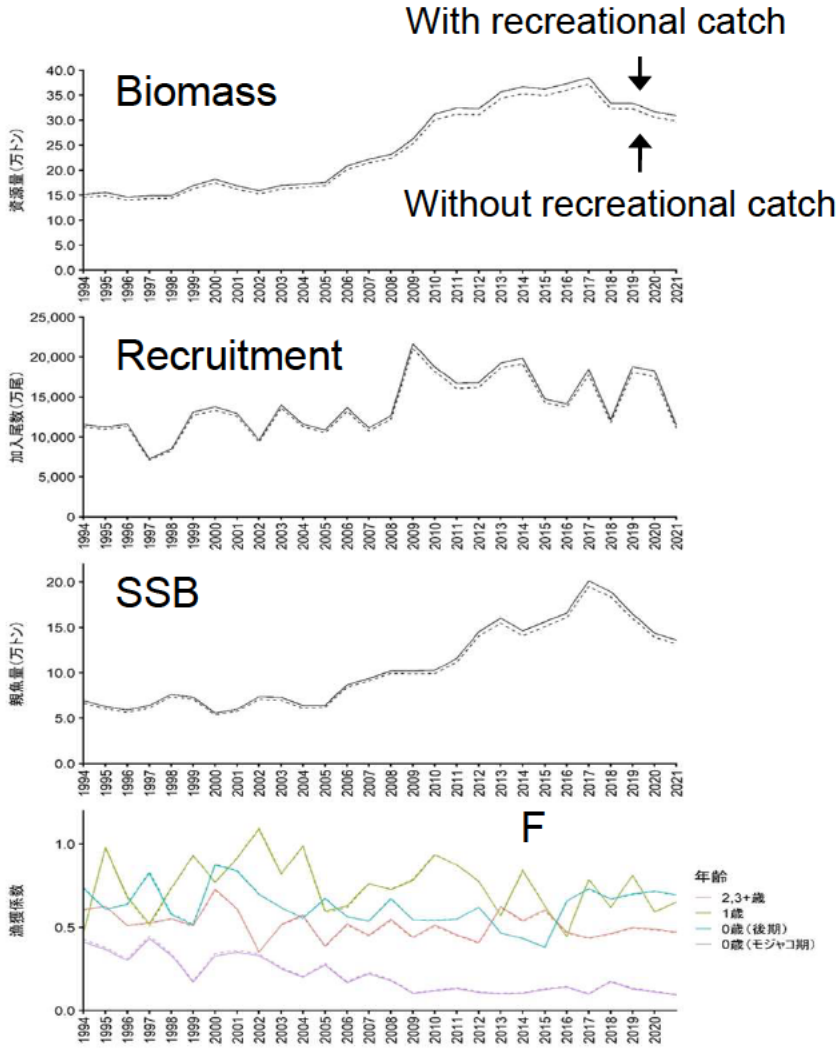
- Mojako catch for pen began to be included in the 2021 JA stock assessment .
  - Same treatment with PBF stock assessment in ISC
  - Inclusion of catch from all stakeholders to stock assessment

- In the JA stock assessment,
  - A year at age 0 is split into two half-year cohorts
    - Age 0 (Mojako) with natural mortality of 0.6 for 1st half of the year
    - Age 0 (Late) with natural mortality of 0.3 for 2nd half of the year
  - To avoid double-counting, estimates related to total biomass do not include estimate of numbers at age 0 (Mojako).

2. Data – Total catch

S-7. Why were recreational catches excluded from the assessment, given that estimates of around 5% of commercial catches were made?

- Recreational JA catch information from official statistics are available in 1997, 2002 and 2007.
  - Accounting for 5.4%, 4.3% and 4.2% of commercial catch, 5.0% on average.
- The stats are not available since 2010.
  - After 2010, biomass was increased.
  - Possibly resulting in increase of recreational catch.
- <u>No size information on recreational catch</u>
- Need furthermore collection of recreational catch.
- Kurashima-san conducted sensitivity run with recreational catch under an assumption 5% of commercial catch in stat-NA years.
  - 3.3 to 4.3% increase in biomass
  - 2.5 to 4.5% increase in SSB
  - 2.4 to 4.1% increase in recruitment



2. Data – Total catch

P-8. I think some of the catch tables may not add up (Table 3-2, 3-3, 4-1)

a. I picked 2020 as a year to check to make sure I'm understanding the numbers used in the VPA.

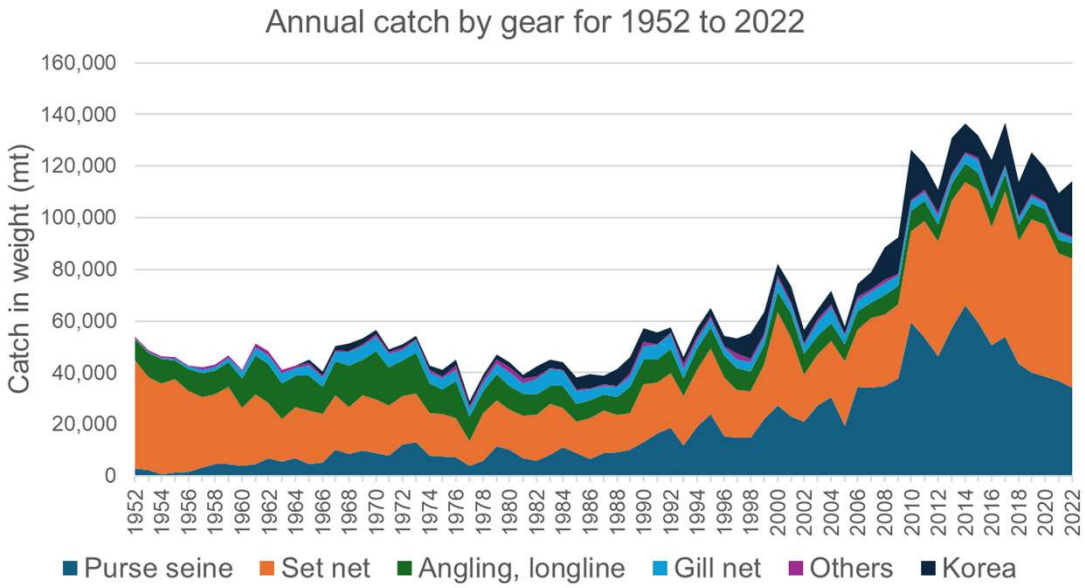
b. The Japan total catch value of 106,315 does not equal the sum calculated from each of the regions which equals 106,317. If I add Korea catches the value is 119,368, which then does not equal the total value of catch in Table 4-1 of 119,461. Please double check these tables to make sure the numbers match.

- I appreciate your keen eyes!
- In Table 3-2, inconsistencies between a sum of regional catch and Japan total catch in 24 year of 29 years.
  - Mistakes in copy and paste when making table.
- No inconsistencies in Japan total catches between Tables 3-2 and 3-3.
- Inconsistencies between a sum of Japan and Korea catches in Table 2-1 and Catch in 4-1.
  - The catch in 4-1 include estimated captured-fish body weight from mojako fishing for pen.

2. Data – Total catch

P-9. The VPA includes data from South Korea, but is the amberjack fishery managed with South Korea? Are there catch limits for each of the countries? Please describe the context behind the fisheries in more detail.

- Korea records approx 10% of total JA catch.
- No JA fishery management JA in Korea.
  - Japan, as well.
  - PS and SN are dominant fisheries in Korea.
- Last March, TAC control was agreed to introduce into the JA management through heavily tough discussion at the stake holder meetings in Japan.



Data – Catch at age

P-2. I recommend including the age, length, weight data described in section 2 in a table and include some details (if available) regarding the sampling, ageing methods, number of fish measured that went into data generation.

→ Thank you for your recommendation, which can improve the stock assessment report.

3. Data – Catch at age

P-1. I recommend expanding the data set table into two different tables: one that describes the data used in the assessment and the other describing other data that are available but not used in the assessment.

S-9. Given that catch-at-size data is missing from different fisheries and different areas at different times, there is a complex process of data substitution being used but the process is not explained. The process is simply described “as deemed appropriate”. Given that cohort analysis is being used, it is very important to understand the data development process. Please explain this data substitution process in detail.

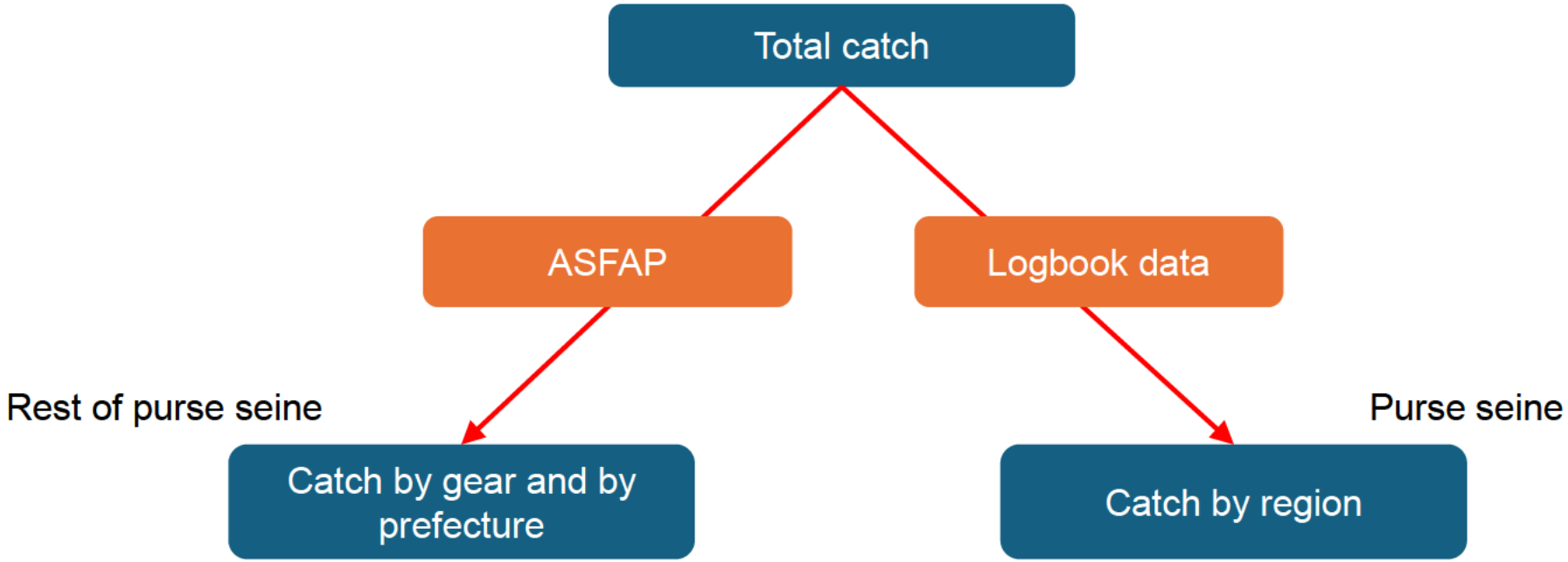
How to construct catch-at-age in the JA stock assessment

How to construct catch-at-age
Data for JA stock assessment

Category	Information	Data source	Application in SA
Total catch	Total catch in Japan	ASFAP	Y
	Total catch in Korea	Official fisheries statistics	Y
	Number of captured-mojako for pen	Official statistics published by the Fisheries Agency	Y
Catch at age	Catch by gear and by prefecture	ASFAP	Y
	Regional catch	Logbook data from large-scale purse seine	Y
	Catch and size (/age)	Monthly catch by market size category (/weight class) and by gear from prefectures from major landing ports	Y
		Size measurement data (Watari et al 2019) (→ Measurement in landing port) Age count data (Watari et al 2019)	Partially Y
		Daily landing in weight by market size category in Kyusyu Region (Purse seine)	Y
Abundance indices	Fisheries catch and effort data	Annual catch and number of fishing unit of large-scale set net from ASFAP	N
	Annual density of larvae	Survey data in ECS	N
	Mojako abundance indices off Kagoshima Pref	Survey data	N

