

*U.S. DEPARTMENT OF COMMERCE  
Office of Inspector General*

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*NATIONAL OCEANIC AND  
ATMOSPHERIC ADMINISTRATION*

*Recent Gear Protocols Should Improve  
NMFS Groundfish Bottom Trawl Survey  
But More Should Be Done*

*Audit Report No. STD-15750-3-0001/September 2003*

**PUBLIC  
RELEASE**

*Office of Audits, Science & Technology Audits Division*



September 30, 2003

**MEMORANDUM FOR:** Dr. William T. Hogarth  
Assistant Administrator for Fisheries  
National Oceanic and Atmospheric Administration

**FROM:**

Johnnie E. Frazier

**SUBJECT:**

*Recent Gear Protocols Should Improve  
NMFS Groundfish Bottom Trawl Survey  
But More Should Be Done*

Final Audit Report No. STD-15750-3-0001

Attached is our final report on NOAA's management of its bottom trawl survey which is used to provide important measures of groundfish abundance to support NMFS stock assessments. We acknowledge that NOAA is taking steps to improve the management of this important program, but more should be done to strengthen the process used to address stakeholder complaints and concerns; identify, implement, and oversee protocols; and track the cost of these surveys to ensure decision-makers have accurate data to budget and plan for existing and new surveys. The executive summary begins on page i and the recommendations appear on pages 10, 21, and 24.

We appreciate the level of attention and careful consideration that you and your staff took to respond to our findings and recommendations. Steps discussed in your response to our draft report should provide a firm foundation for developing an audit action plan. As required by Department Administrative Order 213-5, please provide us with the audit action plan addressing all of the report recommendations within 60 days of this memorandum. Should you need to discuss the contents of this report or the audit action plan, please call me on (202) 482-4661, or Michael Sears, Assistant Inspector General for Auditing, on (202) 482-1934.

Attachment

cc: Ted David  
Acting Chief Financial Officer

William Broglie  
Chief Administrative Officer

Mack A. Cato  
Director, Audit, Internal Control, and Information Management Office

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## Appendix I

## EXECUTIVE SUMMARY

For nearly 30 years the National Marine Fisheries Service (NMFS) has had to balance two competing interests: promoting commercial and recreational fishing as vital elements of our national economy and preserving populations of fish and other marine life. The Magnuson-Stevens Act of 1976 gave NMFS primary federal responsibility for managing marine fisheries and established a regional fishery management system consisting of eight fishery management councils to work in partnership with NMFS. These councils are responsible for preparing fishery management plans intended to sustain the fishing population, in some cases by limiting the fishing effort, seasons, and gear, the number of fishermen allowed to catch a certain species, or the total amount of fish that can be caught. A 1996 amendment to the act added several key responsibilities including preventing and ending overfishing of currently depressed stocks, rebuilding depleted stocks, and reducing bycatch.

To fulfill its mission, NMFS created what it refers to as a "scientific enterprise" composed of six science centers and regional offices. Fisheries management requires high-quality data and well-supported predictions about the status and dynamics of fish populations. Much of the available information is collected and analyzed by NMFS in cooperation with state and interstate agencies. NMFS' Office of Science and Technology Policy and the Science Board (which is composed of the six Science Center directors) are charged with oversight of all of NMFS' scientific activities and with advocating a sound scientific basis for resource conservation and management decisions. The director of the Office of Science and Technology Policy is the agency senior scientist.

Stock assessment is the process of data collection, analysis, and reporting that provides information about the abundance and productivity of harvested fish populations. The National Research Council found that in many fisheries the best fish stock assessments include measures of relative fish abundance obtained from independent surveys of fish populations, in which the gear, timing, survey design and procedures are kept constant from year to year. Stock assessments also include information about commercial and recreational fish catch and mortality rates caused by fishing gear. NMFS' independent surveys are conducted by sampling fish stocks, using fishing gear and research platforms on NOAA or commercial fishing vessels.

Stock assessments have become a key element of the fishery management process. They are used to determine whether there is a need to rebuild fish stocks by instituting additional regulations or whether greater fishing opportunities can be allowed. Because the livelihoods of the nation's fishing communities are often at stake, fish stock assessments are often controversial and the methods used to create the estimates often undergo intense scrutiny. This controversy is evident at NMFS' Northeast Fishery Science Center (NEFSC). The National Research Council has reported that fishermen located in that region have raised concerns about the center's operation of its bottom trawl survey. For example, fishermen have complained that the gear used to conduct the

survey is outdated and the resulting catch does not adequately reflect the actual fish population. Improving communication and outreach with its stakeholder communities, like commercial fishermen, remains a NMFS' priority.

A recent controversy at the NEFSC started as a result of such a concern raised by a local fisherman. On September 3, 2002, based on a longstanding concern raised by the fisherman, the center inspected the trawl cables on the NOAA Research Vessel (RV) *Albatross IV* and found that the cable attaching the net to the vessel was inaccurately marked, which caused the length intervals the crew used to determine how much cable to deploy to be uneven—a difference of about 6 1/2 feet on an average survey. The different lengths of cable deployed on either side of the net increased the risk that the net operated improperly. The mis-marked cable was installed in February 2000 and used in eight bottom trawl surveys, beginning in the winter of 2000 and ending in spring 2002. After detecting the problem, the center reported the issue and the potential implications to the survey data on September 11, 2002, during a regional New England Fisheries Management Council meeting.

### **OIG Audit**

On October 25, 2002, our office received a letter from Senators Olympia Snowe, Edward Kennedy, and Jack Reed concerning NMFS' use of uneven cables to tow the trawling net used by NMFS Northeast Fisheries Science Center to conduct its independent survey of groundfish. We were asked to review various aspects of how the problem occurred; how fish survey gear is calibrated, operated, inspected, and maintained; and the cost of the gear program.

The NEFSC groundfish stock assessments, which have been conducted since 1963, provide the basis for groundfish fishing regulations that impact livelihood of a longstanding community of New England fishermen. Thus, when it came to light that the center's assessments were based on data developed using uneven cable lengths on its trawling nets, stakeholder communities were extremely concerned because of pending implementation of more stringent groundfish regulations based on stock assessments that used the potentially flawed data. Their concerns increased when it came to light that the center did not have a protocol for calibrating the cable and that the fisherman had been warning the center about the potential problem for over 2 years.

Prior to and during the course of our review, NOAA took several important steps to address Congressional, Departmental, and other stakeholder concerns. Five days after the announcement of the cable problem, the NOAA administrator required all NOAA vessels to cease operations and ensure that trawl cables were appropriately calibrated. Because the Northeast Fisheries Science Center did not have protocols for calibrating its trawl cable and since there were no existing NMFS-wide protocols, he gave NMFS 90 days to draft protocols for all of its bottom trawl surveys and an additional 90 days to have the protocols peer reviewed. NMFS completed this process on March 16, 2003. The protocols issued consisted of two sets: a broad set to be implemented "NOAA-wide" and

a more specific, detailed set (following the broad guidelines) developed by the four science centers conducting similar bottom trawl surveys. NMFS also agreed to complete protocols for the other independent surveys conducted by its science centers.

In addition to the revisions to the protocols, the NEFSC also conducted 10 different statistical analyses to detect evidence of any influence on survey data that could be attributed to the gear problems, held workshops to discuss the implications of the gear problem, and conducted other tests to assess the operation of the net when towed with the uneven cable. The center also used outside peer reviewers to assess their analysis, test data, and other data provided by stakeholder groups. Two different peer reviews concluded that the trawl cable problem did not have a significant impact on the actual survey catch data for 2000 and 2001, and that the data was suitable for use in the groundfish stock assessments used by the Fishery Management Council to develop groundfish regulations.

OMB Circular A-123, *Management Accountability and Control*, requires federal agencies to develop management controls—policies and procedures—to ensure that programs achieve their intended results. Based on further discussion with Senate staffers, we focused our review on assessing whether (1) sufficient policies and procedures are in place to effectively capture, identify and, as appropriate, address concerns raised by outside parties; (2) sufficient protocols are available to calibrate, operate, inspect, and maintain bottom-trawl survey gear; and (3) procedures are in place to ensure management information is available to assess the cost of gear calibration, operation, inspection, and maintenance activities.

**NMFS does not have a policy and related procedures for handling concerns raised by outside stakeholders.** NEFSC staff had no procedure for officially handling concerns raised by stakeholders such as the fisherman. As a result, staff that knew about the concern either did not take it as a serious concern, or were not in a position to do something about it. The Acting Center Director and other managers stated that they did not know about the concern until two years after it was raised. As a result, what turned out to be a legitimate concern went unanswered for more than 2 years. NMFS, in both its Strategic Plan for Scientific Research and its Stock Assessment Improvement Plan, has committed to improving its programs, in part by implementing recommendations made by the National Research Council in a series of reports on NMFS produced from 1998 to 2000,<sup>1</sup> which included obtaining input from commercial fishermen about gear operations.

While we are aware that not every concern raised by outside stakeholders will warrant action, having a process for collecting and assessing these concerns is an important management control that would provide a mechanism for ensuring that managers are aware of potential problems and can take sufficient action. NMFS' assistant

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<sup>1</sup>National Research Council. *Review of Northeast Fishery Stock Assessments, 1998; and Improving the Collection, Management, and Use of Marine Fisheries Data, 2000*. Washington, DC: National Academy of Press.

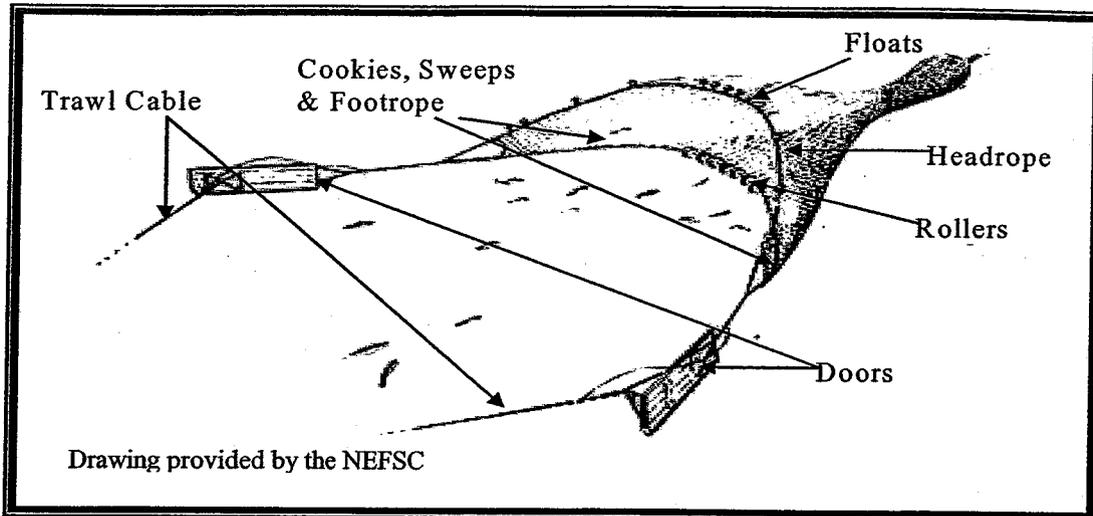
administrator told us during a discussion about our report findings that he is exploring using an automated system to collect concerns raised by outside stakeholders. We believe that a formal policy specifying the methods for addressing concerns or complaints as well as a system for receiving and reviewing them would be an effective start toward making sure concerns are addressed in a timely fashion. (See p. 8.)

**NMFS, in its new set of protocols, needs to include additional policies and procedures for calibrating, operating, inspecting, and maintaining survey gear.**

We assessed the new NOAA-wide and NEFSC-specific protocols to determine whether they sufficiently address calibrating, operating, inspecting, and maintaining bottom trawl survey gear and found several areas for improvement. Where peer reviewers commented on protocols, either for specific centers or NOAA-wide, we used some of their comments as well. (See p. 11.)

- **Protocols for calibrating trawl cables were improved, but additional calibration issues remain.** Calibration, an important part of scientific programs, helps ensure the accurate and consistent operation of equipment to achieve high-quality research results. We found that the NOAA-wide protocols placed a great deal of emphasis on calibration procedures for trawl cables, but did not discuss calibration of other equipment or of new or altered equipment. We also found that the Northeast Center-specific protocols could better reflect the NOAA-wide protocol by more clearly defining how to calibrate and use the back-up trawl measurement system.

