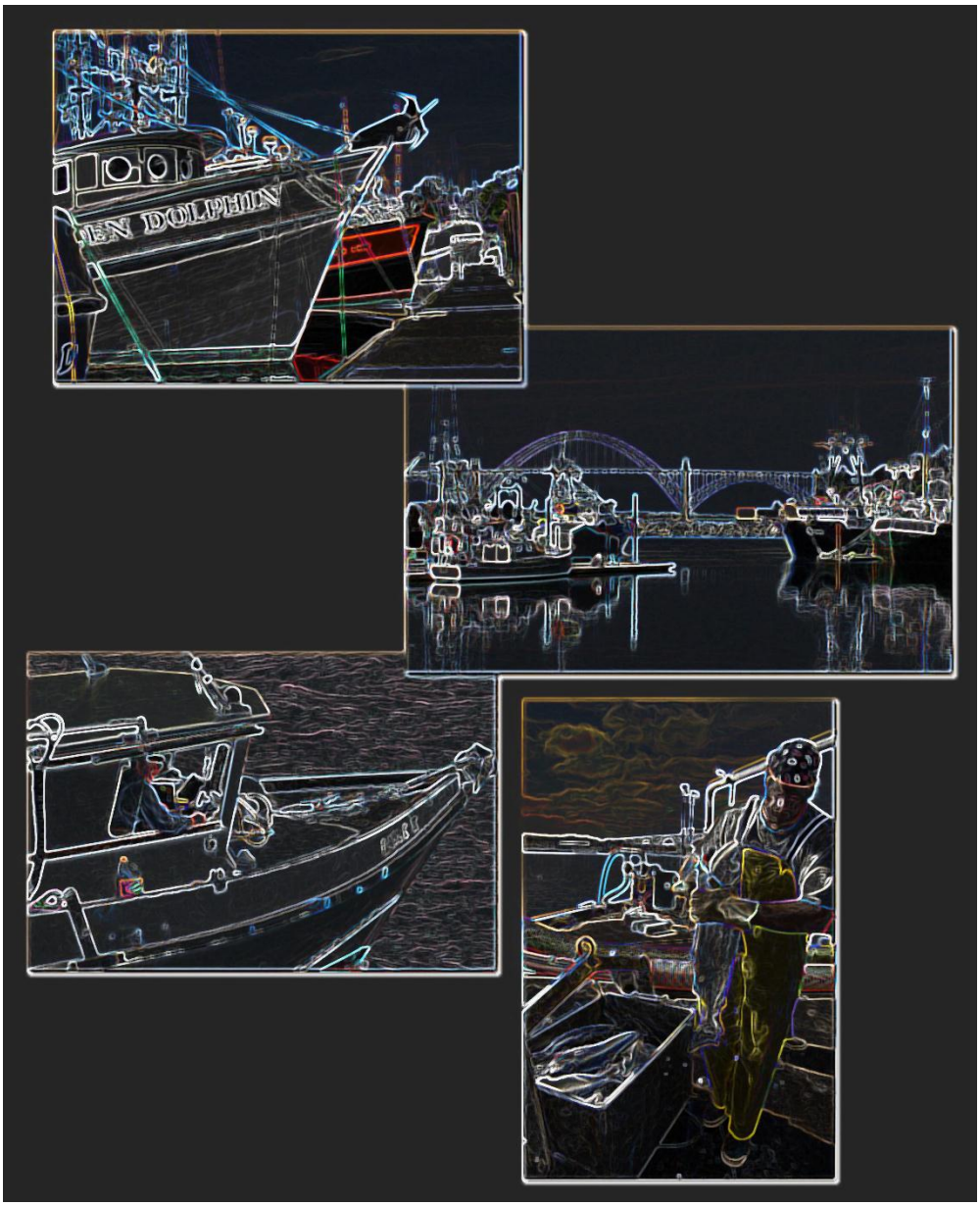

Development of Electronic Fishery Information Systems for West Coast and National Fisheries: Proceedings of Two Workshops

May 3-4, 2011 ◆ Portland, OR

September 8-9, 2011 ◆ Seattle, WA

Final Report, June 2012

ACKNOWLEDGEMENTS

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eFIS West Coast Steering Committee
Gil Sylvia, COMES/OSU, Chair
Jeff Feldner, Oregon Sea Grant
Nancy Fitzpatrick, Oregon Salmon Commission & Oregon Albacore Commission
Pete Lawson, National Oceanic and Atmospheric Administration
Heather Mann, Community Seafood Initiative
Rod Moore, West Coast Seafood Processors
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Terry Smith, National Sea Grant/NOAA
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Heather Mann, Community Seafood Initiative
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Prepared by: Nancy Steinberg
Gil Sylvia
Jenny Dresler

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EXECUTIVE SUMMARY

Fisheries nationwide are facing major challenges that require collection of real time (RT) and near real time (NRT) information. High-resolution RT and NRT data are critical for addressing a variety of fishery needs including quota accounting, observer coverage, bycatch management, electronic logbook and fish ticket requirements, research and monitoring, spatial mapping, and product tracking and marketing. But there are major questions about the development and use of these electronic fishery information systems (eFIS): Who owns the data and how will they be shared? Can data be used to improve the economic success of the industry while also meeting regulatory requirements? How do we avoid costly and duplicative systems? And how do we ensure that systems designed to share data also protect individual privacy? The transition to RT and NRT electronic systems poses potential benefits but also raises major questions.

This document summarizes the proceedings of two workshops to discuss implementation of eFIS for West Coast (May 3-4, 2011 in Portland, OR) and national (September 8-9, 2011 in Seattle, WA) fisheries. At each workshop stakeholders discussed critical issues and developed recommendations for designing and implementing eFIS systems.

A number of important principles emerged about which there was general consensus within and across the two workshops. These principles form a set of findings and recommendations to guide successful eFIS development.

FINDINGS AND RECOMMENDATIONS

Organizational and Structural Guidance

- Bottom up Approach: In the United States, eFIS development will be most successful and efficient if it is industry-driven, that is, using a "bottom-up" incentivized approach, as compared to a "top down" government mandate. As this process plays out, national and state government fishery management agencies will become a "client" of industry that contracts for data that the "regulator" requires, while industry uses its own data to improve economic and management performance. Federal and state government, as well as the fishing and the seafood industry, must both contribute to developing efficient information systems. The challenge is determining what role government should play in encouraging entrepreneurial development that brings value to the industry and supports sustainable fisheries.

- The Need for Standards: Government and industry must work together to develop "standards" that support and catalyze entrepreneurial development of eFIS systems. We recommend that a national-level committee be established to clarify and/or establish critical standards that will advance development and use of eFIS systems.

- Flexibility and Adaptability: eFIS will not happen all at once due to funding, logistical, and technical constraints. However, slow and uneven development can result in systems that are built in a piecemeal fashion that are incompatible, duplicative, or inflexible. We

recommend flexible customizable systems built to enable future expansion and adaptation.

- Organization and Management: The highest hurdles to jump in eFIS development are not technical in nature, but organizational and administrative. These issues include understanding system needs and objectives, privacy requirements, legal issues, and budget requirements and constraints.

- Partnerships: Technology providers must partner with the industry early in the process of system development. This partnership should encourage buy-in and participation from project inception.

Incentives for Industry and Management Agencies

- Incentives are Wide Ranging: Industry incentives for developing and using eFIS include increasing the efficiency and sustainability of fisheries, providing the ability to fish longer and catch more fish, enhancing market opportunities for fishery products, and monitoring catch share quotas and catch of protected species. In some cases the absence of eFIS and near real time data may lead to fishery prohibitions and being constrained by a highly precautionary management framework. Incentives for management agencies include efficiency in data collection, near real time access to comprehensive data, and support for sustainable fisheries.

- Efficiency: eFIS should be designed to improve accessibility and quality of data on a day-to-day basis, reduce inefficiencies, and minimize duplication in data collection, sharing, and use.

- Accessing Individual and Fleet Data: A critical incentive for industry participation is having immediate access to collected data in a form that brings greater understanding and knowledge of individual and fleet performance and helps the industry discover new approaches for achieving success.

- Decreasing Costs: Costs for eFIS development, operations, and maintenance should decrease over time in response to improvements in technology and systems management. Since these systems are scale dependent, the "marginal" cost per additional user will decrease significantly as more users participate.

Technical and Data Recommendations

- Cloud computing**:** Development of eFIS will incorporate cloud computing and a variety of platforms (tablets, smart phones), but it is important to recognize that these platforms are simply "skins" and the database development itself is the critical and difficult part.

- Cameras vs. Observers: Cameras and sensor systems may not be able to replace all of the duties and functionality of human observers, but if technology development goes in the direction of camera/sensor systems, the technology and related support services will need to replicate some of the multiple roles of observers.

- Digital vs. Paper: While digital has many advantages over paper-based systems, in some cases (for some businesses, places, fisheries) paper record-keeping will need to continue as an option for the near future.

- Open architecture: Design a broad, service oriented, open architecture system where users and data can be added as needed.

- Multiple Data Streams: The discussion of eFIS needs to account for six or more different data streams including VMS, observer data, logbooks, fish tickets, scientific survey data, and marketing/traceability data.

Privacy and Security

- Data stewardship and data sharing: Those that manage, use, and contribute eFIS data need to be considered stewards of the data; each participant in the data collection process must recognize their roles and responsibilities in managing and sharing data. They need to retain appropriate control of their submitted data -- and have sufficient access to others' data -- without directly managing database servers or claiming narrowly defined data ownership.

- Privacy and security: Privacy and security issues need to be addressed from the inception of eFIS development.

- Log-In: Systems must include a federated security system with a log-in/password access.

- Managing security: Privacy and security systems must be tested and evaluated throughout the lifetime of the eFIS, not just at the initial development stage.

INTRODUCTION

Fisheries nationwide face major challenges that require collection of real time (RT) and near real time (NRT) information. High-resolution RT and NRT data are critical for addressing a wide range of fishery needs including quota accounting, observer coverage, bycatch management, logbooks, fish tickets, research and monitoring, spatial mapping, and product tracking and marketing. As RT and NRT needs grow, advancing technologies are increasing the speed, reliability, and capacity for collecting, storing, communicating, sharing, and analyzing electronic fisheries data. These RT and NRT technologies are being employed by resource managers, individual fishing businesses, seafood processing and marketing companies, and fishing fleets to manage harvests, reduce bycatch and discards, track environmental conditions, improve stock assessments, coordinate fleet behavior, and increase economic and market benefits.

But there are major questions about the development and use of these electronic fishery information systems (eFIS): Who owns the data and how will they be shared? Can data be used to improve the economic success of the industry while also meeting regulatory requirements? How do we avoid costly and duplicative systems? And how do we ensure that systems designed to share data also protect individual privacy? The transition to RT and NRT electronic systems poses potential benefits but also raises major questions.

Addressing these questions and designing successful eFIS systems is occurring against the backdrop of larger institutional "revolutions" impacting fisheries around the globe – in particular sustainability and property rights. The sustainability revolution is ensuring that fisheries and supporting ecosystems are conserved so that future generations can access healthy fishery resources. The property revolution is creating institutions in the form of economic incentives and privileges that create necessary conditions for achieving sustainability. NRT information systems represent a third, less heralded, but equally important revolution fundamental for ensuring the success of sustainable and profitable fisheries.

This document summarizes the proceedings of two workshops to discuss implementation of eFIS for West Coast (May 3-4, 2011 in Portland, OR) and national (September 8-9, 2011 in Seattle, WA) fisheries. At each workshop stakeholders discussed critical issues and developed recommendations for designing and implementing eFIS systems. Workshop attendees included scientists, fishery managers, fishing and seafood industry representatives, technology providers, individual fishermen, and a variety of other interested parties.

The agenda of the May 2011 workshop, attached as Appendix A, included 1) formal presentations from those currently using or developing electronic systems, 2) panel discussions on issues related to implementing eFIS on the West Coast, and 3) breakout sessions designed to initiate discussion on how best to move toward eFIS implementation. This report outlines outcomes from that workshop, and highlights recommendations made by the breakout groups. The September 2011 workshop was conducted in conjunction with the annual American Fisheries Society meeting. Day one of the Seattle event consisted of an AFS symposium at which presenters gave brief talks about development and use of various eFIS, including a series of talks on development and use of an electronic logbook system used in the Gulf of Mexico shrimp fishery. Day two (agenda in Appendix B) built on the information presented at the symposium, but centered around small breakout group discussions and culminated in a series of recommendations for eFIS development nationally. Because the guiding principles that emerged

from the two events were consistent and overlapping, a final set of recommendations and guiding principles for both West Coast and national fisheries is provided at the end of this report.

WEST COAST EFIS WORKSHOP
May 3-4, 2011
Portland, OR

INTRODUCTION

West Coast fisheries are continuing to evolve while facing increasingly challenging and strict standards in order to meet sustainability requirements, including requirements associated with stock rebuilding, bycatch reduction, annual catch limits, and ecosystem-based management. To achieve these standards there are growing demands for improvements in data collection, analysis, and reporting. This is particularly true for fisheries undergoing rapid changes in management, most notably the trawl groundfish fishery which is now managed using a catch share program based on individual fishing quotas. The fishery is facing significant challenges including requirements for 100% observer coverage and quota caps to rebuild stocks, some of which are extremely low. Electronic fish tickets, quota tracking systems, real time observer data, electronic log books, and camera-vessel sensor systems are examples of electronic RT and NRT systems already employed or under development by the groundfish fishery for managing these challenges in a cost-effective manner.

It was these challenges that motivated organizers to hold a workshop to address the fundamental issues and major challenges for RT and NRT electronic information systems for West Coast fisheries. The overriding challenge was designing these systems for the West Coast so they work to the advantage of individual firms, the broader fishing and seafood industry, and fishery management and science organizations. A unit of information may have significant value for a multitude of uses and users including individual firm performance, broader fleet performance, fishery science and management, seafood marketing, and public relations and education. But how can we manage and share thaose data so that they provide maximum efficiency and value and a distribution of costs and benefits among all potential users? The organizing committee recognized that while some of the challenges are technical, others are financial, legal, and contractual. The workshop was designed to address the following questions:

- Who owns the data and controls the fishery information system(s) – industry, government, or a third party?
- How do we share data among multiple users for mutual advantage?
- Can these systems be designed to increase revenues and profits or are they primarily regulatory or cost-minimizing tools?
- How do we protect privacy?
- How do we ensure quality, transparency, and integrity of the information regardless of who collects and holds the data?
- How do we integrate disparate systems and maximize inter-operational capacity?
- Can we (or should we) develop a single integrated “fishery information system?”
- What range and form of contracts will meet individual needs and provide legal protection?
- What is the best approach to stage development to ensure success?
- How do we integrate fishery dependent data into the science and management system?

- What technologies and fishery information "systems" now exist (market or non-market) and what are their advantages, disadvantages, and costs?
- How do we ensure that today's systems will be consistent with tomorrow's emerging technologies?
- Are RT systems worth the extra cost compared to NRT systems?
- Can cost effective RT/NRT systems be developed for small vessels?

The May 2011 workshop included formal presentations about existing systems in the U.S. and Canada, panel discussions on the major issues related to eFIS implementation, and small group discussions aimed at developing recommendations and next steps.

SUMMARIES OF PRESENTATIONS

The morning of the first day of the workshop consisted of a series of presentations aimed at providing information on existing eFIS on the West Coast and in Canada. Presenters were asked to describe the systems they have in place or are developing, and to address challenges they've encountered related to the questions listed in the introduction. Summaries of those talks follow.

Ron Goruk, DFO Canada
Fisheries and Oceans Canada Electronic Reporting Initiatives

Established in 2000, the First Nations e-reporting database tracks individual catch through the capture of all food, social, and ceremonial catches and the locations of the catch.

In 2006, Canada implemented an electronic recreational fisheries logbook database. The program consists of three components: an on-the-water system, a dockside system, and a lodge database. The on-water system is a handheld device that tracks catch ("fish on") and location through real-time GPS tracking. It is used primarily by fishing guides who can track the catches of individual customers. The dockside component is a touch screen device. The drawback of this tool is that it cannot provide accurate location details. The lodge component has the capacity to import data from other devices (i.e., on-water) and upload the information to a central lodge database. The information is transmitted to fisheries managers on a weekly basis. In 2010, Canada had ten operating lodges, 35 handheld devices, and eight tablets in use by guides. There are currently ten handheld units on loan in Olympia, WA.

In 2005, Canada instituted a commercial electronic logbook system designed to mimic paper logbooks, but with the added capacity to record biological data. Like the recreational logbook, the commercial e-logbook captures catch and other fishing information at the source. For example, the logbook captures when a trip starts ("start trip"), if a trip is canceled ("cancel trip"), if a trip is interrupted ("pause trip"), when a trip ends ("end trip"), and when fish are landed. Catch location is obtained via GPS and satellite; information is stored on a USB stick. Fishermen can access and enter data through an e-log ID, VRN, and email. The log-in does not require personal information, so Canada can protect individual and database security. The electronic logbook system has the benefit of forcing fishermen to meet license conditions and reporting standards. Additionally, the system eliminates the cost of the purchase of paper logbooks and phone-ins and is easy to use. Data/information is received in real-time via a simple, small e-mail

message to DFO. For piloted fisheries, such as gillnet and seine fisheries, log modules can be used for quota tracking and the documentation of landings.

The federal government currently pays for the e-logbook system; however, shrimpers currently split the cost of e-reporting because the fishery lost government funding.

Dave Colpo, Pacific States Marine Fisheries Commission
E-tickets in Oregon Groundfish Trawl Fisheries

Current e-fish ticket applications are Microsoft Access 2007-based with a host server in Portland. The PSMFC controls the hardware and software for CMS (data sent to Portland) and compares data in the KOMODO system (which can be used for e-tickets **and** compliance monitoring).

