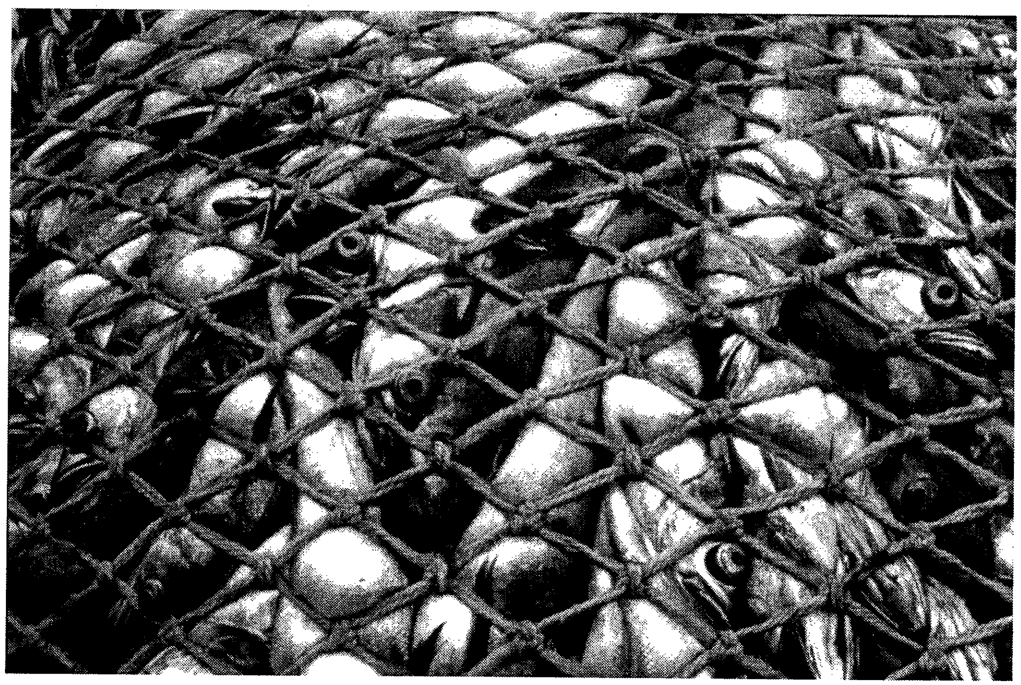
NOAA Technical Memorandum NMFS-AFSC-101

Proceedings of the First Biennial Canada/U.S. Observer Program Workshop

Edited by
H. McElderry, W. A. Karp, J. Twomey,
M. Merklein, V. Cornish, and M. Saunders



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Alaska Fisheries Science Center

May 1999

NOAA Technical Memorandum NMFS

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Proceedings of the First Biennial Canada/U.S. Observer Program Workshop

Seattle, Washington
10-12 March 1998

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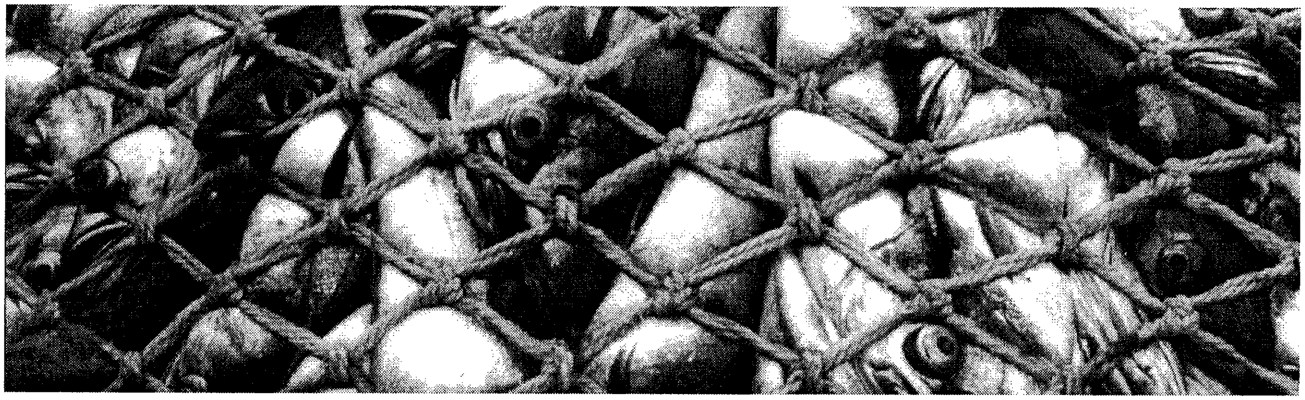


EXECUTIVE SUMMARY

PURPOSE

Agencies depend on fisheries observer programs to provide information which is critical to those responsible for conservation and management of living marine resources throughout North America. Many organizations in Canada and the United States are responsible for management of observer programs and delivery of observer services, often working with similar goals and operational issues. This workshop, the first of a biennial Canada/U.S. series, was organized with the goal of bringing interested individuals together to share ideas and resolve key issues of common interest. The audience of 90 included service delivery groups (government and private sector groups who develop and operate observer programs), and individuals who work with observer information.

FORMAT

The workshop began with presentations outlining the mandate and legislative framework within which observer programs in Canada and the United States operate. These presentations were followed by a series of regional overviews to provide the audience with a general understanding of different North American observer programs. In addition, delegates from Norway, Argentina and Trinidad and Tobago provided a perspective of observer programs within their regions.

The main body of the workshop was devoted to in-depth discussions on three topical observer program issues: catch estimation methodologies, program objectives, and program delivery issues. These themes were examined through a series of panel presentations followed by audience participation.

THEME I: CATCH DETERMINATION METHODOLOGIES: PROBLEMS AND PROGRESS

At the center of most fishery observer programs is the requirement to estimate catch by species. Estimates of catch are used to satisfy management needs for monitoring quotas, bycatch limits and protected species, as well as science needs for stock assessment purposes. This workshop provided a unique opportunity to exchange information on a regional/international scale regarding methods used to estimate catch quantity and catch composition. A panel of regional representatives provided a short synopsis of methods used to estimate catch quantity and composition with particular emphasis on problem areas and any innovative new developments. The main conclusions of this session were:

- Observer programs provide cost-efficient and reliable sources of information about catch, bycatch, and fishing operations and, ultimately, a better understanding of the marine ecosystem and the impact of fisheries on that ecosystem. Alternatives to at-sea observer programs (such as information collected at shoreside processing plants) provide only limited types of data. There is a need to ensure that programs are well designed, operate efficiently and meet their objectives.

- Catch determination methodologies usually involve a three stage sample design: sampling vessels from within the fleet (coverage levels), sampling fishing events on a vessel, and sampling catch from individual fishing events. Practical considerations very often limit the application of classical sampling designs.
- When coverage levels are less than 100%, estimation procedures are generally based on assumptions regarding random placement. Unless the fleet is relatively homogeneous and not greatly dispersed in space and time, it may be difficult for the program manager to allocate observer coverage in a random manner.
- The quality of data collected by observers is influenced by many factors including fishing methods, catch handling methods, catch size and composition, vessel size and suitability for catch sampling, the level of crew cooperation, and the skills and experience levels of the observers employed to collect the data.
- Strategic behavior employed by vessel crews to avoid enforcement action may undermine the ability of an observer to collect unbiased information on catch quantity and composition. **Thus, programs responsible for collecting compliance-related data must recognize the limitations on their ability to collect scientific information.**

THEME II: PROGRAM OBJECTIVES

Observer programs may have single or multiple objectives. Objectives may include estimation of catch composition and quantity, collection of biological information (such as length compositions, age structures, stomach samples), in-season reporting for catch/bycatch management, documentation of marine mammal and seabird interactions with fisheries, and monitoring for compliance with fishery regulations. Some objectives are exclusively scientific in nature while others are established primarily to address information needs for management of catch and bycatch quotas. However, most types of data collected by observers are used to address multiple objectives that serve requirements of scientists, managers, and enforcement officers. For example, determination of catch quantity and composition is required by scientists who must develop annual estimates of fishing mortality for each stock, by managers who must monitor fleets (or individual vessels) to ensure that quotas are not exceeded, and by enforcement personnel tasked with identifying vessels which violate regulations of various types. In this session, scientists, managers, and those involved in enforcement provided perspectives on the extent to which observer programs can and do provide the information necessary to support their activities. Key points from this session included:

- There is a tendency to place unrealistic demands on these programs and, hence, on the observers themselves. **Those who design and manage observer programs must recognize the feasibility of each objective, of resource limitations, and of the need to establish unambiguous data collection priorities for observers. Periodic reviews should be conducted, followed by appropriate adjustments to program sampling designs and priorities.**
- Users of observer data should be aware of observer data quality and program managers have a responsibility to communicate information about limitations and uncertainties to users of their data.
- **Industry cooperation is essential to the success of any observer program. Fostering industry cooperation should be established as a high priority.** However, certain types of data collection objectives may lead to crew members being unappreciative, suspicious, or hostile.
- The most powerful tools for developing the support of industry and other stakeholders in observer programs are outreach and education. These tools should be used to improve understanding of a program's goals and objectives, its data collection protocols, and the uses to which its data will be put.

- When observer programs are designed to meet multidisciplinary information needs, program design and management may benefit from the participation of individuals who can provide an appropriate range of experience and perspectives. Such participation will depend on a program's specific goals and priorities, and may include fisheries managers, fisheries biologists, statisticians, enforcement agents, industry representatives, and experienced observers.
- **Sound sampling designs are essential to successful observer programs.** For programs with 100% coverage levels, sampling design is not problematic. Other programs may require complex sampling designs, which may be difficult or impossible to implement.
- When coverage levels are too low to provide the level of precision required by scientists and managers, a program is unable to meet its objectives. **Observer programs should be implemented and maintained only if the resources are adequate and the goals realistic.**
- There is a risk of making false inferences if scientists do not appreciate the limits and context of observer data. **It is particularly important for analysts using observer data to understand the sampling methods employed, the limitations inherent in the resultant data, and the extent to which the use of observer data exacerbates uncertainties in the estimates they provide.**
- When observers are directed to monitor for compliance with fishery regulations, their presence directly influences crew behavior. **In these types of situations, data obtained from the observed portion of the fleet should not be used to make inferences regarding the unobserved portion.**
- When industry directly pays the costs of observation, coverage levels may be based on economic considerations, such as vessel length. Such considerations may conflict with the setting of coverage levels according to program goals and objectives.
- Enforcement cases that rely on observer data are often difficult and time consuming to prosecute. Questions may arise regarding the credibility of observers and, since observer turnover rates are often high, it may be hard to locate an observer once a case goes to court. **Consequently, it is important for programs with compliance monitoring duties to employ standardized sampling protocols, provide the support and protection their observers require, and take additional measures to retain experienced and skilled observers.**

THEME III - PROGRAM DELIVERY

A variety of service delivery models are in use for observer programs in north America: some fully run by government; some fully out-sourced to the private sector; and, most commonly, programs with a sharing of responsibilities between government and private sector. All these delivery models have common service objectives of being at arm's length from industry, being operationally efficient, being cost-effective, having a high level of integrity, providing highly trained observers and being responsive to the needs of both government and industry. A number of ongoing issues within government and the fishing industry cause regions to regularly examine their service delivery model and consider alternatives that may better meet their needs. The purpose of this workshop was to examine various program models in use and share ideas on their strengths and weaknesses. Three service delivery models were presented as case studies for discussion. Key points identified in this session were:

- Programs that allow fishing companies to negotiate freely with observer contractors may not be conducive to compliance monitoring by observers because of the inherent conflict of interest.
- Service delivery models range from 100% in-house, to those having certain areas of the program contracted out to one or more contractors, to those utilizing many individual contractors. Program areas that tend to be contracted out include the hiring of observ-

ers and other employees, observer deployment, and data entry.

- In many instances, private sector delivery of observer services improves program responsiveness and flexibility.
- **Even when program functions are contracted out, certain functions are inherently governmental.** These include: establishing program goals and objectives, developing sampling designs, determining coverage levels, ensuring that contractual arrangements support the collection of reliable data and that industry is precluded from exerting inappropriate influence on sampling design, data collection methodology, and contractor operations.
- Observer programs throughout Canada are government controlled, contractor delivered and industry-government cost shared. In general, there is a consistent approach to funding arrangements with Department of Fisheries and Oceans paying the program administration costs and industry paying for the costs of the observer. **It was felt that the Canadian model, with its high degree of consistency, and its emphasis on data quality and integrity, had many desirable features.**
- Although national standards and oversight are lacking in the United States, many observer programs are funded and contracted directly by federal or state governments. Several models were reviewed by workshop participants. A number of different organizational structures are employed. These include programs staffed completely by agency employees, those that are entirely government run with observers hired through service contracts, those having certain program functions carried out by contractors, and those operated entirely by contractors.
- Alaskan programs managed by the State of Alaska (shellfish) and National Marine Fisheries Service (groundfish) employ a model under which the fishing industry procures observers from government-certified contracting companies. Industry pays direct observer costs and the agencies cover costs associated with training and certifying observers, and managing data.

CONCLUDING DISCUSSIONS

Upon completion of the theme sessions a summary session was held to develop workshop recommendations and conclusions. In addition, topics or issues for a future observer program workshop were also discussed. Many of the main discussion points from this session are already mentioned above; other points included:

- Observer quality was regarded as one of the most important elements of an observer program. **Observer quality can be maintained by retaining high-quality observers who are capable of making wise decisions in their collection efforts. Fair compensation and adequate support were identified as critical ingredients to retaining professional, experienced observers. Programs should strive to cultivate a motivated workforce by providing a respectful working environment in which observers are supported, acknowledged, and compensated as professional biologists.**
- **The highest standards of safety are essential to the success of any observer program.** While safety issues where not discussed in detail at this workshop, this topic was identified as an essential agenda item for a future workshop.
- The wide use of observer data requires an interdisciplinary approach to the development and implementation of effective programs. This includes identifying observer program objectives, data collection protocols, and the subsequent analysis, interpretation, and application of data for fisheries management. At a minimum, this interdisciplinary team should consist of fisheries managers, fisheries biologists, statisticians, enforcement agents, industry representatives, and experienced observers.

- **There was overwhelming support for convening another Canada/U.S. observer program workshop. The Canadian delegation has proposed the next workshop be held in St. John's, Newfoundland, in late spring, 2000.**

SPECIAL TOPIC SESSION – INFORMATION TECHNOLOGIES

A special topic session was held at the end of the workshop for those interested in observer program information technology issues. Throughout North America, groups are faced with the problem of trying to develop data capture technology for observer information or ways to speed up the process of getting observer data from the field to an electronic format suitable for use by decision makers. The high cost of developing technology for field applications impairs the ability of most observer programs to experiment with and take advantage of emerging technologies. This session allowed those involved in observer information technologies to share their experiences and discuss opportunities and problem areas, thereby facilitating further benefits from these new technologies. Technologies examined during this session included:

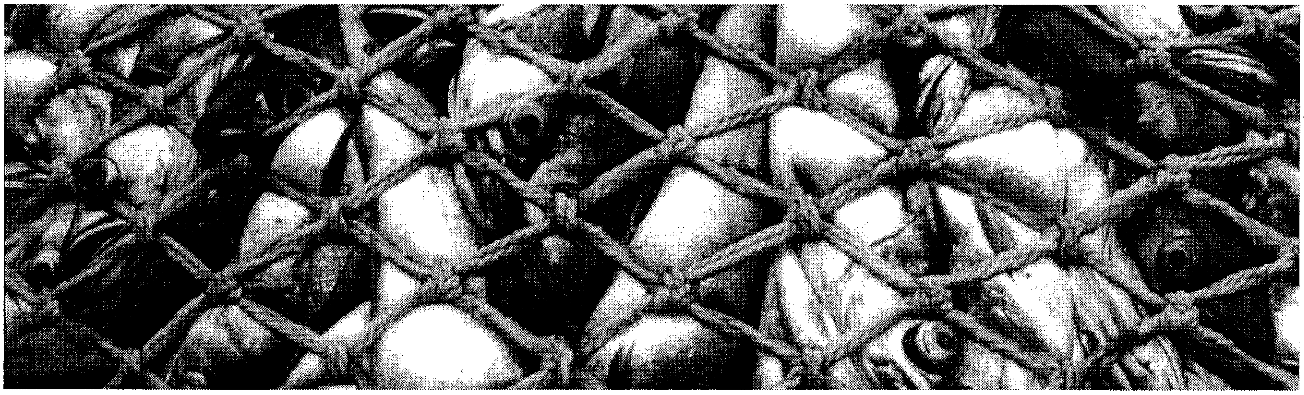
- Real time data reporting using laptop computers and satellite communication technology,
- Using image scanners for storage of hand-written trip reports and other non-keypunched reference material,
- Using optical character recognition for reading data forms,
- The use of a "black box" video surveillance system, aboard fishing vessels,
- Software for at sea and dockside data collection, reporting and analysis.

ACKNOWLEDGEMENTS

The 1998 Canada/U.S. Observer Program Workshop was organized by Howard McElderry, William Karp, Vicki Cornish, Mark Saunders, Lionel Rowe and Darryl Christensen. Logistics and other workshop support was provided by Bob Maier. The workshop proceedings were developed by direction from Howard McElderry, William Karp, Mark Saunders and Vicki Cornish. The workshop rapporteurs, John Twomey and Mandy Merklein, wrote most of the proceedings text with additional contributions by Howard McElderry and William Karp. Angela Rice (Archipelago Marine Research Ltd.) provided document formatting and page layout design. Cover and chapter banner photo provided by Sylvia Harron (Archipelago Marine Research Ltd.). Funding for the workshop was provided by the Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA and the Canadian Department of Fisheries and Oceans and Archipelago Marine Research Ltd.

COMMONLY USED ABBREVIATIONS

ADF&G	Alaska Department of Fish and Game
AFSC	Alaska Fisheries Science Center
APO	Association of Professional Observers
BC	British Columbia
CARICOM	Caribbean Community
CDQ	Community Development Quota
DFO	Department of Fisheries and Oceans
EEZ	Exclusive Economic Zone
ESA	Endangered Species Act
FMP	Fishery Management Plan
IFQ	Individual Fishery Quota
INIDEP	National Fisheries Research and Development Institute
IPHC	International Pacific Halibut Commission
IVQ	Individual Vessel Quotas
MMPA	Marine Mammal Protection Act
M-SFCMA	Magnuson-Stevens Fisheries Conservation and Management Act
NAFO	North Atlantic Fishery Organization
NEFSC	Northeast Fisheries Science Center
NMFS	National Marine Fisheries Service
NPFMC	North Pacific Fishery Management Council
NPFRP	North Pacific Fisheries Research Plan
NRC	National Research Council
OSP	Optimum Sustainable Population
OTC	North Pacific Observer Training Center
OY	Optimum Yield
PBR	Potential Biological Removal
RDG	Regional Director General
SEFSC	Southeast Fisheries Science Center
SFA	Sustainable Fisheries Act
TAC	Total Allowable Catch
U.S.	United States



OPENING REMARKS

Jim Balsiger, Alaska Fisheries Science Center, Science and Research Director, welcomed participants to the Alaska Fisheries Science Center (AFSC) and provided a brief overview of the recent sections of the three U.S. Federal Acts concerned with the management of living marine resources: the Magnuson-Stevens Fisheries Conservation and Management Act, also referred to as the Sustainable Fisheries Act; the Marine Mammal Protection Act; and the Endangered Species Act.

All three of these Acts require reliable data, careful analysis, and effective management of U.S. fisheries. The data used by the agency to support the analysis and management of living marine resources are obtained from two crucial sources: resource assessment surveys, which are independent of fisheries observations, and observer programs themselves, which collect data directly from commercial fisheries.

The SFA requires the National Research Council (NRC) to examine the methods for stock assessment that NMFS use as the basis for the management of groundfish fisheries in the United States. The NRC found that, while the methods of stock assessment were adequate, they did not generate enough data to support effective fisheries management. Although there has not yet been a similar review of the nation's marine mammal management policies, it is likely that the NRC would conclude there too that, while the assessment methods are adequate, there are insufficient data to support them. The underlying conclusion of the NRC is that the agency needs to obtain the best quality data with which to manage fisheries and that data from observer programs be as reliable as possible.

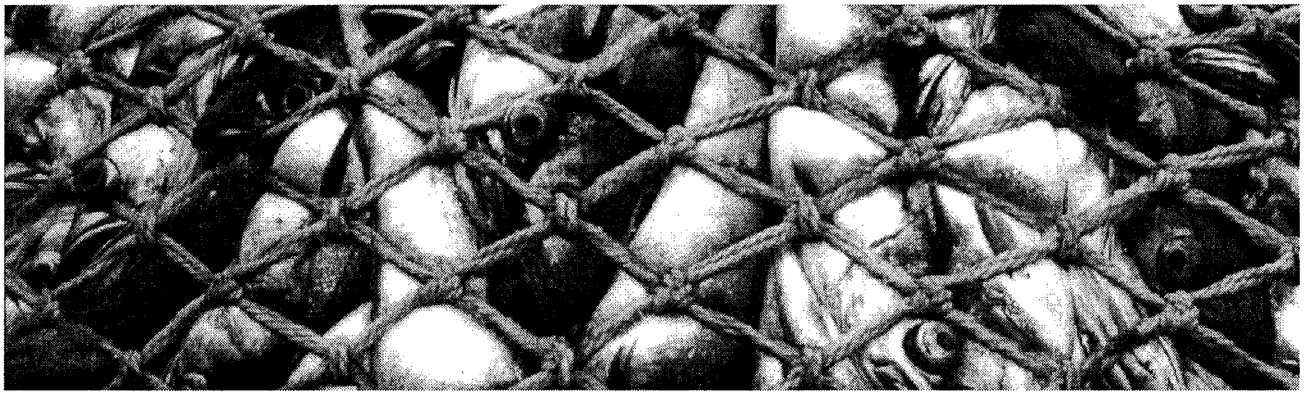
As there is a direct relationship between the experience and morale of observers and the quality of the data they collect, the development, coordination and implementation of effective program policies is crucial.

Initially, observer programs were implemented to collect data that would provide a better understanding of population dynamics. These programs have evolved, however, to serve an important function for quota management and compliance monitoring. The observer's task on fishing vessels is, therefore, an increasingly difficult one, with their presence on board often being resented by the crew. Thus, Balsiger suggested that participants address the importance of providing fair compensation and adequate support in order to retain professional and experienced observers in these programs. As there is a direct relationship between the experience and morale of observers and the quality of the data they collect, the development, coordination and implementation of effective program policies is crucial.

Bill Karp, manager of the North Pacific Groundfish Observer Program at AFSC, thanked participants for their attendance and thanked the steering committee, his staff and, in particular, Howard McElderry for their support and hard work in putting the workshop together. Karp noted that this was the first meeting to bring together expertise from the United States and Canada to focus on observer program concerns.

Although these nations' observer programs often face similar issues, Karp suggested that there are differences in the ways managers address these challenges and that the workshop would provide an opportunity for participants to learn from each other's approaches.

Karp noted that the original intention was to organize joint observer program meetings every couple of years, perhaps at different locations and with different agendas. He suggested, therefore, that it would be helpful to determine, over the course of this workshop, how much support there was for a future workshop, as well as who might wish to take the lead in its organization and what topics it might include.



