6th INTERNATIONAL FISHERIES OBSERVER & MONITORING CONFERENCE

Portland, Maine, USA *July 20 - 24, 2009*

"Sustainable resources through development, promotion and enhancement of fisheries monitoring programs "

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2009 IFOMC Conference Program

Holiday Inn By The Bay, Portland, Maine Monday, July 20 – Friday, July 24

Monday, July 20	2009-Pre-conference workshop schedule
8:00AM-12:00 PM	**Observer Professionalism Working Group:** **Cumberland Room** Members will be contacted directly by the working group chairman with further details.
8:30AM-5:00PM	**Data Extrapolation Workshop:** **Oxford-Somerset Room** This full-day workshop will cover how discrete sets of data are extrapolated to represent the activities of an entire fishery and to support management decisions. The workshop coordinators are Lisa Borges for the European Commission and Vicki Cornish of the Ocean Conservancy. For more information visit the data extrapolation website.
12:00PM-5:00PM	**Vessel Safety Training:** **Rhode Island Room** Safety trainers from US observer programs and the US Coast Guard will be on hand for dockside training. Learn about boat drills and damage control subjects, while trying your hand at patching ruptured pipes and hulls. You'll learn lessons that may save your life, and you'll stay cool on a summer day. This is a great opportunity to train the trainers. Vessel Safety Training is being held off-site.
1:00PM-3:30PM	**Moving Sushi, a Marine Resource Expedition:** **Massachusetts Room** The Marine Resource Expedition is trekking across 42 countries spread between Africa, Europe and Asia over 2 years, filming a documentary both above and underwater, uncovering the positive side to marine resource use and its conservation. Expedition leaders, Michael Markovina and Linda Schonknecht, will share videos, photos, and stories from the expedition route as they film their holistic and objective documentary. For more information please see this website http://www.marine-expedition.co.za/
12:00PM-5:00PM	Conference check-in, poster exhibit setup
Evening event 5:00PM-7:00PM	**Reception** **Casco Bay Hall** Refreshments and light hors d'oeuvres

Tuesday, July 21	Sessions 1 -2 * Indicates key speakers
9:00AM-12:00PM	**Conference plenary commences** **Vermont/New Hampshire Rooms**
	Conference opening and remarks from the chairman **Dennis Hansford, NOAA Fisheries Service, USA**
	Welcome to Portland, Maine **The Honorable Jill C. Duson, Mayor of Portland, Maine**
	Guest speaker- Sustaining Fisheries Through Collaboration **John Annala, Ph.D., Chief Scientific Officer, Gulf of Maine Research Institute**
	Keynote address – Looking Ahead: A Global Approach to Improving Fisheries Science and Enforcement through Observers **Rebecca Lent, Ph.D, Director, Office of International Affairs, NOAA Fisheries Service, USA**
12:00PM	Lunch and Poster Viewing

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1:00PM-3:00PM	***Session 1: What are the different types of monitoring programs available for collection of fisheries information?*** ***Panel leader: Steve Kennelly, New South Wales Department of Primary Industries, Australia***
	Overview of the Namibian Fisheries Monitoring System: the role of the fisheries observer program and the challenges it faces. **Kruger E, Namibia**
	The Scientific Observers Program: as a tool for sustainable management of the marine trawl fishing in Cameroon. **Meke P, Cameroon**
	Inshore small vessel monitoring of cetaceans by observers. **Loveridge C., New Zealand**
	The case for full retention in fisheries: benefits for monitoring. **Kritizer J, USA**
	The integration of commercial groundfish fisheries in British Columbia. **Ackerman B, Canada**
	A shore-based monitoring program in Alaska: catch monitoring and control plans. **Watson J, USA**
	The fully documented fishery using electronic monitoring to improve industry self-reported data. **Dalskov J, Denmark**
	Monitoring tuna transshipments using observers. **Trumble B, USA**
Break	***Canada's Department of Fisheries and Oceans is the sponsor of this afternoon's refreshments.***
3:30PM-5PM	***Session 2: How can fishery monitoring information be standardized and how can data quality be improved?*** ***Panel leader: Charles Gray, New South Wales Department of Primary Industries, Australia***
	Standardized data collection formats: How important are they? **Beerkircher L, USA**
	The data collection regulation of the European Commission. **Stockhausen B, Italy**
	The development of national standards for protected species observers in the US. **Baker K, USA**
	Challenges to data standardization between on-board and alternative platform observation of small vessels. **Passerotti M, USA**
	Introducing e- Monitoring into the mix of AFMAs monitoring options: Insights, benefits and costs **Stanley B, Australia**
	Computer science technology applied to data collection and data management. **Guzman O, Chile**
	Evaluating the reliability of at-sea observer release estimates in British Columbia groundfish trawl fisheries. **Grinnell M, Canada**
5:00PM	Session adjourns
Evening event 6:00PM-8:30PM	**Reception** **Portland Museum of Art** Refreshments, hors d'oeuvres, and music