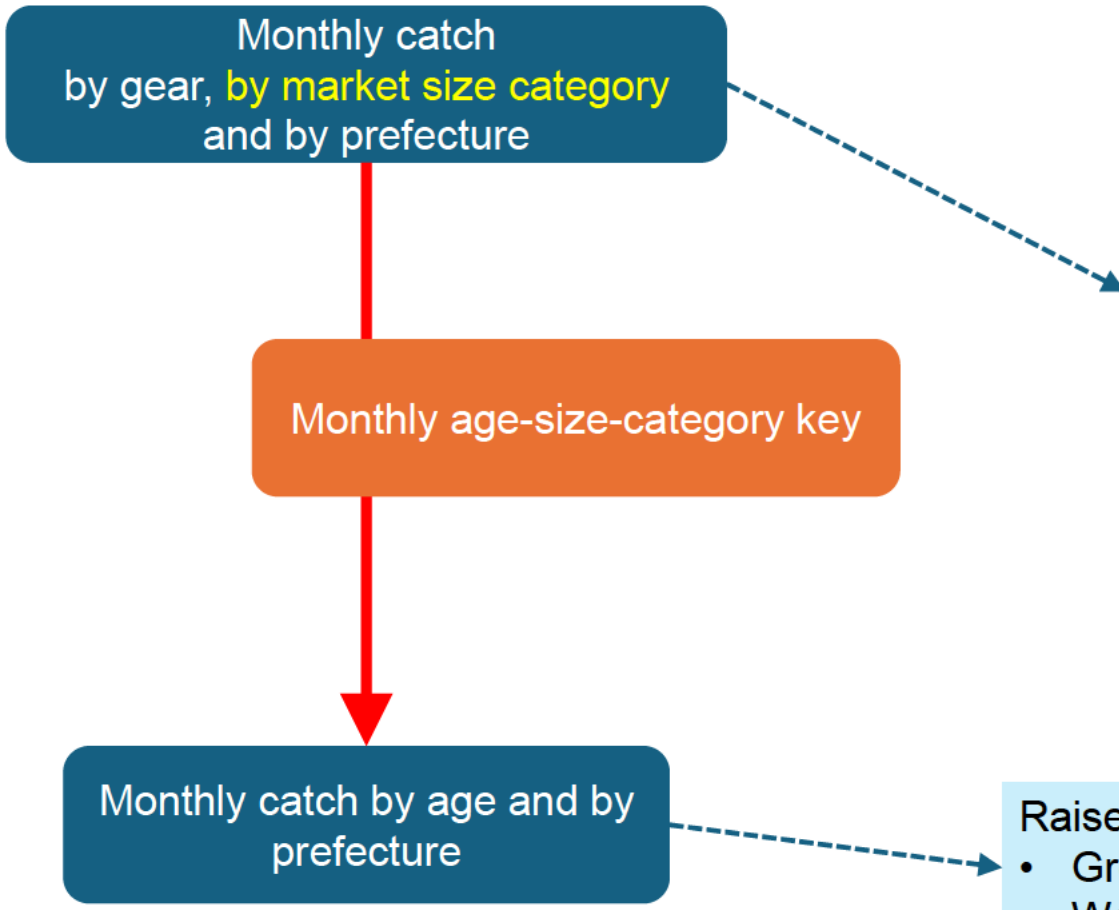
How to construct catch-at-age

Breakdown of total catch



How to construct catch-at-age

Calculation of catch-at-age



Raised issue in monthly catch by gear, by market size category and by prefecture

- Data substitution

→

✓ Former person in charge made data substitution taking in consideration of region-to-region characteristics base on their own knowledge.

✓ Two directions for data substitution

- Prioritization of fishing gear
  - Applying an identical age comp from a neighboring prefecture.
- Prioritization of regional characteristics
  - Applying an identical age comp from the same prefecture

Raised issues in monthly age-size-category key

- Growth change over times
- Weight (/length) overlaps between age classes

3. Data – Catch at age

P-2. a. ii. I'm a bit confused with the von Bertalanffy growth estimation and then description of body length composition cohort slicing method. I would think you would want to use one or the other (ideally estimate some sort of age-length relationship with von Bert). It seems difficult to me to use the cohort sliced data in the von Bert growth estimation.

S-10. It appears that all or most of the catch-at-age data is based on commercial size categories data. Is that correct?

↳ Yes, catch-at-age data are calculated based on commercial size category data without cohort slicing using catch-at-length

- In general, catch at age data for input of stock assessment are calculated with catch at size and age-length key
- In JA case,
  - JA catch are landed at landing ports in almost all over Japan.
  - JA landings are sorted into commercial size category according to size (weight).
  - Using sales slips data, data on landing in weight by commercial size category are gathered.

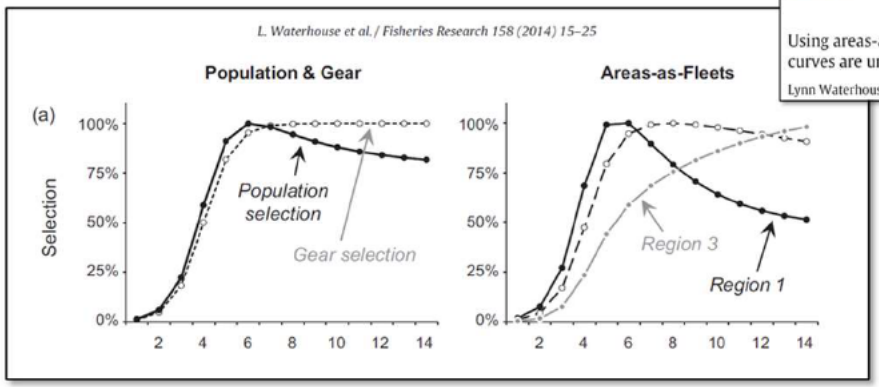
3. Data – Catch at age

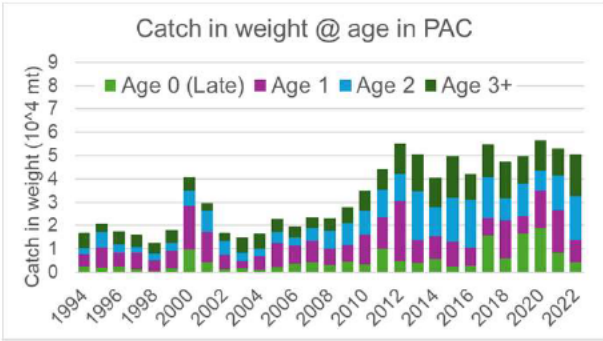
P-6. Can Supplementary Table 2-1 be expanded to include catch as biomass at age for the three regions: Japan and South Korea, Pacific, and Seas of Japan + East China Sea?

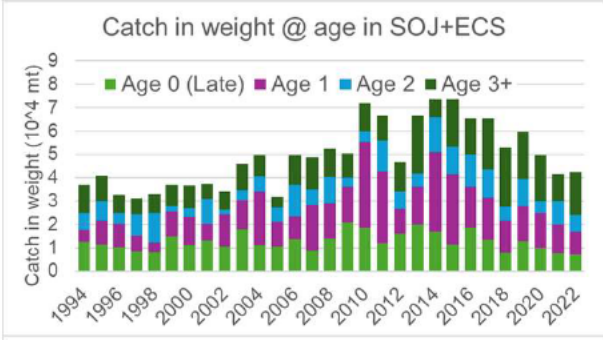
Supplementary Table 2-1. Stock analysis results (Catch in number at age)

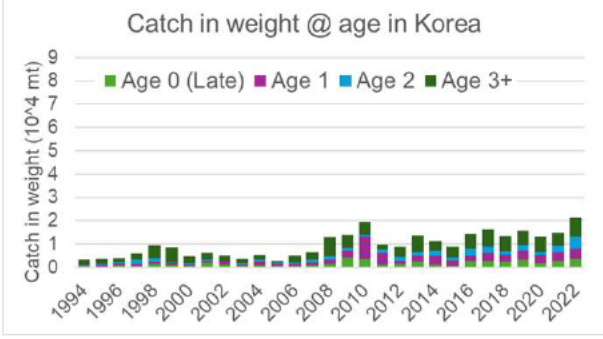
Year	Catch in number at age (Japan and South Korea, 10 thousands)					Pacific (10 thousands)				Sea of Japan・East China Sea (10 thousands)			
	Age 0 (Mojako)	Age 0 (Late)	Age 1	Age 2	Age 3+	Age 0 (Late)	Age 1	Age 2	Age 3+	Age 0 (Late)	Age 1	Age 2	Age 3+
1994	3,355	2,628	646	252	276	480	319	45	82	2,058	317	201	160
1995	2,959	2,353	1,195	375	219	326	520	143	40	1,950	648	221	150
1996	2,589	2,686	1,101	214	202	503	354	83	75	2,020	684	121	103

- Korean catch at age can be independently given.
- What is your intension on this question?
  - areas-as-fleets selectivity?





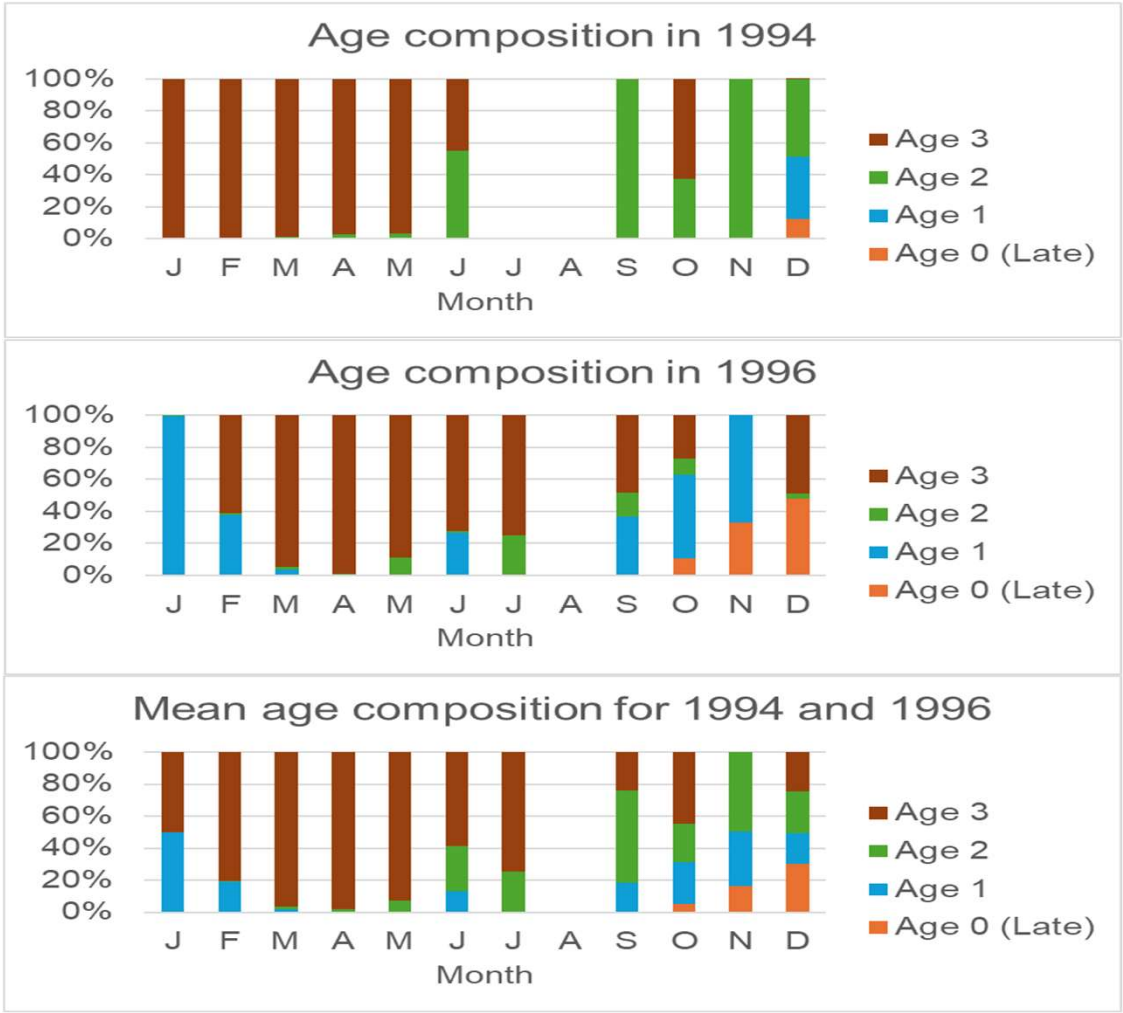




3. Data – Catch at age

S-8. The purse seine age composition data for 1995 was missing, and the 1994 data was used as a substitute for the missing data. Please show a comparison of the 1994, 1996, and average of 1994-1996 age composition data.

- Specifically, data missing of age composition in 1995 occurred in landings by PS in the ECS.



3. Data – Catch at age

S-11. Is the commercial size categories consistent through time? Sometimes, the commercial categories shift in terms of the actual size of fish, so just want to check if this happened here.

- Consistency of the commercial size category.
  - Name of category
  - **Size of fish in a category**

- Size information in the commercial size category have been collected through scientific bodies in prefectures participating to the JA stock assessment.
  - Some changes in size in category were reported from prefectural scientific bodies.
  - Information when those change took place.

3. Data – Catch at age

S-12. Is there any operational or regular aging or size sampling data?

- Towards the next benchmark stock assessment, a broad-based research program has initiated last year.
  - Strengthen size sampling
  - Continuation of collection of catch information by the commercial size category
- In conjunction of this program, aging will be strengthened in future.
  - Sharing of aging procedures and technics.

3. Data – Catch at age

P-5. East of Chiba (in age/growth section of text)?