OBSERVER PROGRAMS IN THE UNITED STATES

LEGISLATIVE FRAMEWORK

REVIEW OF MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

Presented by:
Bill Karp, NMFS, Alaska Fisheries Science Center

The Fisheries Conservation and Management Act was passed in 1976 and, having been reauthorized in 1996 as the M-SFCMA, it is now often referred to as the Sustainable Fisheries Act. Initially, this Act was implemented to address fisheries management policy in the U.S. EEZ. The Act has since gone through a series of authorizations, and each version of the Act has updated the national standards for fishery management. There are currently ten national standards which guide the management of fisheries resources in the U.S. EEZ. Karp briefly explored each of the five national standards that rely on data collected by observer programs.

National Standards (Abbreviated From language in the statute)

- **Prevent overfishing while achieving optimum yield (OY)** - Observers provide the data necessary to determine when a fishery has reached optimum yield or overfishing levels. In some cases, over-fishing can be prevented by the provision of adequate observer data.
- **Based on best available scientific information** - In many cases, best available data are obtained from scientific observer programs.
- **Allow for variations in fisheries resources and catch** - To ensure proper management of fisheries, scientists require data that capture the temporal and spatial characteristics of the stocks. This is best obtained from observers working throughout the fishing area and across all seasons.
- **Minimize bycatch (mortality)** - This requirement reflects Congress's current emphasis on reducing fisheries bycatch, an issue that observer programs can play a critical role in addressing. Currently, it is virtually impossible to evaluate or characterize a fishery accurately because there is so little available bycatch and discard data. This lack of data, in turn, constrains the agency's ability to meet its obligation, under the Act, to minimize bycatch. Likewise there are little data on the impact or viability of at-sea discards.
- **Promote safety of human life at sea** - This is a critical issue that all observer programs can appreciate. There must be a commitment to provide as safe a working environment as possible, for observers and fishing vessel crews alike.

M-SFCMA also requires that regional Fishery Management Councils (in association with NMFS) develop fishery management plans (FMPs). FMPs must assess and specify the nature and extent of scientific data required to manage fisheries. Criteria for identifying and addressing over-fishing and establishing bycatch reporting methodologies are also required, as are procedures for describing fishing sectors and quantifying trends in landings. In some cases, FMPs explicitly require some degree of observer sampling at sea. For fisheries that process their catch at sea, collection of data by observers may be essential.

Additional Sustainable Fisheries Act Provisions Regarding Observers

Currently, the SFA contains language prohibiting implementation of new Individual Fisheries Quota (IFQ) programs. When this prohibition expires, the Act provides for effective enforcement and management of IFQ programs, including observer coverage (and the associated fees to cover the costs of such coverage).

The collection of industry fees to support observer programs is allowed, but not required, in certain situations. One example is the Community Development Quota (CDQ) fishery in Alaska, which sets aside a portion of the Total Allowable Catch (TAC) to be used for the economic development of the western Alaska communities. The native communities that participate in these fisheries may lease their portions of the quota to fishing companies. Regulations require placement of observers to monitor these fisheries and the Act allows for the collection of data that may be used to support fisheries management. There is also a provision in the Act for the North Pacific Fisheries Research Plan, which allows fees to be collected in support of observer placement in fisheries in the Bering Sea and Gulf of Alaska. Currently, only those vessels that are required to carry observers pay for the costs of the program. Payment is made directly from the vessel to the contracting agent that supplies the vessel with an observer. Under the Research Plan, a fee based on catch landed value would be applied to all participants in the fishery and the funds recovered from that fee would be used to place observers. The SFA also provides guidelines to address observer health and safety issues and specifies certain observer training requirements.

PROTECTED SPECIES LEGISLATION

Presented by:
Vicki Cornish, NMFS, Office of Protected Resources

Marine Mammal Protection Act

The MMPA was enacted in 1972 with the stated purpose of prohibiting the taking or importation of marine mammals and marine mammal products. The goal of the MMPA is to restore all marine mammal stocks to optimum levels. Amendments excepting the incidental taking of marine mammals during the course of commercial fishing operations were made in 1994 with the addition of Sections 117 and 118.

Section 117

Under Section 117 of the MMPA, NMFS must provide estimates of stock abundance and annual human-caused mortalities and serious injuries for all U.S. marine mammal stocks. The agency began publishing stock assessment reports in 1995 in an attempt to compile all available information into regional summary documents. These reports contain stock assessments for each species, as well as an analysis of the sources and level of human-caused mortalities and serious injuries of marine mammals, including fishery takes. The reports also identify each stock's Potential Biological Removal (PBR) level, which is defined as the removal level that a stock can withstand while maintaining their Optimum Sustainable Population (OSP). Because the OSP of many stocks is not known, the PBR approach was developed to allow the agency to base management of marine mammals on available stock information, such as productivity levels, recovery factors, and estimated removal levels. The PBR is calculated by multiplying the estimated annual productivity of the stock by a recovery factor. Using the best available data, these reports also assess the status of each marine mammal stock relative to PBR. A stock is designated as strategic if status is listed as endangered or threatened under ESA, is listed as depleted under the MMPA or if fishery takes are greater than PBR.

Section 118

Section 118 of the MMPA addresses the interaction of fisheries with marine mammals and outlines procedures to reduce fisheries takes. It requires that fisheries be categorized based on their level of marine mammal takes: fisheries placed in Category I have "frequent" marine mammal takes, those in Category II have "occasional" takes and those in Category III have "rare" or no known takes. Fishers must report all incidental mortalities and serious injuries to NMFS. In addition, participants in Category I and II fisheries must register with NMFS. Subject to available funding, observers may be placed in Category I and II fisheries on a mandatory basis and in Category III fisheries on a voluntary basis.

Table 1. Number of U.S. Fisheries Identified in the Marine Mammal Protection Act 1998 List of Fisheries (63 FR 5748, Feb. 4, 1998), by region and fishery category (see text for explanation of Category I, II, and III fisheries). Numbers in brackets indicate fisheries with observer programs operating in 1998 (see Part III for review of U.S. observer programs).

MMPA Fishery Type	Alaska	Pacific	Atlantic
Category I	0 [0]	2 [1]	4 [4]
Category II	13 [0]	5 [0]	6 [3]
Category III	39 [7]	68 [3]	52 [5]

Based on 1998 MMPA List of Fisheries (63 FR 5748), and observer programs in operation during FY98 (October 1, 1997 - September 30, 1998)

Objectives and Priorities of the MMPA

The statutory objectives of the MMPA observer programs are: to obtain statistically reliable estimates of incidental mortality and serious injury; to determine the reliability of fishers' reports of incidental mortality and serious injury; and to identify changes in fishing methods or technology that may increase or decrease incidental mortality and serious injury. The ultimate goal of the Act is to reduce takes and injury rates to insignificant levels.

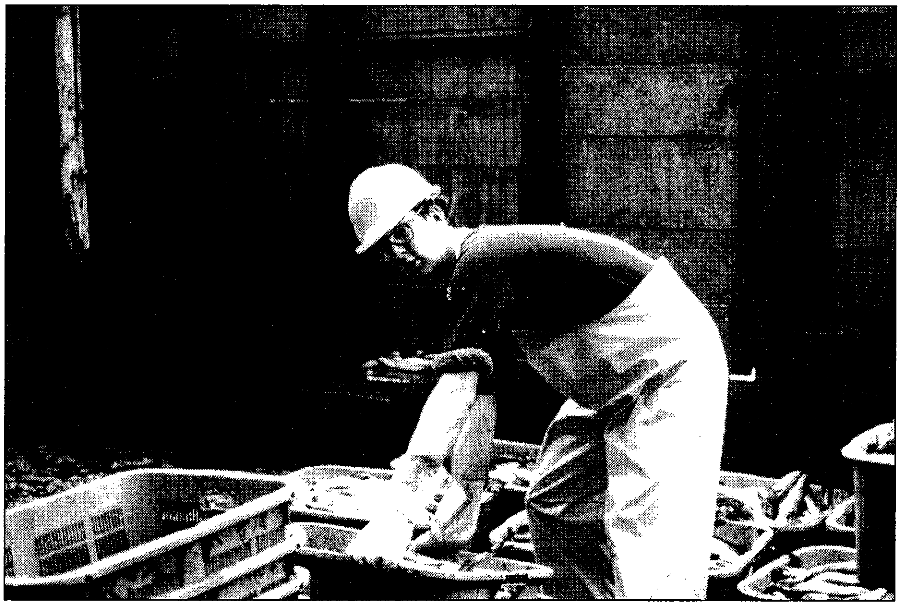
The criteria for determining which fisheries require implementation of observer programs are outlined in the MMPA. The first priority is for fisheries with takes of species listed as threatened or endangered under the ESA. The second priority is for fisheries with takes of strategic stocks, and the third priority is for fisheries that have a take from a stock in which the level of take is uncertain. On the Atlantic Coast there are four Category I fisheries and six Category II fisheries (Table 1). Six of these fisheries are observed. None of Alaska's thirteen Category II fisheries are currently observed, although there are plans to place observers in at least two of these fisheries starting in the summer of 1999. On the Pacific Coast there are two Category I fisheries and five Category II fisheries. One of these fisheries is observed. Limited resources restrict the agency from monitoring all of the fisheries that the Act requires and complicate determining how to allocate monitoring effort.

The MMPA directs NMFS to establish Take Reduction Teams to develop take reduction plans to reduce marine mammal mortalities and serious injuries in Category I and II fisheries to below PBR within six months, and to insignificant levels approaching a zero mortality and serious injury rate within five years. These teams are comprised of fishers, scientists, environmentalists, agency staff and other interested parties who rely on observer data to develop plans and to assess progress in take reduction.

The Endangered Species Act

The ESA requires that all federal agencies seek to conserve endangered and threatened species. The Act prohibits the taking or importing of endangered species and may prohibit the taking of threatened species. Incidental takes in federally managed commercial fisheries are provided for under Section 7.

Under Section 7 of the ESA, consultation is required for all federal actions, including fishery management measures. Such consultation may result in a monitoring program becoming a term and condition of the issuance of an incidental take statement (if takings of listed species are expected to occur), in which case the acting agency (e.g., NMFS) is required to provide the monitoring program. Several fisheries currently require such monitoring programs under Section 7 consultations.



Courtesy AFSC

REGIONAL OVERVIEWS

Observer programs are implemented throughout the United States to assist in the management of fishery resources and the conservation of living marine resources. Although not all fisheries are observed, there are several federal acts and state regulations that provide the authority to develop and implement observer programs. In the United States, observer programs tend to be developed and operated on a local or regional level, rather than nationally. There are currently no national guidelines for NMFS observer programs and little organized coordination between programs. Below are brief descriptions of the observer programs found within each region. For a more detailed summary of each program please refer to Part III of this document.

> In the United States, observer programs tend to be developed and operated on a local or regional level, rather than nationally. NMFS has not established national guidelines for observer programs and coordination among regional progress is generally informal in nature.

ALASKA REGION OBSERVER PROGRAMS

The Gulf of Alaska and the Eastern Bering Sea/Aleutian Islands provide some of the most lucrative and productive fishing areas in the world. Fisheries in these waters are managed by state and federal governments, both of which have implemented mandatory observer programs. NMFS is responsible for the North Pacific Groundfish Observer Program, which places observers both aboard vessels fishing for groundfish in the U.S. EEZ off Alaska and at plants receiving catches from these fisheries. The Alaska Department of Fish and Game (ADF&G) is responsible for the North Pacific Shellfish Observer Program, which places observers aboard crab and other shellfish vessels in state and federal waters off Alaska.

NMFS, North Pacific Groundfish Observer Programs

Presented by:
Martin Loefflad, NMFS, Alaska Fisheries Science Center

The North Pacific Groundfish Observer Program covers those federally permitted fisheries operating with trawl, longline, and pot gear types in the U.S. EEZ off Alaska. In 1997, the program's deployment of approximately 500 observers for 30,000 coverage days yielded a remarkable amount of data for fisheries managers and scientists. This mandatory program requires all vessels over 125 feet to carry an observer during all fishing operations. Vessels 60 to 125 feet must carry observers for 30% of their fishing days, while vessels under 60 feet are exempt from observer coverage. Observers are also stationed at most shoreside processing plants, with coverage being determined by the amount of fish landed.

Initially the program was implemented to monitor foreign fishing effort off the coast of Alaska and the North Pacific. In 1990, the North Pacific Fishery Management Council (NPFMC) and the Federal government were authorized to extend observer coverage to the expanding domestic fleet and shoreside processing plants which had replaced the foreign fleets. However, because the government was not granted the authority to collect fees from the industry, a temporary system (still in place) was established in which private contractors directly bill vessels for the provision of certified NMFS observers. Thus, the responsibilities of the program are shared: NMFS maintains the program database and trains (in conjunction with the North Pacific Observer Training Center of the University of Alaska (OTC)), outfits and debriefs observers; five private contractors employ and coordinate observers, supply those observers to industry and collect fees from industry. This system provides fishers with a degree of choice between the five suppliers while it provides the program itself with a mechanism to cover costs. (Note: industry's annual contribution totals $8-10 million (US), with NMFS providing approximately $2 million a year for program support and staff). Still, while the program has been effective in data collection, its current structure finds observers and contractors vulnerable to industry pressures that jeopardize the quality and credibility of those data. Therefore, while NPFMC and NMFS have been exploring ways to rectify the situation, observers have unionized to ensure fair wages.

> While the NMFS North Pacific Groundfish Observer Program has been effective in data collection, its current structure finds observers and contractors vulnerable to industry pressures that jeopardize the quality and credibility of those data.

ADF&G, Shellfish Observer Programs

Presented by:

Larry Boyle, Alaska Department of Fish and Game

In a 1988 response to concerns that the comparatively high catch rates of at-sea crab catcher processors was due to the illegal retention and processing of sub adult crab, the Alaska Board of Fisheries authorized ADF&G to implement a mandatory observer program for these vessels. Within a year of the program's implementation, the catch rate of the catcher processor fleet dropped to the same level as the non-processing vessels. For ADF&G, this represented a dramatic demonstration of the potential for observer programs to provide both useful in-season data and important enforcement-related information.

Since the late 1980s, the program has been expanded to include several other shellfish fisheries with varying coverage levels. As with the Alaska groundfish observer program, the responsibilities of this program are shared. The OTC trains observers in cooperation with ADF&G, which in turn provides observer testing and certification, debriefs observers, and analyses observer data collection and reportage. Observers similarly collect data that are both used within the season and compiled at the end of each contract, and the same five private contractors supply observers and collect fees from industry. (Note: for this program, industry provides approximately $1.2 to $1.7 million (US) annually while ADF&G provides approximately $470,000 for program support and data analysis.) Despite its remarkable success, the same problems that trouble the groundfish observer program (industry pressure on contractors and observers) confront the ADF&G shellfish observer program: a situation the ADF&G is attempting to rectify through the Alaska Board of Fisheries.

SOUTHWEST REGION OBSERVER PROGRAMS

Presented by:

Tim Price, NMFS Southwest Regional Office

Three fisheries are currently observed in the Southwest Region: the California/Oregon drift gillnet fishery, the Hawaiian pelagic longline fishery, and the Northwest Hawaiian Islands lobster fishery. These are all government funded programs which provide data on the target catch and on incidentally taken sea turtles, seabirds, marine mammals and other non-target fish. In all of these programs, NMFS is responsible for observer training and data management and analysis. The mandatory observer program for the California/Oregon drift gillnet observer program is authorized through the MMPA and covers about 12% of the fleet's effort. The program provides important biological data on species of concern and samples, such as marine mammal tissues, for research scientists. The program's provision of data on the use of pingers to deter marine mammals from nets has led to their mandatory use in this fleet. The observer program was conducted entirely by NMFS until 1996, when federal workforce reductions required that the hiring and employment of observers be contracted out. Currently, one private contractor, working directly with NMFS, is responsible for supplying, supporting, deploying, and debriefing this fishery's NMFS-certified observers.

> Observers on the Alaskan crab catcher processor fleet provided a dramatic demonstration of the potential for observer programs to provide both useful in-season data and important enforcement-related information.

Hawaii's pelagic longline fishery's mandatory program is authorized through the M-SFCMA and the ESA and covers a little over 5% of the fleet's effort. NMFS directly manages and administers all aspects of this program including the hiring of federally employed observers. Of particular concern in this fishery is sea turtle and seabird bycatch. Observers collect biological data on sea turtle bycatch and, when possible, tag and release live specimens. Radio transmitters have also been placed on some of these turtles. The observer program for the Northwest Hawaiian Islands lobster fishery is authorized under the M-SFCMA and focuses on documentation of lobster highgrading, although catch and bycatch data are also collected. NMFS manages and administers this program, directly providing observers to meet the fishery's 1997 coverage level of 66%.

NORTHWEST REGION OBSERVER PROGRAMS

Presented by: Keith Matteson, Pacific States Marine Fisheries Commission (PSMFC)

The five observer programs that have been implemented in Northwest Region fisheries over the last five years are: the Columbia River area salmon gillnet program, the North Puget Sound non-treaty sockeye salmon gillnet program, the Puget Sound non-treaty chum salmon gillnet program, the Pacific whiting (also known as Pacific hake) shoreside-landing program, and the groundfish data enhancement program. The first three salmon gillnet observer programs were short-term assessments of specific bird and marine mammal bycatch rates. Authorized under the MMPA and the ESA, these government-funded programs used alternative platforms to monitor the effort of large fleets of small gillnet boats. These programs relied on interagency cooperation and responsibility sharing between state, federal and tribal agencies. Observers were hired and supported by either state governments or the PSMFC, while NMFS provided further support and oversaw training, sampling design, and data analysis. These programs were completed by 1994.

There are currently two observer programs monitoring groundfish fisheries: the Pacific whiting shoreside landing program and the enhanced data collection program. The main objective of these programs is to collect data on bycatch and discarded species, while other important biological data are also collected. Both programs are voluntary and rely on industry cooperation and funding. In cooperation with the PSMFC and industry, state agencies hire, train, support, and debrief observers. The voluntary nature of these programs, however, limits agency control over program implementation, coverage levels, and observer placement.

SOUTHEAST AND GULF REGION OBSERVER PROGRAMS

Presented by:
Dennis Lee / Elizabeth Scott-Denton, NMFS, Southeast Fisheries Science Center

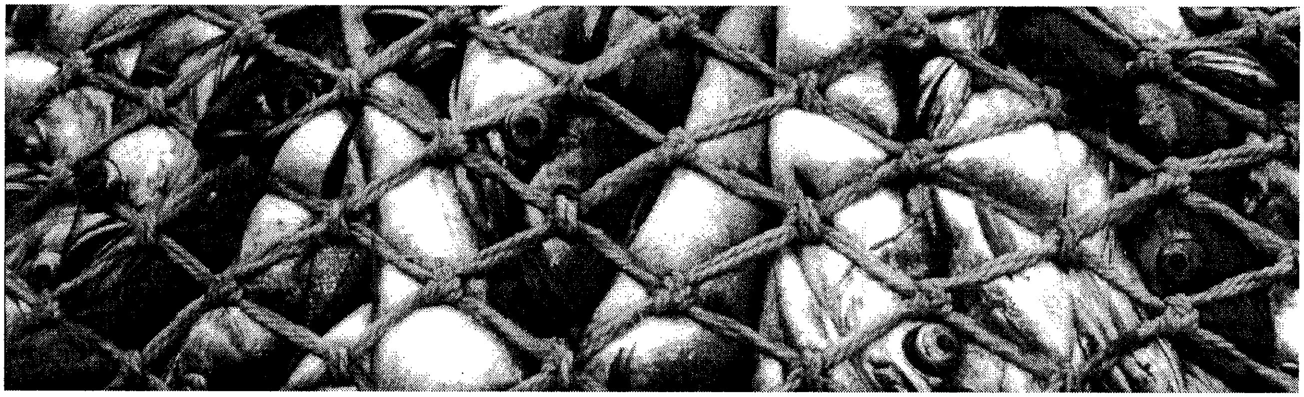
The Southeastern shrimp otter trawl observer program is a voluntary program which focuses on characterizing shrimp trawl bycatch and evaluating the effectiveness of various gear types in reducing turtle, finfish and marine mammal bycatch. However, the program's limited resources allow for the monitoring of less than one percent of this extensive fishery, which involves an estimated 7,000 vessels completing approximately 250,000 fishing days per year. Observers are trained by standard protocol and are supplied either through the Gulf and Atlantic Fishery Development Foundation or directly through NMFS. Vessels are compensated $25 to $50 a day for carrying observers. The mandatory pelagic longline observer program is administered by the Southeast Fisheries Science Center, Miami Laboratory, is government funded, and is authorized under the M-SFCMA and the Swordfish Fishery Management Plan. The program provides approximately 5% coverage of the fishing effort of an estimated 200 vessels. The main objective of the program is to collect data on the targeted swordfish and the bycatch of sea turtles, marine mammals, seabirds and other fish. The program is administered and implemented by NMFS, which hires observers under individual contractual agreements.

NORTHEAST REGION OBSERVER PROGRAMS

Presented by: Darryl Christensen, NMFS, Northeast Fisheries Science Center

The NMFS Northeast Region observer program is administered by NMFS Northeast Fisheries Science Center at Woods Hole. This program, like its North Pacific counterpart, was initially designed to monitor foreign fishing activity. In 1989, the domestic at sea sampling program began off the coast of New England. Since then, the program has expanded to include several fisheries, multiple funding sources, and a variety of delivery models. The program is often required to respond to short-notice requests for observers in fisheries of immediate concern. Thus, observers have been placed in the Atlantic sea scallop dredge fishery, the Atlantic bluefin tuna purse seine fishery, the pelagic drift gillnet fishery, the lobster pot fishery, the New England and Mid-Atlantic gillnet fisheries, and the Northeast Atlantic trawl fishery. Currently, most observer coverage is focused on the activities of the gillnet fishery's large and dispersed fleet of small gillnetters, in which a high rate of marine mammal interaction and mortality occurs.

In many of these fisheries, high costs and inadequate funding have kept coverage levels relatively low. All funding is provided by NMFS while the MMPA, ESA, and M-SFCMA authorize the placement of observers. In each fishery, species composition, bycatch data and biological samples are collected as opportunity allows. One contractor has primarily been responsible for observer recruitment, deployment, insurance and logistical support, as well as for the delivery of observer data to NMFS. Recent problems with the contracting process, however, have resulted in NMFS hiring observers directly.



OBSERVER PROGRAMS IN CANADA

Presentation of the Canadian Observer Programs began with a national overview of the program's mandate, objectives and legislative/regulatory framework. Program summaries for the Atlantic, North Atlantic Fishery Organization (NAFO) regulatory and Pacific Regions were then provided.

LEGISLATIVE FRAMEWORK

Presented by: Brian Donahue, Canadian Department of Fisheries and Oceans

With the 1977 introduction of the 200-mile EEZ, the Canadian Observer Program was first developed to monitor foreign vessels licensed to fish in the Canadian EEZ. Primarily an enforcement program (with scientific aspects), coverage was increased to 100% in 1987. The domestic program began in 1980 with enforcement, scientific and management components and is now part of the total management scheme for all major Canadian fisheries.

