23RD ISC Plenary Stock Status and Conservation Information

John Holmes and Robert Ahrens

ISC Chair and Vice-Chair

https://isc.ac.affrc.go.jp

WCPFC20

December 4-8, 2023

Rarotonga, Cook Islands

Northern Stocks
Stock Status and Conservation Information

- New assessments in 2023 for:
  1. North Pacific Albacore
  2. North Pacific Swordfish
  3. Western and Central North Pacific Striped Marlin

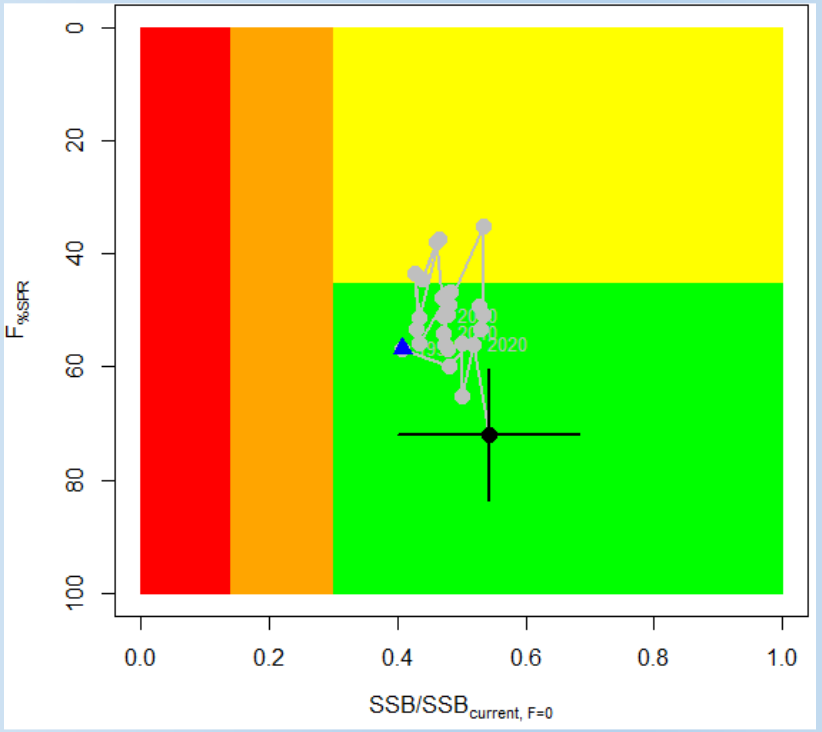
- No new assessments (forwarding previous information) for:
  1. Pacific Bluefin Tuna (but we checked for unusual stock behaviour)
  2. Pacific Blue Marlin
  3. North Pacific Blue Shark
  4. Shortfin Mako Shark

North Pacific Albacore

- Benchmark assessment, model period 1994-2021
- Basecase model with sensitivity runs to evaluate key uncertainties: lack of sex-specific size data, growth and natural mortality, impacts of COVID safety protocols on fishery operations and data collection, and the simplified treatment of the spatial structure.
- Model structure same as 2020 assessment, with improvements to model fits base on changes to fleet definitions, selectivity patterns, a new adult abundance index, and uncertainty applied to age composition data
- WCPFC and IATTC adopted harvest strategies for NPO ALB (WCPFC HS 2022-01; IATTC Resolution C-22-04):
    1. Three management objectives
    2. Target, threshold, and limit reference points
    3. Request for the identification of exceptional circumstances triggering changes to, or a suspension of the harvest strategy adopted for the stock.

