Reviews of the mid-Atlantic supplemental finfish survey and the cooperative monkfish survey

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Introduction

The following report was compiled after 1.5 days of presentations and discussions about two different studies which employ commercial trawl vessels for conducting scientific surveys. The first survey concentrated on doing a number of trawl samples across depth contours (transects) at up to four locations (but consistently two) at different times of year to supplement NMFS survey efforts. This survey used a fixed station design with additional mid-transect stations included according to pre-specified criteria. For the purpose of this report, this survey is referred to as the Supplemental Finfish Survey (SFS). The second survey reviewed was designed with specific goals to better cover the depth and range of monkfish and is referred to here as the monkfish survey. This survey was conducted in 2001 and 2004 and extended the NMFS strata. Station locations were selected on a random basis and subsequently fixed.

An external Panel was invited to review these surveys following terms of reference given as attachment 1. The organization of this report follows the terms of reference for each survey separately in subsequent sections. The Terms of Reference items 5-7 were related since they dealt with the scientific issues and assessment applications. Hence, for our discussions below they are combined.

Supplemental Finfish Survey

1. Design and objectives

The stated goals of the SFS were to use commercial gear for scientific surveys and aid in the interpretation of availability due to seasonal and depth distribution patterns. Further considerations on survey design are presented below. In general, the survey design and approach provides supplemental information compared to the NMFS stratified random sampling approach. The SFS results in samples collected at finer resolutions along depth contours and over seasons compared to the NEFSC surveys.

The "domain of inference" for this survey is very limited. For stocks of fish and invertebrates that are relatively sessile, this survey may reflect only local abundance patterns rather than population-level trends. For more mobile stocks this survey is likely to be highly variable. Also, the utility of this survey as an index is likely to be poor for species that may be at the edges of their distributions.

2. Biological sampling

In general it seems good as presented. The cruise reports presented extensive figures on the samples collected, and should be a useful reference for users. However, it was unclear how the allocation of biological sampling was balanced against doing more stations. Better communication with prospective users would help to determine a reasonable balance. A comparative study with NMFS survey data (from different times of the year and/or areas) could demonstrate added utility of this survey.

3. Data processing

Also seems sufficiently good as presented. The Panel was concerned that institutional memory of issues with data are currently lacking. A meta-data approach (to catalogue and provide added descriptions of the survey) was suggested as a way to avoid misuse of data. As funds become available, electronic systems for data collection (e.g., as in the NMFS survey) may help reduce time spent on these aspects (and may be able to allocate more effort in biological data collection).

4. Survey comparability and continuity

Important survey protocol changes affected the ability to compare the first year with subsequent years. Thereafter, the protocols seemed stable and the surveys should be comparable. The Panel felt that emphasis on tow distance was overstated, because these are measured and can be corrected. It may be more important to standardize tow speed since some species' catchability may be affected. The change in vessels from November 2004 was well documented and since the same gear and methods were adopted the potential for discontinuity was thought to be minor.

The Panel appreciated the efforts at diagnostics for gear performance, in particular, the PCA to detect potential outliers. This confirmed issues related to net mensuration equipment malfunctions in some transects. This will also help establish a record of data quality issues for future users.

5.-7. Scientific approach and utility for assessments

The potential utility of this survey in assessments was not demonstrated. A recent assessment on silver hake attempted to include results from this survey. However, an external review panel (CIE) felt that the assumptions for this application required more study, i.e., they note problems of calibration with NMFS surveys. There was some indication that the study provided some important results on seasonal availability that could impact how Illex squid are currently assessed. The Panel felt that direct inclusion of these survey results in a standard stock assessment context would require careful consideration and would be unlikely to have a large influence on results. The main utility of this survey within assessments is more likely to provide descriptive or qualitative patterns on seasonal and along shelf distributions. Such patterns may help interpret other survey and fishery data. In particular, species poorly sampled by NMFS survey gear may benefit from the SFS information (e.g., estimates of relative gear efficiency/catchability).

The presenters and the Panel noted that more analysis of these survey data is needed to evaluate the biological relevance. This would also help evaluate the survey utility survey in general.

Precision estimates were lacking in both the cruise reports and in the presentations.