An integral part of DFO conservation and protection, science, and fisheries management activities, the observer program's national focus is led by the Conservation and Protection Directorate, coordinated by DFO regional offices, and delivered by private contractors. Contracts are let through a competitive open-bidding process whereby DFO requests proposals on which the Crown conducts independent technical and cost evaluations. Contract authority is retained at the national level while operations are administered at the regional level.

The At-Sea Observer Program's objectives are:

- Vessel Compliance with fisheries management plans and regulations regarding catch composition/prohibited species, bycatch, small-fish protocol, area of capture and gear restrictions;
- Fisheries Science involving stock assessment, scientific sampling, fishery dynamics/distribution, quantification / monitoring of catch, effort bycatch and discards, and oceans ecology; and
- Fisheries Management through fishery openings and closures, production estimation, gear selectivity studies, fishing plan development, field collection of catch data, and protection of marine protected areas and endangered species.

The Program's regulatory framework is comprised of:

- Program authority provided by the Fisheries Act;
- Observer designation/certification authority provided to the DFO Regional Director General (RDG) by the Fisheries (General) Regulations (Section 39(1));
- Observers' duties contained in the Fisheries (General) Regulations (i.e., "the monitoring of fishing activities, measurement of fishing gear, recording of scientific data, taking of samples; the monitoring of fish landings and biological sampling");
- Observers' rights as established in Domestic Fisheries (Fisheries General Regulations, Section 46(2)) and Foreign Fisheries (Coastal Fisheries Protection Regulations, Section 12(1)(e)); and

- Fisher's obligation to carry observers contained in Fisheries (General) Regulations.

REGIONAL OVERVIEWS

ATLANTIC REGION OBSERVER PROGRAMS

Presented by:
Hugh Parker, DFO Maritime Region

Canadian observer programs on the Atlantic Coast are divided into four regions: Scotia Fundy/Maritimes; Gulf Maritimes; Newfoundland; and Laurentian/Quebec. As indicated in Part III of this document, the specific composition of each region's program is unique. Thus, head office location, contractor identity, observer union/non-union status, average number of seadays, seasonal activity, and level of foreign participation all differ from one region to another.

As a whole, the Atlantic Region's observer programs deploy 180 observers in a number of fisheries with varying levels of coverage, for a total of 15,000 observed sea-days each year. Domestic fisheries with a 5-20% coverage level include those targeting groundfish, small and large pelagics and shellfish, while domestic developmental fisheries (e.g., sea urchins), experimental fisheries (i.e., new gear), sample fisheries (for science and industry) and the Northern Shrimp Fishery all operate under 100% observer coverage.

Mirroring the varied composition of their observer programs, these fisheries encompass a wide range of vessel lengths (from 35 feet to over 100 feet) and gear types (from sophisticated hydraulic dredges to hand-lines and harpoons).

Parker concluded with a 'funding message' suggesting that the Region's move to near 100% cost recovery of observer fees (with DFO continuing to pay administrative costs) represents a noteworthy development in the financing of these Canadian observer programs.

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NORTH ATLANTIC FISHERY ORGANIZATION (NAFO) REGULATORY AREA

Presented by:
Tony Blanchard, DFO Newfoundland Region

As noted above, Canadian observation of foreign vessel activity began with the 1977 introduction of the 200-mile EEZ. This was followed, in 1979, with the establishment of the NAFO by 17 voluntary member nations (including Canada and the United States). Adopting the goal of realizing 'optimum utilization and rational management of fisheries of the Northwest Atlantic', NAFO members agreed that the area outside of the members' 200-mile EEZs would be regulated through NAFO Conservation Enforcement Measures.

Canada's interest in regulating fishing activity in this area is especially keen due to the fact that many of the stocks concerned straddle the EEZ and the NAFO regulatory area. Thus, Atlantic Canadian observer programs provide 100% coverage, in both the EEZ and the adjacent NAFO regulatory area, for such activities as the Russian/Baltic Shrimp Fishery, the Russian/Cuban silver hake fishery, the Japanese tuna fishery, and the Russian/ Faeroe Island Greenland halibut fishery.

Compliance with NAFO regulations is voluntary and the activities of non-member vessels continue to detract from the Organization's conservation efforts. The evolution of the observer component of these efforts, however, has provided encouraging results. Beginning in 1992 with the low coverage level of 10% and a relatively undefined role, the initial ineffectiveness of observers in the NAFO area was underscored by the 1994 reporting of 63 vessel infringements. Consequently, 1995 saw both the clarification of observers' compliance monitoring duties and an increase in coverage levels, which was implemented the following year.

As a number of NAFO member countries did not have the existing observer programs to expand, in February 1996, Canada hosted a three-week program in St. Johns for observers and trainers from these countries (and is currently working with Estonia, Latvia and Lithuania on developing their programs). Such efforts at international cooperation and increased observer coverage have made NAFO's conservation goals for the regulatory area achievable. The deterrent effect and cost-efficiency of the area's increased observer component has resulted in 12,000 observed seadays in 1996-1997, with the corresponding decrease in infringements that such coverage ensures.

> Such efforts at international cooperation and increased observer coverage have made NAFO's conservation goals for the regulatory area achievable.

Briefly responding to questions, Blanchard further clarified the following aspects of the NAFO regulatory area's program:

- As the Canadian portion of the program is operated in much the same manner as the Canadian domestic observer program, infringements are reported to fishery officers who determine whether to lay charges, in which case the observer would serve as a witness;
- While training occurs in various countries without a fully standardized procedure, there is a consistent emphasis on compliance monitoring and on maintaining scientific data collection and sampling components;
- Although the potential conflict of interest of having an observer on a vessel with a crew of the same nationality exists, generally, this does not occur (e.g., European Union vessels tend to have Spanish or Portuguese crews and British observers); and finally,
- While non-NAFO vessels are not compelled to comply with the area's regulations or submit to inspections, in 1994 Canada enacted unchallenged legislation that successfully restricted non-NAFO vessels from some areas.

PACIFIC REGION OBSERVER PROGRAMS

Presented by:
Barry Ackerman, DFO Pacific Region

In British Columbia (B.C.), the two main observed fisheries are the domestic trawl fleet, targeting groundfish, and the foreign/domestic joint-venture fleet, targeting Pacific hake. In both programs the main objectives are an accurate accounting of total catch (including discards) on a vessel area and species specific basis and an accurate estimation of species composition, including 'particular species' which are designated as non-retention species (prohibited species).

Observer duties include:

- Estimating total catch;
- Determining the proportion of each of 29 species caught within each of 55 management subareas (every vessel being allotted an individual quota on an area by area basis);

Courtesy Archipelago Marine Research Ltd.

- Differentiating between marketable and unmarketable fish (and estimating the 'high-grading' of the former);
- Monitoring and determining the condition of caught and released prohibited species;
- Estimating species mortality based on a formula involving towing time and the condition and size of the fish;
- Conducting biological sampling of targeted and bycaught species.
- Monitoring vessel compliance with area, operations and gear restrictions;

West Coast ministerial policy created compulsory observer coverage levels for nearly all fishing trips by the domestic groundfish trawl fleet in 1996. This decision recognized the critical importance of observers' independent estimates of catch for the management of the Individual Vessel Quota (IVQ) system, which was to be implemented in 1997.

The observer program for this fishery has an annual cost of $2.3 million (CDN), which is cost-shared between industry and the Canadian Government. This cost represents 5,500 annual observed seadays aboard a fleet of about 90 vessels landing 45,000 t annually.

Similar to the structure of its East Coast counterparts, the Pacific Region observer program has DFO retaining responsibility for defining the program requirements and objectives, identifying a single supplier following an open competitive process and overseeing that contractor's program delivery. The contractor is responsible for hiring, training, supervising, briefing/debriefing, entering and ensuring quality control of data, delivering the data product and recovering industry's portion of program costs through billing. Finally, following the cost-recovery dictum 'you pay/you say', industry involvement in program structure has increased through the Groundfish Trawl Advisory Committee's Observer Sub-Committee, which liaises with the Department.

The foreign/domestic Joint Venture hake (Pacific whiting) fishery, operating off the lower West Coast of Vancouver Island, has had 100% observer coverage since 1987. The $200,000 annual cost is paid by industry. This fishery operates between late May and early October, representing 500 observed seadays and lands 50,000 t of hake annually.

DFO Pacific Region also conducts limited at-sea observer coverage on other fisheries, in order to monitor commitments to the International Pacific Halibut Commission (IPHC) to monitor halibut bycatch. DFO directly pays for 100 days annually to monitor the West Coast shrimp trawl fishery.

In response to questions, Ackerman described the way the observer data are used to reset IVQs and shut down vessels when they have exceeded their quotas. At-sea observers estimate where and roughly how much fish were caught while the precise weight by species is determined by offload monitoring. Actual weights are then pro-rated using at-sea observer data to assign catch to areas. Pro-rated catch, plus at-sea estimates of discards, are then deducted from an individual vessel quota. Overages of a species' catch in an area may result in restrictions on further fishing. Ackerman concluded, however, by noting that, while this is a new program, it is succeeding both in incorporating the data collected to better manage the fisheries and in encouraging industry to adapt their fishing practices so that these quotas are not exceeded.

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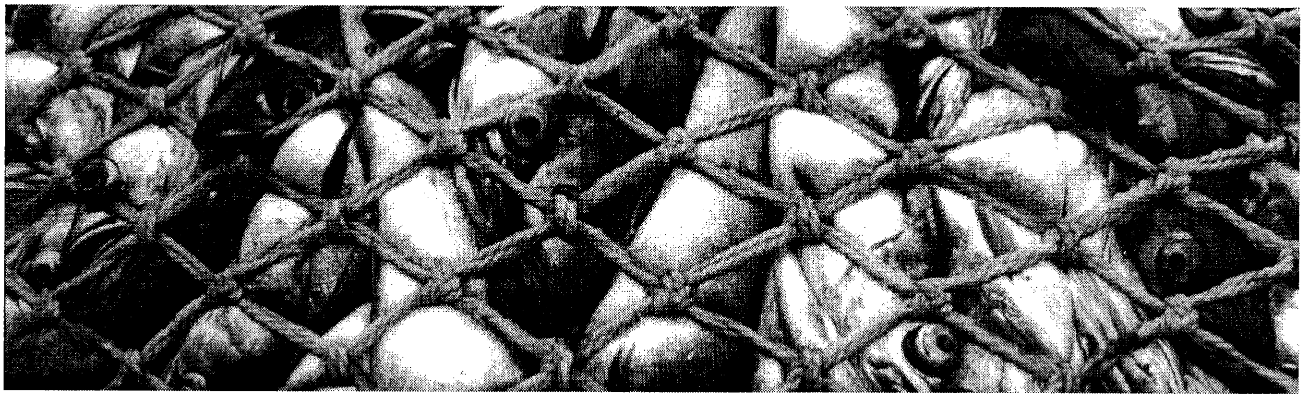


PROGRAMS IN OTHER AREAS

ARGENTINA

Presented by: Guillermo Cañete, National Fisheries Research and Development Institute (INIDEP)

During 1997, the overall catch in Argentina was 1,400,000 t. The most important and observed species were hake with 43.6% of the total catch, squid 30.7 %, shrimp 0.5% and austral species with 9.1%. Argentina's hake fishing grounds are divided into species-specific areas with permanent and temporary area closures protecting spawning adults and juveniles and the total northern fishing ground being co-managed with Uruguay.

> While this is a new program, it is succeeding both in incorporating the data collected to better manage the fisheries of Argentina and in encouraging industry to adapt their fishing practices so that these quotas are not exceeded.

Argentina's on-board observer program began in November 1993 with World Bank financing. The program was suspended in 1996 due to lack of funds, but resumed in January 1997 with a loan from the European Union. The program's most active years have been 1995, with roughly 1,500 seadays, and 1997, with 1,400 seadays. The observer activity proposed for 1998 is 10,460 seadays, with more than 5,800 seadays directed to the hake fishery (20% observer coverage).

Cañete outlined the conditions within the hake fishery that necessitated restarting of the observer program in 1997. Inadequately funded enforcement of fishery regulations resulted in catch levels being exceeded year after year as the factory trawler fleet expanded and statistics on fishing effort became ever more uncertain. The overexploitation of hake became evident through such indicators as decreased yield, decreased total and reproductive biomass and an increased proportion of juveniles within landed catches.

In response to this crisis, hake management measures were taken which included a total annual catch limitation, reduction of effort levels, mesh size and other gear regulations, decreased hake bycatch in the shrimp fishery, and area closures. As a crucial element in implementing these measures, as well as to provide the information necessary for stock assessment and fisheries management, the observer program was developed with the objectives of:

- Estimating total catch and effort;
- Estimating bycatch and discards (including marine mammals and seabirds);
- Conducting biological sampling;
- Determining vessel procedures, production levels and conversion factors;
- Determining effectiveness of various gear types and mesh sizes; and
- Improving communications with fishers.

Today, Argentina's onboard observer program is characterized both by strengths and weaknesses. In its favor, the program's administration has weathered several years of unfavorable conditions, gaining valuable experience in the process. The program is recognized by industry, is politically and economically supported by government and is developing a corps of experienced observers through an effective training and evaluation process. The crisis persists, however, as necessarily strict regulatory measures create both discontent within the fisheries and a great demand for observer data. Thus, the program is being forced to grow rapidly and optimize its components. The overall statistical system requires redesigning, while the observer program itself is in competition with a control system that also involves onboard inspectors. Finally, as the 1996 program suspension serves to remind managers, development must not proceed without a clear source of future funding.

NORWAY

Presented by:
Rolf Blikshavn, Fisheries Directorate of Norway

While Norway does not have an observer program, *per se*, aspects of its enforcement and control activities employ fisheries technicians and inspectors whose duties are at times equivalent to those of observers. A surveillance service monitors the fishing grounds in the Barents Sea and the coastal waters of North-Norway. One of the methods used by the service is to deploy fisheries technicians to stay on board vessels and monitor catch composition. Primarily concerned with juvenile cod in the cod fishery and with cod by-catch in the shrimp fishery, technicians report to their coordinators when limits have been exceeded, coordinators notify the department and the section of the area involved is closed. Likewise, to determine whether a closed area is in a condition to be reopened, vessels are allowed to conduct a limited fishery with technicians aboard. In 1997, 55 sections of areas were closed and opened in this manner which, Blikshavn suggested, accounts for the healthy condition of cod stocks in the Barents Sea.

In Norway's herring fishery, inspection vessels follow the fleet, which follows the herring as it migrates from the north to the south. The inspection vessel gives fishing vessels permission to fish and sends fishery officials to the individual boats where they remain until the operation is completed and the logbook written. In this fishery, the presence of the inspection vessel and on-board fishery technicians serves to deter the dumping which used to occur when a vessel caught more than it was able to bring aboard. With fishery officials aboard, vessels are now compelled to contact the inspection vessel in such instances, which, in turn, commands other boats in the area to bring aboard the excess herring.

Mackerel stocks in the North Sea south of Norway are shared by several nations, including those of the European Union. The enforcement objective in this fishery is to prevent large-scale highgrading or dumping of catches that are deemed of an undesirable size or quality. Because the mackerel stocks and fishers are not as condensed as are those in the herring fishery, using an inspection vessel to monitor this fishery would be inappropriate. Consequently, Norway places inspectors on board a portion of these vessels where they remain until the quota is taken. Data from these vessels are then extrapolated to give an overall picture of the fleet's activity.

In this Norwegian fishery, the presence of the inspection vessel and on-board fishery technicians serves to deter the dumping which used to occur when a vessel caught more than it was able to bring aboard.

Norwegian fishers also participate in the shrimp fishery that occurs in the NAFO area on the Flemish Cap, far from Norway. Because of the expense and logistical difficulty encountered in the first year of observing this fleet from Norway, the Norwegian government contracted with a Canadian observer company. Seawatch supplies observers to these vessels once they have entered the NAFO area, takes care of the day to day operation of the program, and forwards the data to DFO, which, in turn, conveys it to Norway. This has proved to be an excellent solution, which has resulted in strengthened communication and cooperation between Norway, Seawatch and DFO.

Finally, Blikshavn indicated that while fishers pay for 100% of the program costs in the NAFO area, they are not currently required to pay the costs of their being monitored in Norwegian waters. Norway is dusting off its regulations, however, and a system of domestic cost recovery will be implemented.

CARIBBEAN COMMUNITY (CARICOM) REGION

Presented by: Terrence Phillips, CARICOM Fisheries Resource Assessment and Management Program

The goal of CARICOM Fisheries Resource Assessment and Management Program (CFRAMP) is to promote the management and conservation of CARICOM fisheries resources and to conduct exploitation of these resources on the basis of sustainable yield.

The program funded by CIDA (Canadian International Development Agency) and CARICOM began in 1991 with the purpose of enhancing the basic information and institutional capacity necessary to manage and develop fishery resources in the CARICOM region. One aspect of the first phase of the program (which has been extended to 2001) has been concerned with implementing onshore data collection systems within member countries to collect catch, effort, biological and other data, mainly through beach sampling and logbooks. In 1997, an at-sea observer component was added to this data collection program to provide catch, bycatch, discard, biological and technical data.

> The CIDA/CARICOM funded program began in 1991 with the purpose of enhancing the basic information and institutional capacity necessary to manage and develop fishery resources in the CARICOM region.

Initially, CFRAMP and its projected observer component has focused on the Trinidad and Tobago shrimp fishery which, coupled with its bycatch, represents 70% of the island's fish production. The Guyanese shrimp fishery and Jamaican and Belizian lobster, conch and, to a lesser extent, shrimp fisheries have also been included in this first phase of the program.

In 1997, CFRAMP contracted two Canadian consultants, David Kulka and Geoff Hurley, to help design the observer program in consultation with the fisheries departments and other CARICOM state agencies such as the Coast Guard and those responsible for foreign and legal affairs.

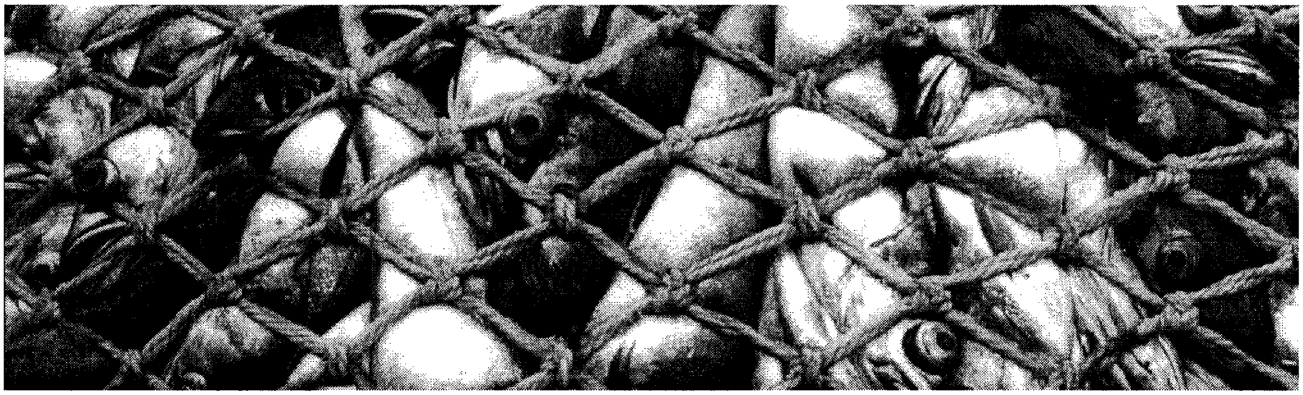
While the observer program is nearing implementation, a number of issues remain unresolved. In building the framework and providing the tools for the observer program to acquire biological and technical data directly from the fishery, the project is attempting to standardize such aspects as sampling and estimation techniques, data forms and data storage, while allowing regulatory and administrative components to remain country-specific.

Due to limited funding, the initial phase of the observer program will concentrate on gathering scientific data from the shrimp fisheries of Trinidad and Tobago, and Guyana. As the program expands to observe other CARICOM fisheries, overall responsibility for program administration will typically be retained by the director or chief officer in the fisheries department of each country, while a program coordinator will be charged with day to day implementation.

The program's consultants have drafted a CARICOM observer training manual similar to those used in the Canadian programs as observer duties and formats in both jurisdictions are to be similar (i.e., monitoring fishing activities, enumerating catch by species, conducting biological sampling, and collecting and reporting data through catch summaries and trip reports). The consultants have also recommended coverage levels ranging from 5% to 12% depending on management objectives, although this will be determined by availability of funds.

Various other preliminary details are also being addressed in anticipation of the program's implementation. Member countries have redrafted or are redrafting their fisheries legislation to require the placement of observers aboard vessels. Observer safety being of paramount concern, program developers have also consulted with local Coast Guard agencies regarding rescue procedures. Likewise, the bordering nations of Venezuela and Suriname have been consulted regarding the treatment of observers who may be aboard vessels which are seized for venturing over these borders.

Liability has been a further area of consideration for program developers and suppliers. It has been determined that, if observers are employed under contract the issuance of liability insurance could be by a private insurance firm. If the observer is a government employee then he/she may already be covered in every country where observers are government employees.



THEME I: CATCH DETERMINATION METHODOLOGIES: PROBLEMS AND PROGRESS

Moderator: Mark Saunders, DFO Pacific Region
Panelists:

Dave Kulka	DFO, Newfoundland Region
Michael Gjernes	Archipelago Marine Research Ltd.
Sarah Gaichas	NMFS, AFSC North Pacific Groundfish Observer Program
Bob Trumble	International Pacific Halibut Commission
Larry Byrne	Alaska Department of Fish and Game
Richard Merrick	NMFS, NEFSC protected species
Guillermo Cañete	INIDEP Argentina

Saunders opened discussion of methods for catch determination by introducing the panelists and outlining the panel's objectives. Saunders suggested that the panel provide an exchange of information on catch estimation and sampling methods. He encouraged panelists to describe data collection problems their programs have encountered and, if possible, to identify potential solutions and opportunities for collaborative research.