North Pacific Albacore – Stock Status

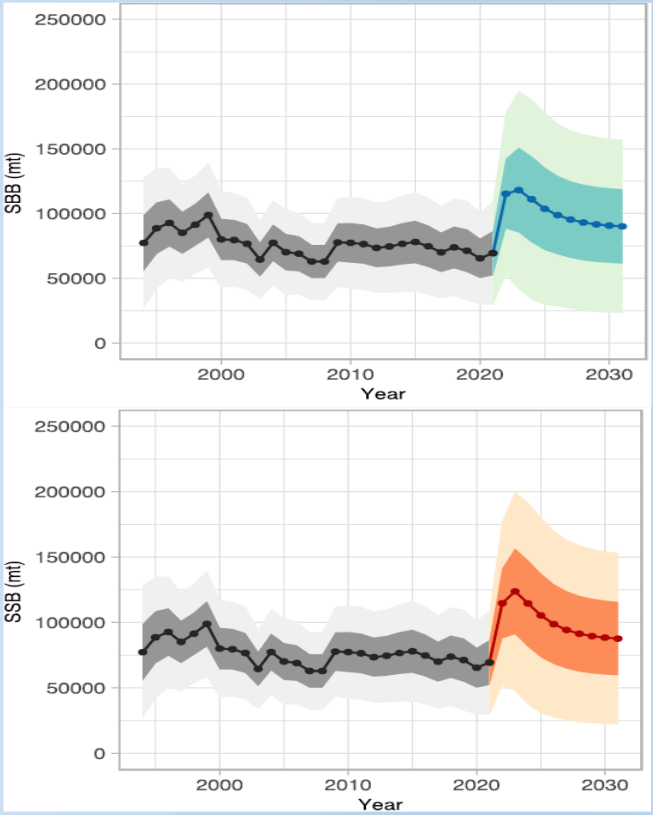
1. The stock is likely not overfished relative to the threshold ($30\%SSB_{current, F=0}$) and limit ($14\%SSB_{current, F=0}$) reference points adopted by the WCPFC and IATTC;
2. The stock is likely not experiencing overfishing relative to the adopted target reference point ($F_{45\%SPR}$); and
3. Current fishing intensity ($F_{2018-2020}$) is lower than the average fishing intensity from the 2002-2004 period (the reference level for IATTC Resolution C-05-02 and WCPFC CMM-2019-03).



'La Jolla Plot' – orange zone is between threshold and limit reference points; red zone is below the limit reference point

North Pacific Albacore Conservation

- Two harvest scenarios to evaluate impacts on achieving the management objectives:
  1) maintain SSB above the LRP, with a probability of at least 80% over the next 10 years;
  2) maintain depletion around the historical (2006-2015) average over the next 10 years; and
  3) maintain fishing intensity at or below the target reference point with a probability of at least 50% over the next 10 years
- Under either scenario, SSB is expected to remain near current depletion (54%$SSB_{current, F=0}$) or decrease slightly (52%$SSB_{current, F=0}$) but remain above the LRP with probabilities >97% for all ten years
- Both IATTC and WCPFC management objectives are likely to be met under either scenario.



Annual changes in spawning biomass
TOP-constant fishing intensity scenario ($F_{2018-2020}$)
Bottom- randomly sampled F (2005-2019) scenario