NMFS also uses the term calibration to refer to the process of using old gear simultaneously with changed or new gear for a set period to establish the conversion factor needed to use the historical data. This type of calibration is particularly important because even minor alterations to the gear that change the catch rate could falsely indicate increases and decreases in the relative abundance of fish stocks. We found that the center had previously calibrated some gear-related changes (including using a different research vessel), but had made other changes to the gear that they believed were not significant and did not calibrate them. Without some type of policy defining the kinds of changes that require calibration, the validity of the center's decision and the quality of the resulting data collected could be questioned. The NOAA-wide protocols should define the types of changes that require calibration and the science centers need to create and document calibration procedures for these types of changes. (See p. 12)



### Bottom Trawl Net

- **Stakeholders' concerns about vessel operations should be more completely addressed in the protocols.** To address stakeholders' concerns about the operation of survey equipment after the problem with the mis-measured trawl cable, the center invited six fishermen to participate in a survey cruise to assess gear performance. NMFS' goal for the trawl gear is to ensure it is operated in a consistent manner, in keeping with the highest quality standards, to provide for data accuracy and consistency from one survey to the next. Of the major concerns the fishermen reported after completing their evaluations, we selected seven of the most frequently discussed observations for comparison to the protocols to see if the protocols adequately addressed the problem. We found that the first three, which involved improperly configured and operated gear, were addressed, but additional clarification was needed; the fourth, which involved the need for a policy and procedures for calibrating changes to the net (as discussed earlier) needs to be addressed; the fifth, which involved a snarled net, was adequately addressed.

The last two observations, which involved tow speed and a net design that fishermen believe caused the net to work inefficiently, were addressed by the protocol. NEFSC stated that these features were part of the original survey design and, for the sake of maintaining consistency, will not be changed. The NRC, during its review of NMFS stock assessment program, also recognized the need for standardizing gear over time to maintain consistent measures of abundance. However, the NRC also responded to stakeholders' complaints about the use of outdated and inefficient gear by outlining the criteria that NMFS should use to assess its gear. According to the NRC, when survey gear is outdated, exhibits unstable performance, or is hard to set up correctly, efforts should be directed toward improving the gear and providing some level of cross-calibration so the value of historic data is maintained. The report further stated that gear performance and operating procedures in all surveys should be evaluated on a regular basis. However, neither the center-specific nor the NOAA-wide protocols

discuss procedures for periodically evaluating gear performance or operating procedures. We believe NMFS needs to develop such a policy as part of the overall protocols issued to the science centers. Requiring periodic evaluation and specific criteria for upgrading equipment as part of its policy will make it clear to all who participate in and assess the operations exactly when and how gear improvements will be made. (see p. 14)

- **A better warehouse management system is needed to ensure that inspection, maintenance, and inventory records are complete and accurate.** As part of our audit, we inspected the warehouse where the nets and other gear are stored, maintained, inspected, and repaired. We tested the completeness and accuracy of the center inspection, maintenance, and inventory system by reviewing the appropriate records for the bottom trawl survey nets. We found that the inventory listing used by staff working at the warehouse and another one maintained at the center were not in agreement. For example, neither listing had the correct data regarding available inventory or status of the nets. During our review, we were told that NMFS has a warehouse in Seattle, Washington, that uses an automated system to help manage its gear inventory. If that system is shown to be effective, the operation of the Seattle warehouse could serve as a useful model for other science centers such as the NEFSC. NMFS needs to ensure science centers have accurate inventory management systems that track the availability and use of construction materials, nets, and other gear. Also, although the center's new protocols address maintenance and construction of nets, the inspection procedures need to be more specific. (see p. 18)
- **NMFS should take specific measures to better ensure protocol recommendations are followed.** While NMFS has taken strides to address the need for bottom trawl survey protocols, more work on protocols needs to be done. For example, NMFS is in the process of completing protocols for its other surveys and has identified the need for a survey standardization working group to coordinate the development of national and regional standards. At the completion of our audit work, there had been no directions to convene such a group, although a staff member responsible for coordinating the protocols stated that a memorandum providing this type of direction was forthcoming. In its response to our draft report, NOAA informed us that directions were received from NMFS' headquarters to initiate the survey standardization working group in August 2003. As NMFS' headquarters continues to implement the protocols, responsibilities and authorities for completing them and related initiatives need to be formally delegated to a specific office or organization to ensure accountability for coordination and oversight of these programs.

The NEFSC also will be updating its gear and bottom trawl survey upon receipt of a new survey vessel in schedule in the fiscal year 2006/2007 timeframe. The center plans to use a new trawl survey advisory committee set up by the Mid-Atlantic and New England Fisheries Management Councils to help plan for the new gear and bottom trawl survey design. However, a formal charter describing the purpose, roles, and responsibilities of the committee has

not been established. Such a charter will provide participating stakeholders with a clear understanding of their role and how their input will be used. (see p. 20)

**More steps should be taken to ensure that the cost of gear-related activities are understood.** Scientific surveys are a vital component of the stock assessment process and form an ongoing operational program for NMFS science centers. As such, decision-makers and agency managers need to know the cost of purchasing, operating, inspecting, and maintaining the gear and other equipment used to conduct this program. However, we found that the center did not track the actual cost of survey gear-related activities for the two fiscal years, 2001 and 2002, that we reviewed. Center managers explained at our exit conference that typically funding for gear-related expenditures has come from end-of-year funds that have not been tracked as survey costs. While these managers can estimate the cost of the surveys, we believe tracking actual expenditures provides a more accurate assessment of the cost of the surveys that can be used for future planning. As part of the fiscal year 2003 budget, NMFS received a new \$14.9 million allocation to modernize and expand stock assessments.

Given that NMFS plans to modernize and expand its stock assessment program, it should ensure that the science centers keep adequate records and track expenditures for the major cost categories related to the independent surveys. Decisions to create new surveys or expand existing ones would be enhanced by having detailed information about the cost of the surveys. Without such information, NMFS risks not having enough funding to support critical survey procedures, such as calibration and maintenance, needed to ensure the consistent quality of the surveys required for accurate measures of relative fish abundance. (See p. 24.)



In response to the draft report, NOAA agreed with 15 of our 18 recommendations. NOAA's response to the other three recommendations varied: in one case, regarding exploring the use of the Seattle warehouse system as a model for other science centers, NOAA stated that it partially concurred, and we believe that its response has met the intent of our recommendation. In the other two cases, regarding designating responsibility for creating and overseeing survey protocols to an appropriate office at headquarters and identifying and tracking gear-related survey costs, NOAA did not indicate whether or not it concurred. We address all of the responses to our recommendations in the appropriate sections of the report. NOAA also made a number of comments that we summarized and addressed at the end of this report, some of which updated information provided during our audit, others of which resulted in our adding further clarification or additional details to the report. NOAA's complete response to our draft report is included as Appendix I.

## INTRODUCTION

The Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) is mandated by a variety of federal statutes to manage, conserve, and protect the nation's living marine resources. The Magnuson Fishery Conservation and Management Act of 1976 was passed principally to address heavy foreign fishing, promote the development of a domestic fishing fleet, and link the fishing community more directly to the fishery management process. The Magnuson-Stevens Act of 1976 gave NMFS primary federal responsibility for managing marine fisheries and established a regional fishery management system to help the agency carry out its mission. A 1996 amendment to the act strengthened NMFS' role in protecting and sustaining fisheries by adding several key responsibilities including preventing and ending overfishing of currently depressed stocks, rebuilding depleted stocks, and reducing bycatch.<sup>1</sup>

NOAA's National Marine Fisheries Service (NMFS) is charged with rebuilding and maintaining sustainable fisheries. NMFS' six science centers conduct the scientific research and fish stock assessments, which involve data collection, analysis, and modeling, to provide information about the abundance, productivity, and harvesting of fish populations. Stock assessments are conducted using several sources of data, including commercial and recreational catch data and independent surveys of fish stocks conducted by the science centers.

NMFS' strategy for ensuring high-quality research and improved stock assessments is detailed in its Strategic Plan for Fisheries Research and National Stock Assessment Improvement Plan. During the years these plans have been in force, NMFS' stated intentions have been to implement recommendations made by the National Research Council<sup>2</sup> to improve stock assessments, data collection, and analysis techniques; involve constituents in research programs; and implement policies to ensure that science programs, analyses, and products are sound, credible, and provide an objective basis for management. NMFS' senior scientist, who is also director of the NMFS headquarters' Office of Science and Technology, and the Science Board (which is composed of the six Science Center directors) are responsible for ensuring the integrity and quality of scientific research by developing science policy for the agency.

The Magnuson Act also created eight regional fishery management councils to work in partnership with NMFS. These councils are responsible for preparing fishery management plans intended to sustain the fishing population, in some cases by limiting

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<sup>1</sup> Bycatch is defined as fish and/or other marine life that are incidentally caught with the targeted species. Most of the time bycatch is discarded at sea.

<sup>2</sup> National Research Council. 1998. *Review of Northeast Fishery Stock Assessments*; and 2000, *Improving the Collection, Management, and Use of Marine Fisheries Data*. Washington, DC: National Academy Press.

the fishing effort, seasons, and gear, the number of fishermen allowed to catch a certain species, or the total amount of fish that can be caught.

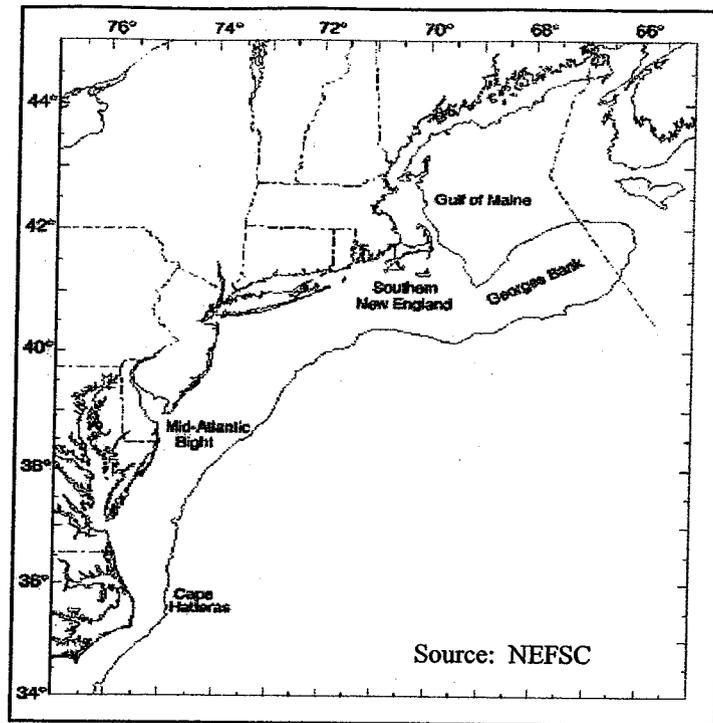
### **Managing Groundfish in the Northeast**

For more than 400 years, the fishing industry off the northeastern U.S. coast has been identified both culturally and economically with harvesting groundfish (fish that swim in close proximity to the bottom of the ocean). The major stocks tracked by NMFS in that region are a mixture of 20 bottom-dwelling species; the principals include cod, haddock, and flounder. Over the years groundfish populations have been severely depleted. The New England Fishery Management Council, using information about fish populations provided by NMFS' Northeast Fisheries Science Center (NEFSC) located in Woods Hole, Massachusetts, is making major modifications, contained within Amendment 13, to the groundfish fishery management plan (FMP). Revisions under Amendment 13 are comprehensive: some seek to end overfishing, others to establish rebuilding plans for some stocks, and still others to reduce bycatch. These modifications are expected to have a significant and negative economic impact on commercial fishermen. The new fishery management plans are required to be in place by May 2004, and the primary source of data used to craft the FMPs is stock assessment data provided by NEFSC.

### **The Northeast Fisheries Science Center Bottom Trawl Survey Program**

The NEFSC bottom trawl survey program began in the autumn of 1963 and required a survey each subsequent fall. In 1968 a spring survey was added. According to the NEFSC, these surveys represent the longest continuous series of research vessel samplings in the world. Since the NEFSC bottom trawl survey program's inception, there have been no significant changes to its objectives, which are to (1) monitor fluctuations in the structure and size of fish populations; (2) assess the production potential of Atlantic coastal waters; (3) determine environmental factors controlling fish distribution and abundance; and (4) provide basic ecological data on fish species (for example, growth rates and food resources) necessary to understand the interrelationships between fish and their environment.