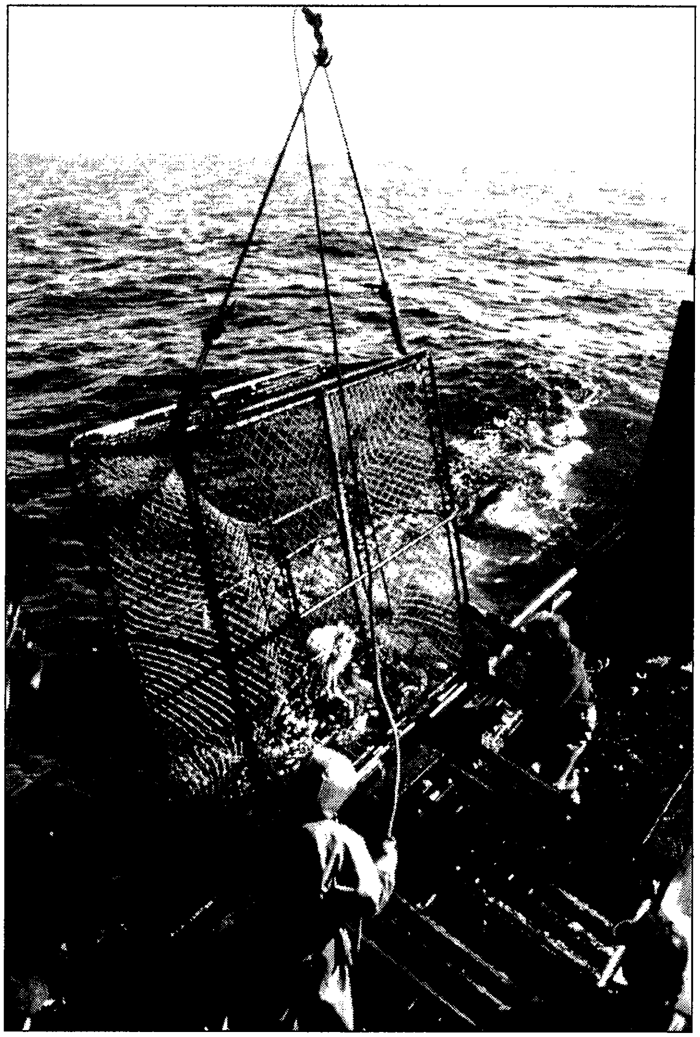
CATCH DETERMINATION OBJECTIVES

Virtually all observer programs require estimation of total catch and species composition. Ideally, estimates include total weight of the catch and the separate weights of each species, including bycatch and discards. While many fisheries management programs can rely on landings for total catch estimates, these figures often fail to represent the true total catch of either the vessel or the fleet. Species are discarded at sea for a variety of reasons including regulations that prohibit their retention, high-grading of target species, and the lack of markets or processing capacity. Observer estimates of catch are also an important data source for extrapolating total catch and/or bycatch levels in fisheries where much of the activity is unobserved. In addition, geo-referenced total weights and species composition estimates, along with data on fishing strategies, may be analyzed to better understand the relationship between catch and bycatch rates and fishery impacts on the marine ecosystem.

While many fisheries management programs can rely on landings for total catch estimates, these figures often fail to represent the true total catch of either the vessel or the fleet.

FISHING GEAR AND STRATEGY CONSIDERATIONS

Panelists noted that many variables may influence the sampling methods observers use to estimate total catch and species composition. These variables include: the gear and strategy used to catch, bring aboard and process the fish; vessel size; deck space and processing area layouts influence on observer access to the catch; the size and composition of the catch; the amount of crew cooperation and assistance; program sampling goals and priorities; and the legislative and financial resources that support them.



Courtesy Mandy Merklein

As gear type may influence the effectiveness of sampling methods, Saunders described the range of gear being used in standard fishing operations. Fishing gear may be generally distinguished as nets, hooks or pots, with methods for sampling and estimating total catch needing to be specifically adapted to each category. Fishing strategies involving nets may be further categorized as midwater or bottom trawl which scoop the catch, gillnet which entangles the catch, and seine net which encircles the catch. There are also some fisheries that use fixed net pens, such as weirs, which trap the catch. Hook and line fisheries include longline gear with hooks suspended on gangions attached to lines that can be miles long and set to soak for hours or days before they are retrieved. Longlines are usually weighted to catch fish along the sea-bottom although some fisheries longline for pelagic species. Trollers also use hook and line gear by trailing hooks off lines from the stern of the vessel, usually targeting pelagic species such as tuna or salmon. Jigging also involves hook and line gear with various species being targeted through the use of different types of hooks, different baits or lures, and different depths fished. Pots or traps may be fished individually or with multiple pots attached along a line. Pots are usually set along the sea-bottom to catch invertebrates such as crab and shrimp or bottom fish such as black cod.

Kulka noted that the different ways in which various fishing strategies bring the catch on board will further influence which sampling and catch determination methods are developed and utilized. In the trawl and seine fishery the catch is usually brought on board or to the processing facility all at once. In the longline hook and pot fisheries and in the gillnet fisheries the catch is usually brought on board in increments during a continuous retrieval starting from one end of the line. In the jig, troll and single pot fisheries as well, the catch may be brought in incrementally - one distinct unit at a time.

The different ways in which various fishing strategies bring the catch on board will further influence which sampling and catch determination methods are developed and utilized.

COLLECTING DATA ON THE CATCH

SELECTING VESSELS AND HAULS FOR SAMPLING

In fisheries with less than 100% coverage, not all vessels will carry an observer, nor perhaps will all hauls or sets be sampled while an observer is on board. In these programs a procedure must be established for selection of vessels and hauls to be sampled. This selection should be made in a random manner. However a random vessel selection is impractical in most fisheries. Once on board the vessel, however, the observer may be able to randomly select the hauls, pots, or sets that will be sampled. Byrne described how observers in the ADF&G shellfish program are encouraged to randomly select pots to sample. Gaichas noted that the North Pacific Groundfish Observer Program uses a random sampling table to select the hauls observers should sample on trawlers and that a similar selection protocol is being developed for longliners.

TOTAL CATCH WEIGHT DETERMINATION

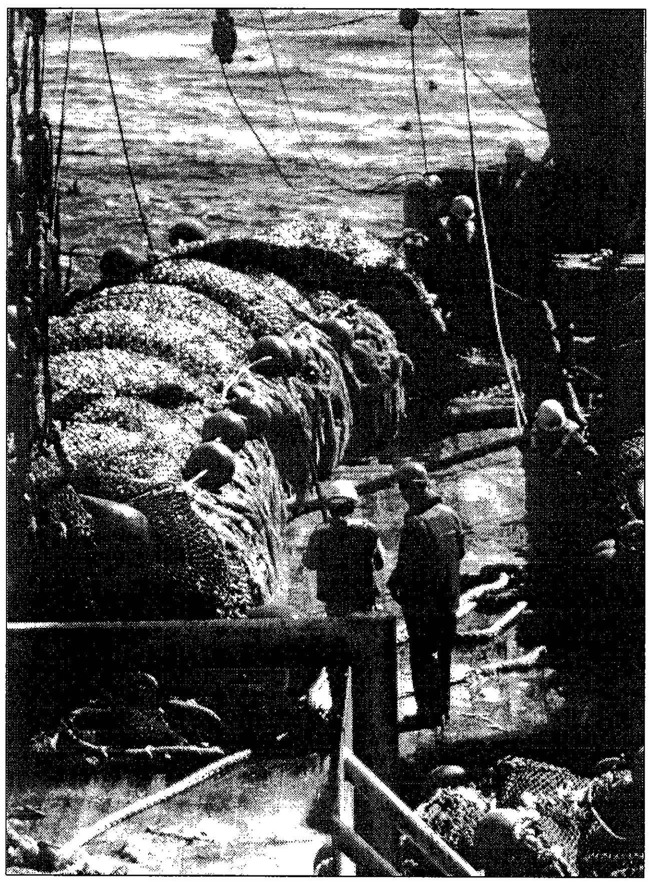
Several panelists described methods used to estimate total catch in their programs. Total fleet catch calculations for many fisheries come from landings data. This is the amount of fish landed by the vessels to processors or processed at sea and reported by the fishing industry to management agencies. Unverified landings data can be inaccurate and misleading due to poor estimation or intentional underreporting of retained and discarded catch. Kulka suggested that landing figures are generally inadequate sources for catch effort data or geo-referencing of catch. Catch figures from landings usually lump reported catch into general fishing areas or reflect the area the fish was landed in rather than where it was caught. Thus, in many fisheries, observer data are used to refine or verify landings data reported by industry. Cañete described this as the primary objective of Argentina's foreign hake fishery observer program.

Agencies often rely on industry reports of catch from hauls or sets that observers have not sampled or could not make total catch estimates of during an observed fishing trip. Skipper total catch estimates for such hauls or sets may provide geo-referencing that landings data cannot reflect. In some observer programs, such observer at-sea catch weight estimates may be used to apportion the trip's overall landing weights to specific fishing areas.

Gjernes further suggested that the size of the vessel may also influence the observer's ability to sample the catch, with small boats often having significantly limited sampling space and observer access. As a result, small boat observers are often left with no choice but to rely more on visual estimation than on the actual weights, counts, and volumetric estimates that are available to observers on larger vessels. Panelists agreed that there is considerable uncertainty involved in visual estimation and that the method requires a great deal of experience and confidence before an observer can make reasonably accurate visual catch estimates. There was, however, some disagreement among participants regarding whether observers should not employ this method or whether it serves as a legitimate method of last resort.

OBSERVER VOLUMETRIC ESTIMATES

Observers often estimate the total weight of a catch by measuring its volume and multiplying it by a density factor. This method is common in the trawl fishery where the entire catch is brought onboard at once. Ideally observers derive a volume by measuring the dimensions of the net's codend on deck or from the dimensions



Courtesy Archipelago Marine Research Ltd.

of the catch once it is dumped into the fish hold. Panelists described many challenges that observers face in obtaining accurate volume and density measurements.

Accurate volume estimates must be combined with equally accurate density estimates if their calculation is to accurately reflect total catch weight. Gaichas discussed recent NMFS research on density measurement. Densities determined by North Pacific Groundfish Program observers differed significantly from each other's. To eliminate these inconsistencies, NMFS now prescribes a walleye pollock density standard, based on research data, for the entire fishery. In the future, NMFS hopes to establish appropriate density standards for other fisheries.

Panelists noted that observers may encounter difficulty in estimating volume accurately. For example, NMFS research has suggested that the volume of large codends is often overestimated by observers. As many of these codends are too large for an observer to measure alone, assistance from the crew is often required. In addition, bin volume estimates of catch can be affected by excessive water, poor visibility, and limited visual access to bins. Thus, it was suggested that educating industry with regard to the importance of providing enough time for accurate codend measurement, allowing for full visual access to well marked bins, and implementing water control measures in those bins could contribute to improved catch estimates.

The ideal, of course, is for observers to obtain actual weights of the total catch by species. Gaichas described flow scales that have been placed on some factory trawlers to weigh the catch before sorting and processing. Load cells can be used for some catches but are less practical in heavy seas. Direct measurement of catch weights may be unobtainable on small vessels that do not process their catch.

Finally, in fisheries where the catch is brought aboard incrementally, such as the longline or pot fisheries, an effective tally or counting method may be used to estimate total catch. In this method, all pieces are counted and an average weight applied to calculate a total. If only part of the haul is sampled, an average weight and species count per hook or pot in sampled sections can be applied to the total set using the known number of total hooks or pots.

SPECIES COMPOSITION DETERMINATION

In fisheries with low species diversity where one target species dominates the catch, such as the pelagic hake or pollock fisheries, species composition may be determined using whole haul sampling. This involves initially estimating a total catch weight and then sorting through the entire catch and counting or weighing all bycatch. The bycatch weight is then subtracted from the total catch weight providing a total weight of the target species. If the total catch weight is accurate and the observer is confident of bycatch weights or numbers, this is a very accurate method for estimating species. However, because even 1 % bycatch in a 80 t haul is a considerable amount of fish for an observer to weigh in its entirety, this approach will not always be applicable.

In most cases, sampling is necessary for determining species composition. Sometimes large subsamples (or partial haul samples) can be taken. This approach is appropriate if the sample weight can be obtained directly or volumetrically, species diversity is low, and time and space are available for sorting. When this is not possible, small subsamples (or basket samples) must be taken. Samples are sorted and weighed by species and composition for the sample haul.

In some programs, fishers may provide an estimate of bycatch through a factory tally when the observer is not able to sample the catch. Gjernes noted that in some B.C. fisheries, a total tally of fish or totes of fish by species will be collected by the crew when the observer is not present. An average weight is then applied to the number of totes to estimate weight of bycatch species. However, as this estimation method both presupposes crew cooperation and represents a potential conflict when bycatch levels affect the vessel's future opportunity, it is only of value in certain circumstances.

For fisheries in which the catch is brought up incrementally, such as the longline and pot fisheries, observer estimation of total catch and species composition occur simultaneously. Gaichas pointed out that random sections of the longline or pots should be selected and sampled for species composition. Average weights are then used to calculate a total sample weight, which is then applied to the total number of hooks or pots in the set.

> True random sampling is an unrealistic expectation, given the unpredictable and uncontrollable nature of fishing.

Several panelists agreed that true random sampling is an unrealistic expectation, given the unpredictable and uncontrollable nature of fishing. Byrne explained that observers in the ADF&G shellfish program are directed to avoid obvious bias and to select pots as randomly as possible. To avoid such bias, pot selection on the basis of their content or the time of day fished should be avoided in favor of selecting pots before they come up and throughout a 24 hour period.

SPECIES COMPOSITION SAMPLING PROBLEMS

In addition to the above challenges, panelists noted several difficulties observers may encounter when estimating species composition. These difficulties include crews presorting the catch and observers being allotted inadequate sampling access, time or space. First, the catch may be sorted before the observer is able to determine species composition (e.g., when the catch is immediately sorted along conveyor belts, or through pumps or grinders). When possible, some observers have responded to this problem by collecting their sample on deck before it enters the fish bin. In other cases, however, the crew may inadvertently or intentionally presort the catch to remove unwanted or prohibited species prior to observer sampling.

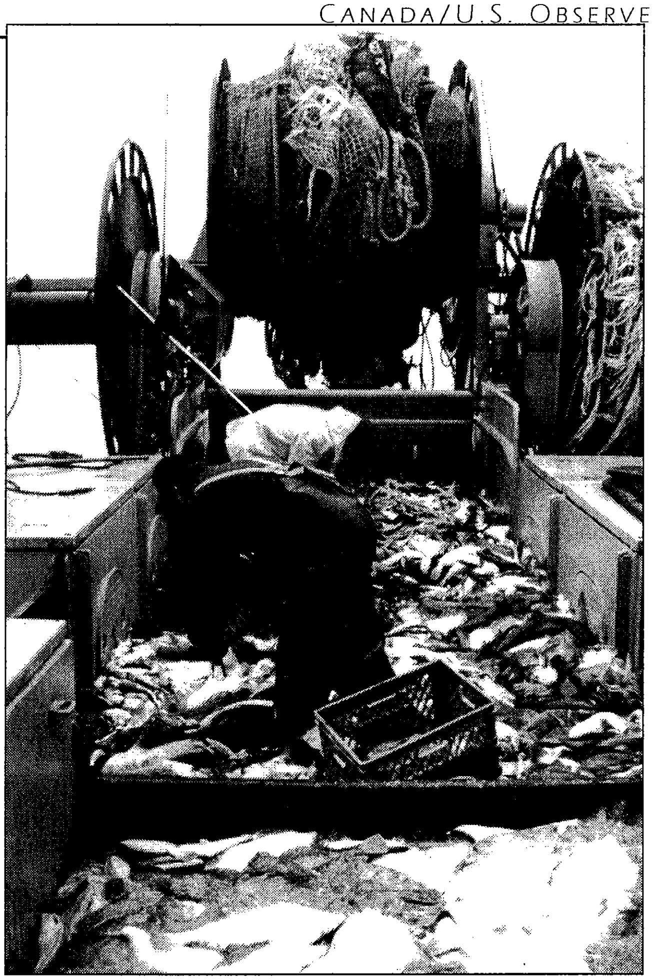
Further difficulties observers encounter in determining species composition include:

- Not being notified of haulback;
- Inaccessibility of catch;
- Inadequate workspace;
- Being prevented from slowing the conveyor;
- Being required to work in a heavy traffic or dangerous area;
- Poor lighting; and
- A lack of places to hang a scale.

Observers in new or under-funded programs may not be provided with adequate sampling gear, in which case they will be required to improvise in achieving their sampling goals. Cañete described such a situation in Argentina's groundfish fishery program where observers are encouraged to adapt their sampling methods to the conditions and resources available. Gjernes agreed that the nature of fishing is unpredictable and that, especially on small boats, observers are required to use their judgment and apply the sampling methods they feel are most appropriate in any given situation. In general, observers work in a difficult and dynamic environment and must rely on industry cooperation to achieve their sampling goals. Panelists suggested that many of the challenges and problems confronting observers could be mitigated or resolved by cultivating industry cooperation through education and, if necessary, through enforcement.

ESTIMATING DISCARDS

Fishers discard fish for a variety of reasons including situations in which retention of particular species or size groups is illegal (regulatory), or unmarketable (economic). Observers may be able to estimate these discards relatively easily when the amounts are manageable and the conditions favorable. In these instances, observers simply count and/or weigh every species and apply a corresponding average weight or number to estimate total discards. However, obtaining accurate discard estimates, particularly in fisheries with diverse catches and high dis-



Courtesy Mandy Merklein

programs simply calculate discards by subtracting the total delivered or processed weight from the total estimated catch weight. In the case of at-sea processors, product recovery figures may also be used to estimate the whole or round weight of the processed fish.

Discard Viability Estimation

Mortality of halibut, crab, salmon or herring may result in North Pacific groundfish fisheries being shut down before they are able to reach their quota. Elsewhere, bycatch and mortality of protected marine mammals, sea turtles or birds may close or restrict fisheries. Observer estimates of both the amount of certain discards and their condition when released is of great concern in these fisheries. In the case of halibut, for instance, the IPHC has researched expected survival rates for halibut under various conditions and has determined that their survival is enhanced if they are released quickly and handled carefully. Observers are trained to collect halibut condition information to which a viability factor is applied. Observer data is thus used to establish an annual discarded mortality rate for each fishery and halibut mortality is determined by applying this rate to observer bycatch estimates. Time on deck is a critical factor in determining mortality rates and the sooner the fish are returned to the water the better their chance of survival. However, observers must balance the need to return the fish to the water as quickly as possible with the need to obtain important data on both halibut and the rest of the catch before releasing those fish.

These same challenges apply to observers and program mangers developing observer protocol in fisheries with bycatch of endangered or protected species such as marine mammals, birds, and sea turtles. In all cases, observers must have a clear protocol for evaluating the viability of the species in question and for fulfilling data collection requirements without jeopardizing survival.

Sampling Design Considerations

Extrapolation of observer data depends not only on accurate sampled catch information, but also on accurate measures of total fleet effort. Merrick noted that many MMPA fisheries derive total mortality levels of marine mammals by multiplying a calculated observer take rate by the total effort. Determining overall fleet and vessel effort may therefore be an important aspect of observer program design. Observer coverage and sampling levels need to be set high enough to ensure confidence in the data. Since poor or uncertain estimates of protected species bycatch can close a fishery, obtaining reasonable confidence in observer data is also important to industry. In determining the optimal allocation of sampling effort, however, managers often need to work within strict budgetary constraints. Especially in many of the larger fisheries, obtaining precise bycatch esti-

> Obtaining accurate discard estimates, particularly in fisheries with diverse catches and high discard rates, is one of the greatest sampling challenges confronting observer programs.

optimal allocation of sampling effort, however, managers often need to work within strict budgetary constraints. Especially in many of the larger fisheries, obtaining precise bycatch estimates of rare species may require higher levels of observer coverage than program budgets will allow. Theme II of this report considers the issue of balancing scientific needs with cost constraints when allocating and prioritizing observer coverage.

Saunders concluded the panel discussion by noting that, although there are interesting technical solutions to some of the problems facing observer programs, panelists had repeatedly suggested that the solution to most problems involved fostering industry cooperation through education and outreach programs or through enforcement action. Therefore, in opening the general panel/audience discussion, Saunders asked the panelists to detail how they felt such outreach efforts could foster industry cooperation.

GENERAL DISCUSSION

FOSTERING INDUSTRY COOPERATION

Trumble described how the IPHC had successfully used education and outreach programs to elicit understanding and cooperation from fishers and to ultimately decrease halibut mortality. Trumble suggested, however, that this success depended on going beyond vessel owners or industry representatives and reaching the crews who actually handle the fish. As a result of these efforts, the IPHC estimates that halibut mortality in some fisheries has been halved. Loefflad added that education and outreach efforts were more likely to succeed if there was a positive incentive for industry to cooperate. In situations in which industry cooperation might entail temporary or long-term limitations on its fishing opportunity, such educational efforts would likely require regulation and enforcement.

Several participants felt that observers could contribute to educating the fleet about program issues. Gaichas suggested that observers clarify for vessel owners how a primary purpose of their sampling is to ensure fairness amongst vessels. Saunders asked Doug March, a commercial fisher in attendance, what he thought would be the best way to encourage industry cooperation. March responded that most fishers wanted to be sure that well trained, experienced biologists were deployed as observers. He suggested that the professionalism of observers was a key to gaining the respect and cooperation of industry.

> Professionalism of observers was a key to gaining the respect and cooperation of industry.

Steve Meyer, NMFS Alaska Region Enforcement, related how the tuna/porpoise observer program conducted observer placement orientations in which skippers had questions about the program answered and were briefed on observer sampling protocols and crew assistance requirements. Meyer felt that this was a valuable method for creating understanding between industry and agency with regard to observer program issues.

QUALITY OF OBSERVER DATA

Several participants expressed concern over the use of observer visual estimates in determining total catch or species composition. Merrick mentioned that NMFS now discouraged the use of visual estimates, especially by inexperienced observers who are more likely to misidentify species or misjudge numbers of individual pieces. Despite its comparative inferiority, however, it was again acknowledged that in some circumstances visual estimation is the only method available to an observer.

Because such influences as observer experience and sampling conditions will affect the accuracy of observer data, Merklein asked what methods might be introduced to rank data quality and to alert data users to potential problems. Loefflad responded that, although the North Pacific

Groundfish Observer Program ranks observer performance, no cross-reference currently exists to flag data quality.

The best way to create confidence in observer data is to develop and maintain an experienced, involved and motivated corps of professional observers.

McElderry concurred that it would be valuable to create a mechanism that would reflect the quality of observer data, and he added that many data users do not realize the conditions under which observer data is collected. There was general agreement that not enough is done to place observer data in the context in which it is collected, although it was also recognized that systematically assessing the quality of such data would be a complex exercise. Some participants felt that an index of data quality could be reflected in the experience of the observer, in that inexperienced observers tend to be more readily influenced by the crew. Byrne related an ADF&G proposal to directly hire observers (as opposed to using observer contractors) to ensure that the program benefits from a more experience corps.

Workshop participants recognized that observers work unsupervised in remote, difficult and often unfriendly conditions, with little outside contact or support. Merklein noted that observer's ability to collect quality data in such an environment rests heavily on their experience, and that the work requires a great deal of self-direction and motivation. Programs that do not provide their observers with a sense of being valued will fail to maintain a professional, experienced corps, with data quality suffering accordingly. Merklein suggested that observer motivation could be cultivated by providing a respectful working relationship in which observers were supported, acknowledged and compensated as professional biologists. In addition, motivation can be cultivated by increasing observer understanding of how the data they collect are used, and by further including observers in the process of developing sampling protocols and data analysis. Several panelists agreed that observers are often career track biologists and appreciate being acknowledged in papers and publications that result from the use of their data.

Saunders suggested that, in addition to informing observers of how their data are being used, program managers should also listen to observer concerns and include their suggestions in improvements to sampling protocols. Saunders noted that one of the most frequent concerns he hears from observers is that the data they collect are not being used or are considered unreliable. Ianelli agreed that the attitude of observers is key to the quality of data collected and he voiced concern that observers might not understand the long-term value of the data they collect. After considerable discussion on the topic, workshop participants agreed that the best way to create confidence in observer data is to develop and maintain an experienced, involved and motivated corps of professional observers.

