Fiscal year 2025 peer review
Splendid Alfonsino Pacific Japan

Participating organizations

- Chiba Prefectural Fisheries Research Center
- Tokyo Metropolitan Islands Area Research and Development Center of Agriculture, Forestry and Fisheries
- Kanagawa Prefectural Fisheries Technology Center
- Shizuoka Prefectural Research Institute of Fishery and Ocean
- Aichi Fisheries Research Institute
- Mie Prefecture Fisheries Research Institute
- Kochi Prefectural Fisheries Experimental Station
- Kagoshima Prefectural Fisheries Technology and Development Center

2026.1.21

Fisheries Resources Institute,
Japan Fisheries Research and Education Agency

Order of Presentation

- Background information of splendid al
  biology, catch, fishing gear, management flamework
- CPUE Standardization
- Stock assessment (VPA)
- Results

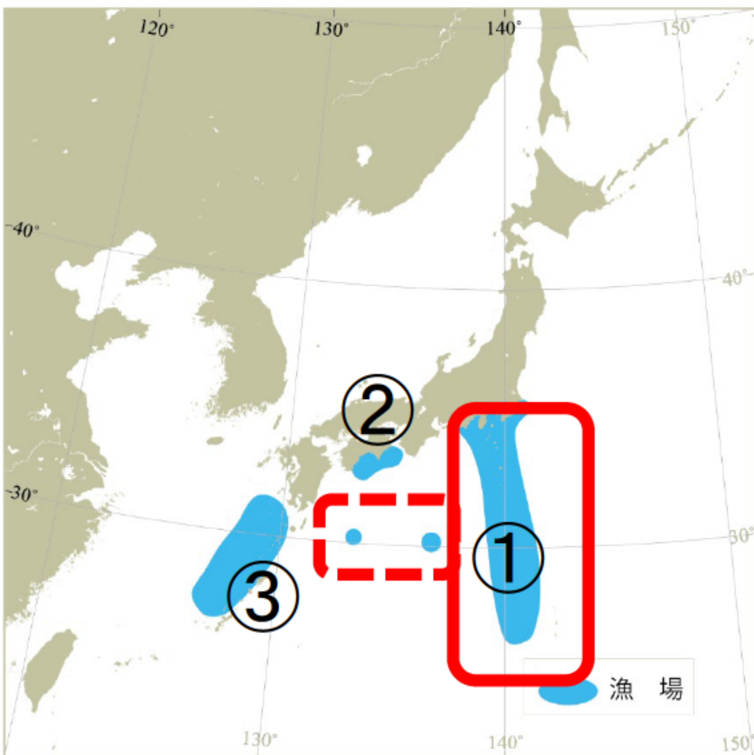
Biology

Longevity	Approximately 26 years (long-lived species)
Age at Maturity	4–5 years old
Habitat	Distributed along the continental shelf edge of the Pacific coast from Hokkaido southward, occurring on slopes of seamounts, oceanic hills, and sea mountains in a scattered pattern
Movement and Migration	Tag-recapture data indicate that the majority of individuals remain near the release location for about five years post-release. After ten years or more, some individuals exhibit long-distance movements, migrating from the Kanto coast ① to offshore waters around Shikoku ② and the Nansei Islands③.
Recruitment	Juveniles settle in coastal shallow habitats

Main fishing grounds of Splendid Alfonsino

Reviewer comment

There appears to be a very large area in the north Pacific Ocean where splendid alfonsino are caught. Are there any studies to assess stock-structure throughout the North Pacific Ocean? Can this reasonably be assumed to behave as a single breeding stock? Or could there be more than one separate breeding stock of S. Alfonsino in the North Pacific Ocean?



Basic concept for stock assessment

・Comprehensive judgment based on results of tagging and release surveys

・Currently, information is sufficient in both quality and quantity in ①

Estimate stock size for area ①

For areas ② and ③, promote data collection and research

Information of ② and ③ are included in supplementary materials

Detailed map ①

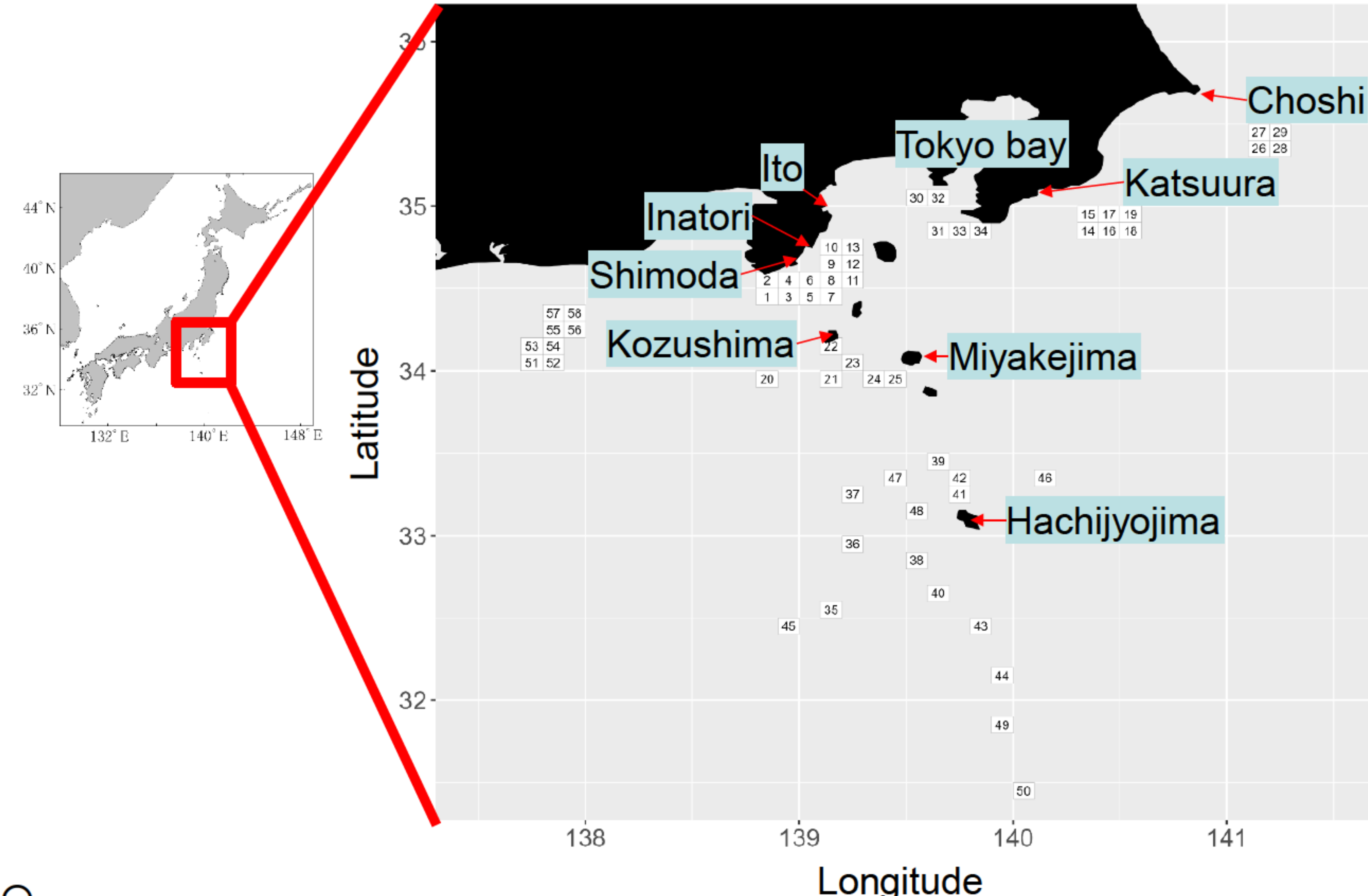
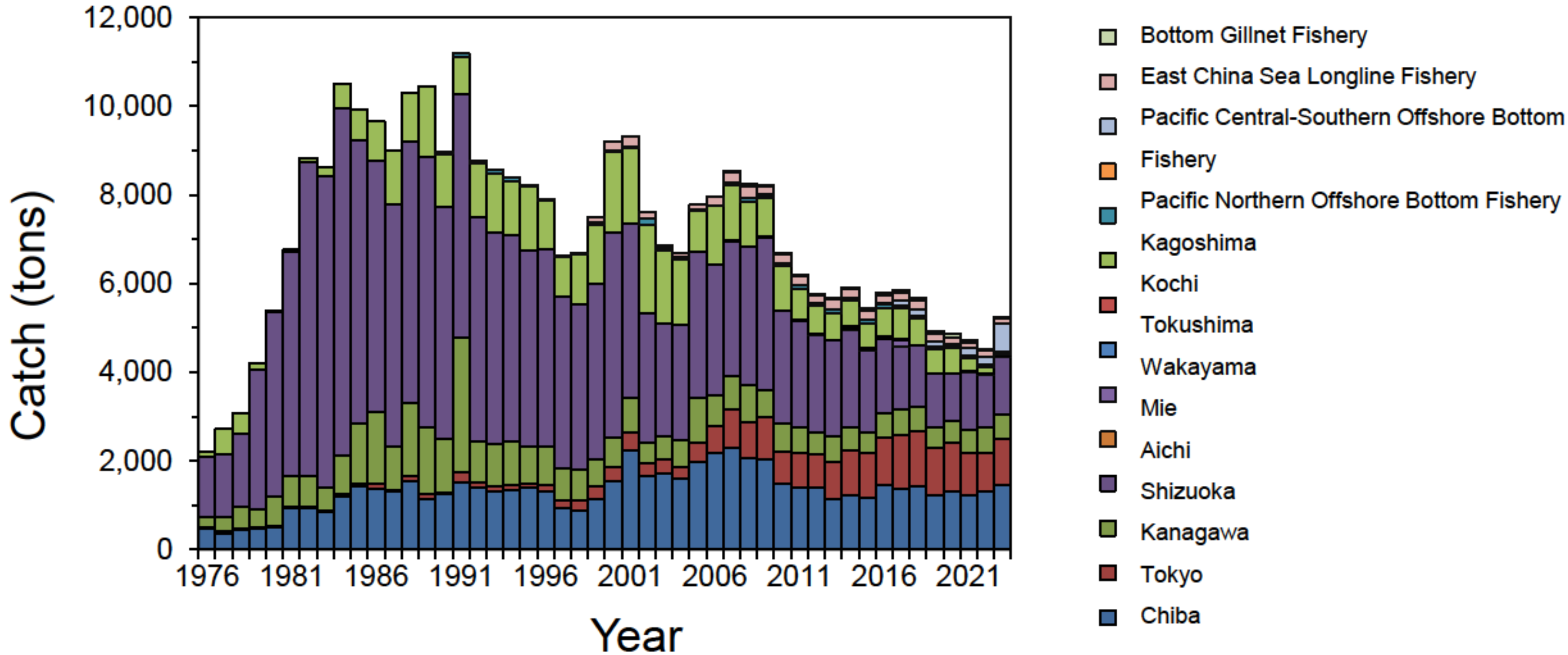