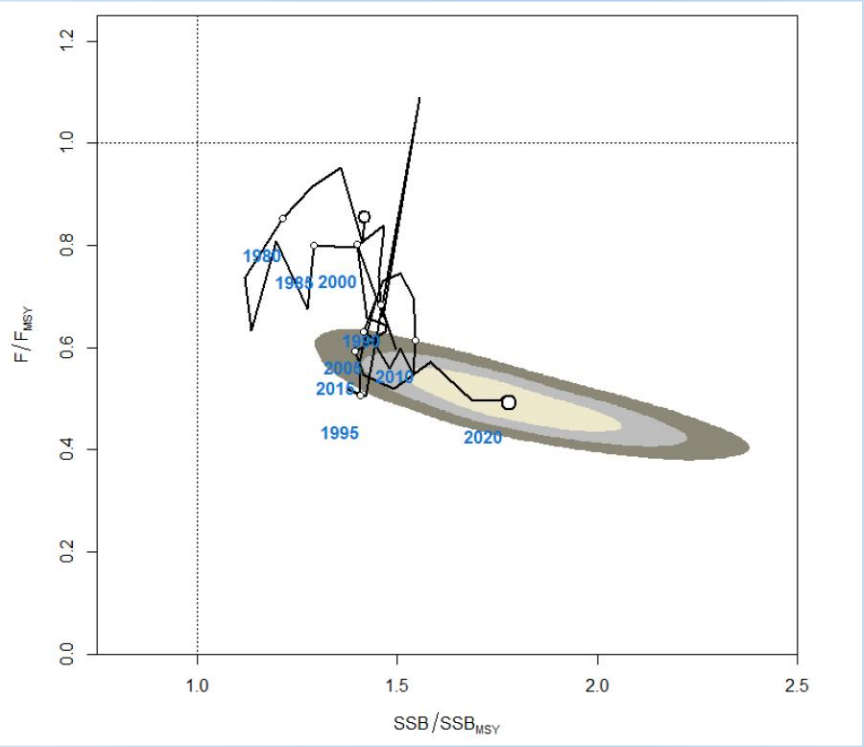
North Pacific Swordfish

- Stock area north of the equator – combines former WCNPO and N EPO stocks into one unit
- Benchmark assessment, 1975-2021 model period
- Basecase model with sensitivity runs to evaluate uncertainty associated with natural mortality rate at age, stock-recruitment steepness, growth curve parameters, female length at 50% maturity, input data and model structure.

North Pacific Swordfish – Stock Status

1. Female SSB was estimated to be 35,778 mt in 2021, with a relative SSB ratio of SSB_{2021}/SSB_{MSY} = 2.18;
2. Estimated F (arithmetic average of F for ages 1 – 10) averaged roughly F=0.09 yr^{-1} during 2019-2021 with a relative fishing mortality of F_{2021}/F_{MSY} = 0.49; and
3. Relative to MSY-based reference points, overfishing is very likely not occurring (>99% probability) and the NPO SWO stock is very likely not overfished (>99% probability).

- No references points have been established for this stock by either the IATTC or WCPFC

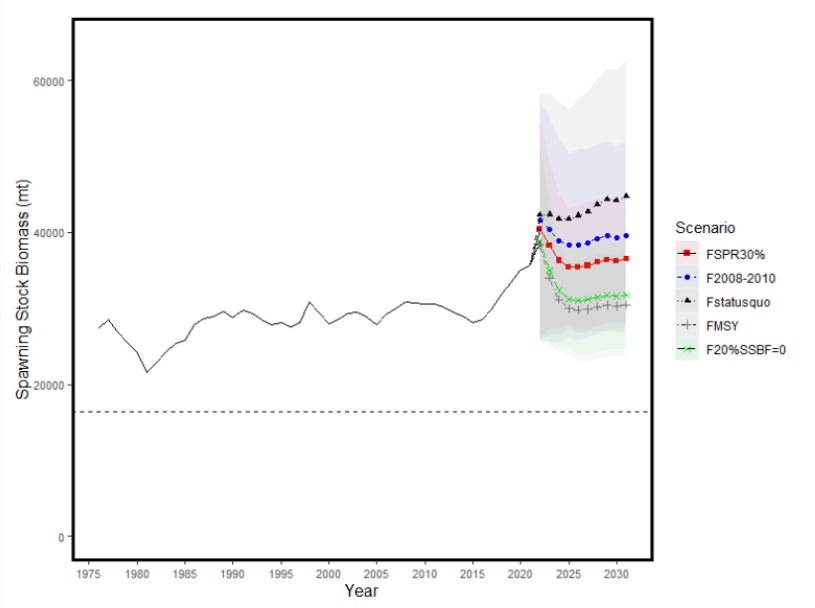


Kobe plot of stock trajectory relative to MSY-based reference points. Shading shows 50%, 80% and 90% confidence intervals around 2020 estimates.

North Pacific Swordfish - Conservation

- 10-yr projections starting in 2022 through 2031
- Five fishing mortality scenarios: (1) $F_{20\%SSB(F=0)}$, (2) $F_{(2008\text{-}2010)}$ reference years for the proposed CMM for NPO SWO, (3) $F_{30\%SPR}$, (4) F_{MSY}, and (5) $F_{2019\text{-}2021}$.