OBSERVER BIAS

Observer bias – the deviation from regular fishing behavior as a result of the presence of an observer.

Lionel Rowe, DFO Ottawa and Karp raised concern regarding the extent to which fishers modify their behavior as a result of the presence of an observer - a phenomenon referred to as observer bias. This is especially problematic in fisheries with less than 100% coverage. Observer presence may have a serious, but unaccounted for effect on the fishing strategy of a vessel because fishers may avoid areas of high bycatch or may treat the catch differently when an observer is on board. If bycatch figures are lower with an observer on board, data collected may not accurately reflect fleetwide performance. Karp emphasized that this issue was an important consideration for managers and scientists using observer data.

Merrick suggested that managers assume that any observer estimate of mortality or bycatch is a minimal estimate of actual take levels. Saunders related how Alan Sinclair, DFO Maritimes, had conducted a study that compared observed and unobserved distributions of trawling activity and found that different areas were fished when an observer was on board. Other participants discussed ways to document and/or mitigate this problem. John Chouinard, DFO Laurentians suggested that dockside sampling of unobserved vessels could reveal differences in species composition. Other suggestions included at-sea placement of observers and spot checks of fishing vessels as described earlier by Blikshavn of Norway. Finally, it was suggested that mandatory retention regulations combined with dockside data collection could replace observer programs in some situations. Several participants responded, however, that the only way to verify the extent of at sea discards and to collect geo-referenced data on the catch was to place observers directly on fishing vessels.

ESTIMATING FISHING EFFORT OF UNOBSERVED VESSELS

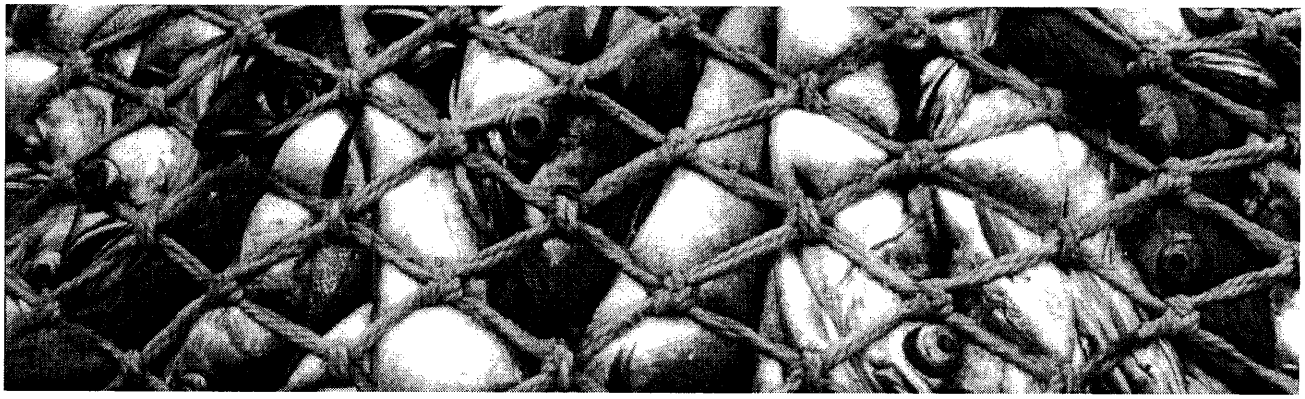
In many U.S. fisheries, little is known about the fishing effort and distribution of unobserved fleets. Merklein suggested that in such unobserved and little-known fisheries a skipper logbook program could provide useful insights for fish managers who are developing observer programs. Such logbooks could be used to provide important information such as area and time fished and could be used to geo-reference skippers' catch estimates. In turn, this information would be valuable for extrapolation and analysis of observer data, as well as to stratify observer effort and design or modify existing observer programs to increase effectiveness. Byrne added that ADF&G conducts confidential interviews with skippers to gain information regarding unobserved trips.

OBSERVER PROGRAM COVERAGE

DeMaster, NMFS National Marine Mammal (NMML) Laboratory, pointed out that, given the reality of funding limitations, program managers often need to rely on common sense and qualitative data in determining appropriate observer coverage levels. For small-scale observer programs, logbook data and qualitative information can be used effectively by managers when evaluating whether a bycatch threshold is being approached. For example, managers may reasonably assume, on the basis of qualitative data, that the fishery is either dramatically above or below a certain bycatch threshold. This information could help managers determine the urgency of implementing a costly, comprehensive observer program.

ESTIMATING RARELY ENCOUNTERED SPECIES

A concern voiced by Sue Salveson, NMFS Alaska Region, and shared by many participants was the challenge of using observer data to estimate the bycatch of rarely encountered species. Salveson noted that industry has become increasingly able to take advantage of the inherent weakness and uncertainty of observer data. Since many rarely occurring species are protected, it is imperative that management agencies be able to defend observer programs' mortality estimates. Merrick agreed that this was an issue of U.S. national concern that challenges observer programs on both coasts. He mentioned that a recent NMFS stock assessment workshop discussed evaluation of the impact of fishing on rare species or species for which there is little information. Merrick added that these issues will be receiving a greater deal of attention given that recent changes to the SFA require the implementation of management efforts to evaluate and reduce bycatch in NMFS managed fisheries.



THEME II: OBSERVER PROGRAM OBJECTIVES

Introduction to Observer Program Objectives

Presented by:
Bill Karp, NMFS, Alaska Fisheries Science Center, Alaska Groundfish Observer Program

Karp began this session by noting that the primary objective of most observer programs is to provide accurate data for the conservation of living marine resources. The balance of scientific, management, and enforcement tasks required to meet these objectives varies depending on the fishery, area, and species in question. Although limited resources and other constraints may make it necessary to prioritize tasks and compromise some observer sampling objectives, observer programs are particularly valuable because of their ability to address multiple objectives.

> Observer programs are particularly valuable because of their ability to address multiple objectives.

SCIENTIFIC OBJECTIVES

Moderator: Dave Kulka, DFO, Newfoundland Region
Panelists:

Jim Ianelli	NMFS, AFSC
Doug DeMaster	NMFS, AFSC
Mark Showell	DFO, Maritime Region
Mark Saunders	DFO, Pacific Region
Jean-Denis Lambert	DFO, Laurentian Region
Richard Merrick	NMFS, NEFSC

Virtually all observer programs collect scientific information that is used in stock and bycatch assessment. The geo-referenced catch data that observers collect can be incorporated into area density models that yield biomass densities, which can then be incorporated into assessment models. This geographic data can also be used to describe the distribution of different fisheries over time and to evaluate the impact of fishing.

In addition to total catch and species composition data, observer programs collect other vital information that can be used to support marine ecosystem models and provide a deeper understanding of fisheries and their impacts. Observers may be requested to collect such biological and morphometric data on designated species as length, width, girth, and sexual maturity. Observers may also be asked to collect age structures and collect various samples, such as stomachs, tissues for genetics or toxicity studies, or rare species for collections. Finally, observers may collect data on fishing and processing activities such as product recovery rates, fishing strategies and gear modifications.

U.S. GROUNDFISH FISHERY

Ianelli began the panel discussion by describing some discrepancies in the understanding of various species studied by NMFS scientists at AFSC. For example, while there is a vast amount of information concerning pollock, virtually nothing is known about many other species. In order to incorporate observer and survey data into assessment models, Ianelli said that there needed to be a better understanding between managers responsible for observer program data collection and those involved in stock assessment analysis. Without this understanding and active communication within the agency, fisheries managers may inadvertently "cruise along on auto pilot" without realizing that sampling priorities and protocols need to change as the agency's overall priorities change.

There are several changes developing in U.S. national policy that may affect observer programs. For instance, Merrick mentioned the increasing national focus on bycatch issues, which finds NMFS requiring better data on non-targeted and discarded species. Another change is that, with the recognition that stock assessment surveys are often prohibitively expensive, managers may have to increasingly rely on data collected aboard fishing vessels. Ianelli suggested that the International Tuna Commission (IATTC) and the IPHC have successfully collected data from fishing vessels for decades. In order to use these opportunities most effectively, however, scientists need to better understand current observer sampling priorities and cooperate with program managers to identify areas where these priorities may lead to over or under sampling. In addition, Ianelli agreed with Karp that if scientists are going to increase their need for observer data they must appreciate the limits and context of those data.

CANADIAN FISHERIES

Showell began by emphasizing that, regardless of apparent differences between science, management and enforcement, the program objective of conserving fisheries stocks and other marine species is paramount to all three. Showell contended that observer data should be a useful tool for fisheries scientists, managers and enforcement agents alike. However he cautioned that, because observer programs become ineffective as they become overextended, they benefit from clearly defined goals. In the Maritime Region, observer programs have reduced their focus to three primary objectives: collecting data on undersized fish, identifying and geo-referencing bycatch and discards, and collecting data to assist in the development of effective fisheries. Showell also reminded managers that the recent trend of encouraging industry funding of observer programs had the potential of adversely influencing these programs' data collection protocols and priorities.

> Observer programs become ineffective as they become overextended and they benefit from clearly defined goals.

Saunders described some of the scientific data collected by observers in the Canadian Pacific joint venture and shoreside monitoring programs. In addition to estimating the species composition of the catch for stock assessment and ecosystem studies, Pacific hake length, age and stomach data/samples are collected for annual assessment and trophic studies, while biological samples of bycatch are taken at the request of biologists.

Saunders echoed previous speakers' concerns with the difficulty of assessing the quality of observer data and estimating measurement error. In addition, he felt that it was sometimes difficult to determine and communicate to data users the sampling effort that can be expected from observers. Since observer programs may not have the resources to fulfill various data and sample requests, special scientific projects need to be prioritized. Saunders noted the importance of recognizing how the protocol for some types of data collection and sampling will limit the opportunity for other types. Some forms of biological sampling can also impact the quality of the catch. Given that actually measuring observer error and data quality is often impossible, Saunders suggested that the most effective way to ensure confidence in those data is to maintain a corps of experienced, reliable observers who are capable of making wise decisions in their collection efforts.

Lambert explained that scientists assessing stocks off the north and west coasts of Newfoundland rely very heavily on observer data because shore-side delivery catches are presorted and independent fish surveys are prohibitively expensive. In addition, the remoteness of some of the fish landing stations would make shore-side sampling difficult. In order to create representative models, a selectivity vector for the gear type is combined with observer catch composition data to refine stock and species distribution assessments. Lambert also pointed out that observer data provides important recruitment information, which is used to calculate projections of future trends of fish stocks.

MARINE MAMMAL PROTECTION ACT OBSERVER PROGRAMS OBJECTIVES: BYCATCH FOCUS

While observer programs may be implemented to pursue a wide variety of objectives, Merrick noted that the specific goal of MMPA-funded programs is to determine the level of marine mammal injury and mortality as a result of commercial fishing activities. In particular, these programs focus on strategic stocks of marine mammals, which on the East Coast of the United States include rare species, such as right whales, as well as species that fisheries take at high rates such as harbor porpoise and bottlenose dolphins. Information on bycatch of each marine mammal species is incorporated into an annual report on stock assessment and mortality. Three scientific review groups (Alaska, Pacific, and Atlantic) evaluate the status of each marine mammal stock in U.S. waters and make recommendations based on the impact of fisheries. If bycatch levels are considered serious (i.e., takes are above potential biological removal), a take reduction team is formed to develop a plan to reduce the impact of fishing on the species in question. In summary, the MMPA directs the agency to collect data through observer programs that may then result in management actions to modify or close fishing areas in order to reduce marine mammal bycatch.

Secondary objectives of MMPA observer programs include the collection of fisheries data (i.e., fishing strategies and gear types used) and marine mammal life history data. Fish catch and bycatch data are not only valuable to fishery managers, but may also help scientists determine how and why marine mammals are being caught. Observer data on fishing methods may also help explain marine mammal mortality. In New Jersey, for example, high rates of marine mammal bycatch have been associated with longer periods of gillnet soaking. Given that life history data for marine mammals are difficult for scientists to obtain, requests for data collected from dead marine mammals can be extensive with observers often being encouraged to retain the entire carcass. In addition to morphometric data, observers often collect stomachs and tissues for toxicological and genetic studies.

Courtesy Archipelago Marine Research Ltd.

DETERMINING OPTIMAL INTERVALS FOR OBSERVER PROGRAMS AND ABUNDANCE SURVEYS FOR MANAGEMENT

While the MMPA requires the determination of marine mammal stock abundance and human-caused mortality rates, NMFS does not have the resources to conduct annual surveys on each marine mammal stock or to implement long-term observer programs in every fishery of concern. Consequently, managers must devise feasible annual effort levels and frequency intervals to be implemented in both abundance surveys and observer programs. Given that fisheries management decisions are based on these abundance surveys and given that observer bycatch data may often result in a fishery being severely limited, it is critical that NMFS have confidence in data.

DeMaster discussed a new procedure used to evaluate the risk of drawing false conclusions about classifying a commercial fishery as strategic (i.e., total kill greater than PBR). DeMaster described how the approach could be used to plan the optimal frequency and intensity of observer programs and abundance surveys. Their underlying assumption in that work was that an error rate in classification of 10% or less was acceptable to the agency. DeMaster used, as an example, data from North Atlantic harbor porpoise where the estimated CV (abundance) was 0.26 and the CV (mortality) was 0.6. In this case, if observer programs could estimate mortality every year, the abundance surveys would only need to be run every five or six years to achieve an error rate of 10%. If the mortality rate could only be estimated once every 3 years then abundance surveys would need to be run every year. Finally, if the CV (mortality) could be improved to 0.4, the 10% error rate could be realized by both running surveys and estimating mortality every fourth year.

While this exercise reveals the value of obtaining low CVs for abundance and mortality estimates, it is of course a complex matrix for managers to consider. To achieve a low CV may, for example, require such high observer coverage levels as to be prohibitively expensive. Four interrelated variables contribute to the error rate: the CVs of abundance and mortality estimates and the frequency of surveys and observer programs. Comparison of various combinations of these four variables can help in prioritizing and planning surveys and observer programs.

DeMaster pointed out that if the only consideration was cost (which is rarely the case) an optimal solution could be found across all four variables. This would require knowing the costs associated with any given effort level for both abundance survey and observer programs, and knowing the relationship between effort and the CV of both the abundance and mortality estimates. Supplied with such information, managers could decide, with relative confidence, how often and to what extent to implement observer programs and abundance surveys.

Further, while the model described by DeMaster was devised for the protection of marine mammal stocks, similar matrixes could address non-native communal bycatch.

PANEL DISCUSSIONS

Kulka opened the panel discussion with a two-part question: to what extent do observer programs meet the expectations of stock assessment and science objectives, and are there more cost-effective or better ways to attain data?

DeMaster responded that, in terms of fish and marine mammal bycatch that is normally discarded at sea, observer programs meet the most fundamental scientific objectives of estimating and characterizing fishery bycatch and mortality rates. However, DeMaster agreed with earlier panelists that funding limitations require managers to consider the degree of precision between fisheries dependent and independent research. DeMaster further suggested that managers consider potential bias and data confidence issues more carefully when developing observer programs and analyzing data.

Merrick addressed the second part of Kulka's question by describing how attempts at using alternatives from observer programs to estimate fishing-related marine mammal mortality were generally ineffective. For example, beach cast surveys for stranded marine mammals may reveal mortality due to fishing activities but will not usually provide evidence that would enable scientists to attribute that mortality to a particular area or fishery. He agreed with DeMaster that although observer programs were the best way to assess bycatch of marine mammals, the high CVs associated with observer programs could limit the ability of managers to either justify the expense of certain observer programs or, consequently, to implement restrictive bycatch reduction regimes based on their data.

> The potential of observer data was finally being recognized as something that could go beyond supporting stock assessment to contribute to a better understanding of the marine ecosystem by providing information on small fish and other underutilized species.

While observer sampling may often be the only way to gather information regarding such things as discards, Showell pointed out that other important fisheries data that could be collected from catch offloads would include length frequencies and age structures of target species, while in some circumstances industry itself might be called upon to conduct some types of data collection.

Saunders commented that observer programs have become a critical and integral part of Canadian fisheries management. He also suggested that the potential of observer data was finally being recognized as something that could go beyond supporting stock assessment to contribute to a better understanding of the marine ecosystem by providing information on small fish and other underutilized species.

Kulka pointed out that geo-reference observer data such as catch, effort or length frequency distribution has become more valuable as the time series has become longer. When observer programs are first implemented the data they generate can only provide a limited snapshot in time. However, as the program's database expands over time, it becomes ever more valuable for determining trends, cycles and other characteristics of the species and ecosystem involved. Kulka added that an under-acknowledged aspect of observer programs is their provision of data to industry, which facilitates improvements to fishing gear and strategy, increases catch rates, decreases bycatch, and leads to the development of new fisheries.

> Geo-referenced observer data such as catch, effort or length frequency distribution has become more valuable as the time series has become longer.

Ianelli explained that there are several problems associated with observer data that, if not recognized, could result in scientists making false inferences. For example, geo-referenced observer data could indicate more about a fishery's regulations, gear modifications, fishing strategies, and/or time and area closures than it does about actual species distribution. Still, while scientists must recognize these potential distortions, much observer data remains underutilized due to an inadequate understanding of the nature of observer data collection. Ianelli suggested that this problem could be addressed through improved communication between data analysts and program staff.

Lambert added that scientific sampling objectives were constrained by the multipurpose nature of observer duties. Lambert's contention was that if observers were allowed to focus entirely on scientific tasks they could conduct more complex and time consuming sampling protocols and experiments.

Obtaining Unbiased Samples

Cornish asked the panelists how observer programs with less than 100% coverage might provide unbiased data. DeMaster responded that it was a difficult problem, which confronts most programs. DeMaster suggested that, to be confident in data collected from a fishery with less than 100% coverage, one must be convinced both that the bycatch that observers sample is representative of the general population of that species and that the boats on which observers sample are representative of the fleet. However, it is difficult to be satisfied that an observed vessel's activities mirror those of unobserved vessels. Saunders agreed that these are inherent uncertainties, which need to be acknowledged when extrapolating observer data.

> To be confident in data collected from a fishery with less than 100% coverage, one must be convinced both that the bycatch that observers sample is representative of the general population of that species and that the boats on which observers sample are representative of the fleet.

While an obvious indication that vessels are behaving differently while observers are on board would be their fishing in different locations to the unobserved fleet; more subtle differences may occur on observed vessels that are fishing alongside unobserved vessels. Several workshop participants suggested that the longer a vessel was obligated to carry an observer the less willing the skipper would be to incur the financial loss associated with changes in normal fishing strategy.

Observer Placement

Several panelists indicated that observer placement was particularly problematic in small boat fisheries that don't require 100% coverage. With numerous skippers operating from various ports and fishing grounds, providing little or no advance notice and tending to be difficult to contact, program managers must often rely on opportunistic methods to coordinate observer placement.

> Observer placement was particularly problematic in small boat fisheries that don't require 100 % coverage.

McElderry described how in some programs observers actually found themselves hiding in bushes in order to surprise skippers and board vessels. Adding to this problem in some fisheries is the difficulty in determining the number of active participants or their total effort. Tracking down pre-selected vessels in this environment requires extra resources and is a difficult endeavor. Showell noted that, to avoid these frustrations, observers will often be placed on the few vessels that do not actively avoid coverage. The consequence is a biased representation of actual fishing effort.

Merrick noted that some programs have addressed these problems by using motherships from which observers can be placed on vessels at the fishing grounds. However, Price related a situation where fishers had continued to skirt observer placement by alerting each other of the presence of the program's mothership and then simply moving out of the area. Price further contended that using motherships to board vessels at sea was especially problematic at night, on rough seas, or in fisheries where effort is widely dispersed. Several panelists concurred that operating motherships could be expensive and might increase risk of injury to observers and damage to the vessels involved. It was acknowledged, however, that this approach is appropriate in some situations.

Price noted that independent research or support vessels have been effective in the California set net fishery where they could be stationed at specific sites. Merklein added that in those fisheries where fishing vessels were particularly small, and the fishing effort was concentrated and carried out in protected waters, a mothership could be used to address the placement problem by safely and effectively moving observers throughout the fleet.

Adaptive Sampling

Merrick pointed out that, in some cases, it would be advantageous for observer programs to respond in-season to changes in fishing effort and data requirements. Karp agreed but noted that such adaptive sampling requires the ability to track both fishing and sampling effort. He mentioned that some programs have recently implemented the use of satellite technology to report data from sea and that such systems could facilitate adaptive sampling.

General Comments

Ianelli commented that, even though scientists and managers now have faster access to more and better fisheries data, further improvements in analysis reveal that scientists have less of an understanding of the marine ecosystem and targeted stocks than they thought they did. Ironically, although there are improvements in both data collection and data analysis, the confidence with which scientists make many projections is decreasing. Ianelli summarized that we are more certain that we know less, and he suggested that this realization, coupled with the growing reliance on a precautionary approach, should play a decisive role in the future development of fisheries management.

Asked if he thought the implementation of this precautionary principal would increase the demand for observer coverage, Ianelli responded that, while it would, it remained to be seen whether the political will and financial support necessary to meet that demand would also be forthcoming. Merrick offered that supportive policies, including regulations requiring observer coverage, had been put in place in some fisheries with high bycatch rates.

Showell noted that, until recently, assessment biologists tended to be a conservative and cautious group; unenthusiastic about changes in methodology and satisfied to rely on port sampling data to calculate stock assessments. Showell suggested that, while fisheries stock crashes in many areas indicated that this approach to data gathering was insufficient, such costly changes as the implementation of observer programs will come only in response to strong demands from within and outside the fishing agencies.

> Ironically, although there are improvements in both data collection and data analysis, the confidence with which scientists make many projections is decreasing.

Determination of Scientific Objectives

Lambert suggested that wider societal and cultural changes account for the development of the current precautionary approach to fisheries management, with its emphasis on more and better data on both targeted and non-targeted marine species. Lambert also suggested that fishers and coastal communities, having suffered stock collapses in a variety of fisheries on both coasts, appreciate the importance of data gathering and have hired their own biologists to address certain issues. Saunders agreed and suggested that observer programs could contribute to the further development of industry's appreciation of the importance of scientific data for fisheries management. He added that such recent developments such as IFQ programs and government agency cutbacks further encouraged fishers to play a more progressive role in fisheries management.

Several panelists voiced their concerns that fishers were often unappreciative or suspicious of the objectives of observer programs. Fred Koontz, NMFS Enforcement, suggested that, because it was critical for observer programs to gain the understanding and cooperation of working fishers in coastal communities, program managers should organize workshops and educational outreach programs directly with the fishing community. Lambert and other Canadian participants agreed.

Merrick briefly described NMFS efforts to work with the fishing industry through the Regional Fishery Management Councils and directly with the fleet. He agreed that some of the most noteworthy instances of cooperation stemmed from working directly with fishers and including them in such research programs as the ongoing Northeast net pingers program. He also described a remarkable improvement resulting from the NMFS observer program's placement of staff in Alaska's two main fishing ports. Merrick did wonder, however, whether the agency's ability to elicit more cooperation from the North Pacific Fishery Management Council than from the New England Fishery Management Council was in some way associated with the comparatively healthy state of the North Pacific fisheries.