Fig 3-1

Total catch

Currently, there are no official catch statistics
Data collected through cooperation with research institutes

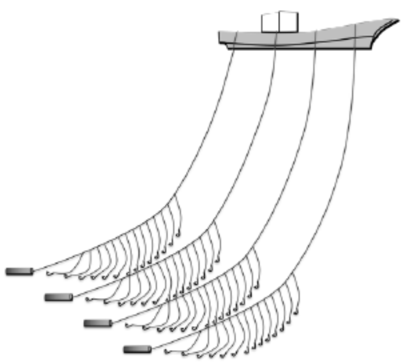


2023: Total 5,398 tons
Assessment target area:
Chiba, Tokyo, Kanagawa, Shizuoka 4,360 tons

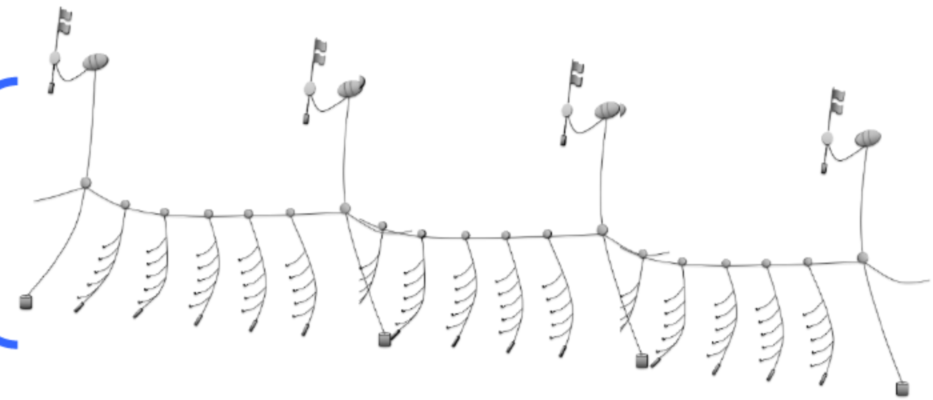
Main fishing gear

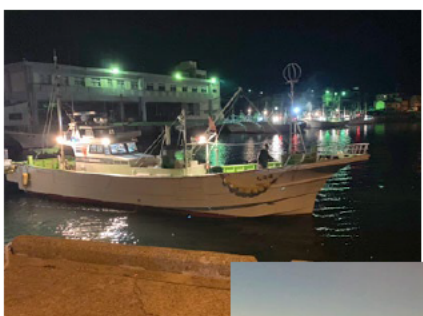
Vertical longline

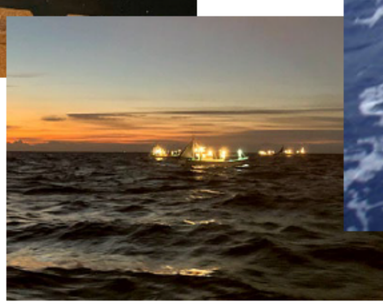
Bottom-set longline

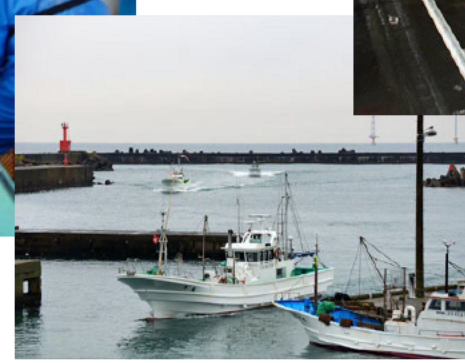


Several hundred meters





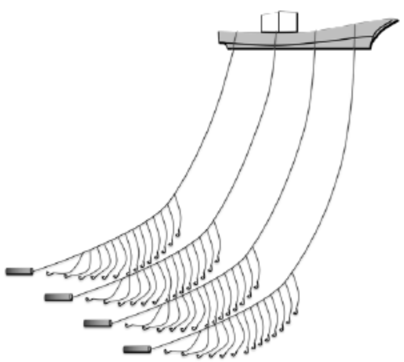




http://www.tsurikinme.jp/about_day.html

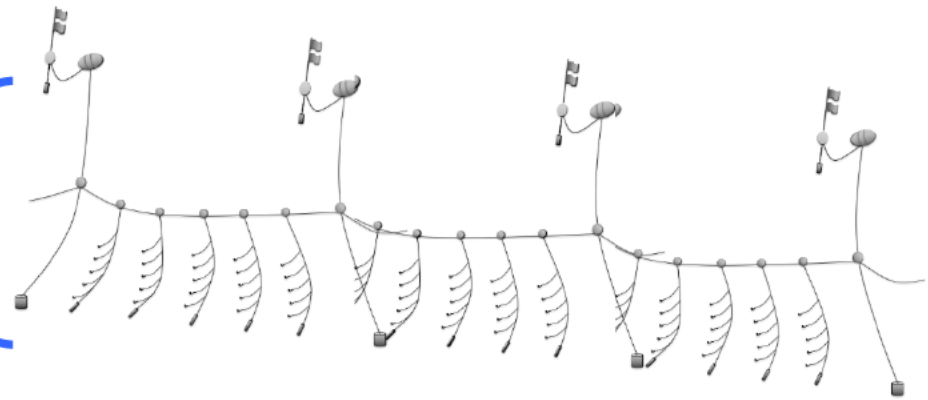
Main fishing gear

Vertical longline



Several hundred meters

Bottom-set longline



Community based management by region

- Number of main lines
- Number of hooks
- Type of bait
- Size restrictions on landed fish
- Operating time, season, and area

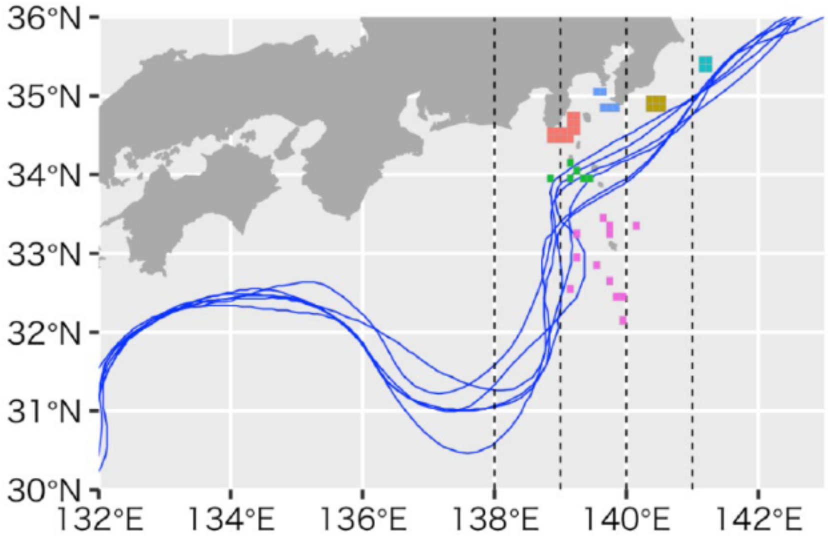
Council for fisheries management

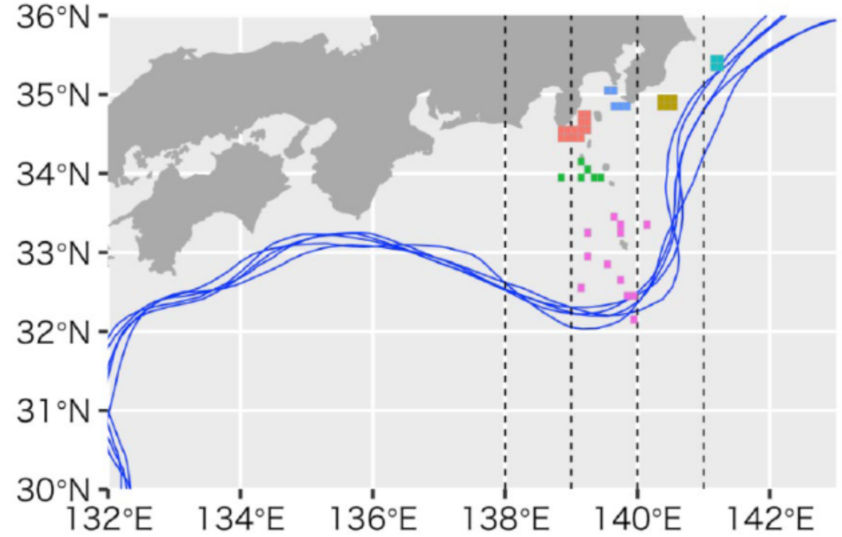
Chiba, Tokyo、Kanagawa and Shizuoka prefectures to promote community based management under a unified management unit
Fishermen･Fisheries Cooperative･Prefectural government, Fisheries Agency･FRA