- I guess Peter mentioned Fig. 2-2.
- Fig. 2-2 is based on the data from Watari et al (2019).
  - They provided the estimated VB growth parameters in the PAC west of Chiba and the SOJ.
  - The SOJ included Sanriku region (=PAC east of Chiba)

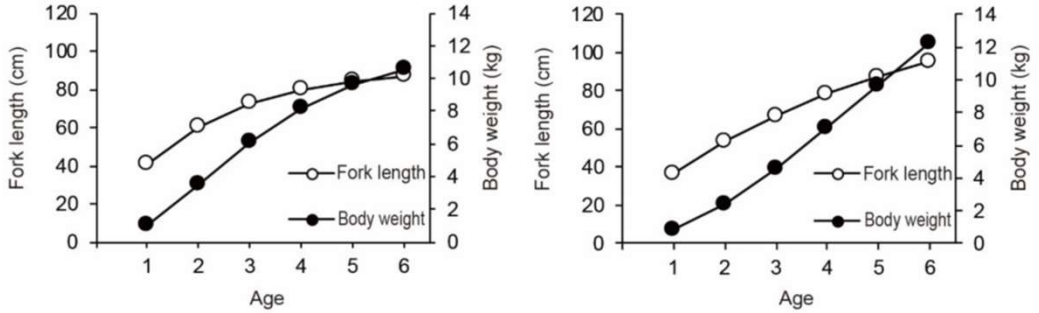


Fig. 2-2. Age and growth in the Pacific Ocean west of Chiba (left) and in the Sea of Japan and northern Pacific Ocean (right)

This figure shows the relationship as of January when using January as the starting month for age.

Brief explanation on Watari et al (2019)

- Watari et al (2019) used age-length data from
  - Sea of Japan (SOJ),
  - Sanriku region (North PAC region),
  - Kanto Region (Central PAC region),
  - Central-south PAC region.
- They examined regional grouping of growth using total AIC from several pattens of grouping.
- They found that the following grouping returned the smallest AIC
  - Kanto and Central-south PAC regions (=The PAC west of Chiba)
  - SOJ and Sanriku regions (=SOJ)

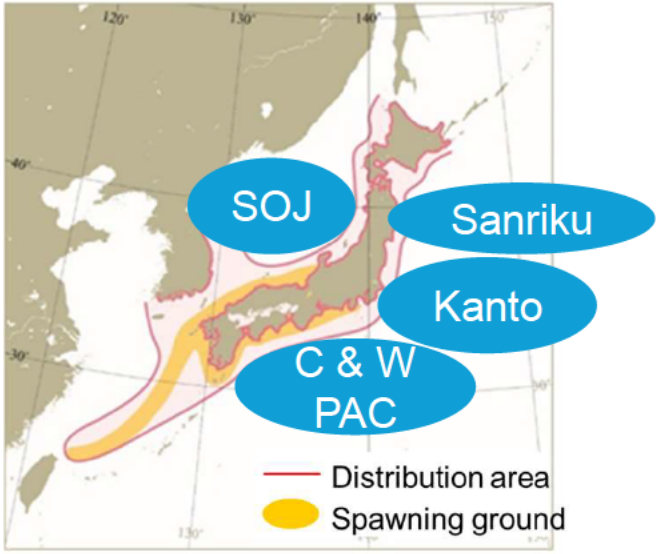
3. Data – Catch at age

S-13. Please show the age-length data from the Watari et al 2019 paper.

Watari et al (2019) provides overview and information on JA's growth, age-length and age-weight.

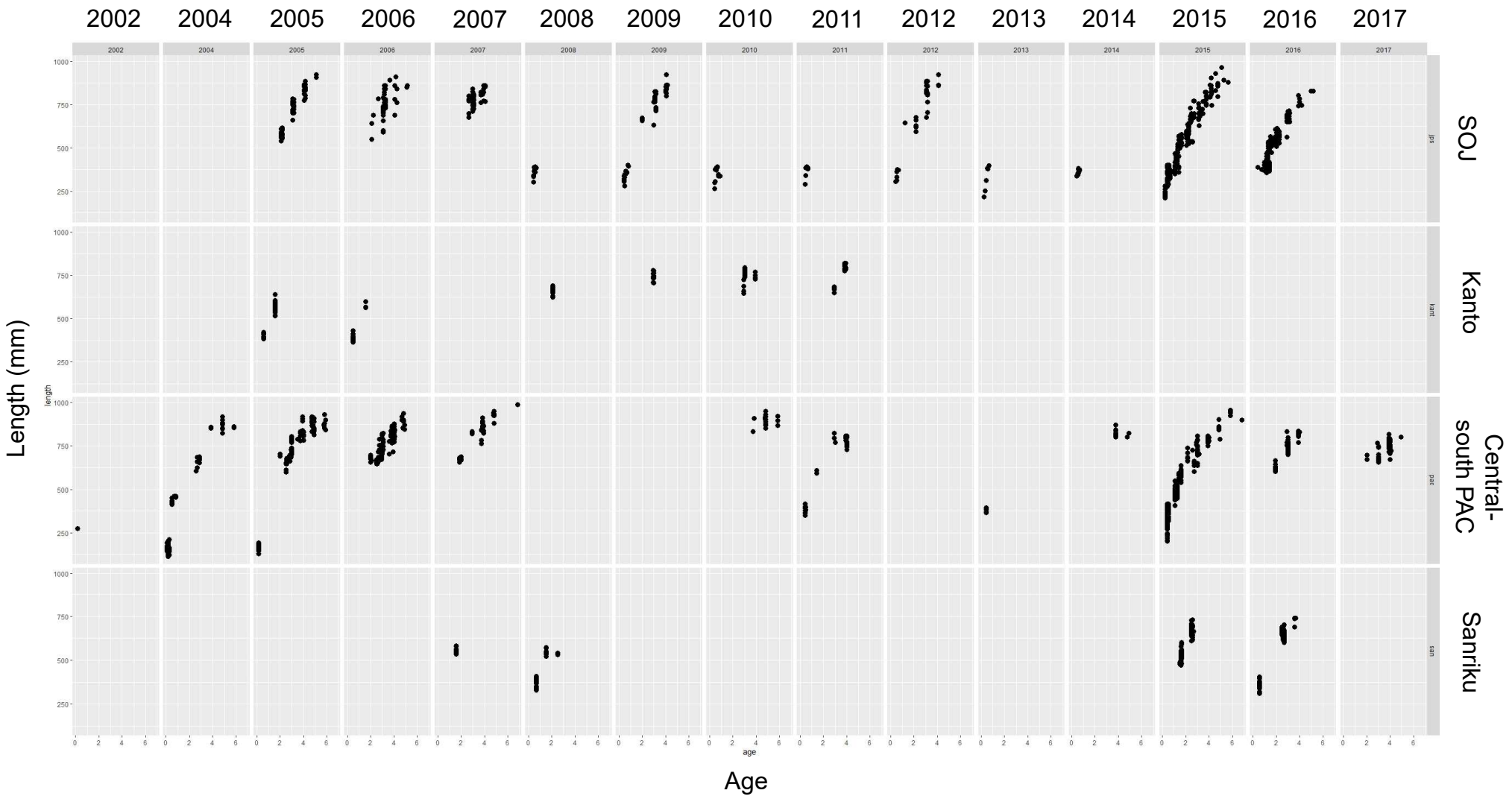
Duration of data: 2002 to 2017

Regions: Sea of Japan (SOJ), Sanriku, Kanto region, Central and Western Pacific,



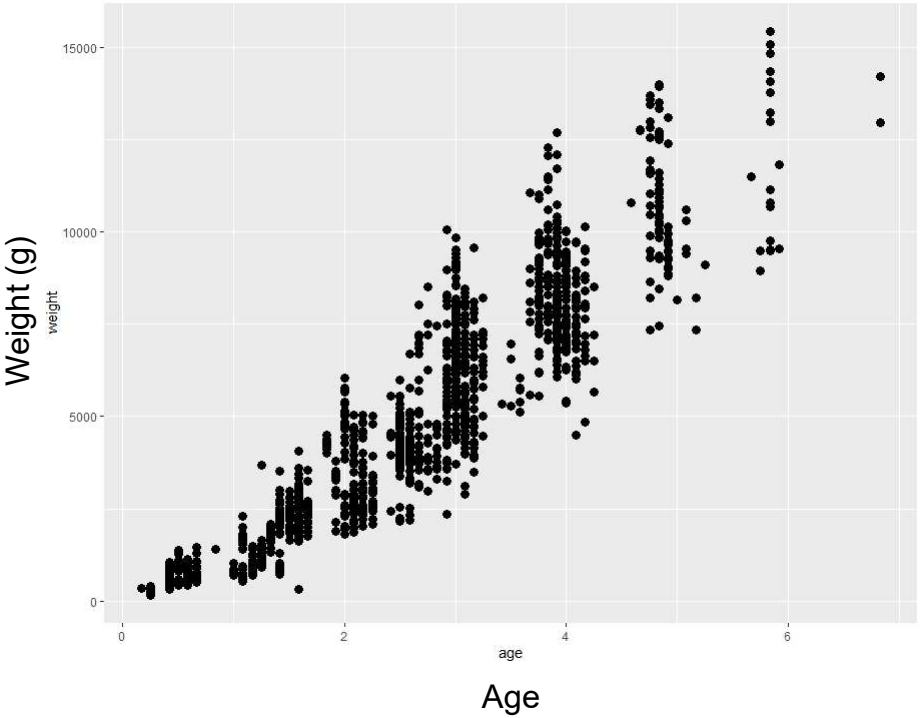
3. Data – Catch at age

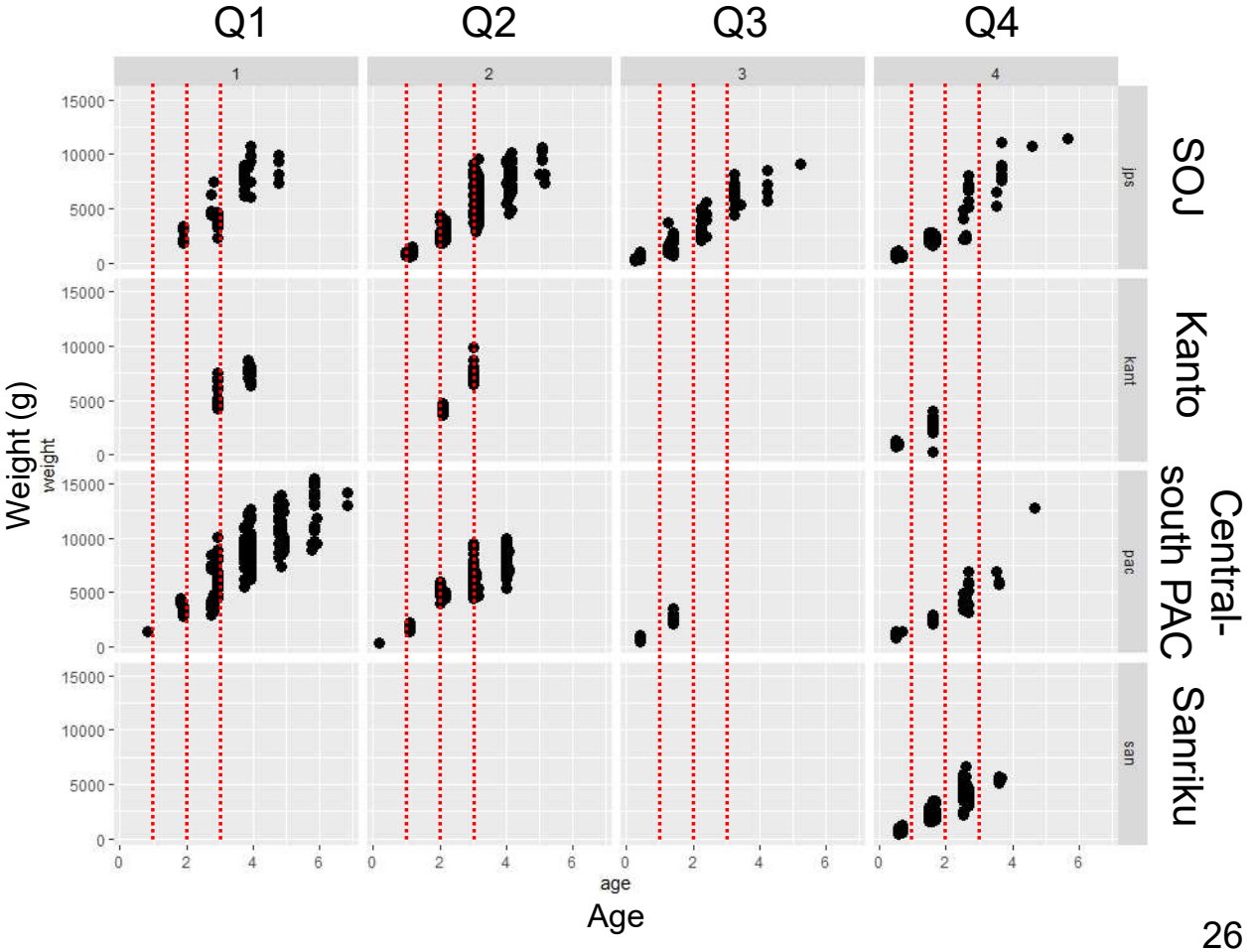
S-13. Please show the age-length data… *Continued*



