North Pacific Fisheries Commission

NPFC-2026-TCC09-IP03

Submitted by Secretariat

Review of MCS related issues from SC

Abstract

This paper is submitted to the TCC09 meeting for information purpose and intended for coordination between SC and TCC.

There is one issue that SC10 will report on to TCC09 based on the COM09 tasking to the Chairs of TCC and SC to work together to understand potential observer needs for the Commission.

Based on a set of questions shared with SC subsidiary bodies and discussed during their meetings, the attached paper provides a comprehensive overview of their findings in NPFC-2025-SC10-WP03 Rev.2.

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NPFC-2025-SC10-WP03 (Rev. 2)

NPFC At-Sea Regional Observer Program: potential scientific components

Abstract

To support the COM direction to continue the consideration of elements of an NPFC observer program, the SC responded to 6 questions from the TCC Chair in 2024 about data needs to inform decisions about the development of a regional observer program (ROP) in the NPFC's Convention Area. At COM09 in 2025, the Commission endorsed the TCC08's recommendation that the TCC and SC Chairs continue to work intersessionally towards identifying the potential data needs for a broader Regional Observer Program. The TCC Chair has since asked SC to respond to 5 new questions. The SC convened SWG OP 2025-01 on 30 July 2025 to discuss initial responses to these questions. Members agreed to iteratively review and update SC responses summarized in this working paper (WP) between SWG OP 2025-01 and SC10. SC Members also agreed to identify at least 1-2 data types for NPFC's priority species to inform the design of a ROP and ultimately improve stock assessments of these species (this was one of the TCC questions in 2024). Members provided suggestions to clarify SC's initial responses to the TCC Chair's 2025 questions and the 2024 question identified above in two previous drafts of this working paper. The Chairs of SC's subsidiary groups and the Leads of SC's Small Working Groups also contributed to the last table in this WP about the types of data and their units that could be collected to improve stock assessments of priority species. The TCC Vice-Chair reviewed the draft of this WP submitted to SC10 and asked for clarification. SC discussed the WP and TCC Chair's questions, and revised during SC10. The WP will be communicated to the TCC before TCC09.

Task from COM09 and Context for Five TCC Chair's Questions

The Convention, Article 7.2.b calls for the development and implementation of an NPFC Observer Program. The NPFC has been discussing how best to develop an observer program for many years and the SC responded to 6 questions from the TCC in 2024. Some Members were concerned that feedback from the SC was insufficient during the TCC08 meeting and TCC08 recommended that the TCC and SC Chairs continue to work intersessionally towards identifying the potential data needs for a broader Regional Observer Program (ROP). The Commission endorsed this recommendation at COM09 in March 2025.

The TCC Chair has asked the SC Chair to respond to 5 new questions in 2025. The SC SWG Observer Program (SWG OP) agreed on the following process for responding to these new TCC questions:

- convene SWG OP 2025-01 as a brainstorming session on 30 July 2025

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- summarize key responses in a draft working paper for SC10
- circulate that working paper for comments twice between SWG OP 2025-01 and SC10
- discuss and revise the working paper as needed during SC10
- communicate SC's responses to the TCC before the next TCC and COM meetings

In addition Members agreed to identify at least 1-2 types of data that could be collected through a ROP to improve NPFC's stock assessments. This was one of the TCC questions for SC in 2024.

Question 1. What are the critical data points used for current/ongoing stock assessments and management of NPFC stocks?

Table 1a. Assessment models and data needs for priority species.

Stock	**Assessment model**	**Data needs**
Chub mackerel	SAM (State-space age structured assessment model)	- Catch (for cross validation with the catch at age and mean weight at age). - Biological data: age/length composition, weight-at-age, maturity, natural mortality - Fishery dependent and independent indices (preferably the independent should cover all ages)
Pacific saury	BSSPM (Bayesian State-Space Production Model); SS3 (Stock Synthesis 3)	Catch, fishery dependent and independent indices Catch, fishery dependent and independent indices, biological data
Neon flying squid	Not yet determined	
Splendid alfonsino	YPR (Yield per Recruit) and SBPR (Spawning Biomass per Recruit)	Biological data: age/length composition, length-weight relationship, histological data, gonadosomatic index data
North Pacific armorhead	Depletion model	Catch, effort, intended target species
Japanese sardine	Not yet determined	