Since 1990s	Council for discussing community-based fisheries management
2016	Assessed for the purpose of providing resource assessment results to the council
2020	Revision of the Fisheries Act, discussions on the introduction of TAC have been underway.
	Suggestions for improvements to the stock assessment are also raised from the fishing sites
2022	Major updates to resource assessments, including CPUE standardization
2026	As part of the ongoing improvement of stock assessments, past initiatives are reviewed

CPUE Standardization
Effect of Oceanographic Conditions

Blue line indicates the Kuroshio axis





Kuroshio large meander period
2017.8-2025.4

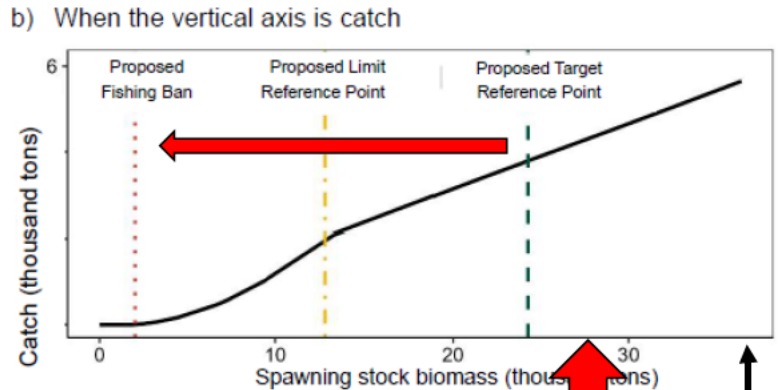
Before 2021, Influence of the Kuroshio Current and other oceanographic factors had not been incorporated into resource assessments

Step in stock assessment

Stock assessment of 2024
☑ **CPUE Standardization**
☑ **Tuning VPA**

Allowable Biological Catch will not be calculated

Proposed Harvest Control Rules



2022 meeting for Reference Point
☑ Stock–Recruitment Relationship: HS, RI, BH
☑ Whether to include data from 2021 in the stock–recruitment relationship
☑ Consideration of autocorrelation: Yes or No
☑ HS parameters:a = 454.85, b = 21,723.3, SD = 0.2
☑ Proposed Target Reference Point:SBmsy = 24.3 thousand tons
☑ Proposed Limit Reference Point:0.6 × SBmsy = 12.8 thousand tons
☑ Proposed Closure Level:0.1 × SBmsy = 2.0 thousand tons
☑ Value of β

SSB of 2024
+
Setting Recruitment for future projections

CPUE Standardization

The types of marine environments to consider and how to quantify the Kuroshio Current were developed through discussions with research institutions in prefectures.

○ Implement CPUE standardization by area

× Implement one CPUE standardization incorporating area effect

Effort data

Reviewer comment
Please define this term more clearly. Is number of landings a measure of catch or fishing effort and is day vessel a measure of fishing effort, type of fishing trip or fishing vessel? What was the frequency of zeros in the catch data set, i.e., what was the percentage of records with zero catch? I see that there could be no zeros, since catch is by month, but it would be good to confirm this, and if not, then confirm the percentage of records that have zero catch for a month. And if there are zero catches, then this will give some zero cpue values, and the log-normal GLM formulation will not work with zeros for dependent variable data points.

Data source :sales slip	For the alfonsino-targeted fishery, each sales slip represents one fishing operation
Number of landings	The fishery primarily operates on a single-day basis, with effort measured as one unit per fishing trip
Zero catch	non
Location	no precise operating location like a logbook Approximate sea area can be identified based on the relationship between the landing port and the fishing grounds.

Incorporating Oceanographic Conditions into CPUE Standardization (GLM)

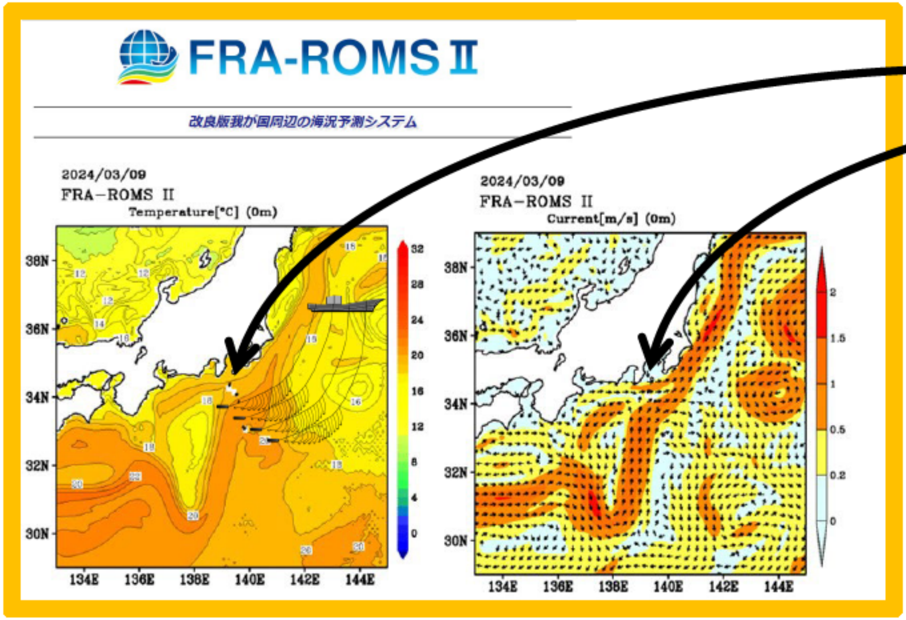
Reviewer comment
This is actually not an accurate statement of the model since it does not distinguish between factors (e.g., Year and Quarter) and covariates (e.g., Temperature_100, Temperature_200, Temperature_300) in the terms listed on the right side of the equation when it should denote covariates in the form biXi and have appropriate subscripts to denote time and space units. Please provide a more precise and accurate statement of the statistical model.

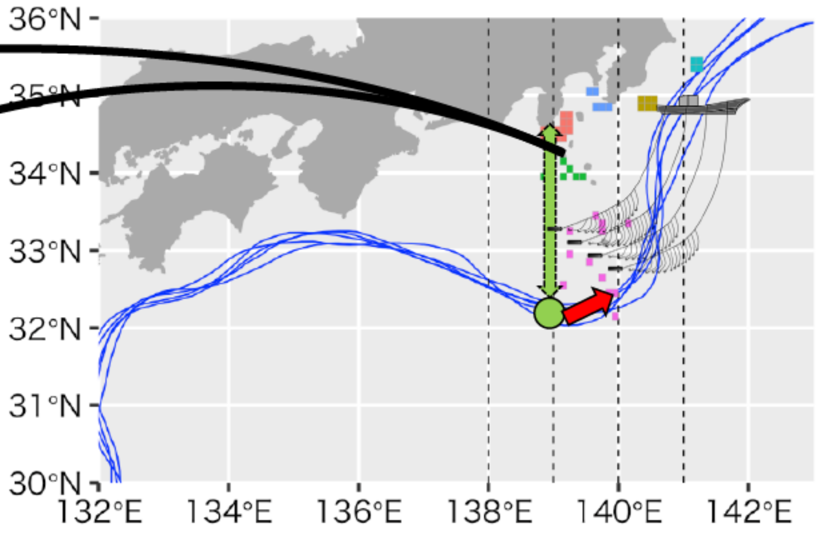
Log(CPUE) = Intercept + Year + Quarter + Water temperature + Current direction + Current speed + Latitude of the northern edge of the Kuroshio + Latitudinal difference in the northern edge of the Kuroshio between longitudes + Error

- ✓ Considers only main effects
- ✓ Interactions are not included
- ✓ Factors are shown in green.
- ✓ Covariates are shown in yellow.
- ✓ In the stock assessment report, both were described as “fixed effects”, but I will use this as a reference for revisions in the following fiscal years.

Combined Effect of Three Factors

Log(CPUE) = Intercept + Year + Quarter + Water temperature + Current direction + Current speed + Latitude of the northern edge of the Kuroshio + Latitudinal difference in the northern edge of the Kuroshio between longitudes + Error





Using the shape of the Kuroshio and the environmental conditions of the area as explanatory variables.