The e-ticket administrators are responsible for setting up users on the system and serve as the points of contact for a group of users. Before entering data through the e-ticket system, the PSMFC must obtain a dealer name or contact and create a buyer (i.e., organization). The newly established organization requires one administrator or contact person. The organization can have many users, but administrators manage users. After an organization is established, a password is set up through an email account. Users can then enter and submit data. On the West Coast, IFQ landings must be submitted within 24 hours. The boat name is confidential to protect security and buyers keep a list of boat names. The software is adaptable, such that administrators/users can edit tickets at a later date. PSFMC provides run-time Microsoft Access 1997 free, which can be run on almost any personal computer.

The e-ticket system has several incentives for participants. It can provide reports of past landings, past deliveries, quarterly reports, and even tax assessment reports.

Catch monitoring data is reported by onboard observers on PSMFC-provided netbooks after the fishing trip. The system is very similar to the e-ticket system. Information from the e-ticket and compliance systems is compared via KOMODO.

ODFW's e-ticket program is managed by the agency's Commercial Fish Information Project (Salem, OR). In Oregon, while fish tickets were developed to aid in determining ad valorum taxes the state assesses on commercial fish landings, they are also the most complete source of catch data, and are therefore valuable for biological assessments and for addressing some additional fisheries management needs. ODFW currently imports e-ticket data from PSFMC; all IFQ groundfish landings must be reported via this system, and at least one dealer is using it for some landings in other fisheries. ODFW also accepts paper fish tickets from fish dealers for landings not required to be reported electronically; staff enter these data manually. More than half the groundfish tickets processed by ODFW continue to be paper; these come primarily from Oregon's commercial nearshore fishery, in which many fish buyers are small-scale, isolated, or mobile, and have not yet transitioned to maintaining electronic records. .

John Gruver, United Catcher Boats
Bycatch Reduction Agreements – Integrating Electronic Data with Fishing Practices in the Bering Sea Pollock Fishery

Chinook and chum salmon are the dominant bycatch species in the Bering Sea pollock fishery. Chinook were originally regulated by a trigger-closure system, but beginning this year, there is a hard cap allocated across all sectors. Non-Chinook (e.g., chum) bycatch was regulated through time and area closures that also had a trigger mechanism. The Council currently has plans to review the chum regulations.

The industry initiated Inter-cooperative Agreements (ICAs) in 2001 for chum salmon. The ICA utilized the Rolling Hotspot (RHS) format for the fishery, which is defined as a series of temporarily closed areas that can be used to supplement fixed closures. This format was designed to avoid catch trigger areas, which did a poor job of reducing bycatch (actually increasing it in some instances). The ICAs were voluntarily joined by everyone.

The ICA implemented a fixed closure format in 2007 in a portion of the Bering Sea where Chinook bycatch is high. Because the fixed-closure area is always closed, it requires strict monitoring (via VMS systems). Boat captains must pay a $10,000 fine for a single infraction (fishing in the area), $15,000 for a second infraction, and $20,000 for subsequent infractions.

Today, management is transitioning from an ICA to an incentive plan agreement (IPA). The IPA is a hard cap for Chinook salmon in the pollock fishery (at 60,000), allowing for access to a higher number of fish, if the fleet does everything possible to reduce bycatch. This program attempts to encourage fishermen to think responsibly about bycatch.

Karl Haflinger, Sea State Inc.
Using Federal Fisheries Data in Managing Private Fishery Co-ops

NOAA relies on observer and landings data to manage the Alaska pollock and Pacific whiting fisheries.

There are three separate salmon initiative programs in the pollock fishery (that would allow fishers to access a higher cap):

1) the shoreside salmon program (SSIP) is based on landing reports (near 100 percent coverage and near real-time access). These are filed with NMFS and the onboard observer program;
2) rolling hotspot closures are based on the conditions of the contracts and VMS data; and
3) IPAs from offshore platforms can use observer data to estimate discards and are enforced through VMS.

The boats are given a program to upload data, which are then transmitted to NOAA within 15 minutes (in near real-time). A benefit of this rapid-access system is that fisheries managers can view bycatch data as soon as they are entered into the system, a particular benefit for hard-cap systems. NOAA can also send out closure notices (rolling closure, fixed closure, etc.) through this program. The small fleet receives this information via email. The larger fleets use a website application, where information on common bycatch numbers is available to all participants in the fishery.

VMS data is more difficult to obtain. Enforcement is via a private, third party agreement.

Janell Majewski, NOAA
Northwest Fisheries Science Center E-observer Programs

Ms. Majewski urged that when we consider creating a real-time data entry system, a good starting point is to look at the current system and improve its efficiency. In the at-sea hake fishery and the West Coast groundfish fishery, paper logbooks and forms are the primary tools for recording observer data. Therefore, efficiencies should be sought in the paper logbook system first.

Currently, the at-sea hake fishery observers are required to fill out paper data forms. Data are then entered into the computer-based Norpac system. Data are entered every 12 hours and are available to the industry almost immediately. Similarly, in the West Coast groundfish fishery, onboard observers fill out paper forms while at sea. The data are then entered into the web-based WCGOP database by observers after each trip.

There are substantial implantation costs for implementing near real-time data technologies, like video monitoring. However, NWFSC is looking at the following IFQ projects with additional funding:
1) Improving the efficiency of the catch share program,
2) Designing a web-based portal for observer data access (to benefit industry),
3) Facilitating fixed gear logbooks or an e-logbook for trawlers, and
4) Investigating alternative technologies.

NWFSC's near-term priorities are:

1) Implementing draft summary IFQ trip receipts. Observers will enter fishing data onboard. When the boat docks, the observers will send the data to NMFS. NMFS will send it back to print on the dock. This receipt will include catch data and halibut mortality estimates.
2) Ensure the collection of required variables (catch up on data, electronically)
3) Plan for other variables, since the catch shares fleet is dynamic. These could include the reduction of Pacific halibut mortality or gear modifications.
4) Update publically-available data.
5) Fishery data:
    a. Fishermen: individual access that is flexible and easy to use
    b. Managers: easier access to observer data
    c. Public: access to aggregated observer data

Heather Mann, Seafood Consumer Center
North American Fish Trax

North American Fish Trax is an information sharing and knowledge creation system that was originally created conceived of by a West Coast fisherman. This tool, which grew out of Project CROOS (Collaborative Research on Oregon Ocean Salmon), can be applied to many different audiences.

Project CROOS objectives include determining patterns of "weak" salmon stocks in virtual real-time and allowing fishermen to collect data and enter them into digital logbooks. It looks at economic performance and essentially allows industry more control over their future.

Fishermen can enter information into data loggers at sea (or on forms). The data are analyzed on shore within one to two weeks. This tool is useful for industry, and for marketing in particular. One piece of data can be used in many ways and in different applications. For instance, it can be used by consumers and managers to track seafood products, by individual fishermen to plan future fishing trips, in science portals, and by fisheries managers.

Fish Trax is a secure and neutral holder of data. Stakeholders decide what data to share and who can use them. The Fish Trax program has been used for tracking salmon catches, albacore tuna, and more recently, West Coast groundfish.

Matt Merrifield, The Nature Conservancy
E-catch: Technology for Collaborative Fisheries Management

The eCatch program is a secure, web-based application that aggregates fisheries information for visualizing, reporting, and/or mapping. Users can share information with other members as part of cooperative agreements.

The Nature Conservancy (TNC) leases permits to fishermen and operates as a cooperative, similar to an IFQ system. Developed in 2007 in response to NMFS's requirement for biweekly reports from TNC's cooperative fishing permits, eCatch digitizes paper records, monitors geographic constraints, monitors the capture of depleted species and progress towards collective catch limits, and tracks costs and revenues for each permit. ECatch collects data, generates quota-tracking reports, and maps and exposes the information to the entire group (co-op members) for collaboration. Its output includes fine-scale spatial information.

The core functions of the eCatch program are:

1) The application is organized around a trip and the associated landing receipts.
2) The observer's quick-sheet is filled out at the end of a trip and informs the administrator about discards.
3) The program allows for graphic reporting and tables based on Google maps that can pinpoint species and allow for queries.

Fishermen who participate in eCatch still own and control their own data, while TNC acts as an administrator and protects individual privacy through a secure system that is similar to bank log-ins.

Mr. Merrifield projects that eCatch will soon be available for use on a tablet (by summer 2011). This will be an e-logbook system, developed in HTML 5. The application will also be able to pinpoint weak stock hot spots in time and space.

The problem with current fisheries data systems is still that there are no data standards, so integration with third parties (like Fish Trax and eCatch) and federal or state agencies is difficult and/or time consuming. Merrifield called for the development of data standards and integration.

Howard McElderry, Archipelago Marine Research Ltd.
Use of Camera Systems to Collect Fishery

Archipelago representative Howard McElderry, introduced onboard video surveillance as a cost-effective method to monitor West Coast fisheries.

McElderry discussed several advantages to onboard video surveillance technology. First, the technology is not limited by vessel size. The cameras can also be turned on automatically, so monitoring is less impacted by irregular fishing schedules (as opposed to onboard observers), and the technology allows for 24/7 data collection. Additionally, the technology is less costly than a human onboard observer, and labor input is adjustable. Despite these advantages, there are several challenges to implementing the technology. First, the video surveillance system is not tamper proof, and technology can fail. Second, incorporating video surveillance across the industry requires industry engagement and incentives. Finally, video surveillance technology has complex infrastructure requirements, which could be difficult to meet unless fisheries technology becomes more advanced in the future.

In summary, onboard video surveillance is a proven and reliable tool for real-time onboard monitoring of commercial fishing vessels. The cost of the technology should continue to decline, and the technology will likely become more integrated with other systems in the near future.

SUMMARIES OF PANEL DISCUSSIONS

In order to solicit expertise and encourage discussion on a range of issues critical to eFIS development, a series of panel discussions was held on the afternoon of the first day of the workshop. Summaries and outcomes follow.

Panel 1: Management Requirements for eFIS – What will NOAA Require? What will the States Require? What Makes Sense?

Moderator: Terry Smith, NOAA

In some cases, use of electronic information collection will be driven by regulatory requirements. What might those requirements be at the federal and state level? What existing requirements would be easier to meet using electronic systems? Panelists were asked to consider the following questions:

- *What is each agency requiring now with respect to electronic systems (for all fisheries)?*
- *What does each agency expect to be requiring a year from now? Five-10 years from now?*
- *How are current and future systems to be integrated?*

- *What types of information need to be real time or near real time?*
- *What are the major challenges in implementing these systems for the fisheries you manage? Cost? Collaboration with industry? Interoperability?*

Frank Lockhart, Northwest Region NMFS, NOAA

Frank Lockhart of NMFS reminded the group that from a federal perspective, monitoring data required by NOAA is mandated by three laws: the Magnuson-Stevens Act, the Marine Mammal Protection Act, and the Endangered Species Act. Three levels of monitoring must be carried out: in-season monitoring to track catch limits, annual monitoring that feeds into stock assessments, and longer time scale data collection to support ecosystem-based monitoring and basic science. This discussion focuses mostly on in-season monitoring, for which NMFS simply needs to know what was caught, what was killed by fishing activity, and sometimes, where it was caught and/or landed. In this data collection system, electronic systems would be replacing human observers with a camera. While Lockhart, and NOAA in general, is interested in exploring the utility of eFIS further, he urged the group not to ignore the functions of observers that cannot be easily replaced by cameras, such as judgment, adaptability, memory, and even the ability to turn over a fish to examine it more closely. The cost of eFIS is also an important issue. It will be important to take into consideration what the federal agencies, states, and industry needs in order to design systems that provide the relevant capabilities, and to make decisions about who bears the costs.

Caren Braby, ODFW

Caren Braby of ODFW explained that her agency is charged with conservation but also with providing access to resources, a dual mission that drives much of their data collection. She emphasized that development of electronic systems must bring efficiencies to management but also to industry, who will be actually collecting the data and will have to interact with these systems. Industry needs to think about what's important to them, and what costs are acceptable, the ideal example being the Bering Sea talk presented earlier by John Gruver. Currently ODFW is working on an electronic fish ticket system as part of the new ITQ management system. Any new electronic systems must address efficiencies; for industry this might mean finding ways to increase efficiencies in the logbook system. The challenges are money and time to develop these systems, which are in short supply for federal and state regulators and industry. We all need to think clearly about what we need and develop the best, low-cost, fastest, simplest solutions we can.

Corey Niles, WDFW

Corey Niles of the WDFW groundfish program explained that under the IFQ system his agency has been working on being able to accept electronic submissions using the system Dave Colpo of Pacific States described earlier. Their remaining technical issues are almost resolved and they are hoping to be able to accept electronic fish ticket submissions by the time the whiting fishery opens in June. It has been suggested that this system be expanded beyond the groundfish IFQ fisheries since fish tickets and many of the buyers are the same for other fisheries (crab, sardine) as for groundfish. He believes the agency will move that way slowly, as managers see a lot of efficiencies in such a system. Currently, there can be as much as a 30-60 day delay in the fish

ticket system. While electronic logbooks are not currently mandated, the agency could move in that direction, as they are being asked frequently about acceptance of electronic logbooks, sparked by the development of The Nature Conservancy's e-catch system. Integrating systems may be a challenge, but Niles believes that the technical issues seem easier to address than the substantial logistical and administrative issues that accompany these systems. The requirement for RT or NRT data depends on the specific issue or fishery; there is more need for RT/NRT data if the fishery requires in-season adjustments. WDFW's groundfish program has very stringent monitoring requirements and will need to count every pound for the foreseeable future. Challenges to developing eFIS include personnel, time, and funding.

Question and Answer

Question for Frank Lockhart: Given that the Council is concerned about the small vessel fleet, why resist electronic monitoring when human observers represent such a substantial cost to the small vessel fleet, and might even put the small boat owners out of business?

Response: Negotiations are underway with Congress and those in the CFAs and risk pools about reducing or sharing the costs of observers, and all options for reducing costs have not yet been explored. The small communities are not likely to go out of business in the short term. Mr. Lockhart reiterated that it is unwise to rush into electronic systems – they need to be developed carefully and designed for efficiency and affordability.

Question for Frank Lockhart: With respect to your comment about electronic systems replacing only "the eyes" of human observers, can you give us a concrete list of the other aspects of human observers that electronic systems would have to replicate in order to be most effective?

Response: While there is no checklist of such traits, a larger discussion should begin with the things mentioned during my presentation. We want a very accurate accounting of what species come onto a boat and which are dead. The example given earlier of yelloweye rockfish is appropriate: the quota of 0.6 mt of yelloweye for the entire coast-wide fleet for one year is not a lot of fish – how do you do monitor carefully enough to measure that catch? E-systems need to be designed to be able to carry out tasks like that, with that fine level of specificity.

Question for the Panel: On the issue of cost, the Canadian system explored this morning considered cost recovery from the start. Canadian boats could not afford to fund trained scientists on every platform, but if you can afford that system it probably is the best approach. Overall, it's important for the agencies to look at the big picture and the needs that could be addressed using electronic systems. These systems are not necessarily a "plug and play" replacement for human observers.

Panel Response: Agreed. Given the bottom lines for all of us – the states need information for tax collection purposes, the federal government needs data to comply with the Magnuson Act – what type of systems do we need and what is the best way to get to our goals? For some fisheries electronic monitoring might be very cost effective, such as for long line or fixed gear fisheries. In other cases, such as when considering bycatch in the groundfish fishery, where very small quantities need to be tracked, it would be harder to get away from need for observers.

Comment: We also need to consider how to incentivize the whole process, as traditional agency approaches to such issues might not work in this case.

Panel 2: Challenges and Benefits to the Industry
Moderator: Nancy Fitzpatrick, Oregon Salmon Commission/Oregon Albacore Commission

While electronic systems present some clear benefits to the industry, they might impose burdens as well. What is the industry's perspective on these systems? Panelists were asked to consider the following questions:

- *What are the potential challenges and benefits to the industry of implementing electronic information systems? In addressing this question consider impacts on industry income and profits, conservation, marketing, bycatch monitoring, privacy, and other issues.*
- *Are there specific systems you would like to see developed?*
- *What role should industry play in developing these systems relative to the management or science community?*

Rod Moore, West Coast Seafood Processors Association

Rod Moore began by reminding the group that the more data you have the better off you are. More data and faster and cheaper data collection are important goals, but these systems must be developed carefully while weighing short and long term costs. The needs and procedures of the users must be kept in mind; to do so, eFIS must be developed in cooperation with the users (fishermen and processors) and not dictated by one agency or entity. Costs, benefits, and user acceptance must all be weighed before committing resources. For example, state-of-the-art wireless systems might seem beneficial, but not if users are still on dial-up modems or landline telephones. The electronic fish ticket system presented by Dave Colpo is a perfect case study, where the system is not as simple as it might seem. The concept is a good one: design and implement an electronic system for fish tickets to operate within the groundfish IFQ system that can quickly and easily capture the necessary data, provide additional monitoring capability, and ease the way for electronic fish tickets in all three states. In theory, the system would mesh easily with federal and state systems. In practice, each state has different fish ticket requirements. Landings often occur at odd hours and remote locations, some of which do not have IT capabilities. This "top-down" design does not work with all of the industry's operational requirements. Some solutions are being discussed now, including acknowledging that some paper systems may need to be maintained to cover those odd times and locations of landings. We must recognize that we have to work more closely with all users as systems are refined. In the end, we're all interested in the same thing – good data.

Pete Leipzig, Fishermen's Marketing Association

Pete Leipzig said that while the IFQ program is too new to draw too many conclusions, a few lessons can be learned from it with respect to implementing electronic systems. The costs of observers in the IFQ program could be astronomical (one quote estimated that an on-demand

observer could cost as much as $100,000 per year per boat for boats that bring in an average of $220,000 per year). This proportion is high enough to eliminate profits altogether unless boats share observers to minimize costs. But sharing can also be problematic, as some boats may have to stay tied up if their observer is not available. Perhaps the best way to minimize these costs is by using cameras, a proven technology that will continue to evolve. Pete's organization will initiate a pilot project this summer to test the efficacy and accuracy of back deck cameras vs. human observers on trawlers to provide some data to inform this issue. The challenge will be developing sampling protocols for camera-based data collection and algorithms for identifying anomalous incidents in the footage so a person doesn't have to watch all of the resulting camera footage.