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Wednesday, July 22	Sessions 3 – 6 * Indicates key speakers
8:30AM-10:00AM	***Session 3: Using fishery monitoring information in assessments and management.*** ***Panel leader: James Nance, National Marine Fisheries Service, USA***
	Use of observer-based surveys in monitoring and assessing environmental conditions imposed on developing fisheries. **Gray C, Australia**
	Sea turtle bycatch in U.S. Mid-Atlantic gillnet gear: characteristics, magnitude, and opportunities for conservation. **Murray K, USA**
	The evolution of a discard policy in Europe. **Borges L, Belgium**
	The Peruvian Anchovy Fishery Observer Program and its role in monitoring interactions with top predators. **Van Oordt F, Peru**
	Fisheries observers and bycatch reduction research. **Benaka L, USA**
	Fisheries observer program in Sierra Leone and its implications for fisheries management. **Bangura AA, Sierra Leone**
	Estimating bycatch and discards from observer data in tropical tuna purse seine fisheries: the case study of silky shark (*Carcharhinus falciformis*) in the Indian Ocean tuna purse seine fishery. **Amande JM, Cote d'Ivoire**
Break	***This morning's coffee break is sponsored by NOAA Fisheries Service.***
10:30AM-12:00PM	***Session 4: How can fishery monitoring information be used to ensure compliance with fisheries regulations?*** ***Panel leader: Mark Showell, Department of Fisheries and Oceans, Canada***
	Northeast Fisheries Observer Program: facing challenges in a changing program. **Wetmore S, USA**
	An introduction of the IATTC Tuna Transshipment Observer Program. (Are we looking at a real solution to a worldwide problem?) **Arceneaux S, USA**
	The accuracy of yelloweye rockfish catch estimates from the British Columbia Groundfish integration project. **Workman G, Canada**
	Observers and the enforcement process. **Walker G*, USA ; Adams M**
	Enforcing observer victim crime. **Lagerwey N, USA**
	Law enforcement concerns in international observer programs. **Dubois T, USA**
	Towards the integration of new technologies based on molecular biology, genetics, chemistry and forensics into a European framework for fisheries monitoring, control and surveillance. **Martinsohn JT, Italy**

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12:00PM	Lunch and Poster Viewing
1:00PM-2:30PM	***Session 5: What factors should be considered when addressing access to fishery monitoring information?*** ***Panel leader: Dennis Hansford, Office of Science and Technology, National Marine Fisheries Service, USA***
	Public access to fishery observer data as a critical component of management. **Fleming R, USA**
	Data sharing and data accessibility in Canada. **Bond S, Canada**
	When it rains it pours – a program's struggle to balance data collection with data dissemination. **Van Atten A, USA**
	A case study in agency implementation of statutes – The confidentiality requirement and associated exceptions under the Magnuson-Stevens Fishery Conservation Act. **Hagg K, USA**
Break	
3:00PM-4:30PM	***Session 6: What are the major factors impacting fisheries observers?*** ***Panel leader: John LaFargue Northwest Fisheries Science Center, National Marine Fisheries Service, USA***
	Minimizing the risk to observers from foreign charter vessels operating in New Zealand's EEZ. **Woods A , New Zealand**
	Description and logistics of the U.S. Gulf of Mexico Reef Fish Observer Program. **Pulver JR, USA**
	Observer safety in the Gulf of Mexico. **Walia M, USA**
	Multi-resistant bacteria: Concerns for observer programs and their field staff. **Gulak SJB, USA**
	Anger management much? Using video dramatizations and hands on drills to desensitize observers with conflict and teach them how to resolve it successfully. **Vieria S, USA**
	Assisting observers in bridging the gap. **Lengares J, USA**
	Observer support mechanisms. **Patten J, Canada**
	The art and science of juggling the increasingly complex observer work load **Donovan C*, USA; Tuttle V**
4:30PM-6:30PM	**Poster Review and Reception at Casco Bay Room**
Optional additional events, fee & pre-registration required	Sunset schooner cruise with the Portland Schooner Company Shopping excursion to Freeport

