

Developing Effective Monitoring for the Northeast Multispecies Fishery: Methods and Considerations



White Paper

New England Fishery Management Council

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Program Goals and Objectives

In October 2011, the New England Fishery Management Council (NEFMC; “Council”) convened a workshop on lessons learned during the first year of sector management, which included both panels of sector representatives and breakout groups with a larger number of participants. In the panel that focused on monitoring and in each breakout group, many questions were raised that challenged the efficiency and effectiveness of the monitoring program for the New England groundfish fishery. While participants discussed many specific aspects of the program, both the panel and most of the breakout groups felt that it was necessary to reconsider the goals of the program and then determine whether the current program was the most cost-effective way to meet those goals.¹ The Groundfish Plan Development Team (PDT) has prepared this paper in response to those comments in order to assist the Council in designing a more effective program.

A comprehensive fishery monitoring program consists of both at-sea and shore-side components, and must be designed in a way that at-sea observers, dockside monitoring, and electronic monitoring (or whatever combination of the three are used) complement each other in order to collect the necessary data. These programs also augment or complement the federal Observer Program (NEFOP). Managers are faced with the difficult task of determining the nature of the monitoring and the desired levels of each type of coverage in order to achieve management goals.

Participants at the October NEFMC workshop stated overwhelmingly that affordability was their main concern in the design of a monitoring program. That principle is therefore assumed in this paper. Once program goals and minimum data needs are determined, calculations can be done to determine the most cost-effective way to achieve the desired outcomes. It would also be possible to identify basic requirements for the program and then secondary goals that could be considered as tiered advantages if they are cost-efficient.

The authority for requiring monitoring programs in U.S. fisheries is laid out in the Magnuson Stevens Fishery Conservation and Management Act (“Magnuson Act”). Under the discretionary provisions in §303(b)(8), the Magnuson Act states that:

“...Any fishery management plan which is prepared by any Council, or by the Secretary, with respect to any fishery, may require that one or more observers be carried on board a vessel of the United States engaged in fishing for species that are subject to the plan, *for the purpose of collecting data necessary for the conservation and management of the fishery*; except that such a vessel shall not be required to carry an observer on board if the facilities of the vessel for the quartering of an observer, or for carrying out observer functions, are so inadequate or unsafe that the health or safety of the observer or the safe operation of the vessel would be jeopardized.”² (Emphasis added).

While the Magnuson Act stipulates that observer programs have the purpose of collecting data necessary for conservation and management, it does not provide any further guidance on developing goals and identifying needs for such programs.

¹ New England Fishery Management Council. 2011. Meeting Summary: “New England Fishery Management Council Sector ‘Lessons Learned’ Workshop”. Available at: http://www.nefmc.org/nemulti/council_mtg_docs/Nov%202011/8_SectorWorkshopSummary.pdf (last accessed February 14, 2012).

² 16 U.S.C. §1853. Sec. 303 “Contents of Fishery Management Plans”.

Current Management Goals:

The current rules for monitoring in the groundfish fleet were adopted in Amendment 16 to the Northeast Multispecies Fishery Management Plan (FMP).³ It is important to note that the amendment adopted rules for industry-funded at-sea and dockside monitoring programs, but was largely silent on the interaction (in terms of objectives) between those programs and the NEFOP observer program. What is clear is that the industry-funded component was meant to gather additional data to build upon the NEFOP coverage and to facilitate operation of the sector management program. The amendment stated only one main goal for the industry-funded monitoring program, and did not explicitly make a link between the goal and the monitoring requirements. However, by looking at some of the language in the document it is possible to construct some information on what the overall purpose of monitoring was intended to be.

The clearest statement of the purpose of the monitoring program in Amendment 16 is this:

“The primary goal of observers or at-sea monitors for sector monitoring is to verify area fished, catch, and discards by species, by gear type. This data will be reported to the sector managers and to the NMFS. Electronic monitoring may be used in place of actual observers or at-sea monitors if the technology is deemed sufficient for a specific trip based on gear type and area fished.”⁴

However, based on other information in the document and the particular standards that it adopted for monitoring, there seem to be secondary goals or other purposes for which the program was intended. The requirements for sector operations plans included several references to both dockside and at-sea monitoring proposals that would provide adequate monitoring for ACE, as well as monitoring of sector regulations including landings and discards.⁵ It is not clear what, if any, other sector regulations were meant to be included in that category. For the stated primary goal, it is also not clear whether the information is meant to be used to ensure that sectors do not exceed their allocations, or whether there was meant to be scientific or other components to the program.

Strategic Guidance for Setting Monitoring Goals in New England:

The United Nations Food and Agriculture Organization (FAO), in its handbook “Guidelines for Developing an at-Sea Fishery Observer Programme”, states that, “Observer programmes are usually implemented in order to generate data for both *fishery science* and *compliance* purposes,

³ New England Fishery Management Council (NEFMC). 2009. Amendment 16 to the Northeast Multispecies Fishery Management Plan. New England Fishery Management Council, Newburyport, MA.

⁴ *Ibid.*, p. 109.

⁵ “...A plan and analysis to show how the sector will avoid exceeding their allocated TACs (or target TACs if the allocation is in terms of DAS). This plan should include provisions for monitoring and enforcement of the sector regulations, including documentation of both landings and discards...detailed information about the sector’s *independent third-party weighmaster system* that is satisfactory to NMFS for monitoring landings and utilization of ACE... [and] detailed information about a monitoring program for discards.” *Ibid.*, p. 100.

which in turn serve wider *fisheries management* objectives.”⁶ The handbook goes on to further delineate the two categories and concludes that a program must develop a balance between the two in accordance with management priorities and programmatic constraints. It also states that priority-setting and evaluation of constraints should ideally be performed when management plans are developed or updated, but that if no management priorities are available they can be assessed at the time of developing an observer program.

In 2008, two researchers from the Archipelago organization in British Columbia authored a paper evaluating monitoring and reporting needs for sectors in New England.⁷ In the paper, they urged that, “The design of an effective and comprehensive monitoring program is guided by having a clear understanding of the objectives for the program.” Objectives were broken into categories based on whether they were objectives of managers or industry participants, and some were considered to be shared while others were distinct between the two groups. The objectives for managers included TAC management, quantifying total mortality, species and area management, timely information, improved stock assessment, and improved compliance. Industry’s monitoring objectives were listed as timely and accurate data, a level playing field, affordability, and economic benefits.

Another study that was conducted by MRAG Americas in order to develop principles for development of monitoring programs⁸ found that goals should be established in similar categories to those described by the FAO and Archipelago studies. The reasons for establishing goals include science (conservation initiatives or stock assessment needs), management (assessing catch and landings), industry (community sustainability or value-added processing or marketing), and enforcement (enforcing regulations). In addition, they reason that goals for monitoring must be carefully crafted to ensure attainment of overall management goals, and that goal-setting must be adaptive and include regular evaluation and revision of the monitoring program through a formalized evaluation framework that is developed alongside the monitoring program itself. The MRAG paper goes on to identify several fisheries in Alaska and British Columbia that set goals for monitoring and illustrates how the monitoring program and evaluation were tailored to achieve those goals.

Goal-Setting in Other Regions:

In catch share fisheries around the world, comprehensive monitoring programs exist to meet the needs of science, management, compliance, and industry as outlined above. This paper will focus on three regions of Canada (Scotia-Fundy, Quebec, and Pacific) and the U.S. West Coast Groundfish Observer Program due to some general similarities with the New England groundfish

⁶ Davies, Sandy. 2003. Guidelines for Developing an at-Sea Fishery Observer Programme. Reynolds, Eric (ed.) FAO Fisheries Technical Paper 414. Available at <http://www.fao.org/DOCREP/005/Y4390E/y4390e00.htm>.