David Jincks, Midwater Trawlers Cooperative

David Jincks suggested that the shoreside whiting system is not an ideal example of the use of eFIS because that fishery was a problematic, overcapitalized derby fishery that was marked by incidents where cameras were turned off and other violations were committed. Today's rationalized fisheries are solving or addressing many of these problems. The IFQ system, for example, has changed the dynamics of the groundfish fishery significantly. While it will be a challenge to replace the many functions of human observers, these challenges can be surmounted. Efforts to implement these systems must be undertaken jointly (by states, feds, and the industry), and must take into consideration the types of information that are needed by different users (NMFS may not be interested in some types of data that are crucial to the industry, for example). Mr. Jincks concluded that he encourages the continued use and study of electronic systems.

Jeff Feldner, Oregon Sea Grant/Fisherman

Jeff Feldner suggested that eFIS can be used not only to collect monitoring data, but also to provide data back to the operator to assist in issues such as bycatch and quota monitoring. These RT data can increase efficiencies in the industry as well. For example, oceanographic data provided to a boat in real time can inform decisions about where to fish, saving fuel costs and increasing catch. The obvious beneficial outcome of this type of data collection will be better management. Precautionary management is now required, but verifiable knowledge about stocks might reduce the precautionary margin. These data can also be used for marketing purposes, as the CROOS project does. Many challenges will need to be addressed, chief among them management questions and allocation consequences. Fishermen are often hesitant to come together to share information even when it's to their benefit. Information sharing could lead to loss of competitive advantage. Cost, and who bears it, is also a significant issue.

Questions and Answers

Question for Pete Leipzig: In your feasibility study this summer, how will halibut viability be addressed? How will the observer sample halibut without accruing more mortality to your boat?

Response: This is an important question that has been discussed at length. Halibut will not be retained, and observers will proceed as usual in recording halibut viability as the camera's

operation will not interfere with the observer's activities during the trials. It remains to be seen whether the camera can capture halibut status.

Comment: Recording halibut viability might be one observer function that will be a particular challenge to replicate.

Response: The prohibition on retention of halibut in that fishery does not make much sense, given that the size of the fish captured in the trawl fishery is larger than the fish caught by hook and line. Juvenile mortalities are not a problem in this fishery the way they were many years ago in the Bering Sea.

Panel Question: What is the best way for a captain to get information about progress toward quotas of protected species like canary and yelloweye rockfish? How does a captain know where he stands on his quota?

Response: This system is not always straightforward. For halibut in the trawl IFQ fishery, data are recorded and reported when observer gets to shore. Raw data can be given to skipper at the time of landing but the total halibut mortality has yet to appear anywhere publicly. Skippers can get the info from NMFS. The question is how best to get that information out of the system to use in decision-making. Under the new IQ program, those fish that had formerly been discarded (canary, yelloweye) are being landed and sampled by shoreside monitors. That information is then provided to the skippers and it is their obligation to keep track of it themselves. It would be a mistake for them not to, and to rely on NMFS data alone. If you're on a quota system, you'll want to know how close you are.

Comment: We need to be very careful moving forward as fisheries are changing dramatically. For example, the whiting fishery will be radically different this year. Retention rate in the trawl fishery is 98%, a standard met by few fisheries worldwide. We need to keep this new system and regime in mind as we move forward, and not design systems for last year's or last decade's fisheries.

Panel 3: Legal and privacy issues
Moderator: Gil Sylvia, COMES/OSU

One of the biggest issues for industry with respect to eFIS development is how privacy of individual fishermen and companies will be protected. What is the legal landscape with respect to privacy? What laws and ethical considerations will need to be consulted? What are the industry's concerns? Panelists were asked to respond to the following questions:

- *What is the relevant and current federal-level legal landscape with respect to privacy that we need to be aware of as we develop these systems?*
- *What are the fisheries-specific legal and privacy issues we need to be aware of?*
- *What obstacles have already been encountered with respect to privacy?*
- *What are the industry's main concerns with respect to privacy?*
- *What are the "best" approaches for addressing legal/privacy issues?*

Dan Steinberg, Booz Allen Hamilton

Dan Steinberg explained that challenges in development of eFIS are predominately issues of *security* rather than *privacy*, and he discussed the differences between these two linked issues. It is not necessarily helpful to think of privacy as a subset of security; privacy is broader than that and encompasses different concerns than security. The Fair Information Practices published by the U.S. Department of Health, Education, and Welfare in 1981 outlined a number of critical concepts, including an individual's rights of **notice** (record-keeping cannot be completely secret; with some exceptions you should know who is holding your information and why, **access** (you should always have access to your own information), **choice** (with some exceptions you should have a choice as to what is done with your information), **redress** (you should be able correct inaccurate information and have a mechanism to address problems that arise if the information is wrong), and **security** (your information has to be protected from inappropriate use and disclosure). Security and privacy are two interlinking disciplines that have areas of unique interest. Privacy relates to information only about the individual, while security relates to all kinds of information. The two disciplines share an important area of intersection: protecting information about the individual from inappropriate use and disclosure. Most important for eFIS is the issue of intellectual property, and in particular, trade secrets. For eFIS development, it seems that questions of privacy are pretty clear: we basically know what we want to collect, by whom, and why. However, there are outstanding challenges surrounding security. Security is not an issue that is addressed for any given project once. Rather, a risk management framework is fundamental to any good security process which involves testing the new system, monitoring it after public release, and making adjustments as necessary. While there is a tendency to think that security is a technology issue, the most critical part of security system development is to create policies and procedures to document everything that is relevant to the security program and then to implement thorough training and awareness programs.

Mariam McCall, National Marine Fisheries Service

Mariam McCall deals with legal and confidentiality issues pursuant to the Magnuson Act, Section 402(b) in particular. The federal law that addresses that section of the Act is out of date; it does not incorporate changes made in either the 1996 or 2002 amendments to the Magnuson Act (although new regulations are expected soon). The principle rule that governs data release and confidentiality states that "All information that is submitted to the Secretary, a state fishery management agency, or a marine fisheries commission by any person in compliance with the requirements of this act shall be confidential." Each word or phrase of this rule has specific meaning which must be interpreted by lawyers, and there are exemptions from the law. NMFS takes confidentiality very seriously, and will not release information unless it is very clear that an exemption is required, or under a court order. New regulations will soon address the agency's proposal for application of another provision "Information can be disclosed when such information is required to be submitted to the Secretary for any determination under a limited access program." Congress has also clarified another outstanding issue: observer data is also considered confidential, and will not be disclosed (with some exception). One important aspect of this rule is that the definition of "observer information" does include information collected by electronic systems. Data not specifically considered confidential under the Magnuson Act are not

necessarily released either. Other guidance arises from the Privacy Act and the Trade Secrets Act, and in particular the FOIA exemption for commercial business information. Information must not be released if it puts the subject at a "substantial competitive disadvantage."

Laura Anderson, FishCred & Local Ocean Seafoods

Laura Anderson explained that FishCred was formed to be a conduit for dealing with data requests to the fishing industry and to consider the risks and benefits of releasing data. The genesis of FishCred was a project in which Oregon fishermen collaborated with EcoTrust to develop maps aggregated across fisheries of perceived economic value of areas within the Territorial Sea. The organization is now involved in a project with ODFW using logbook data for marine spatial planning projects. While it has been stated that the status of the ocean as a public resource means that data collected there by the fishing industry should be released to the public, the issue is not that simple. Harvest turns a public resource into a private good, and information is needed to allow individual fishermen to make that transition. That information is gained over a lifetime of experience and trial and error, and shared within the industry with networks based on trust and respect. The industry is considering the question of whether even aggregate data should be considered confidential and therefore exempt from public records laws. Trade secrets have three components: the information is generally not known to the public, it confers economic benefit to the holders, and the holders maintain an effort to keep the information secret. Based on these criteria, an argument could be made for fisheries data to be considered trade secrets. The industry has four main concerns about data disclosure: use of data by the competition, attracting fishing effort from other areas, use of the data to hurt the industry (e.g., use of the data by environmental interests to argue for closure of certain areas), and potential misuse of information. Questions to be asked about data sharing include who has access to the data, what experience do they have in using confidential data responsibly, what spatial and temporal resolution is needed, how long is the data needed for, and what will be done with it? Maybe all of these concerns could be addressed in a code of responsibility or a confidentiality agreement, which would be a good next step.

Question and Answer

Question for Mariam McCall: How do you define the confidentiality of various levels of detail or aggregation of data? At what level of detail or aggregation does confidentiality kick in? At what point can we allow the public to have access to the data, at what level of aggregation?

Response: It depends. The facts of each situation will help determine whether the data can be released. Aggregation of data can mean the data can be released, but do those data constitute a trade secret? This is an interesting question. Overall this is not a settled issue, and there is no case law on this topic. For most fisheries NOAA supports withholding specific location information, but DOC disagrees. This is an issue NMFS will have to grapple with for some fisheries.

Question for Mariam McCall: If one fisherman agrees to release his information, can it be released?

Response: Yes, it can be released if one person agrees or everyone agrees. It is important to ensure that the person releasing the information is the actual owner of the information.

Panel Question: Is there anything different, in a legal sense, about electronic systems or RT systems compared to the old data collection systems?

Response: One difference in moving from paper to electronic systems will be that for federally maintained systems, systems of record notices will have to be updated, as mandated by the Privacy Act. Any time information will be retrieved using an identifier of an individual from a federally-owned system, a Privacy Act notice is required, and it needs to be announced in the Federal Register. Security concerns for electronic systems are different too – what used to be very difficult to carry out of a building is now very easy (via tiny flash drives, etc.). In moving to electronic systems, some things will be easier and some more complex. Well-constructed security systems are no less risky than paper systems.

Question for Mariam McCall: Has there been any guidance or case law on use of data from electronic systems or cameras that might have captured the execution of potential crimes unrelated to fishing (e.g., one fisherman hurting another)?

Response: This kind of information could be required to be released via court order. This type of issue could arise for observers, and the same would apply to video; newspapers or litigants could request this information as well. We don't look at the reason a requester wants a particular piece of information or whether it's for a good or bad use, we just look at the legality of releasing the requested information.

Question for Laura Anderson: You mentioned that even aggregated data could be viewed as a trade secret which could provide an unfair competitive advantage. But where is the balance between protecting the confidentiality and rewarding the individual fisherman who collected the data and the need for the data to be released to benefit the industry as a whole by decreasing bycatch and increasing efficiency.

Response: The industry has always understood that their data would be used internally by agencies to better manage the fishery. There was never a notion that data would be released into a publicly available database. Industry needs to look at the legitimacy of uses of the data for better fishery management, territorial sea planning purposes, and academic research, and determine appropriate confidentiality guidelines. Other than for general education, the value of releasing all of the industry's data to the general public is questionable. FishCred *does* evaluate good versus bad requests.

Question for Laura Anderson: On the issue of trade secrets: should logbook data, in an aggregated format that can protect confidentiality, be released for use by public processes (territorial sea planning, etc.)? If those data are going to influence a public process, such as improving fisheries management, shouldn't they be part of the public record?

Response: The more publicly available the data will be, the more dilute they will be when we release them. We're reluctant to release fishery-specific data; rather, right now we release

economically aggregated data. For some uses we may use a grid system for releasing data and get down to more detail. For a process such as territorial sea planning, planners and managers can use the data presented to them in a meeting and make decisions without walking out of the room with copies of the data. A non-disclosure agreement could be developed so that high resolution data could be used by managers and other professionals without releasing them to the public.

Panel Question: Could there be two levels of data specificity depending on the group requesting its use?

Response: There is a process like this for the use of medical records. For example, a medical researcher conducting research can review specific data and even look at individual patients' records, including their health care histories, in order to form a hypothesis without carrying that information out of the room.

Panel 4: Technical Issues and Interoperability
Moderator: John Lavrakas, Advanced Research Corp.

Some of the challenges to development of these electronic systems will be technical in nature. What is possible now, and what will be possible, technologically speaking, in a few years? What are the obstacles to interoperability? Panelists were asked to consider the following questions:

- *What are the current technological limitations on electronic systems?*
- *Tell us about your background and area of expertise in the technical side of e-fishery information systems.*
- *What is your sense of the state of the art in eFIS technology?*
- *What are the current challenges in interoperability of systems and what steps can and should we take to overcome these obstacles?*
- *What will be possible in 5-10 years that isn't possible today?*
- *What are the challenges of transitioning from "legacy" systems to new systems?*
- *What design elements are the most and least cost-effective?*
- *How is data security ensured?*
- *What is needed to make forward progress in this industry?*

Panelists: Wil Black, Advanced Research Corp.
Charles Steinback, EcoTrust
Rick Busch, Finsight AK

Joint Panel Response

Moderator John Lavrakas asked the panelists to start off by discussing some of the issues they've encountered in development of eFIS that might have broad implications for further eFIS development or the industry's use of these systems. All panelists agreed that the highest hurdles to jump in eFIS development are not technical in nature, but organizational or administrative issues, including questions of privacy (whose data is it, once it's collected? Who has the right to say what data can be used for?) and of determining what a given system actually requires. What

problem is it being designed to solve? Clients do not always know what they want, and there is no easy way to solve that problem. It is also difficult to get users to adapt to using new technologies, and communications between technical personnel and fishermen can be difficult. It is critical to really understand the problem you are being asked to solve, perhaps by experiencing the fishery or processing plant first-hand through hands-on site visits. One solution is to ensure that the technology providers are partnering with the industry early in the process of system development. This partnership can encourage buy-in and participation from the inception of a project. As fisheries management changes and becomes more complex, the tools developed to assist management must reflect these changes.

The moderator asked the group to consider the question of interoperability: how many of the systems described earlier in the day are interoperable? Have you designed systems for interoperability, and what steps can we take to achieve interoperability? Panelists agreed that rather than developing a single integrated system, which has been the recent approach and not terribly successful, it would be more beneficial to develop standards for data collection and a simple database, and allow industry and other practitioners to communicate with that central storage system.

With respect to the future of eFIS, use of cloud computing and a wider range of platforms (tablets, phones) will likely be more common. Video monitoring will continue to improve to the point where camera systems can be used to count and measure fish, and perhaps even identify species. Data collection will be able to be used for broader types of decision-making, and will be cheaper overall. It will be possible to collect data when a boat is "offline" at sea and then synch up once a boat is back within range (in answer to a question from the audience, it was stated that the eCatch system already works this way). Many advances will be incremental, and more related to people than technology, as various industry sectors and participants are "weaned" off of paper records.

Comment: Technology improvements are a never-ending story. The most significant cost in developing these systems is labor. If the database and data collection system is designed well, that is more important than the "skin" of the system (tablet vs. rugged PC vs. phone, etc.). Don't worry too much about this end of the technology; it's the database that needs to be robust.

The issue of security was discussed. Does the rapid evolution of technology mean that security is more of an issue than in the past? The panel stated that the most important aspect of security for these systems is password access (a delegable security model), but good policies and procedures (not just good technology) need to be put in place as well.

SUMMARIES OF BREAKOUT GROUP PROCEEDINGS

The centerpiece of the workshop's second day was discussions in smaller breakout groups. Four groups, randomly self-selected, were given the following guidance:

> ***Please address the following question: If West Coast fisheries are moving towards electronic real-time and near-real-time information systems, how do we ensure these systems bring value to industry, science, and management?***

Please present the fundamental components of your optimal, ideal, even visionary system, and explain how they:

- *Ensure standardization*
- *Protect privacy/security*
- *Benefit industry (provide incentives), management, and science by maximizing economic and social benefits and minimizing environmental impacts*
- *Can be implemented starting from where we are now*

You may want to consider existing systems in order to determine what fundamental existing conditions may need to be changed. Compare your system to the way things are done now.

How will you use incentives (carrots as well as sticks) to ensure success? Explain how benefits exceed costs and how your system would be paid for. Use specific fisheries to illustrate key components of your system.

WHAT ARE YOUR FOUR MOST IMPORTANT RECOMMENDATIONS FOR IMPLEMENTING YOUR SYSTEM? PLEASE BE SPECIFIC.

Major outcomes for each of those four groups are as follows.

Group 1: Rod Moore, Moderator

Discussion Points:

- Data needs fall into two categories: short term (latest quota tally, total mortality, total catch, logbook data to help avoid threatened species or to find target species in order to increase efficiency), and long-term (aging and other biological information, economic information, ocean conditions for future modeling, parameters helpful for stock assessment and science).

- VMS is ancillary to this discussion, a separate entity with very specific purposes, but it would be beneficial to be able to coordinate data collection and storage with VMS.

- Questions of data housing (where and by whom?) and access are critical to answer.

- Incentives for eFIS will be increased efficiency, increased market potential, the ability to fish longer and catch more, and the fact that the costs of the system tend to go down as more users are added. The basic "stick" is being prohibited from fishing, and the fact that management "buffers" may be reduced the better data you have.

- The question of who will pay for eFIS is central. In a rationalized fishery, industry groups can do this. In a dispersed fishery, perhaps access to eFIS could be on a subscription basis. There will have to be a discussion about what costs are payable by the industry and what costs should be borne by the taxpayers, given that they want to see a sustainable

fishery. Because this is what the public demands, the public has some responsibility to shoulder the associated costs.

- Who collects the money? A co-op or other organization could collect funds from its members, or could hire a contractor to collect (but this leads to issues of potential monopoly and profit motive).

Recommendations:

- A shift in thinking from "top-down" to "bottom-up" must occur such that these systems are designed and operated by industry, and government becomes one (of many) clients of industry in order to access the data. This approach will require development of agreed-upon rigorous standards, and possibly changes in state and/or federal law.

