

Electronic Monitoring Data in AFSC Stock Assessments

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Introduction

The AFSC Stock Assessment staff conducted a one-day meeting to prepare for using electronic monitoring (EM) data in the 2021 stock assessments. The purpose of the meeting was to provide assessment authors with information regarding the different EM programs and resultant data streams that feed into the AFSC stock assessments. The meeting was well attended and in addition to stock assessment staff, attendees included staff from the NMFS Alaska Regional Office (AKRO), the Fisheries Monitoring and Analysis Program (FMA), the Council's Scientific and Statistical Committee (SSC), Pacific States Marine Fisheries Commission (PSMFC) and the Alaska Fisheries Information Network (AKFIN). This report highlights the outcomes of that meeting.

Two EM programs currently exist in Alaska that are used in catch accounting (trawl EM and fixed-gear EM). There are many nuances between the two programs and the three gear types involved (pelagic trawl, hook-and-line, and pots). Although testing with non-compliance EM systems began as early as 2002, regulated EM programs for catch accounting began in hook-and-line (HAL) fisheries in 2018 and in pot fisheries in 2019. In addition, an exempted fishing permit was issued in 2020 which allows for a portion of the pelagic trawl pollock fishery to use EM for compliance monitoring and shifts catch data collections from at-sea observers to those deployed in the shoreside processing plants. There are five primary areas of concern for stock assessment that were discussed that span both programs and all gears:

- 1) Loss of haul level information
- 2) Biological samples: reduced spatial resolution and/or distribution shifts of sampled fish (trawl EM); lack of any biological samples (fixed gear EM)
- 3) Selection bias and getting observers where needed to ensure sufficient at-sea catch weight and biological specimen data are available to support catch estimation and inform stock assessment parameters for the EM portion of the fleet
- 4) Coordinated effort for authors to voice concerns regarding fishery dependent data
- 5) Access to data

Loss of Haul Level Information

The replacement of at-sea observers by EM systems on a portion of trips has removed the ability of analysts to estimate haul-level effort metrics for HAL (hook counts and spacing) and trawl gears (tow duration) on EM trips. Some of this information can be gained by access to self-reported logbook data and keypunching this into electronic form, or potentially adding information to the EM video review process.

Vessels who are participating in the trawl EM EFP may forgo accommodating at-sea observers and instead carry EM systems that continually record fishing activity. These vessels are prohibited from discarding most catch at-sea (maximum retention); however, large organisms such as sharks are allowed

to be discarded. Length composition data and specimens (i.e., otoliths) from the trawl EM EFP are collected by shoreside observers for sampled trips (all trips in the BSAI and 30% random selection of trips in the GOA). Species composition of the catch is captured in the fish ticket data for each trip and NMFS area. As a result, haul level analytics are no longer possible (e.g., location or time of day analyses of bycatch). This reduction in haul-level data is a concern for the development of Ecosystem Based Fishery Management analyses. If there are no biases between at-sea observer coverage and EM coverage (e.g., two methods are equally representative), then these concerns are reduced. Alternatively, for haul specific information researchers will have to rely on industry participation and on fishers to record any ancillary data for special projects (e.g., haul location, time, etc...), which, without at-sea observers, could be costly.

A potential approach to help analysts obtain haul-level catch estimates discussed at the meeting was to back-apportion fish ticket landings to the hauls within the EM trip. The AKRO can provide these back-apportioned catches, however, it will take some time to implement programming changes. This approach will be important to implement moving forward to provide spatially-explicit information on fishery removals, though it will be important to flag these estimates as being different from estimates produced by at-sea observers. Methods will also need to be developed to utilize this information while taking into account its lower resolution and assumptions.

In addition, observers collect data on marine mammal and seabird interactions that are not captured during EM trips. Mammal/bird presence is not detectable in EM videos and depredation cannot be resolved further than “sand flea depredation” and “other depredation”, but could be recorded in EM logbooks. **It would benefit AFSC stock assessments to include information on whale presence and depredation in the EM logbooks.**

Biological Samples

The SSC noted that “The adoption of EM must not degrade the quality of the fishery dependent biological sampling” (Feb 2021). For the pollock trawl EM program, biological specimens and samples are collected at the offload. The spatial and temporal resolution of these data are at lower resolutions than previous observer data collections. Currently none of the pollock stock assessments require lengths or ages be reported at the haul level resolution, so no change to assessment methodology is needed as data are proportioned by NMFS area.