Responsibility for conducting these independent surveys is shared between NEFSC and NOAA's Marine and Aviation Operations (NMAO) staff. Center scientists within the Ecosystems Surveys Branch are responsible for research gear-related activities and for collecting fishery data onboard research vessels maintained and operated by NMAO personnel. Currently the survey is conducted using the NOAA research vessel *Albatross IV*, with the *Delaware II* as a back-up. The area surveyed by NEFSC encompasses approximately 94,474 square nautical miles and extends from Cape Hatteras, NC, to the western Nova Scotia shelf.



**Cape Hatteras, NC to western Nova Scotia Shelf  
Area covered by NEFSC's bottom trawl survey**

During each survey, approximately 300 half-hour tows are conducted at randomly chosen locations. The objective is to catch a representative sample of various species in a given area, as opposed to simply catching large numbers of fish. The distribution of trawl locations is established using statistical methodology. The accumulated trawl survey data set represents 20,000 stations and includes millions of individual pieces of information about resources of the region. The entire data series is available to fishery scientists who use it to examine trends in abundance and distribution, and to answer numerous scientific questions. According to NMFS protocols, because this is a scientific sample, survey design, gear, timing, and procedures must be carefully controlled and managed to ensure consistency from one survey to the next.

On September 3, 2002, NEFSC and NMAO staff inspected the trawl cables on the *Albatross IV* and found that the cable attaching the net to the vessel was inaccurately marked. Because these inaccurate length intervals were used by the research vessel crew to determine how much cable to deploy, the result was that different lengths of cable were deployed on either side of the net, which increased the risk of the net operating improperly. The center estimated that at an average length of 300 meters the difference was about 2 meters (about 6 1/2 feet). According to the NEFSC and NMAO staffs, the mis-marked cable was installed in February 2000 and used in eight bottom trawl surveys, beginning with the winter of 2000 and ending the spring of 2002. Although NMAO staff were responsible for obtaining the cable and overseeing the contractor who measured and

marked the cable, NMFS as the manager of the survey took overall responsibility for the cable problem.

When the center reported that the trawl cable lengths were uneven, stakeholder communities were extremely concerned because the pending implementation of Amendment 13 was strongly influenced by NEFSC data. Stakeholders concerns further increased when it came to light that the center did not have a protocol for calibrating the cable and that a fisherman had warned the center about the potential problem more than 2 years earlier.

The center's discovery of the trawl cable problem sparked a flurry of activity to both assess the quality of the survey data collected with the mismarked cable and to create protocols to ensure that the problems with the gear would not recur. Table 1 contains a timeline of these events. To address the stakeholders concerns, on September 16, 2002, the NOAA administrator immediately required that all NOAA vessels cease operations and ensure that trawl cables were appropriately calibrated. He gave NMFS 90 days to draft protocols for all of its bottom trawl surveys and an additional 90 days to have the protocols peer reviewed. NMFS completed this process on March 16, 2003.

To further address the issue, on September 24, 2002, six fishermen were invited by NEFSC staff to accompany them on a trawl observation cruise to assess gear performance under cable offset conditions. We discuss some of the fishermen's observations about survey gear and operations on that cruise starting on page 14 of this report. The NEFSC also conducted a side-by-side comparison cruise with the *Sea Breeze*, a commercial fishing vessel, and the *Albatross IV*.

In addition to revising the protocols, the NEFSC—along with fishery scientists from Canada, the state of Massachusetts, and from the Center for Independent Experts—studied the impact of the cable offset. The scientists conducted 10 different statistical analyses to detect evidence of any influence on survey data that could be attributed to the gear problem. They also conducted analyses to determine how much assessment advice would change if survey catches for the years in question were larger. These tests resulted in almost no change in management advice for groundfish. After evaluating the results of these analyses, the group unanimously endorsed using the actual survey catch data for 2000 and 2001 in providing advice to managers. CIE scientists from England, Scotland, and Canada conducted further evaluations in February 2003 using data from the side-by-side comparison and other sources. Again, the experts concluded that the survey data should be used for stock assessments.

The center is scheduled to get a new survey vessel in the fiscal year 2006/2007 timeframe and plans to update its gear and survey design as part of the transition process. The center also plans to use a trawl advisory committee established by the Mid-Atlantic and New England Fishery Management Councils to help update the protocols and develop the new gear and survey design.

**Table 1: Timeline of NOAA Actions In Response to Trawl Problem**

<b>2000</b>	
<b>February</b>	Fisherman observes trawl cable marking and installation and raises concerns about the method used to mark the trawl cable.
<b>2002</b>	
<b>February</b>	Acting Science and Research Director was informed by staff about the trawl cable concern. The Director requested that NMAO staff check the cable. NMAO measured first 100 meters of cable on <i>RV Albatross IV</i> and finds little deviation.
<b>September 3</b>	Trawl cables are re-measured on <i>RV Albatross IV</i> .
<b>September 11</b>	Northeast Fisheries Science Center (NEFSC) reports mis-marked trawl wires on <i>RV Albatross IV</i> .
<b>September 16</b>	NOAA Administrator orders National Marine Fisheries Service (NMFS) to study trawl problem and implement protocols.
<b>September 17</b>	Trawl cables on <i>RV Delaware</i> are measured.
<b>September 24</b>	<i>RV Albatross IV</i> conducts bottom trawl survey and tests trawl gear with six industry fishermen on board.
<b>October 2-3</b>	NEFSC convenes workshop to study the effects of cable offsets on trawl performance.
<b>October 8-11</b>	Groundfish Assessment Review Meeting (GARM) held in Woods Hole, MA, with Center for Independent Experts (CIE) peer reviewers.
<b>October 25</b>	NOAA news release states that survey data is not impacted by mis-marked trawl wires. GARM report released.
<b>October 28- November 6</b>	<i>RV Albatross IV</i> conducts side-by-side comparison cruise with <i>Sea Breeze</i> fishing vessel to collect additional data on impact of trawl and other gear problems.
<b>November 13-15</b>	NOAA-wide Trawl Survey Standardization Workshop to establish procedures for creating bottom trawl survey protocols is held at the Alaska Fisheries Science Center.
<b>December 5</b>	Results from side-by-side cruise with <i>Sea Breeze</i> are released.
<b>2003</b>	
<b>January 14-15</b>	Trawl Workshop on the <i>Sea Breeze</i> side-by-side cruise is conducted with stakeholder groups.
<b>February 3-8</b>	Science experts assemble for groundfish meeting to assess quality of survey data for use in stock assessments and find the data—unadjusted—is sufficient.
<b>February 7</b>	Peer reviewers complete review of <i>NOAA Protocols For Groundfish Bottom Trawl Surveys Of The Nation's Fishery Resources</i> .
<b>March 16</b>	<i>NOAA Protocols For Groundfish Bottom Trawl Surveys Of The Nation's Fishery Resources</i> are issued.
<b>May 2003</b>	Mid-Atlantic Fishery Management Council announces creation of the Trawl Survey Advisory Committee.

## OBJECTIVES, SCOPE, AND METHODOLOGY

On October 25, 2002, our office received a letter from Senators Olympia Snowe, Edward Kennedy, and Jack Reed concerning the National Marine Fisheries Service's problems with bottom trawl equipment. We were asked to review various aspects of how the problem occurred, how fish survey gear is calibrated, operated, inspected, and maintained, and the cost of the gear program.

From December 2002 through May 2003, we conducted a performance audit to address concerns raised about the fishing gear used to sample groundfish populations off the northeastern U.S. coast. After meeting with Congressional staffers on January 7, 2003, reviewing pertinent criteria, and assessing NMFS ongoing activities, we focused our review on assessing whether (1) sufficient policies and procedures are in place to effectively capture, identify and, as appropriate, address concerns raised by outside parties; (2) sufficient protocols are available to calibrate, operate, inspect, and maintain bottom-trawl survey gear; and (3) procedures are in place to ensure management information is available to assess the cost of gear calibration, operation, inspection, and maintenance activities.

To become familiar with the management controls in place during the trawl cable incident, we analyzed both old and revised protocols, peer review comments on those protocols, and other pertinent bottom trawl survey documentation. We also reviewed protocols used in other stock assessment programs conducted by NMFS' science centers, state organizations, and international groups. We interviewed senior management at NOAA headquarters; current and retired NMFS personnel at NEFSC, and NOAA Marine and Aviation Operations (NMAO) personnel responsible for operating the research vessels *Albatross IV* and *Delaware II* about the gear and bottom trawl surveys. We also toured both the *Albatross IV* and *Delaware II* to view the various gear components; and we visited the warehouse facility located in Pocasset, Massachusetts (14 miles north of Woods Hole) where the nets and other gear are stored, maintained, inspected, and repaired.

To better understand their concerns about NEFSC's bottom trawl survey program, we spoke with commercial fishermen and members of the New England Fisheries Management Council. We also reviewed several NEFSC workshop documents on both the bottom trawl survey and the impact of the mis-marked cables on fish population data, the fishermen's comments from the observational cruise on the *Albatross IV*, and several National Research Council reports that made recommendations to NMFS for improving stock assessments and data collection activities. We also reviewed NMFS' Strategic Plan for Fisheries Research (December 2001) and its Stock Assessment Improvement Plan (October 2001).

To identify the costs associated with conducting the bottom trawl surveys, we examined financial data provided by NMFS personnel and interviewed administrative personnel at

NEFSC responsible for managing the center's allocation and the Ecosystems Survey Branch Chief responsible for managing the bottom trawl surveys.

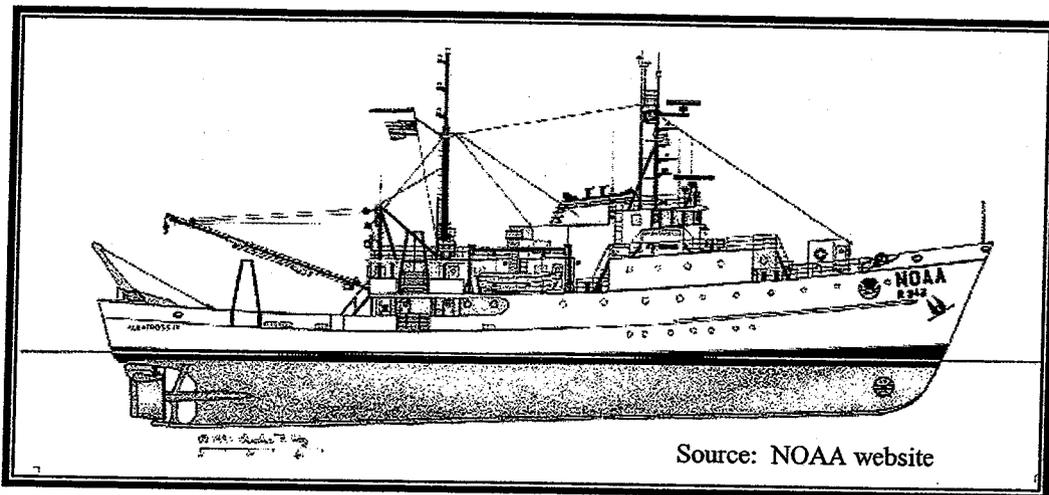
We reviewed applicable laws and regulations including the 1976 Magnuson-Stevens Fisheries and Conservation Act and the 1996 Sustainable Fisheries Act (SFA). We interviewed NOAA and New England Fishery Management Council personnel about the status of plans to implement new requirements promulgated under the SFA and were informed that new fishery management plans are required to be in place by May 2004.

Finally, we did not assess the quality of the survey data because such a step was not included as part of our audit objectives. We also did not assess the reliability of computer-generated data because such data was not material to our audit objective. This audit was conducted in accordance with Government Auditing Standards issued by the Comptroller General of the United States and performed under the authority of the Inspector General Act of 1978, as amended, and Departmental Organization Order 10-13, dated May 22, 1980, as amended.

## FINDINGS AND RECOMMENDATIONS

### I. A Formal Process for Addressing Stakeholder Concerns Would Help the Center Respond in a Timely Manner

A concerned fisherman informed us that in February 2000 he was docked next to NOAA's *RV Albatross IV* and watched as a contractor measured, marked, and installed trawl cables onto the vessel. The cable is used to deploy and haul back the survey trawl net, and each mark on the cable indicates 50-meters. The fisherman was concerned with the fact that the cables had been measured and marked one at a time instead of simultaneously, and believed that this method could cause the cable to be marked unevenly.