⁷ McElderry, H. and B. Turriss. 2008. Evaluation of Monitoring and Reporting Needs for Groundfish Sectors in New England. Available at: <http://www.gmri.org/upload/files/GroundfishMonitoringNeedsFinalReportfinal.pdf>.

⁸ MRAG Americas. 2011. Guiding Principles for Development of Effective Monitoring Programs. Available at: <http://blogs.edf.org/edfish/files/2011/05/MRAG-EDF-Guiding-Principles-for-Monitoring-Programs-Final-Final.pdf>

fishery. Some of these fisheries operate under ITQs and therefore may demand differing program objectives.

The Canadian framework for fisheries monitoring⁹ differentiates between fishery monitoring and catch reporting, but considers them to be complementary processes that together provide a picture of how a fishery is operating. *Fishery monitoring* is defined as “observing and understanding the fishery and its dynamics... includ[ing] observation and examination of the catching and landing of fish and any related activities, such as counting of vessels and gear and sampling of any fish caught.” *Catch reporting* is defined as “providing information either verbally, in writing or electronically on the catch and other essential details related to the fishing activity (location, gear type, etc).” The framework suggests that monitoring and catch reporting are not activities that are clearly defined to be conducted by monitors alone.

“Monitoring is carried out by harvesters, First Nations and, increasingly, third party observers designated by DFO. Departmental staff including fishery officers, fishery guardians, fishery managers, biologists and scientists also conduct monitoring activities... Reporting is performed by harvesters or by fish buyers, off-loaders or contracted third party dockside monitors/observers... on behalf of harvesters.”

This approach suggests that the activities normally associated with monitoring may be performed by parties other than traditional observers if it is more sensible logistically or economically. The delineation of duties for each party in a monitoring program needs to be considered carefully in order to ensure accuracy of data, elimination of redundancy, and cost reduction. Following the framework, each region in Canada is able to create its own monitoring program based on local conditions, priorities and capabilities.

In the early years of the monitoring program in the eastern Canadian Scotia-Fundy region, an operations manual was developed that described the objectives and operations of the program.¹⁰ These were relatively narrowly defined compared to some goals in other regions. The primary objectives were:

1. To maintain an observer presence of between 50% and 100% on all foreign vessels within the coverage area;
2. To maintain an observer presence of 10–15% on all domestic groundfish vessels greater than 30 m;
3. To gather information on fish stocks and fishing techniques to improve the state of knowledge in the areas of stock assessment, setting of TAC's, population dynamics, gear behaviour, etc;
4. To monitor and report on compliance with fisheries acts, regulations, and policies.
5. To provide senior management with relevant information necessary in the formulation of sound fisheries policies and regulations; and

⁹ Fisheries and Oceans Canada Pacific Region Fisheries and Aquaculture Management. 2010. Strategic Framework for Fishery Monitoring and Catch Reporting in the Pacific Fisheries. Available at: <http://www.pac.dfo-mpo.gc.ca/consultation/picfi-ipcip/docs/monrep-survdecl/stratfwk-cadre-strat-eng.pdf>

¹⁰ Van Helvoort, Gus. 1986. Observer Program Operations Manual. Department of Fisheries and Oceans. Halifax, Canada. FAO Fisheries Technical Paper 275. Available at: <http://www.fao.org/DOCREP/003/S8480E/S8480E00.HTM>.

6. To assist the fishing industry when and where possible and to acquaint it with the goals of the observer program.

There were also two secondary objectives identified:

7. Pollution control monitoring; and
8. Protection of submerged telecommunication cables.

While these objectives are clearly identified, it is unclear what led to the goals describing specific coverage levels. It is likely that objectives three through five led to the development of goals one and two.

The Quebec region employs at-sea observers who are independent but accredited by the Department of Fisheries and Oceans. The program website describes its mandate, which is not necessarily equivalent to an objective but does define the purpose of the program. The mandate is defined as... “Allow[ing] for the collection of detailed, geographically co-ordinated information on the fishing effort, catches and discard at sea. This information, which would be difficult to collect through other programs, allows the DFO to meet its information needs” in the areas of conservation and protection, fisheries management, and science.¹¹

In contrast, the more recently developed Pacific Canadian monitoring system has very broad and explicitly stated goals. The primary goal is, “To have accessible, accurate, and timely fisheries information, such that there is sufficient information and public confidence for fisheries to be managed sustainably and to meet other reporting obligations and objectives.”¹² A risk-based strategic framework has been developed for Pacific Canada in order to balance the biological, socioeconomic, management and other risks for Pacific fisheries and determine the highest priorities for monitoring. There is also a strategic approach to implementation outlined that puts the observer program into an effective overall monitoring system, including through the completion of a comprehensive information management system. Five main principles are identified to guide the application of the strategic framework: conservation and sustainable use, consistency and transparency, tailored requirements, shared accountability and access, and cost-effectiveness.

The West Coast Groundfish Observer Program’s (WCGOP) goal, as defined in the training manual for observers, is “to collect bycatch information that can be used to assess the total mortality of a variety of groundfish species.”¹³ This very specific goal has been also stated

¹¹ <http://www.qc.dfo-mpo.gc.ca/peches-fisheries/surveillance/observateur-observer-eng.asp>.

¹² Fisheries and Oceans Canada Pacific Region Fisheries and Aquaculture Management. 2010. “Summary of the Strategic Framework for Fishery Monitoring and Catch Reporting in the Pacific Fisheries. Available at: <http://www.pac.dfo-mpo.gc.ca/consultation/picfi-ipcip/docs/monrep-survdecl/summfwk-sommcad-eng.pdf>.

¹³ (NWFSC) Northwest Fisheries Science Center. 2011. West Coast Groundfish Observer Manual April 2011 Catch Shares Training Manual. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd. East, Seattle, Washington, 98112. p. 2-2. Available online at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/pdf/cs_manual_2011/Chapter%202%20WCGOP%20April%20CS%202011.pdf.

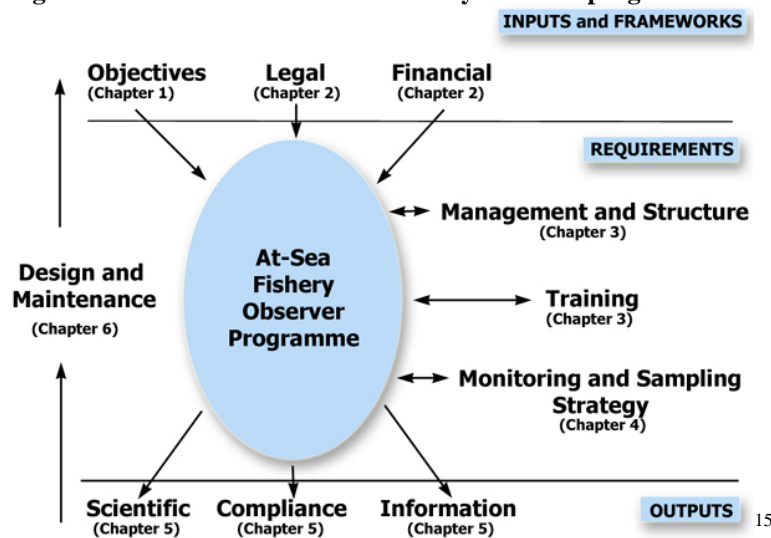
slightly differently as “to improve total catch estimates by collecting information on the discarded catch (fish returned overboard at-sea) of west coast groundfish species.”¹⁴

Together, these examples from other regions serve as examples of the types of goals that may be adopted in order to design a monitoring system that meets the most critical management objectives while keeping overall industry costs down.