- Design a broad, open architecture system where users and data can be added as needed.

- Clearly articulate government versus industry responsibility for the cost, including long-term maintenance, of the system.

- Develop a system and protocols for determining access rights and security. These protocols must comply with state and federal laws.

Group 2: Maggie Sommer, Moderator

Discussion Points:

- The fishing industry is certainly moving towards eFIS (it is not a question of "if" but of "when"), but there will always be a need for paper record-keeping for a variety of contingencies (e.g., for those who can't or won't use e-reporting).

- The discussion of eFIS needs to account for five different data streams: VMS, observer data, logbooks, fish tickets, and scientific survey data.

- The industry is frustrated by the fact that one stream of data needs to be recorded multiple times and sent to different entities (for management, taxation purposes, etc.). They would like to be able to send it once and have the various entities take the information they want, in order to streamline the data collection and reporting process. For example, a lot of time is spent reconciling logbook and fish ticket data. How can those data streams be kept separate (or do they need to be?) yet easily reconcilable?

- There are two opposing viewpoints about construction of eFIS: emphasis on a centralized data system vs. development of a set of standards and multiple systems that comply with those standards.

- The question of costs should consider whether a "cost" is actually an investment. If an expense saves you time down the road it should be considered an investment.

- Development may not need to start from scratch: can we start by "borrowing" an existing system?

- State and federal agencies must come to agreement on what core data elements are required for fish tickets and logbooks.

- The best incentive for the industry to collect good data is to have the data sent back to them for their own use.

- Transparency and clarity for metadata is critical.

Recommendations:

- With respect to standards development, a well-documented public API (application protocol interface) is needed.

- Because data, data needs, and data collection requirements are variable, any database will need to be flexible as well.

- Use a web-based interface that includes a public way to access data to ensure ease of entering and retrieving data.

- A federated (where one entity provides user accounts) rather than a delegated security system is needed.

Group 3: John Lavrakas, Moderator

Discussion Points:

- Various system models were discussed, including the choice between a "Google model" in which users extract the information they want from the web and the "Amazon model," a "confederated" system in which many organizations are represented but one group manages the whole system. The latter model might work best in this case; a data clearinghouse would be established and managed by one entity but all groups would use the system according to a set of standards.

- With respect to security, the best is a "bank account model" in which the bank is the steward of an individual's money, and access is restricted to the right individual(s) accordingly.

- Standards are needed to guide data access but also data quality. A common vocabulary is also necessary.

- Development processes should leverage existing databases and build on systems we already have. New types of access and new platform functionality may need to be added.

- Security systems will need smart technology but also good policy, processes, training, and monitoring post-launch. Contingency plans are also critical.

- Benefits of these systems for industry include tracking catch totals vs. quotas, monitoring bycatch, and minimizing costs. The systems will also benefit science and management. But society needs to benefit from them as well. Legislators who appropriate funds need to understand fisheries issues, as does the public at large.

Recommendations:

- Assess what data is being collected by state, federal, and private organizations in order to identify data gaps and create effective feedback loops, then leverage existing assets to determine what needs to be developed.

- Create a standard framework on which specific applications can be built. This framework must define what data is collected, how it is collected, and allow for verification and process transparency.

- During the development process and at every level of the system, security must be a consideration with respect to which groups need and have access to each set or subset of data.

- Explicitly define the requirements and limitations of such systems as stewards of participants' data, such that each group retains sufficient control of their submitted data and has sufficient access to others' data, without directly managing database servers or claiming data ownership.

Group 4: Heather Mann and Suzanne Bauer, Moderators

Discussion Points:

- This group used a "story" approach to illuminate the fishing process in order to determine the industry's data and communications needs. When a trawler first leaves the dock, it has a list of target species and amounts, and it declares what it is targeting. During the trip the boat logs its catch, information that is provided to the processors and regulatory agencies. In some cases, fishermen will also communicate with each other during the trip, or with processors who might want to amend their initial orders.

- The group discussed the possibility of using electronic logbooks (possibly tied to Twitter) for marketing purposes.

- When the boat comes in, there are communications that take place as the fish are landed, including fish tickets. At some plants this step is done electronically and at some it is done using paper. A small mobile app might be useful here, but the software must be

well-designed and "boat-proof." Book-keeping might be streamlined if some of these data feeds could be merged.

- After landing, data can be used for traceability (e.g., Project CROOS), for developing name brands for marketing, analyzing quotas for individual boats and for the fleet, for in-season management, and later for stock assessment.

Recommendations:

- The Pacific States Marine Fisheries Commission should lead the process of convening stakeholders to identify and determine standards, which would then be adopted by the Pacific Fishery Management Council.

- Engage the fishing industry in this process by going to fishing communities, and by building a demonstration database to assist in engaging the industry.

- Provide clear data feed guidelines for the software engineers, who need to know where the data live, what data streams can be combined, and what the expectations are with respect to privacy and security.

WRAP-UP DISCUSSION POINTS

- The question of whether to proceed with eFIS by designing a centralized or a distributed system is difficult to address, and complete consensus has not yet emerged.

- Real-world system design is very difficult; there are issues of data sharing, politics, turf, control, and practical implementation that need to be surmounted. How can the culture of fisheries management be changed in order to advance this agenda? It may not be enough to identify the entity that will convene the stakeholders (suggested at the workshop by some to be Pacific States Marine Fisheries Commission); perhaps the "destination" needs to be known in order to recruit support for the issue.

- While it was suggested that laws need to change in order to facilitate eFIS development, it was also pointed out that we need to understand what to change the law *to* (this could be characterized as a "chicken and egg" problem). One suggestion is to simply have the law state that "the industry will provide the following pieces of data electronically," then let the industry determine how to comply. On the other hand, there are many advances toward eFIS that could be made with the law the way it is now, and the law can be changed to accommodate the new technologies later.

- One way to proceed is by using existing technologies as a starting point (such as FishTrax). This approach could show individuals what is possible, and help stimulate and alter people's sense of what is possible.

- Data sharing is really only an issue once data go into an agency's database. Before that point, data belong to the fishermen that collect them, and they can do whatever they want with them. A standard way of handling data will streamline this.

- If each agency that wants data would publish a data standard ("This is how we would like to see the data"), then the software industry would work on solutions to make their programs comply. Then industry would purchase these products as they realize the advantages these systems would confer. Then the states and other agencies would see the advantage to upgrading their own systems, on their own time line. This process amounts to a progressive implementation, or evolution. Trying to get all these pieces in place at once will probably not work. This process will result in cost-sharing as well, as the stakeholders will take on costs as they "buy in."

- There seem to be multiple approaches emerging. One is the "low-hanging fruit" approach where successful (existing) models are used to demonstrate the possibilities of these systems to other groups. Another approach is somehow bringing about fundamental change, perhaps by government offering to assume a large portion of the costs for industry to collect data to its standards. A third model posits that industry will drive the process, treating government as their client. Industry then owns the data, and they contract with government to provide them the data they require. In any case, if we can get the standards right (which may simply need to be *defined* by each stakeholder, rather than *the same* for all stakeholders), implementation can occur.

- While privacy and security don't seem to be prohibitive concerns, it is critical to get those pieces of the systems right.

- The question of access remains: public data need to be easily accessible, but how? The confidentiality of the individual certainly needs to be protected, but some data (such as stock assessment data) should be available.

- If security is too tight, people will often develop workarounds, thus defeating the purpose of the security system. The concept of security needs to also consider data integrity and availability.

- It is critical to work with stakeholder groups from the beginning in designing these systems, in order to bring value to all groups and therefore solicit buy-in.

- Currently, government seems to need more aggregated data, while the industry itself seems to need the greatest level of detail. This may change, as government wants more detailed data for activities such as marine spatial planning.

- A longer conversation on this topic with users, the states, and the federal government needs to take place. How can this group make that a more successful conversation? One way is that all participants at this workshop need to bring the importance of this issue "home" to their colleagues and constituents.

- The e-ticket system described by Dave Colpo provides some important lessons. First, the system needed to be designed quickly, for a specific purpose, under a hard deadline, and industry needed to be included in the process in order to meet the deadline. The IT industry will mobilize and use the best available technology if there is a hard deadline. Second, it is critical to continue to evaluate the effectiveness of these systems after they're implemented to determine how they are working. Third, after the system is designed additional functionality can be added by any stakeholders.

- One limitation to having Pacific States convene stakeholders for future conversations is defining who the stakeholders actually are. The answer to that depends in part on what data stream is being discussed. In addition, many "layers" of personnel at each agency will need to be involved, starting with the highest levels and working through the IT personnel. Conversations with the IT personnel may have been lacking in the past; they should be brought in earlier, but they need to be told by their bosses to participate.

- While we recognize that eFIS implementation will require a long process and many conversations, is it worth doing? The answer goes back to the question of costs vs. benefits. If the outcome will be "valuable enough," it is worth doing.

- Value will be recognized when the industry comes together and realizes that eFIS will provide benefit to them, via decreasing costs, increasing efficiency, and improving marketing. Pacific FishTrax is an example of this. Then eFIS will grow as people recognize the benefits that accrue from their use. Industry will use and expand these systems until they are prohibited by a government agency or regulation, and at that point further conversations will have to take place (which could include Pacific States serving in the role of convener).

- While this may be the scenario that develops, ideally industry will be collaborating with state and federal agencies from the beginning, and will simultaneously be pushing the agencies to accept these new ways of doing business. Project CROOS is a good example of this inclusiveness; ODFW was involved from the start.

- While industry is less constrained and more flexible (until they hit a regulatory or other wall), the reality is that fisheries and fisheries management will not change very quickly. They are too complex. The best approaches are those that invite all players to the table and try to anticipate the problems.

- The issue of funding for eFIS is important. If costs are the responsibility of industry, the resulting systems might be very different than if government shoulders the costs. Industry will design systems that best serve their needs. Perhaps it is best if industry and government share costs, which will motivate development of systems that are efficient and bring value to both parties.

- However, the more "evolutionary" approach discussed above would probably result in each sector paying for the aspects of the system that affect them directly.

- Once the report from this workshop is produced, it would be beneficial to make a report on its findings to the Council, and probably to other groups as well. Participants were asked to think about appropriate venues for such a presentation, and forward those ideas to coordinator Nancy Steinberg (nsteinberg@charter.net). Also, any feedback that comes from individuals' presentations to their own group about this issue should also be funneled to Nancy.

NATIONAL EFIS WORKSHOP
September 8-9, 2011
Seattle, WA

INTRODUCTION

For 21st century fisheries, real time (RT), and near real time (NRT) information is critical for success. Whether it is bycatch reduction, quota accounting, trip limit management, collaborative science, spatial monitoring, product tracking, or sustainable marketing, demand is growing for high resolution RT and NRT data. At the same time, rapidly improving software, hardware, sensor, and satellite technology are increasing the speed, reliability and capacity for storing, communicating, sharing, mapping, integrating, and analyzing data.

The transition to RT and NRT electronic fishery information systems (eFIS) poses exciting possibilities but also major questions. The overriding challenge is designing systems so they work to the advantage of science and management, individual fishing firms, and the broader seafood industry. A single unit of information may have significant value for a multitude of uses and users. But how do we manage and share that data so that it provides efficiency and value, distributes costs and benefits, improves data quality as well as quantity, while also protecting privacy? While some of the challenges are technical, many are financial, legal, and contractual.

To address these issues, a symposium and workshop on electronic fishery information systems was held in conjunction with the September 2011 American Fisheries Society annual meeting in Seattle. The one-day symposium featured more than twenty-five speakers discussing design and application of electronic logbooks and other electronic information systems in the United States and throughout the world. The first part of the symposium focused on the value of eFIS in the wake of the BP Gulf oil spill for addressing scientific and management questions. The afternoon section included speakers representing a variety of eFIS systems addressing specific technical, legal, management, and financial issues. The follow-up one-day interactive workshop brought together national and international expertise to review the lessons from the Symposium, highlight critical issues, and develop recommendations to improve the design and implementation of these systems.

SUMMARIES OF AFS SYMPOSIUM PRESENTATIONS

James Nance, National Marine Fisheries Service
The History, Development and Implementation of an Electronic Logbook Program in the Gulf of Mexico Penaeid Shrimp Fishery

The penaeid shrimp fishery in the Gulf of Mexico is one of the most valuable fisheries in the United States. Measures of the directed effort from this fishery are used to monitor the status of the shrimp stocks and to estimate bycatch of finfish and protected species. The Electronic Logbook (ELB) data collection program for the Gulf of Mexico offshore penaeid shrimp fishery began in FY2004 to provide better estimates of fishing effort. This program uses a GPS unit

connected to a small computer to periodically collect location data for a volunteer and randomly-selected sample of vessels. Activity at a given location is determined by analysis of vessel speed and relationship of a specific observation to observations surrounding it. Data are analyzed to calculate detected tows, which are summarized into detected trips. Trip data are matched with NMFS landing data to associate catch with effort. Approximately 500 vessels in the Gulf of Mexico have ELBs, and effort and bycatch estimates have greatly improved since the program's inception. This critical program is supported by the shrimp industry and has become a main and reliable source of scientifically sound data in support of fisheries management.

Benny Gallaway, LGL Ecological Research Associates
Estimation of the Magnitude and Distribution of Fishing Effort in the Gulf of Mexico Shrimp Fishery

Revised estimates of offshore fishing effort (nominal days fished) for the Gulf of Mexico penaeid shrimp trawl fishery were provided for the period of record, 1960 to 2009. The revised estimates are based on a pooled approach and take changes in the fishery, changes in data collection and management approaches, and advancements in technology into account. Within year, effort is estimated for three trimesters (January-April, May-August, September-December) and, within trimester, for four regions. Each region is subdivided into three depth zones (0-10 fathoms,>10 to 30 fathoms, > 30 fathoms). This approach requires data for 36 time/space cells as compared to 2,628 cells requiring data in the historical approach. Offshore effort levels were low in the 1960s (~ 118,000 nominal days fished) but increased to levels on the order of 200,000 nominal days fished by the late 1970s. Offshore effort remained high and relatively stable from this time through about 2002, but plummeted over the period 2003-2009.

Elizabeth Scott-Denton, National Marine Fisheries Service
Spatial Fishing Patterns Exhibited by Regional Shrimp Fishing Fleets in the Gulf of Mexico

At the beginning of the National Marine Fisheries Services' (NMFS) ELB Program for measuring fishing effort in the Gulf of Mexico penaeid shrimp fishery, a group of industry and NMFS scientists determined that fishing patterns could be characterized by dividing the fishery into nine regional fleets. ELB effort data from each fleet were summarized by percentage of total effort located in each of 12 spatial cells (4 regions by 3 depths) for each of three trimesters (January-April, May-August, September to December) for each year 2005-2010. The 36 time/space cells are the same as used by NMFS to determine total effort. Similarity analyses were used to evaluate differences in regional fishing patterns and consistency of the observed fishing patterns across years. With the exception of the Florida Panhandle fleet, and to a lesser extent Alabama, regional fleets were found to fish in very distinct and consistent patterns for the same seasons across years (percent similarities averaged 70-88%). In contrast, similarity across fleets was low, and tended to be lower the farther separated the two fleets were geographically.

Rick Hart, National Marine Fisheries Service
Geographic Delineation of Fishing Grounds for Brown, White, and Pink Shrimp in the Gulf of Mexico Based on Electronic Logbook and Landings Data

Species composition of the catch for each trip by an ELB vessel in the Gulf penaeid shrimp fishery can be estimated from the corresponding shrimp landings data. Beginning in 2007, we used these data to determine the distribution of tows from trips by vessels carrying ELB units where over 90% of the catch was restricted to only one of the three targeted species: brown shrimp *Farfantepenaeus aztecus*, white shrimp *Litopenaeus setiferus*, and pink shrimp *Farfantepenaeus duorarum*. Of the estimated 76.5 thousand nominal days fished in 2009**,** an estimated 36.3 thousand days were directed at brown shrimp, 24.6 thousand days were directed at white shrimp, and 3.3 thousand days were directed at pink shrimp. Our analysis confirms that brown shrimp occur from Alabama to the Texas-Mexico border (and beyond), and are taken mainly from about 10 fathoms to the continental shelf edge. White shrimp are taken mainly inside of the 10-fathom depth contour from Alabama to about Corpus Christi, Texas. The pink shrimp fishery is largely restricted to the Florida Gulf shelf, especially in the area north of the Florida Keys.

James Nance, National Marine Fisheries Service
The Royal Red Shrimp Fishery of the Gulf of Mexico

The royal red shrimp *Hymenopenaeus robustus* is targeted by a small commercial fishery operating on the continental slope of the Gulf of Mexico. Annual landings in this fishery have never exceeded 350,000 pounds of tails equivalents, and the maximum number of vessels participating in this fishery has never exceeded 26. Landings from 1960 to 2010 suggest alternating patterns of high (1970s, 1990s) and low (1980s, 2000s) landings exhibiting an overall trend of increase for the period of record. The highest peak (350,000 lbs) occurred in 2002. From 2007 to 2010, we used ELB data from vessels fishing for royal red shrimp to map the fishing grounds. These ELB-equipped vessels made 47 trips representing 40% (2010) to 75% (2009) of the total landings. The fishery is strongly associated with the 500-m (approximate) depth contour and is most intense in three areas of the eastern Gulf of Mexico. The northernmost fishing grounds occur from offshore the Mississippi River delta to just east of Perdido Bay, Florida. The next area occurs further south, bounded on the north by about 28.5° N and on the south by about 26.5° N. The southernmost fishing ground lies south of the Dry Tortugas.