Source: NOAA website

*NOAA Ship Research Vessel Albatross IV*

#### A. Cable-related concern went unaddressed for two years

During our audit, the fisherman told us he had verbally expressed his concerns to several NEFSC staff from the time the cable was installed in 2000 until September 2002, when the cables were finally removed and re-measured, and he stated that he had at one point even offered NEFSC the money to have the cables checked.<sup>3</sup> When we tried to corroborate his story, center staff with one exception, either could not recall having such a conversation with the fisherman or reported thinking that the conversations about the cable were simply discussions rather than a concern that required management's attention. The exception was one staff person who reported his conversation with the fisherman in May 2001 to the manager of the NEFSC Ecosystems Survey Branch, which is responsible for gear-related activities. The manager retired 4 weeks later and we were unable to find evidence that he addressed the concern.

<sup>3</sup> The fisherman told us that he had never put his concerns in writing.

The Acting Director indicated that he was not made aware of the problem until February 2002, almost 2 years after the cables were installed, at which time he directed NMAO staff to measure the first 100 meters of cable. The staff found that the marks on the trawl cable were only off by 1 inch and, therefore, did not believe there was a problem. Nevertheless, the center agreed that the cable needed to be removed and re-measured; staff told us that they scheduled this effort in coordination with the fisherman who had made the initial concern to make sure that he would be present. The re-measuring was done on September 3, 2002, by a contractor who found that the cables had indeed been mis-marked when originally installed, thus validating the fisherman's concern.

The NEFSC determined that the cable was off by approximately 2 meters (about 6 1/2 feet) at cable lengths of 300 meters and up to about 3 meters (close to 10 feet) at longer cable lengths. Of all the tows made in the surveys, 75 percent deployed 300 meters of cable or less. This cable offset concerned both the NEFSC and the fishing community because of the potential impact the mis-marked cables could have had on the survey data and stock assessments. After meeting with stakeholder groups and conducting an observational cruise to assess the impact of the cable offset, the center conducted a series of data exploration studies for evidence of changes in trawl survey efficiency associated with trawl misalignment. These studies tested the sensitivity of the stock assessments to changes in the catch data.

After reviewing the results of the studies, observational cruise data, and survey trend data, a regional peer review process—with participants from Canadian Department of Fisheries and Oceans, Massachusetts Division of Marine Fisheries, the Center for Independent Experts (CIE),<sup>4</sup> New England Fisheries Management Council, and the NEFSC—concluded in October 2002, that there was no indication of systematic reduced survey catch based on the trawl warp offsets. A second peer review process using CIE scientists from England, Scotland, and Canada was held in February 2003 to consider the results of the regional peer review meetings and data from subsequent experimental trawl comparisons as well as other pertinent information. After reviewing the data in a series of public and private meetings, the scientists supported the conclusion that there is no detectable systematic reduction in trawl survey catch based on the trawl warp offsets. Nevertheless, because NMFS did not address the gear-related concern in a timely manner, the unfavorable media coverage about the incident has damaged NMFS' credibility within the fishing industry, increased the industry's distrust of survey results, and required NMFS to divert resources from other projects.

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<sup>4</sup> NOAA Fisheries formalized the process of independent peer reviews by developing a Center for Independent Experts (CIE) in 1998. The CIE is operated from the Cooperative Institute for Marine and Atmospheric Science (CIMAS) at the University of Miami where it develops a database of qualified scientists who can be called upon to review specific assignments. NMFS provides the funding and crafts the terms of reference for the peer reviews and the CIE selects the reviewers.

NMFS does not have an agency policy for handling complaints or concerns raised by outside stakeholders. Without a policy, center staff had no procedure for officially handling such issues. Thus, the fisherman's concern went unanswered for more than 2 years and, once the concern was eventually validated, NMFS spent months addressing the subsequent fallout. NMFS, in both its Strategic Plan for Scientific Research and its Stock Assessment Improvement Plan, has committed to improving its programs, in part by implementing recommendations made by the National Research Council in a series of reports produced from 1998 to 2000,<sup>5</sup> which included obtaining input from commercial fishermen about gear operations. While we are aware that not every concern raised by outside stakeholders will warrant action, having a process for collecting and assessing these concerns is an important mechanism for ensuring that managers are aware of potential problems and can take sufficient action.

NMFS Assistant Administrator recently stated that he is in the process of collecting and addressing concerns raised by constituents, and will be exploring the use of an automated system to collect such information. While the NMFS senior scientist and science board are responsible for ensuring scientific integrity, during our review we learned of a newly formed NOAA headquarters organization, the Office of Constituent Services, established in October 2002, that we believed could be helpful in establishing an agency policy. This office provides liaison, communications, and outreach between NMFS and external stakeholder groups. Because the mission of this office involves liaison, communication, and outreach, we believe that it could be instrumental in helping devise a strategy for tracking and handling stakeholder concerns. The director was open to our idea and indicated that the office could work with the centers to create such a process. Strategies discussed included setting up a hotline whereby concerns would be referred to an expert at headquarters or to an appropriate field office.

## B. Recommendations

The assistant administrator for fisheries should:

- direct NMFS' Senior Scientist and Science Board to work with the Office of Constituent Affairs to develop a policy specifying the methods for accumulating, reviewing, and addressing concerns and complaints in a timely fashion, and
- communicate the policy to stakeholder groups as part of NMFS' continuing efforts to foster an open dialogue.

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<sup>5</sup>National Research Council. *Review of Northeast Fishery Stock Assessments, 1998; and Improving the Collection, Management, and Use of Marine Fisheries Data, 2000*. Washington, DC: National Academy of Press.

### C. NOAA's Response to Recommendations

NOAA concurs with these recommendations and stated that it plans to develop the policy by 2004 and when approved, communicate the policy to stakeholder groups. These actions are responsive to our recommendations.

## II. Recent Protocols Should Include Additional Steps for Calibrating, Operating, Inspecting, and Maintaining Gear

At the request of the NOAA administrator, a working group composed of staff from the NMFS science centers, headquarters, and NMAO developed standardized protocols<sup>6</sup> for the bottom trawl surveys. The objective of the effort was

to ensure that all aspects of preparation for trawl surveys and trawl survey procedures are consistent and in keeping with the highest quality standards to provide for data accuracy and consistency from one survey to the next.

The NOAA-wide and center specific bottom trawl survey protocols were peer reviewed<sup>7</sup> and issued on March 16, 2003. They are organized under four major themes—length measurement of trawl cables, autotrawl (computerized) systems, operations, and trawl construction and repair. The NOAA-wide protocol is addressed in general terms, and because of the diversity among NOAA bottom trawl surveys, the four science centers using similar bottom trawl nets have their own specific protocols. The responsibility for developing and updating the protocols was delegated to the director of each center.

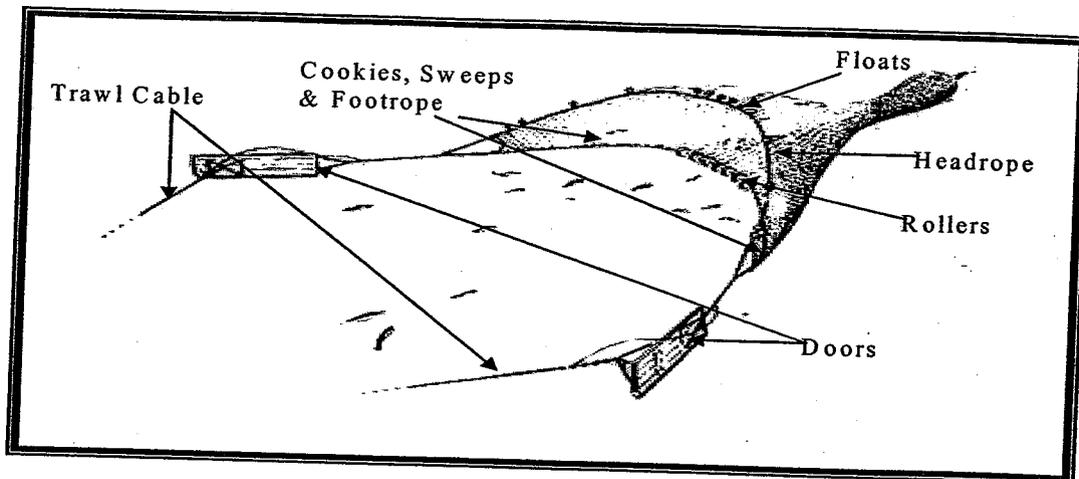
There were six peer reviewers: two captains of commercial fishing vessels, one scientist from the University of Washington, one scientist from New South Wales Fisheries in Australia, and two other scientists hired by CIE. No summary report of reviewer comments was made; instead, each reviewer provided specific recommendations for improving the protocols. Recommendations ranged from the importance of using trawl instrumentation to assess operations, to the need for continuing improvements and leadership.

Using data from observations made by the fishermen on the experimental cruise and, where applicable, the peer review, we assessed the completeness of the overall NOAA protocols and the specific NEFSC protocols. Where peer reviewers comments are included, they were typically directed at more than one science center. Our findings are discussed below.

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<sup>6</sup> NOAA *Protocols for Groundfish Bottom Trawl Surveys of the Nation's Fishery Resources*, March 16, 2003.

<sup>7</sup>A total of six peer reviewers from the fishing industry and U.S. and international academic and research organizations were selected.



**Bottom Trawl Net**

Drawing provided by the NEFSC

**A. Protocols for calibrating trawl cables have improved; additional calibration issues are still to be addressed.**

Calibration involves comparing an instrument's measurements to a known standard. It is an important part of scientific programs because it helps ensure the accurate operation of equipment to achieve high-quality research results. NMFS also uses the term *calibration* to refer to the process of comparing the performance of old gear to new or changed gear. For example, the old gear and the new gear are used simultaneously for a set period of time to establish the conversion factor needed to compare differences in catchability so that new catch data can be accurately compared to historical data.

- **NOAA protocols should address the need for calibration of all survey equipment.** Existing and new problems with the trawl cables created a focus on developing calibration procedures for them, but there has been little emphasis on calibrating other equipment. For example, the new NOAA-wide protocols discuss how to calibrate the cables by simultaneously measuring and marking them with a known standard (a wire that measures 50 meters) to ensure that markings are accurate. The protocols also discuss the need to use a back up or redundant real-time measuring system to double check that markings are correct. There is, however, no protocol that requires the science centers to identify and develop calibration procedures for other equipment such as the floats.

We believe calibration is important and that the protocols would be improved by requiring science centers to identify *all* equipment requiring calibration and create detailed steps to conduct that process. NEFSC staff told us that they had included more details about calibrating equipment in the center specific protocols that they included as part of the new bottom trawl protocols, but were told to simplify these protocols to make them more useful. We are not advocating for all protocols to be

in one "bottom trawl survey protocol's document." However, we do want to emphasize that as NMFS continues to define and develop *additional* protocols, it should include a NOAA-wide protocol that requires science centers to identify all equipment needing calibration and ensure that calibration procedures are documented and followed.

- **NEFSC's redundant system calibration protocol should be better defined.** The *Albatross IV* has a back-up measurement system, the running line tensiometer (RLT),<sup>8</sup> that if properly calibrated and carefully used should have detected that the cable was sometimes 6 1/2 to 10 feet longer on one side. However, according to NMAO staff, their understanding of the procedure for calibrating the RLT was to use the measurements on the cable, which means the RLT was calibrated with the mis-marked cable, causing its readings to also be unreliable. In addition, NMAO staff believed it was all right to manually adjust readings that did not agree with trawl cable depth readings provided by the onboard computer system.

The new NOAA-wide protocols call for using redundant measuring systems (like the RLT) to detect differences in trawl cable length beyond a tolerance level, and require that these systems be inspected to maintain calibration levels by using known lengths of wire at least annually and using manufacturer recommended procedures. Our review found that the NEFSC did not specifically address the calibration process for redundant systems similar to the NOAA-wide protocol. For example, the NEFSC protocol discusses calibration of trawl cables but does not address how the RLT calibration and operation procedures will be done and inspected. We believe this detail is important to ensure that staff at the center and NMAO are made fully aware of the calibration requirements.

- **NOAA calibration protocols should address changes in gear configuration.** NMFS and the National Research Council point out the importance of properly calibrating new or changed equipment using parallel operations with the old equipment. For example, in its response to our draft report NOAA pointed out that the NEFSC has, and continues to conduct extensive calibration work for three significant changes in survey gear: a door change implemented in 1984/85, a net change implemented on the Spring survey between 1973 and 1982, and alternate use of the RV Albatross IV and RV Delaware II to conduct surveys using bottom trawl gear. This type of calibration is particularly important because even minor alterations to the gear that change the catch rate could falsely indicate increases and decreases in stocks.