Summary:

It is useful to keep in mind this overarching framework from the FAO guidelines in order to visualize how objectives fit into an overall monitoring program.

Figure 1 – Structure for an at-sea fishery observer program



The authority for creating fisheries observer and monitoring programs comes from the Magnuson Act, but aside from allowing monitoring for collecting necessary data its guidance is vague. In the current groundfish rules for New England, Amendment 16 mentions the goal of verifying sector catch but some of the standards it adopts seem to imply other goals. Several guidance documents are available that describe different categories of goals. The FAO’s guidelines divides goals into those relating to science and compliance and the Archipelago report differentiates between managers’ and industry’s goals, while the MRAG report reiterates those categories and stresses the need for evaluation and adaptive planning. While all the reports outlined the need to identify goals and principles for monitoring in order to craft a closely-tailored, cost-effective, and useful system, they also noted that goals may need to change based on changing data needs, and should be reviewed periodically.

¹⁴ Bellman, M.A., A.W. Al-Humaidhi, J. Jannot, J. Majewski. 2011. Estimated discard and catch of groundfish species in the 2010 U.S. west coast fisheries. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112. p. 6. Available online at: http://www.pcouncil.org/wp-content/uploads/E2c_NWFSC_ELECTRIC_NOV2011BB.pdf.

¹⁵ Davies, S. 2003.

In other regions with mixed-stock fisheries that are managed by catch shares, different goals have been adopted that shape the structure of their monitoring systems. The Canadian framework for monitoring introduces the idea that monitoring and reporting information is necessary, as is the ability to gather it from different sources. In eastern Canada in the 1980's, monitoring goals were narrowly defined, and the Quebec region gathers information on catch, effort, and discards in order to support conservation, fisheries management, and science activities. The goals in Pacific Canada are broad-ranging but strategically closely tied to program implementation and periodic review, and in the West Coast groundfish fishery the goals are very specifically attached to estimating total mortality including discards.

The following table summarizes some example goals for a comprehensive monitoring program that have been gleaned from the above literature as well as comments at the NEFMC sector workshop. The goals are separated based on whether they relate to science or management goals as suggested by the FAO paper. Some of the items in the table may be contradictory or partially or wholly redundant with other items, but all are provided as possibilities for consideration. Also included is a statement of whether the goals are being met or performed by NEFOP at this time and, in some cases, the current sector at-sea monitoring program (ASM).

Table 1 – Sample goals for monitoring programs

Category	Goal	Does NEFOP Do This?	Notes
Science	Determine total catch and effort of target or regulated species	YES	
Science	Determine total catch and effort of non-target or non-regulated species	YES	
Science	Biological sampling	YES (NO DNA w/ASM)	Spawning condition, fish size, disease rates, shell condition?
Science	Environmental parameters	YES (LIMITED w/ASM)	
Science	Monitor for high-grading	YES	
Science	Determine condition of caught and released species	YES	
Science	Protected species monitoring or sampling	YES (NO DNA w/ASM)	
Science	Determining gear effectiveness	YES (LIMITED w/ASM)	
Science	Estimates of pollution levels	NO	
Science	Production estimation	YES if all discards assumed dead; otherwise estimates of viability must be applied to discards	Must include caution not to introduce a deployment bias
Science	Determine discard rate	YES	
Science	Quantify total mortality including discards	YES	
Science	Gather data to determine mortality rate	NO for groundfish (YES for some species - mammals, turtles, birds, sharks, sturgeon, tuna)	Species of fish, condition identifiers, gear used, fishing depth, or length of fishing time

Science	Determine catch by area	YES	
Science	Obtain accurate catch and effort information	YES	From BSAI crab rationalization
Science	Describe fishing practices	YES (LIMITED gear characteristics w/ASM)	From BSAI crab rationalization; Potential socioeconomic benefit
Compliance	Area and gear restrictions	YES	
Compliance	Illegal discarding	YES	
Compliance	Prohibited species	YES	
Compliance	Size limits	YES	
Compliance	Validate vessel logbooks	NO	
Compliance	Labeling of processed fish (?)	NO	
Compliance	Monitor overall ACL	YES	
Compliance	Monitor sector catch in order to prevent overage and coordinate ACE transfer	YES	
Compliance	Protection of non-biological resources	NO	I.e. shipwrecks, telecom cables in Canada
Other	Affordability	YES (i.e. competitive pricing with cost-to-value consideration)	
Other	Improved communication with fishermen	YES	
Other	Improve stock assessment inputs	YES	Coordination needed with NEFSC to determine how data can be improved for ready incorporation
Other	Promote fairness among industry participants	YES	
Other	Allow for improved business planning	DON'T THINK SO	
Other	Provide greater operation flexibility	YES	
Other	Remove need for certain management measures	NO	Rolling closures, trip limits, etc.
Other	Reduce management and/or biological uncertainty	YES	
Other	Improve asset value of allocations	YES	More clearly defined access and improved economic returns
Other	Develop timely entry of fishery data into searchable databases	YES	From BSAI crab rationalization
Other	Review monitoring program for effectiveness	YES	
Other	Have individual accountability	NO	From BSAI crab rationalization
Other	Transparency	YES	From Pacific Canada
Other	Consistency	YES	
Other	Tailored requirements for different fleet components	NO	
Other	Shared accountability and/or access	YES	

2012 Goals for New England Groundfish:

On March 29 2012, the Groundfish Committee voted to adopt the following goals for a comprehensive monitoring program for New England groundfish (subject to approval by the full Council).

Goal 1: Improve documentation of catch

Objectives:

- Determine total catch and effort, for each sector and common pool, of target or regulated species
- ~~Determine catch by area to ensure accurate catch accounting while maintaining as much flexibility as possible to enhance fleet viability (Council motion April 2012)~~
- Achieve coverage level sufficient to minimize effects of potential monitoring bias while maintaining as much flexibility as possible to enhance fleet viability (Council motion April 2012)

Goal 2: Reduce cost of monitoring

Objectives:

- Streamline data management and eliminate redundancy
- Explore options for cost-sharing and deferment of cost to industry
- Recognize opportunity costs of insufficient monitoring

Goal 3: Incentivize reducing discards

Objectives:

- Determine discard rate by smallest possible strata while maintaining cost-effectiveness
- Collect information by gear type to accurately calculate discard rates

Goal 4: Provide additional data streams for stock assessments

Objectives:

- Reduce management and/or biological uncertainty
- Perform biological sampling if it may be used to enhance accuracy of mortality or recruitment calculations

Goal 5: Enhance safety of monitoring program

Goal 6: Perform periodic review of monitoring program for effectiveness

Monitoring Program Standards

Current Monitoring Requirements and Practices

To be completed (including current cost information)

Sectors are required to monitor members to ensure compliance with self-regulating measures designed to prevent a sector allocation overage. Sectors must fund a sector manager, who oversees reporting requirements, and develop and enact an at-sea monitoring program. The existing NMFS observer program will not be replaced by the industry funded program. It can be used to provide an estimate of costs as the goals of both programs are to verify areas fished and record catch and discards by species and gear type. Based on Groundfish Fishing Year 2010, the overall cost at-sea monitoring seaday cost is \$917.95. The costs for an at-sea monitor can be separated into two components: at-sea and infrastructure. At-sea monitors are paid a sea day rate and an hourly rate when they're on land or extended travel. They use an average of 12 hours per day for at sea time. The average at-sea monitor seaday wages and insurance and benefits (?) comprise the highest percentage of costs at 68.68% (\$630.44). Travel and training are smaller components at 3.52% (\$32.28) and 4.08% (37.46) respectively. Infrastructure and support costs account for the remainder. These include coordination of trip logistics, gear and equipment, communication and shipping, business fees and taxes. Sector contract labor including training and data processing costs \$114.17 (12.44%). Support contracts for expert trainers, vessel training trips, freezers and facilities cost \$37.88 (4.13%). Gear costs another \$8.85 (0.96%). FSB FTE labor costs \$50.86 (5.54%) and travel is \$6.00 (0.65%).