While the assessment model may not change, research projects that have historically been conducted by at-sea observers will be challenged. Projects such as food habits, maturity, and genetic studies, which rely on specific location or a window of sampling time (e.g., day vs night) for evaluation, may no longer be feasible from samples collected at the trip level and delivered days later on vessels participating in the trawl EM program.

The workshop noted concerns regarding the port sampling of offloads from the trawl EM vessels. Due to the required full census of salmon, initial understaffing of the shoreside observers for the trawl EM program in 2020, and the impacts of Covid-19 on standard observer data collections and deployments, the ability to sample critical bycatch species was substantially reduced. In the case of Pacific cod, where no directed fishery was conducted in 2020, the pollock fishery was an important source of catch in which little biological sampling of Pacific cod occurred (Pacific cod are included in EM EFP shoreside sampling targets although the typically small shoreside sample fractions may limit encounters of less common species). These nuances indicate an **increased need for stock assessment authors to work with FMA to**

integrate sampling priorities for shoreside monitoring of offloads (number of otoliths and lengths) rather than the more typical at-sea haul-specific sampling plan.

For the fixed-gear EM program, there is no biological sampling. This is a substantial concern for stock assessments, both for the collection of otoliths/lengths, but also in how catch numbers are converted to catch weight. At-sea observer sampling should be representative of the catch by time/area so that biological specimens can be collected appropriately. A suggested alternative would be to port-sample the landings from fixed-gear EM trips. However, for species that are discarded at-sea, samples would be representative of the retained catch only and would not be representative of the entire catch, even for target species, and caution is needed when incorporating such data into assessments. Additionally, samples collected from deliveries (port-samples) would have trip-level resolution (i.e., without haul specificity), with similar concerns defined above, however, this would be an improvement over no sample collections.

Under the current program, some level of at-sea observer coverage is needed to ensure adequate biological samples are collected. This could take the form of **deploying at-sea observers such that there is sufficient overlap in time and space between at-sea observed trips and EM trips so that data collections remain representative.**

Selection Bias

Authors identified two concerns regarding bias introduced by the EM programs: self-selection into the programs and the ability to change from EM to non-EM for the pollock trawl vessels. Both programs are voluntary, with vessels non-randomly participating in either program. While trip selection within each strata is random, scenarios can arise where there is not sufficient spatial and temporal overlap between observed EM and at-sea observed trips to ensure randomness of biological sampling. In the trawl EM program, vessels can opt to register a trip as EM or non-EM, and change the trip. For example, if the trip is planned to be an EM trip, but the camera breaks, the vessel can switch to a non-EM trip. These scenarios create spatial and temporal biases in the catch data, of which analysts need to be aware. **At-sea observers should be deployed in a method that accounts for the spatial and temporal distribution of EM trips and maintains regional sampling objectives.**

Author Feedback Process

This workshop was integral in connecting stock assessment authors with FMA and AKRO staff who manage the various aspects of the EM programs. However, there is currently no unified process for authors to provide feedback to the NPFMC, and to FMA and the AKRO, regarding EM considerations. REFM staff are involved in the Observer Science Committee (OSC), which provides input on the Annual Deployment Plan and Annual Reports. To date the OSC has not been a venue for discussions such as the concerns brought forward during this meeting. A suggestion was made to **utilize the Plan Team process for authors to provide feedback to the NPFMC bodies that advise the NPFMC on EM program design and EM deployment to ensure that EM development is such that stock assessment data needs are addressed and responded to** (potentially at the September Plan Team meetings). For this to be a regular process, there would need to be a coordinated discussion amongst authors prior to the September Plan Team meetings, possibly a sub-group of authors tasked with identifying and coordinating analytical efforts related to fishery monitoring and providing feedback to the NPFMC.

Staff at FMA have also requested authors to consider metrics going forward to help form future data need discussions.

Data Access

While the catch from EM vessels has been accounted for in catch estimates, the catch data specific to the EM programs either are not available to stock assessment authors, or have recently become available. Through various efforts and collaborations, the data availability is improving. These data access issues fall into three categories: 1) catch data from the EM vessels; 2) logbook data; and 3) biological sample data.