Table 1b. Available data used for current/ongoing stock assessments

Species	Data Type	Temporal Resolution	Spatial Resolution	Fleet Resolution
CM	Age-Length Key (ALK)	Quarter	EEZ and CA	all Member's fleets
CM	Age composition	Quarter	EEZ and CA	all Member's fleets
CM	Length composition	Quarter	EEZ and CA	all Member's fleets
CM	Catch number at age	Quarter	EEZ and CA	all Member's fleets
CM	Catch weight at age	Quarter	EEZ and CA	all Member's fleets
CM	Maturity ogive	Quarter	EEZ and CA	all Member's fleets
CM	Chub and blue mackerel ratio	Annual	EEZ and CA	all Member's fleets
PS	Catch	Month	1 x 1 degree	Gear
PS	Effort	Month	1 x 1 degree	Gear
PS	Length composition	Month	1 x 1 degree	Gear
PS	Age composition	Month	1 x 1 degree	Gear
PS	ALK	Month		Gear
PS	Maturity ogive			Gear
JS	Catch	Month	EEZ and CA	Gear
JS	Effort	Month	EEZ and CA	Gear
JS	Length composition	Month		Gear
JS	Length-weight	Annual		Gear
NFS	Catch	Month	1 x 1 degree	Gear
NFS	Effort	Month	1 x 1 degree	Gear
NFS	Length composition			Gear
BM	Chub and blue mackerel ratio	Annual		
BM	Length composition	Month		
BM	Length-weight	Annual		
NPA, SA	Length composition	Month	Seamount	Gear
NPA, SA	Age composition	Month	Seamount	Gear
NPA, SA	Catch	Month	Seamount	Gear
NPA, SA	Maturity ogive	Month	Seamount	Gear
NPA, SA	Effort	Decade	30" x 30"	Gear
NPA	Catch	Day	Seamount	Gear
NPA	Effort	Day	Seamount	Gear
NPA	Ratio of Fatness Index >30%	Day	Seamount	Gear
NPA	Length-weight	Day	Seamount	Gear
NPA, SA	Species target information	Day	Seamount	Gear

Question 1a.

Would it be valuable to have those data points confirmed through independent at sea monitoring?

Responses:

- Most of the current data used in stock assessments comes from a combination of national observer programs and port sampling.
- The SC does not believe that existing scientific data collected via national monitoring/observer programs requires additional verification.
- Therefore, ideally, any new observers as part of a ROP would not be collecting data to confirm existing data or functions, rather they would collect more data in addition to what SC already has, either additional types of data, such as size composition or set-level catch per unit effort, or a larger sample size.
- There are some gaps in data collection among Members (e.g. length/maturity data from some parts of the PS fleets) and some components of the landings (e.g. fish that are transshipped). Filling these gaps with an ROP would be useful.
- It is always useful to collect additional data for stock assessment.
- Catch data listed for some species in the table above (Data used for current/ongoing stock assessments) is an important data point that should be collected for all priority species, however, it is unclear if at sea monitoring would be the best method for catch data verification.

Question 1b.

Are there any critical data points missing that independent at-sea monitoring could obtain?

Responses:

- Each of SC's expert groups made up a list of useful data.
- Such missing data may include body length composition by fleet, operational data on species composition and target species, and data for separation of squid cohorts. Other missing data include basic species composition, for example, the ratio of blue mackerel to chub mackerel, and length data that vary spatially and could be used to distinguish cohorts of squid.
- Some parts of fishing fleets do not provide data for stock assessment. For example, fish that are transshipped are excluded from the length data that is obtained via port sampling, and current transshipment records do not include length data.
- There is inconsistency with how effort data is defined and recorded. New observers could help measure and report on effort in a consistent format, which would help improve stock assessment.
- This question was partly answered in NPFC-2024-SC09-WP04 (Rev. 4) and is addressed below.

Question 1c.

What level of monitoring would need to be required to ensure that those missing data points are collected?