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Thursday, July 23	Sessions 7 -9 * Indicates key speakers
8:30AM-12:00PM	**Observer Professionalism Workshop** **Oxford-Somerset Room** Concurrent with plenary sessions 7 & 8, the Observer Professionalism Working Group (OPWG) will conduct a workshop exploring observer employment practices from around the world. The theme is *"**Fostering Recruitment and Retention of a Professional, Equitably- Employed Observer Workforce**"*
8:30AM-10:00AM	***Session 7: How can self-reported data by the fishing industry be improved for use in assessments and management?*** ***Panel Leader: Lisa Borges, European Commission, Directorate General for Maritime Affairs and Fisheries, Belgium***
	Fishery management by fishermen for fishermen: The area A crab association taking a leading role. **McElderry H*, Canada ; Scherr J**
	Good communication: the key to reliable results from self sampling. **Quirijns F, Netherlands**
	Ensuring accurate reporting: Examining incentive structure in fisheries management **Chen F*, USA ; Slifka L ; Martens B**
	Fisher-based audit system in the BC Groundfish Fishery. **Fedoruk A, Canada**
	Validation of study fleet data collected through the SMAST study fleet program. **Roman S, USA**
	The representativeness of the reference fleet data and how it is biased by changes in the dynamics of the Norwegian Mackerel Purse Seine Fishery. **Huse I, Norway**
	Comparison of self-reported logbook data with at-sea observations in the recreational headboat fishery in Florida and Alabama. **Sauls B, USA**
	Self Monitoring system An indigenous system developed by Sri Lankan fishermen-a case study in Southern Sri Lanka. **Patabendi P, Sri Lanka**
Break	***The Pacific States Marine Fisheries Commission is the supporter of this morning's coffee break.***
10:30AM-12:00PM	***Session 8: What specific issues are important to the fishing industry regarding fishery monitoring?*** ***Panel leader: Amy Sierra Van Atten, Northeast Fisheries Observer Program, National Marine Fisheries Service, USA***
	After Four Years: A fisherman's experience with the British Columbia Groundfish Integration Pilot Project. **Boyes D, Canada**
	An inaugural case study in groundfish sector monitoring. **Brazer E, USA**
	Development of Fishtrax, a reporting tool designed by fishermen for groundfish sectors. **Giacalone V, USA**
	Importance of safe and sound monitoring programs from a Fishery Management Council member. **Avila R, USA**

	New handling and accounting procedures on deck to reduce halibut mortality rates while improving catch accounting. **Gauvin J, USA**
	Fishermen and the University of the Azores working together to observe the tuna fishery. **Neves E*, (Azores) Portugal; Machete M**
	Developing a monitoring program in the U.S. Atlantic herring fishery. **Tooley MB, USA**
	Benefits of cooperative research as seen by the Gulf Fishermen's Association in Florida. **Ward W, USA**
12:00PM	Lunch and Poster Viewing
1:00PM-3:00PM	***Session 9: What specific issues are important to non-governmental organizations (NGOs) regarding fishery monitoring?*** ***Panel leader: Vicki Cornish, The Ocean Conservancy, USA***
	The Association for Professional Observers (APO): Strengthening fisheries monitoring through advocacy and education, since 1995. **Davis K*, USA , Billings A, Rojas E**
	The application of observer data by NGOs in advancing policies for protected species conservation. **Griffin E, USA**
	Data requirements in Marine Stewardship Council Certification. **Lugar J, Canada**
	Fisheries monitoring in the recreational sector: Challenges and opportunities in the Gulf of Mexico**.** **Robbins C, USA**
	Slippage in the commercial fishing industry. **Baker P, USA**
Break	***NOAA Fisheries Service is the sponsor of this afternoon's refreshments.***
3:30PM-5:00PM	***Session 10: "How can observer capacity be developed and/or expanded?"*** ***Panel Leader: Andrew France, Observer Services, Ministry of Fisheries, New Zealand***
	Capacity building in West Africa. **Turk T, USA**
	Utilizing observers to collect social data about fishermen's well-being. **Westwood A D, USA**
	Fisheries observer program staffing strategies. **Orcutt M, Canada**
	Should I stay or should I go? Observer retention and attrition in the WCGOP. **Shama R, USA**
	Retention of observers in a global market. **Belay B, USA**
Evening event 6:00PM-10:00PM	**Conference Banquet** **Gulf of Maine Research Institute** A Maine lobster bake!

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Friday, July 24	Sessions 11 – 12, and Concluding session * Indicates key speakers
8:30AM-10:00AM	**Session 11*: "What are the monitoring issues with right-based managed fisheries?"*** ***Panel Leader: Teresa Turk, Office of Science and Technology, National Marine Fisheries Service, USA***
	Robust & accurate monitoring is the key to successful catch share management. **Sanderson M, USA**
	No data, no fishery-the crucial role of catch monitoring in providing access to fish resources. **Gislason G, Canada**
	Observers' role in monitoring multi-species individual quota (IQ) programs. **Majewski J, USA**
	How new quota systems aimed at stopping overfishing impact observer programs. **Faunce C, USA**
	Count, cap, and control-a comprehensive approach to managing fisheries mortality. **Brogan G*, USA; Lowell B, Griffin E, Banmann B, Bilsky E**
	Rights based management of European Fisheries. **Parkes G, UK**
	Using fishery observer data in community-based fisheries management. **Billings A, USA**
Break	***This morning's coffee break is supported by Archipelago Marine Research Ltd.***
10:30AM-12:00PM	**Session 12.** ***How can electronic monitoring be used to improve data collection activities?*** ***Panel leader: Howard McElderry, Archipelago Marine Research Ltd, Canada.***
	Electronic monitoring in the Central Gulf of Alaska Rockfish Fishery. **Bonney J, USA**
	Electronic catch monitoring in New England's Groundfish Fishery. **Sanderson M, USA**
	Using electronic monitoring to estimate reef fish catch on bottom longline vessels in the Gulf Of Mexico: a pilot study. **Dyas M, Canada**
	Assessing protected species interactions using electronic monitoring technology -a pilot study in New Zealand Longline Fisheries. **France A, New Zealand**
	A new approach to monitoring protected species interactions with inshore trawl vessels. **Rowe S*, New Zealand; Anderson S, Debski I, Pierre J**
	Summary of the North Pacific Electronic Fisheries Monitoring Workshop, July 2008. **Loefflad M, USA**
12:00PM	Lunch and Poster Viewing
1:00PM-3:00PM	***Concluding Session:*** ***Panel Leader: Dennis Hansford, Conference Chair, Office of Science and Technology, National Marine Fisheries Service, USA*** The Conference Chair and a diverse panel of delegates will offer their perspectives on IFOMC 2009 and Thoughts on the future of the conference. The Session will include audience discussion.
3:00PM	Adjourn Conference