Method for Selecting the Best Model

Full model

Log (CPUE) = Int + fact_Year + fact_Quarter +cov_Temp + cov_Speed + cov_Dire. +
cov_Latitude of the northern edge of the Kuroshio +
cov_Latitudinal difference in the northern edge of the Kuroshio between longitudes +error

The full model includes all depth layers

↓

For water temperature, current direction, and current speed across five depth layers (surface, 100 m, 200 m, 400 m, bottom), only one layer was used to ensure interpretability and avoid overfitting

↓

Models within AIC + 2 range were considered
candidates with fewer parameters were prioritized

↓

Statistical, environmental, and fisheries
explanatory power considered

↓

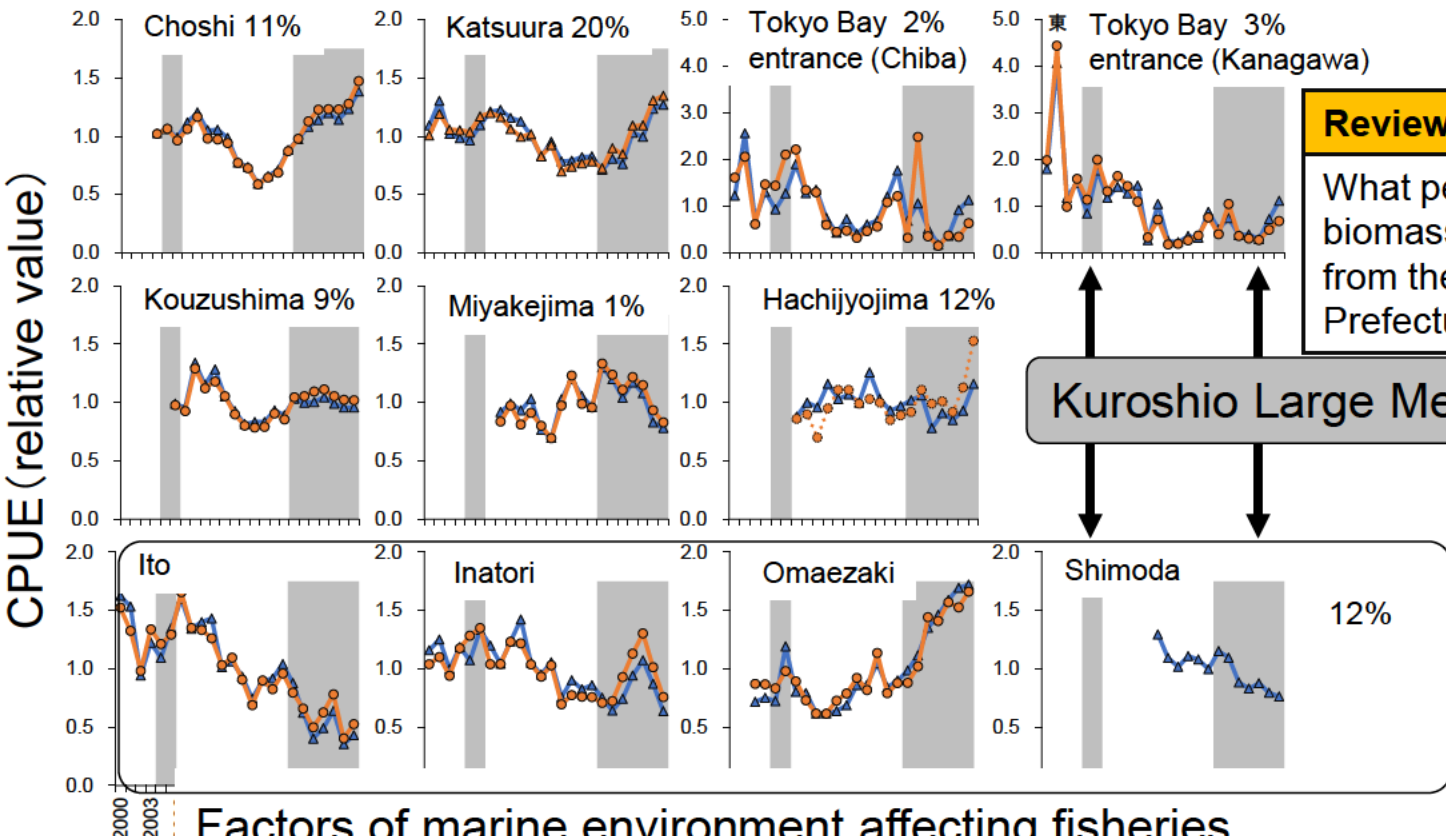
Best Model

Example: Selecting both 100 m and 200 m current speed → ×

Selecting 100 m current direction and 200 m current speed → ○

Fig 4-1.

Standardized CPUE by Region



Reviewer comment

What percentage of catch biomass for this stock is taken from the Choshi district of Chiba Prefecture?

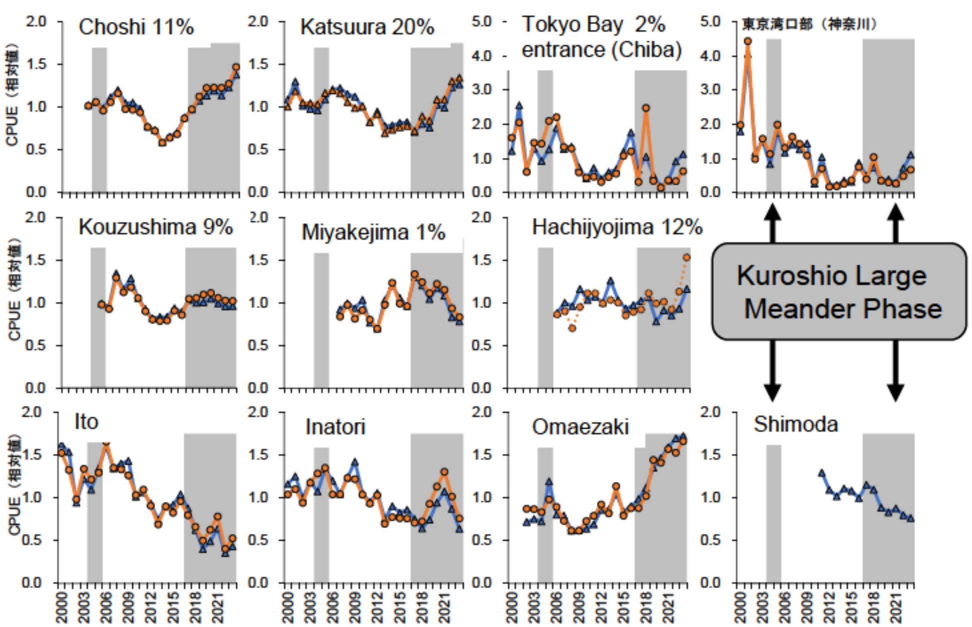
Factors of marine environment affecting fisheries

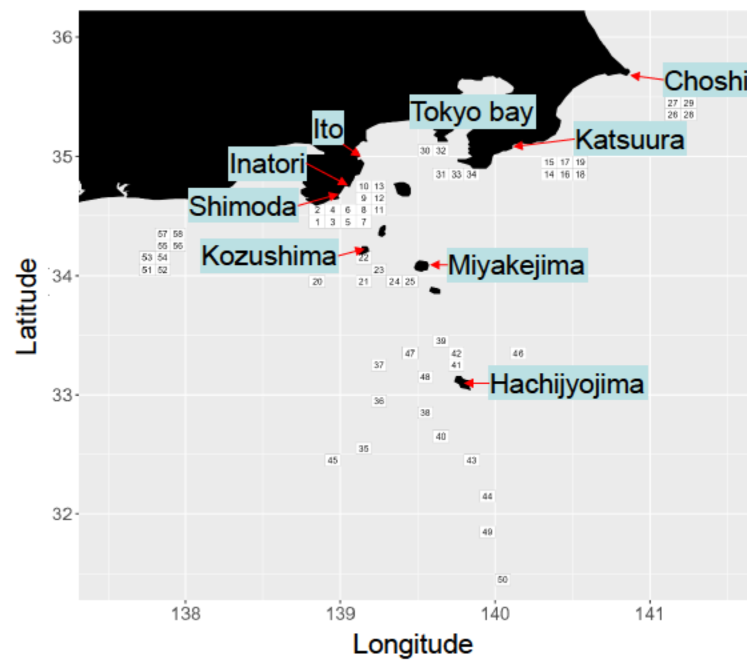
Nominal CPUE		Before removal
Standardized CPUE		After removal
Under trial		

Difference between fishing area

Reviewer comment

静岡県では漁獲量が長期的に低下傾向にある一方，千葉県や東京都では横ばいもしくは増加傾向である。また，CPUEにおいても静岡県では御前崎を除いて低下傾向にあるのに対して，千葉県や東京都では横ばいもしくは増加傾向である。このような傾向の違いの原因として何が考えられるか？　長期的な水温上昇傾向によって資源分布の重心が次第に東進しつつあるといったことは考えられないか？　関連して，高知県での漁獲量が1990年代以降，長期的に減少傾向にある（図3-1，表3-1）のも気になる点である。