1. The NPO SWO stock has produced annual yields of around 11,500 mt per year since 2016, or about 2/3 of the MSY catch amount;
2. NPO SWO stock status is positive with no evidence of F above FMSY or substantial depletion of spawning potential (Figure 13); and
3. It was also noted that retrospective analyses show that the assessment model appears to underestimate spawning potential in recent years.

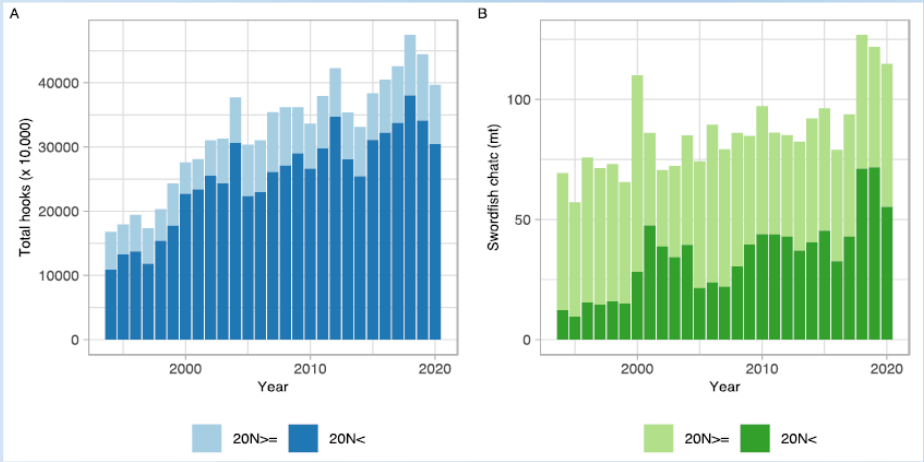


Spawning biomass projections based on five F scenarios. Shading is 95% credibility interval
Dashed line = SSB_{MSY}

North Pacific Swordfish Catch Distribution

- WCPFC-NC18 requested that the BILLWG compile public domain NPO SWO catch and effort north and south of 20°N.
- Much of the SWO catch is from LL fleets, and only effort data are from LL fleets.
- Catch is approximately equal north and south of 20°N; effort is greater south of 20°N
- The effort south of 20°N includes most of the effort from Vietnam and Indonesia and is estimated because the logbook coverage varies substantially over time.
- Recent catches by the longline fishery in the 0-10°N area of the eastern Pacific have increased. Gillnet fishing conducted in the waters around Vietnam also contributes to the increase in catch south of 20°N.

Effort Catch



Distribution of fishing effort (A) and catch (B) for NPO SWO north and south of 20° N. latitude.

WCNPO Striped Marlin

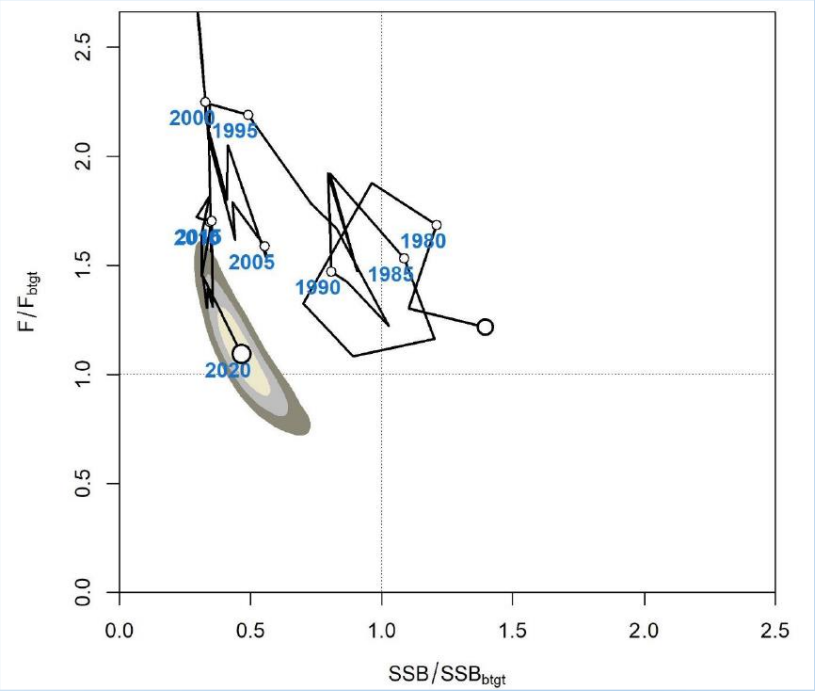
- Benchmark assessment, completing work begun in 2022; model period 1977-2020
- Model structure similar to 2018 assessment
- Basecase model and sensitivity runs to evaluate uncertainty related to M at age, stock-recruitment steepness, growth curve parameters, female length at 50% maturity, input data and model structure.