We found one example, brought to our attention by fishermen we interviewed, where the northeast center changed the way the net was connected to the gear but

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<sup>8</sup> The RLT or running line tensiometer is a real-time measuring device that deflects the running wire by a known amount to facilitate measuring under tension. This device may be subject to deviations from true measurements due to wire slippage and should be calibrated using known lengths of wire.

did not calibrate the change. When we asked the manager in charge of the survey operations about the change, he indicated that a correction had been made to keep the net from slipping and bunching up, but it was not significant enough to require calibration. However, without some evaluation of the effect of the change on catch rate, it is unclear how the center made its determination.

In another case when we were reviewing the net construction design and comparing it to the existing procedures, we found changes had been made to the design, such as the type of net webbing, sizes of some net panels, and other aspects. Again, staff at the center did not think these changes were significant, but indicated that they would attempt to document how and why the changes were made and their overall significance. Assessing the significance of the change is important, as discussed above, because without some evaluation of the effect of the change on catch rate, it is unclear how the center made its determination.

While we agreed with the center's approach in documenting how and why changes were made to the net configuration and construction, and their potential impact, we also suggested that they work with the new trawl advisory committee to assess these changes and to help determine what, if any, calibration testing is required. These steps will be useful in addressing the center's specific calibration issues. To address the broader issue of the lack of a clearly defined process for determining when gear changes should be calibrated, NMFS needs to develop a policy defining the types of changes that would require calibration. Without such a policy, the validity of future survey changes that are not calibrated by a science center could be questioned and the quality of data collected uncertain.

**B. Observations from trawl evaluation cruise should be more completely addressed by protocols.**

To address concerns about survey operations in light of the trawl cable incident, the center invited six fishermen to participate in a survey cruise to assess operational performance. Inviting the fishermen on the observation cruise was a good step toward involving these stakeholders in the process of addressing survey concerns. The NEFSC actions in this case support the National Research Council recommendation to include fishermen on scientific surveys. As the Council has noted, fishermen have valuable expertise that can be useful to NMFS and mutual efforts at communication and education will help strengthen relationships between fishermen and NMFS staff.

The fishermen made several observations about the gear. We evaluated seven of their recurring observations (see Table 2) against the NEFSC protocols to determine whether they were adequately addressed by the protocols.

**Table 2: Fishermen's observations about gear operations**

OBSERVATIONS	Did NMFS or NMAO staff confirm that the situation occurred?	Is the situation addressed by the new protocols?
There were fewer and older "cookies" (small rollers) on one "sweep" making it 16 inches shorter and lighter in weight than the other.	Partially <sup>a</sup>	Partially
The shine on the trawl doors was different and the backstrap was twisted, indicating a problem with how the doors were operating and functioning to spread the net.	Partially <sup>b</sup>	Partially
The "cans" (floats used to hold the headrope up) displayed atypical flat spots from wear, suggesting that the cans were dragged under the footrope, essentially collapsing the net opening.	Partially <sup>c</sup>	Partially
A change had been made in the way the net was attached to the footrope; the impact is unclear, but the change was never calibrated.	Yes	No
The net was snarled as it was being set—that is, the cans dipped through the footrope and sweep—which would prevent the net from opening properly.	Yes	Yes
The tow speed of 3.8 knots is too fast, causing the net to be lifted off the bottom.	Yes	Yes
There is a 6-inch difference in height where the "cookies" meet the rollers, which allow some fish to escape under the net.	Yes	Yes

<sup>a</sup> Per the NOAA response to our draft report, observation #1 could have been more accurately worded as, "There was a difference in coverage of 'cookies' (small rollers) of 16 inches between the two sweeps on the net, possibly resulting in a weight difference between the two sweeps."

<sup>b</sup> Center and NMAO staff did not agree that the backstrap was twisted.

<sup>c</sup> Center staff told us the cans were flat because they had been dragged on the deck, not because they were caught under the footrope and dragged on the ocean floor.

- **Directly addressing corrective actions in the new center protocols would give staff clearer direction in operating all aspects of the survey.** We believe that the new protocols adequately address observation 5, which noted the snarl in the net. The new protocols require several steps regarding the careful inspection and operation of the net during deployment. However, more could be done to address the remaining observations.

Observation 1 Regarding the missing cookies or lack of cookie coverage on the sweep, the new protocols provide a detailed discussion of the specifications of the sweep. However, we found a minor deviation between the engineering plan depicting the sweep and the text describing the sweep specifications, which the center agreed to correct. Also, the inspection checklist that was to be used to

approve the net before delivery to the vessel would be more effective if it included the detailed specifications discussed in the text of the new protocols. For example, the checklist did not include measurement information about the length of the sweep. Inconsistent and incomplete information would make it difficult to ensure the proper sweep configuration. Several of the peer reviewers also discussed the need for improved construction and inspection of nets at the science centers. For example, one peer reviewer made 7 of his 17 recommendations toward improving trawl construction, inspection, repair, and quality control. His recommendations include the need for more detailed construction plans; parts lists that include length, diameter, material, class and weight, and manufacturer; and more detailed inspection checklists and quality control procedures.

Center and NMFS staff agreed with the need to provide accurate engineering and detailed construction plans, and NEFSC agreed to correct its engineering diagrams and provide more specificity to its inspection checklists. NMFS has already responded to some of the reviewers' recommendations and stated that it plans to continue to respond using the survey standardization working group.

Observation 2 The doors are attached to the trawl cable and are used to spread the net opening and anchor the trawl net on the ocean floor. Fishermen evaluate the shine (wear pattern seen on the doors and other equipment caused by the friction of the ocean floor) to determine whether the doors are operating properly. For example, more shine on the rear of the door could indicate that the door is riding on its heel causing it to not properly spread the net. With regard to the different shines on the trawl doors observed by the fishermen, the center staff stated that they did not see any evidence of the backstrap of the door being twisted but did think that the shine on the doors indicated that the doors might not be operating properly when being pulled on the sea bed. The doors are an important part of net operations because they are used to spread the net opening. The NEFSC protocol discusses developing a certification procedure for ensuring doors are operating properly. However, the protocols did not specify the need for a detailed checklist for this procedure, similar to the one used for trawl nets.

Peer reviewers also commented on different science center's protocols relating to the doors. These comments included the need to monitor door operations using acoustic measuring instruments, specifying the manufacturer, weight, and dimension of the doors, and increased inspection of all parts of the doors.

The center stated that it could have included additional details about door certification, but was told to simplify its protocols. As a result, it did not add all of its new procedures to the existing protocols. In its response, NOAA also emphasized that the NEFSC had already documented these procedures and continues to document other procedures not addressed in the bottom trawl protocols. In addition, the NEFSC is adding more detailed acoustic measuring systems to monitor door performance for each of its tows made on a survey. We

agree that protocols should be simple enough to be easily followed, but given the numerous areas that require detailed lists and quality control procedures, other manuals or protocols will eventually need to be developed and should become part of a standard protocols requirement for each science center. The areas (such as door certification procedures) requiring documented protocols or procedures should be specified by NMFS for all of the science centers to follow. A process for ensuring the adequacy of these protocols should then be adopted by NMFS.

Observation 3 With regard to concerns expressed about the floats—that atypical flat spots suggested they were dragged under the footrope—center staff stated that the areas in question on the cans were the result of their being dragged on the deck and not on the ocean floor. Our review of the protocol found that it lists the number and type of floats to be used, but does not provide details on what their condition should be for optimal operation or whether changes in shape will affect operability.

One peer reviewer commented on the need for more detailed specifications about the floats, including dimension, buoyancy, and exact location on the net. In response, the NEFSC included additional details about float location on its engineering diagram. We believe the center should develop a quality standard for the floats, as well as inspection procedures for ensuring they operate as intended.

Observation 4 With regard to the change in the way the net was attached to the footrope, as we noted in the preceding section about calibration, center officials did not feel that the change impacted consistency, but the fishermen did. As noted previously, a policy on the types of changes that require calibration would help the center know what to do in a situation like this.

Observations 6 and 7 Concern was also expressed about the too-fast tow speed and the height difference in rollers that allowed fish to escape under the net and according to the fishermen, skewed population counts. Peer reviewers also commented on tow speed, indicating that it seems high (almost twice as fast as other surveys) and should be re-evaluated. At our exit conference, center staff indicated that the extent to which fish were escaping under the net had not been evaluated to assess the severity of the problem. While staff believed that the loss of fish under the net was not a big problem, they indicated that they planned to further study the issue.

Center staff also pointed out that while the trawl design and tow speed (3.8 knots) have been a source of contention with fishermen for years, the design and speed have remained consistent throughout the course of the survey. Because the center is taking a sample of the fish populations over a time series, it makes the argument that it is more important that the sample be taken consistently each time (to ensure comparability) than changing the sampling method without good cause. The NRC, during its review of NMFS stock assessment program, also recognizes the

need for standardizing gear over time to maintain consistent measures of abundance.

Alteration of tow speed or net design would require calibration, which in the center's opinion is rarely advisable when the maintenance of a consistent time series is a programmatic objective. In response to other peer reviewer comments about changes to the survey gear, the center also discussed the expense—\$500,000—to conduct the parallel testing needed for calibration. Although the center does not believe there is a need to change the tow speed and design of the existing survey, it is planning a trawl net redesign as part of the planning for receipt of a new survey vessel. As part of this process, the center plans to involve its trawl advisory committee in redesigning the net and operations, including the tow speed.

The NRC also responded to stakeholder's complaints about the use of outdated and inefficient gear by outlining the criteria that NMFS should use to assess its gear. The NRC recommended that when survey gear is outdated, has unstable performance, or is hard to set up correctly, effort should be directed at improving the gear and providing some level of cross-calibration so the value of historic data is maintained. The report further stated that gear and operating procedures used in all surveys should be evaluated on a regular basis (for example, every 5 to 10 years and particularly at the time research vessels are changed).

The center's plans to reevaluate the net design now that it is to receive a new research vessel is consistent with the National Research Council's recommendation, but we noted that NMFS does not have a policy or associated criteria for evaluating gear and operating procedures on a regular basis. We believe that creating such a policy for periodic evaluation will make it clear to all those participating in and evaluating survey operations when and how gear improvements will be made. The center's argument that calibration can be expensive is not a sufficient reason for not having a policy for evaluating gear performance, particularly when errors may be introduced into the data collection process. We believe that NMFS needs to develop a policy and associated criteria for evaluating gear and operating procedures on a regular basis.

**C. A better warehouse management system would ensure that inspection, maintenance, and inventory records are complete and accurate.**

Survey nets are constructed, inspected, and maintained at the NEFSC warehouse, which is located about 14 miles from the center. Two full-time as well as occasional part-time and contractor staff work at the warehouse, which houses raw material for not only bottom trawl survey nets but also the nets used by the center for its other surveys. Different material and different specifications are used to construct each type of net. The need for consistency requires that each net used for a particular survey be built to detailed specifications developed for that survey and be maintained in the same fashion.

- **The center needs to ensure that gear records are accurate, complete, and up to date.** Center staff told us that nets are inspected before and after use and that the status of the nets is monitored through maintenance records. As part of our review of warehouse operations, we tested the completeness and accuracy of their inventory, inspection, and maintenance system by reviewing the appropriate records for the bottom trawl survey nets. The center maintained a record book with the number of the net written on each page and a record of the maintenance and status of the net—for example, “in the warehouse,” “retired,” and so forth. The supervisor of the warehouse kept a separate database record with a list of nets on hand, the date inspected, the inspector’s name, and when the net was last used.

We compared the database listing to the record book maintained by the warehouse staff and found that the systems were not in agreement. Neither system had the right number of nets. Nets that had been retired on one record were indicated as being available on the other but could not be located, and new nets on one system were not included on the other.

We asked the staff and supervisor to reconcile the two systems and provide an accurate status of the inventory. The following day the staff was able to provide us with an accounting of the nets that were on hand during our inspection of the warehouse. One of the major problems was that severely damaged nets had been used to create new nets and the old net numbers were still in the record books. As a result, the manager believed that more nets were listed in the inventory than were available, and the existing inspection and maintenance records were inaccurate.

Maintenance and construction of nets are addressed in the center’s new protocols, but record-keeping related to those nets is not. Nevertheless, accurate records of the use of materials, construction, and availability of the nets need to be available to ensure that nets are constructed in the consistent fashion required to ensure the integrity of the survey. As we discussed earlier, we found changes had been made to the net that were inconsistent with the engineering specifications. Without taking steps to better manage warehouse operations, center managers cannot demonstrate that the nets are being constructed and maintained according to specifications thus jeopardizing the accuracy of the survey data. Further, managers will not have accurate information about the availability and condition of the gear.