The following information is currently gathered by the NEFOP observers and is incorporated into assessments for at least some groundfish stocks:

For kept and discarded catch, the following data is collected (note that not all catch is sampled; sometimes it is only a subsample and then extrapolation imputes the results to all catch):

- actual weights;
- length frequencies;
- age structures;
- tissue and/or other samples (otoliths, scales, etc); and
- kept and discarded catch.

The data is used to establish:

- length-weight relationships;
- age-weight relationships (and maturity-at-age);
- migration patterns;
- food habits;
- other information; and
- catch and discards at age/length.

The observers are also collecting:

- some economic information;
- gear information;
- tow information such as wave height and time; and
- information on protected species.

Data Needs and Other Monitoring Outputs as Determined by Program Goals

To be completed

Other Considerations

Standards for Accuracy and Precision

To be completed

Biological and Management Uncertainty Associated with Monitoring

To be completed

Observer Bias

To be completed

Full Retention

The Northeast Multispecies FMP specifies minimum size limits for cod, haddock, yellowtail flounder, winter flounder, witch flounder, plaice, redfish, pollock, and halibut. Minimum size limits are not specified for white hake, wolffish, ocean pout, or windowpane flounder (three of these species cannot be landed under present regulations).

Possession limits no longer apply to sector vessels for allocated groundfish¹⁶, but they are still used for common pool vessels fishing under effort controls.

The impacts of removing minimum size regulations are difficult to predict because of the interactions with minimum mesh regulations and other factors that affect selectivity (time and area fished, targeting behavior, etc.). The combination of minimum size and mesh increases has affected the size of fish captured. The selectivity of several multispecies stocks has shifted to older fish as these regulations changed over time, generally consistent with the adoption of increased mesh sizes and minimum sizes.

While it is sometimes argued that requiring full retention will merely convert discards to landings and not affect the catch at age, this assumption may not prove valid if profits can be increased by targeting smaller fish. Whether a change in selectivity will occur depends on several factors, including whether there is a price differential for a species that is based on size, whether it is easy to target smaller fish, and the relative abundance of different size fish. If fishermen can catch smaller fish more quickly and thus reduce operating costs then a change in selectivity is more likely. If removing minimum fish sizes leads to a change in fishing behavior and selectivity, then there will be changes in the yield per recruit (YPR) and biological reference points (including F_{MSY} and SSB_{MSY} or their proxies).

Based on analysis of GOM cod and CC/GOM yellowtail flounder, a change in selectivity to younger ages would result in a reduction in yields over the long term. It does not appear that there would be an increase in fishing mortality in the short term that would be caused by fishing on a quota that was set with a different selectivity.

While this analysis focuses on changes in YPR, it does not address possible changes in recruitment. For some groundfish stocks there is evidence that older, larger fish have higher fecundity. YPR analyses do not address the changes in recruitment that may occur from reducing the number of older fish in the population.

While there does appear to be the potential that requiring full retention by removing minimum size and possession limits may result in a change of fishery selectivity, as long as catches are adequately monitored and the change can be detected in reasonable amount of time it should not lead to biological concerns for most groundfish stocks. If there is a shift, the long term impacts are that fishery yields will decline, F_{MSY} or its proxy will likely decline, and SSB_{MSY} or its proxy will probably increase. Rebuilding periods may be extended if adjustments are not made to projected catches to account for the change in selectivity. These changes should be anticipated and planned for.

A more detailed report can be found at www.nefmc.org.

¹⁶ Ocean pout, windowpane flounder, Atlantic wolffish, and SNE/MA winter flounder are not allocated and retention is prohibited.

Length Frequency Analysis of Discards

The PDT examined the established minimum sizes of the allocated groundfish following discussion of the large number of sub-legal yellowtail flounder (approximately 12" Total Length) being discarded. Fishermen are faced with paying for at sea monitoring from FY2013 and beyond. The reduction in regulatory discards could increase landings and reduce monitoring costs but may have unexpected impacts on a population if fishing behavior changes in response to markets developing for currently undersized fish.

ASM and NEFOP observer data from 2008 to 2012 were examined to determine the length distribution of discarded cod, haddock, Pollock, witch flounder, yellowtail flounder, American plaice, Atlantic halibut, winter flounder and redfish. This analysis focused on trawl gear, including variations such as the Ruhle trawl and the haddock separator trawl. A number of other parameters were looked at to detect any influences on the length frequency by statistical area, gear type, mesh size, mesh shape, depth, quarter and year.

Large numbers of sub-legal sized fish are being discarded for allocated groundfish. A reduction in the minimum size would reduce discards on some species but may not have a significant effect for others because factors other than the minimum size regulations are driving those discards. A reduction in the minimum size, e.g. by an inch, is expected to reduce discards for cod, haddock, witch flounder, yellowtail flounder, plaice and winter flounder; reductions for pollock, halibut and redfish may not be as significant. Some of the revised minimum size estimates are below the length at 50% maturity. For the species where estimates of size at 50% maturity are available, it is clear that the majority of the fish over the minimum size is mature and has a higher probability of having already contributed to the spawning population. The initial contribution of newly maturing fish to the spawning population may be small but their lifetime fecundity may contribute significantly. The reduction or removal of the minimum size regulations would alter the ratio of mature and immature fish. If the minimum size is reduced more mature fish would be removed. The analysis also indicates that changes to trawl gear mesh size or configuration could also reduce discards.

A more detailed PDT report can be found at www.nefmc.org.

Funding Mechanisms and Cost-Sharing

Several different methods have been used or considered to generate funds for payment of monitoring programs in United States fisheries. Some of these methods, with considerations for each, are described below. There may be legal or policy barriers to implementing some of these cost-sharing models in the Northeast groundfish fishery, but all are listed for purposes of reference.

Traditional Industry-Funded Model

There are several ways in which the industry could pay directly for a monitoring program. These include through a monthly fee, an annual fee, or through fee-for-service (in which payment would be made on the basis of an observed sea day or given component of a sea day). Costs could also be distributed among sectors, and the sectors could be responsible for dividing and collecting fees in order to pay them. If fees are lumped rather than charged per sea day, the timing of payments may need to be considered, as certain times of the year may see less revenue generated in given segments of the fishery.

Differentiation of costs

The industry-funded model could also be implemented in such a way that industry is only responsible for payment of certain components of the cost of monitoring. One consideration could be to evaluate who is benefitting from what information, and allowing the beneficiary to pay for the information they are collecting. For example, sectors may use information about ACE accounting, while the government may use information about protected resources, compliance, or auditing.