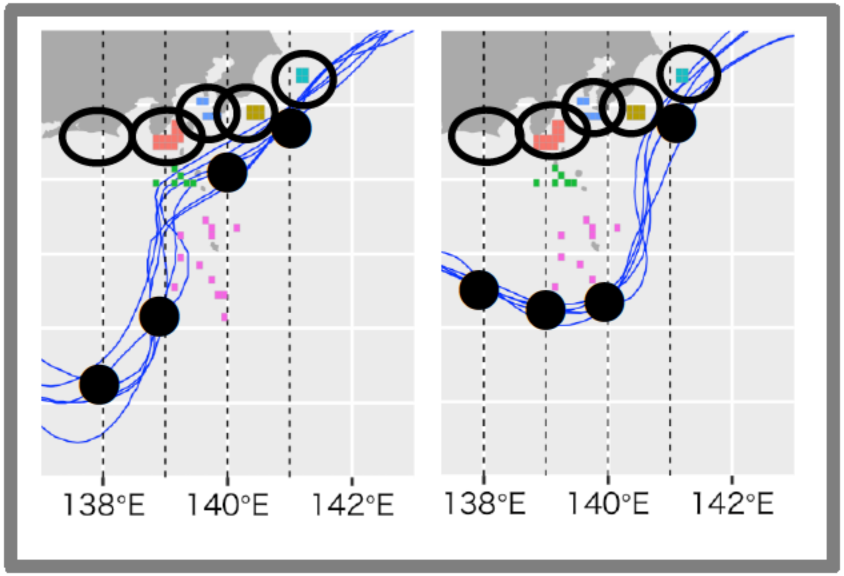


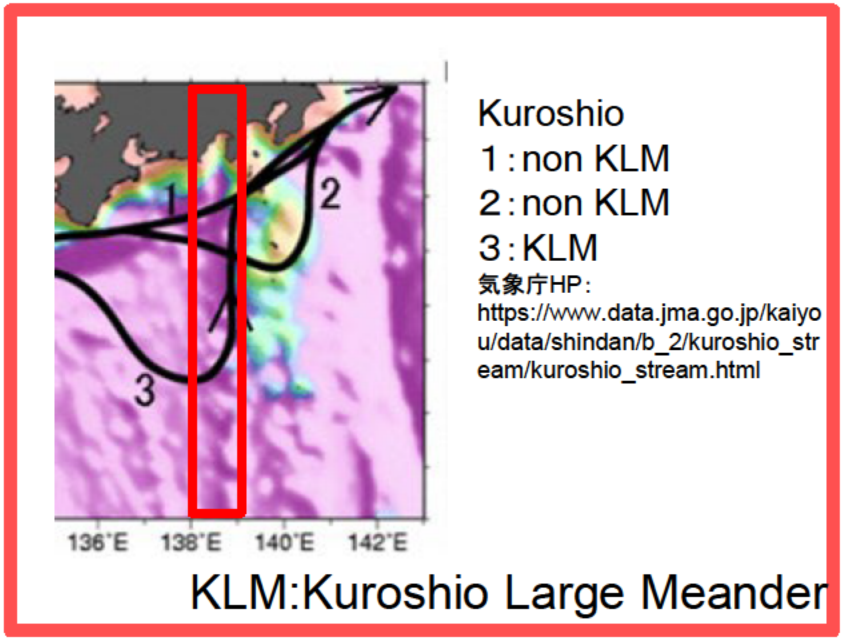


Detailed resource conditions vary by fishing area

Effects selected by GLM

	Coastal area	Izu islands
Latitude of the northern edge of the Kuroshio	○	△
Latitudinal difference 138-139	○	△
temp, speed, direction	Not constant	

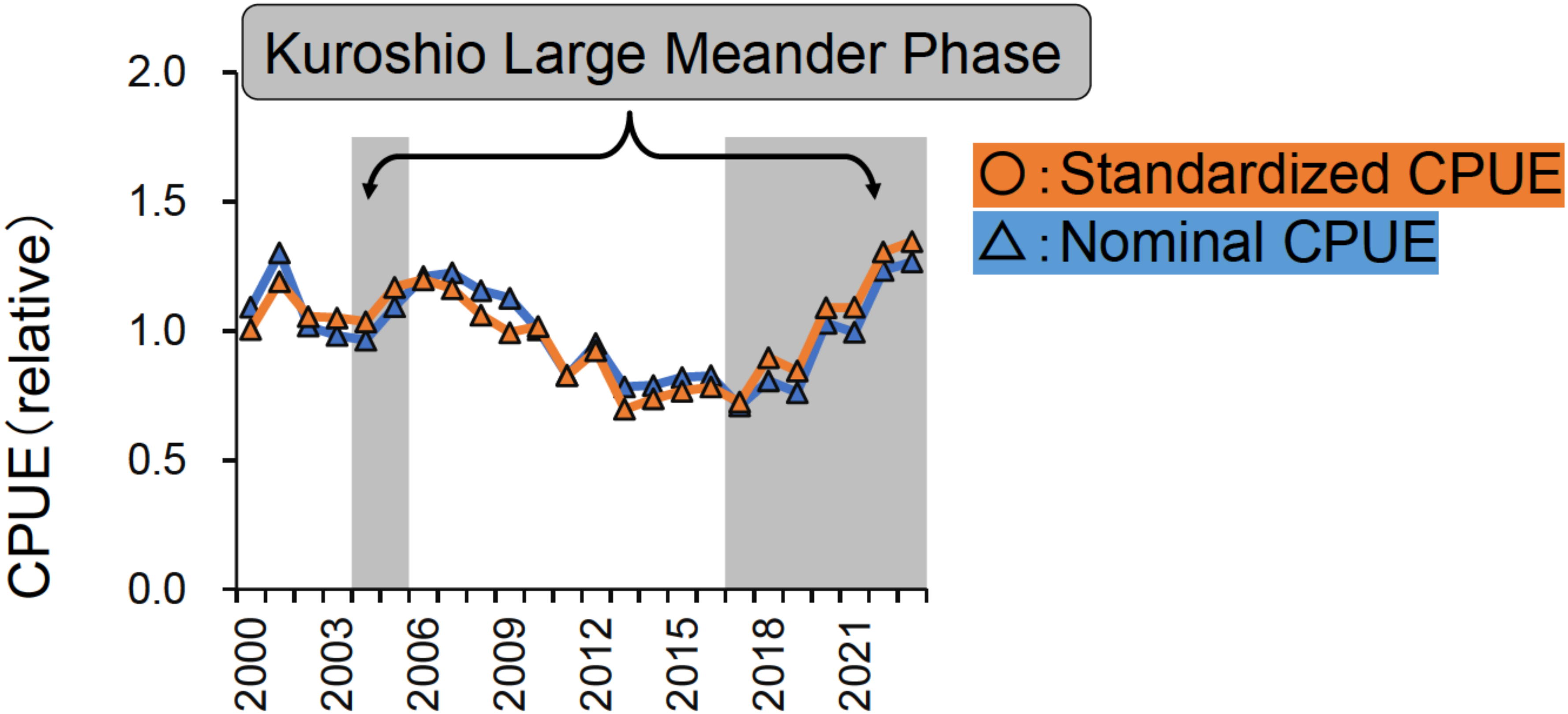




Reviewer comment about CPUE results

Reviewer comment
R-squared values should be given for the cpue vs temperature 200 and cpue vs Lt138_139 plots. Also, it appears one very large cpue outlier at low temperature might be resulting in the negative relationship between cpue and temperature. A linear model should be refitted to the cpue vs temperature 200 dataset which does not include the outlier to check whether the significant negative relationship persists when the outlier is relieved. 2017年以降の黒潮大蛇行と関連して，「海洋環境の影響を除去していないノミナルCPUEでは，近年の資源状態を過小評価する可能性があることが示唆された」とあるが，黒潮大蛇行の影響による水温や流速の高まりによって，操業効率やキンメダイの行動特性が変化して漁具能率が低下したということか？　そうであれば問題ないが，実はそうではなくて，例えば黒潮大蛇行の影響で水温が高くなると資源水準が低下してCPUEも低下するが，高水温等による資源減少の影響をCPUE標準化によって形式的に除去した結果として，標準化CPUEの値が過大評価されてしまっている，といったことは考えられないか？　もしそうだとすると，CPUE標準化の説明変数に水温等を入れることは問題があるということになる。近年は加入量が低下傾向にあるということと関連して，気になる点ではある。 さらに，補足図10-2（室戸地区の漁獲物の年別尾叉長組成）において，黒潮大蛇行の開始年である2017年から徐々に大型個体がいなくなって小型群に偏るとともに，水揚尾数も急激に低下してきたことを勘案すると，関東近海においても黒潮大蛇行が本種の資源量の低下に少なからず影響していることが考えられるので，CPUEの標準化において黒潮大蛇行に直接関係する要因を説明変数に導入してしまうと，そのことによって資源量の過大推定を招いてしまう可能性があるのではないかと危惧するが，いかがか？ CPUEの標準化において，水温と流速，黒潮北縁の緯度など，互いに強い相関（多重共線性や非線形相関）のある説明変数が同時に用いられている。強い相関があってもCPUEの予測性能自体はさほど影響されないかも知れないが，係数の解釈や変数選択の観点で問題となるため注意が必要だろう。強い相関関係にある説明変数のうちの一方を除く，または複数の説明変数を合成して1つの変数にまとめる，などの対策も検討してみる必要があるのではなかろうか？

Result of standerdization



Kuroshio Large Meander Phase　Standardized＞Nominal
Following the termination of the Kuroshio Large Meander it is essential to monitor trends in catch conditions.