Panel Session Abstracts

Panel Session 1:

What are the different types of monitoring programs available for collection of the fisheries information?

Panel Leader: Steve Kennelly, New South Wales Department of Primary Industries, Australia

Overview of the Namibian fisheries monitoring system: The role of the Fisheries Observer Program and the challenges it faces

Kruger E, Namibia

Before the country's independence, marine resources were exploited with very little benefit to the local Namibians until the point where most stocks reached near depletion levels. With independence in 1990 Namibia gained control over its EEZ which gave right to determine and introduce laws for the conservation and management over the resources in such zone. The realization that the water off the Namibian coast was one of the most productive marine ecosystems in the world influenced fisheries managers to adapt a precautionary approach in the development of the fisheries sector. In order to prevent a situation that is commonly referred to as the "Tragedy of the Commons" it was imperative to put legislation in place to control the harvesting of the resources that would ensure sustainability. Management measures put in place for the protection of the countries marine resources include entry limitation with the requirement for fishing rights, limitations on the volumes to be harvested by TAC's and non-transferable quotas, limiting the number of vessels into the fishery by vessel licenses, controlled fishing effort by limitations and restrictions on certain types of gears, closed areas and fishing seasons. In order to meet government objectives it is important that such measures be effectively monitored and enforced. The contribution of the sector towards the value of total export grew to about 25% by 2007 while the industry provides direct employment to about 14000 Namibians (MFMR 2008). This contribution towards the national economy thus required a rigorous Monitoring Control and Surveillance (MCS) system. The MCS comprises an integrated programme of inspections and patrols at sea and in the air, inspections of all landings in port, real time monitoring of vessel movements and activities by a Vessel Monitoring System (VMS) as well as a Fishery Observer programme managed by the Fisheries Observer Agency. Fisheries observers monitor compliance to legislation onboard vessels as well as collecting scientific data. All commercial fishing vessels in Namibia are required to carry Fisheries Observers. The observer programme in Namibia was started in 1991. The main functions of observers then were to monitor harvesting operations and report on violations. The programme was initially started to create additional employment opportunities for people returning from exile. Poor employment conditions and training prompted authorities to establish the Fisheries Observer Agency. Since the establishment of such organization training is provide to observers to also collect scientific data. While the observer programme in Namibia is contributing positively towards the achievement of government objectives for the fisheries sector it still faces a lot of challenges. Should these be overcome, the contribution of the fisheries sector to the national economy of the country would further increase.

The scientific observers program: As a tool for sustainable management of the marine trawl fishing in Cameroon.

Meke P, Cameroon

Cameroon with almost 17,476,497 inhabitants and a coastal length of 402 km, is the core of intense fishing activities. It is a multi-species fishing region, contributing to 1.7 percent to the GDP (2003). Since the 1970's there has been a constant change in the fishing effort strategy in the fishery where shrimp vessels are dominant, 30 on average against 16 trawlers, targeting the pink shrimp (*Penaeus notialis*) and very recently the tiger shrimp *Penaeus monodon*. The various stocks assessments surveys conducted since 1982 and from 2004, 2005, 2006, 2007, show an overexploitation of the costal resources. Due to economic importance and high value of the target species, depressed catch rates and economic returns are being experienced, which necessitates the need for effective management. Due to the business environment and the decrease of the resource base, most of the vessels in the area buy fishing licenses in two or three countries. Since the early 1990s, due to lack of national investors, the country implemented the so called Time-charter. Moreover, after the Cameroon self ban on exports of shrimp products to Europe Union countries, all the shrimps fished by those vessels are exported fraudulently to neighbour countries, contributing to heavy losses in terms of export taxes estimated at 2 billion cfa f/annum since 2002. The losses in value from lack of landing and declaration of catches was estimated at 15 billion cfa francs per annum for around 1117 million tons of shrimps and 4 billion cfa francs for fish 7500 m. tons (Meke, and Njifonjou, 2007). (Take 1US$=500 cfaF.).The Ministry of Livestocks, Fisheries and Animal industries is responsible of the fishery policy through licensing. However, there have been an increasing number of vessels. No closed season has been decided yet. Economic objectives of the fisheries have