During our review, we were told that NMFS has a warehouse in Seattle, Washington, that uses an automated system to help manage its gear inventory. If that system is shown to be effective, the operation of the Seattle warehouse could serve as a useful model for other science centers such as the NEFSC. NMFS should consider using the Seattle warehouse operation as a model for other center’s warehouse operations and ensure that those staff responsible for operating

the warehouses and constructing the nets implement steps for quality assurance of those operations.

**D. NMFS should ensure protocol recommendations are followed.**

NMFS' work on survey protocols is far from ended. NMFS, as part of the initiative to improve bottom trawl survey protocols, has pledged to complete protocols for all of its other survey programs. The bottom trawl survey protocols also made several recommendations for additional work to implement the protocols. These included (1) setting up a NOAA Fisheries Survey Standardization Working Group to fulfill an ongoing need to coordinate the development of national and regional standards and protocols, and to share information to improve the precision and accuracy of surveys, (2) establishing National Marine Resource Survey Workshops to facilitate information and technology exchange, and (3) instituting a national program for trawl construction and repair to improve quality control in the construction and repair of survey trawls. Peer reviewers commented on the need for continued work on the protocols and suggested actions for the working group to address.

OMB Circular A-123 requires management controls for the delegation of authority and organization. According to the circular, managers should ensure that appropriate authority, responsibility, and accountability are defined and delegated to accomplish the mission of the organization, and that an appropriate organizational structure is established to effectively carry out program responsibilities. To the extent possible, controls and related decision-making authority should be in the hands of line managers and staff.

As NMFS continues to create and oversee protocols for managing its surveys, it must assign accountability for ongoing and new initiatives, such as the Survey Standardization Working Group and national program for trawl construction and repair. We are told that NMFS' Office of Science and Technology Policy and Science Advisory Board are currently working to address these issues; however, the ongoing responsibilities and authorities need to be formally delegated to a specific office or organization to ensure specific accountability for coordination and oversight of these programs. As one peer reviewer stated, "This [the protocols] is a constructive initiative, but the document does not indicate any directions for the group's [the protocol authors] development." Designating an office at NMFS headquarters to support this initiative is critical.

Similarly, on a regional basis, the NEFSC, in conjunction with the Mid-Atlantic and New England Fishery Management Councils, has set up a trawl advisory committee to assist the center in updating the protocols and to provide a forum to discuss trawl survey concerns. However, we understand that a formal charter describing the purpose, roles, and responsibilities of the committee has not been established. Such a charter will provide participating stakeholders with a clear understanding of their role and how their input will be used and would serve to build stakeholder trust and understanding of the process.

## **E. Recommendations**

The assistant administrator for fisheries should officially designate responsibility for creating and overseeing survey protocols to an appropriate headquarters office, and require that office to:

1. create and oversee the Survey Standardization Working Group and the national training program for trawl construction and repair,
2. require science centers to identify all equipment that requires calibration and create detailed steps to conduct that process;
3. develop a policy that defines calibration procedures for changes in gear;
4. specify for all science centers the operational areas that require documented protocols;
5. develop a policy and associated criteria for evaluating gear and operating procedures on a regular basis;
6. ensure that the NMFS Seattle warehouse management system is explored for use as a model for other regions, and if applicable, used to establish science center warehouse operations, and
7. develop quality assurance procedures to ensure warehouse operations follow the new protocols.

In addition, the assistant administrator for fisheries should also direct the NEFSC director to:

1. better define protocols for calibrating redundant systems such as the RLT;
2. ensure that a charter is established for the trawl survey advisory committee;
3. use the new trawl advisory committee to evaluate changes to the net configuration and construction materials to help assess what, if any, calibration testing is required;
4. implement a more accurate inventory management system,
5. improve the checklist and specifications describing the various components of the trawl net;
6. include the door certification procedures as part of the inspection checklist; and
7. develop protocols for ensuring floats operate as intended and a gear checklist describing the condition of floats that can be used to conduct the survey.

## **E. NOAA's Response to Recommendations**

In response to our first set of recommendations directed to NMFS headquarters, NOAA concurred with all but two of the recommendations. NOAA stated that it only partially concurred with the recommendation regarding the Seattle warehouse system; however, its response appeared to address the intent of our recommendation. NOAA did not address the recommendation to designate a responsible official at headquarters to create and oversee survey protocols. This recommendation is important because it creates a

mechanism to ensure that all science centers continue to develop, update, and maintain protocols that meet an acceptable standard established by NMFS. To address a comment made by NOAA in its response to our draft report, we also clarified the recommendation regarding developing a policy and associated criteria for evaluating gear and operating procedures to make it more consistent with the text in the report. NOAA's other responses (which we have summarized below) provide a good foundation for developing an action plan to implement our recommendations.

A summary of actions indicated as planned or taken by NMFS that respond to our recommendations include:

- mandating the formation of the survey standardization working group in August 2003, which will focus on creating a national training program starting in November 2003;
- requesting a list of scientific equipment requiring calibration from all centers by January 2004 and requiring the centers to organize and, if necessary, develop procedures for calibrating identified gear;
- developing a general framework to define the types of gear changes needing calibration, including changes where (1) experimental calibration is generally recommended, (2) gear modeling and/or flume tank work may answer gear performance questions, and (3) decisions concerning calibration can be made locally through consultation with gear experts;
- creating a methodology to evaluate survey gear performance at each science center on a 10 year rotating basis that would include input from stakeholders and external reviewers; and
- establishing a program that involves periodic short-term exchanges of personnel among warehouses to identify best practices initiated by individual operations that can be adopted among the science centers.

Actions that need to be more fully explained in the audit action plan include NOAA's response to our recommendations regarding specifying operational areas that require documented protocols and developing quality assurance procedures for warehouse operations.

In response to our second set of recommendations directed to the NEFSC, NOAA concurred with all of our recommendations. Many of NOAA's responses (which we have summarized below) adequately address our recommendations; however in a few cases, we believe NOAA could provide additional details in the audit action plan.

A summary of actions indicated as planned or taken by NOAA that respond to our recommendations include:

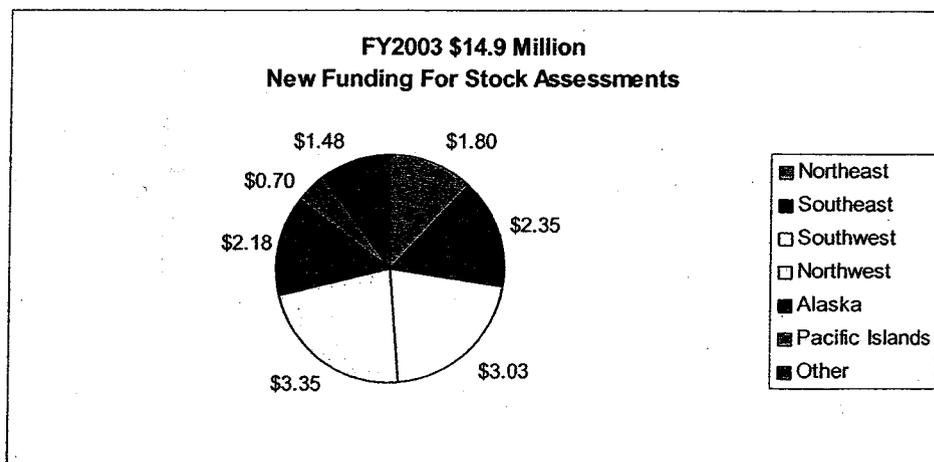
- having NEFSC personnel work with NMAO personnel responsible for calibration of RLT systems to ensure that calibration protocols are revised by January 2004;
- working with the Mid-Atlantic and New England Fishery Management Councils to draft a formal charter for the trawl survey advisory committee;

- contracting with a group (planned for September 2003) that is, according to NMFS, recognized as being a world leader in the development of fishing gear standardization to address the various components of the trawl net inspection checklist and specifications;
- planning and initiating changes in door certification procedures including more rigid gear handling and updated drawings and checklists related to door certification; and
- implementing revised instructions for trawl survey protocols concerning observation of the gear, having a checklist that includes procedures for inspecting floats to ensure that they are not cracked or filled with water, and conducting gear standardization work to quantify the buoyancy of floats currently used on nets.

Actions that need to be more fully explained in the audit action plan include NOAA's response to our recommendations regarding using the trawl survey advisory committee to evaluate changes to the net configuration and construction materials and creating an inventory management system.

### III. More Steps Can Be Taken to Ensure that the Cost of Gear-Related Activities Are Understood

Scientific surveys are a vital component of the stock assessment process and form an ongoing operational program for NMFS science centers. As such, decision-makers and agency managers need to know the cost of purchasing, operating, inspecting, and maintaining the gear and other equipment used to conduct this program. In fiscal year 2003, NMFS was allocated approximately \$14.9 million in new funding for modernizing and expanding stock assessments. These funds will be used to support NMFS stock assessment improvement plan activities, including the implementation of survey protocols and other activities for collecting and analyzing data to support accurate stock assessments. Chart 1 shows a breakout of these funds by science center.



### **A. The NEFSC needs to better track survey-related expenses**

Although independent surveys have been part of the operational program at the center for years, the center did not track the actual costs of calibrating, operating, inspecting, and maintaining survey gear for the two fiscal years, 2001 and 2002, that we reviewed. While the NEFSC manager in charge of this program could estimate the overall cost of the surveys and the center tracked other survey costs, costs related to gear were not captured. The manager explained that while funds were not allocated, the funds that were used for gear came from end-of-year funding sources that were not tracked by their accounting system as gear-related expenditures. While managers can estimate the cost of the surveys, we believe tracking actual expenditures provides a more accurate assessment of the cost of the surveys that can be used for future planning.

For fiscal year 2003, in addition to the \$14.9 million in new funding for its stock assessment program, NMFS also plans to use end-of-year funding and other funds to support the stock assessment program at its science centers. Given that NMFS plans to modernize and expand its stock assessment program, it should ensure that the science centers keep adequate records and track expenditures for the major cost categories related to the independent surveys. Decisions to create new surveys or expand existing ones would be enhanced by having detailed information about the cost of the surveys. Without such information, NMFS risks not having enough funding to support critical survey procedures, such as calibration and maintenance, needed to ensure the consistent quality of the surveys required for accurate measures of relative fish abundance.

### **B. Recommendations**

The assistant administrator for fisheries should ensure that all major cost categories, including gear-related categories, for its independent surveys are identified and tracked.

### **C. NOAA's Response to Recommendations**

NOAA did not state whether it concurred with this recommendation. Rather it explained that currently it is difficult to track gear and survey related costs because only small amounts of base funds are allocated to support gear related costs for activities considered core to the scientific programs at science centers. While the response does state that the NEFSC will work to produce a more accurate assessment of survey costs to be used for future planning and allocation exercises, NOAA needs to further address in its audit action plan how funding (whether part of the base or transfers) used for these surveys will be identified and tracked to ensure that decision-makers have accurate information to estimate, plan, and adequately fund future surveys.

#### **IV. Additional Explanations Regarding NOAA's Response to the Draft Report**

NOAA provided us with numerous comments about our draft report. Some of the comments questioned the accuracy of information included in the report, while others reflected the need for additional clarification or provided additional information. To address NOAA's concerns about the accuracy of a particular statement or piece of information, we summarized those specific comments and provided individual responses for each of these concerns. To address NOAA's other comments, where appropriate, we added additional details or clarifications in the report. NOAA's complete response to our draft report is included as Appendix I.

##### **NOAA Comment**

*OIG Statement: "The different lengths of cable deployed on either side of the net caused the net to operate improperly."*

NOAA did not agree with our statement that the different lengths of cable deployed on either side of the net caused the net to operate improperly. NOAA believes that if the net had been truly operating improperly, the NEFSC would have detected significant changes in catch; however this did not occur.

##### **OIG Response**

Our report does point out that the center evaluations and peer reviews did not detect significant changes in catchability. However, we were using the definition of proper operation to refer to operating the net following the NEFSC protocols. Improper operation, using that definition, would mean deploying the cable in unequal lengths on each side of the net. However, to address the NOAA concern, we revised our report to state that different lengths of cable deployed on either side of the net increased the risk that the net operated improperly.

##### **NOAA Comment**

*OIG Statement: "Their concerns increased when NMFS announced that it did not have a protocol for calibrating the cable and when it came to light that the fisherman had been warning the center about the potential problem for over 2 years."*

NOAA did not agree with our characterization that the NEFSC "announced" that NOAA did not have a protocol for calibrating the cable.