Some fisheries in the United States differentiate responsibility for costs between the industry and the government. In Alaska, for example, the rules for monitoring programs changed recently but under the previous program NMFS provided the costs associated with managing the program (operational oversight, certification training, definition of observer sampling duties and methods, debriefing of observers, and management of data). The vessel and plant owners paid for the entire cost of observers on a daily basis through contracts with private observer companies. This industry portion of the costs included travel, accommodations, and insurance for the observers.¹⁷

The industry-funded model also does not have to apply to the entire fleet. Until this year, vessels under 60 ft. in length were exempt from payment for monitoring coverage in the Alaska fisheries.

License fee Model

Monitoring coverage could be paid for using a license fee model, in which a fee is collected at the beginning of the fishing year or when permits are transferred. The implementation date of the monitoring program could be delayed until the desired level of funding is achieved.

¹⁷ North Pacific Fishery Management Council, Letter to Eric Schwab. June 30, 2010. Available at: http://www.fakr.noaa.gov/npfmc/PDFdocuments/conservation_issues/Observer/ObserverFundingLtr610.pdf.

Cost-recovery model

This model, which is used in some fisheries including the Alaska sablefish and halibut IFQ fishery, allows funds to be recovered as a percentage of ex-vessel value (or poundage of fish caught). This type of cost recovery is authorized for LAPP fisheries in the Magnuson Stevens Act, and is capped at three percent of the vessel's revenue. The fees can be collected in three ways:

1. At the time of landing;
2. At the point of sale; or
3. At the end of the year.

Lease/Credit Model

Under this model, fishermen would be offered leases or credit up front to pay for the cost of monitoring. There are several ways in which they could then repay the loans, such as with a landing fee or a percentage of ex vessel value. The payments could be returned only when income is generated from the fishery, assuring that the cost of monitoring would not make fishing businesses unprofitable.¹⁸

While this model would be expensive to fund at its inception it may, at least in part, mitigate the issue of interannual uncertainty in the NMFS budget by allowing funds to be disbursed on a one-time basis. There are several variations that could be considered, including having funds disbursed at once to cover a multi-year period, or using repayments in one fishing year to fund loans the following year. It would also enable a monitoring program to be implemented relatively quickly, even when stock levels are low and fishermen lack capital for financing such a program.

Quota set-asides

With a quota set-aside, part of the allowable catch in the fishery is reserved for the purpose of paying for monitoring. This is the approach used in the Northeast sea scallop fishery. This approach lacks utility if the value of the fish that are set aside is too low to pay for an effective monitoring program.

A derivative of this concept would be the auctioning of the part of the ACL that is set aside for management uncertainty; this idea is fully explored in a previous PDT report.

Public/private partnerships

The Fisheries Conservation and Management Fund was created by the Magnuson Stevens Act so that donations may be gathered from government, industry participants, and private corporations:

“The Secretary shall establish and maintain a fund, to be known as the “Fisheries Conservation and Management Fund”, which shall consist of amounts retained and deposited into the Fund... Amounts in the Fund shall be available to the Secretary of Commerce, without appropriation or fiscal year limitation, to disburse as described for... Improvement of monitoring and observer coverage through the expanded use of

¹⁸ Jain, Monica. 2011. Making Data Collection and Monitoring Financeable. Available at: <http://www.fisheriesforum.org/sites/www.fisheriesforum.org/files/ECF%202011%20%28Jain%29%20-Making%20data%20collection%20and%20monitoring%20financeable.pdf>.

electronic monitoring devices and satellite tracking systems such as VMS on small vessels... Any amount generated through quota set-asides established by a Council under the Magnuson-Stevens Fishery Conservation and Management Act and designated by the Council for inclusion in the Fishery Conservation and Management Fund, may be deposited in the Fund... The Fishery Conservation and Management Fund may also receive funds from—

(A) appropriations for the purposes of this section; and

(B) states or other public sources or private or non-profit organizations for purposes of this section.”

Agreements for sharing of costs can also be formed through other arrangements, such as commercial/value-chain partnerships.¹⁹

Incentives for Payment

Incentives such as eco-certifications or labeling can also be used to encourage fishermen to share the responsibility of cost by creating market value. In Alaska, participants in the groundfish fishery were willing to fund observer coverage to refute claims of ecosystem damage.²⁰

Monitoring Program Safety

To be completed (including observer/crew interactions and other safety information)

What Changes Are Needed to Meet Goals?

To be completed

Dockside Monitoring

To be completed

At-Sea Monitoring

To be completed

Electronic Monitoring

To be completed

Conclusions and Next Steps

To be completed

¹⁹ Holliday, Mark. 2012. “Meeting Monitoring Priorities in U.S. Fisheries”. Available at: http://www.pcouncil.org/wp-content/uploads/14b_SUP_NMFS_PPT_APR2012BB.pdf.

²⁰ MRAG Americas. 2011. Guiding Principles for Development of Effective Monitoring Programs. Available at: <http://blogs.edf.org/edfish/files/2011/05/MRAG-EDF-Guiding-Principles-for-Monitoring-Programs-Final-Final.pdf>.

Appendices: Case Studies from Other Regions

Monitoring Programs in Other Regions

ALASKA REGION

Central Gulf of Alaska Rockfish Fishery

The Central Gulf of Alaska rockfish fishery takes place in Federal waters near Kodiak, Alaska. The fishery was managed under the Rockfish Pilot program from 2007 to 2011, which was a 5-year pilot project that allowed harvesters to form voluntary cooperatives and receive exclusive allocations of 6 groundfish species. This program was set to expire in 2011, but was made permanent as the Central Gulf of Alaska Rockfish Fishery LAPP Program in 2012. The program assigns quota share for primary and secondary rockfish species to LLP permit holders, which is then assigned to a rockfish cooperative to fish for the year. Halibut Prohibited Species Catch (PSC) is also allocated to participants based on historic halibut mortality rates in the primary rockfish species fisheries. Shore-based processors receiving rockfish cooperative quota must be located within the boundaries of the City of Kodiak. The rockfish cooperative fishing season is authorized May 1 through November 15 of each year. An entry level fishery starts January 1 of each year for harvesters who are directed fishing for rockfish primary species using longline gear only. The discussion to follow focuses on the trawl catcher vessel sector, which is most similar to the Northeast groundfish fleet.

The CGOA rockfish fisheries are prosecuted almost exclusively with trawl gear (including catcher vessels and catch /processors). There were 176 trawl-endorsed catcher vessel licenses, endorsed for operation in the CGOA, issued in 2009. This number is expected to decline to 97 catcher vessel licenses once recent Council actions to remove inactive licenses in the fishery take effect. Of these, 32 have an LOA of less than 60 feet, while 64 will have an LOA of 60 feet to 125 feet and 1 will have an LOA of 125 feet or greater. More than 900 non-trawl (longline) endorsed licenses have been issued for the CGOA, but few longline vessels actually participate in the fishery (~1-2 vessels). In the last 5 years, longline catches have averaged slightly less than 20 metric tons (CITATION). For trawl catcher vessels, Pacific cod composes the majority of landings, peaking at over 1,400 metric tons in 2003, followed by sablefish, shortraker rockfish, roughey rockfish, and thornyhead rockfish. Since the rockfish fisheries are prosecuted only in July, vessels that participate in the rockfish fisheries also participated in several other fisheries in the GOA and the BSAI, primarily pollock and Pacific cod. Thus, revenues from the CGOA rockfish fisheries (including revenues from rockfish secondary species harvested in the rockfish fisheries) are a minor part of the revenues of catcher vessels eligible for the CGOA rockfish fisheries (i.e., less than 10% of total ex-vessel gross revenues). Between 1996 and 2006, ex-vessel gross revenues ranged from \$655,000 to \$2,499,000 for rockfish, but vessels were also eligible to fish for Pollock, halibut, groundfish, pacific cod, crab, with combined total ex-vessel revenues of \$28,366,000 to \$54,096,000 (NPFMC, 2011).