All catch from EM vessels is accounted for in total catch estimates. Fixed-gear EM haul level catch data is now readily available on AKFIN for all authors, but excludes effort data for HAL. Haul level catch data will not be available from trawl EM; however, because full retention is required (with a few exceptions), all catch is accounted for in fish tickets at the trip level. It has not been possible to parse out total catch estimates resulting from EM vessels from total catch estimates resulting from non-EM vessels. Thanks to efforts by the AKRO and AKFIN, fields are being added to the data to allow stock assessment authors to query and filter catch by observer category and sampling strata for assessment analytics. These data will not be available for the 2021 assessment cycle.

As noted in the Loss of Haul Level Information section, critical data currently used by stock assessment authors rely on at-sea observer collections. With EM, authors are going to have to rely on vessel logbook data when using EM, but those data are presently unavailable from either EM program. The AKRO and AKFIN are working to have those data available from the trawl EM program for stock assessment purposes. It is unclear if they will be available for the 2021 stock assessments. Fixed-gear EM logbooks have been stored as paper copies, and staff at the AFSC and PSMFC are working to define which logbook fields are needed, how to validate the data, and how best to develop logbook data record keeping for future landings. When completed, keypunching historical logbook data will be required.

Historically, biological samples have not been linked to the observer category (partial or full coverage) and sampling strata (e.g., trawl EM, hook-and-line, pot, etc.) as defined in Annual Deployment Plans. Staff at AFSC and AKRO are working together to develop methods to link records but it is unlikely to be available for the 2021 assessment cycle.

Advantages

Two types of pots are known to be used in the fisheries: rigid (traditional pots) and collapsible "slinky pots". It is unknown how prevalent each pot type is and how the catch rates differ. Data on the types of pots being fished have not been available previously and EM may advance the collection of those data. Pot type can be discerned during video review and the AKR is working with PSMFC to include this information in the video review process. A parallel project for at-sea observers is being developed in conjunction with FMA, ABL, and the AKRO to collect pot types and characteristics of pots being used in the sablefish fishery.

Pots are fished in two different pot configurations: single pots and strung pots. Strung pots are a number of pots strung together on a single groundline while single pots are each fished individually. Strung pots

can be identified during EM video review and FMA staff have worked to add fields identifying strung pots.

Other advances of the EM tools may include, but are not limited to, improved species ID and estimates of catch for large animals (e.g., sharks), the ability to revisit haul videos to investigate potential errors/sources of confusion, and the ability to improve data recording as technology advances. See the EM Innovation Teams work for more information.

Recommendations

It is clear that EM will continue to develop as an efficient means to monitor fisheries. Alaska is leading the nation in implementing EM programs. However, there are substantial concerns with the changes in the data streams that need to be addressed to ensure that data are collected and processed in a manner that can most effectively be used within stock assessments. Below are some recommendations that resulted from this workshop:

1. At-sea observers deployed in a way that is representative of fishing effort. The levels of this deployment should be sufficient enough to account for any potential temporal and spatial biases in the lack of biological information due to EM coverage.
2. The Plan Team process (or some other) should be developed so assessment authors can provide coordinated feedback to NPFMC advisory bodies regarding stock assessment data needs.
3. Metrics should be developed and shown in stock assessments to help inform on EM program performance and potential impacts. For example, how does trip level information compare with haul level sampling efforts? Also, can such changes be shown to affect uncertainty in management advice?
4. Continue to develop methods to accurately estimate catch weight of at-sea discards in the EM strata based on only catch numbers and observer-data derived estimates of weight per fish.

The working group commends the people from the different offices for their work in improving communications. Specifically, assessment authors have had the opportunity to participate in the trawl EM EFP and have been invited to participate with the AKRO in the development of the regulatory proposal package for the regulated pollock trawl EM program. The AKRO, AKFIN/PSMFC and FMA have been very helpful and receptive to authors' various requests and questions as authors learn about the EM programs. The working group noted that the FMA, observers, and EM providers deserve recognition for managing to get observers and EM systems to ports/vessels while continuing normal data collections during the ongoing pandemic.