##### **OIG Response**

We revised our draft to better reflect how the lack of protocols was disclosed.

### **NOAA Comment**

*OIG Statement: "We found that NMFS had previously made some changes to the net, but because they believed the changes were not significant, they did not calibrate them."*

NOAA felt our statement about previous gear-related changes that were not calibrated could be misleading because our report did not specifically state which changes we were discussing.

### **OIG Response**

We clarified our statement.

### **NOAA Comment**

*OIG Statement: "Still, there have been no directions to convene such a group."*

NOAA believed that our statement regarding the lack of direction to convene the survey standardization working group was inaccurate because this direction was given in August 2003.

### **OIG Response**

Our draft report reflects the status of our audit at the completion of our audit field work. However, we added information about the recent direction to establish the working group to the appropriate sections of the report. We do agree that the working group is an important step for implementing recommendations made by peer reviewers and NMFS staff.

### **NOAA Comment**

*OIG Statement: "NMFS estimated that at an average depth of 300 meters the difference was about 6 feet."*

NOAA commented that the draft report inaccurately states that when 300 meters of cable was deployed it created a difference in cable length of approximately 6 feet. Instead NOAA stated that the accurate statement should be, "that at 300 meters the difference was about 2 meters."

### **OIG Response**

We obtained the information included in our draft report from the NEFSC website used to provide information about the trawl problem. According to the information provided by NEFSC, "at 300 m (984 ft) the difference was just under 6 ft. Of all tows made in the surveys, 75% deploy 300 m of cable or less." We changed our report to reflect the apparent revised estimate.

### **NOAA Comment**

*OIG Statement: "Acting Center Director hears about trawl cable concern. Staff checks 100 meters of cable on RV Albatross IV and finds no problem."*

NOAA questioned the accuracy of one of the statements in the table describing the trawl cable events. Instead of our comment that the Center Director heard about the trawl problem and staff checks the cable, NOAA preferred that we state, "Science and Research Director (S&RD) was informed by staff about trawl cable concern. S&RD requested that NMAO measure the cable. In response, NMAO personnel measured the first 100-meters of cable and found little deviation."

### **OIG Response**

Although the formal name for the Center Director is the Science and Research Director, we used the more general terminology to provide the reader with a better understanding of the organization the Director manages. We clarified our comment in the table.

### **NOAA Comment**

*Table 1:*

This table makes repeated reference to the Albatross VI. References to the vessel in the table should be changed to the Albatross IV.

### **OIG Response**

Correction made.

### **NOAA Comment**

*OIG Statement: "The exception was a staff person in the NEFSC Ecosystems Survey Branch, which is responsible for gear-related activities. He reported his conversation with the fisherman in May 2001 to his branch manager, who retired 4 weeks later without having addressed the complaint."*

NOAA provided clarification regarding the position of the staff person that reported the conversation to the Ecosystem Branch Manager.

### **OIG Response**

We added the clarification.

### **NOAA Comment**

*OIG Statement: "The NEFSC determined that the cable was off by approximately 6 feet in depths of 300 meters and up to 9 feet in deeper depths."*

Similar to a prior comment, NOAA requested the following revision: "The NEFSC determined that the difference between marks on the two cables was approximately 2 meters at cable lengths of 300 meters and up to about 3 meters at longer cable lengths."

### **OIG Response**

As stated earlier, this information differs from earlier information provided by the Center, but to address their current revision, we updated the information in our final report.

### **NOAA Comment**

*OIG Statement: "There were fewer and older "cookies" (small rollers) on one "sweep" making it 16 inches shorter and lighter in weight than the other."*

NOAA states that the information about the cookies and sweep provided on the first line of the chart discussing the fisherman's observations is not accurate. NOAA preferred that we change the statement in the report from, "There were fewer and older 'cookies' (small rollers) on one 'sweep' making it 16 inches shorter and lighter in weight than the other"...to..."There was a difference in coverage of 'cookies' (small rollers) of 16 inches between the two sweeps on the net, possibly resulting in a weight difference between the sweeps."

### **OIG Response**

The statement referred to by NOAA reflects comments made by the fishermen that went on the observational cruise. We asked the NEFSC staff at different times to confirm whether the statement was correct. At no time did they indicate that they only partially agreed with the statement. However, we noted their partial agreement and revised language in the final report.



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NOAA FINANCE AND ADMINISTRATION

SEP 29 2003

MEMORANDUM FOR: Michael Sears  
Assistant Inspector General for Auditing

FROM: *for* William Broglio *Charles C. Lawrence*  
Chief Administrative Officer

SUBJECT: *Recent Gear Protocols Should Improve NMFS Groundfish  
Surveying But More Should Be Done*  
Draft Audit Report No. STD-15750-3-XXXX/August 2003

Attached is the National Oceanic and Atmospheric Administration's response to the Office of Inspector General's draft audit report on the National Marine Fisheries Service's management of its groundfish survey. The response was prepared in accordance with Department Administrative Order 213-3.

We appreciate the opportunity to respond to your draft audit report.

Attachment

**NOAA Comments on the Draft OIG Report Entitled  
"Recent Gear Protocols Should Improve NMFS  
Groundfish Surveying But More Should Be Done"  
(STD-15750-3-XXXX/August 2003)**

**Recommended Changes for Factual Information**

*Page ii, 2<sup>nd</sup> paragraph, 3<sup>rd</sup> sentence and similar wording several times later in the report:  
OIG Statement: "The different lengths of cable deployed on either side of the net caused the net to operate improperly."*

This statement is not accurate. A more accurate statement should read, "The different lengths of cable deployed on either side of the net may have caused the net to operate improperly."

This continues to be a point of contention and depends on your definition of improper operation. If the net was truly operating improperly, the Northeast Fisheries Science Center (NEFSC) would have detected significant changes in catch when comparison tests between tows using proper cable lengths and those using the mismatched cable lengths were made. No definitive differences were identified.

*Page ii, 4<sup>th</sup> Paragraph, 3<sup>rd</sup> Sentence:*

*OIG Statement: "Their concerns increased when NMFS announced that it did not have a protocol for calibrating the cable and when it came to light that the fisherman had been warning the center about the potential problem for over 2 years."*

The NEFSC never announced that NOAA did not have a protocol for calibrating the cable. A potential restatement of the increased concern might be: "Their concerns increased when it was announced that the cable had not been measured over a two year period and that the fisherman had mentioned the potential problems to several Science Center staff members during the same period."

*Page iv, Paragraph 4, 3<sup>rd</sup> Sentence:*

*OIG Statement: "We found that NMFS had previously made some changes to the net, but because they believed the changes were not significant, they did not calibrate them."*

This statement is misleading because it implies that the NEFSC has not previously calibrated for gear changes during the course of the survey. In fact, the NEFSC has, and continues to conduct extensive calibration work for three significant changes in survey gear: a door change implemented in 1984/85, a net change implemented on the Spring survey between 1973 and 1982, and alternate use of the RV Albatross IV and RV Delaware II to conduct surveys using bottom trawl gear. Other changes such as replacement of a twine or roller type that is no longer commercially available with an equivalent or similar component have generally not been calibrated because they were deemed to have no significant effect on net performance.

*Page vi, Paragraph 3, 4<sup>th</sup> Sentence:*

*OIG Statement: "Still, there have been no directions to convene such a group."*

This statement is not correct. Directions were received from NMFS Headquarters to initiate the agency-wide survey standardization working group in August 2003, prior to the release of the draft OIG report on August 29, 2003. OIG staff may want to include a statement emphasizing the importance of initiating this group.

*Page 3, 2<sup>nd</sup> Paragraph, 3<sup>rd</sup> Sentence:*

*OIG Statement: "NMFS estimated that at an average depth of 300 meters the difference was about 6 feet."*

This statement is not accurate. A more accurate statement should read, "NEFSC estimated that at an average cable length of 300 meters the difference was about 2 meters."

*Page 5, Table 1, February 2002:*

*OIG Statement: "Acting Center Director hears about trawl cable concern. Staff checks 100 meters of cable on RV Albatross IV and finds no problem."*

This statement is not accurate. A more accurate statement should read, "Science and Research Director (S&RD) was informed by staff about trawl cable concern. S&RD requested that NMAO measure the cable. In response, NMAO personnel measured the first 100-meters of cable and found little deviation."

*Page 5, Table 1:*

This table makes repeated reference to the Albatross VI. References to the vessel in the table should be changed to the Albatross IV.

*Page 8, 2<sup>nd</sup> Paragraph, 3<sup>rd</sup> Sentence:*

*OIG Statement: "The exception was a staff person in the NEFSC Ecosystems Survey Branch, which is responsible for gear-related activities. He reported his conversation with the fisherman in May 2001 to his branch manager, who retired 4 weeks later without having addressed the complaint."*

This statement is not completely accurate. A more accurate statement should read, "The exception was a staff person who at the time worked in the Population Dynamics Branch on fisheries issues that did not depend on trawl survey results. This individual reported his conversation to the Branch Chief of the Ecosystems Surveys Branch (different division and branch), which is responsible for gear-related activities. The Branch Chief at that time retired approximately one month later, and we were unable to find evidence that the complaint was addressed."

If the OIG wishes to further clarify this situation, the following text may also be included: "Subsequently, the Population Dynamics staff member who originally reported the complaint

was promoted to serve as Branch Chief of the Ecosystems Surveys Branch in May 2002, and oversaw the wire measurement before the next scheduled bottom trawl survey in September 2002.”

*Page 9, Paragraph 2, 1<sup>st</sup> Sentence:*

*OIG Statement: “The NEFSC determined that the cable was off by approximately 6 feet in depths of 300 meters and up to 9 feet in deeper depths.”*

This statement is not accurate. We recommend the following revision: “The NEFSC determined that the difference between marks on the two cables was approximately 2 meters at cable lengths of 300 meters and up to about 3 meters at longer cable lengths.”

*Page 15, Table 2, Observation 1:*

*OIG Statement: “There were fewer and older “cookies” (small rollers) on one “sweep” making it 16 inches shorter and lighter in weight than the other.”*

This statement is not accurate. The two sweeps were in fact the same length. The issue is that the cookies on one sweep were either compressed or some cookies were lost resulting in a difference in cookie coverage between the sweeps of 16 inches. These cookies are essentially round discs cut from used tires, and therefore, are variable in width. These are essentially the same material used in commercial nets. Through time, cookies have a tendency to reorient themselves resulting in compression in the distance of their coverage.

The OIG statement appears to provide a factual statement concerning weight, when in fact the two sweeps were never weighed. Such a measurement would require removal of the sweep from the net. Because the sweeps were not removed and weighed, neither the NEFSC nor stakeholders participating in the video observation survey would be able to confirm whether one sweep was heavier or lighter than the other. The weight of cookies covering 16 inches of sweep is approximately 8.5 pounds, compared with the weight of an average sweep (117 pounds) and the entire net (1,670 pounds). We are unaware of a methodology for determining the age of cookies, so attributing terms such as “older” to this component of the gear is a subjective observation that neither NEFSC staff nor industry stakeholders could reliably assess.

A more accurate statement of this concern might be: “There was a difference in coverage of “cookies” (small rollers) of 16 inches between the two sweeps on the net, possibly resulting in a weight difference between the sweeps.”

### **General Comments**

There is an inconsistent use of the terms NMFS and NEFSC. Activities or actions implemented at an agency level should be termed “NMFS”, while activities or actions attributed at a Science Center level should be termed “NEFSC” to avoid confusion.

The terminology of “groundfish survey” is prevalent through the report including the title of the

report. The NEFSC conducts three bottom trawl surveys that sample groundfish, epipelagic and some pelagic fish species. The difference between conducting a "groundfish" versus a "bottom trawl" survey is an important scientific distinction. We recommend the consistent adoption of the term "bottom trawl survey" throughout the report.

The concern expressed by a fisherman is intermittently labeled as a "concern" or a "complaint." The concern was never expressed in any form other than through informal oral discussions. In addition, up to the day the cable was actually measured, the fisherman was unsure whether the measurement methodology had actually led to a mismarking of the cable, only that the methodology was prone to error and that it was important to check to see if an error had actually occurred. On this basis, the term "concern" may be a more accurate description than the term "complaint."