never been considered. Law enforcement, one of the weaknesses of the management has gone through very important changes with the creation of Monitoring Control and Surveillance Brigade in the Department of fisheries and Aquaculture. Since 2006, a vessel monitoring system (VMS), with satellite Argos, is operating and only vessels equipped with transponders/transceivers are allowed to fish. A plan against illegal and unreported fishing (IUU) has been validated. Within the framework of the GEF/UNEP/ 201/project, Cameroon conducted some sea trials on the use of the BRDs and TEDs in the trawl fishery and experienced two years scientific observations on some shrimpers. This contributed in building a knowledge base on by- catches and discards from shrimp trawlers. This paper, examines how effective can be a scientific observer programme in fishing effort data collection, as well as other biological and socio-economic data for a sustainable management of fish resources. In management strategies, the government should make a choice between heavy investment on VMS associated with patrol boats or set up a thorough efficient scientific observer program or a combination of both.

Inshore small vessel monitoring of cetaceans by observers

Loveridge C, New Zealand

In 1986 New Zealand established an observer programme to monitor the activities of large trawlers operating in its exclusive economic zone. Since then observer coverage has increased to approximately 7000 observer days per year. Originally only large deep sea trawlers were observed, now most New Zealand fisheries have been covered at some stage. However, significant coverage in inshore fisheries, (characterized by small vessels, short trips and weather dependence) has been particularly difficult to achieve. Recent observer coverage has been <0.5% of inshore fishing effort (days) rising to >10% for offshore fisheries. In October 2008 the NZ Ministry of Fisheries announced various measures to protect two endemic dolphins, the endangered Hectors and critically endangered Maui. One of these measures was increased monitoring of fishing interactions within the dolphins' range by Ministry observers. Increased coverage in inshore fisheries using the historical model for observer placement would have been prohibitively expensive and impractical. Instead, observers will be placed on individual vessels for 2 months over the summer of 2008/09. These observers will be solely monitoring interactions between fishing operations and Cetaceans. The planned coverage level is 50% for inshore

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fishing effort during summer in identified regions. The observers will be using hand held electronic devices with software designed specifically for this project. The increased monitoring will result in a better understanding of the nature and extent of risks associated with current and proposed fishing management regimes. The project will also increase our knowledge of dolphin life history and population demographics. Should mortalities be observed, carcasses will be returned by the observer for necropsy examinations. The information gathered this summer will contribute to management policies that protect Hectors and Maui dolphin populations while allowing commercial fishing activities to continue with an acceptable level of risk.

The case for full retention in fisheries: benefits for monitoring

Kritizer J, USA

Wasteful discards are a problem in many fisheries worldwide. Sometimes, discarding is a decision by the fisherman. But often discarding is forced upon the fisherman by regulations that limit catch of a given species by trip, by day, or by season. A shift from such input-based controls to output-based management, especially limited access privilege programs (LAPPs) or catch shares, can eliminate the need and incentives for this waste. In fact, a shift to output-based management opens the door to requiring full retention in fisheries, at least of primary target species and perhaps of bycatch species as well. This is a policy that has been recommended by several agencies and organizations, and even implemented in a handful of fisheries across the globe. There are many reasons to move toward full retention in our fisheries, including ethical considerations, fishing efficiency and cost-effectiveness. And, there are important benefits for monitoring as well. Full retention coupled with comprehensive portside monitoring allows 100% of the catch to be documented more carefully and at lower cost. In addition to basic species composition and catch volume data, detailed biological data such as size, age, sex and genetic characteristics can be collected with greater precision, less error, and in greater quantity as observers are freed from the time constraints and distractions of collecting these data at sea. Also, safety risks faced by observers and obstacles that observers present to the crew are alleviated when more data are collected onshore. Of course, a shift toward full retention and greater portside monitoring also presents challenges and limitations. A degree of spatial and temporal resolution in the data can be lost, with the amount depending upon the fishing patterns of the fleet or vessel. There is also a need to ensure that all fish caught are in fact brought to shore. These issues can be addressed through electronic tools such as VMS, cameras and hydraulic monitors that provide coarse records of fishing activity and catch to be characterized in greater detail onshore. Ultimately, there will always be a need for at-sea observers to calibrate and ground-truth the data, but a shift toward full retention fishing and comprehensive portside monitoring can provide numerous environmental, scientific, financial and management benefitsill receive transshipments from longliners. Similar programs are now being rolled out by other Regional Tuna Management Organizations, including the Inter-American Tropical Tuna Commission (IATTC), the Indian Ocean Tuna Commission (IOTC) and the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). This paper describes the unique challenges of setting up an observer program to monitor transshipments from carrier vessels, including deployment and recovery, trip duration, vessel transfers, using observers in a compliance monitoring role and the design of effective monitoring protocols.