Catch at age

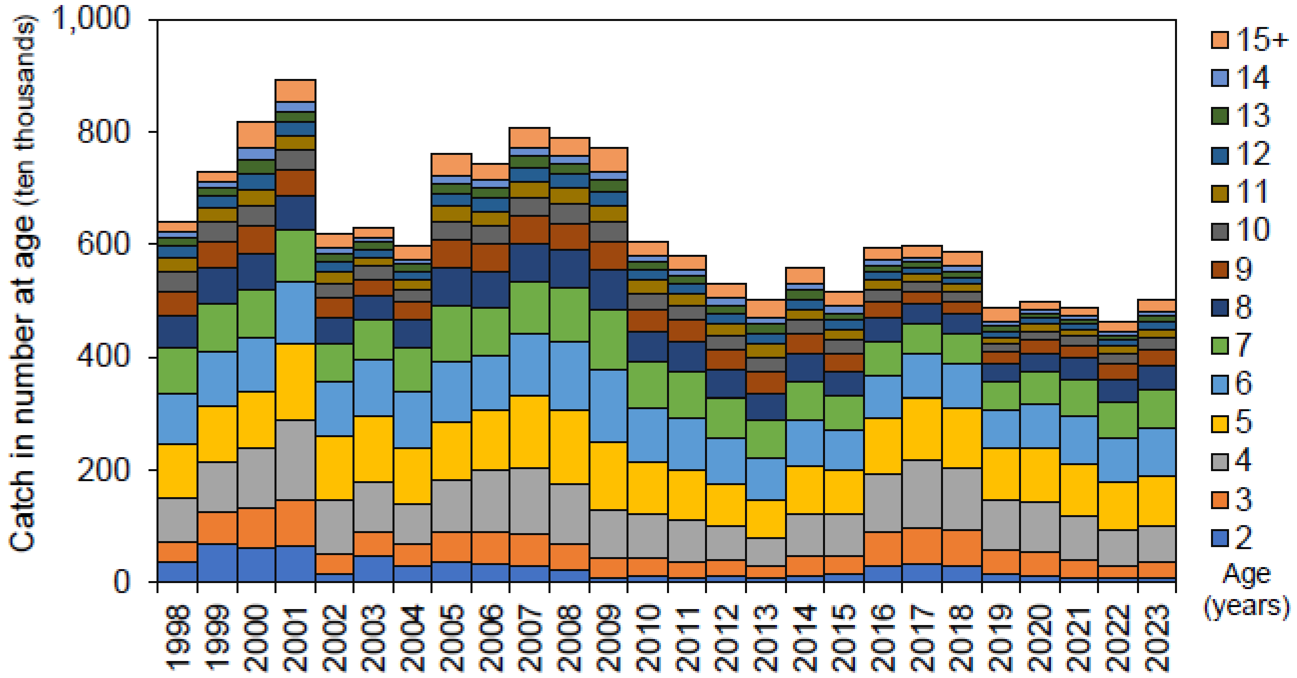


Fig. 3-2. Trends in catch in number at age

Maturity occurs at approximately 50% at age 4 and reaches 100% by age 5, while the harvest of immature individuals aged 2–3 remains negligible.

Tuning VPA

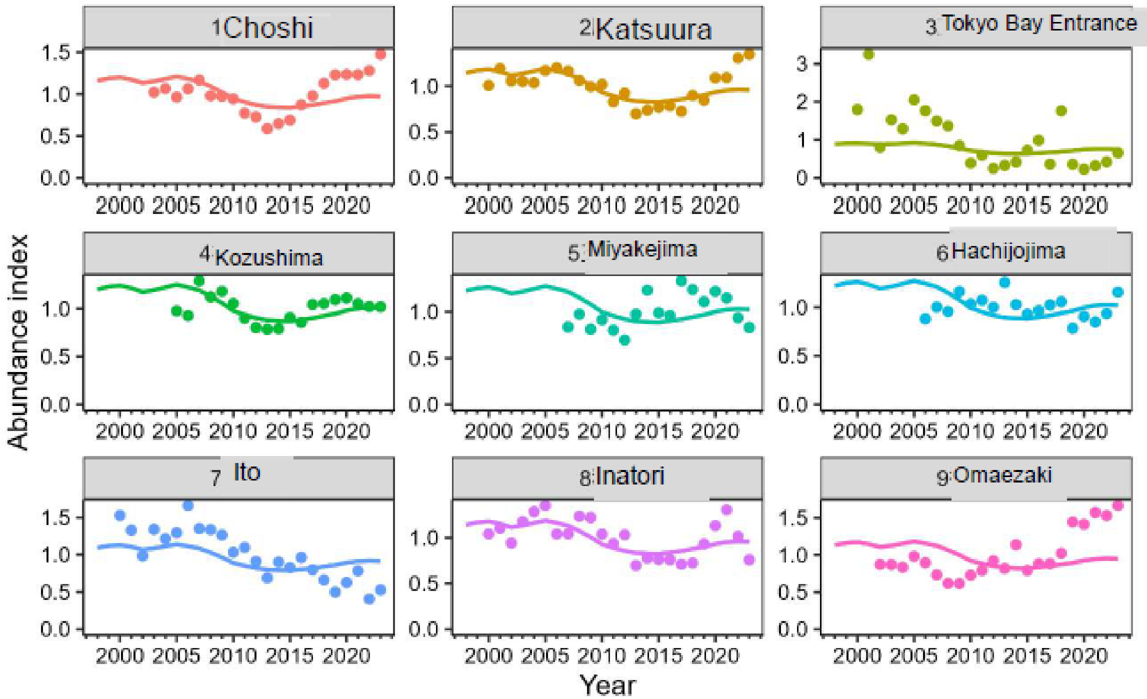
$$\ln(\hat{u}_{i,y}) = \ln q_i \sum_{age_i}^{A_i} N_{a,y} W_a \qquad (I\text{:area } i = 1,\ldots,9)$$

$$\mathrm{RSS} = \sum_{i}^{I} \sum_{y_i}^{2023} (ln(u_{i,y}) - \ln(\hat{u}_{i,y}))^2$$

Tokyo Bay entrance where fishing areas overlap: Chiba, Kanagawa → 0.5 times

Set start year y_i and age range (age_i-A_i) for each area

Estimated SB and observed CPUE



Supplementary Fig. 2-2. Time series plot of observed index values (circular markers) and model-projected values (solid line)

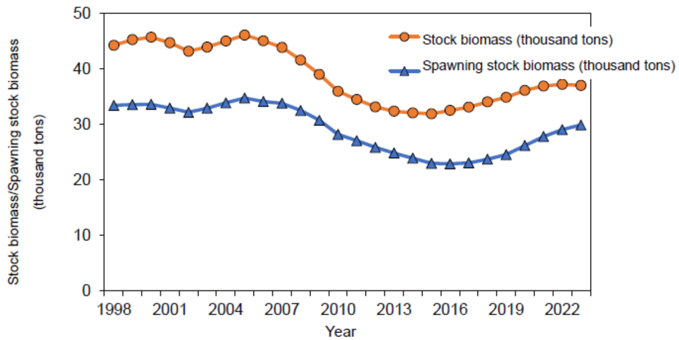
Reviewer comment

The model fits to most of these cpue time series is quite poor, especially, 1, 2, 3, 5, 6, 7, and 9. It is recommended that some explanations are provided for why the fits to these indices are so poor.

- ✓ While the unit of assessment is the entire resource, CPUE is calculated for a specific fishing area.
- ✓ Detailed resource conditions vary by fishing area

Trends in Spawning Stock Biomass（SSB）, Stock Biomass（SB）and Number of Recruits（R）

(Main text)



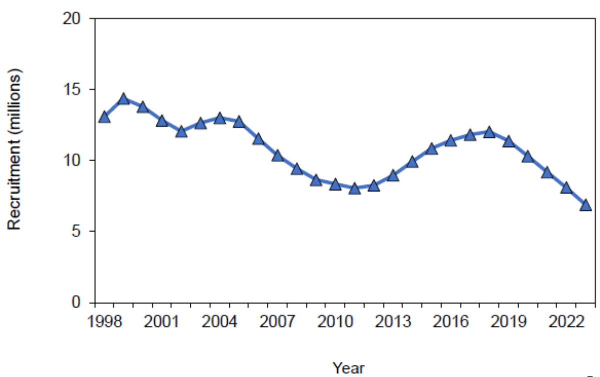
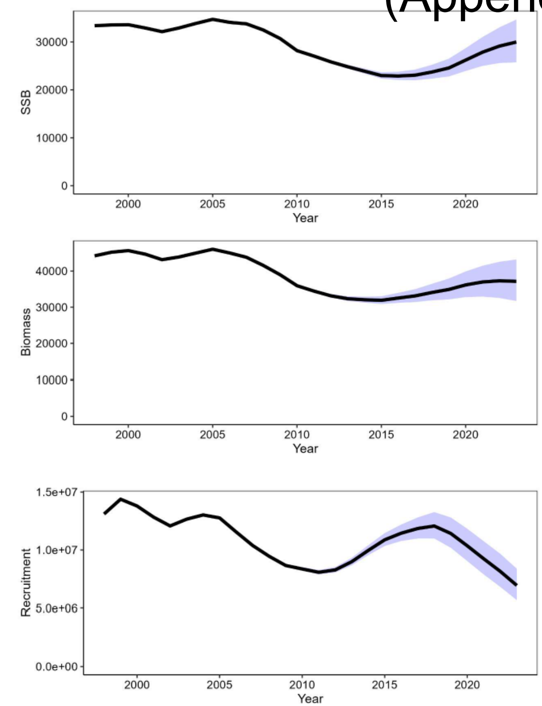


Fig. 4-3 Trends in recruitment

(Appendix)



Supplementary Fig. 2-4. Bootstrap analysis of spawning stock biomass (SSB), biomass, and recruitment. The black solid line represents the estimated values, and the blue indicates the 95% confidence interval

Reviewer comment

As mentioned in the other assessments, the VPA should be bootstrapped to allow calculations of confidence for stock assessment quantities of interest.