3. Data – Catch at age

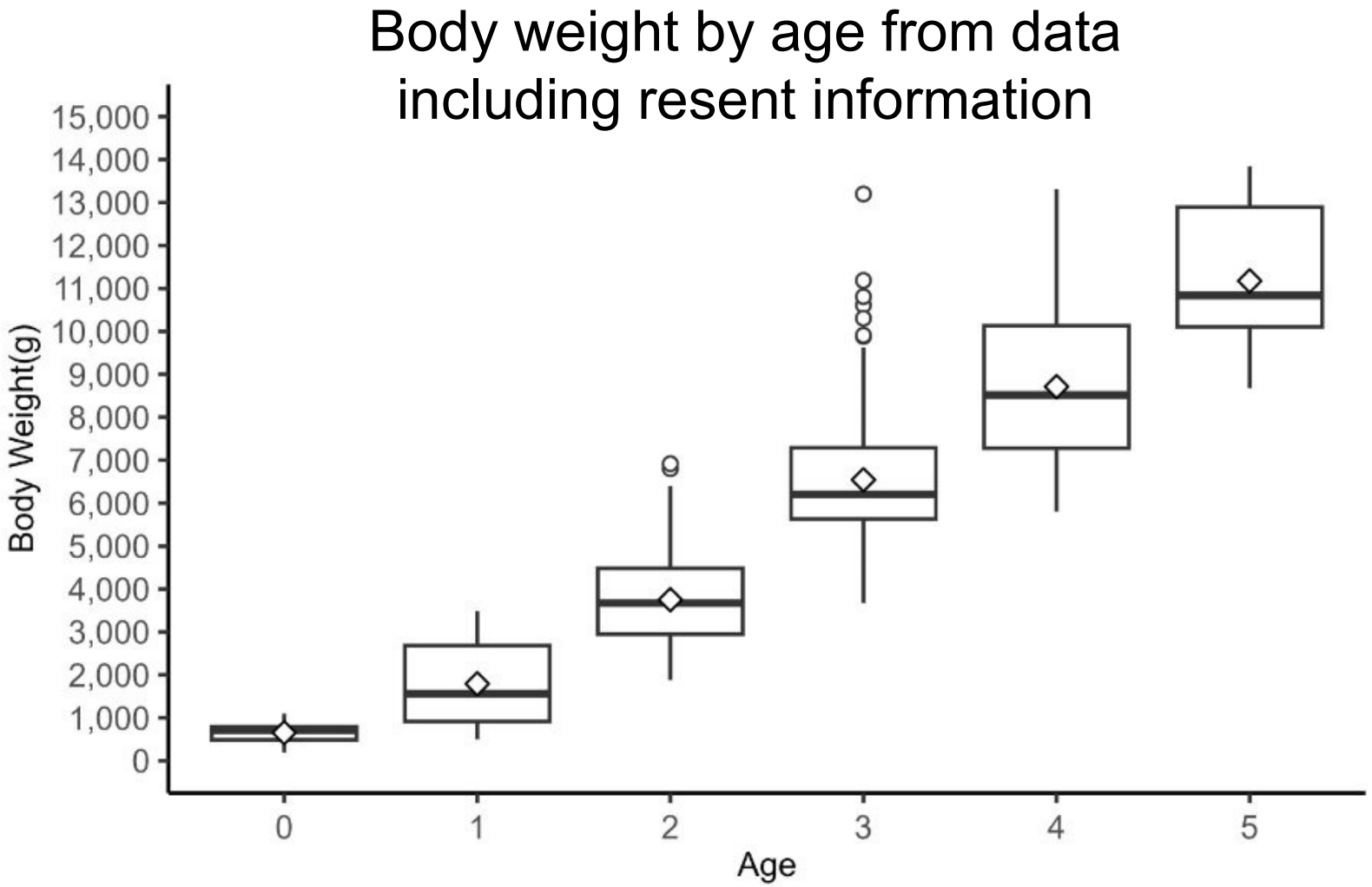
S-15. In cohort analysis, it is important to have confidence in the catch-at-age data. Cohort slicing is generally not a good idea unless there is strong support that there is negligible overlap in size between ages, and that the age-weight or age-length relationship is consistent through the years. Therefore, using the data in Watari et al 2019, please plot the weight by age by qtr. Also please plot by weight by age by quarter by year.





3. Data – Catch at age

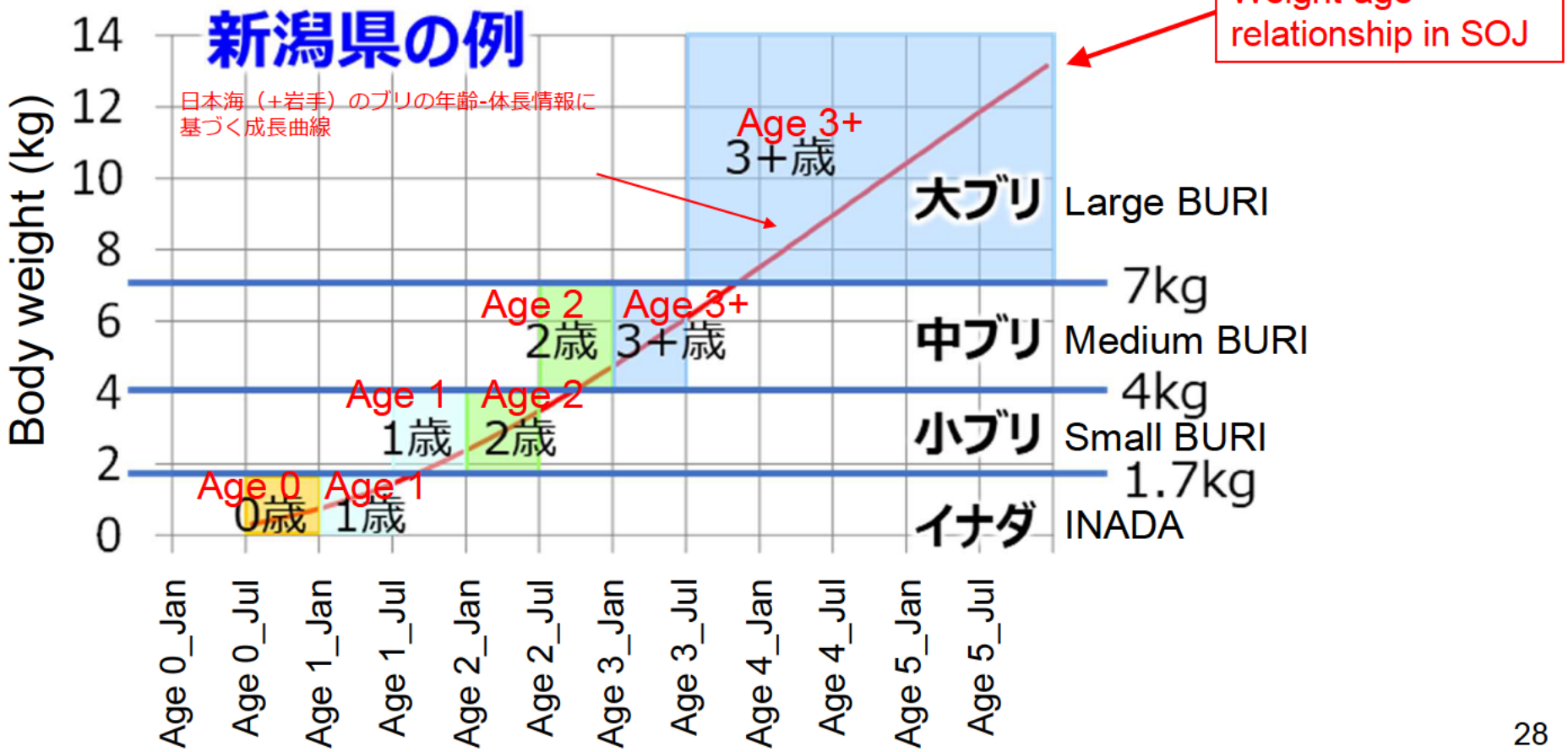
S-15. In cohort analysis, it is important… *Continued*



3. Data – Catch at age

P-2. a. i. Is it possible to include the actual age, length, and weight data that underly these categories?
S-14. Please show the data to support the conversion of commercial size categories into age data.

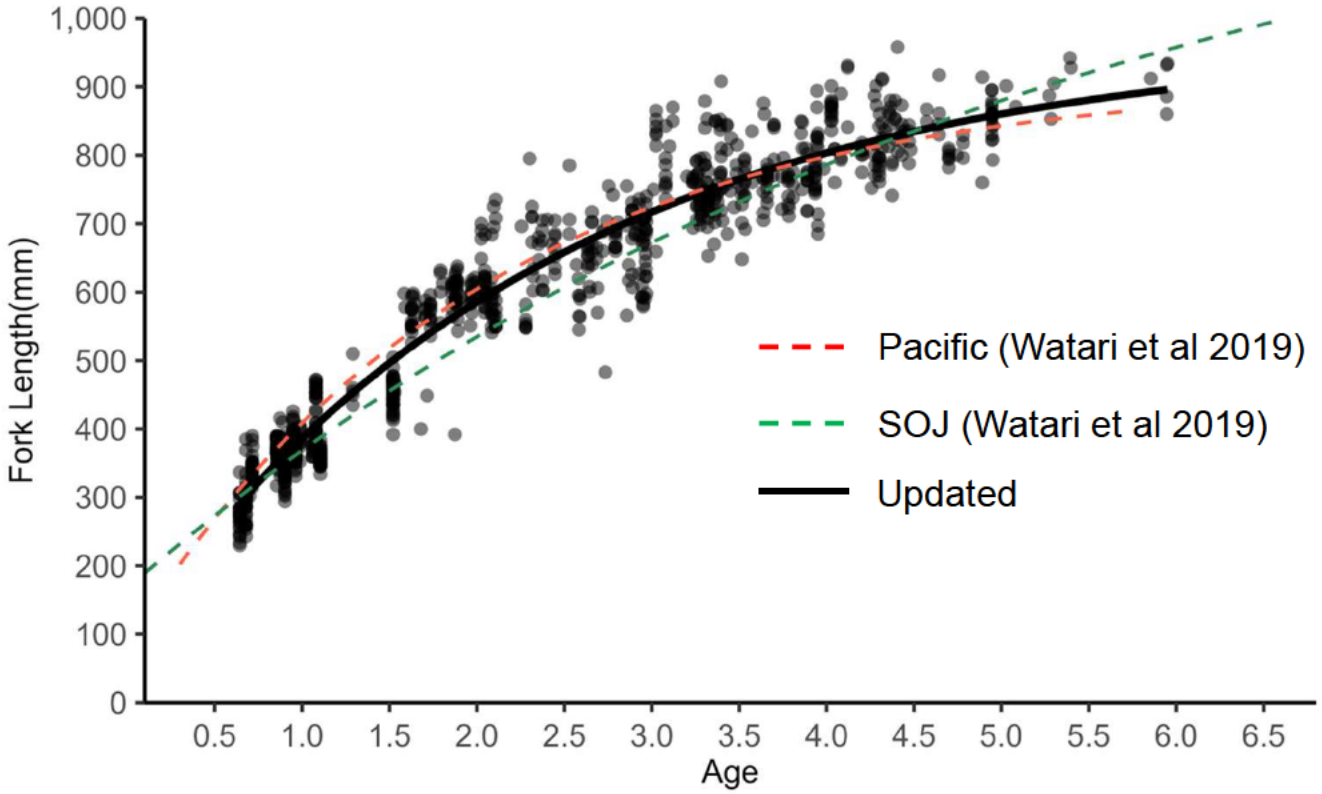
Example of conversion of comm size categories into age data applied to JA landings in Niigata Pref



3. Data – Catch at age

S-16. Has there been changes to the length-age or weight-age relationships over the years?

- According to report from prefectural scientific bodies, there were observations of change in length at age within local scale in recent year.
  - Getting smaller
- Intensive collection of age-length information has been started in last year.
  - Changes in growth could be examined in future.



- ✓ Updated age-length relationship is provisional.
- ✓ Updated age-length relationship does not change with previous ones.

4. Data – Tuning indices

S-17. It appears that no tuning indices were used to tune the model. Is that correct?

- Yes, we do conduct plain VPA without tuning indices.
  - No intension to continue to apply this type of VPA.