WCNPO Striped Marlin – Stock Status

- WCPFC18 requested that stock status be estimated relative to 20% $SSB_{0\ F=0}$, dynamic B_0 where SSB_0 is the moving average of the last 20 years of SSB_0 estimates

1. When the status is evaluated relative to dynamic 20%$SSB_{(F=0)}$ based reference points, the SSB_{2020} = 1,696 t is 54% below 20%$SSB_{F=0}$ (3,660 t) and the 2018-2020 fishing mortality is about 28% above $F_{20\%SSB(F=0)}$; and
2. Relative to 20%$SSB_{F=0}$ based reference points, the WCNPO MLS stock is very likely to be overfished (>99% probability) and is likely to be subject to overfishing (>66% probability).

- Growth curve is a major uncertainty. Sensitivity runs shows that the growth assumption may affect the interpretation of stock status.

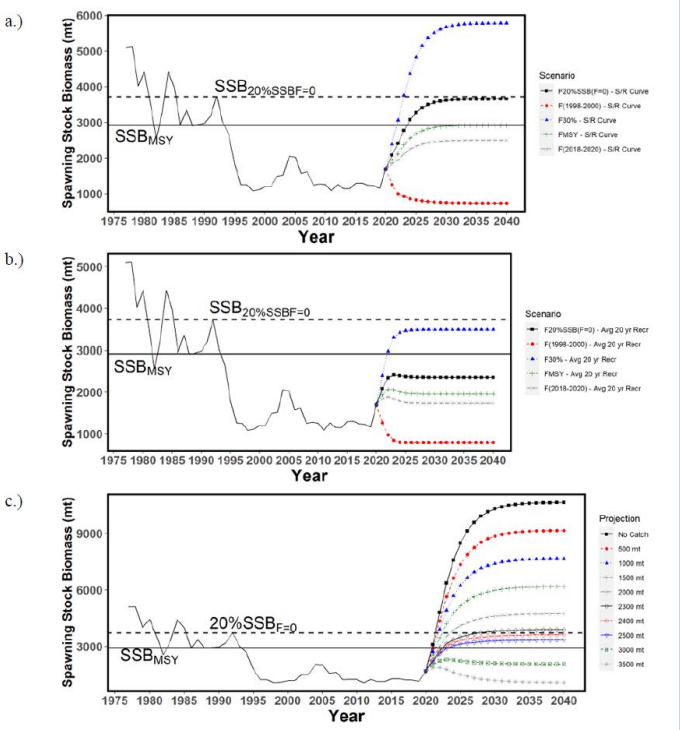


Majuro plot of WCNPO MLS stock trajectory relative to fishing mortality (average of age 3-12) and SSB, 1977-2020. Fbtgt and SSBbtgt refer to F20%$SSB_{(F=0)}$ and 20%$SSB_{F=0}$, respectively. Shading indicates 50%, 80%, and 95% confidence intervals, respectively.

WCNPO Striped Marlin - Conservation

- Projections started in 2021 and continued through 2040.
- Five levels of fishing mortality with the two recruitment scenarios Ten catch levels with only the 20-year average recruitment scenario were applied for projections.