Under the Pilot Program, catcher vessel participation remained about the same. Total catch (no discarding is allowed) of primary rockfish species was around 8500mt in 2007 and 2008. Only the five qualified processors participated in the rockfish fisheries in the first 2 years of the Pilot Program. Under the permanent program, processors and shore plants must land in or be located in Kodiak to form an association with a rockfish cooperative to receive deliveries.

The Monitoring Program

The Rockfish Program largely retained the monitoring requirements of the Rockfish Pilot Program, with some modifications. The purpose of these requirements is to ensure against misreporting of catch and high-grading and to provide defensible estimates of total catch. Under the Pilot Program, catcher vessels were required to have 100% coverage in July when they were called into the program (catcher vessels can notify NMFS on a haul-by-haul basis what fishery they are participating in). The Rockfish Program modified the coverage requirement such that catcher vessels must have 100% coverage while participating in the program at any time during the fishing year. Vessels contract directly with providers on a pay-as-you-go system. Thus, the timing and method of notification for trips is determined by the vessel and provider.

Under the Pilot Program, processors were required to have an observer to monitor every rockfish delivery and multiple observers in 12 hour shifts if the offload was longer than 12 hours. Under the Rockfish Program, processors are required to have a catch monitoring control plan (CMCP) for processing rockfish species. Before the offload of any rockfish deliveries, the processor must notify a CMCP specialist at NMFS who will monitor landings and compliance with the CMCP. The CMCP would be a full time NMFS staff member paid for by a portion of the cost recovery fees collected from the program. To reduce costs and eliminate redundancies, the rockfish CMCP specialist would only monitor program deliveries to ensure compliance with the CMCP and would not be trained as an observer or requested to complete any observer duties such as verifying non-rockfish fish tickets, assisting vessel observers, or collecting biological or scientific data. Program processors would be required to notify the CMCP specialist at least an hour prior to a program delivery. The CMCP specialist would establish a monitoring schedule such that most (if not all) deliveries would be monitored. In the event of conflicting deliveries, the CMCP specialist would determine which program deliveries would be monitored. Since only 5 or more processors are eligible to participate in the program and all are located in Kodiak, a CMCP specialist is expected to be able to provide 100% coverage of all IFQ deliveries.

For the entry level fishery (longline vessels), which is allocated only primary species (3 species), only 30% observer coverage would be required to monitor relatively small levels of catch. Because catch accounting will take place shoreside, participating entry level processors will be required to meet the same standards as other program processors (100% coverage).

Costs and Funding

NMFS estimated the labor costs of a CMCP specialist to be approximately \$40,000 per season. As this position would be funded by cost recovery fees, NMFS provided up-front funding for this position in 2012 until cost recovery fees become available. Because cost recovery fees are used to pay for the specialist, the cost of the shoreside monitoring program is born by the catcher vessel and catcher/processor sectors in addition to the costs of at-sea monitoring. The Council reasoned this was justified because the allocation of IFQ created the need for the increased monitoring of landings and IFQ share holders are effectively determining the distribution of landings among plants by their delivery choices.

NMFS provides and covers the cost of observer training, administration, and data-processing for the at-sea monitoring program as part of the North Pacific Groundfish Observer Program, so the industry is only responsible for the costs of hiring an observer for sea-day coverage. In 2008, the estimated cost of observers under the pay-as-you go system in the Rockfish Pilot program was \$366/day. A total of 311 sea days were monitored, resulting in a total estimated cost to the industry of \$113,826 for at-sea monitoring (CITATION).

Lessons-Learned

Fishing year 2012 was the first year of the new Rockfish Program and monitoring requirements, so information is not yet available on the performance of the program.

NORTHWEST REGION

Pacific Coast Groundfish Trawl IFQ Fishery

The Pacific Coast Groundfish Fishery is a multispecies fishery including more than 90 species in a management unit spanning from the U.S. border with Canada to the U.S. border with Mexico. Managed species include sharks, several species of roundfish (e.g., sablefish, pacific cod, pacific hake), several species of flatfish (e.g., soles, sanddab, turbot), and numerous species of rockfish. The fishery is composed of different components, including the at-sea catcher-processors and motherships (both trawl fisheries), and the shorebased IFQ fishery (trawl and fixed gear), some of which target whiting and some non-whiting species complexes. The non-whiting groundfish fishery is prosecuted mainly with trawls, longlines, and pots. The shoreside non-whiting trawl sector focuses mainly on species like sole, rockfish, and roundfish.

Prior to 2011, the trawl fishery was managed under a limited entry program with annual quotas and bi-monthly trip limits. In 2011, Amendment 20 to the Pacific Coast Groundfish Fishery Management Plan implemented an Individual Fishing Quota (IFQ) program for the limited entry trawl sector (includes shorebased whiting and non-whiting trawl sectors, at-sea catcher-processors and motherships). The trawl sector began fishing

under the program January 2011, and various portions of the program have been phased-in in 2011 and 2012. The following discussion focuses on the monitoring requirements of the shorebased non-whiting trawl IFQ sector, as that component of the fishery is the most akin to the Northeast groundfish fishery.

The trawl sectors account for 98% of all groundfish landings between 1995 and 2008, mainly because of the high volume of landings of Pacific whiting. From 1995 to 2008, total annual landings of the non-whiting shorebased trawl sector ranged between 17,846.41mt and 51,227.39mt (PFMC, 2010). By comparison, the fixed gear sector landed between 2,357.09mt and 7,728.84mt during the same period. Annual ex-vessel revenue ranged between \$20,879,203 and \$56,489,165. Since 2002, ex-vessel revenues have stabilized at around \$23 million to \$27 million per year. Although non-whiting species account for a relatively small portion of total groundfish landings by the trawl sector (only 9% on average 2004-2008), it accounts for 39% of ex-vessel revenue because of the comparatively higher value of non-whiting species (PFMC, 2010). The number of shorebased trawl vessels, including whiting and open access vessels, ranged between 155 and 159 from 2004 to 2007. Shore-based vessels range in size from less than 40 feet to over 90 feet in length. Larger vessels tend to focus on the DTS species complex (dover sole, thorny head, sablefish) and whiting in deeper waters, and tend to have a longer fishing season. Smaller vessels tend to fish for roundfish, flatfish, and rockfish, on the continental shelf closer to shore and have a shorter fishing season, presumably due to weather conditions.

2011 was the first year the trawl sector fished under the IFQ program. In 2011, there were 138 IFQ holders that fished IFQ on 108 vessels. These vessels landed IFQ species at 49 processing or landings sites in Washington, Oregon, and California. In 2011, the entire trawl fishery (including whiting) was valued at \$54 million, up from \$38 million average revenue between 2006-2010. In the non-whiting portion of the fishery, average revenues increased 146% compared to 2006-2010 (NWRO, 2012).