Responses:

- More information would be required to determine the specific level of monitoring required (e.g. from a pilot study or Members providing the necessary data), unless Members drew on domestic observer programs or used information from other RFMOs with similar fleets.
- The level of coverage needed to address an objective should be estimated by fleet characteristics, including composition of the catch and how fishing effort is structured (e.g. by number of fishing days, trips, vessels…) and what kind of data is required.
- A simulation study (e.g. parametric statistical test) may be conducted to determine the appropriate sample size for obtaining reliable results.
- Determining the level of catch monitoring to determine species caught during fishing operations requires information from fisheries about how rare and how variable species catches are. For example, rare events such as catch of coral in longlined trap gear may require 100% observer coverage to accurately monitor.
- A regional observer program may cover all fleets or start with one fleet (although implementing it this way for all priority species would take a long time).
- Dip net and jigging fleets have less species variety in their catches in comparison with trawl and purse seine fisheries.
- New metrics to measure effort such as number of trips or number of fishing days could be identified to inform discussions about the level of monitoring required to ensure that missing data points are collected.

Relevant scientific papers include:

Jiaqi Wang, Luoliang Xu, Bai Li, Siquan Tian, and Yong Chen. 2020. An evaluation of the effects of sample size on estimating length composition of catches from tuna longline fisheries using computer simulations. Aquaculture and Fisheries. Volume 5, Issue 3, Pages 122-130. https://doi.org/10.1016/j.aaf.2019.09.001

Elizabeth A. Babcock, Ellen K. Pikitch, and Charlotte G. Hudson. 2011. How much observer coverage is enough to adequately estimate bycatch. Oceana. 36 pages. https://www.researchgate.net/publication/267378274_How_much_observer_coverage_is_enough_to_adequately_estimate_bycatch

Question 2.

What is the current level of confidence in our stock assessments (i.e. what is the uncertainty in our stock assessments and stock assessment models)?

Responses:

- This is a difficult question to answer because confidence currently is not quantified.
- NPFC scientists have identified some issues, such as retrospective patterns, residual patterns and confidence intervals for key outputs and parameters in all stock assessments. Some of these issues may be improved with collection of additional data.
- Stock assessments should be underpinned by reliable and consistent catch data, at least one long and independent survey index, and sufficient biological sampling (age, length, maturity etc.) to inform the stock structure, when age or length structure models are needed. The available datasets should not strongly contradict each other. Instead, all data sources (survey, catch, and CPUE) should point in the same overall direction. The reliability of assessment outputs is only as strong as the data they are built on. If the input data are incomplete, uncertain, or of poor quality, the model will inevitably reflect those weaknesses.
- On the modelling side, the assessment should converge, and diagnostic checks indicating robustness. Retrospective patterns should be stable and free from systematic bias as much as possible. Ideally, Mohn's rho should be small, indicating little bias. However, this should not result from positive and negative retrospective patterns cancelling each other out across peels. Parameter estimates should be biologically plausible, and overall stock dynamics consistent with what is known about the species and fishery. Sensitivity analyses and alternative model structures should produce broadly similar trends.
- A condition for acceptable confidence is that the assessment withstands independent external review.

Question 2a.

In an ideal situation, what is the minimum/acceptable level of confidence would you as a scientist want to have in NPFC stock assessments to inform management?

See the above responses.

Question 2b.

Do you believe data from independent at sea monitoring could help reach or achieve that confidence level?

Responses:

- This is a difficult question to answer quantitatively. However, in general, at sea monitoring that increases accuracy and quantity of data about the relevant population would help improve stock assessments and confidence in the stock assessment results.

Question 2c.

Are the national programs (or other programs being used) providing sufficient information to achieve the SC's desired level of confidence in stock assessments?

Responses:

- The SC currently does not have a "desired level of confidence."
- Data from national programs, which are often collected within members' national waters, are unlikely to be representative of NPFC stocks as a whole because fishing in the convention area may take place using different gears and during different seasons, and may catch different sizes or cohorts of fish.
- To evaluate whether current sampling is adequate, we need information on both overall fishing activity (e.g., effort by fleet segment, gear, area, and season) and the sampling itself (e.g., trips and hauls sampled, observer/EM coverage, biological samples collected, and their spatial/temporal distribution). This comparison makes it possible to identify not only whether any data are missing, but also whether the existing data are representative of the fishery and its variability. The SC currently does not have information to this level of detail.
- The report on existing Observer Programs (NPFC-2024-SC09-WP02 (Rev. 4)) helps answer this question. However, it lacks some important information, such as fleet characteristics.