The cruise reports shows two figures for each species by station and depth, one is for kg/km^2 and the other is kg/swath. The documentation on exactly how the second calculation was done is unclear. Presumably this scales the data to derive an overall abundance estimate along the transect.

There was a lengthy discussion and presentation on using adaptive stations to learn more about key species after the fixed stations were completed. The study used a strict rule based on catch-rate ranks to determine where to add stations between those already completed.

The presenters argued that the analysis on the utility of doing "adaptive" stations was worth the extra effort since binomial tests suggest that certain species were biased.

The presenters assert that inclusion of adaptive stations has the following benefits:

- Minimization of bias in stock estimates.
- Swath area estimates reveal tendency to underestimate stock abundance with reduced sampling intensity.

While including adaptive stations result in higher biomass estimates along the swath of a transect for some species, it is unclear to us that this in fact minimizes bias or reveals a tendency to underestimate abundance. Many fish species are known to have high levels of spatial correlation and this process would inherently bias adaptive stations (as they are selected) upwards. The Panel feels that since these adaptive stations are not independent representations of abundance, doing statistical tests (binomial as presented) are inappropriate.

The Panel encourages analysis on the sampling variability and further study on the consequences of selecting additional stations using their criteria.

8. Survey cost effectiveness

The Panel had difficulty judging the cost effectiveness of this survey. The presenters detailed some costs, but judging the benefits requires further analysis. Given the information presented, the cost-per-station appears to be higher for this survey compared to NMFS and the cooperative monkfish survey. The Panel felt that the general approach to fund cooperative research through "research set-asides" was innovative. Also, this survey provides information that is not available through other projects or programs. However, the extent that it has or will be useful in assessments has not been demonstrated. The Panel feels this data has been underutilized for either management or scientific purposes. The Panel did not address the issue of future utility of this survey after the NEFSC surveys undergo significant gear and stratification changes in approximately 2008.

Cooperative Monkfish Survey

1. Design and objectives

For the monkfish survey, the goals were clearly specified to improve the current survey efforts to better cover the range and habitat area of monkfish. The Panel felt that the "domain of inference" was better than that covered by the standard NEFSC surveys, but that further study on the depth distribution is warranted. Stations were selected based on a stratified random sampling design but used a mix of industry-selected locations and random within-strata locations. The presenters evaluated the effect of potential bias due to non-random selections and concluded there appeared to be little or no bias.

The Panel recommends that the survey timing be better oriented to suit the assessment process (SARC), i.e., it may be preferable to have the survey occur the year before the SARC so that the data can be used in a more timely fashion.

The stated survey objectives were generally well met. The objectives important for assessment purposes (absolute abundance and calibration with NMFS surveys) received adequate attention and detail.

2. Biological sampling

The biological sampling in the monkfish surveys follow NMFS protocols and was adequate. The Panel was encouraged to learn that data on species other than monkfish were also routinely collected.

3. Data processing

The shift to electronic recording capabilities in the 2004 survey was an obvious benefit for processing data. The monkfish survey data incorporation into the NMFS database was lagging, but analyses have been able to proceed. The data processing appears to be improving and the Panel felt the system was adequate but will require continued attention.

4. Survey comparability and continuity

The presenters are to be commended on the efforts to provide direct comparisons with standard NMFS surveys. The shift from two to one vessel between the 2001 and 2004 surveys provides some cause for concern, especially since target tow speed between the boats was different and the length of the survey period was substantially different (much longer in 2004). The degree to which 2001 results can be compared to 2004 was considered. In both years analyses of efficiency were conducted using depletion experiments. The Panel commends this effort and feels that this helps resolve issues of continuity and comparison with other surveys.

The Panel recommends that results on these efficiency studies be used in considering future research survey nets on the new RV. The experiment comparing rock-hopper gear with flat-net gear provided the needed conversion for monkfish efficiency. The video work also provided insight on aspects of gear catchability.

5.-7. Scientific approach and utility for assessments

There were adequate descriptions on the experimental design, methods, and data analysis. In particular, the monkfish survey presentation included substantial information on estimation precision. The documentation included careful consideration on the effects of survey design (i.e., the benefits of stratified-random sampling versus simple random sampling designs). The stratified random sampling design demonstrated a substantial improvement over simple random sampling in terms of reduced variance.