The Monitoring Program

One of the problems the trawl rationalization was intended to address was the bycatch of overfished species, mainly of rockfish. Bycatch of overfished species had led to numerous closed areas and triggered bycatch closures that were making catching healthy species difficult. Prior to Amendment 20, bycatch was estimated using a fleet-wide average bycatch rate set for the season and then updated with observer data from West Coast Groundfish Observer Program (WCGOP) coverage of 10-20% of trips. These discard rates were used to predict and project bycatch for fishery closures and, thus, the uncertainty around these estimates were viewed as constraining the fishery and were highly controversial. In addition, the WCGOP did not have sufficient coverage for real time fishery management and there was a considerable lag time in the delivery to managers of catch estimates based on WCGOP data. In addition, there was no direct incentive for individual fishermen to avoid bycatch and thereby extend the fishing season. Thus, two of the goals of Amendment 20 were to provide a mechanism for total catch accounting and to promote practices that reduce bycatch and discard mortality.

With Amendment 20, each permit holder received IFQ against which both their landings and discards would count. To support this system of individual catch, Amendment 20 required 100% monitoring of discards at sea and 100% monitoring of landings shoreside. In addition, this system would produce more accurate estimates of total mortality.

Vessels are required to contract with one of the five approved providers currently certified by NMFS for providing observer coverage in the fishery. There is no minimum timing for vessel notification to the provider before a trip, it is left up to the vessel and provider to negotiate. If a provider is unable to fulfill a vessel's request for an observer, it must notify NMFS at least 4 hours prior to the trip departure. When an observer is obtained for a trip, the observer calls into a NMFS hotline to give the details of the deployment. Vessels are required to sort all catch at sea to facilitate the accurate monitoring of catch (this is required of all west coast Federal fisheries, except the at-sea whiting fishery). Observers collect fishing effort information, estimate total, retained, and discarded catch weight by species or species group, document discard disposition, take biological samples, and record protected species interactions. To facilitate the accurate attribution of catch to area, vessels are restricted to fishing in one area per trip. Upon returning to port the observer calls the deployment hotline again to report the trip ended. To guard against collusion or bias, an observer cannot be assigned to the same vessel for more than 90 days in a 12 month period (DOC, 2010). In 2011, the groundfish observer program observed 8,305 sea days, up from 4,000 sea days in the previous year.

Under the new program, shoreside processors and dealers wishing to receive IFQ species (i.e., all IFQ dealers) are required to be licensed as "first receivers" by NMFS. A site license is required for each physical location where the IFQ first receiver will receive, purchase or take custody, control, or possession of an IFQ landing from a vessel. And any vessel with IFQ species on board is required to land at a licensed "first receiver." To qualify, they must submit an application to NMFS with a catch monitoring plan that details the handling of IFQ species in the plant; have state certified scales; use the electronic fish ticket system and submit reports daily; provide internet access to catch monitors; and undergo an inspection by NMFS staff. Site licenses must be renewed annually. First receivers are required to hire NMFS-certified catch monitors through a NMFS-certified provider to monitor all shoreside deliveries of IFQ species, verify the electronic fish ticket, and ensure compliance with the CMP. In contrast to observers, catch monitors are intended to serve as compliance monitors rather than samplers. To facilitate the accurate monitoring of landings, once offload of IFQ species have begun, it must be completed and all IFQ species must be offloaded before the vessel departs on another trip. If IFQ species are being offloaded at multiple first receivers, an observer must remain onboard during transit. At the conclusion of offloading, the observer inspects the hold to ensure all catch is offloaded. A catch monitor cannot be assigned to the same first receiver for more than 90 days in a 12-month period.

The Compliance Monitoring Program is managed by the Pacific States Marine Fisheries Commission (PSMFC), which also administers the fish ticket reporting system for dealers and processors. As a cost-savings, almost all catch monitors are observers who follow

catch off the boat and into the plant (this is only allowed where the observer can complete the catch monitor sampling within limits on the length of shifts). In 2011, 2,500 catch monitor days were completed.

Electronic monitoring is undergoing testing in the nonwhiting fishery.

Costs and Funding

The WCGOP was restructured and expanded to accommodate the new trawl rationalization monitoring requirements to maximize efficiencies and cost-savings from using existing training, administration, and data processing infrastructure. In addition, in 2011 NMFS compensated the industry for 90% of the cost of hiring observers and catch monitors, and reimbursed providers for a portion of training costs. NMFS intends to reduce its subsidy every year subject to available funding so that in 2014 the industry will be responsible for 100% of the costs of hiring observers and catch monitors.

Prior to implementation of the program, the projected cost of an observer was estimated to be \$500 a day. This was projected to result in a direct annual cost to the shorebased non-whiting trawl fishery of \$3.8 million. The projected cost of a compliance monitor was \$350 per day, which was project to result in a direct annual cost of just over \$1 million. In 2011, NMFS estimated the cost of hiring an observer or catch monitor to be \$365 per day and compensated vessels/first receivers \$328.50 per day. In 2012, NMFS announced its intent to maintain this compensation rate as well as reimbursing providers \$150 per day for observer training.

During the development of Amendment 20, the Northwest Fisheries Science Center presented the Pacific Council with estimates of observer costs under different compensation scenarios, including pay by day, monthly stipend, and observer group options (i.e., several vessels can group to share observers and observer costs). Their analysis suggested that if an observer is placed on a monthly stipend under which the observer can be guaranteed to work 20 days, the daily rate of an observer could be lower. It is unknown whether any vessels or first receivers employed these strategies in their contracts with providers. Amendment 20 also implemented an extensive economic data collection program which will collect data on actual observer and catch monitor costs in addition to other information, but data from the first year of the program is not yet available.

Lessons-Learned

As fishing year 2011 was the first year of the trawl rationalization and new monitoring programs, little information is available about the performance or actual costs of the monitoring programs.

NMFS did implement one change to the program in a trailing rulemaking to improve efficiency and reduce costs in the program. For 2011, NMFS required the observer to remain onboard the vessel until all IFQ species were offloaded. In response to industry

feedback, NMFS revised the offload regulations so now the observer may depart the vessel upon return to port provided the catch monitor can conduct the hold inspection at the end of the offload.

NORTHEAST REGION

Atlantic Sea Scallop Fishery

The Atlantic sea scallop fishery is prosecuted along the Atlantic coastal shelf from the Gulf of Maine through the Mid-Atlantic. Atlantic sea scallops are managed as a unit stock, with four regional components and six resource areas: Delmarva (Mid-Atlantic), New York Bight (Mid-Atlantic), South Channel, southeast part of Georges Bank, northeast peak and northern part of Georges Bank, and the Gulf of Maine (NEFMC, 2007). The fishery for scallops is managed using a system of rotational access areas, days-at-sea, trip limits, and individual fishing quotas (IFQs). The two main components of the fishery are the limited-access fishery, which operates primarily under days-at-sea with trip limits and with some limited trip allocations allowing access into the rotational access areas, and the general category (LAGC) IFQ fishery, which operates under IFQ allocations in the open and access areas (NEFMC, 2011). There is also a small limited entry fishery in the northern Gulf of Maine (NGOM) that operates under small trip limits, as well as some incidental catch allowed in other fisheries.

In fishing years 2009 and 2010, landings for the entire fishery were higher than previous years, about 56 million pounds. Total fleet revenue in 2010 was over \$450 million, due to high landings per unit of effort (LPUE) and high ex-vessel prices for scallops (\$8.00/lb). Open area DAS allocations have declined since 2005, but have been offset by a parallel increase in LPUE from 1600 lb/DAS in 2007 to over 2000 lb/DAS in 2010. The majority of value is in the limited access fishery, with average scallop revenue per limited access vessel in 2010 at over \$1.2 million. In contrast, average scallop revenue per IFQ vessel was \$75,000 in 2010 (NEFMC, 2011).