1. It is recommended that catch should be kept at or below the recent level (2018-2020 average catch = 2,428 t); and
2. The results of deterministic projections show that when catches are 2,400 t, or less, the stock is expected to recover above SSB_{MSY} and near the 20% $SSB_{F=0}$ reference level by 2040, or sooner at the lower catch levels under a low recruitment regime (3,660 t).

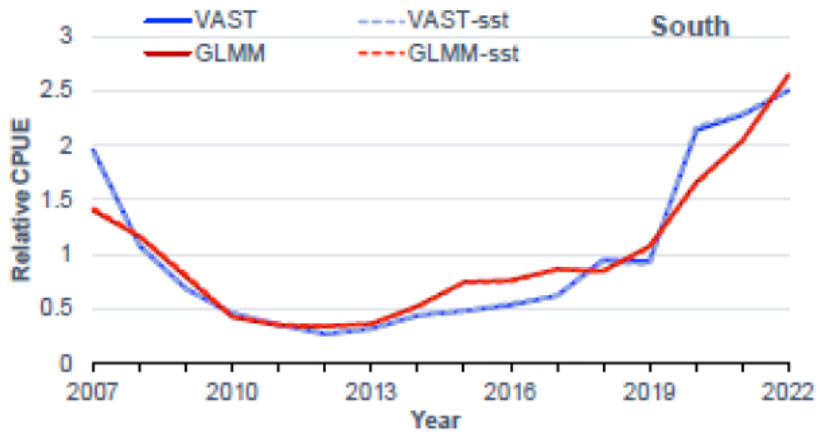


Historical and projected trajectories of spawning biomass based upon: (a) F scenarios projected spawning biomass using recruitment estimated from the stock-recruitment curve; (b) F scenarios projected spawning biomass using average recruitment from 2001-2020. (c) Catch scenarios projected spawning biomass using average recruitment from 2001-2020. Dashed line indicates the spawning stock biomass at the dynamic 20%$SSB_{F=0}$ reference point. Solid line indicates the spawning stock biomass at SSB_{MSY}.

Independent Peer-Review

- ISC23 approved independent peer-review process of stock assessments modeled on process approved by WCPFC
- Agreed to use recently completed WCNPO Striped Marlin assessment as first test of process
- BILLWG Chair and ISC Vice-Chair were tasked to develop the process and report results to ISC24 Plenary

Pacific Bluefin Tuna



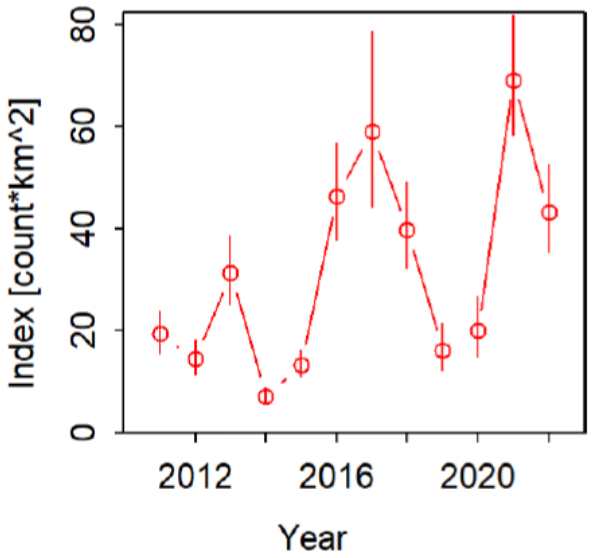


Figure 9. Trends in the spawner index (left, Yuan et al., 2023)[3] and recruitment index (right, Fujioka et al., 2023)[4] for PBF.

- Based on a review of CPUE (abundance) and recruitment indices, ISC23 Plenary concluded that there is no new information necessitating changes to the existing stock status or conservation information

ISC Assessment Workplans, 2023-24

- Pacific Bluefin Tuna
- Shortfin Make Shark

Questions?