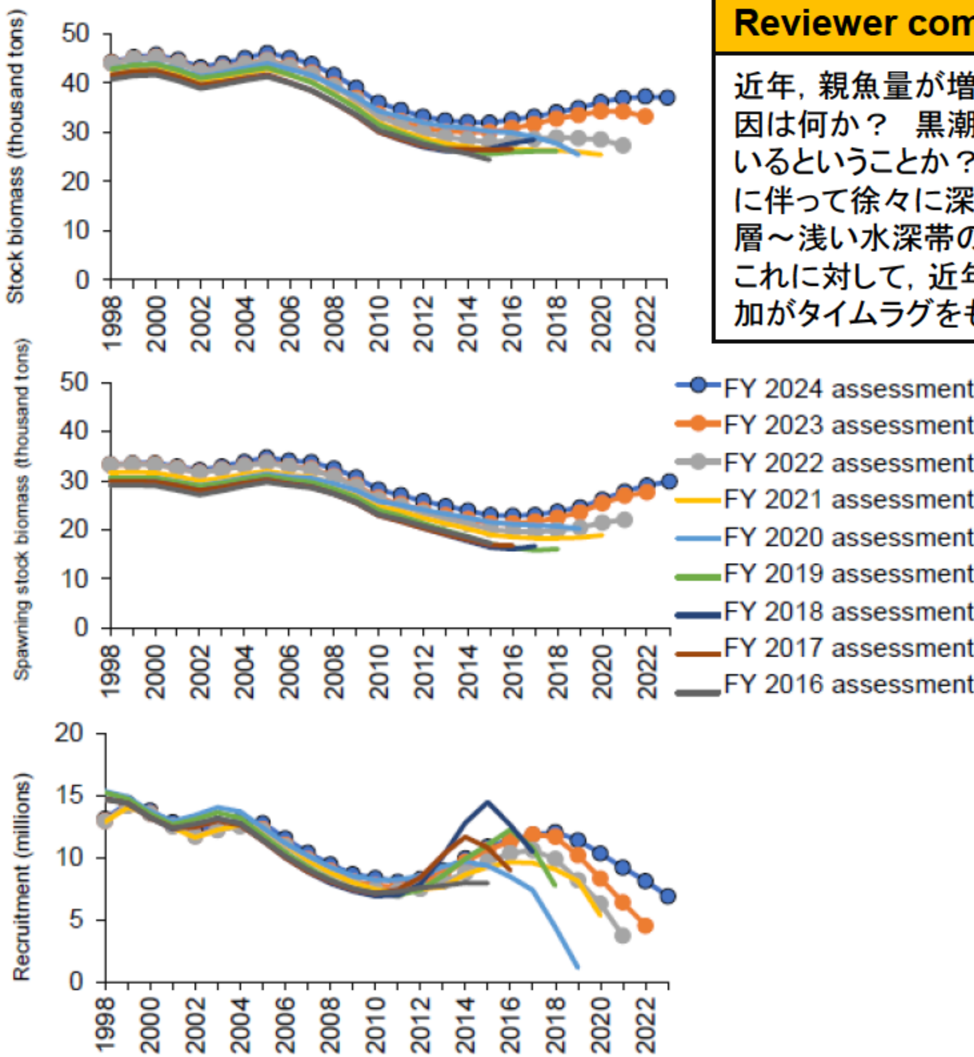
Reviewer comment

Why are the time trajectories for estimated recruitment for shotted halibut (Fig. 4-4) and splendid alfonsino (Sup. Fig. 2-4) so remarkably smooth while those for Japanese Anchovy (Fig. 4-6) and round herring (Figure 4-5) far more variable between years (See these assessment document plots copied in Figure 2 below)?

Appendix include sensitivity analysis and figures showing confidence intervals.

- Both SB and SSB show an increasing trend
- Because the Age-Length Key (ALK) is common across years, fluctuations in recruitment appear smoothed.

Trends in Assessment Results Since 2016



Reviewer comment

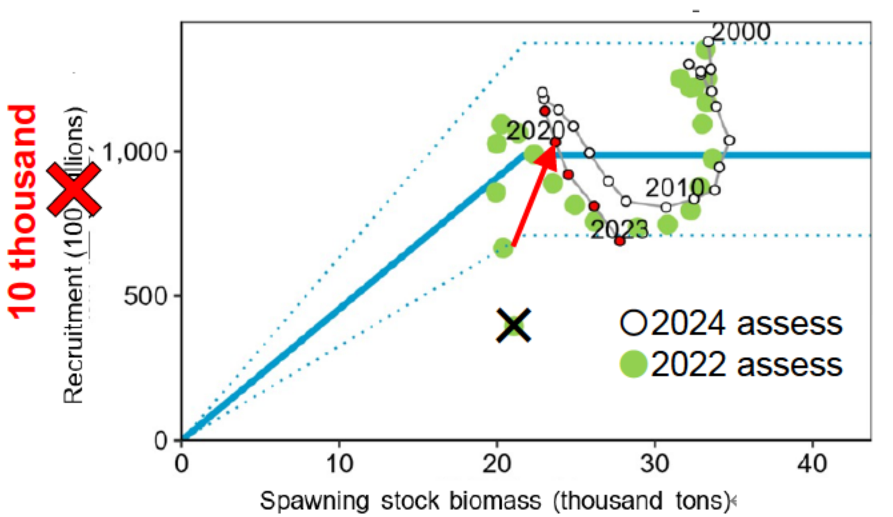
近年，親魚量が増加傾向であるのに対して加入量が低下傾向にある。この原因は何か？　黒潮大蛇行による高水温等の影響によって加入が低調になっているということか？　キンメダイの仔稚魚や若齢魚は浅い水深帯で過ごし，成長に伴って徐々に深場へ移動していくことから，仔稚魚期～若齢期においては表層～浅い水深帯の海洋環境変動の影響を受けやすいことが予想される。
これに対して，近年における親魚量の増加は，2011～2017年頃の加入量の増加がタイムラグをもって反映されてきているということ？

SSB and SB have been reasonably estimated.

Recruitment: Since 2015, there have been temporary periods of high recruitment, but these have not been accurately captured.

It is necessary to consider resource management measures with an understanding of these characteristics.

Stock-recruitment relationship



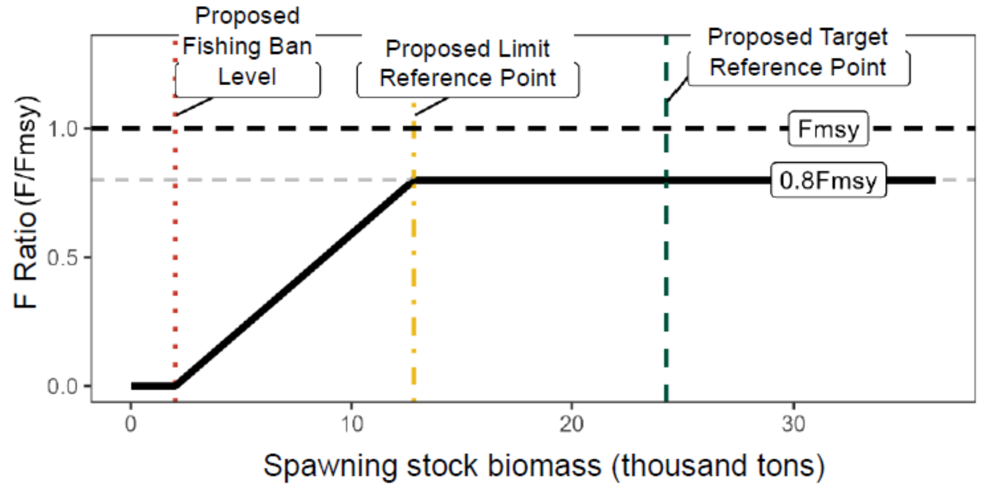
Reviewer comment

The hockey stick stock-recruit model which had been considered in some historical stock assessments and by Ram Myers in some of his papers a few decades ago has been replaced by the Ricker and Beverton-Holt stock recruit functions. The hockey-stick model fails to accurately represent commonly occurring ecological processes which determine how recruitment of marine fish stocks on average varies with spawner abundance. In Hilborn and Walters 1992 the hockey stock model represents only situations with very strict territoriality and a finite number of spawning nest sites in breeding females. Strict territoriality and a finite number of spawning nest sites is not a known behavioural attribute of marine fishes. The hockey stick model has been identified as having features such as a sharp break between linearly increasing versus constant average recruitment which does not correspond to any known ecological processes commonly shaping fish population dynamics. The hockey stick model also fails on two stringent
The recruitment rate (R/S) should decrease continuously with increases in parental stock size
Continuity The function is a smooth one without any sudden discontinuities or breaks
再生産関係において，加入量の残差の自己相関は考慮されていないが，グラフを見る限り，自己相関があるのではないか？　近年の加入量が低下傾向にあるということを考慮すると，補足資料4の将来予測においても，その点を反映させた保守的なシミュレーションを併せて実施するべきではなかろうか？
Lag 1 recruitment residual autocorrelation, however, can be tested for in the stock-recruit model residuals. This can be done by regressing residuals in year y with residuals in year y-1. The estimated slope coefficient gives the lag 1 autocorrelation coefficient.