Question 2d.

In an effort to actionize Performance Review Recommendations (e.g. 4.2.1), are Members providing data to the SC and the Commission in a harmonized and standardized way that can be used for comparative analyses (i.e. across regions/species/gear types/members)? Are these data collected/submitted (in-part or in-whole) independently verified in some way?

Responses:

- The SWG Data is working on standardized templates for data provision taking into account templates developed by SC's expert groups.
- Members noted that catch and effort data may require verification, although it may not be possible for an at-sea observer to verify total catch due to its potentially large volume and the logistical constraints of at-sea observing. At-sea observers may be best suited for collecting samples and recording catch data (e.g. species composition).

Question 3.

If the Commission is seeking to detect and collect data on rare events, what level of statistical power would be required and what would be the associated level of monitoring required? For this question and those below, please provide an answer for each of the following "rare events:" bycatch, incidental catch, marine mammals, seabirds, sharks, and marine reptiles.

Responses:

- Information about how rare these species are is important to respond to this question, as the necessary coverage rate would depend on the rarity of the events. The rarer the event, the

more coverage is needed.

- A simulation study to define a relationship between “event rarity” and observer coverage level may be conducted to answer this question.
- There is a need to define what “bycatch” and “incidental catch” mean in the context of answers to this question.

Question 3a.

What level of confidence (percentage) would you as a scientist want to have in detecting rare events and to assist in informing the management?

Responses:

- The answer to this question is related to the answer in the previous question.
- One needs to know (make assumptions on) the true zeros to devise a sampling strategy.
- It is important to specify whether detection applies to rare events occurring, or rare events not occurring.

Question 3b.

Do you believe data from independent at sea monitoring could help reach or achieve that confidence level?

Responses:

- There is a tradeoff between the level of observer coverage and the level of confidence or the probability of detecting a rare event, where 100% observer coverage would result in a very high level of confidence.
- For biological sampling, which focuses on routinely available data such as length, age, or maturity, relatively modest coverage can still yield representative samples, provided that the sampling is well-designed across fleets, areas, and seasons. In contrast, detecting rare events (e.g., interactions with vulnerable species, high bycatch hauls) requires much higher coverage. This is because the probability of encountering and recording these events is low, and insufficient coverage can easily result in such events going entirely undetected. Consequently, achieving reliable estimates for rare events generally demands higher observer coverage rates than those needed for biological sampling.

Question 3c.

Are the national programs (or other programs being used) providing any information on rare events? If so, are they providing sufficient information to achieve the necessary level of confidence so that decisions can be made?

Responses:

- Members did not identify existing programs that provide information on rare events.
- There have been some information papers / working papers submitted to meetings of the NPFC SC subsidiary groups that contain information on bycatch records from individual

members and specific gears or fleets based on at-sea observations and logbook entries. These existing datasets may provide sufficient information for some fleets, but do not contain enough information on rare events to design an overall regional observer program. Some example papers include: PS14-IP06 Korean stick-held dip net fishery status up to 2024, PS14-WP04 Bycatch information from the Japanese fisheries, CMSA10-WP04 Bycatch information in chub mackerel fisheries from the Japanese fisheries, and NFS01-WP23 Species in the Northwest Pacific ecosystem from Chinese survey and bycatch in fishery.

Question 3d.

Are data being submitted to the SC and the Commission compiled in a way that can be compared across fisheries and/or verified? Is the data collection standardized?

Responses:

- Currently, none of the data on "rare events", including bycatch, is submitted to SC, except data on the capture of sharks (CMM 2023-14) and salmon (CMM 2024-16), are required to be submitted to the Commission.
- Standardized data templates developed by SWG Data in 2025 could be applied to any species.

Question 4.

In considering the development of management procedures and accounting for potential effects of climate change, what additional data, e.g., fine scale environmental data, would be valuable to collect from the fishery to develop and test management strategies?