Trumble responded that this was more a factor of the different history of groundfish fishery development on each coast. He contended that the North Pacific groundfish fishery was newer and less entrenched than those on the U.S. East Coast. In addition, the U.S. West Coast benefited from its inheriting the comprehensive observer program and conservation regulations that had initially been developed for the foreign groundfish fishery.

Defining Scientific Objectives

McElderry noted that if it was difficult to keep the discussion focused on scientific objectives, it may be because scientific objectives do not drive observer programs. McElderry further suggested that it may be unrealistic to expect observer programs to provide an avenue for pure scientific research. DeMaster agreed and suggested that scientific objectives should be defined in terms of applied science focused on management needs. Funding limitations and lack of control over the fishing environment make pure research generally impractical for observer programs. Kulka and Saunders countered, however, that data collected through observer programs provided scientists with new insights and sometimes even new species. From this perspective, they suggested, observer programs did have the potential to support important research projects and scientific investigations.

MANAGEMENT AND COMPLIANCE OBJECTIVES

Moderator: Paula Cullenberg, North Pacific Observer Training Center

Panelists:

Ben Rogers	DFO, Newfoundland Region
Denis Tremblay	DFO, Laurentian Region
Tom Curran	DFO, Newfoundland Region
Barry Ackerman	DFO, Pacific Region
Steve Meyer	Special Agent, NMFS Office of Enforcement, Alaska Division
Larry Boyle	ADFG, shellfish observer program
Sue Salveson	NMFS, Alaska Region
Lauren Smoker	NOAA General Council, Alaska Region

Cullenberg asked the panelists to briefly describe their observer programs in the context of:

- Their enforcement and management objectives;
- Their effectiveness in meeting these objectives;
- The conflicts they have encountered; and
- The flexibility with which they respond to changing objectives and data needs.

> Observer programs play an integral and effective role in fisheries management, providing data and information to managers, enforcement agents and scientists.

ENFORCEMENT AND MANAGEMENT OBJECTIVES

There was general panel agreement that observer programs play an integral and effective role in fisheries management, providing data and information to managers, enforcement agents and scientists. Data collected for management purposes included: inseason information used to open and close fisheries, haul by haul geo-referencing, bycatch and discards rates, and such biological data as spawning condition, fish size, and disease or shell condition. Curran and Tremblay pointed out that, in addition to inseason data, observer-provided information helps managers develop and implement management plans and regulations to meet longer term objectives.

It was acknowledged that important fisheries enforcement methods, other than observer programs, include enforcement agents conducting dockside spot checks and monitoring fish offloads at processing plants. In addition, U.S. and Canadian authorities conduct air surveillance and fishing vessel boardings. Rogers indicated that this practice was particularly important offshore of Newfoundland's 3-mile limit. However, all panelists agreed that observer programs provide the only means of verifying and reporting such critical information as bycatch data and geo-referenced catch and effort data. Occasionally observer programs are initiated by industry groups concerned with allocation and other issues. Ackerman related how, when DFO asked Pacific Region industry members who were resisting observer programs to suggest an alternative means for obtaining reliable at-sea catch data, they were unable to do so.

Observer programs are also used in some circumstances to deter fishers from engaging in illegal fishing behavior. However, Rogers pointed out that these programs can only provide a reliable deterrent if there is 100% coverage of fishing activity and that this coverage level is often financially unobtainable.

Although participants felt that the data generated through these programs were generally useful to management and enforcement agencies, Salveson cautioned that the confidence with which observer data could be used depended on the species in question and the segment of the fishery observed. Estimates of target species in fisheries with little bycatch that have 100% observer coverage may warrant confidence for the purposes of management, enforcement, and science. However, there may be less confidence in data relating to the bycatch levels of rarely occurring species such as marine mammals or salmon. In addition, data from fisheries with less than 100% coverage may be biased. Salveson therefore suggested that all parties working with observer programs be aware of the limitations on the reliability and confidence that can be expected.

THE FLEXIBILITY OF OBSERVER PROGRAMS

The ability of many observer programs to respond to changing management needs and objectives is constrained both financially and logistically. While there is a growing reliance on industry funding for observer programs, many fisheries are in financial crisis, with the fisheries that require observer programs the most often being the ones that can afford to support those programs the least.

Boyle and Salveson described how the financial and regulatory limits of their programs prohibited achieving optimal coverage levels and observer placement flexibility. This is described in more detail in the following section on Service Delivery Models. Both programs are tied to a system of direct payment for observer coverage in which vessel owner payment is based on the number of days they are required to carry an observer. The agencies are unable to place observers in accordance to data needs because of the cost to fishers that this would involve. Both agencies are attempting to implement alternative program structures to address this concern. Boyle described a plan being developed by ADF&G that would allow the agency to sell a portion of the Total Allowable Catch to help fund the observer program independent of coverage requirements.

The North Pacific Fisheries Research Plan was an abortive attempt by NMFS to address this problem in the North Pacific Groundfish Observer Program. Salveson explained that this plan had required fishers to pay a fee based on their vessel catch value (up to 2%) which would then go into a pool to cover observer program costs. Not only would this have allowed NMFS to adjust observer coverage levels in response to data needs, it would also provide a more progressive form of cost distribution. However, because the most productive vessels would have experienced a dramatic fee increase, their adamant protests through the North Pacific Fishery Management Council (NPFMC) effectively derailed further implementation of the plan. Thus, the agency was required to reimburse industry some $5.6 million (U.S.) in col-

While there is a growing reliance on industry funding for observer programs, many fisheries are in financial crisis, with the fisheries that require observer programs the most often being the ones that can afford to support those programs the least.

lected fees and return to the status quo. The NPFMC and NMFS have yet to resolve this issue.

CONFLICTING OBJECTIVES

Some panelists expressed reservations about classifying observer program goals according to science and management objectives. Salveson referred to discussions from earlier in the workshop and pointed out that the overall goal of observer programs is the conservation of living marine resources and long-term fisheries.

> Observers experience increased crew pressure when the data they are collecting might affect how long the vessel can fish.

In some programs, observers are directed to change their sampling priorities in order to collect enforcement data. Tremblay explained that DFO can direct observers to change their sampling priorities as soon as they find a compliance problem on the vessel. Observers are instructed to refocus their monitoring efforts on problem areas as they arise. This type of adaptive sampling allows observers to collect the necessary data to support enforcement actions.

Salveson explained how, from an industry perspective, different observer tasks may seem to have different objectives because of their varying impacts on a vessel's future catch potential. For example, while the collection of age, length and food habitat data used by scientists for assessment models does not immediately affect a vessel's opportunity, the data collected for in-season quota management may provide the basis for closing a fishery within days. The direct impacts of these latter types of observer sampling are especially tangible in fisheries that are managed by an individual quota system.

Smoker indicated that NMFS enforcement has noted how observers experience increased crew pressure when the data they are collecting might affect how long the vessel can fish. Efforts by the crew to influence observer sampling may range from pre-sorting the catch to harassing and abusing the observer. In addition, the fishing industry has determined that the credibility of observer data is often the weak link in legal enforcement cases, with defense lawyers often attempting to cast doubt on an observer's professionalism during a prosecution. Such observer-related cases are difficult and time consuming to prosecute, and are often further complicated by the fact that, because there is a high turn-over rate in some programs, it may be hard to locate the observer once a case goes to court. Given these challenges, it is important for programs to develop mechanisms to support and protect observers so that they can both carry out their duties and, when necessary, be available to act as witnesses.

OBSERVER'S ENFORCEMENT ROLE

Cullenburg asked panelists to comment on their programs' success in using observers to support enforcement efforts and act as witnesses in prosecutions. Rogers responded that DFO is usually able to use an observer's testimony in such prosecutions even though it can also take considerable time to develop a case. He felt that it is easier to use observers as witnesses if the agency has been working with the same contractor for a number of years and is able maintain contact with their observers during the development of the cases.

Ackerman suggested that observer data will be more admissible as evidence if the observer program has a standardized protocol for recording and handling compliance related issues. Boyle agreed and explained that observers in the ADF&G shellfish program are specifically trained in handling compliance related situations and collecting pertinent data.

> Observer data will be more admissible as evidence if the observer program has a standardized protocol for recording and handling compliance related issues.

Ackerman added that the ideal is for the presence of observers to change fishing behavior so that prosecution can be avoided. When observers are able to point out compliance concerns to the skipper and crew, the problem can often be corrected at sea. Rogers described DFO policy changes regarding the manner in which observers should respond to violations they witness while onboard fishing vessels. In the past, observers were not directed to inform the captain or crew about infractions they witnessed and intended to report to the agency. While this policy was adopted in part to protect the observer, a judge was concerned that the policy did not give the fishing master the opportunity to alter the behavior once it had been noticed. DFO lost that case and a new policy was adopted which requires observers to inform captains when they witness a potential violation. This policy has resulted in more enforcement concerns being settled at sea, but with increased harassment of observers.

Boyle explained that the ADF&G also encourages observers to be open with the captain and crew about violations they intend to report. However, the agency makes it clear that it is the vessel's responsibility to ensure compliance with regulations.

Tremblay explained that Laurentian Region observers are directed to change their sampling priorities as soon as they encounter a compliance issue on the vessel, refocusing their efforts to monitor problem areas as they arise. This type of adaptive sampling allows observers to collect the data necessary to support enforcement actions, and has resulted in a conviction rate of approximately 80% of all relevant prosecutions.

> Observers can be expected to be reluctant to collect compliance data, particularly if they feel agency and contractor support is lacking.

OBSERVER PROGRAM STRUCTURE AND MEETING OF ENFORCEMENT AND MANAGEMENT OBJECTIVES

Loefflad pointed out that a primary difference between Alaskan (NMFS and ADF&G) and Canadian observer programs was that the former used multiple contractors to provide observer services. In Alaska, five observer contractors compete for business contracts with industry to supply observer services. Loefflad and several participants expressed concern that this program structure considerably weakens the agency's efforts in compliance monitoring and prosecution. In a program structure in which industry clients can simply fire the contractor and take their business to another, more "cooperative" contractor, observers may well come to equate reporting violations with jeopardizing their future employment. Boyle agreed that this was a serious problem and noted that it was further complicated when contractors had profit sharing plans that could provide observers with a further stake in maintaining good client relations, at the expense of quality enforcement data.

Meyer and several participants agreed that requiring observers to be state or federal employees would both eliminate this potential conflict of interest and make it easier to work with observers on compliance issues.

OBSERVER SUPPORT

Merklein pointed out that observers can be expected to be reluctant to collect compliance data, particularly if they feel agency and contractor support is lacking. She asked panelists to describe the support that their agencies currently offer observers in this area.

The Canadian panelists commented that there is supporting legislation that requires the captain and crew to provide access to all parts of the vessel for the observer to collect the required data. Rogers added that restriction of an observer's access will be reported to DFO which will investigate and, if necessary, board the vessel on the fishing grounds.

Meyer expressed frustration that NMFS Enforcement has not supported the observer program well. He suggested that it was in part due to an institutional problem whereby law enforcement personnel lacked understanding of the observer responsibilities or the program objectives. Meyer felt that NMFS needed to address this problem by providing better training of their staff, although he conceded that there was a serious shortage of enforcement personnel and resources in the Alaska region. Currently there are only six enforcement officers dedicated to the Alaskan groundfish fishery, with their highest program-related priority being the protection of observers from interference or harassment.

Boyle explained that, while observers in the ADF&G shellfish program were paid for briefing and debriefing, observers being brought back to testify during cases were only paid per diem. Although Boyle indicated that this rarely happens, he empathized with observers who could not afford to cooperate with the agency during a lengthy trial. Smoker explained that observers acting as witnesses for NMFS were provided with a small witness fee for their time during a trial.

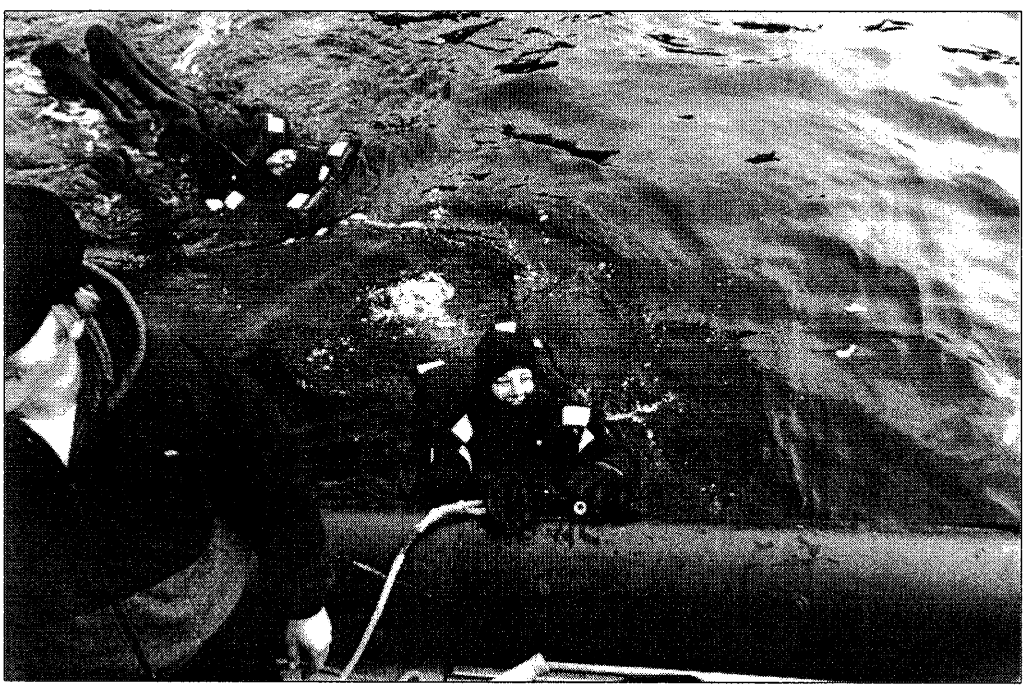
Several of the Canadian participants explained that DFO observer programs provide financial support to observers during training and debriefing periods, as well as during the development and trial of a case. McElderry suggested that suppliers operating in a single contractor model were better positioned to support and protect observers without incurring the loss of business to a competitor.

OBSERVER SAFETY

An observer in the audience (McDiarmid, Archipelago Marine Research Ltd.) asked panelists how their programs respond to observers reporting vessels as unsafe. Rogers responded that observer safety was a serious concern for Canadian observer programs and that DFO's policy is to allow observers to refuse to board such vessels until the Department has conducted a safety investigation. However, because the investigation process can be slow, observers may be encouraged to accept a trip on a vessel for which they have a minor safety concern. The situation has become more complex as observer programs have expanded to include smaller vessels that do not always adhere to the same safety standards as larger vessels.

Meyer explained how vessels participating in the U.S. groundfish program must carry a U.S. Coast Guard decal that certifies their compliance with safety inspection requirements. However, while NMFS enforcement will investigate vessels reported to be unsafe, Meyer felt that the agency should develop a better protocol to evaluate a vessel's seaworthiness and safe operation. He suggested that "unsafe" is a vague and relative term, and that clearer criteria needed to be developed to evaluate vessel safety. Meyer also agreed that smaller vessels presented a greater challenge.

Rogers felt that there were limits to the extent to which an observer program could evaluate the



Courtesy Mandy Merklein

safety of a vessel and protect an observer. He suggested that, because boardings often occur in isolated and remote areas where there is little or no agency presence, observers must use common sense and make independent judgments on whether a vessel is adequately safe.

Turk, Association of Professional Observers (APO), emphasized the importance of this issue, pointing out that observers in some programs could be fired and replaced for refusing to board a vessel they considered unsafe. She suggested that, at a minimum, the agencies must support their observers by ensuring that they have a reasonably safe work environment, and pointed out that inexperienced observers are not qualified to evaluate vessel safety. Salveson agreed that this was a serious problem in the Alaska groundfish program.

> At a minimum, the agencies must support their observers by ensuring that they have a reasonably safe work environment.

Emerson, Frank Orth and Associates, reiterated McElderry's earlier point that observer safety was easier to ensure when there was only one contractor, as this enables that contractor to require vessel owners to meet safety standards without the threat of losing business to a competitor. Emerson added that the sole-source model allows the contractor to work directly with the vessel, the agency and, if necessary, the U.S. Coast Guard when responding to an observer's safety concern.

McElderry concluded that observer safety was a crucial and complex issue that deserved more discussion and focus than this workshop could provide. The evaluation of a vessel's safety involves determining whether the vessel itself conforms to all safety regulations, and requires a further assessment of the manner in which that vessel is being operated by the crew. Several participants agreed that this ought to be the focus of a session at the next observer workshop.

OBSERVER PLACEMENTS

Parker asked the U.S. panelists if they had the authority to require the industry to pay for observer coverage levels when those levels are set by the agency.

Salveson responded that NMFS did have authority, under the M-SFCMA to require the industry's financial support for the Alaska groundfish observer program, but that this authority did not necessarily extend to other fisheries in the nation. As elsewhere in the United States, NMFS requires Congressional authorization to collect observer program fees. Coverage rates are established through regulation. The agency uses logbooks and other means to monitor vessel compliance with coverage requirements, although there is currently no link between program compliance and fishing permit issuance. Boyle indicated that the ADFG shellfish program's coverage levels were also established through regulation.

In many observer programs with less than 100% coverage, captains may select the time and area of their observer coverage. Price asked panelists what impact they thought this process had on the effectiveness of enforcement and management objectives.

> In programs with less than 100% coverage, fishers often succeed in avoiding observer coverage when the burden of arranging an observer trip falls on the agency or contractor.

Salveson responded that the Alaska groundfish program attempted to avoid biased data by controlling observer placement through regulations that specify coverage requirements based on the fishing season, area and target species. Currently, vessels must carry an observer at least once during each target fishery in each calendar year in which they participate.

Some programs require fishers to carry an observer when requested. However, when the burden of arranging an observer trip falls on the agency or contractor, fishers often succeed in avoiding observer coverage. In such instances, a mandatory program may become operationally voluntary. Merklein asked the Canadian panelists whether this problem presented itself in any of their programs.

Rogers responded that the issue did arise in some observer programs and that, currently, DFO notifies a vessel when it is required to take an observer on its next trip or for a specific fishery. The observer will be assigned to that vessel until it makes its next trip, regardless of how long it takes for the vessel to depart. The longer the vessel delays departure, however, the less coverage is obtained and the greater the expenses incurred by the observer program.

In response to this problem, observer programs in Atlantic Canada have developed a new policy whereby the captain is required to notify the program coordinator of the vessel's scheduled departure time at least eight hours in advance so that the coordinator can arrange for observer placement. Although the \$2,000 - \$5,000 (Cdn) fine for non-compliance is not particularly heavy, it does serve as an incentive for fishers to cooperate with the program. When industry members are paying for the program, they will insist on obtaining coverage in a cost-efficient manner. However, Rogers insisted that the Department will not maximize observer deployment by allowing recalcitrant vessels to go unobserved, as these are often the vessels which most warrant observer coverage.

INDUSTRY FUNDING OF OBSERVER PROGRAMS

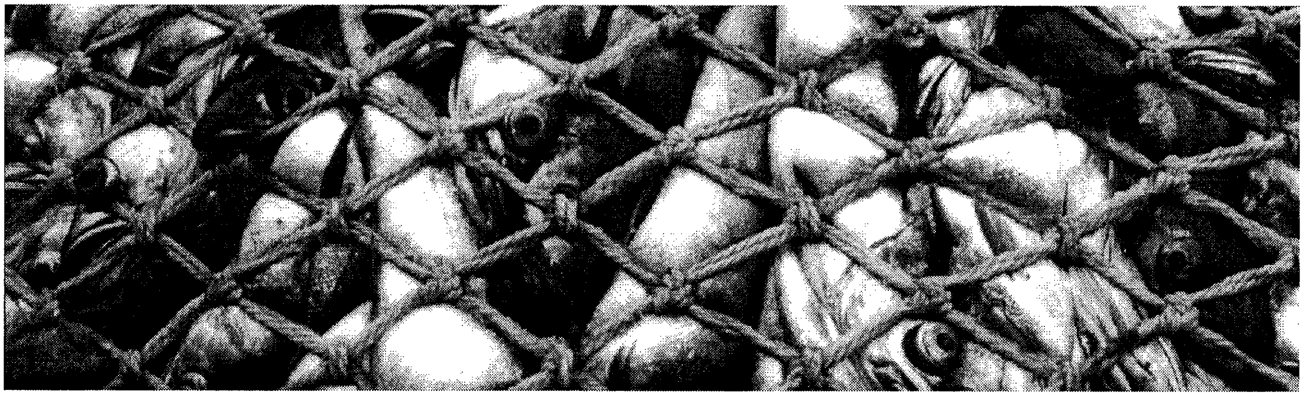
Cullenberg asked participants how they would like to see industry funding of observer programs implemented. Rogers responded that ideally a fishery would pay a single fee at the beginning of the season for licensing, observer programs, dockside monitoring and so forth. This money would go into a program fund to be used to provide the agency with the best and most valuable data. However, because most programs are prohibited from assessing or collecting industry fees, managers need to cooperate with industry in developing payment methods that do not compromise the goal of collecting the best data for managing the fishery. Rogers did not feel that industry pressure had been effective in influencing compliance objectives, although funding limitations had impacted program effectiveness. He emphasized the importance of involving industry in the observer program process to facilitate better appreciation of the need for reliable science and compliance data in fishery management. And he indicated that the Department was making new efforts to develop this sense of cooperation.

Salveson explained that the industry currently provided \$7-10 million (U.S.) of the cost of the Alaska groundfish program. While NMFS' current policy endorses industry financial support for observer programs, this may be difficult to implement in certain fisheries. Salveson offered an ideal scenario in which U.S. observer programs were supported through a government performance base organization. However, she conceded that this option was unlikely to be realized, given the process of government downsizing. The current structure of observer contractors competing for industry clients has lowered observer compensation to a level that discourages observers from remaining in the program. In response to this problem, observers in the Alaska groundfish program have unionized.

> Because most programs are prohibited from assessing or collecting industry fees, managers need to cooperate with industry in developing payment methods that do not compromise the goal of collecting the best data for managing the fishery.

Loefflad suggested that many observer programs were already driven more by politics and allocation issues than by scientific considerations, with individual quota and vessel accountability programs increasing the compliance monitoring role of observers and influencing sampling objectives and protocols. Loefflad feared that industry and others unfamiliar with observer programs harbor unrealistic expectations.

Salveson agreed that agencies need to better inform decision makers regarding the extent to which increasing the focus of observers on allocation and enforcement related data collection might compromise other program objectives. Turk suggested that, even when decision-makers appreciate the issues and limits of observer programs, political considerations may preclude their developing policies that reflect that understanding. Ackerman agreed and suggested that agency and industry leaders needed to work together to develop management plans that better integrated these various program objectives in a realistic and well-conceived manner.



THEME III: PROGRAM DELIVERY

Presented by: Howard McElderry, Archipelago Marine Research Ltd.