The integration of commercial groundfish fisheries in British Columbia

Ackerman B, Canada

The groundfish fishery in British Columbia (BC) is comprised of seven fleets: trawl, halibut, sablefish, outside rockfish, inside rockfish, dogfish and lingcod. Collectively the fleet comprises approximately 1,250 licences with 27 active vessels that engage in about 14,600 days at sea annually. The landed value, defined as the price paid to the commercial harvester, of the groundfish fisheries in 2007 was $133.5M. The groundfish fisheries are complex to say the least. The fleets collectively catch approximately 140 species with 61 of which are managed by a separate total allowable catch (TAC) delineated by species and area. Prior to 2006, the seven primary groundfish fisheries were licensed and managed separately. The fleets employ different gear and fishing methods to target individual groundfish species or groups of groundfish species. Unfortunately, none of the fleets were capable of restricting their harvest to target species, and the resulting harvest of non-directed catch raised significant conservation concerns. In 2006, based on an industry proposal, Fisheries and Oceans Canada approved a pilot program that attempted to integrate the management of the commercial groundfish fisheries. The new arrangements include an inter-fleet reallocation system, full accountability of catch (retained and released) by individual harvesters, wider application of quota management and a comprehensive catch monitoring program. The two key elements of the monitoring program are the use of 100% at-sea monitoring (either by at-sea observer or by electronic monitoring) and 100% dockside monitoring. Harvesters are required to hail in and hail out for each fishing trip and must fill in an integrated groundfish logbook. The logbook requires the harvester to record by set the number of pieces of all fish retained and released. A 10% sample of the fishing events is randomly selected for image interpretation. Viewers identify

the following: retrieval event, all catch by species including whether they were retained or released and size (legal or sublegal). The results of the image interpretation are compared with the catch recorded in the logbook and the level of agreement is examined. The random selection serves as an estimate of the total removals as well as an audit of the logbook data quality. In addition, a comparison between the off-loaded catch by piece to the retained catch that is recorded in the logbook is also examined. Failure of a harvester to meet the standards established results in 100% viewing of the electronic monitoring data collected for that trip. The implementation of the integration program has resulted in improved catch data and reduced wastage of fish. During the three years of the pilot program, no TACs have been exceeded and in fact, there have been many TACs that have been under harvested. In addition, individually accountability of all catch has increased the incentive of harvesters to fish in a sustainable manner. Furthermore, the pilot program has established new institutional arrangements whereby representatives from each of the fleets co-operatively manage the commercial fishery with the Department. Industry commitment and participation in this process was a vital component of the success of the program.

A shore based monitoring progam in Alaska: catch monitoring and control plans

Watson J, USA

Limited access privilege programs increase the burden on fishery managers to provide highly defensible estimates of catch, especially when those estimates directly impact quota holders. NOAA Fisheries in the Alaska Region has dealt with these issues by clearly articulating goals for the management of quota-based fisheries and imposing new and more stringent monitoring as these programs have been developed. This presentation will describe the application, including strengths and weakness, of one of the new monitoring programs: Catch Monitoring and Control Plans (CMCPs). Shoreside processing facilities participating in specified quota programs are required to develop and operate under an approved CMCP. These monitoring plans detail a series of performance based standards that ensure 1) all delivered catch can be effectively monitored by an observer; 2) that the observer can effectively conduct their sampling duties; and 3) that all catch is accurately sorted and weighed by species. CMCPs were not designed to track individual fish throughout the processor nor designed to monitor small quantities of rare bycatch species. Instead, the focus of the performance standards is to monitor the large volume of species such as pollock. CMCPs have been implemented as part of the American Fisheries Act pollock fishery, the Crab Rationalization crab fisheries, and the Rockfish Pilot Program.

The fully documented fishery using electronic monitoring to improve industry self-reported data.

Dalskov J, Denmark

Although the fisheries policy of the European Union is partly formulated in terms of Total Allowable Catches (TAC) it is widely recognized that there is a major discrepancy between the actual outtake of fish stocks and TAC reported landings. This discrepancy is caused by discards, high grading, illegal landings and area misreporting partly due to increasingly complicated and non-transparent regulation. In order to minimize this discrepancy and achieve higher accuracy in the data which forms the basis for fisheries advice, the Danish Government has proposed a new reporting and quota paradigm based on actual catches rather than reported landings. The foundation for this new paradigm is to give the individual vessel operators the responsibility to provide detailed reports of actual catches while verifying these with Electronic Monitoring (EM) in the form of cameras and logging of fishing operations (GPS, hydraulic sensors, etc.). In order to ensure proper incentives for the operators, participation in EM programs is followed by increased quotas. Importantly, these increased fishing possibilities can be allotted without causing further strain on fish stocks due to the reduced discard and elimination of unreported outtake. Finally, an added benefit of the paradigm is that by giving the industry a responsibility in terms of self-reporting, they will experience a much tighter link between their operations and the stock assessment that forms the basis for quota allotment and other fisheries policies. Ending July 2009 the National Institute for Aquatic Resources, Technical University of Denmark has run a test program for six representative commercial Danish fishing vessels in order to demonstrate the feasibility and potential of EM systems. Following this test program what are the lesson learned? What are the most important improvements in data reliability? What changes did the program bring to the fishing patterns of the participating vessels? What is the industry