Responses:

- It was noted that fine scale environmental data may be straightforward to collect but scientists were unsure how such data could be integrated directly into an MSE or stock assessment process.
- Spatially-explicit environmental data may be useful for the development of MSE, but it is considered a lower priority.
- Identifying and collecting basic environmental data such as ocean temperature that could provide insights about catchability is more important.

Relevant scientific papers from SC09 include:

NPFC-2024-SC09-OP02 Developing the climate test: robustness trials for climate-ready management procedures

NPFC-2024-SC09-OP03 Developing the climate test: performance metrics of climate robustness

Question 5.

In considering the use of EM in similar fisheries where electronic monitoring systems are being used to successfully attain needed data, how can we utilize EM in NPFC to attain scientific data needed?

Responses:

- For most fisheries, EM does not replace an at-sea observer program, but can supplement data collected by at-sea observers.
- EM might be useful for verifying [catch and] effort in some fleets, however some biological data (e.g. age and maturity) cannot be collected.
- In general, EM is not feasible for estimating catch composition or collecting length data, in particular for large-scale pelagic fisheries such as NPFC fisheries, while EM is more useful for compliance purposes.

Question 5a.

What minimum standards would be needed for their implementation?

No minimum standards were identified.

Question 5b.

Would it be useful to have a third party (e.g. EM vendor) present on options to better understand what is feasible and necessary for NPFC?

Responses:

- This is a question for the Commission.

TCC Question from 2024

What new data would the SC prioritize/need from a ROP to help improve its stock assessments? Please identify 1-2 types of data that could be collected for each of the NPFC's priority species. Included in this table are the SC responses from NPFC-2024-SC09-WP04 (Rev. 4). Please add detailed comments on the data units and any other information that could inform the design of a ROP and ultimately improve stock assessments of these species.

Species	Data type	Units	Comments
Pacific saury	Size for unsampled portions of the fleet, Seasonal maturity ogive		Seasonal maturity is a priority for age-structured models for Pacific saury
chub mackerel	search time of school of targeted species	time	Amount of time spent considering information from the bottom sonar, visual

			observations, experimental sets, moving to perspective sites, etc.
chub mackerel	target by operation (set)	species names	Species that the captain expected to catch for each set
chub mackerel	number of operations (sets)	number	
chub mackerel	biological information on the catch		Samples for maturity and age
chub mackerel	on-board devices to enhance fishing efficiency		
chub mackerel	length data		
chub mackerel and blue mackerel	Ratio of BM:CM		Observers could collect operation (set)-level BM:CM information
neon flying squid	catch composition		
neon flying squid	size composition data		
Japanese sardine	search time of school of targeted species	time	Amount of time spent considering information from the bottom sonar, visual observations, experimental sets, moving to perspective sites, etc.
Japanese sardine	target by operation (set)	species names	Species that the captain expected to catch for each set
Japanese sardine	number of operations (sets)	number	
Japanese sardine	biological information on the catch		Samples for maturity and age

Japanese sardine	on-board devices to enhance fishing efficiency		
Japanese flying squid	search time of school of targeted species	time	Amount of time spent considering information from the bottom sonar, visual observations, experimental sets, moving to perspective sites, etc.
Japanese flying squid	target by operation (set)	species names	Species that the captain expected to catch for each set
Japanese flying squid	number of operations (sets)	number	
Japanese flying squid	biological information on the catch		Samples for maturity and age
Japanese flying squid	on-board devices to enhance fishing efficiency		
blue mackerel	search time of school of targeted species	time	Amount of time spent considering information from the bottom sonar, visual observations, experimental sets, moving to perspective sites, etc.
blue mackerel	target by operation (set)	species names	Species that the captain expected to catch for each set
blue mackerel	number of operations (sets)	number	
blue mackerel	biological information on the catch		Samples for maturity and age

blue mackerel	on-board devices to enhance fishing efficiency		
blue mackerel	Length data		
North Pacific armorhead			
splendid alfonsino			
skilfish			
sablefish	Additional size data by sex (length and weight) Otoliths and maturity	Cm/kg Age in years/maturity stage	

Note: The information in the table above may be already collected through other means. Please refer to the response to Question 1 above.