Introduction:
McElderry began by offering some general guiding principles. He suggested that, in effect, there is a 'simple research model' that all scientific processes follow. The model has five steps (problem definition, study design and methodology, data collection, analysis, conclusions and recommendations) and observer program activities generally fall within the third – data collection – stage. Thus, while such program functions as hiring and training, deployment and scheduling, information processing and disseminating, and quality assurance and control may not constitute data collection *per se*, they are conducted in service of that collection and may be located at this stage of the research model.

It is important to recognize the location of observer programs within a larger research model, even though this becomes increasingly difficult as programs become more complex. The tendency for increasing numbers of groups or agencies to take on responsibility for separate aspects of the research process creates a complex network that is increasingly difficult to coordinate.

McElderry noted that there is a wide variety of issues that drives the program delivery model. There is a need for an ongoing process to examine the positive and negative aspects of the evolving service delivery structure. McElderry concluded his introduction by pointing out that information technologies have significantly improved quality and quantity of observer data, potentially masking some underlying program design issues. Without denying the program improvements that these technologies have provided, a note of caution was sounded that the very impressiveness of technological advances might mask problems that persist within the program design itself and that continued vigilance is warranted.

The tendency for increasing numbers of groups or agencies to take on responsibility for separate aspects of the research process creates a complex network that is increasingly difficult to coordinate.

CASE STUDY 1
THE CANADIAN MODEL

Moderator: Marc Gagnon, Biorex
Panelists:

Lionel Rowe	DFO, Ottawa
John Chouinard	DFO, Laurentians
Robert Sciocchetti	DFO, Maritimes
Dave Kulka	DFO, Newfoundland
Barry Ackerman	DFO, Pacific
Jacob Chabinka	Javitech Ltd.
Cheslie Rose	Seawatch Inc.
Howard McElderry	Archipelago Marine Research Ltd.

Gagnon moderated the first Program Delivery case study and began by itemizing the six essential elements of the Canadian model: arms-length from industry, operationally efficient, cost-effective, a high level of integrity and perception of integrity, providing highly qualified, experienced observers, and responsive to government and industry needs. While program managers look to all six of these objectives when evaluating their own programs, Gagnon indicated that, for the purpose of this discussion, the panel would consider three of the six essential elements: program integrity, cost-effectiveness, and provision of qualified, experienced observers.

CANADIAN SERVICE DELIVERY MODEL (PRESENTATION)

Lionel Rowe, DFO Ottawa, gave a presentation on the design evolution of the Canadian Service Delivery Model. Since its inception in 1977, the Canadian Service Delivery Model has evolved from a program that was government controlled, delivered and funded through a stage of government control and funding with contractor delivery, to the present status which is government controlled, contractor delivered and industry/government cost-shared. This evolution went from a model under which government had single-party control over all elements of the program, with industry simply required to comply with those elements, to the current tri-party model in which government retains regulatory and contractual control over a program delivered by a private sector contractor and cost-shared between the industry (through sea-day rates) and government (through administrative overhead).

Throughout this evolution, the program delivery model's developers have concerned themselves with: program integrity; cost-effectiveness; compliance, science and management effectiveness; data quality and delivery; and cost to industry and government. While it was acknowledged that concepts such as 'integrity' and 'effectiveness' were subjective, the following summary of these considerations was made.

Program integrity refers to the need for the program's outputs both to be true and accurate and to be perceived as being true and accurate. All parties must be assured that there is no opportunity for collusion between other parties or misreporting/falsification of data.

Cost-effectiveness is always of concern. Compared with the patrol/surveillance programs it partially replaced, and coupled with the opportunity to move to a 'user-pay' relationship with industry, this service delivery model has proved to be highly cost-effective.

Rowe examined the roles within the tri-party relationship between government, contractors and industry and how they served to ensure that program objectives are met. The contractors are responsible for service delivery including: recruitment, training, deployment, briefing/ debriefing and supervision of observers; data quality assurance and delivery; contract administration and management; and interaction with government and industry. The Government is responsible for program delivery through its control of the regulatory regime, the contracting process, requirements and administration, coverage levels, deployment strategy and policy, and product quality management. Industry is responsible for carrying observers as required and paying associated costs.

> The Canadian emphasis on exclusivity has provided an environment which has enabled program delivery to develop effective data collection procedures free from conflicting interests.

The Government manages this tri-party relationship through regulation, contractual arrangements and administrative policy-making. The Government/contractor relationship is regulated through contracts and a Government observer-certification process. Noteworthy aspects of this contractual relationship include the arms length/conflict of interest clause that prohibits industry involvement with the observer contractor and the contract exclusivity provision which allows for only one contractor to deliver this service in any region at any time. Contracts also impose requirements regarding recruitment, training and data management and are monitored through regional project authorities. Government has the authority to set administrative policies, such as deployment controls and briefing/debriefing requirements, which serve to guide the tri-party relationship and minimize any opportunities for collusion or compromised integrity.

Rowe concluded his presentation with a look to the 'next steps' for the program. Firstly, the program must address industry's concern regarding cost. Some industry participants have argued that costs could be reduced by allowing multiple contractors to compete in the supply for observer services. Movement away from the exclusivity of the current program delivery model raises a number of issues pertaining to the maintenance of program integrity. Competition among suppliers could result in compromised data quality through observer salary reductions and contractors' accountability to their industry clients.

The Canadian program is proceeding with certification of observers and suppliers through the Canadian General Standards Board's standards process. These standards for the training and certification of observers have been established, while finalization of a similar standard for suppliers is in progress.

PANEL DISCUSSION

Discussion began by addressing the question of whether keeping program delivery arms-length from industry was sufficient to ensure program integrity. Chouinard noted that contractor exclusivity was also integral to program integrity. McElderry added that the Canadian emphasis on exclusivity has provided an environment that has enabled program delivery to develop effective data collection procedures free from conflicting interests. The introduction of cost-recovery, and the attendant concept of 'user pay/user say', has resulted in a challenge to this exclusivity model.

This led to a discussion of the extent to which exclusivity was essential to program integrity. Rowe noted that industry largely concurs with the notion that integrity and the perception of integrity is in everyone's best interest. He suggested that the arm's-length nature of the program was paramount to the retention of this perception of integrity, whereas exclusivity, while contributing, was not essential. Panelists agreed, however, that the arm's-length nature of the program was essential to maintaining this integrity and that exclusivity has been instrumental in ensuring such a distance.

Ackerman pointed out that the key to the success of the program is unbiased data and that a multiple provider model could compromise integrity. He also suggested that even though a multiple provider model may lower some costs, government oversight would be more extensive and could result in more cost to industry.

Ackerman suggested that increased industry participation in the supplier-selection process might ease fishers' concerns with exclusivity. He suggested that including industry in such discussions in his region increased their understanding of the complexity of the process and underscored the fact that industry's main concern is program cost. Having realized that the data collected by observers may be used to dispel criticism of certain fishing practices, the industry has come to advocate the use (if not the cost) of observers whenever such criticisms arise.

CASE STUDY 2
THE U.S. NORTH PACIFIC (ALASKA) GROUNDFISH MODEL

Moderator: Chris Oliver, North Pacific Fishery Management Council

Panelists:

Bill Karp	NMFS, AFSC
Sue Salveson	NMFS, Alaska Region
Lauren Sampler	NMFS, Alaska Region
Theresa Turk	Association of Professional Observers
Michael Lake	Alaska Observers Inc.
Paula Cullenburg	North Pacific Observer Training Center

OVERVIEW

Moderator Oliver and program manager Karp summarized the changes that this model is undergoing. Currently, the program is delivered through a pay-as-you-go system whereby vessels pay placement costs directly through a flat sea day rate. Coverage is mandatory with levels fixed at 100% for larger vessels, 30% for intermediate vessels, 0% for small vessels, and some additional requirements for plants. While NMFS retains responsibility for training and certifying observers (in cooperation with the University of Alaska) and certifying contractors, vessel owners may negotiate with any of five certified suppliers for the provision of observers.

Concerns that persist under this model include real and apparent conflicts that arise when the fishing industry can negotiate with multiple suppliers, and the effects that competition among contractors can have on observer working conditions, which may, in turn, compromise data quality.

Two sets of problems have arisen which require development of a new delivery model. First is cost inequity, in that there is no relationship between vessel catches and the amount they pay for observer coverage. Second is that, under this model, coverage levels are fixed and may not be reassigned to better meet the needs of the program. Concerns that persist under this model include real and apparent conflicts that arise when the fishing industry can negotiate with multiple suppliers, and the effects that competition among contractors can have on observer working conditions, which may, in turn, compromise data quality.

In its efforts at restructuring this program delivery model NMFS must work with the North Pacific Fishery Management Council, which is a statutory body under the M-SFCMA. While there is broad recognition among Council members that the above stated issues need to be addressed, changes have not been made.

In one attempt to address these issues, NMFS and the Council had developed and implemented a user fee system to fund the observer program. Termed the North Pacific Fisheries Research Plan, this system authorized NMFS to charge industry up to 2% of the landed value of their catch to be used to procure and deploy observers. Initial attempts to implement this approach failed.

Following this failure, NMFS and the Council again addressed the conflict of interest issue by considering a modified pay-as-you-go system, under which a not-for-profit organization would become the single source for procuring observers. This organization would receive all requests for observers from industry and subcontract with supplier companies to place observers. (Soon after the workshop took place, work on this modified multiple contract model ceased after insurmountable legal problems were encountered.)

Turk related how observers unionized in 1997 as a response to the failure of the fee-based program and the disappointed expectation of improved working conditions. Turk noted that, while the founding of the Association of Professional Observers has also resulted in improvements to observer work conditions, regulatory changes are still required to protect observers from the industry pressure that the current competitive, multi-contractor system creates.

The question and answer portion of the panel discussion was dominated by a logistical consideration of Alaska's projected implementation of the modified multi-contractor model. A summary of this discussion has been eliminated, however, as the introduction of that system was subsequently cancelled.

CASE STUDY 3
OTHER U.S. MODELS

Moderator: Vicki Cornish, NMFS, Office of Protected Resources

Panelists:

Tim Price	NMFS, Southwest Region
Wendy Emerson	Frank Orth and Associates
Jay Wennemer	Manomet Observatory
Dan McKiernan	Massachusetts Division of Marine Fisheries
Elizabeth Scott-Denton	NMFS, Southeast Region
Dennis Lee	NMFS, Southeast Region

INTRODUCTORY OVERVIEW

Presented by
Vicki Cornish, NMFS, Office of Protected Resources

Vicki Cornish provided an overview of the general characteristics of these programs. All are quite different from the Alaska model. While the Alaska program is largely industry funded, observer programs in the rest of the United States are funded and contracted directly by the government. Consequently, the specific government office providing that funding tends to determine the primary focus of each program. Thus, a marine mammal program called for by the MMPA, a sea turtle program funded under the ESA, and a fish total catch or bycatch program funded under the SFA will each have different goals and objectives.

In all of these programs, coverage levels are relatively low, with 20% generally being the highest coverage level and less than 5% being the norm (although one fishery is nearly 100% covered). Compliance is not currently a large component in these models, although some marine mammal reduction programs are now implementing take-reduction plans in which observers will be asked to monitor compliance.

From a management perspective, these programs all operate under the same MMPA and SFA provisions that specify the requirements that vessel operators must meet. Despite these common requirements, observer programs in the United States remain decentralized along regional lines with little or no national oversight or coordination. There are, as yet, no national standards or policies regarding program management or operation. Nor is there an adequate level of industry participation in program design.

There are several factors that influence the development of a service delivery model and account, to some extent, for the wide range of current models. As government downsizing has put strict constraints on the hiring of government employees, many programs have had to move away from the in-house model. The level and quality of contracting support a program receives from its procurement officials is another factor which will help or hinder managers' development of a particular delivery model.

Model types range from being 100% in-house, to those having certain areas of the program contracted out to one contractor, to those utilizing many individual contractors. When a model evolves away from being 100% in-house (or is initially designed to incorporate contractors), there remains a preference to retain within government such aspects as training, certification/decertification, long-term data management and analysis. Thus, the program areas that tend to be contracted out include the hiring of observers and other employees, observer deployment, and data entry.

> There are, as yet, no U.S. national standards or policies regarding program management or operation.

Cornish introduced the panelists and suggested that discussion revolve around the evolution and current structure of each delivery model, the effect of model structure on program integrity, cost-effectiveness, and future direction.

SOUTHWEST REGION - NMFS

Price provided a summary of the program delivery models being employed in the California/Oregon Drift Gillnet, Hawaiian Pelagic Longline and Northwest Hawaiian Islands Lobster Fisheries. While the Southwest Region has been involved in observer programs since 1976, these three programs all began in the 1990s with in-house delivery models. The California/Oregon Drift Gillnet fishery was contracted out in 1996 as part of the national effort to reduce the number of federal employees. Continued government funding has allowed each of these programs to develop without reliance upon industry, although budget constraints may require exploration of options such as cooperative agreements with state agencies and universities.

Over the course of the programs, NMFS has used a range of recruiting techniques from seasonal NMFS employees, to temporary, term and student hiring, to contracting out the recruiting role itself. In all cases, NMFS has retained responsibility for training and for establishing the data collection requirements and coverage levels. Data analysis is conducted by NMFS and the management decision-making that stems from that data continues to be an agency responsibility.

Price noted that both the Southwest Region's in-house and contracted delivery models had distinct advantages to recommend them. The in-house model provides NMFS with more flexibility to assign observers work within the various programs and fisheries as well as retaining ultimate control over personnel decisions. The in-house model also tends to provide observers with the increased credibility of being government employees who are held to a higher standard of conduct than their private sector counterparts. Furthermore, in-house employee retention tends to be better due to the career possibilities and other benefits. Finally, the in-house model provides more direct contact with the fleet, lower program costs due to the absence of contractor insurance and overhead.

Conversely, under the contract delivery model contractors are able to respond more quickly to hiring needs than the government hiring process allows. As well, contracts can bind contractors to coverage levels and overall performance requirements. Finally, by bringing new people into the mix, contracting provides new perspectives and ideas that may be beneficial.

Adding that the program was a small one, which benefited from dealing with a single contractor, Price reiterated some of the advantages of exclusivity – consistency of data quality, less confusion – and concluded with the reminder that, whether in-house or contract, a program's success is predicated on the quality of the observers and staff involved.

SOUTHWEST REGION – FRANK ORTH & ASSOCIATES

Emerson provided a contractor perspective on the Southwest Region's California/Oregon Drift Gillnet Observer Program (presented above). This program operates with 20% mandatory coverage of 110 active vessels which operate 6 – 20 day trips from 15 August to 31 January of each year. The contractor provides: recruitment; vessel monitoring (observers conduct 100% sampling and monitor incidental catch); deployment/logistics; insurance/benefits; debriefing; and editing, entry and delivery of data to NMFS.

Emerson emphasized the contractor's on-going efforts at improving the delivery of services in this fishery. Having achieved last season's coverage, data quality, observer retention and NMFS reporting goals and requirements, Frank Orth & Associates is now concentrating on enhancing its database, improving its observer performance tracking and vessel tracking/coverage, and reducing its expenses.

Emerson attributed much of the success and continued improvement of this delivery model to the recruitment of good observers and the maintenance of good communication between the contractor and NMFS.

NORTHEAST REGION – NMFS

Christensen provided an overview of the development of the service delivery model being used in the various observed Northeast Atlantic fisheries. The program began observing foreign vessels in 1977 and domestic vessels in 1989.

With the move to domestic sea-sampling, the program came under the Northeast Fisheries Science Center and a system under which observers had been hired as federal employees evolved into a series of contracted and semi-contracted arrangements.

Christensen suggested that this use of multiple delivery models (in-house, contracted and combinations of the two), as well as varied sources of funding (from fixed-fee to cost-reimbursement), represents the kind of freedom that managers should have in adopting the model that best suits specific program needs. Furthermore, Christensen added, any of these models can and will work if needs are properly defined and communicated.

Finally, while the uncertainty of funding is a constant challenge, the fact that observers are well paid (GS-7 level) has resulted in the retention of high quality observers throughout the program's evolution and has consistently provided dependable data.

NORTHEAST REGION – MANOMET OBSERVATORY

Wennemer provided a contractor perspective on the NMFS Northeast Region delivery model (presented above). Manomet is responsible for observer recruitment, deployment, logistics, insurance and delivery of observer data to NMFS. Providing 2,500 – 3,500 observer seadays in more than a dozen fisheries, with up to 70 % of the deployments being single-day trips, represents a complicated logistical environment in which to deliver this program. Manomet's task has been further complicated by on-going changes within these fisheries such as stock collapses, regulatory adjustments and an increased concern for incidental catch of marine mammals.

Wennemer considered some of the benefits involved in contracting service delivery in such an environment. Since contractors are one step removed from the regulatory agency that is affecting changes in the fishery's management, their observers have a narrow range of clearly defined objectives which keeps them from becoming the target of industry discontent. Contractors also have more flexibility in hiring and, especially, firing observers and operate with the built-in performance incentive of potential contract loss.

Wennemer also touched on the advantages and disadvantages of the cost reimbursement and fixed seaday funding mechanisms. The fixed seaday model that existed until 1992 provided Manomet with more staffing flexibility, especially with regard to management and data positions. This model did, however, represent a greater financial risk to the contractor because costs had to be covered by the agreed upon fee and, therefore, responding to unforeseen expenses or instituting program upgrades could be problematic.

The cost-reimbursement model that was in effect from 1992 to 1997 created different concerns. Manomet became more dependent on NMFS' provision of certain tools and equipment, such as government-developed data software. Training and certification of observers under this model provided a surplus of observers, which resulted in a higher turnover rate because there were too few trips available. Finally, under cost-reimbursement, more decisions regarding program costs were retained at NMFS and this was not always to the benefit of the program.

> Trust, a commitment to creative problem solving, and a conscious aversion to assigning ownership of those problems to one or the other partner are essential to a successful program.

Even though administrative and government oversight roles (and costs) are somewhat different in the fixed-fee and cost-reimbursement models, Wennemer concluded that either model will work if there is strong co-operation between the partners. Trust, a commitment to creative problem solving, and a conscious aversion to assigning ownership of those problems to one or the other partner are essential to a successful program.

NORTHEAST REGION – MASSACHUSETTS DIVISION OF MARINE FISHERIES

McKiernan provided a summary of the Massachusetts observer program and how it interrelates with the NMFS programs in the Northeast Region. The Massachusetts Division of Marine Fisheries operates a relatively small program (2 full-time and 6 seasonal in-house observers/state biologists) designed to conduct biological lobster monitoring and to better characterize some of the inshore (small-mesh) trawl fisheries. With the collapse of groundfish stocks, the State program has been called upon to participate in solving some of the problems involving state-licensed inshore and offshore vessels. Benefiting from a good working relationship with both NMFS and Manomet, this program has adopted the same protocols (lobster monitoring continues to use state-devised protocols) and data system that NMFS has established through its contract with Manomet. NMFS has also provided training for the program.

McKiernan explained that this program compliments the other programs that are active in state waters (e.g., providing support and seadays for innovations and initiatives that might lack adequate NMFS funding). The state advocates for development of the best random data collection procedures possible and supports the interests of state fishers as they are confronted with increasingly restrictive federal regulations. Accepting such a mediator's role between industry and the Federal Government has not compromised relations with NMFS.

SOUTHEAST REGION – NMFS SHRIMP OTTER TRAWL OBSERVER PROGRAM

Scott-Denton described the delivery model for the Southeast Region Shrimp Trawl Bycatch Observer Program which undertakes to characterize and quantify shrimp trawl bycatch and evaluate various gear types for their effectiveness in reducing bycatch.

Industry participation in the program is 100% voluntary. Vessel operators are paid $25 (U.S.) per day to allow data collection by observers and $125 (U.S.) per day to allow for evaluation of bycatch reduction devices. The fishery is comprised of 7,000 documented vessels and an unknown number of multi-permitted state boats (estimated at 50,000). Annual fishing effort consists of 250,000 fishing days. Two hundred-ten million pounds are landed with an annual value of $417 million (U.S.). Port agents collect catch reports from dealers and interview 20% of vessel operators to characterize fishing effort. Observer coverage is less than 1% - 1992 being the most active year with 1,000 observer seadays.

Observation began in 1992 and three separate programs were developed to cover the fishery. The NMFS program and the industry-based, federally funded Gulf and South Atlantic Fisheries Development Foundation program remain in operation. Each of these programs utilize(d) the same methods for training, vessel compensation, data collection and reporting and all of the data are archived at NMFS.

Observers were initially hired as NMFS employees at the GS-5 Fishery Biologist level. In 1997 the programs' administrative roles were contracted out with deployment, training and data roles remaining in-house.

Scott-Denton argued that the program would benefit from a move to industry funding by dealers and independent owner/operators. She noted that industry has established a powerful political lobby at the state and federal levels.

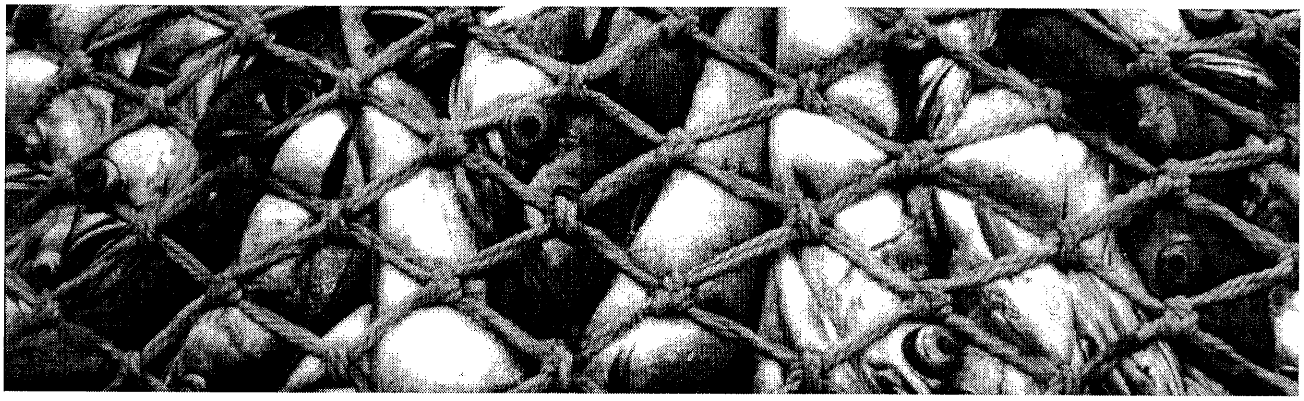
SOUTHEAST REGION - PELAGIC LONGLINE OBSERVER PROGRAM

Lee described the Pelagic Longline Observer Program, which is quite different from the program implemented elsewhere along the U.S. Atlantic coast.

The 1991 Swordfish Fishery Management Plan provided for an observer program and NMFS developed a delivery model, which provided observers through various means and was in effect until 1995. Miami Lab personnel, non-lab personnel under individual contracts (with benefits), and observers with previous experience procured through various arrangements were used to staff the program during this period.

In 1995, with the reduced availability of grant money, the program became completely dependent on observers hired through individual service contracts. Under this model, NMFS provides funding and overall administration of the program, while the program coordinators provide logistical/travel support, deploying the contracted observers on NMFS-selected vessels.