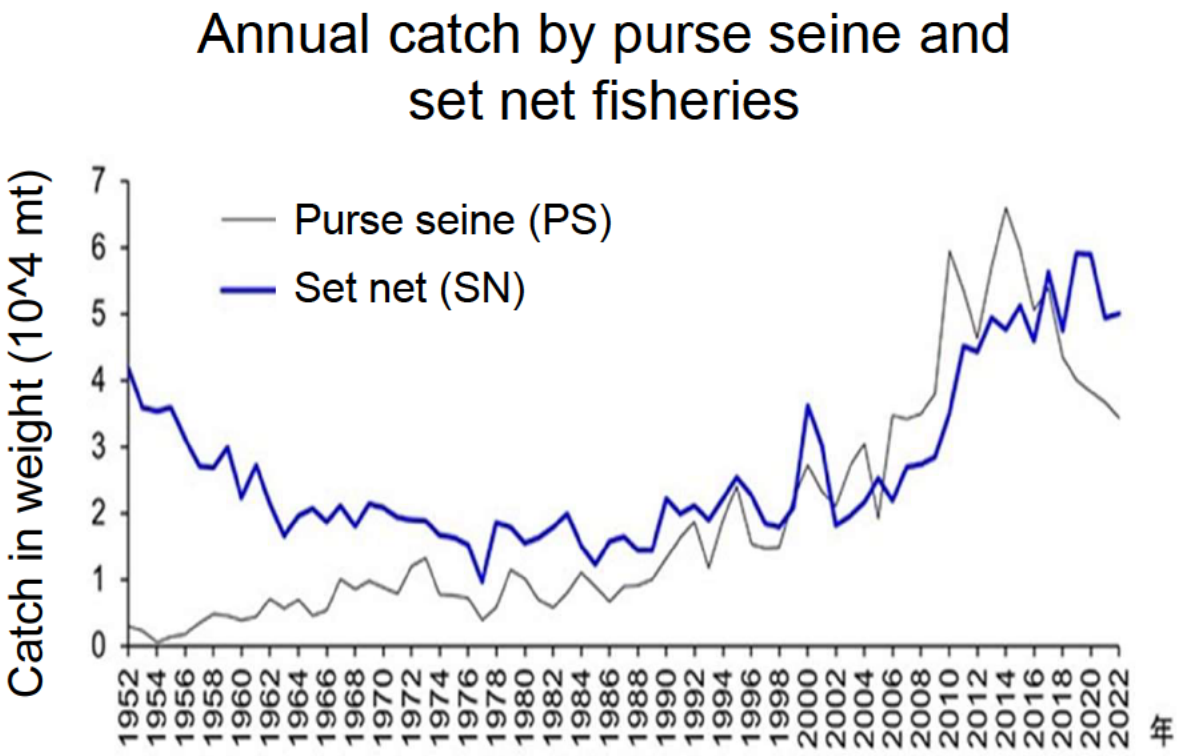
Justification of application of plain VPA

- No catch limits under no effort limits.
- Fishing efforts of various fisheries, which are deployed around the Japanese coastal and offshore waters.
  - We could assume that catch amount by age represent abundance by age.

Need to develop abundance indices in near future stock assessment

4. Data – Tuning indices

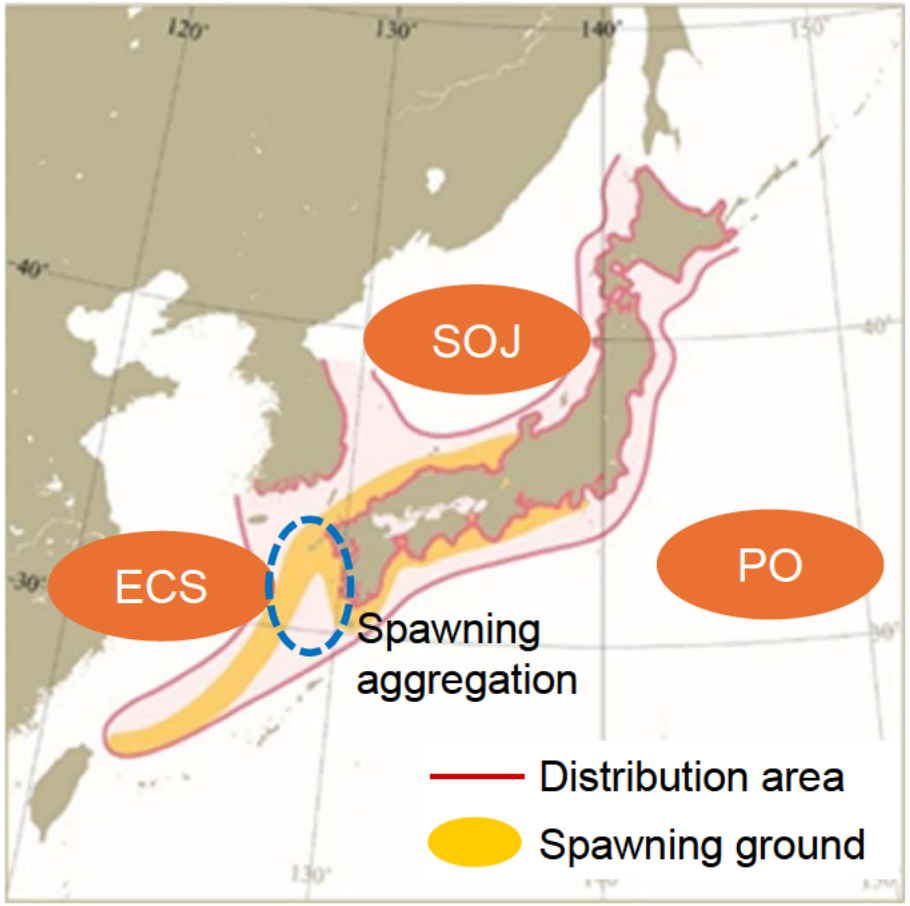
S-18. Was there an attempt to develop a standardized abundance index from set net CPUE?



- PS and SN fisheries are main ones fishing JA.
- SN yields the largest catch in recent years.
- SN are deployed around Japanese coasts.
- Capture multiple age groups.
- Different fish availability by age and by region.
- Difficulty to specify age group(s) for abundance indices in VPA and statistical catch-at-age models.

4. Data – Tuning indices

S-19. In general, adult indices are more useful for management purposes. Which fishery is the primary fishery that catches adult fish? Can an index be developed from that?



- Large-scale PS is operated in
  - Waters off Pacific side coast of north Japan
  - Western Sea of Japan
  - East China Sea
- PS targets spawning aggregation of JA in ECS during spawning season.

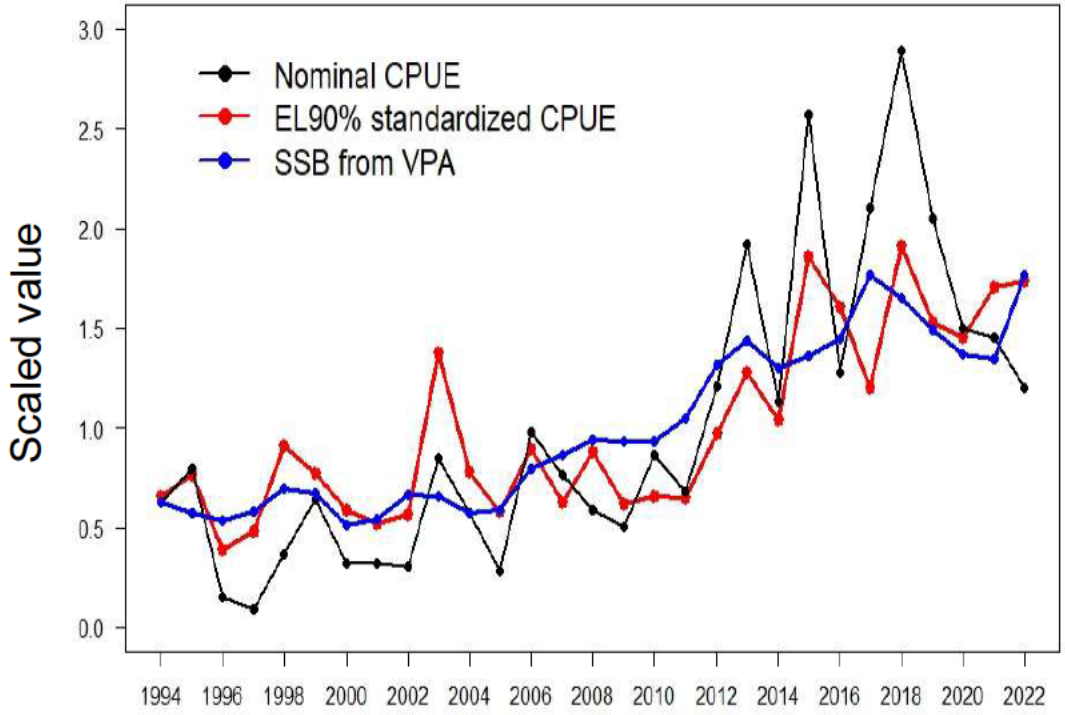
Possible candidate of adult indices

4. Data – Tuning indices

S-19. In general, adult indices are… *Continued*

- Nishizawa-san has been addressing to develop adult abundance indices using logbook data from PS fishery targeting JA spawning aggregation.
  - Data filtering according to season and area.
  - Application of Biseau (1998) to extract catch and effort data of JA-targeting operation.
  - CPUE standardization through GLM.

Preliminary result on standardized CPUE from JA-targeting PS in ECS



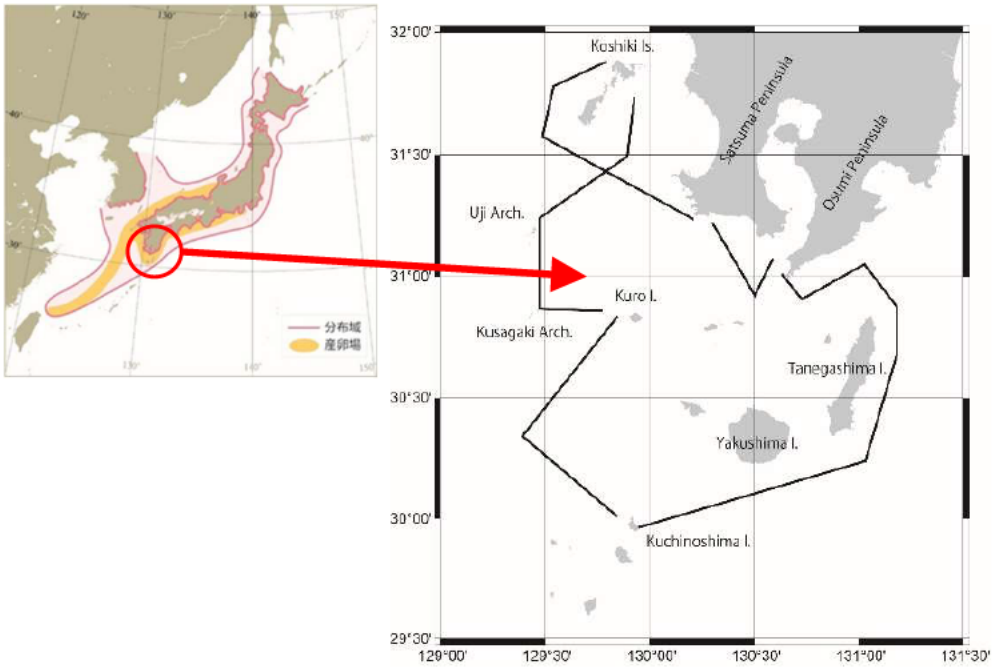
This CPUE time series will be introduced into JA stock assessment, after further development.

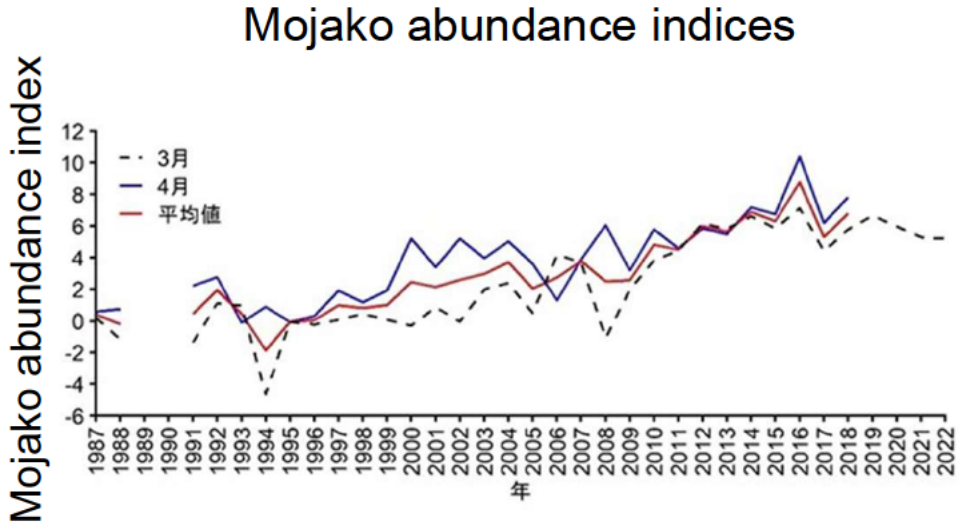
4. Data – Tuning indices

S-20. Are there scientific surveys that catch amberjacks?