Will Heyman, Texas A&M University
Planning for National Marine Sanctuaries in the Gulf of Mexico: Reducing User Conflicts Using Electronic Logbooks

The Flower Garden Banks National Marine Sanctuary (FGBNMS), one of only 13 national marine sanctuaries in the nation, contains some of the healthiest coral reefs in the world. To better meet its mission, the FGBNMS management plan is being revised, including provisions for boundary expansion. In developing this plan, the Sanctuary is cognizant of the multiple users of these areas (e.g., commercial and recreational fisheries). This study was designed to identify the overlap between those areas proposed for the inclusion in the Sanctuary and the existing penaeid shrimp fishery. Using GIS maps of the proposed expansions in Sanctuary boundaries and ELB data, the spatial overlap in shrimp trawling effort and the proposed Sanctuary boundaries are highlighted along with management alternatives that reduce user conflict.

Kyle McCain, Texas A&M University

Patterns of Shrimp Fishing Intensity in Relation to Offshore Oil and Gas Platforms and Artificial Reefs in the Gulf of Mexico

Algorithms have been developed for use with the Gulf ELB system to delineate actual trawling versus other activities. We used these data in conjunction with offshore platform and artificial reef location data to determine patterns of fishing intensity around these artificial reefs. Random samples were taken from the artificial reef and oil and gas platform files and the distribution of trawling around these sites was evaluated to determine zones of avoidance. We also defined areas of no trawling in areas where trawling intensity in adjacent areas was high. These areas suggest bottom obstructions, natural or artificial are likely present. ArcGIS was utilized in our study to conduct spatial analyses on the ELB data around the artificial reefs and the oil and gas platforms. Density analyses were combined with the known structural material of individual reefs in order to determine if spatial patterns of trawling effort differed by reef type.

Scott Raborn, LGL Ecological Research Associates
Using Electronic Logbook Data to Estimate the Impacts of the Deepwater Horizon Oil Spill on Shrimp Fishing Effort in the Gulf of Mexico

The BP Deepwater Horizon (DWH) oil spill began on 20 April 2010, discharging sufficient volumes of oil to result in closure of large areas of the federal waters of the Gulf of Mexico traditional penaeid shrimp fishing grounds. The closure boundaries changed frequently in the first two months (19 times in May and June), after which changes occurred at approximately weekly intervals from July to October. By November, the closure area had diminished to a relatively small area (2697 km^2) near the well site**.** We used NMFS' ELB and landings data in a Before-After/Control-Impact (BACI) design to estimate the effects of the closures on shrimp fishing effort for the shrimp fleets of the five Gulf states. Texas and Alabama fleets did not exhibit significant changes in effort attributable to the closures, but significant reductions in shrimp fishing effort were observed for the Florida (50%; 95% confidence limits= 17-20%), Mississippi (93%; 88-96%), and Louisiana (45%; 20-60%) fleets. Overall, the oil spill closures resulted in an approximate 65% (57-73%) reduction in penaeid shrimp effort during the second trimester of 2010, the period when large area closures were in effect.

John Cole, LGL Ecological Research Associates
Penaeid Shrimp Harvest in Inshore Mississippi Waters by Out-of-State and Local Fishers

One of the benefits of the Gulf penaeid ELB program is that state-specific information can be obtained from the overall dataset. A case in point is Mississippi, which suffered an 88% reduction in shrimp fishing effort attributable to the Deepwater Horizon blowout and oil spill. Even though Mississippi has the smallest coastline of any gulf state (3%), its fleet typically accounts for about 10% of the total offshore annual shrimp landings. ELB equipped vessels from 8 of the 9 fleet regions in the Gulf have recorded effort in Mississippi territorial seas. In these waters, vessels from Alabama (60.4% of the total effort), Mississippi (29.8%) and Louisiana and Florida (3.7%) are the largest users. Most return to home ports to land; 91.9% of the landings in Mississippi ports are made by Mississippi vessels. Mississippi vessels mainly fish in federal waters (73% of the total effort) and land their catch in three primary port regions, Mississippi (41.3%), Mobile, AL (29.6%) and Louisiana (25.1%). The traditional fishing

grounds of the Mississippi fleet were the hardest hit by oil spill-related closures of any of the gulf states.

Shinichi Kobara, Texas A&M University
A Description of Penaeid Shrimp Fishing Intensity Pattern for the Gulf of Mexico Continental Shelf

We used ELB data to determine fishing intensity for the Continental Shelf of the Gulf of Mexico. Kernel density technique as a spatial cluster analysis was conducted to estimate fishing hot spots. This technique identifies intensity of incidents hot spots. Fishing intensity is lower in the eastern Gulf as compared to the western Gulf. Within the western Gulf, highest levels of fishing intensity during the first six months of the year typically occur in nearshore areas less than 10 fathoms deep. Intensity remains high in nearshore areas during the last half of the year, but some deeper areas also show high levels of fishing intensity during this period. Low levels of fishing intensity appear characteristic for the annual reoccurring hypoxic area sited offshore western Louisiana.

William Gazey, Gazey Research
Effect of Shrimp Fishing Effort on Juvenile Red Snapper Bycatch in the Gulf of Mexico

The Gulf of Mexico Fishery Management Council's (GMFMC) stock assessment for red snapper *Lutjanus campechanus* includes the assumption that juvenile (ages 0 and 1) red snapper fishing mortality is directly related to penaeid shrimp fishing effort. Results of regression analyses of juvenile red snapper mortality on shrimp fishery effort estimated from ELB data in the western Gulf at depths between 10 and 30 fathoms suggest that this is a reasonable assumption. Reef Fish Amendment 27/14 of the GMFMC, implemented in February 2008, established a target juvenile red snapper mortality (effort) reduction goal of 74% less than the benchmark years of 2001-2003. In 2008, the effort reduction was 84% and, in 2009, the effort was 77%. Had the target reductions not been met, additional seasonal closures would have been imposed on the penaeid shrimp fishery. Evaluation of whether the effort/mortality reduction goal had been met would not have been possible without ELB data. In 2011, the target effort reduction will be reduced to 67% and eventually to 60% by 2032 when the stock will have been rebuilt.

Gil Sylvia, Oregon State University
Advancing Electronic Fishery Information Systems: The Third Revolution in Fishery Management

Two major institutional revolutions are impacting fisheries around the globe: sustainability and property rights. The sustainability revolution ensures that fisheries and supporting ecosystems are conserved so that future generations can access healthy fishery resources. The second revolution creates institutions in the form of economic incentives and privileges that are necessary for achieving sustainability. But a third less heralded fishery revolution is gaining importance and recognition for its role in supporting the first two revolutions – (near) real time information systems. Modern information technologies including hardware, software, and communication infrastructure are being designed and employed to collect, share and transform real time data into near real time knowledge vital for sustaining fisheries and improving

economic benefits. These electronic information systems include logbooks, fish tickets, observer and vessel monitoring systems, catch and quota reporting, research and monitoring, and market traceability. They are being employed by managers, industries, fleets, and fishermen to manage harvests and reduce bycatch and discards, track environmental conditions, improve stock assessments, coordinate fleet behavior, and increase market benefits. However, there are complex institutional, technological, and management challenges in developing and designing efficient systems. This paper summarized some of these challenges, provides three alternative approaches for designing integrated information systems, and highlighted their relative advantages. The paper concluded by discussing the changes needed in fishery policy and management to create incentives that foster a real time information revolution that maximizes benefits and supports sustainability.

Bob Stanley, Australian Fisheries Management Authority
Implementation of Electronic Fisher Logs: The Australian Perspective

Stanley provided an overview of electronic logbook projects in Australia, reflecting on issues that arose and lessons learned during all phases of design and implementation. In 2001 AFMA commenced the *Electronic Logbook Returns Project*, planned for completion in December 2002. Delivery of the e-Logbook project suffered from a lack of dedicated resources, inconsistent project leadership, poor industry uptake, a lack of incentives, and a regulatory framework that reflected paper-based business process. In 2007, AFMA went from a Statutory Authority to a Commission, with opportunities to better fund key in-house business initiatives and IT systems upgrades. A comprehensive re-examination of the agency's data needs was necessitated by the adoption of harvest strategies and the agency embracing more adaptive management. The new commission also embraced the concept that much of the business between the agency and fishers could be electronically based. April 2008 to March 2009 saw e-Logs progress rapidly through business analysis, use case articulation, systems development, and build and testing phases to an operational release. This allowed e-Logs to be AFMA's first client accessible electronic business application. In mid-2009 the capability was extended by the development and testing of additional fishing method based schemas as well as an email submission option in addition to the initial web based service. In the two years following the first operational release there has been implementation of revised firewall and security procedures, virtualization of in-house servers and release of other related client accessible electronic business functions. With the software offerings of vendors and the AFMA in-house systems having demonstrated robustness and reliability for two years, the challenge for 2011 is to improve and encourage fisher take up and use. The software that is currently available to fishers should be suitable for 85% of AFMA licensed operators. With an increase in demand from fishers, AFMA remains confident that software vendors will seek to include the remaining three fishing method options in their software offerings.

Ron Goruk, Department of Fisheries and Oceans Canada
Fisheries and Oceans Canada Electronic Reporting Initiatives

Fisheries and Oceans Canada (DFO) has been transmitting data from source, at sea, since 1998. In recent years the department has been exploring technology applications to enhance the speed, accuracy, and user-friendliness of this data capture approach. This work has led to the

development of the Pacific electronic logbook (E-Log) initiative that will significantly enhance the efficient and cost effective collection of catch reporting information for commercial, recreational and First Nations fisheries. E-Log has proven itself to be a highly efficient technology for reducing DFO data management and input costs. E-log reduces errors related to the re-input of data from fisher's paper logs and significantly improves data accessibility for the department (i.e., moving from data lags of up to months with paper logs, to real or near real time with E-log). DFO data entry costs for the department are avoided with E-log as the data entry is one time and by the client. Collectively these improvements have led to an improved ability to manage the fisheries E-log currently supports. Particularly, the department's ability to provide effective in-season management, including compliance and position reporting of vessels, has been significantly improved. Initial challenges related to E-log data transmission have been successfully overcome and E-log can now transmit data to any location using Iridium satellite modem, Orbcomm satellite modem, satellite telephone, cellular telephone, and USB internet devices. Transmission of comma-delimited text has been chosen as the most cost efficient method of data transfer, particularly when employing satellite modem technology. Initial security challenges around the transmission of personal fisher data have been overcome through the application of sophisticated encryption technology.

Amos Barkai, Olrac

Electronic Logbooks for the Commercial Fishing Industry: Is It Really Working and What Can be Learnt from International Experiences?

Two fundamental obstacles facing resource management within the fishing industry are the lack, or poor quality, of available data on fishing operations, and the mechanisms through which such data is recorded and transmitted. Current paper logbooks are inconsistent, often illegible, and cause significant delays in delivery. Fishing operations are dynamic by nature, and fish are an ever-moving resource. By the time data reaches the decision-makers on land, has been "cleaned up," verified, and manually typed up (often weeks/months later), they become less relevant to the operation happening at sea. In light of this, Olrac a South African company, set about developing an electronic data logging software solution specifically designed for the data collection, management, and reporting needs of commercial fisheries. The resultant software, Olfish, is capable of collecting, analyzing, plotting, mapping, reporting, tracing and transmitting all data related to fishing operations and totally eliminates the need for paper-logbooks. The Olfish components include an onboard version and a shore component, as well as a web-based data management hub. The methodology adopted by OLRAC in its eLog development process was to address several issues inherent in both the fishing industry and regulatory requirements. These included:

1. The fact that the software had to conform to national statutory regulations, whilst at the same time being able to meet distinct regional requirements.
2. Making the software flexible enough to adopt altered regulations in the light of experience gained during the implementation phases.
3. Overcoming resistance from the fisher community by bringing commercial value to users and not just regulatory functionality.
4. Overcoming the fact that many fishers lack computer experience.

5. Addressing the need for security and confidentiality of data on both sides of the eLog solution (client and server) and during transmission.
6. Educating and encouraging fishers to use eLog technology.

Since its initial development Olfish has undergone many changes and upgrades and rigorous testing worldwide and is currently operating on hundreds of vessels in Europe, Australia, New Zealand, the USA, Canada and Africa.

Pete Lawson, National Marine Fisheries Service
The Power of Data: Using Fine-Scale, near-Real-Time Information to Advance Fishery Science and Management

Starting in 2006 Pacific Northwest commercial ocean troll fisheries for Chinook salmon have been severely restricted or closed due to low abundance of Sacramento River and Klamath River fall Chinook. In 2005, anticipating the Klamath River fishery restrictions, a collaboration of fishermen, scientists, and seafood marketers initiated Project CROOS (Collaborative Research on Oregon Ocean Salmon) to explore the potential of genetic stock identification (GSI) to provide fisheries managers with better data to manage harvest. The object was to improve knowledge of Chinook salmon stock distributions in the hope of enabling fishermen to avoid weak stocks. Fishermen bar-coded each fish caught, recorded the location using geographic positioning system (GPS) devices, collected fin clips (for GSI) and scales (for aging), along with fish length and depth caught. Data were used to map changing distributions, by stock, throughout the fishery. In 2010, Oregon and California ocean fisheries were sampled weekly from May through September. Data were assembled in a central data base where they can be associated with supporting data sets including oceanographic data, satellite observations, and coded-wire tag data. Results can be used to examine patterns of distribution at regional (1000 km) to local (1km) scales. Applications include coast-wide fishery management, scientific investigations of salmon migratory behavior in relation to the dynamic ocean environment, and a resource for individual fishermen to track and understand their fishing operations. Through the Pacific Fish Trax website, www.pacificfishtrax.org, data base access, analysis, and mapping tools are being developed to serve a broad audience. The web site is designed to provide access tailored to the needs of specific user groups, and to be extended to accommodate new species, data types, and users. The ultimate goal is to develop a coast-wide data network with flexible tools to serve the full spectrum of needs and services supporting a variety of West Coast fisheries.

John Gruver, United Catcher Boats
Bycatch Reduction Agreements – Integrating Electronic Data with Fishing Practices in the Bering Sea Pollock Fishery

In 1999 the American Fisheries Act (AFA) rationalized the Bering Sea pollock fishery via a cooperative structure program. Utilizing formal agreements to manage fishing practices by the AFA vessels and cooperatives has resulted in the creation of several Intercooperative Agreements (ICAs), all of which require access to a reliable source of fishing data in order to accomplish their intent. While various ICAs have been written to monitor and manage both directed fishing and bycatch issues, the most complex ICAs are used to reduce Chinook and chum salmon bycatch. Due to the high variability of salmon encounters, in terms of both time

and area, the salmon bycatch ICAs require rapid data collection, analysis, and distribution to the fleet. These initial bycatch ICAs, also called a Rolling Hot Spot Agreement, have been employed voluntarily by the Bering Sea pollock fleet for reducing both Chinook and chum salmon bycatch. More recently, the North Pacific Management Council has initiated new Chinook salmon bycatch regulations that provide several hard cap options. One of those options allows vessels that elect to participate in an Incentive Plan Agreement (IPA), similar to an ICA, access to a higher hard cap provided the IPA provides incentives or penalties to keep bycatch low at all levels of encounter. For the incentives in an IPA to be effective, and for penalties to be enforced, the "data bar" has been set to a new height.

Karl Haflinger, Sea State
Using Federal Fisheries Data in Managing Private Fishery Cooperatives: Examples from the Alaska Pollock and Pacific Whiting Fisheries

Alaska pollock and Pacific whiting TACs have been allocated to sectors and in some cases to fishery cooperatives since 1999. Minimizing bycatch of salmon and rockfish is necessary to fully harvest these allocations, as in recent years councils have developed hard caps for Chinook salmon in Alaska and several overfished rockfish species in the Northwest. In both fisheries, observer and/or shoreside landings data are used in conjunction with VMS information to pinpoint areas of high bycatch and also to delineate in-season area closures to alleviate the effect of those hotspots. Development of closure areas and enforcement of fishing prohibitions (also using VMS data) is prescribed in cooperative contracts and carried out by coop managers and data managers who are granted access to the observer, landings, and VMS data by vessel owners. Authorization to use this confidential data is contained in contracts among coop members and has become a central feature of coop bycatch management in these fisheries.

Heather Mann, Community Seafood Initiative
North American Fish Trax

Contemporary demands on fishery managers and the private seafood industry require new approaches for supplying resource and product information. These demands are consistent with a future in which the real time stock and flow of information is shared among scientist, producer, and marketer to support sustainability, improve profitability, and build a community of common interest. An example of this future is ProjectCROOS (Collaborative Research on Oregon Ocean Salmon), an industry and science partnership designed to improve management of the West Coast salmon fishery. The project uses near real-time genetic, oceanographic, and fishery information to reduce harvests of weak salmon stocks and improve economic performance of the industry. A fundamental project feature is the use of barcodes to track harvested fish and related information. A website -- *PacificFishTrax.com* -- maps, analyzes, tracks, and communicates information for scientists, managers, fishermen, processors, retailers, consumers, and the public. This presentation discussed the structure of Project CROOS and the management of information using the PacificFishTrax website. Project findings including Chinook salmon stock composition, fleet behavior, catch and effort data, and stock migration patterns were presented. The role of real time information to improve salmon policy, management, fleet performance, and seafood marketing were discussed.

Matt Merrifield, The Nature Conservancy
Ecatch – Technology for Collaborative Fisheries Management

In Central California, The Nature Conservancy (TNC) has purchased and subsequently leased federal groundfish permits to fishermen. These leases are structured to test how specific changes to traditional groundfish harvest can improve economic and conservation performance of the local fleet, thereby benefiting local fishing communities who have witnessed declines in groundfish landings. In order to monitor these leases and efficiently report to NMFS, TNC collects information on fishing locations, amount, and species caught using its permits. To maintain these data and ensure their integrity and efficiency, TNC developed a web based application called eCatch that centralizes spatial and tabular information associated with fishing activity. By taking what was traditionally paper data and placing it on the web, participants in the fishery are able to gauge performance, identify spatial behaviors that can improve catch and minimize by-catch, and monitor regulatory limits on the fishery. This project demonstrates how co-management of a local fishery can be enhanced by technology and providing ready access to digital information.