Once selected, vessels are notified by letter that observer coverage is mandatory for a specified duration and 5 days notice of all trip departures must be provided to the program office. While this process has not inspired a high level of cooperation or enthusiasm from the vessels involved, Lee indicated that the overall model works well. Direct access to observers through training and debriefing provides an ongoing means of ensuring data quality and good program/observer communication. Program communication is quite effective under this model. Observers leave vessel operators with a form that allows for their feedback and NMFS circulates data summaries to industry in the form of a newsletter.



CONCLUDING WORKSHOP DISCUSSION AND RECOMMENDATIONS

Moderator:	Bill Karp, NMFS, Alaska Fisheries Science Center
Panelists:	
Vicki Cornish	NMFS, Office of Protected Resources
Mark Saunders	DFO, Pacific
Chris Oliver	North Pacific Fishery Management Council
Dave Kulka	DFO, Newfoundland
Paula Cullenberg	North Pacific Observer Training Center
Marc Gagnon	Biorex Inc.
Howard McElderry	Archipelago Marine Research Ltd.

Karp began the final discussion by asking participants to comment on issues and problems raised during the last panel discussion on contract delivery models and then to comment on other issues raised during the workshop.

CONTRACT DELIVERY MODELS AND DATA QUALITY

There was considerable agreement that the competitive nature of the multi-contractor system in place in Alaska made it unreliable. Participants were concerned that contractor competition for industry clients created a potential for conflict of interest, and eroded confidence in the reliability of the data. This system also limits government control over contract performance and observer placement.

> Program delivery models which allowed industry influence to compromise the integrity of the data or which mitigated government control or flexibly in placing observers, setting coverage levels, and designing sampling protocols should be avoided.

McElderry pointed out that, at first glance, a federal program that provides government employees as observers may appear to allow for tighter government control, which in turn ensures dependable data quality. However, several participants agreed that downsizing of government programs made the future of this approach uncertain. McElderry also pointed out that governments are typically more encumbered with a variety of bureaucratic hiring protocols and program implementation restrictions than are their private-sector counterparts.

Responsiveness and flexibility are critical to observer programs, which are often required to adjust to dramatic and unpredictable shifts in fishing effort. Another advantage of involving independent contractors is their ability to provide a bridge between government and industry. Participants agreed that the weakness of the delivery model in Alaska was not its reliance on contractors, but rather allowing industry to select and pay contractors directly.

Boyle noted that it was important to consider how the government might lose important opportunities to better understand the nature of the fishery, the sampling conditions, and other vital information, if most observer program tasks are turned over to a contractor. Kulka agreed, pointing out that the usefulness of the data generated by observers is compromised if the government has little understanding of either the conditions under which the data were collected or of the inherent biases. There was agreement that program delivery models which allowed industry influence to compromise the integrity of the data or which mitigated government control or flexibly in placing observers, setting coverage levels, and designing sampling protocols should be avoided. Cornish suggested that it was the responsibility of program leaders to ensure that decision makers are aware of these issues. In addition, she pointed out that it was important for decision makers to recognize that some delivery models are more cost-effective than others and that some observer program functions are inherently governmental. She further suggested that this and similar meetings reveal challenges and lessons that are common to all observer programs and that this information can help in developing national or universal standards to strengthen and guide observer programs in the future.

UNIVERSAL OBSERVER PROGRAM STANDARDS

Oliver noted that it was surprising that universal standards or guidelines in support of these programs had not yet been developed. Oliver suggested that such standards could provide assurances regarding quality of the data and integrity of the observer programs. Cullenberg agreed and added that clear direction and consistent standards could help ensure that all delivery models provide strong support for observers and the objectives they pursue. Cornish mentioned that some efforts to provide national standards for observer safety in the United States had already been initiated through a provision of SFA.

> It is a fundamental government responsibility to ensure that contractual arrangements support the collection of reliable data.

Several participants noted that it might be difficult to develop a national standard that would suit every program. It was suggested that a set of principles to help observer programs provide consistent and reliable data might be more appropriate. Karp agreed that observer program standards cannot be universal because of programs' wide range of objectives and the acts and authorities under which they are implemented. As an example, he pointed out that there were significant differences between United States and Canada with regard to government and contract law. Participants did agree that, despite any limitations on the setting of universal observer program standards, there may be a basis for defining inherently government functions and constructs which best support them.

IDENTIFYING INHERENTLY GOVERNMENT FUNCTIONS

Rowe suggested that there might be problems in identifying inherent government functions because the roles and responsibilities of contractors and governments tend to change over time. Saunders contended, however, that it is a fundamental government responsibility to ensure that contractual arrangements support the collection of reliable data. Merrick added that it would be a conflict of interest for industry to control the vehicle for data collection and that sampling design and contract oversight are, therefore, inherent government functions. Karp felt that observer training and debriefing, as well as some compliance duties, are also inherently governmental functions.

Merklein suggested that managers and scientists had to oversee such definitive elements of an observer program as sampling design, estimation methods, coverage levels, observer placement, and observer professionalism and competence to ensure confidence in data quality. Participants agreed and emphasized how the effectiveness of any observer program in securing these elements is contingent on the strength of its authority and the reliability of its funding. Merklein suggested that one could predict and measure the success of a program by evaluating its ability to control and support these basic elements. Rowe felt that the most important of these functions was the reliability of the observers as competent professionals.

DATA QUALITY AND OBSERVER PERFORMANCE

Participants agreed that the success of an observer program rested on the caliber of its observers. There was further agreement, however, that there are many other factors that affect the ability of observers to achieve program objectives. Mark Saunders suggested that high standards for hiring, training, and certifying observers are preconditions to their collecting accurate, unbiased data. Several participants added that programs endeavoring to ensure this consistently reliable data must strive to retain their experienced observers.

Participants indicated that a high observer turnover rate would result in more inexperienced observers presenting a greater safety risk, collecting lower quality data, lacking confidence in dealing with regulatory issues and, possibly, encountering difficulties adjusting to life at sea. Turk cautioned that a high turnover rate may indicate that observers feel discouraged and unmotivated by their working conditions. Since observers work unsupervised, it is difficult to assess their work effort or professionalism. A disgruntled work force, experience aside, cannot be relied upon to collect high quality data. Thus, there was a consensus that programs should attract and retain long-term, professional observers.

Karp mentioned that the difficulty of the job represented a challenge to retaining experienced observers. Some participants responded, however, that many observers, like fishers, appreciate the seasonal nature of their work and were intent on continued observing as part of their careers and lifestyles. In many programs, therefore, observer turnover may be better accounted for by funding issues, inconsistent observer coverage demands, and other considerations which make it difficult to provide observers with long-term job security. Turk pointed out that, although most observers would certainly appreciate better job security, many were field biologists who understood the unpredictable demand for observers. Rather, Turk argued many good observers left the programs in Alaska because they felt that they were not supported adequately or treated professionally.

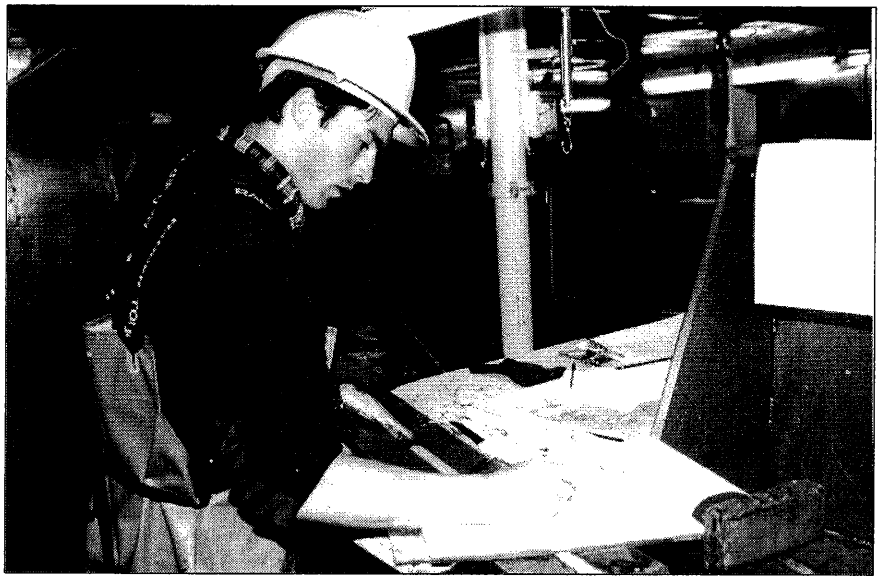
Kulka suggested that agencies and industry need to understand that programs require professional biologists as observers, and that the data required cannot be generated by simply placing bodies on boats. Both Cornish and Karp felt that there was a perception problem within NMFS regarding observers, partially because generally observers do not work directly for the agency. Participants agreed that it was vital for program developers and data users to appreciate that reliable data collection is predicated on the maintenance of an experienced, professional observer corps.

Karp suggested that one way to address many of the concerns over high turnover rates would be through a type of observer bill of rights. Participants agreed that this would be an excellent topic for a future workshop.

SAMPLING DESIGN: BALANCING PRIORITIES AND GOALS

Price expressed concern that industry, the general public, and even agency managers may overestimate the number of issues that can be resolved by implementing a program to place observers on fishing vessels. Over-ambitious objectives often lead to frustration when observer programs cost more and deliver less than first expected. Thus, participants agreed that a mechanism for identifying and prioritizing clear and realistic observer program goals should be established. Cornish emphasized the need for periodic reviews and adjustments of program sampling designs and priorities, as the conditions and mandates under which a program operates tend to evolve over time.

Over-ambitious objectives often lead to frustration when observer programs cost more and deliver less than first expected.



Courtesy Javitech Ltd.

The coverage and sampling requirements for analyzing and addressing one issue will differ from those required for another issue. Participants recognized, for example, that coverage levels for estimating bycatch of rarely occurring prohibited species will be different from those required to estimate distributions of targeted species. Merrick cautioned that a program that is incapable of generating statistically meaningful data, due to the fact that minimum coverage levels cannot be met, is potentially useless as a management tool. Generally, funding limitations constrain observer coverage levels and, therefore, managers must carefully assess coverage requirements, sampling design feasibility, and program cost-effectiveness prior to implementation.

> A program that is incapable of generating statistically meaningful data, due to the fact that minimum coverage levels cannot be met, is potentially useless as a management tool.

Karp noted that the need to prioritize becomes obvious when requests for data collection and monitoring exceed an observer's capability or cause conflicts. Karp emphasized that data users must recognize the limits and weaknesses, as well as merits, inherent in observer programs and appreciate how scientific and regulatory objectives may conflict. Kulka reminded participants, however, that a carefully coordinated observer program should be able to reconcile disparate data requests and contribute to a wide range of scientific, management, and enforcement objectives.

COMMUNICATION

Participants agreed that well-run observer programs are often the only way to provide certain types of data to fisheries managers, enforcement agents, and scientists. However, since observer programs involve substantial costs, safety risks, and burdens to industry, planning, cooperation, and support are essential. The resolution of many of the problems discussed during the workshop depends on developing and maintaining a consultative process between observer program designers and managers, data users and industry. Turk remarked that observers too had valuable insights to contribute to this dialog. Karp agreed and pointed out that it is often observers who first recognize problems and call for their solution.

> The resolution of many of the problems discussed during the workshop depends on developing and maintaining a consultative process between observer program designers and managers, data users and industry.

RECOMMENDATIONS FOR THE NEXT WORKSHOP

Karp asked participants if they thought that further workshops should be scheduled. Participants responded that the meeting had been a unique and valuable opportunity to share ideas and experiences that would help them improve their own programs and provide guidance to those developing new programs. The following recommendations for future observer workshops were made.

Suggested Themes for Future Meetings Included:

- Sampling design;
- Discard determination;
- Coverage level determination;
- Outreach and communication;
- Program assessment and evaluation;
- Program delivery models;
- Balancing compliance and scientific objectives;
- Long-term and short-term program goals;
- Observer performance evaluation;
- Maintaining an experienced and professional observer corps;
- Observer remuneration and "bill of rights"; and
- Safety issues.

Suggested Methods for Future Meetings Included:

- Retain current format of a large group meeting with panel and audience participation;
- Small simultaneous workgroups that report back to the main meeting; and
- Smaller special-topic workshops before and after the main meeting (such as the Information Technology Session which followed this workshop).

Workshop participation:

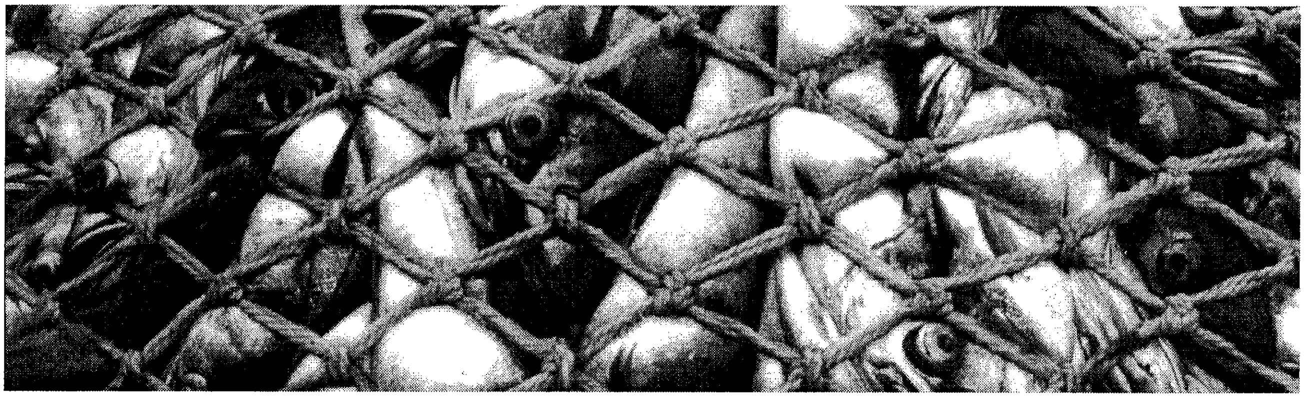
- Include and fund observer participation for the next meeting; and
- Organize separate meetings or focus groups to be held with the fishing industry and other interested parties, such as environmental groups.

Timing:
Workshops could be held once every 2 years, with the next one being tentatively planned for Fall, 2000.

Other venues for discussion of Observer Program Issues:
Several participants suggested that other venues could also be used to address some issues that were discussed during the observer workshop. Anneke Bane, NMFS Headquarters, remarked that although large workshops were useful for sharing ideas, smaller focus groups could often be more successful at actually tackling specific issues. In particular, Bane encouraged the inclusion of industry so that all the players were at the table. It was recommended that a steering committee, with technical subcommittees, could help develop a network to share observer program information and coordinate efforts to address some of the issues brought up at this workshop.

Merrick mentioned that avenues for further discussion include meetings held by organizations such as the American Fisheries Society. Saunders suggested that an Internet webpage could also provide a useful forum for posting information and relevant discussion, as well as for housing observer program publications and useful grey literature which is often otherwise inaccessible.

Finally, participants agreed that the workshop discussions revealed the importance of every observer program developing and maintaining internal avenues of communication to facilitate integration and to improve understanding and support between agency staff and decision makers. It was suggested that to be effective these efforts should be inclusive, bringing together all those involved in, or dependent on, observer program data. In addition, it was agreed that in pursuit of creating stronger and more useful observer programs formal outreach efforts need to be developed to improve understanding and cooperation between the agencies, observers, contractors, and industry in pursuit of creating stronger and more useful observer programs.



SPECIAL TOPIC SESSION: INFORMATION TECHNOLOGY ISSUES AND OBSERVER PROGRAMS

Moderator:	Shawn Stebbins, Archipelago Marine Research Ltd.
Panelists:	
Mike Brown	NMFS, Alaska Fisheries Science Center
Shawn Stebbins	Archipelago Marine Research Ltd.
Dave Kulka	DFO, Newfoundland Region

Stebbins began the Special Topic Session by posing the question of why observer programs are quite slow in responding to the technological advances that promise to improve the timeliness and quality of observer data. He suggested that one paradoxical answer is economic – that while the need to save money argues in favor of adapting to technological advances, that adaptation initially costs money. Stebbins suggested that other reasons for programs being slow to respond to these advances include the concern for confidentiality and protection of information and the inherent barriers of the at-sea work environment. He asserted, however, that technological advances could and do improve such program components as initial data collection (sampling/catch estimation), transferring information (fax/e-mail) and editing/verifying data (scrutiny). Stebbins concluded by asking the presenters to consider how much or little these technological advances represent real cost savings and data quality improvements.

Brown related the progression that has occurred in the use of information technology for observer catch reporting in Alaska's North Pacific Groundfish Observer Program. From the initial use of Morse code, the program advanced to the use of FAX, VHF and TELEX, then to primitive electronic reporting, and finally to the current implementation of the new ATLAS system.

ATLAS allows observers to enter data into computers at-sea, more thoroughly check for errors and transmit that data and other communications, via satellite, to Seattle. While this new system promises to alleviate past problems of data duplication, manual processing, delays, and error detection, new challenges include minimizing implementation cost, handling increased volume of data and making the process easier for observers. As this implementation progresses, however, the following benefits to the program are being realized:

- Reduction in workload for staff;
- Reduction in delays in availability of data;
- Reduction in keypunching costs;
- Better quality data; and
- Better communication with observers.

Coupled with these program improvements, introduction of the ATLAS system is also proving to give observers:

- More flexibility in sampling methods;
- Better communications with NMFS;
- Shorter debriefing time
- Elimination of most tedious paperwork
- Elimination of most paper forms; and
- No increase in workload.

Testing began last year with 20 vessels. Currently about 75% of data are handled through ATLAS; including 5 processing plants. Transmission costs are $10-20/week depending on data volume and are covered by the vessel. The vessel is also responsible for providing the hardware required by the ATLAS System, which uses the INMARSAT A for satellite communication. These units are worth about $40,000 (US) each.

Haul data is still recorded on paper forms, while species composition information is recorded on a plastic deck form. Observers keep back up copies of their data on floppy disks.

In conclusion, Brown noted that the experience of introducing this new information technology has shown that everything takes money and time, and that managers must keep it simple, recognize limitations, and take things gradually - while retaining their vision of a technologically improved program.

Stebbins related three information technology innovations that have been implemented in Canadian Pacific Region observer programs. The first innovation is that of scanning observer trip reports into a graphics image for review by government clients. This simply involves the scanning of multiple pages of handwritten comments and methods into graphic images that can be viewed at the convenience of various clients. The images are stored on an in-house computer, which can be accessed by modem. With the appropriate viewing software this hand-written narrative data can be easily accessed by remote users. In the past, these reports were filed away, never to be seen again unless someone went to great effort to retrieve them from the archives. Future plans include "burning" the images onto compact discs at the end of each season for distribution to each client, and making the images available on a webpage if the related security concerns can be satisfied.

The second information handling innovation involves the use of Optical Character Recognition (OCR) technology to produce structured electronic data from the scanned image of a hand written data form. This technology has not been fully implemented yet, but has been tested with some success. There is a requirement to turn observer catch data into a machine readable format within 12-36 hours of a vessel landing. For this reason, ways of reducing keypunch costs and turn around time are being explored. The OCR product is called Teleform and involves reader and verifier components. A structured data form including a form identification signature and cornerstone is used by the observer. It must be completed neatly with consistent character shapes. Once completed it is scanned and interpreted with the resulting data moved directly into a database. The operator is responsible for interpreting and correcting characters with which the software is not confident. The software allows the operator to set variable confidence levels on different fields. Thus far, the OCR technology has proven very successful, depending on the neatness of the recorded data. Up to 99% success has been achieved and the software is reliable in identifying unclear characters. Visual checks have shown that it very rarely would misinterpret a character without identifying it as a problem. The success rate is greatly improved using only numerals 0-9 rather than letters, which have 26 variations. It must be recognized, however, that the only way to ensure 100% accuracy is with a full visual check of every data field, and that without this, it is possible for translation errors to occur.

Participants did voice concern that OCR is not 100% error-free and that the occurrence of random errors in the database, although small in number, could have far-reaching effects. Stebbins acknowledged that this technology did not preclude the need for proofreading data entries and he added that the OCR system has also not eliminated the at-sea use of paper data forms, as the ATLAS system promises to do. Stebbins asserted, however, that the ability to directly scan faxed hard-copy forms does have the potential to reduce the time and costs associated with manual computer entry.

The third information technology innovation that Stebbins discussed was the development, by the Pacific Blackcod Fishermen's Association in co-operation with Archipelago Marine Research Ltd. (AMR), of video-surveillance systems designed to effectively replace human at-sea observers in the experimental Pacific Blackcod Seamount Fishery. The systems are comprised of three components: a battery/back-up power source, which ensures that the system will continue working if the vessel's power source is cut, a combination GPS/VCR, which constantly indicates the vessel's position in latitude and longitude on the video screen and the camera itself, which is secured in a location providing the best view of the fishing deck.

The Seamount fishery licenses no more than three vessels at a time. Each vessel is able to rent one of the systems from the Association. AMR delivers and sets up the system on the vessel, ensures that it is working and locks the GPS/VCR box. The camera then takes a picture of the deck every 10 seconds for the duration of the trip. Archipelago is responsible for retrieving the equipment and tape when the vessel lands. When the video is played back at the AMR offices, it is monitored to ensure that the vessel is fishing where it should be and is not loading or off-loading product at sea. The video does not currently have adequate resolution for identifying species. This technology is also not suitable for catch enumeration applications.

The temptation for crew sabotage of the system has been effectively circumvented. The GPS/VCR component has a small screen on its exterior, which shows exactly what the camera is picking up at any given time. The crew is responsible for ensuring that the camera is working properly. If it is not, the trip is effectively over and the vessel is required to proceed immediately to port. Any gaps in the film would be reported by AMR to DFO and appropriate action would be taken (e.g., relinquishment of the catch, a fine etc.).

The cost to produce each unit was approximately \$10,000 (Cdn) with a total of 4 units being produced. The Association rents the units to the vessel for approximately \$1,500 for the 30-day permit period. This presents about a 500% cost savings to the vessel over onboard observer coverage (~\$8,000). However, system failures have occurred, usually due to power problems, which have required vessels to return to port, thereby incurring financial loss.

Kulka presented the FoxPro FFS (Fisheries Form System) data collection software used on research cruises and by port samplers in the Newfoundland Region. This technology allows the user to enter information directly into a database at sea, analyze the data in real time, edit 'on the fly' and output in various reporting formats. The time saved by having this system automatically produce summary reports allows observers to devote more of their attention to observation of the catch and fishing activity.

The port sampling and research vessel versions of FFS have been implemented for years and are now regarded as indispensable. However, funding limitations have delayed implementation of the observer module of FFS that also exists. Such implementation is imminent, however, and promises to relieve observers from having to spend up to 3 hours per day writing reports and catch summaries, which are subject to error. In place of that tedious process, such information technology will enable observers to produce error-free reports and summaries (to the extent that the initial raw data is entered error-free) at the push of a button.

To view

PART II: OBSERVER PROGRAM DESCRIPTIONS

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