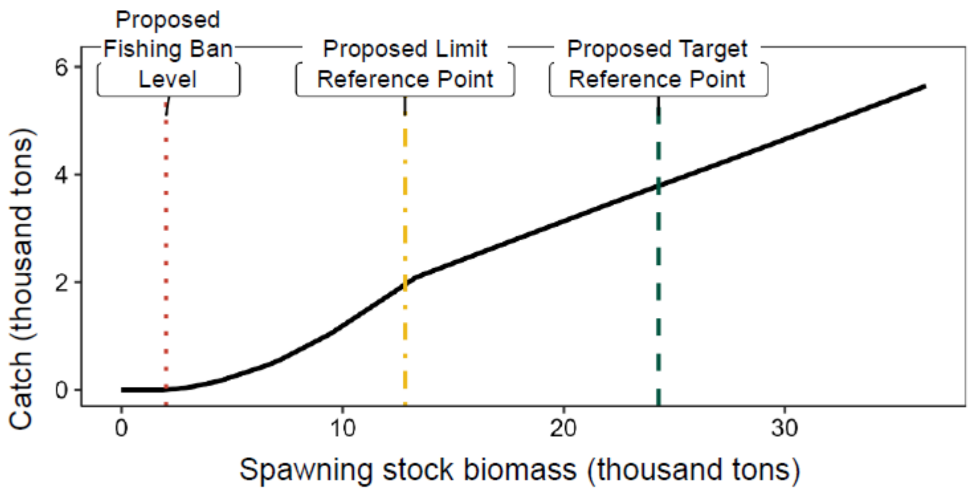
- For RI and BH models
- Recruitment is estimated to be larger than for HS when below the historical minimum SSB
- Maximum estimated SSB level is extrapolated
- Additional calculations were performed regarding uncertainties in reproductive relationships, including autocorrelation
- Conclusion: Using β=0.8 for HS should be acceptable for resource management
- This will be re-evaluated during the next update of management reference points.

Harvest control rule

a) When the vertical axis is fishing pressure



b) When the vertical axis is catch

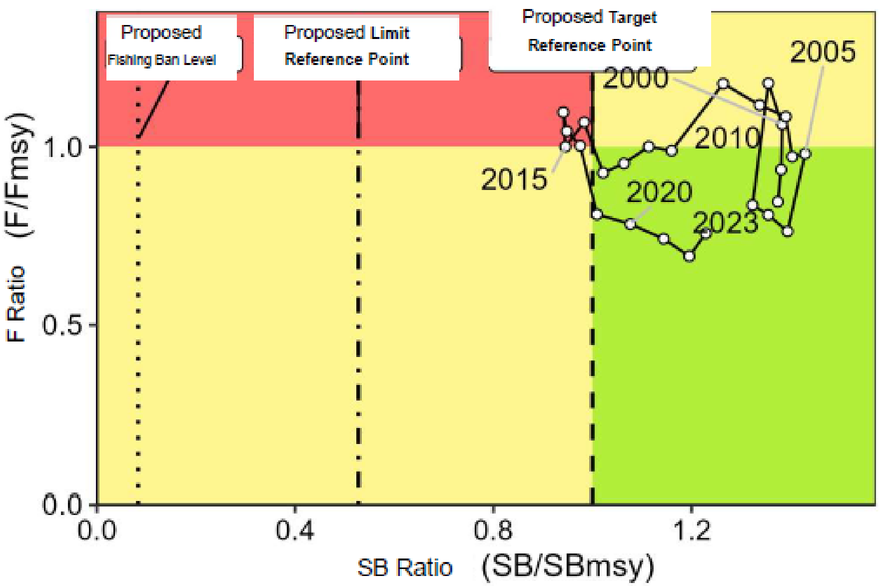


Proposed reference point

Item	Value	Explanation
SBtarget (proposed)	24,300 tons	Proposed target reference points. Spawning stock biomass to achieve Maximum Sustainable Yield MSY (SBmsy).
SBlimit (proposed)	12,800 tons	Proposed limit reference point. SSB to achieve a catch of 60% of MSY (SB0.6msy)
SBban (proposed)	2,000 tons	Proposed fishing ban level. SSB to achieve a catch of 10% of MSY (SB0.1msy)
Fmsy	Fishing pressure to maintain SBmsy (Age 2, Age 3, Age 4, Age 5, Age 6, Age 7, Age 8, Age 9, Age 10, Age 11, Age 12, Age 13, Age 14, Age 15+) = (0.03, 0.06, 0.14, 0.19, 0.20, 0.21, 0.19, 0.18, 0.17, 0.17, 0.20, 0.23, 0.26, 0.26)	
%SPR (Fmsy)	22%	%SPR corresponding to Fmsy
Maximum Sustainable Yield (MSY)	4,700 ~~47,000~~ tons	Maximum Sustainable Yield (MSY)

Stock assessment summary in 2024

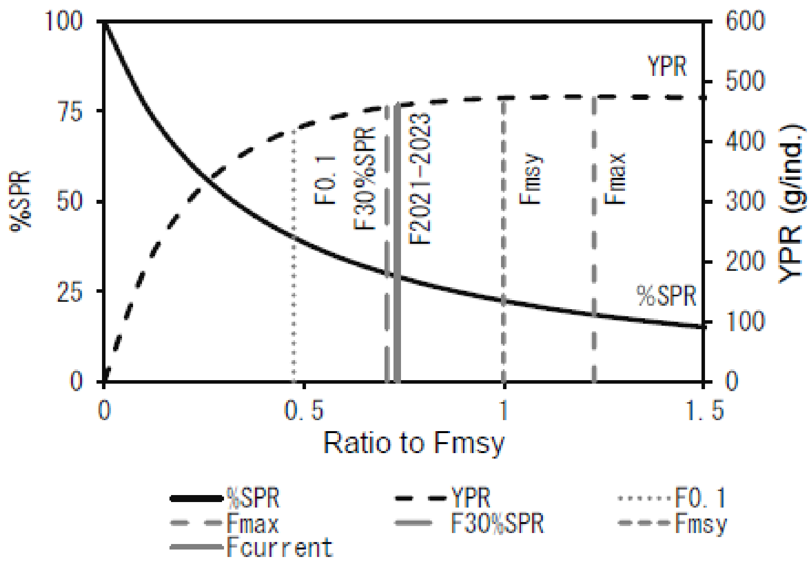
Total Stock Biomass	37.0 thousand tons
Spawning Stock Biomass	29.9 thousand tons
Catch	4.4 thousand tons
Exploitation rate	12%
F2023 / Fmsy	73%
%SPR (F2023)	28%
%SPR (F2021–2023)	29%



YPR,SPR

Reviewer comment

「6. その他」のところに「加入あたり漁獲量（最適な漁獲圧と年齢の関係）」についての記述があり，「現状の選択率かつ，現実的な漁獲圧の変化の範囲でYPRの最大化は困難である」としているが，漁業者に対する管理メッセージとして，漁獲開始年齢の引き上げによって全体のYPRがどのように変化（増加）するかも計算して示しておいてはどうか？　本種は寿命の長い魚種であり，漁獲開始年齢の引き上げによるYPRの引き上げ効果はおそらくかなり大きいのではないかと思われる。地域によって漁獲される年齢構成に違いがあるにしても，いずれの地域でも漁獲開始年齢の引き上げによってYPRは大幅に向上しうるのではなかろうか？



age	Selectivity	Body weight	YPR increase rate
2	0.10	289g	1.01
3	0.23	434g	1.02
4	0.54	543g	1.04

Fig. 4-8. Relationship between YPR and %SPR with respect to Fmsy

SPR（Spawning Potential Ratio） ＝％SPR（％Spawning per Recruit）

Summary of issues to be further considered

	Issues for consideration
Stock assessment method	Improving the accuracy in estimating catch in number at age and by year Further consideration of methods for improving stock assessment
CPUE standardization	Improving the precision of standardized CPUE Expansion to areas and fisheries where CPUE standardization has not been conducted Considering data collection frameworks for detailed information, such as every ten days or daily variations
Recreational fishing, depredation damage, and fisheries in the target area	Reviewing the information collection frameworks
Incorporate into stock assessment	Continue collecting data and consider expanding resource assessment areas and fisheries