Elizabeth Etrie, Northeast Sector Service Network
FishTrax, an Industry-Funded Electronic Reporting and Management System for Groundfish Sectors

FishTrax is a multifaceted tool designed specifically to simplify and satisfy the reporting requirements of New England Groundfish Sectors. Sectors are defined in the Northeast as a group of persons holding limited access vessel permits under the FMP through which the sector is formed, who have voluntarily entered into a contract and agree to certain fishing restrictions, consistent with goals and objectives of the FMP, for a specified period of time. FishTrax Onboard is a stand-alone application with GPS capabilities used on vessels to collect detailed catch information on a tow-by-tow or string-by-string basis to determine appropriate stock attribution. FishTrax Onboard is also designed to send various notifications and reports as required by the implementing regulations, including Vessel Trip Reports. FishTrax Dockside Monitoring (DSM) is comprised of two parts, the DSM Hub that relays communications from the vessels to third party dockside monitoring companies, and the DSM Handheld application, which runs on an Android-based smartphones and enables monitors to enter all weights for landed fish, digitally sign their reports, and transmit them accordingly. FishTrax Online and SMACTrax are used for sector quota management and "near real time" quota usage, as adjusted by trades, for members and managers. In varying capacities these tools are currently being utilized by eleven of the Northeast Fishery Sectors. The Northeast Groundfish Sector reporting system relies on multiple data streams generated by various entities. Designing a third party system such as this one requires a comprehensive understanding of data requirements, formatting, and dissemination strategies. However, in New England the development of the Sector management policy and the implementation of the various components necessary to meet these objectives occurred simultaneously instead of consecutively. Simultaneous development of fisheries management measures, and the tools needed to meet these measures, results in costly, duplicative, and inconsistent systems.

Adam Baukus, Gulf of Maine Research Institute

Implementation of Electronic Vessel Trip Reporting (eVTR) In the New England Groundfish Sectors

The Gulf of Maine Research Institute is currently testing the feasibility of adopting electronic solutions for vessel reporting requirements across a range of sector and common pool vessels in the northeast groundfish fleet. This initiative includes testing a range of electronic logbook products (FLDRS, Olfish DDL, and FishTrax) in conjunction with NMFS' web-based data entry system to identify obstacles to their use and compatibility with NMFS' data collection systems. To date, 32 captains have been provided with electronic equipment, software, training, and support under this project, and software providers have received support to modify and fine-tune their software to meet reporting needs. Review of the project to date indicates that electronic Vessel Trip Reporting (eVTR) is a plausible reporting method that may serve as a viable alternative to paper-based vessel reporting. At this time several challenges and limitations exist, including: cost of installation and maintenance of electronic logbooks; cost of adaptation and time before proficient reporting occurs from the fleet; and cost and reliability of ship to shore data transmission. This presentation described the attributes of each electronic logbook product, challenges of onboard installation, operation, and transmission, and thoughts for future application and development.

Kate Burns, Gulf of Maine Research Institute
The Feasibility and Benefits of a Real-time Information Tool to Support Fishing Selectivity in the New England Groundfish Industry

GMRI has undertaken a project to develop a spatial and temporal information tool to assist fishermen in developing bycatch avoidance strategies for critical stocks in the New England Groundfish management region. The project will enable fishermen to be selective about where and when they fish, to avoid bycatch hot spots, and to select target fishing areas by time, place, season, and oceanographic conditions. The tool will provide both historical and real time information on the distribution of key species that are to be targeted and avoided, likely including yellow tail flounder, cod, and spiny dogfish. Project implementation includes an analysis of how eVTR systems could assist the management and flow of information to the system. The scoping and development of suggested systems for interpreting oceanographic information is also required as is industry approval for access to observer data. Buy-in and engagement of industry is the most critical component of the project. Enhanced use of IT by industry may increase the potential of the tool and is a further consideration for the scoping process. Year one of project is due to be completed in September 2011, including completion of the scoping and feasibility process plus the development of a detailed specification and implementation plan for roll out in year two.

Riley Young Morse, Gulf of Maine Research Institute
Engineering Data Interoperability with Coastal Ocean Data Collection Systems

The ocean observing community has been moving toward a web service based architecture, using community-developed standards to integrate data from distributed sensors and sub-systems into centralized portals and decision-support tools for a variety of end users. For the last few years, the Ocean Data Products team at the Gulf of Maine Research Institute has worked on a

variety of initiatives at the regional and national level aimed at improving accessibility, discoverability, and interoperability of marine and environmental data. These efforts include the evaluation and adoption of community-developed metadata, schema, and web service standards to facilitate the exchange of data. The highlights of these efforts were reviewed along with a demonstration of several web-based applications that utilize web services to integrate real-time observation and modeling data. Lessons learned and potential opportunities for use of these data sources and standards in the development of applications for the fisheries community were explored.

N. David Bethoney, University of Massachusetts Dartmouth
An Information System to Avoid River Herring (*Alosa pseudoharengus, A. aestivalis*) Bycatch in the Northwest Atlantic

Managers of the Atlantic herring (*Clupea harengus*) and mackerel (*Scomber scombrus*) fisheries have added river herring (*Alosa pseudoharengus*, *Alosa aestivalis*) bycatch reduction as a management goal and are currently considering adding regulations to reduce or cap river herring bycatch. A collaboration between the Sustainable Fisheries Coalition, the Massachusetts Division of Marine Fisheries (MA DMF), and the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST) seeks to address this issue by helping mid-water trawl fishermen avoid river herring. A major part of this project is a near real-time system, based on the program developed at SMAST for the Atlantic sea scallop fishery, to inform fishermen of the location and magnitude of river herring catches. Catch composition is compiled through MA DMF port sampling program which relies on electronic communications from captains that identify the location and time of vessel landings. Estimated species weights and tow locations are then emailed to SMAST within two days of vessel landing. This information is then analyzed at SMAST and sent to fishing vessels through Boatrac emails. To simplify and reduce the amount of emails and text sent, areas with historically high amounts of river herring bycatch were assigned coded grids. The grids, which were distributed by mail and in person, are then referred to in order to establish a location that is classified as having high, moderate, or low bycatch. Though technologically simple each step of this system confronts challenges relating to accuracy, privacy, and usefulness.

Greg DeCelles, University of Massachusetts Dartmouth
Near Real-Time Bycatch Avoidance in the Sea Scallop Fishery

The Atlantic sea scallop (*Placopecten magellanicus*) fishery on Georges Bank has been constrained by bycatch of yellowtail flounder (*Limanda ferruginea*), resulting in lost economic yield, derby-style fishing and spatial shifts in fishing effort. We developed a near real-time information exchange system with the sea scallop fishing industry to identify yellowtail flounder bycatch "hotspots." A similar system was subsequently developed for bycatch avoidance in the Atlantic sea herring fishery. A coded grid map was overlaid on the fishing grounds, enabling fishermen to report on bycatch rates at a fine spatial scale. Fishermen collect tow by tow information on the location and amount of bycatch and send daily bycatch reports to SMAST scientists through existing Vessel Monitoring System technology. We analyze the bycatch data in near real-time, and send a daily advisory to the active fishing fleet documenting spatially specific bycatch amounts. To address issues associated with data sharing and confidentiality, we

collaborated extensively with the scallop fleet during the development of the bycatch avoidance program. The system is technologically straightforward, user-friendly and cost-effective; however the data has limited uses. This case study demonstrates use of near real-time information exchange to avoid fisheries bycatch. The implications of collecting and employing spatially-specific, fisheries dependent information to solve fisheries bycatch problems were presented.

John Hoey, National Marine Fisheries Service
Status - Northeast Cooperative Research Study Fleets and Electronic Reporting

The development and testing of vessel based electronic reporting and study fleets was identified as a long-term research priority for the NEFSC Northeast Cooperative Research Program (NCRP) in 2000. Initial prototype development tested a variety of hardware and software (e-logbook) options on 15 vessels. Further system development by the Northeast Fisheries Science Center included a standardized eVTR database, VMS and other data transmission protocols, secure web-based data access providing opportunities for data confirmation, editing, and catch and effort visualization. Additional refinements to the vessel based logbook system were guided by the priority need to satisfy all Federal permit reporting requirements, while maintaining adaptable capacity to support additional detailed research and assessment data needs. As additional vessels were added to the study fleet, the logbook system was adapted to new gears and revised based on fishermen's comments to improve ease of use. Sub-trip reporting options were developed and tested to support fisheries where tow-by-tow reporting was impractical or unnecessary. In most cases, trip and tow records can be accessed by vessel captains within 2 – 3 hours of the trip ending and logbook transmission via VMS. Tow records are subsequently integrated with GPS polling data recorded automatically by the logbook and temperature - depth data. Study fleet vessels also provide opportunities for enhanced biological sampling, which is supported by the latest logbook system modifications.

SUMMARIES OF PANELIST COMMENTS AND DISCUSSION

A follow-up interactive workshop on development of eFIS nationally was held on the day following the AFS symposium. Panelists were asked to consider the following:

> *We would like you to reflect on the talks you heard at the AFS symposium on the 8th and your own experiences with eFIS development to help frame the issues fisheries face in developing these systems, and to discuss the benefits of implementing them.*
>
> *Some issues to consider include:*

- *Can data be used to improve the economic success of the industry while also meeting regulatory requirements?*
- *Who owns these data and how will they be shared?*
- *How do we avoid costly and duplicative systems?*

- *How do we ensure that systems designed to share data also protect individual privacy?*
- *How will these systems be integrated into or be helpful in addressing future management initiatives, such as ecosystem-based management, spatial management, managing using "precautionary science," and support for fishery self-governance?*

Your thoughts on additional issues related to these systems are encouraged.

Steve Freese, National Marine Fisheries Service

Steve opened his remarks by reflecting on the range of systems presented at the AFS symposium, from the very simple logbook system being used for the Gulf of Mexico shrimp fishery to the comprehensive Olrac system. For many systems, private companies are helping industry organize their data to give to the government, or using government-mandated data collection to help avoid bycatch and accomplish other goals. He noted that his own personal "data management system" consists of multiple devices that are each designed for different purposes; similarly, we can't expect one eFIS device to serve all purposes. In order to develop the right device, we need to first have specific goals and objectives. Yesterday we heard that we need to evaluate the tradeoffs among ease of data collection, data utility, and degree of participation within the industry. In Steve's own experience, there are also tradeoffs in that data collection needs to be cheap, quick, and high-quality. Often you can solve two out of three. Steve's experience in developing these systems has imparted a few lessons. First, it is critical to find the right people to work with. The Northwest Fisheries Science Center has borrowed from a system developed in the southeast region for their reef fish fishery because that system was well-documented and the skill sets of the Northwest Center IT office matched those of the people that designed that particular system. While collaboration is key, the more people who are involved in system development, the longer development takes. Standards are critical as well. On the West Coast, each state, Pacific States, and others have their own ID systems so in order to develop a single database someone will need to change their system or a new system will have to be invented. Another issue is, how do people think? Data collection could be by permit number, by vessel number, or in some other way. Finally, confidentiality, including perceived industry confidentiality, is a big issue as well.

Kate Burns, Gulf of Maine Research Institute

Three main issues emerged for Kate from the range of presentations made during the AFS symposium. The first was data access and the interface between NMFS's requirements and broader system functionality. Pacific FishTrax is an exciting example of how industry can drive development and use of these systems, but it was unclear what role FishTrax is playing from a regulatory perspective. Can systems do both? The SeaState system discussed at the symposium would make a good case study, as it does seem to have been integrated into the regulatory process. In general, this issue is difficult to address because varying and competing data collection requirements stem from NMFS and other management entities, the industry itself, and others. How do we address the problem that industry does not want to collect and give government any data this they are not required to collect? Do we design a single system with multiple entry points? Do we work with industry to reassure them that data will not "come back

to haunt them?" The second key issue is incentives for industry. Kate noted that the Gulf of Mexico shrimp fishery system discussed at the symposium was fascinating because of its simplicity, and because of the multiple uses of the system that emerged that were not planned for originally. But their process for engaging the industry was not clear – what incentives were there for industry to participate? She agreed with Gil Sylvia's assertion that eFIS will be critical to supporting sustainability and property rights, as outlined in his AFS talk. She added that there were many lessons to be learned from the Australian and other international examples on incentivizing eFIS, including ease of use and data accessibility. Of course, the primary incentive for collecting data efficiently is that fishermen get to catch more fish. Others include participating in a rolling closure management scheme, or using data for spatial management and traceability applications. Traceability systems could be used to incentivize sustainable fishing practices as well. Finally, the issue of interoperability of systems was raised by the AFS speakers. These systems need to be needs-driven, with the technology being responsive to those needs and requirements. Is it possible to do that with single system? Can one system do everything, or do we need to have a system dedicated to reporting required regulatory data and a separate system that does everything else?

Bob Stanley, Australian Fisheries Management Authority

Bob reminded the group that good, cohesive, integrated data and information systems are powerful for everyone, including fishers, managers, scientists, NGOs, and for traceability chains. For eFIS to be successful, the users' needs need to be clearly understood and defined. It is important to remember that these systems have two major types of elements: technical and policy. The technical side of eFIS development is a challenge, but does come with rules, accepted standards, and models that are worth looking at and understanding. While we have needs that we can clearly identify now, there will also be needs that will emerge over time. Therefore, flexible systems must be designed that are capable of accommodating those changes. Finally, we must be cognizant of the many and varied data input streams that could be incorporated into eFIS, including VMS, logbooks, fish tickets, and more.

Jeff Chandler, Absolute Software

Jeff presented an overview of how his company has addressed many of the needs that have been articulated at the symposium and workshop. Absolute Software's main expertise is in developing fleet information systems, and they have also developed electronic logbooks, e-forms, and VMS for fisheries worldwide. He presented a schematic representation of how his company views all of these pieces fitting together and described the approach Absolute Software has taken to developing each piece and to integrating them. Their system can accommodate all types of data collection, including observer data, gear sensors, and VMS information that contribute to quota management. Surveillance data, including satellite imagery and data from enforcement agencies, can also be incorporated, as can dockside data (landings, weights, etc.). All key stakeholders (managers, license and permit holders, vessel owners, international organizations, etc.) have been taken into account in system development and use. All data collected with this system are placed in a central repository that allows for mapping, data searching, notification, and reporting functions. Data is secure; fishermen can log in and access their own data (over a specific period of time). Jeff shared information about some of the customizable electronic forms Absolute

Software has developed, which can be used to capture information on days at sea, catch, and shipment activities, among other data types.

Discussion

Questions to the panel and the ensuing discussion centered around a few key issues. First, the question arose as to how to bring about compliance, which led into a discussion of the issue of providing incentives for industry participation. Panelists agreed that these linked issues need to be addressed, as eFIS do incur costs for both hardware and data transmission. The Australian system relies on the fact that their ITQ management uses a RT electronic quota trading board, and once 90% thresholds are reached, fisheries are very actively monitored and fishers are urged to use the trading board so they don't exceed quotas. Kate Burns reminded the group that for some fisheries, such as for smaller boats that aren't part of a fleet, other types of incentives are still needed in addition to electronic systems; it is important to incentivize best practices. There were competing opinions within the group as to whether more efficient data collection will result in more or less conservative management of fisheries, but most agreed that additional and efficient data collection, aided by eFIS, will reduce uncertainty, allowing fishermen to catch more while maintaining sustainability. One example of this intense need for data comes from New Zealand, where for some fisheries where there is a paucity of relevant data, the government "invents" catches, which forces an overly-precautionary approach to management. If catch shares and data collection improve asset value, some of that needs to be reinvested in the management of the fishery.

The group agreed that collaboration will be one key to making these systems accepted and successful. Kate Burns offered the example of cooperative research programs, in which fishermen participate in large part because data comes back to them to help them make their own business more efficient and helps to contribute to the future of the fishery.

The related question of the relative advantages to top-down and bottom-up approaches to development and implementation was raised in the context of the initiation of a top-down approach by the NEFMC in the New England herring fishery. While Bob Stanley reported that the Australian system was developed successfully in a "top-down" fashion, there is no single response as to how to incentivize in a top-down system. Factors that led to the success of the Australian system include clear leadership on the issue and sufficient resources to complete development. The group agreed that it is still an open question as to whether in the U.S. the appropriate role of government is to mandate the system or to establish standards, guidelines, and incentives.

SUMMARIES OF BREAKOUT GROUP PROCEEDINGS

Three breakout groups convened for more active discussions. Two groups approached the issue by discussing how best to bring value to the industry and incentive they use of eFIS, and one group focused more on technical and standards issues. The groups were given the following charge:

Assuming fisheries nationwide are moving toward implementation of eFIS, how do we address the issues of privacy and security; what is the best way to bring value to the industry; what are the key technical interoperability issues standards; and what are the best management structures and incentives for participation? How do we design a system that brings the greatest value to the industry, management, and science? Please develop specific recommendations for addressing each issue in the context of eFIS development nationally.

Major outcomes for each of those groups are as follows.

Group 1: How to bring value to the industry and incentivize the use of eFIS (A)
Moderator: Terry Smith, NOAA

This group unequivocally endorsed implementation of eFIS, and developed the following set of guidelines:

Vision and objectives

- There is no one way, no single system, that will make everybody happy
- Some questions need to be answered at the outset of eFIS development: What data do we need and when? Do we need it electronically? What are the costs and benefits that need to be addressed and how do we balance simplicity and complexity?
- It is critical to have the political will to get these systems developed
- It is also critical to create a source of quality data that users can trust; uses will develop over time

Incentives

- A critical thread in this discussion was the need for context and perspective. Who is supplying the incentive? To whom should incentives be given? Who benefits from the incentive?
- The bottom-line incentives are generally better science, sustainability of the resource, and increased revenues for the industry.
- Examples of value-added programs were discussed as potential incentives
- One of the biggest incentives for fishermen is providing a mechanism for traceability for consumers.