Monitoring tuna transhipments using observers

Trumble B, USA

The International Commission for the Conservation of Atlantic Tunas, (ICCAT) is the primary organisation responsible for the conservation of tunas and tuna-like species in the Atlantic Ocean and adjacent seas (including the Mediterranean). In 2006, ICCAT expressed grave concern about the existence of organized tuna laundering operations that were handling a significant volume of catch by IUU fishing vessels and transhipping this under the names of legitimate, licensed fishing vessels. To mitigate this problem, ICCAT has agreed to ensure that the transhipment activities of large scale longline vessels in the Convention area are monitored. In November

2006 ICCAT passed Recommendation 06-11 to establish a programme for transhipment. This Recommendation requires that all transhipments of tuna and tuna-like species in the ICCAT Convention area take place in port. However, under certain conditions, ICCAT Members may authorise at-sea transhipment by their own flag vessels (large scale tuna longline fishing vessels (LSTLVs). Chief among these is the monitoring of the transhipments by trained ICCAT observers deployed on board carrier vessels. Since May 2007, observers have been trained and deployed on ICCAT's behalf by a private consortium. The service provider is responsible for recruiting, training and deploying observers onto all the Carrier Vessels operating in the Atlantic that will receive transhipments from longliners. Similar programmes are now being rolled out by other Regional Tuna Management Organisations, including the Inter-American Tropical Tuna Commission (IATTC), the Indian Ocean Tuna Commission (IOTC) and the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). This paper describes the unique challenges of setting up an observer programme to monitor transhipments from carrier vessels, including deployment and recovery, trip duration, vessel transfers, using observers in a compliance monitoring role and the design of effective monitoring protocols.

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Session 2: How can fishery monitoring information be standardized and how can data quality be improved

Panel Leader: Charles Gray
New South Whales Department of Primary Industries, Australia

Standardized data collection formats: How important are they

Beerkircker L, USA

It has become a common theme in the fisheries observer community that national and even international standardized formats (data forms, data units, coding systems, etc.) for observer programs are sorely needed. Proponents of standardization cite benefits such as increased utility to a larger number of data end users, decreased costs when training observers who have previously worked for another observer program, and increased mobility of observers between programs. While standardized formats certainly should be developed for use by start-up observer programs, the need to convert existing programs to standardized criteria is less of a settled argument. In this presentation we will closely examine the supposed benefits of standardization and deconstruct in detail the implications of implementing standardized schemes. For example, converting data into a standardized format that is agreed upon by all data users does not necessarily require a front-end fix (i.e. the observers and the observer programs themselves); rather it could be done using a back end fix (i.e. data conversion programs). The time and funding required to create conversion programs cannot be looked upon as a reason to move toward standardization, because even if front-end standardization is adopted these conversion programs will be needed anyway to convert existing legacy data to the new format. Similar conversion issues can be highlighted for the other benefits of standardization. Observer programs, and those who fund them, need to closely weigh the true costs of conversion to standardized formats versus the actual benefits before making decisions to implement standardization. Moreover, observer programs need to consider their primary objectives (which are generally regional and specific in nature), whether or not they are meeting those objectives, and whether changing to standardized formats would negatively impact their primary objectives, before implementing standardization. In summary, the United Nations, a diverse organization devoted to world peace, finds it possible to exist by transacting business in various languages and even alphabets. Surely if world peace does not require speaking the same language, counting fish must not?

The data collection regulation of the European Commission

Stockhausen B, Italy

The Data Collection Regulation (DCR) of the European Commission (EC) was implemented in 2001. Its purpose was to collect biological and economic data relating to fisheries targeted by fishing fleets belonging to EU Member States (MS). Although it was a good first attempt to collect the relevant data necessary to improve EU fisheries management, it has been widely recognized for some time that issues exist in relation to the quality of the data and the differing data collection methodologies employed by the Member States. Thus, in 2005, the EC started a consultation process to develop a new, improved regulation that would better assist fisheries management decision making; the Data Collection Framework (DCF). In force since the beginning of 2009, the new framework includes several changes. The talk will highlight: differences between the old regulation and the new one, the methodological problems encountered by MS when compiling DCR data, and possible improvements in fisheries management decision making at EU level.

Panel Session Abstracts

The development of national standards for protected species observers in the U.S.