### **Specific Comments**

*Page 12, 2<sup>nd</sup> Paragraph, 5<sup>th</sup> Sentence:*

*OIG Statement: "There is, however, no protocol that requires the science centers to identify and develop calibration procedures for other equipment such as floats and other equipment used to weigh and measure fish caught in the sample."*

The agency-wide protocol development effort focused strictly on developing protocols for fishing gear and its deployment related to bottom trawl surveys. It was never the intent of this effort to develop protocols for catch sampling. The NEFSC has extensive protocols for calibration of both electronic balances and electronic measuring boards utilized to measure sampled fish. In fact, electronic balances are calibrated on a daily basis during bottom trawl surveys and routinely serviced between surveys.

*Page 13, Paragraph 1, 2<sup>nd</sup> Sentence:*

*OIG Statement: "NEFSC staff told us that they had included more details about calibrating equipment in the center specific protocols that they included as part of the new bottom trawl protocols, but were told to simplify these protocols to make them more useful."*

In its initial submission to the agency-wide effort to standardize bottom trawl survey protocols, the NEFSC included considerable information related to catch sampling, including calibration procedures for equipment used to measure fish. External reviewers of the draft protocols commented that the NEFSC protocols contained too much detail to represent a useful document, and that there were consistency issues in the level of detail between center specific protocols. NMFS made the decision that agency-wide protocols should focus on common features related to obtaining representative samples (experimental design, gear specifications and handling, and fishing operations), and materials related to catch sampling were omitted from the final draft. Although these catch sampling and other protocols were omitted from the agency-wide protocols, they exist and are used by the NEFSC and other Science Centers.

*Page 14, 2<sup>nd</sup> Paragraph, 1<sup>st</sup> Sentence:*

*OIG Statement: "In another case when we were reviewing the net construction design and comparing it to existing procedures, we found changes had been made to the design, such as the type of the net webbing, sizes of some net panels, and other aspects."*

The type of net webbing has remained consistent through time, but the manufacturers nomenclature for labeling net webbing has changed. Every effort has been made to ensure that the twine was as close as possible to the twine used in the past. Furthermore, the effort was complicated by the fact that the system used to describe the twine changed. The body of the net called for a "#54" twine yet in reviewing the specifications for this twine from different manufacturers, we found there was no standard for "#54" between the companies. In addition, this numbering system was being phased out.

The new twine was being specified using a system based on deniers (weight in grams of 9,000 meters of twine) or runnage (expressed in several ways, i.e., ft/lb or m/kg). This problem was identified by the International Council for the Exploration of the Sea, which stated that twine size should be specified using the Rtex system (grams/1,000 meters). The twine that was ordered in recent years is close to the twine ordered in prior years. This was accomplished by inspecting the twine prior to ordering. We asked the vendor for the Rtex value of the twine, but had difficulty getting this value since it is not commonly used in the U.S. Furthermore, twine vendors seem to place little emphasis on ensuring the duplication of twine sizes because this is not called for in the industry. Our needs were met by the manufacturers providing us their best estimation of a twine that matches the previously specified #54 twine.

NEFSC personnel currently involved in building nets believe that the net panels have remained a consistent size through at least the past 15 years (during their tenure at the NEFSC). Panels are usually cut by the same vendor and have been cut similarly and hung similarly over time. If a net panel was cut differently, it would not "fit" into the net properly, which ensures that the specifications were met. Since panels are sewn together and must match, if a panel's size changes, it is easily detected.

The NEFSC believes that many of the inconsistencies detected by the OIG staff stem from historical net drawings that left some construction aspects open to interpretation and a failure to update these drawings to indicate changes in twine naming and labeling conventions. The NEFSC is committed to updating these drawings to thoroughly and accurately describe survey gear, as recommended in this report.

*Page 14, Paragraph 4, 3<sup>rd</sup> Sentence:*

*OIG Statement: "The National Research Council recommended including fishermen on scientific surveys, recognizing that these stakeholders have valuable expertise that can be useful to NMFS and that mutual efforts at communication and education will help strengthen relationships between fishermen and NMFS staff."*

The NEFSC has hosted commercial and recreational fishery stakeholders on fishery independent surveys for many years dating back to the 1960s. Participation has been sporadic because

industry members generally cannot afford to volunteer for the 12 day average length of the survey, and funding to provide compensation to stakeholders to participate has been inconsistent through time.

### NOAA Response to OIG Recommendations

Prior to the investigation, NMFS initiated a multi-year effort to develop an accreditation program, which, when implemented, will give us the means to address all of the recommendations in the report. NMFS is developing this program in an expeditious manner and will adopt the recommendations as noted.

#### Recommendations to the Assistant Administrator for Fisheries:

**Recommendation 1: Direct NMFS' Chief Scientist and Science Board to work with the Office of Constituent Affairs to develop a policy specifying the methods for accumulating, reviewing, and addressing complaints in a timely fashion.**

We concur. NMFS will develop this policy by 2004.

**Recommendation 2: Communicate the policy to stakeholder groups as part of NMFS' continuing efforts to foster an open dialogue.**

We concur. NMFS will communicate this policy to stakeholder groups as soon as it is approved by NOAA management.

**Recommendation 3: Create and oversee the Survey Standardization Working Group and the National Training Program for trawl construction and repair.**

We concur. NMFS Headquarters mandated the formation of the working group in August 2003 and an outline of the structure and initial remits for this group has been prepared and is currently under review. Implementation of the National Training Program is one of the two initial foci of the working group. NMFS anticipates that this group will initiate activities during November 2003.

**Recommendation 4: Require science centers to identify all equipment that requires calibration and create detailed steps to conduct that process.**

We concur. We will request a list of scientific equipment requiring calibration from all Science Centers by January 2004. By June 2004, all Science Centers will be required to organize and if necessary, develop procedures for calibrating identified gear.

**Recommendation 5: Develop a policy that defines calibration procedures for changes in gear.**

We concur. The necessity to calibrate gear depends on the nature of the gear changes, which are likely unique to most gears and surveys. In addition, specific calibration procedures depend on the abundance, catch ability, and spatial distribution of the resource(s) being sampled. NMFS will develop a general framework to define the types of changes in gear where calibration may be necessary. This framework will include changes where experimental calibration is generally recommended, changes where gear modeling and/or flume tank work may answer gear performance questions, and changes where decisions concerning calibration can be made locally through consultation with gear experts.

**Recommendation 6: Specify for all science centers the operational areas that require documented protocols.**

We concur. NMFS is currently supporting efforts to develop agency-wide protocols for other types of resource surveys including pelagic trawl, shellfish dredge, shrimp trawl, acoustic, long line, and ichthyoplankton surveys. Many of these protocols will be completed before the end of 2003. Incorporated into this protocol development are specific operational areas where protocols would be expected to lead to greater standardization within and between survey programs.

**Recommendation 7: Develop a policy that establishes a schedule and criteria for periodic evaluation of survey gear performance.**

We concur with the recommendation assuming that it refers to periodic reevaluation and updating of methodology discussed on page 18 of the draft report. We believe that the frequency of this type of thorough evaluation should be on a 10 year basis to avoid continual shifts in survey methodology that threaten time series. Such reviews should include input from stakeholders and external reviewers. One model for achieving this type of review would be the use of the Center for Independent Experts to conduct reviews of fishery independent surveys on a rotating basis among Centers, such that each Center's programs are evaluated on a 10 year rotating basis. We recommend that OIG clarify this recommendation to be consistent with text within the report.

**Recommendation 8: Ensure that the NMFS Seattle warehouse management system is explored for use as a model for other regions, and if applicable, used to establish science center warehouse operations.**

We partially concur. The NMFS Seattle warehouse services both the Alaska and Northwest Science Centers, and also performs maintenance work on fishing gear from the Southwest and Northeast Science Centers and the states of Oregon, Washington, and Alaska. Staffing at the facility is high (7 FTEs) relative to the NEFSC warehouse (2 FTEs). Consolidation of services in a common warehouse facility does allow for economies of scale in terms of management systems. NMFS believes that periodic short-term exchanges of personnel among warehouses can result in adoption of best practices initiated by individual operations. The NEFSC sent one

of its warehouse contractors to the Seattle facility to work for a week to initiate discussions concerning warehouse management systems. Such exchanges will continue in the future with best practices identified and adopted among Science Centers.

**Recommendation 9: Develop quality assurance procedures to ensure warehouse operations follow the new protocols.**

We concur. Quality assurance procedures can apply to gear construction, inspection, repair, and maintenance activities and also to warehouse inventory management systems. We believe that implementation of a national program focusing on trawl construction and repair as outlined in Recommendation #1 will focus on quality assurance procedures. We are committed to providing resources for staffing, acquisition, and training required to upgrade warehouse inventory management systems as outlined in this recommendation and Recommendation #4 to the NEFSC S&RD.

Recommendations to the NEFSC Science and Research Director:

**Recommendation 1: Better define protocols for calibrating redundant systems such as the RLT.**

We concur. Procurement, operation, maintenance, and repair of RLT systems on NOAA research vessels is an NMAO responsibility. Personnel from the NEFSC will work with NMAO personnel responsible for calibration of RLT systems to ensure that calibration protocols are revised by January 2004.

**Recommendation 2: Ensure that a charter is established for the trawl survey advisory committee.**

We concur. The NEFSC developed a document in January 2003 that contained many elements typical of a formal charter including the composition of the committee, funding responsibilities, and initial and long-term remits. The Trawl Survey Advisory Committee is a joint function of the Mid-Atlantic and New England Fishery Management Councils. The NEFSC will work with these two entities to draft a formal charter for this advisory committee.

**Recommendation 3: Use the new trawl survey advisory committee to evaluate changes to the net configuration and construction materials to help assess what, if any, calibration testing is required.**

We concur. The trawl survey advisory committee has been established and has held three meetings (over six days) since May 2003. The NEFSC fully intends to utilize the expertise on this committee to evaluate any future changes in the net configuration and construction materials used to construct trawl nets. The committee has already considered recent changes to the Yankee #36 trawl and determined that allocation of resources and effort to calibrate these changes was a lower priority relative to investigating the implementation of net gear in the future.

**Recommendation 4: Implement a more accurate inventory management system.**

We concur. The NEFSC is currently evaluating the level of detail required for a more accurate inventory management system. For instance, should inventory systems simply track constructed nets and dredges, or track inventories of components used to build, rig, and repair various gear? Once the level of inventory management detail is defined, the NEFSC will investigate the availability of commercial inventory software. The NEFSC anticipates that software will be identified and inventory management implemented by March 2004.

**Recommendation 5: Improve the checklist and specifications describing the various components of the trawl net.**

We concur. The NEFSC has been in discussions with personnel at the Memorial University. This group is internationally recognized as being a world leader in the development of fishing gear standardization, and they are routinely contracted by agencies from Canada, Norway, the United Kingdom, and other European countries to standardize research survey gear. We anticipate initiation of a contract with this university in September 2003 and completion of work by June 2004.

**Recommendation 6: Include the door certification procedures as part of the inspection checklist.**

We concur. The NEFSC has already initiated changes in door certification procedures including more rigid gear handling and measurement procedures for chain back straps and more frequent replacement of door shoes. Contractual work conducted by the Memorial University will include updated drawings and checklists related to door certification. Door shoes for doors utilized on the NEFSC Spring, Autumn, and Winter bottom trawl surveys are no longer available from U.S. vendors and must be specially ordered from a European supplier. To ensure a timely supply of door shoes required for maintenance of doors, the NEFSC has initiated procurement of a supply of door shoes expected to meet maintenance needs through the projected phase-out of doors currently used on the survey (2009). Finally, the NEFSC has initiated procurement of two additional pairs of doors to ensure an adequate supply of doors. Delivery of new doors and replacement door shoes is anticipated by December 2003.

**Recommendation 7: Develop protocols for ensuring floats operate as intended and a gear checklist describing the condition of floats that can be used to conduct the survey.**

We concur. The NEFSC has already implemented revised instructions for trawl survey protocols concerning observation of the gear during deployment and retrieval to ensure that the float line of the net is deployed as intended. The gear inspection checklist already includes procedures for inspecting floats to ensure that they are not cracked or filled with water, thus impairing their buoyancy. Gear standardization work to be conducted by the Memorial University will include quantification of the buoyancy of floats currently used on nets.

Survey Related Cost Recommendation:

**Recommendation 1: The assistant administrator for fisheries should ensure that all major cost categories, including gear-related categories, for its independent surveys are identified and tracked.**

It is currently difficult to track gear and survey related costs due to the manner in which these costs are funded. There are little base funds allocated to support gear related costs for activities considered core to the scientific programs at Science Centers. The NEFSC will work to produce a more accurate assessment of survey costs to be used for future planning and allocation exercises.