Processes for issuing incentives

- Collaboration among groups is essential to keep from reinventing the wheel – we need to rely on the good work that has already been done on this issue
- Increase communication among all stakeholder groups in order to be clear about objectives. Make sure to define the difference between gathering basic regulatory data and value-added fishery data.
- Whatever framework is developed needs to be flexible to adjust to the ever-changing industry

- Attitude toward data needs to transition from "ownership" to "stewardship"

Implementation

- Depending on the particular situation, top-down and bottom-up solutions can be appropriate; this needs to be decided on a case-by-case basis.
- Since the benefits of these systems will be shared among many stakeholders, costs may need to be shared as well.
- Success in many case studies has depended on strong leadership that takes responsibility for moving the process forward.
- Transparency and access to data are key.

Issues or points of contention within the group included lack of complete agreement on first steps and whether to develop simple vs. complex systems. Despite these differences, the group came to a consensus to endorse quick adoption of e-catch reporting of some kind.

Discussion of the group's presentation began with the question of what parts of the eFIS development process are referred to when we discuss top down vs. bottom up. Does this distinction refer to all parts of the process, including incentives, standards, and design? Or is eFIS development a shared responsibility in which "the top," meaning government, has certain responsibilities, and at the bottom, industry and the market has others? Terry responded that this latter model is the correct one – both approaches are needed at the same time. There are parts of the process that need to be stimulated by government. From the industry perspective, there will be economic incentives because some of their self-interest will drive the process. An additional issue discussed by the group was the division between what functions are inherently governmental and what functions are inherently the domain of the private sector, without coming to consensus. This division includes, but is not limited to, who pays for these systems when at issue is private use of a public resource. Gil asked whether there is a smart public-private partnership model that might work for who and how to pay for them.

Group 2: How to bring value to the industry and incentivize the use of eFIS (B)
Moderator: Maggie Sommer, ODFW

This group was also focused on bringing value to all stakeholders, and also discussed appropriate eFIS management structure, addressing the issue of top-down vs. bottom-up control among others. Their main recommendations are as follows.

Management Structure

- Managers must be explicit about information needs and (working with scientists as appropriate) specify required data elements. Managers must justify those information needs through clear objectives. This clarity will help encourage buy-in from data providers.
- NMFS should provide strong leadership in coordinating eFIS efforts and facilitating communication within and between agencies. This will help achieve manager buy-in.
- Recognize that eFIS will not happen all at once due to funding, logistical, and technical constraints. However, we also need to avoid building systems piecemeal

that are then incompatible, duplicative, or inflexible. Build flexible, customizable systems to enable future expansion and adaptation. Engage fishery sectors that are likely to join or need eFIS later in early requirements-gathering to facilitate this.

- Don't recreate the wheel. Don't create a lot of wheels that can't work together, i.e., use overarching objectives (NMFS) and coordination/communication role with bottom-up approach that caters to the differences between fisheries. Perhaps some of this function could be achieved by further communications among this group.
- Remember that some functions (i.e., protected species interactions) can only be done by a human. For example, observers might be required in situations where protected species are not ever coming onboard a vessel.
- Validations of data will still be required to ensure data quality.
- Make systems as user-friendly and simple as possible. Don't stick to paper form look-alikes only.
- Decide when the best time and place to collect various data types is. EFIS systems might allow improvements here.

Incentives

- Eliminate duplicate reporting and simplify reporting, which will make reporting easier and more cost-effective
- Provide industry-desired data summaries and information products
- Provide marketing-related incentives (e.g., Japan example in which small boats can take a picture of a particular fish they've caught and consumers can buy the fish online; Catch a Piece of Maine; CSA model; direct chef contact; Pacific FishTrax, etc.)
- Government will be more likely to use the data in a timely manner, leading to better management and better industry buy-in
- If industry takes the lead (working with vendors), industry will probably get a product they like better than if government creates and mandates a product

The group also discussed issues of data ownership/stewardship, confidentiality, privacy, etc., without developing specific recommendations for addressing these issues. Questions arose in the group about ownership of data collected by gear sensors or video (there was concern about lack of precedent and expectations with respect to privacy and data ownership for these new technologies). Amos Barkai suggested that in order to make the most efficient use of energy and know-how, standards must be created that sectors in fisheries can communicate about and decide how to meet. John Lavrakas added that one approach would be to have the federal government use its funds to leverage some of the motion that has already happened on this issue and to enable standardization through collaboration with stakeholder groups.

Group 3: Technical Issues, Interoperability, and Standards
Moderator: John Lavrakas, Advanced Research Corp.

This discussion group focused on technical issues that need to be addressed in eFIS development. They derived a list of general issues that need to be resolved as eFIS development advances, as well as a short list of recommendations.

Issues to Address

- It is critical to start with defining system needs, and to determine who needs what information.
- Communication among stakeholder groups is also critical.
- The ability to share data is important, as is defining which data to share and addressing privacy concerns.
- Ensure that we develop systems that fishermen are comfortable using and that match the hardware and existing systems being used.
- Data transmission and communicating data will be important, including transmitting data to outlying areas and from sea, defining and accommodating the volume of data to be transferred to ensure appropriate bandwidth, considering the need for timely communication (e.g., transmitting and receiving data in time to use it for decision-making about quotas). It will also be important for fleet vessels to communicate among themselves.
- Costs to be considered include development, deployment, and maintenance (including license fees, hardware costs).
- Flexibility and scalability are important – systems need to be designed that can be scaled to small fleets/vessels *and* large fleets.
- Consideration needs to be given to database development. Some participants already have too many databases to manage or use, and the databases don't always talk to each other or are inaccessible.
- Organizational resistance to change or to "outside" solutions must be addressed.
- Data quality and integrity are important issues. Data needs to be tamper-proof. Establish a proper security protocol designed for protecting the data.
- Standards for data sharing need to be developed.

Recommendations

- Develop a common guide to species names and other parameters for data entry as part of standards development.

- Establish a national committee for development of different types of standards. Carry out a study of existing natural resource data systems to determine what systems already exist from which fisheries could borrow.

- Communicate with stakeholder groups and work with a business analyst to define what information is needed and to develop and describe protocols for data sharing. Stakeholder groups need to be brought together, but simply convening them is not enough; *effective* communication needs to be facilitated as well. Communication needs to continue throughout the development and testing phases.

The group remained undecided about whether it is preferable to develop one big system that does everything or two or more smaller systems, perhaps one of which is for regulatory data only.

The question arose as to whether the process of eFIS development or maintenance involved unusual costs above what other businesses might incur if they were undertaking a new initiative. Unusual costs for eFIS include standards development, ongoing facilitation of communication, and the exorbitant costs that can accompany a sea-change in regulations when systems are under development. High costs can also accompany a lack of stakeholder involvement (if a redesign becomes necessary, for example). Another unique cost is use of personnel to analyze video for on-board video systems, although eventually a technological solution to this problem is likely to be developed.

However, there is also a cost associated with *not* developing eFIS and collecting needed data: the lost opportunity cost of locking fisheries into a highly precautionary management framework. The question becomes, how do we operationalize the concept of precaution, and how do we reward the industry and science for reducing data variance and improving data quality by allowing for more fishing opportunities. Industry will drive this process if we can answer this question and set the right incentives in motion.

SUMMARY OF OPEN DISCUSSION:

The group discussion focused largely on the issue of development of standards. While the critical need for standards development and promulgation is a major theme that emerged from both the West Coast workshop and this one, it is not entirely clear what kind of standards were being referred to by different discussants. In addition, participants in this discussion revealed that many standards do, in fact, exist, and are maintained by regional bodies such as the Atlantic Coastal Cooperative Statistics Program (ACCSP, www.accsp.org) and PacFIN. In each case, the relevant states and the federal government have jointly endorsed the standards, and the databases maintained by the regional organizations are able to be queried. Perhaps the issue is more one of communication and outreach about existing standards than actual standards development.

Clarity is needed on this issue. Do standards exist for defining fishing operations (when does fishing "begin" and "end?" How is CPUE defined for different gear types?)? For data transmission and sharing? For amending, deleting, or aggregating data? Are there sufficient standards for adding new data streams into existing systems? Are there QA/QC standards that will allow fishermen to contribute data on issues of importance to them, such that those data will be appropriate for inclusion in scientific studies or will hold up in court? Can protocols for communicating with databases be clarified? Further communication on this set of issues is required.

OVERALL RECOMMENDATIONS AND GUIDING PRINCIPLES

While all participants in each workshop recognized that these discussions would not necessarily address all of the issues inherent in developing eFIS, a number of important principles emerged about which there seemed to be consensus within and across the two workshops. These principles form a set of recommendations and guiding principles that should guide eFIS development.

GUIDANCE, INCENTIVES and RECOMMENDATIONS

Organizational/Structural Guidance

- Bottom up Approach: In the United States, eFIS development will be most successful and efficient if it is industry-driven, that is, using a "bottom-up" incentivized approach, as compared to a "top down" government mandate. Although elements of these systems are sometimes led by government and U.S. management agencies on a regional level, unlike other nations including members of the European Union, they are not being mandated by the federal government. In the U.S., these systems are evolving as industry grapples with the need to address sustainability requirements, expansion of co-management and self-governance, and improvement of economic and market performance. As this process plays out, government will become a "client" of industry that contracts for data that the regulator requires, while industry uses its own data to improve economic and management performance. However, the "top" (federal and state government), and the "bottom" (fishing and the seafood industry) must both contribute to developing efficient information systems. The challenge is determining what role government should play in encouraging entrepreneurial development and testing of pilot eFIS systems that bring greater value to the industry, and achieve sustainability for the nation's fisheries.

- The Need for Standards: Government and industry must work together to develop "standards" that support and catalyze entrepreneurial development of eFIS systems. A national-level committee on determining data and system standards should be established. Besides developing guiding principles to encourage eFIS development, the committee would work toward clarifying and developing standards for:
    - application protocol interfaces (API) for sharing and exchanging data
    - defining, adding, amending, deleting, or aggregating data
    - data quality
    - system documentation, validity, and transparency
    - privacy and security

- Flexibility and Adaptability: Recognize that eFIS will not happen all at once due to funding, logistical, and technical constraints. However, we also need to avoid building systems piecemeal that are then incompatible, duplicative, or inflexible. Build flexible, customizable systems to enable future expansion and adaptation. Engage fishery sectors that are likely to join or need eFIS in the immediate future and that have a reputation as early adopters.

- Organization and Management: The highest hurdles to jump in eFIS development are not technical in nature, but organizational and administrative. These issues include understanding system needs and objectives, privacy requirements, legal issues, and budget requirements and constraints.

- Partnerships: Technology providers must partner with the industry early in the process of system development. This partnership can encourage buy-in and participation from project inception. As fisheries management changes and becomes more complex, the tools developed to assist management will more readily be able to reflect these changes.

Incentives

- Incentives are Wide Ranging: Incentives for developing and using eFIS include increasing the efficiency of fisheries, providing the ability to fish longer and catch more fish, enhancing marketing and market potential for fishery products, and monitoring catch share quotas and catch of protected species. The basic disincentive or "stick" is being prohibited from fishing, and avoiding being locked into a highly precautionary management framework. eFIS sytems can be critical for "operationalizing" the precautionary system and reducing precautionary buffers by conducting targeted research, reducing data variance, and improving data quality. Industry will drive this process if management can develop standards and approaches for validating improved science and data quality. Reducing uncertainty can allow fishermen to catch more fish while meeting sustainability requirements.

- Efficiency: eFIS should be designed to reduce inefficiencies and duplication in data collection, sharing, and use.

- Accessing Individual and Fleet Data: A critical incentive for industry participation is having access to collected data in a form that brings greater understanding and knowledge of their individual and fleet performance and helps them discover new approaches for achieving success.

- Decreasing Costs: Costs should decrease over time in response to improvements in technology and systems management. Since these systems are scale dependent, the "marginal" cost per additional user should decrease significantly as more users participate.

Technical and Data Recommendations

- Cloud computing**:** Development of eFIS will incorporate cloud computing and a variety of platforms (tablets, smart phones), but it is important to remember that these platforms are simply "skins" and the database development itself is the critical and difficult part.

- Cameras vs Observers: Cameras may not be able to replace all of the duties and functionality of human observers, but if technology development goes in the direction of

camera systems, the technology needs to try to replicate the multiple roles of observers (beyond just the observer's "eyes," including their "ears" and "hands").

- Digital vs Paper: In some cases (for some businesses, places, fisheries) paper record-keeping will need to continue to be an option in the immediate future.

- Open architecture: Design a broad, open architecture system where users and data can be added as needed.

- Multiple Data Streams: The discussion of eFIS needs to account for six or more different data streams including VMS, observer data, logbooks, fish tickets, scientific survey data, and marketing/traceability data.

Privacy and Security

- Data Stewardship: Those that manage eFIS data need to be considered stewards of the data; each participant in the data collection process needs to retain sufficient control of their submitted data and maintain sufficient access to others' data, without directly managing database servers or claiming data ownership.

- Privacy and security issues need to be addressed from the inception of eFIS development.

- Log-In: Systems must include a federated security system with a log-in/password access.

- Managing security: Privacy and security systems must be tested and evaluated throughout the lifetime of the eFIS, not just at the initial development stage.

NEXT STEPS

All workshop participants are urged to discuss the importance of eFIS development with their colleagues and constituents. Workshop organizers will present this report to the stakeholders and leaders that are critical for eFIS development, including state and federal agencies, fishery management organizations, commissions and other trade groups, NGOs, and academic scientists. A series of presentations to some of these entities will be made.

CONTACTS

For more information about this initiative, or to submit comments on this report, please contact steering committee chair Gil Sylvia, gil.sylvia@oregonstate.edu.

Appendix 1:
West Coast Workshop Agenda
and
Breakout Group Guidance

West Coast Electronic Fishery Information Systems Workshop
Sheraton Portland Airport
May 3-4, 2011
Agenda

THANK YOU TO OUR SPONSORS:
Coastal Oregon Marine Experiment Station
Project CROOS (Collaborative Research on Oregon Ocean Salmon)
Environmental Defense Fund
Oregon Department of Fish and Wildlife

RECEPTION SPONSORS:
Archipelago Marine Research, Ltd.
Real Time Research, Inc.

May 3

8:00 Registration
St. Helen's Foyer

8:30 Plenary
St. Helen's C/D

8:30 Welcome
Gil Sylvia, Coastal Oregon Marine Experiment Station, Oregon State Univ.

8:40 Overview of the issue and charge to the conference: Successes and challenges of developing electronic fishery information systems
Gil Sylvia

9:15 Fisheries and Oceans Canada electronic reporting initiatives
Ron Goruk, Department of Fisheries and Oceans Canada
Fisheries and Oceans Canada (DFO) has been transmitting data from source, at sea, since 1998. In recent years the department has been exploring technology applications to enhance the speed, accuracy and user friendliness of this data capture approach. This work has led to the development of the Pacific electronic logbook (E-Log) initiative that will significantly enhance the efficient and cost effective collection of catch reporting information for commercial, recreational and First Nations fisheries.

9:45 E-tickets in Oregon groundfish trawl fisheries
Dave Colpo, Pacific States Marine Fisheries Commission/Maggie Sommer, ODFW
The development and use of an e-ticket program and compliance monitoring reporting system on the West Coast and Oregon's plans for e-fish tickets will be reviewed.

10:05 Bycatch reduction agreements – integrating electronic data with fishing practices in the Bering Sea pollock fishery

John Gruver, United Catcher Boats
Gruver will review the requirements of several Intercooperative Agreements (ICAs) for the Bering Sea pollock fishery, all of which require access to a reliable source of fishing data in order to accomplish their intent. These initial bycatch ICAs, also called a Rolling Hot Spot Agreement, have been employed voluntarily by the Bering Sea pollock fleet for reducing both Chinook and chum salmon bycatch.

10:30 Break
St. Helen's Foyer

10:45 Using federal fisheries data in managing private fishery cooperatives: examples from the Alaska pollock and Pacific whiting fisheries
Karl Haflinger, Sea State Inc.
Alaska pollock and Pacific whiting TACs have been allocated to sectors and, in some cases, to fishery cooperatives since 1999. Minimizing bycatch of salmon and rockfish is necessary to fully harvest these allocations. Development of closure areas and enforcement of fishing prohibitions (also using VMS data) is prescribed in cooperative contracts and carried out by coop managers and data managers who are granted access to the observer, landings and VMS data by vessel owners.

11:15 E-observer program
Janell Majewski, National Oceanic and Atmospheric Administration/Jon McVeigh, NOAA
NOAA representatives will discuss e-observer programs on the West Coast.

11:35 North American FishTrax
Heather Mann, Community Seafood Initiative
Project CROOS (Collaborative Research on Oregon Ocean Salmon), an industry-science partnership designed to improve management of the West Coast salmon fishery, uses near real-time genetic, oceanographic, and fishery information to reduce harvests of weak salmon stocks and improve economic performance of the industry. This presentation discusses the structure of Project CROOS and the management of information using the Pacific FishTrax website where bar codes are used to track harvested fish and related information.

11:55 eCatch – Technology for Collaborative Fisheries Management
Matt Merrifield, The Nature Conservancy
In Central California, The Nature Conservancy (TNC) has purchased and subsequently leased federal groundfish permits to fishermen. In order to monitor these leases and efficiently report to NMFS, TNC collects information on fishing locations, amount, and species caught using its permits. To maintain these data and ensure their integrity and efficiency, TNC developed a web based application called eCatch that centralizes spatial and tabular information associated with fishing activity.

12:15 Use of camera systems in collecting fishery information
Howard McElderry, Archipelago Marine Research Ltd.

Some fisheries are considering, or using, on-board cameras to collect information electronically. Archipelago is an industry leader in developing these systems. Advantages and challenges will be discussed.