The limited access scallop fishery consists of 347 vessels, 313 of which are full-time. Most limited access category effort is from vessels using scallop dredges, including small dredges. About 80% of the scallop pounds are landed by full-time dredge vessels and about 13% landed by full-time small dredge vessels. According to ownership data for 2011, only 71 out of 343 vessels belonged to single boat owners. The rest were owned by several individuals and/or different corporations with ownership interest in more than one vessel. Both full-time and part-time limited access vessels have a high dependence on scallops as a source of their income. For the majority of full-time vessels (94%), they derived more than 90% of their revenue from the scallop fishery in 2010. Comparatively, part-time limited access vessels were less dependent on the scallop fishery in 2010, with only 46% of part-time vessels earning more than 90% of their revenue from scallops (NEFMC, 2011).

In 2010, there were 333 LAGC IFQ permits. Most general category effort is from vessels using scallop dredge and other trawl gear. Ownership in the LAGC IFQ fishery is less complex than in the limited access fishery and is composed mostly of single boat owners (155 out of 259 vessels belonged to the single boat owners in 2010). In general, LAGC permit holders, including IFQ and limited entry NGOM, are less dependent on scallops for their income than limited access permit holders. In 2010, only 49% of LAGC IFQ permitted vessels earned greater than 50% of their revenue from scallops (NEFMC, 2011).

The Monitoring Program

Scallop vessels have been subject to industry-funded observer coverage in some capacity since 1999. Amendment 10 to the Atlantic Sea Scallop Fishery Management Plan (FMP) in 2004 established the present-day set-aside program that set aside 1% of the access area Total Allowable Catches (TACs) and open area DAS to use in compensating vessels for observer coverage on trips into these areas. The general purpose of the set-aside program was to ensure funding for adequate coverage necessary for the monitoring of access area bycatch TACs established for yellowtail flounder, a groundfish species caught incidentally to scallops. Observer coverage was also needed to collect more information on scallop fishery interactions with sea turtles. Although approved, NMFS never made use of this program until it was revived in 2006 through emergency action and finally made permanent through Amendment 13 in 2007.

The 1% set-aside is a hard TAC component of the overall ACL for scallops that is subdivided proportionally between the access areas and open areas. The Regional Administrator is to use the amount of funds generated by the set-aside and a reasonable compensation rate to maximize observer coverage without placing “undue hardship” on the industry. In 2012, this resulted in target coverage levels of between 8-23% for access areas and 15% in open areas. In 2012, the Delmarva Access area was closed through emergency action, so the set-aside and 8% coverage for this area were reallocated along with scallop fishery effort to the Closed Area I access area. It is unclear from past management actions what coverage rate was determined to be necessary to meet the goals of the industry-funded monitoring program and target coverage rates have evolved over time. Presently target coverage rates calculated from the set-aside appear to be meeting the goals of the program and additional coverage has not been required.

Under the scallop industry-funded observer program, permit holders contract directly with one of the three approved providers. Providers have to apply to NMFS for approval to provide observer services to the scallop fishery and must be able to demonstrate their ability to provide services and coordinate deployments. Observers must be trained and certified by NMFS, and comply with certain national minimum observer standards. Providers must be able to provide a copy of the provider-permit holder and provider-observer contracts upon request.

Limited access vessels are required to notify the observer program of their intent to take a trip into open or access areas 72-hours in advance of each trip. LAGC IFQ vessels have

to notify weekly for access area trips planned for the following week (a minimum of 2 trips have to be covered each week). Within 24 hours, the vessel receives an email from NMFS notifying of their selection for observer coverage or issuing a waiver from coverage. If selected for coverage, the vessel must give at least 48-hours of notice to their observer provider of their need for an observer. The observer provider must reply to the vessel within 18-hours of notification whether an observer is available or not. If no observer is available, the vessel must call NMFS back for a waiver for the trip. Providers have to report coverage deployments to NMFS on a daily basis for NMFS to monitor coverage levels. To guard against collusion or preference, an observer provider must not deploy any observer on the same vessel for more than two consecutive multi-day trips, and not more than twice in any given month for multi-day deployments. Industry-funded scallop observers generally collect the same information as a NEFOP observer, because the program has a protected species as well as general bycatch focus.

Costs and Funding

In the scallop industry-funded observer program, NMFS pays for the costs of training and certifying observers. Vessels are required to pay for any observer coverage and are compensated with additional pounds of scallops or additional DAS. The compensation rates are calculated based on projected scallop price (adjusted for trip costs), estimated DAS, amount of set-asides, and expected LPUE. In determining coverage rates, the RA is to try to achieve sufficient coverage while providing a compensation rate that has a neutral effect on fishing effort (i.e., doesn't provide incentive to fish with an observer). The set-aside usage, LPUE, and scallop prices are monitored during the year and the compensation rate can be adjusted inseason.

The cost of an observer in the industry-funded program is \$775/day at sea. In 2012, compensation rates for limited access vessels fishing DAS on open area trips was 0.08 DAS per DAS fished with an observer on board, and 150 lb per day or part of a day for access area trips. So a limited access vessel fishing in an open area with an observer on board would be charged 0.92 DAS for every DAS fished. Whereas a limited access vessel fishing with an observer on an access area trip would be allowed to land an additional 150lb of scallops per day or part of a day fished. LAGC IFQ vessels can land an additional 150 lb *per trip* if they have an observer on board. For access areas in 2012, the compensation rate is expected to be \$709 per day more than the per day cost of an observer at the projected price of scallops. For open areas, the compensation rate is expected to provide \$1,225/day more than the cost of an observer. The additional compensation is intended to buffer against lower realized prices of scallops or lower realized LPUE and may change if compensation rates are updated inseason.

NMFS covers some of the "indirect" costs of the industry-funded program, by providing training and data processing. The estimated cost of training and data processing is estimated to be between \$100-150 per sea day (compared to \$114 of the sector at-sea monitoring program and \$165 for the NEFOP program).

Lessons-Learned

The NEFOP receives few complaints about the scallop industry-funded observer program. In past fishing years, the compensation program has faced shortfalls, when the set-aside was not closely monitored and observer coverage was front-loaded, such that the set-aside was used up for one or more areas before the end of the fishing year. At this point, vessels were responsible for paying for the cost of the observer, and NEFOP would begin to receive some complaints. The most common complaint was dissatisfaction with data quality (e.g., vessels did not feel they were getting their money's worth when observer data from a trip could not be used because of sampling errors). This has not been an issue in recent years because the set-asides are monitored more closely to ensure compensation and coverage is available throughout the year. In addition, the high price of scallops results in higher set-aside value available to cover compensation.

There have also been issues as a result of compensation rates set too high compared to the actual cost of carrying an observer, resulting in an incentive for vessels to take an observed trip in order to be able to land more scallops. However, this has not been an issue in recent years.

The New England Council is considering modifications to the set-aside program in an upcoming scallop framework. To provide more flexibility in allocating observer coverage and compensation between areas, the Council is considering modifying the set-aside to be a single pool that is 1% of the total ACL, rather than dividing the set-aside into separate TACs for each access area. The Council is also considering adding LAGC IFQ open area effort, which is currently monitored by NEFOP, to the set-aside program to ensure more consistent funding and, consequently, coverage of this portion of the fishery.