The authors presented a detailed analysis on efficiency (catchability) based on depletion experiments. A total of 7 depletion experiments were conducted in the 2001 and 2004 surveys. These provided a range of biomass estimates that can be used to complement values from assessments.

The general design (broad-scale stratified random sampling) of this survey is very close to the current design of the NEFSC surveys and for that reason has a number of advantages. This should ease its incorporation into the assessment process (providing biological advice for management). This survey averaged about 10 monkfish per tow whereas in the NEFSC standard survey caught about 1 or fewer monkfish per tow.

The different duration needed to execute the surveys may not affect the survey utility (since monkfish don't appear to undertake extensive migrations). However, the protracted length of a survey may be inefficient for staffing and other reasons.

8. Survey cost effectiveness

As with the other cooperative survey, the Panel had difficulty judging the cost effectiveness of this survey. The presenters detailed some costs, but judging the benefits requires further analysis. The Panel believes that these data are well suited to be directly included into assessment analyses and therefore hold utility for management. The cost per station appears to be efficient compared to standard NEFSC surveys. This survey enhances current survey efforts in important ways. The additional depth strata included are clearly important since more of the habitat for monkfish is covered. Future studies should continue to emphasize encompassing the range of this species distribution. The Panel did not address the issue of future utility of this survey after the NEFSC surveys undergo significant gear and stratification changes in approximately 2008.

Conclusions

Both the Supplemental Finfish Survey and the Cooperative Monkfish Surveys used commercial gear which had much higher catch rates for most species of interest. Commercial gear also has the advantage of being familiar to Industry and a better chance of "buy-in". The Supplemental Finfish Survey differed significantly from the NMFS surveys in design which means that it might provide information that they cannot. On the other hand, this divergence would tend to make it more difficult to include the results. The monkfish survey was designed similar to the NMFS, but has the advantage of a more efficient net and slightly deeper strata. Although the incorporation of the Cooperative Monkfish Survey results into an assessment should be easier, their use has been limited to date.

Survey products seem to be available and reliable, the principal impediment to their endorsement is the demonstration of their utility, either in the provision of management advice or in the support of broader scientific studies.

Attachment 1

TERMS OF REFERENCE

FOR REVIEWS OF THE

COOPERATIVE MONKFISH SURVEY

AND THE

SUPPLEMENTAL FINFISH SURVEY TARGETING

MID-ATLANTIC MIGRATORY SPECIES

1. Review the survey design with respect to the project goals and objectives, highlighting any strengths, weaknesses, and potential biases. Evaluate the domain of inference (or sampled population) for the survey. Consider transect/station selection, survey area estimation, biomass estimation, and partitioning by size/age class and by species. Recommend any changes to the current survey design and timing given the results of the review.

2. Review the biological sampling aspects of the surveys, including accuracy of subsampling procedures and length/age structure sampling designs. Recommend modifications if necessary.

3. Review the data recording, error checking, archiving, and editing methods. Recommend changes, if necessary.

4. Review the survey operations conducted in each year and comment on the utility, appropriateness, and consistency of the methods used. Identify and evaluate any methods used to ensure comparability of survey observations across years and, if applicable, within years [especially if different nets/vessels have been used]. Provide recommendations on improvements to these methods.

5. Are there adequate descriptions of the approaches to experimental design, methods, and data analysis? Are these approaches appropriate? Are there other approaches that the participants should have considered or used? Are the results and conclusions well supported by the data and statistically valid? Review specific data and analyses from the survey and indicate how these measurably improve stock assessments for various species.

6. Evaluate measures of precision, and assess the gain in precision associated with the sampling design relative to simple random sampling and other designs.

7. Provide recommendations on the utility of the data in current and future biomass assessments and management. This includes the interoperability and comparability of the data with data from other fishery-independent surveys (*e.g.*, NMFS bottom trawl surveys, etc).

8 Is the survey cost effective relative to the information obtained. Could it be more cost-effective? If so, how? If the survey is not cost effective or provides only marginal information/data to that obtained from other surveys [or available from other sources], should the survey be done at all? Are there other survey or non-survey related data inadequacies where funding would be more appropriately invested to improve stock assessments?