Two fishery-dependent surveys

- Mojako abundance survey in waters off Kagoshima Prefecture
- Survey on JA larvae in the East China Sea

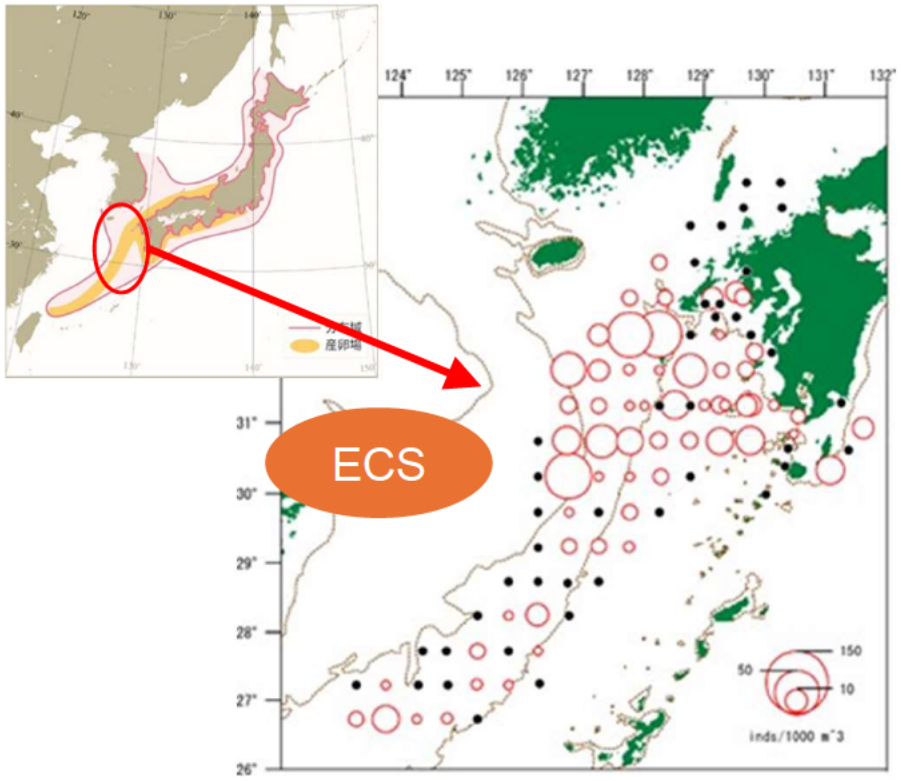




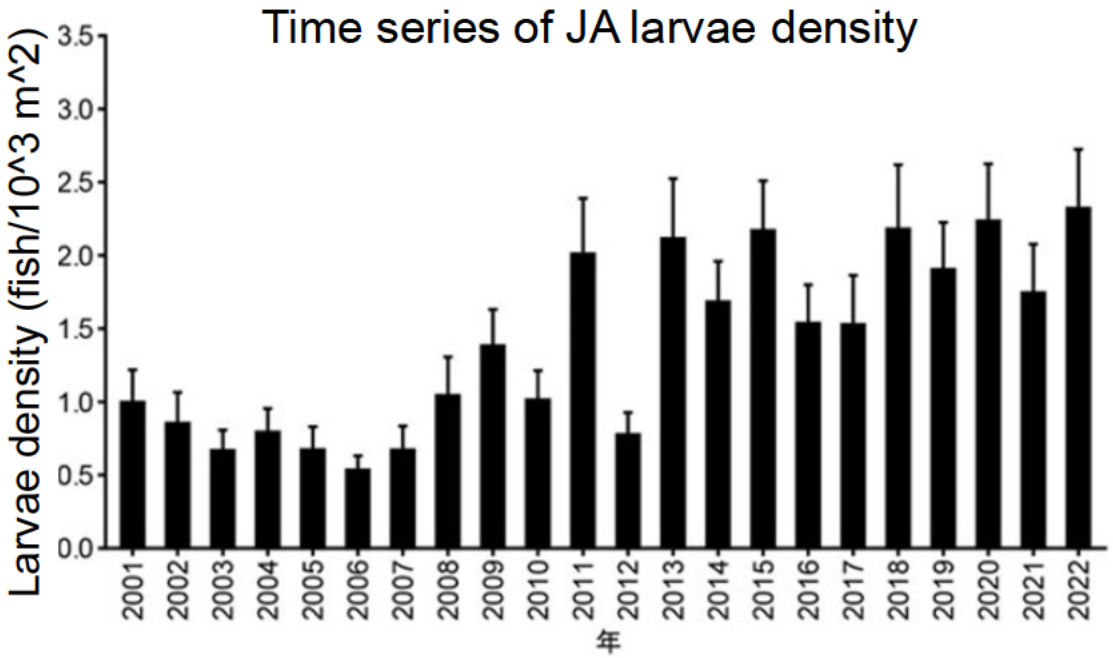
4. Data – Tuning indices

S-20. Are there scientific surveys that catch amberjacks? *Continued*

Survey on JA larvae in the East China Sea



P-10. Were the survey data not used for tuning the model because they were not considered representative of the overall population? Please describe the rationale in more detail.
a. Particularly because Supp Fig. 7-2 seems to roughly follow the estimated population trend.



This time series is possible candidate of SSB index

5. Biology

S-21.The M schedule appears to be somewhat arbitary. Please explain in detail why the following M schedule was used: 0.6 for mojako (first half of age-0) and 0.3 for all other ages. The literature on M was reviewed (Section on Natural Mortality in Appendix 2) but a decision was made to not use them in the assessment modelling. I would suggest discussing that decision.

- Existing JA's M vector older than age 0 (Mojako) is a constant of 0.3, based on Tauchi & Tanaka's method of 2/Amax, returning 0.357 under Amax = 7.
  - It returned 0.278 under Amax = 9.
  - 0.3 corresponded to an intermediate value of 0.357 and 0.278. → M = 0.3 was agree to use.
- Oshima's first attempt on JA stock assessment was to review and change M vector. → Decision to keep existing M vector.

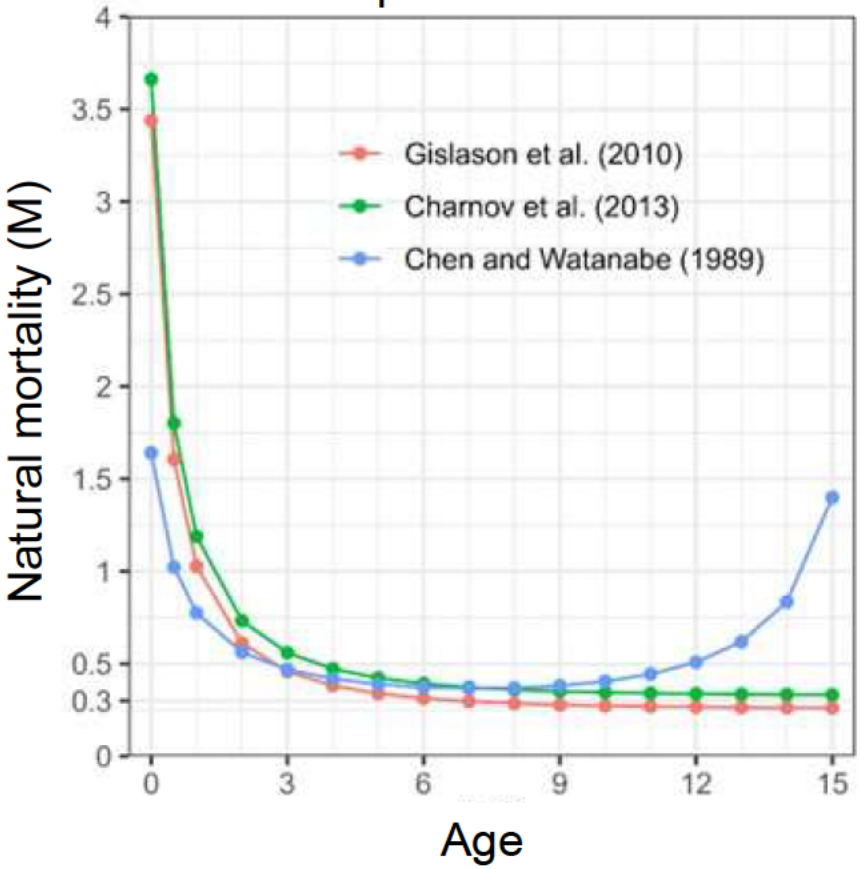
Type	Eq	M	Linf	K	Amax	References
JA stock assmt	–	0.300	–	–	–	
Tauch & Tanaka	2.5/Amax	0.357	–	–	7	Tanaka (1960
Pauly_update	$4.12Linf^{-0.33}K^{0.73}$	0.397	102.7	0.33	–	Then et al (2015)
Jensen	1.5K	0.495	–	0.33	–	Jensen (1996)
Hoening	4.30/Amax	0.614	–	–	7	Hoening (1983)
Hoening_update	$4.90/Amax^{-0.916}$	0.824	–	–	7	Then et al (2015)
FishLife	-	0.553	–	–	–	Thorson et al (2019)

Growth parameters of Linf and K were based on Watari et al (2019).

5. Biology

S-21. The M schedule appears to be… *Continued*

Age-specific M vector based on 3 empirical methods



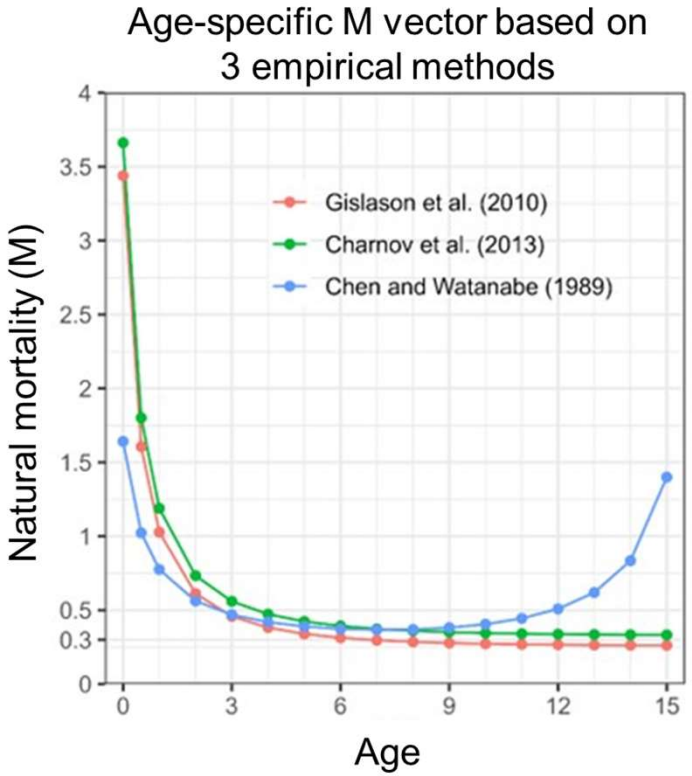
- Three methods returned age-specific M values higher than 0.3.
- Current M vector is lowest.
- Some scientists believe that JA's M must be possibly low based on tag release-recapture data.

- Topics on M application will continue to be discussed towards the next benchmark stock assessment.
- Tremendously abundant tag release-recapture data will be reviewed in terms of M setting.

5. Biology

P-14. Are the mojako caught for farming then released back into the wild?

a. Mojako M should maybe be higher than 0.6. Please include more description for the value used.



- At the 2021 stock assessment, the scientific bodies discussed M setting on age 0 (Mojako).
- Using 3 empirical methods for estimation of age-specific M,
  - Ratio of M for age 0 (Mojako) to M for age 0 (Late)
  - Each method returned 2.15 (Gislason et al), 2.03 (Chamov et al) and 1.60 (Chen & Watanabe), resulting in 1.93 on average.
  - The bodies assigned 0.6 (double of 0.3) to Mojako M.

5. Biology

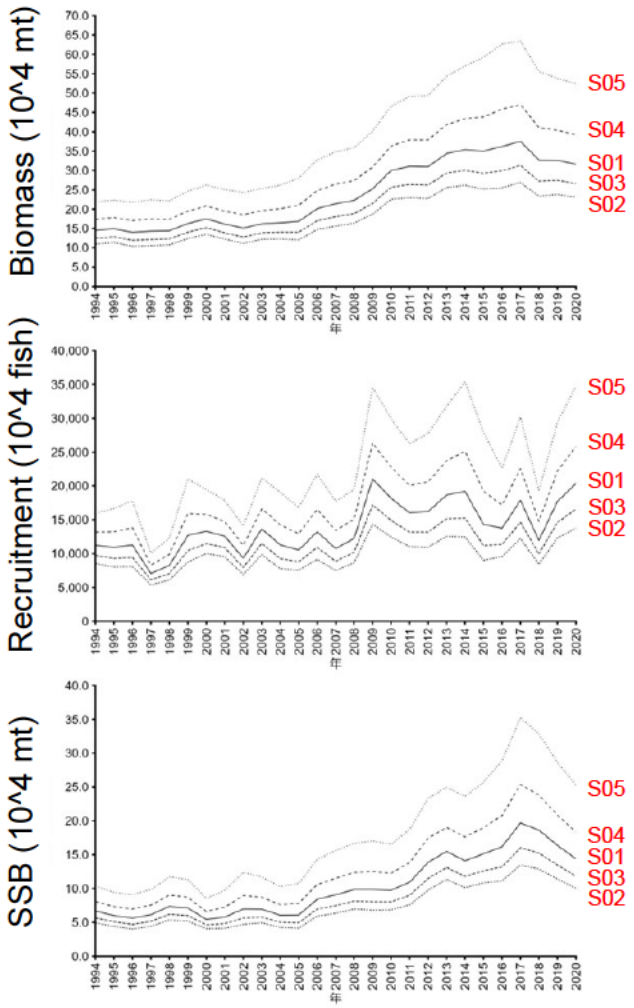
S-22. Was there consideration of the uncertainty in M?