12:35 Lunch
St. Helen's Foyer

1:30 Panel discussion: Management requirements – what will NOAA require? What will the states require? What makes sense?
In some cases, use of electronic information collection will be driven by regulatory requirements. What might those requirements be at the federal and state level? What existing requirements would be easier to meet using electronic systems?
Moderator: Terry Smith, NOAA
Frank Lockhart, Northwest Region NMFS, NOAA
Caren Braby, ODFW
Corey Niles, WDFW

2:15 Panel discussion: Challenges and benefits to the industry
While electronic systems present some clear benefits to the industry, they might impose burdens as well. What is the industry's perspective on these systems?
Moderator: Nancy Fitzpatrick, Oregon Salmon Commission/Oregon Albacore Commission
Rod Moore, West Coast Seafood Processors Assn.
Pete Leipzig, Fishermen's Marketing Assn.
David Jincks, Midwater Trawlers Cooperative
Jeff Feldner, Oregon Sea Grant/Fisherman

3:00 Break
St. Helen's Foyer

3:15 Panel discussion: Legal and privacy issues
One of the biggest issues for industry with respect to eFIS development is how privacy of individual fishermen and companies will be protected. What is the legal landscape with respect to privacy? What laws and ethical considerations will need to be consulted? What are the industry's concerns?
Moderator: Gil Sylvia, COMES/OSU
Dan Steinberg, Booz Allen Hamilton
Mariam McCall, National Marine Fisheries Service
Laura Anderson, FishCred & Local Ocean Seafoods

4:00 Panel discussion: Technical issues and interoperability
Some of the challenges to development of these systems will be technical in nature. What is possible now, and what will be possible, technologically speaking, in a few years? What are the obstacles to interoperability?
Moderator: John Lavrakas, Advanced Research Corp.
Wil Black, ARC

Charles Steinback, EcoTrust
Rick Busch, Finsight AK

4:45 Summary and instructions for day 2
Gil Sylvia

5:00 Adjourn; Reception sponsored by Archipelago and Real Time Research, who will showcase some of their fishery information technologies
St. Helen's Foyer

6:30 Dinner on own

May 4

8:00 Group convenes for Day 1 summary and instructions
St. Helen's D
Gil Sylvia

8:30 Breakout sessions
Garden A
Garden B
St. Helen's C
St. Helen's D

Working breakout sessions address the question:

IF WEST COAST FISHERIES ARE MOVING TOWARDS ELECTRONIC REAL-TIME AND NEAR-REAL-TIME INFORMATION SYSTEMS, HOW DO WE ENSURE THESE SYSTEMS BRING VALUE TO INDUSTRY, SCIENCE, AND MANAGEMENT?

Please present the fundamental components of your optimal, ideal, even visionary system, and explain how they:

- Ensure standardization
- Protect privacy/security
- Benefit (maximize economic benefits, social benefits, minimize environmental impacts)
    - ❖ Industry (Incentives)
    - ❖ Management
    - ❖ Science
- Can be implemented starting from where we are now

You may want to consider existing systems in order to determine what fundamental existing conditions may need to be changed. Compare your system to the way things are done now.

How will you use incentives (carrots as well as sticks) to ensure success?

Explain how benefits exceed costs and how your system would be paid for.

Use specific fisheries to illustrate key components of your system.

WHAT ARE YOUR FOUR MOST
IMPORTANT RECOMMENDATIONS
FOR IMPLEMENTING YOUR SYSTEM?
PLEASE BE SPECIFIC.

10:15 Break
St. Helen's Foyer

10:30 Breakout groups reconvene

12:00 Lunch
St. Helen's Foyer

1:00 Reports from breakout groups
St. Helen's C/D

1:45 Discussion of remaining issues,
develop list of recommendations

2:30 Synthesis, wrap-up, next steps

3:00 Adjourn
Cookies and coffee for the road, St.
Helen's Foyer

Appendix 2:

West Coast Workshop Attendees

Kelly Ames
PFMC

Laura Anderson
FISHCRED

Ben Andrews
Saltwater Incorporated

Suzanne Bauer
ODFW

Wil Black
Advanced Research Corp.

Caren Braby
Oregon Department of Fish and Wildlife

Rick Busch
Finsight

John Childers
NMFS/SWFSC

Dave Colpo
PSMFC

Kelly Corbett
Oregon Department of Fish and Wildlife

Shannon Davis
The Research Group

Morgan Dyas
Archipelago Marine Research

Allen Evans
Real Time Research

Jeff Feldner
Oregon Sea Grant

Nancy Fitzpatrick
Oregon Salmon Commission &
Oregon Albacore Commission

Mark Freeman
Oregon Department of Fish and Wildlife
Stephen Freese
NMFS Seattle

Maureen Gilbert
Ilwaco Fish Co.

Ron Goruk
Fisheries and Oceans Canada

John Gruver
United Catcher Boats

Karl Haflinger
Sea State

Mike Hawbecker
Real Time Research

David Jincks
Midwater Trawlers Cooperative

Shems Jud
EDF

Chris Kern
Oregon Dept. of Fish and Wildlife

Gway Kirchner
Oregon Department of Fish and Wildlife

Sandra Krause
PFMC

Paul Kujala
F/V Cape Windy, Warrenton OR

Steven Kupillas
ODFW/PSMFC

Jeff Lackey
F/V Miss Sue & F/V Seeker, Newport, OR

John Lavrakas
Advanced Research Corporation

Alex Lawson
OSU/Project CROOS

Peter Lawson
NOAA Fisheries

Peter Leipzig
Fishermen's Marketing Association

Frank Lockhart
NMFS-Northwest Region

Martin Loefflad
NMFS, Alaska Fisheries Sci. Center

Darin Macey
Canadian Fisheries Observer Programs

Kirsten MacTavish
International Pacific Halibut Commission

Janell Majewski
NOAA

Sean Malone
CA DFG

Heather Mann
Community Seafood Initiative

Dawn Mann
Archipelago Marine Research Ltd.

Dayna Matthews
OLE - NMFS

Mariam McCall
NMFS

Howard McElderry
Archipelago Marine Research Ltd.

Scott McMullen
OFCC

Jon McVeigh
NOAA

Matt Merrifield
The Nature Conservancy

Elizabeth Mitchell
Assn. for Professional Observers

Rod Moore
West Coast Seafood Processors Association

Mary Nerini
Sea State

Corey Niles
WA Department of Fish and Wildlife

Brad Pettinger
Oregon Trawl Commission

Heather Reed
WA Department of Fish and Wildlife

Terry Smith
NMFS/National Sea Grant Office

Mandi Smith
Community Seafood Initiative

Maggie Sommer
Oregon Department of Fish and Wildlife

Charles Steinback
EcoTrust

Nancy Steinberg
COMES/OSU

Dan Steinberg
Booz Allen Hamilton, Inc.

Marc Stoddard
Jessie's Ilwaco Fish Company

Gilbert Sylvia
Oregon State University

Keri Taylor
Archipelago Marine Research Ltd.

Aregash Tesfatsion
International Pacific Halibut Commission

Eric Torgerson
Finsight

Bill Tweit
WA Department of Fish and Wildlife

Linda Van Dyke
California Department of Fish & Game

Micki Varney
Oregon Department of Fish and Wildlife

Farron Wallace
WA Department of Fish and Wildlife

Lorna Wargo
WA Department of Fish and Wildlife

Robert Woodard
WA Department of Fish and Wildlife

Appendix 3:

National Workshop Agenda

and Breakout Group Guidance

National Electronic Fishery Information Systems Workshop
Washington State Convention Center
September 9, 2011
Agenda

THANK YOU TO OUR SPONSORS:
Coastal Oregon Marine Experiment Station
Project CROOS (Collaborative Research on Oregon Ocean Salmon)
Environmental Defense Fund
Advanced Research Corporation
Oregon Sea Grant
Gulf of Maine Research Institute
NOAA
Atlantic Coastal Cooperative Statistics Program

Additional thanks to Heather Mann and Pacific FishTrax for hosting our materials on the FishTrax web site

8:00 Registration
Room 2A/2B

8:30 Welcome, summary of issue, summary of West Coast workshop outcomes
Gil Sylvia, COMES
Terry Smith, NOAA/Sea Grant
Room 2A/2B

9:00 Panel of participants presents summary of Day 1 activities and what they see as major issues to address for national eFIS development

Panelists: Steve Freese, NOAA, Seattle
Kate Burns, Gulf of Maine Research Institute
Bob Stanley, Australian Fisheries Management Authority
Jeff Chandler, Absolute Software

10:00 Presentation of four issues to discuss today in breakout groups:

A. Privacy and security
Moderator: Pete Lawson, NMFS
Recorder: Jenny Dressler
Room 2A/2B

B. How best to bring value to the industry
Moderator: Terry Smith, NOAA/Sea Grant
Recorder: Adam Baukus
Room 204

C. Technical issues/Interoperability/Standards

Moderator: John Lavrakas, Advanced Research Corp.
Recorder: Libby Etrie
Room 205

D. Management structure and incentives for participation (who owns the data? Who develops the systems? What does the chain of custody of data look like?)

Moderator: Maggie Sommer, ODFW
Recorder: TBA
Room 206

[E. New topic if needed]

Brief discussion: Are these the right issues?
Break into four groups by issue

10:30 Break

10:45 In breakout groups, address the question:
ASSUMING FISHERIES NATIONWIDE ARE MOVING TOWARD IMPLEMENTATION OF EFIS, HOW DO WE ADDRESS THE FOUR ISSUES ABOVE AND DESIGN A SYSTEM THAT BRINGS THE GREATEST VALUE TO THE INDUSTRY, MANAGEMENT, AND SCIENCE?

Address this question from the perspective of the issue of your breakout group (can provide more specific questions like the ones provided to the panels at the WC workshop). Please develop specific recommendations for addressing your issue in the context of eFIS development nationally.

12:00 Lunch

1:00 Breakout groups reconvene

3:00 Break

3:15 Reconvene in plenary: four groups share outcomes/recommendations (15 minutes each)

4:15 Discussion/summary/next steps

4:45 Conclude

Appendix 4:

National Workshop Attendees

Baltzell, Mark
Washington Dept of Fish and Wildlife
mark.baltzell@dfw.wa.gov

Barkai, Amos
OLRAC
amos@olsps.com

Bass, Scott
Point No Point Treaty Council
sbass@pnptc.org

Baukus, Adam
Gulf of Maine Research Institute
abaukus@gmri.org

Black, Wil
Advanced Research Corp.
wil.black@oregonarc.com

Boldt, Shannon
Point No Point Treaty Council
sboldt@pnptc.org

Burns, Kate
Gulf of Maine Research Institute
kburns@gmri.org

Carroll, Tim
Saltwater, Inc.
tim@saltwaterinc.com

Chandler, Jeff
Absolute Software
jchandler@absolutesw.com

Coughlin, Scott
EDF
scott.p.coughlin@gmail.com

Cox, Brodie
Washington Department of Fish and Wildlife
brodie.cox@dfw.wa.gov

Defilippi, Julie
Atlantic Coastal Cooperative Statistics Program
julie.defilippi@accsp.org

Dietrich, Kim
kdiet@uw.edu

Etrie, Elizabeth
Northeast Sector Service Network
libby.etrie@gmail.com

Freese, Steve
NMFS NWR
Steve.Freese@noaa.gov

Gage, Tamara
Port Gamble S'Klallam Tribe
tgage@pgst.nsn.us

Gilroy, Heather
International Pacific Halibut Commission
heather@iphc.int

Goruk, Ron
Fisheries and Oceans Canada
Ron.Goruk@dfo-mpo.gc.ca

Gray, Cindy
Skokomish Tribe
cgray@skokomish.org

Hastings, Jay
Sustainable Communities International
hastingsjd@aol.com

Hatch, Randy
Point No Point Treaty Council
rhatch@pnptc.org

Heyman, Will
TAMU
wheyman@tamu.edu

Hoey, John
NEFSC
john.hoey@noaa.gov

Holliday, Mark
NOAA Fisheries Service
mark.holliday@noaa.gov

Kloempken, Karen
WDFW
karen.kloempken@dfw.wa.gov

Kobara, Shin
TAMU
shinichi@tamu.edu

Krueger, Katherine
Quileute Tribe
katie.krueger@quileutenation.org

Lavrakas, John
Advanced Research Corporation
jlavrakas@oregonarc.com

Lawson, Pete
NMFS
peter.w.lawson@noaa.gov

Lillig, Diana
Marine Education
Dlillig1@comcast.net

Litsinger, Emilie
Environmental Defense Fund
elitsinger@edf.org

Lockhart, Frank
NOAA Fisheries - NW Region
frank.lockhart@noaa.gov

Lowman, Dorothy
Natural Resource Consultant
dmlowman01@comcast.net

Luers, Daniel
JIMAR/ NOAA
daniel.luers@noaa.gov

Malone, Sean
California DFG
smalone@dfg.ca.gov

Mann, Heather
Community Seafood Initiative
hmann@seafoodschool.org

McConnell, Carmen
Fisheries and Oceans Canada
Carmen.McConnell@dfo-mpo.gc.ca

McElderry, Howard
Archipelago Marine Research Ltd.
howardm@archipelago.ca

Miko, Dave
Pennsylvania Fish and Boat Commission
dmiko@state.pa.us

Miller, Alex
Gulf States Marine Fisheries Commission
amiller@gsmfc.org

Mitchell, Elizabeth
Association for Professional Observers
apo@apo-observers.org

Niles, Corey
Washington Department of Fish and Wildlife
corey.niles@dfw.wa.gov

Paine, Brent
United Catcher Boats
bpaine@ucba.org

Phillips, Todd
Ocean Conservancy
tphillips@oceanconservancy.org

Schnaittacher, Gwynne
A.I.S., Inc
gschnait@mercury.wh.whoi.edu

Sfeir, Alfredo
Shellcatch
alfredo.sfeir@shellcatch.com

Singleton, Pamela
Washington Department of Fish and Wildlife
pamela.singleton@dfw.wa.gov

Smith, Terry
NOAA
terry.smith@noaa.gov

Soboil, Mark
Aotearoa Fisheries Ltd, New Zealand
mark.soboil@afl.maori.nz

Sommer, Maggie
Oregon Department of Fish and Wildlife, Marine Resources
maggie.sommer@state.or.us

Stanley, Bob
Australian Fisheries Management Authority
Bob.Stanley@afma.gov.au

Steele, Lori
New England Fishery Management Council
lsteele@nefmc.org

Steinberg, Nancy
COMES
nsteinberg@charter.net

Stevenson, Bryan
Electric Edge Systems Group Inc.
& FACTS
info@fisheryfacts.com

Stilwater, Gabrielle
WDFW
gabrielle.stilwater@dfw.wa.gov

Stoll, Joshua
NOAA Fisheries Service
joshua.stoll@noaa.gov

Sullivan, Gerald
DFO
sullivang@dfo-mpo.gc.ca

Sylvia, Gil
Oregon State University
gil.sylvia@oregonstate.edu

Trumble, Bob
MRAG Americas
bob.trumble@mragamericas.com

Van Dyke, Linda
California Department of Fish and Game
Lvandyke@dfg.ca.gov

Van Voorhees, Dave
NOAA Fisheries Service
dave.van.voorhees@noaa.gov

Warren, Brad
Sustainable Fisheries Partnership
wordworksa@earthlink.net

Welch, Abigail
Port Gamble S'Klallam Tribe
awelch@pgst.nsn.us

Witzig, John
NOAA FIsheries
John.Witzig@noaa.gov

Appendix 5:
eFIS Resources

RESOURCES RELATED TO EFIS DEVELOPMENT

This list of resources is far from comprehensive. Information about other programs can be found with the abstracts of the American Fisheries Society symposium talks associated with the National eFIS Workshop, beginning on page 32 of this report.

1. Data standards

Atlantic coast fishery data standards, promulgated by the Atlantic Coastal Cooperative Statistics Program
http://www.accsp.org/documents/programdesign/2012/ACCSP_StandardsandAppendices2012_Final05082012.pdf

Web site focused on fishery data standards, with links to standards promulgated by a variety of organizations
http://www.fisherystandards.org

Web site of Organization of Fish and Wildlife Information Managers, Data Standards and Technology Trends Committee
http://www.ofwim.org/org/dstt_committee.html

2. Existing electronic fishery information programs

DFO
http://www.pac.dfo-mpo.gc.ca/consultation/picfi-ipcip/docs/monrep-survdecl/stratfwk-cadre-strat-eng.pdf

Alaskan fisheries
http://www.fakr.noaa.gov/npfmc/PDFdocuments/conservation_issues/EM211.pdf

http://alaskafisheries.noaa.gov/elandings/faq.htm

Pacific FishTrax
http://www.pacificfishtrax.org

The Nature Conservancy's partnership with fishermen on the central California coast
http://www.nytimes.com/2011/11/28/science/earth/nature-conservancy-partners-with-california-fishermen.html?pagewanted=all

EcoTrust and Alaskan fisheries
http://ecotrust.ca/ecotrust-canada-support-and-strengthen-north-coast-crab-fishery

3. Books

http://www.nap.edu/openbook.php?record_id=9969&page=1

http://books.google.com/books?id=47CnOi612IcC&source=gbs_navlinks_s

4. A short bibliography of traceability references

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Caswell, J.A. Quality assurance, information tracking, and consumer labeling. *Marine Pollution Bulletin* 53, 650-656 (2006).

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Regattieri, A., Gamberi, M. & Manzini, R. Traceability of food products: General framework and experimental evidence. Journal of Food Engineering, 81 (2007) 347-356.

Sahin, E., Dallery, Y., & Gershwin, S., (2002). Performance evaluation of a traceability system. In: Proceedings of IEEE International Conference on Systems, Man and Cybernetics, Vol. 3, ISSN: 1062-922X. 210–218

Thompson, M., Sylvia, G. & Morrissey, M.T. Seafood Traceability in the United States: Current Trends, System Design, and Potential Applications. *Comprehensive Reviews in Food Science and Food Safety* 4, 1-7 (2005).

Other

NMFS Strategic Plan for Fisheries Research, calling for development of eFIS systems and standards for data collection: http://www.st.nmfs.noaa.gov/st4/s_plan/NMFS-Strat-Plan-2007.pdf