S-23. Were there sensitivity model runs for different M values? A good approach would be to develop a posterior for M using several relationships for M and biological parameters, and use the posterior to develop the uncertainty bounds for M and use these for sensitivity runs.

- Kurashima-san carried out sensitivity runs on different M vectors in the 2023 stock assessment.

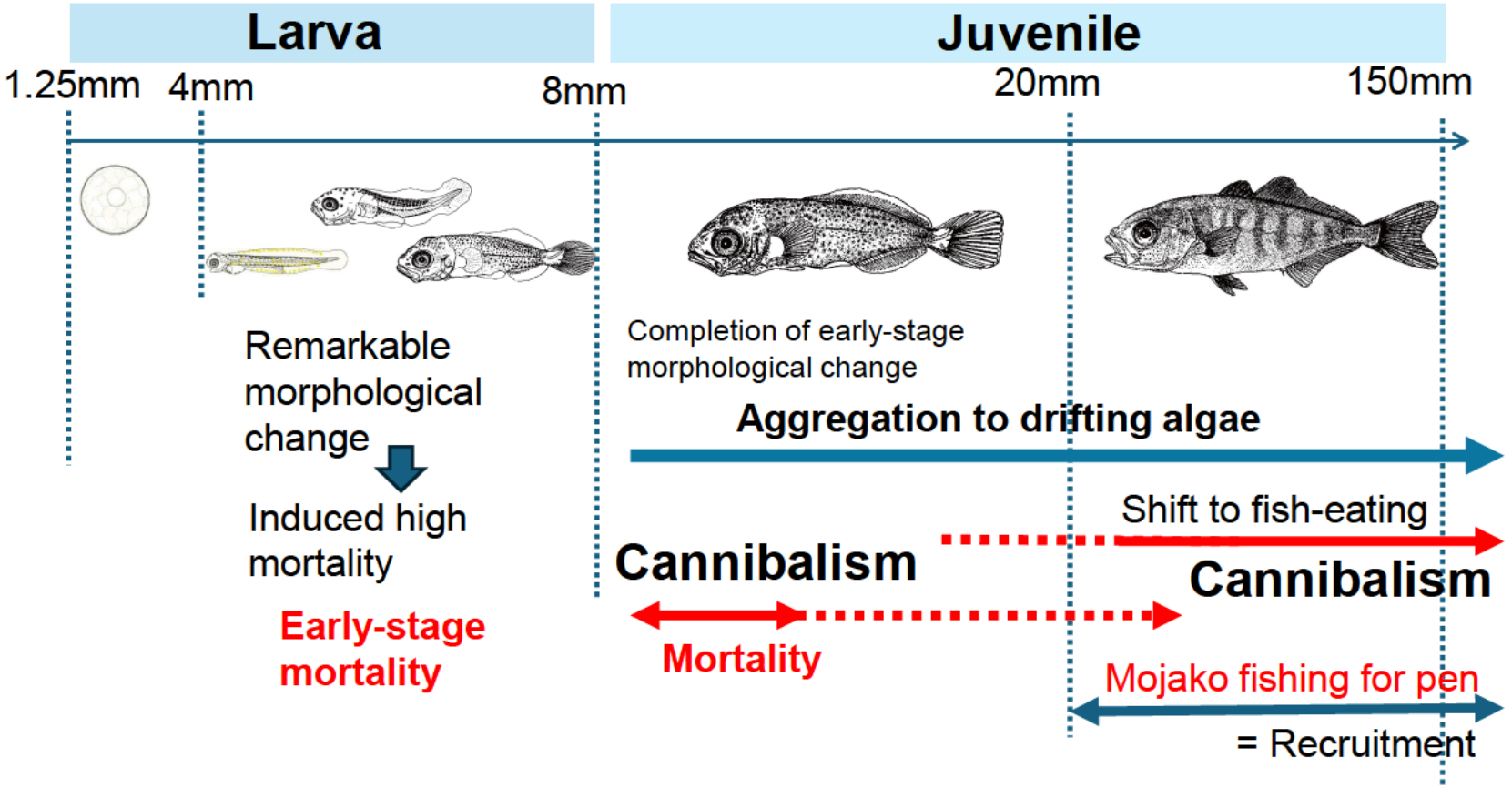
Scenario	Age 0 (Mojako)	Age 0 (Late)	Age1	Age 2	Age 3+	SBmsy (10^4 mt)
S01 (base case)	0.6	0.3				22.2
S02	0.2	0.1				17.9
S03	0.4	0.2				19.7
S04	0.8	0.4				25.9
S05	1.0	0.5				25.3

P-4. Selecting a value of M ends up determining much of the model diagnostics. Ideally, the estimate for M is informed by the data and is consistent with our biological understanding of the population dynamics.



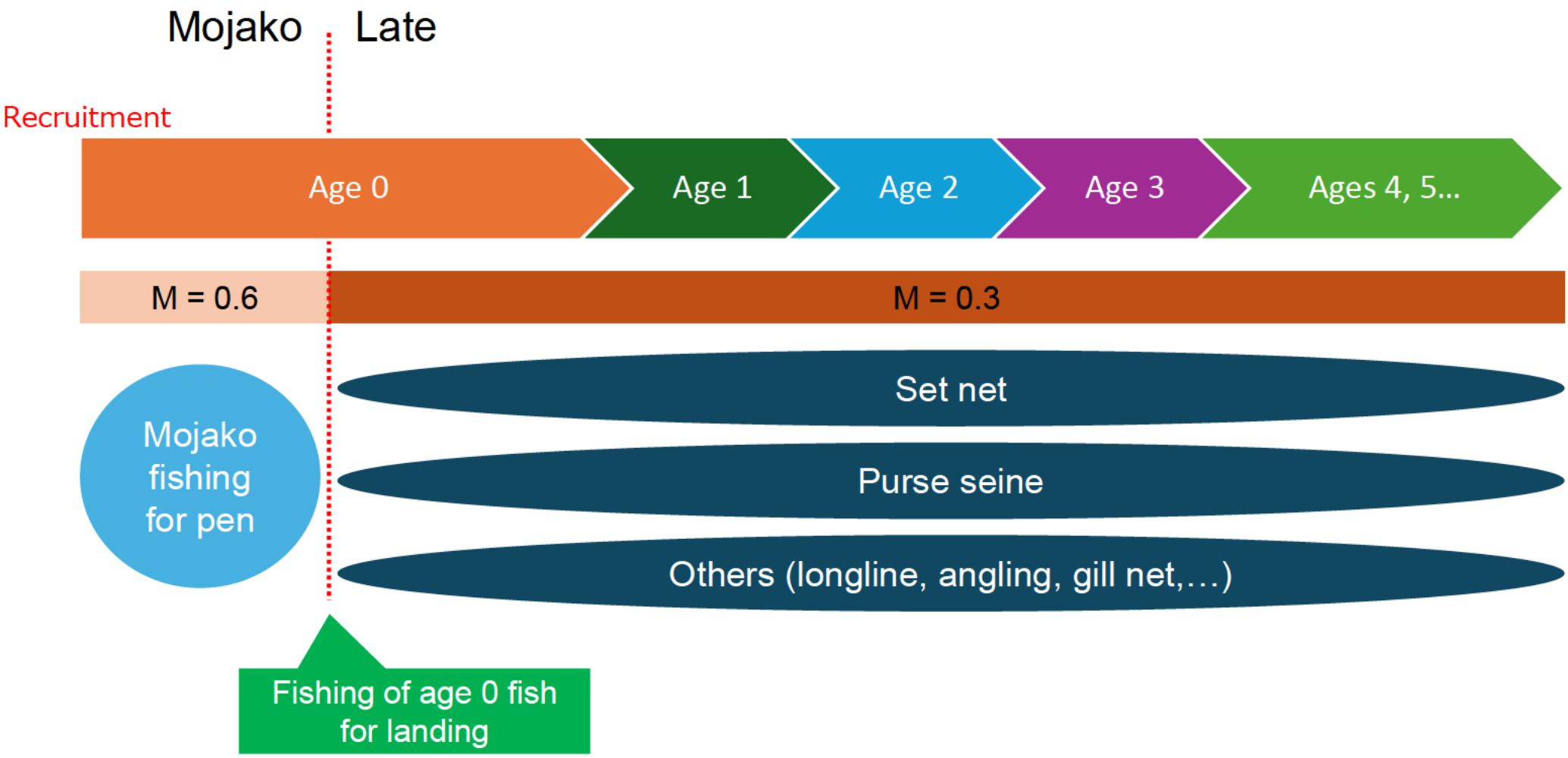
6. Model and diagnostics

S-24. The model is basically a standard cohort analysis without tuning indices. The part that is different is the splitting of age-0 into 2 periods but it is not clear why that was done. Why use 6 month periods for age-0 and annual time steps after? Why not just use 6 month time steps for all ages?



6. Model and diagnostics

S-24. The model is basically a standard cohort analysis … *Continued*



6. Model and diagnostics

S-25. Why start the model in 1994 when there appears to be data going much further back? For example, Fig 3-3 & 3-4.

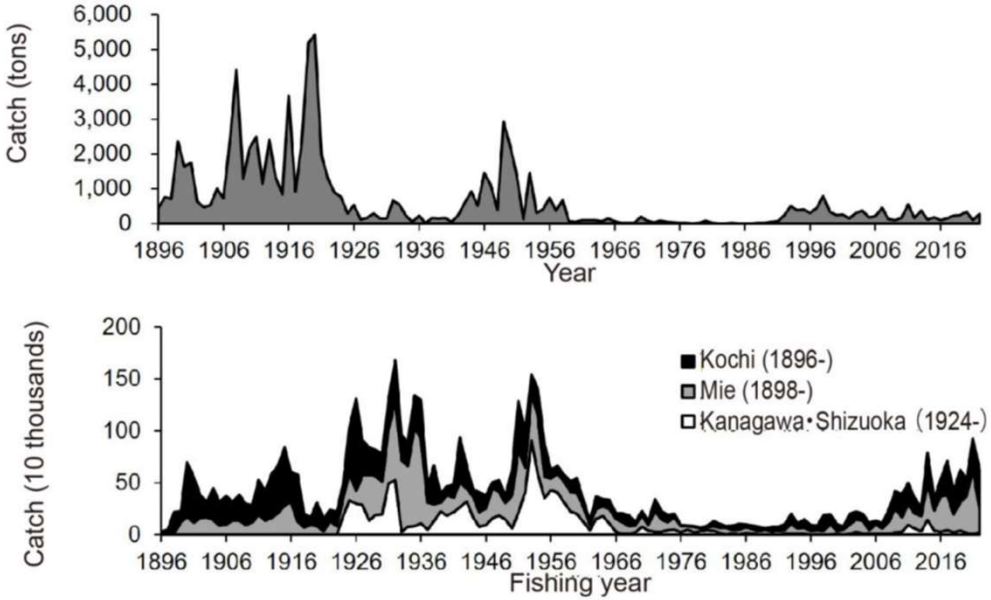


Fig. 3-3. Long-term trends in catch for the buri category

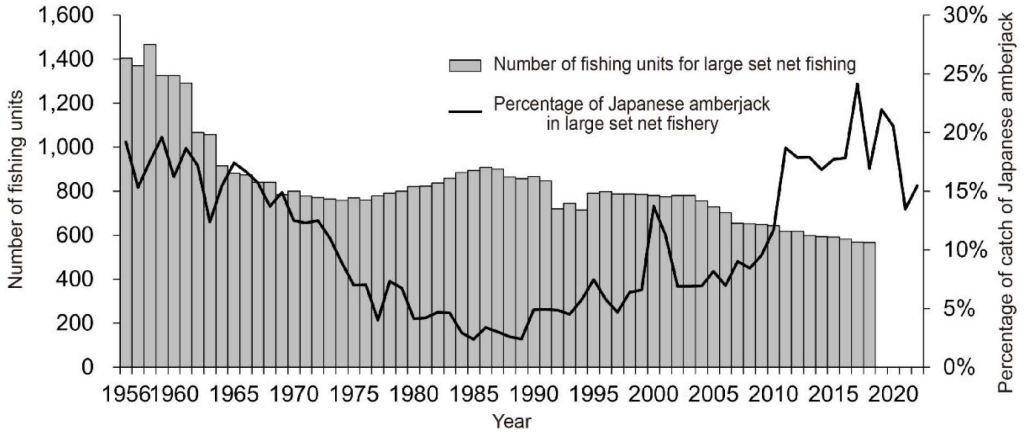
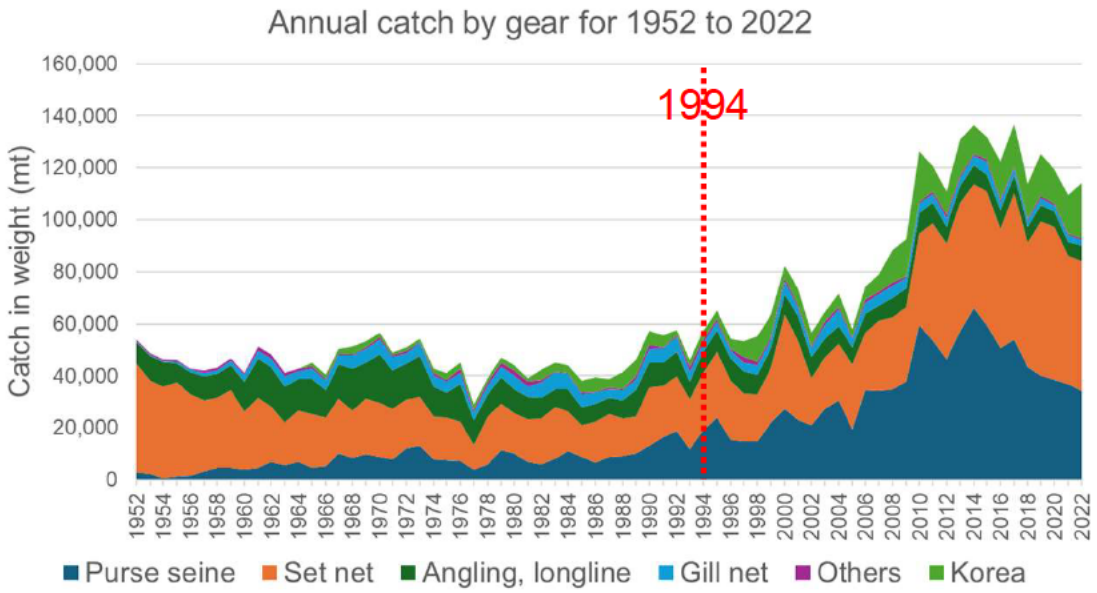


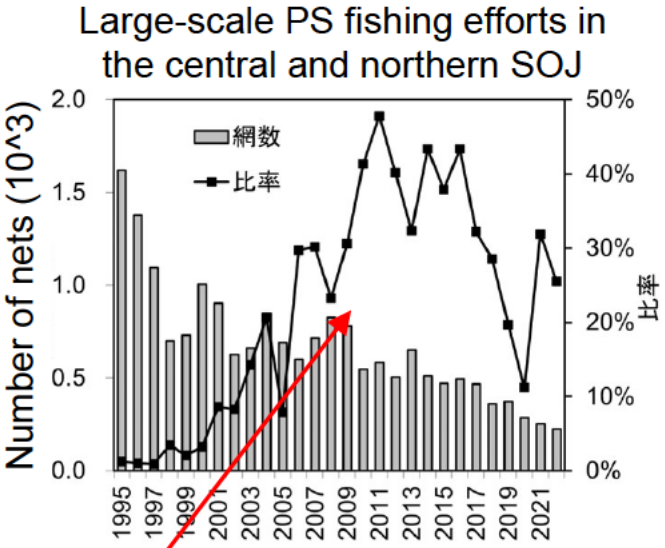
Fig. 3-4. Trends in the number of large set net fishing units nationwide and the proportion of Japanese amberjack within catches

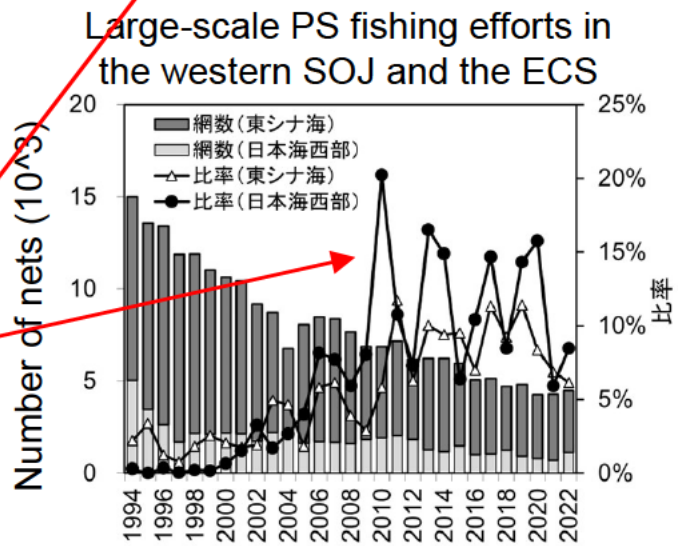
- Information on catch amount are available in longer period.
- Sales slip data for construction of catch-at-age got available at least since 1994.

7. Stock-recruitment

S-26. What were the causes of the low catches during 1970s-1990s?







- Since 1994, catch contribution of PS has increased.
- The catch proportion of JA in total PS catch increased after 1990s in the SOJ and ECS.

8. Projections

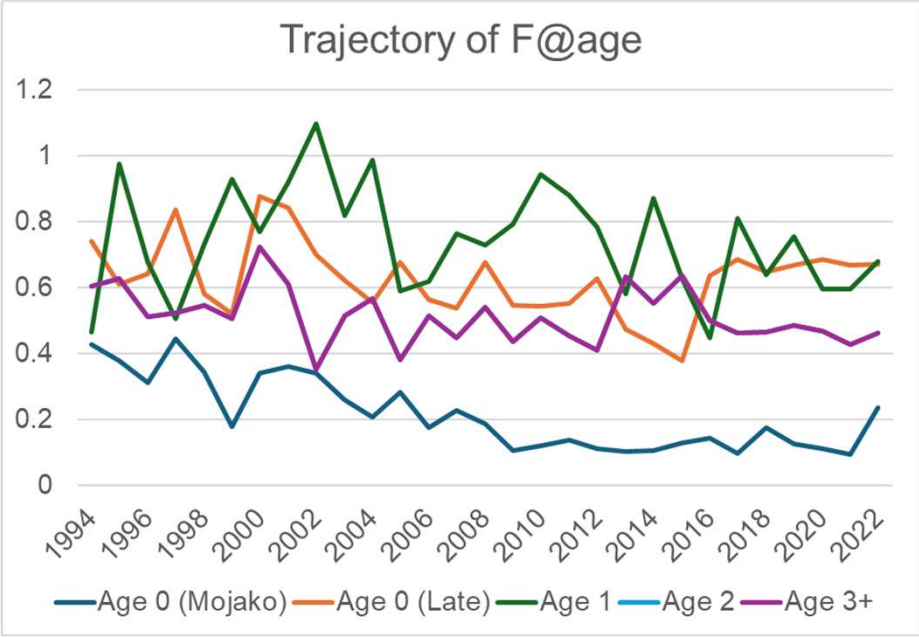
S-27. Doing 1 and 2 year projections are important for management. What is the prediction skill of these short term predictions?

- In this case, we need to carry out hindcasting to check the prediction skill.
- No results on JA hindcasting at this moment.
- We will conduct hindcasting in future.

9. Others

P-13. How is the fishery managed? F does not seem to be controllable or at least reduced in the entirety of the assessment time frame. Throughout the time period presented, the stock has had F > Fmsy and B < SBmsy

- No JA fishery management related to setting of TAC so far.
- Last March, setting of TAC was agreed by stakeholders.
- After experimental period, TAC control will get started.



Our message is

- ✓ Reduction of F on entire JA stock could achieve reduction of F at younger age groups such as ages 0 and 1.
- ✓ F reduction can be expected by setting of TAC.

9. Others

S-29. What are the potential improvements for this assessment?

Kurashima-san is struggling to progress the following major 3 challenges to introduce into the near-future JA stock assessment.

1. Introduction of abundance indices for tuning.
2. Further separation of plus group (age 3+).
3. Review of biological parameters such as maturity ogive, M vector and growth.

P-16. M of 0.3 is at the lowest of the values presented in Supp Table 2-2. Hamel and Cope (2022) would use 5.4 / 7 = 0.77 as M.
a. The challenge with using growth estimates is that you have to have a good ageing lab in order to get good estimates of growth

<u>Long-term challenge just in my mind</u>

Application of stock assessment models where different selectivities can defined to different fleets such as SS3 and WHAM.

P-11. The number of different gear types for amberjack suggest that it may be beneficial to allow the selectivities for each of these fleets vary. Something to consider if the assessment method shifts to integrated statistical catch-at-age models.

WHAM!

10. General comments

10. General comments

S-28. Based on the document “Guidelines for HCRs and ABC calculations”, these calculations are supposed to be risk-based and incorporate the uncertainties in the assessment. However, the only uncertainty included in the projections appeared to be the uncertainty in future recruitment deviates. There did not appear to be any uncertainty in the reported stock assessment results. For example, the estimated SSB, recruitment, N-at-age, F-at-age, and SRR did not appear to have any uncertainties associated with them. Were these uncertainties not estimated or not reported?

- In JA case, plain VPA (without tuning) is applied.
- Estimates from JA VPA
  - No uncertainties were estimated for N at age and F at age.
- Confidence intervals are estimated for SRR.
  - Recruitment deviates were used for future projection.

10. General comments

P-G1. Please describe the methods for combining F (and Fmsy) values across ages. I thought that in most cases they would be averaged together, but I could not get my calculations to match the values reported in the documents.

→ Same answer with Uehara-san's presentation

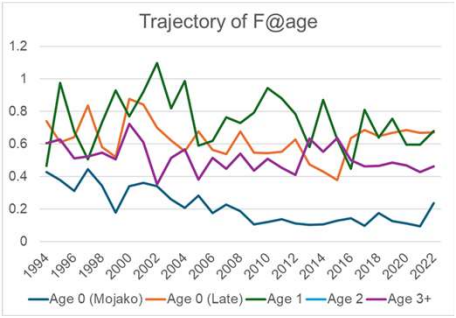
a. The F values for the plus group and the age class before often have identical F values. Based on the equations provided in the appendices, this seems like it should only occur if the catch values for the two age classes are the same. Please correct me if I am misinterpreting or provide more detail.

→ Same answer with Uehara-san's presentation

b. Another concern is that the F values for older age classes can become very high. Some of these stocks have relatively specific distribution boundaries and my sense is that some of these older fish might be moving out of the boundaries rather than caught in the fisheries. VPA doesn't really have "selectivity" in which the authors could specify a selectivity curve that has very low (~0) selectivity values for these older fish. My concern is that some of the F values (and F/Fmsy ratios as a result) could be biased high.

→ No assumption on emigration of older fish.

→ Not higher F for older age groups such as ages 2 and 3+.



10. General Comments

P-G2. I think there are often some difficulties with assuming the data represent a closed population. An integrated catch-at-age analysis (which can be modeled with Stock Synthesis) may offer a better ability to make the model assumptions more explicit. Additionally, it will offer the assessment authors the chance to explore model sensitivities to different assumptions.

→ Same answer with Uehara-san's presentation

a. This is particularly the case when multiple sectors of the fishery (purse seine, bottom trawl) each make up a large part of the catch but can have very different selectivities. In a VPA the assumption has to be that each of the fleets have the same "selectivities," although this is treated as age-specific F.

→ Same answer with Uehara-san's presentation

b. An additional benefit will be to estimate the uncertainties associated with the data and model estimates. I think the VPAs likely have a large amount of uncertainty in the age-length relationships that cannot be made explicit. Catch advice based on the stock assessments could be modified based on the data/model uncertainties.

→ Same answer with Uehara-san's presentation

- In JA case, the scientific body proposed an adjustment factor (β) of 0.95.

10. General Comments

P-G3. I recommend including more detail and description of the data used in the assessments. Specifically, the data used to relate lengths to ages and weights to lengths. I recommend including the number of observations and the data source (specific to purse seine fishery, bottom trawl fishery, bottom trawl survey for example). It was difficult in most cases to determine how lengths were converted to ages. This is very important as age data are a key component of these models, and I don't think there is a way to incorporate uncertainty in the age-length relationships or age observations in the models.

- Appreciate your recommendation.
- It will be our future considerations to improve the stock assessment reports.

10. General Comments

P-G4. The decisions to use fixed M values should be detailed a bit more. In my assessments we generally use Hamel and Cope (2022) in order to define the prior around natural mortality, but then estimate M from the data. The prior around M ends up being relatively wide. Generally, this calculation is 5.4 / maximum age in the data. M is an influential parameter in these models and will affect the management quantities like B/Bmsy and F/Fmsy. I recommend including a profile across M values as a general sensitivity in these stock assessments in order to understand the affect that assuming M has on stock status estimates.

→ Same answer with Uehara-san's presentation.

- I explained M settings and sensitivity runs in the previous slides.

a. I also recommend including more description of the decision to use a time-invariant M value rather than an age-specific M value. Evidence for this is in Lorenzen (1996) and Lorenzen (2022).

→ Same answer with Uehara-san's presentation.

10. General Comments

P-G5. Please double-check that the catch values reported in the tables and used for the stock assessments all match. In some cases, I found discrepancies that were greater than might be expected from rounding (~60 mt).

→ Appreciate your finding of errors in Table 3-2.

→ We will do avoid inconsistencies in our stock assessment reports through double-checking and so on.

Thank you for your attention!