Baker K, USA

The use of protected species observers (PSOs) is a common mitigation practice both in the U.S. and internationally to protect marine species from unintentional harm or harassment. Many commonly occurring activities that may adversely affect protected species are required to utilize PSOs to minimize the potential take of these species, and to collect data during the activity. Requirements for PSOs are typically issued by the National Marine Fisheries Service under the authorities of the Marine Mammal Protection Act and Endangered Species Act. When implementing NMFS mitigation requirements under these statures, a lead federal agency directly monitors or provides oversight in ensuring monitoring and mitigation measures are properly carried out for activities under their jurisdiction. Data collected by observers during these activities can provide reliable information to improve the information base for NMFS to monitor the effectiveness of mitigation, improve protocols, and identify data collection needs for future activities. Currently, PSO requirements can vary considerably between project type, geographic region, and individual companies providing observer services; thus, standardization of observer requirements will reduce potential conflicts of interest and promote consistency that will greatly improve the effectiveness and management of the PSO program. Recognizing a need for a more standardized and independent approach to observer hiring, training, and performance standards for non-fisheries activities, a Protected Species Observer Working Group (PSOWG) was formed in 2008 to discuss the development of standards for a national PSO program. The group has been considering PSO needs nationally, and particular attention was given to the large observer program that currently exists for seismic occurring in the U.S. EEZ, which is being used as the model activity upon which to develop the program. Consequently, NMFS has cooperatively discussing the development of the PSO program with the Minerals Management Service, the lead federal agency with federal oversight of oil and gas activities on the Outer Continental Shelf. The PSOWG intends to complete a report in 2009 that will recommend national PSO standards to be implemented for many core observer issues. The implementation of national standards for training, observer qualifications, safety, data collection, data management, and reducing conflicts of interest are core issues of the PSO program. The PSO model identifies the roles and responsibilities of stakeholders involved and outlines training and eligibility requirements in regard to these core issues. Some challenges to implementing a PSO program include identifying the associated PSO program administration costs, the establishment of a central data repository within NOAA, developing new training resources, and identifying any regulatory requirements that may be required.

Challenges to data standardization between on-board and alternative platform observation.

Passerotti M, USA

The gillnet fishery in the southeastern US is primarily made up of small vessels (~ 20-40 ft in length), many of which frequently change gear type and target species to follow species abundance patterns or fishery closures. Because of their small size, varying gear set-up and vessel layout may preclude fisheries observers from safely observing fishing operations while on-board. Additionally, some vessels may not have space for observer safety, sampling, or protected resources gear, further complicating efforts to cover them. Data collection from this fishery is of high importance, however, not only for quantification of catch and bycatch but also for protected resources monitoring. One possible way to overcome these issues is the use of an alternative platform for observing, namely a small outboard vessel operated by the observer. Inherent problems exist, however, in standardizing data collection between the on-board and alternative platform methods. Species identification, number of fish caught, and disposition and number of discarded fish can be difficult to obtain due to the distance required to avoid obstruction of fishing activity. Additionally, neither direct measurements nor biological samples can be taken unless the fishing vessel is boarded, and even then only kept fish are likely to be available for measurement. Finally, guidelines for observer safety must be created to address the hazards involved with small vessel operation by fisheries observers. Finding solutions to these problems will greatly enhance the ability of observer programs to gather valuable data from small vessels, for which observation has been largely absent in the past.

Introducing e-Monitoring into the mix of AFMAs monitoring options:- Insights Benefits and Costs

Stanley B, Australia

When considering e-Monitoring and its worth in the matrix of options for the monitoring of fisheries AFMA decided upon a staged approach. The stages included a proof of concept stage where we identified and trialled the systems to determine the capability of the systems, their relative strengths and weakness against the other monitoring options. The proof of concept stage also allowed us to showcase the technology to the fishing industry. The interest and support from industry was encouraging and they indicated a preference to progress e-Monitoring further. The second stage was to undertake a cost benefit study that benchmarked e-

Monitoring costs against the costs of existing observer programmes. This study identified a number of different thresholds in a range of fisheries where e-Monitoring would be cost effective when compared to observers. The third stage was to bring together and model all the monitoring options such that we had a detailed understanding of the strengths, weakness, flexibility, extendibility and costs of each of the monitoring options. The presentation will outline the key features and elements in the costs and capabilities of the monitoring options that AFMA has identified as preferable as it moves to going operational with an all of fleet e-Monitoring system in the Eastern Tuna and Billfish Fishery.

Computer science technology applied to data collection and data management

Guzman O, Chile

IFOP, as non profit marine research institute has the mission to provide to the Under Secretariat of Fisheries in Chile, the technical information and scientific basis for the regulation of Chilean Fisheries. For this purpose it has 150 Scientific Observers distributed throughout the Chilean coast. With the intention to improve the process of data production, a group of scientists has developed a new computer science system for data collection, data management, and automatic publication of fishing and biological indicators in Web Page. The system allows us to collect data of: fishing trips; captures and species composition; length distribution and biological variables. For this is being carried out the following process: collection of data in Pocket PC with first level data validation; data transmission in XML format; form Pocket PC (PPC) to Transition and Correction Data Base (TCDB); through cellular, satellite telephone, or by Internet; reception of data in TCDB; report in real time of data transmission delay form PPC to TCDB; visualization of data transmitted from PPC for second level data validation and management; third level data validation using 130 verification criteria; automatic system for calculation of fishing and biological indicators; publication of fishing and biological indicators in Web Page. This allow to scientists to have validated data, 10 days from the moment the data is collected by the Scientific Observers. Besides it permits to have an efficient and opportune system for data management, to reduce data errors and to improve data collecting effort capacity.

Evaluating the reliability of at-sea observer release estimates in British Columbia groundfish trawl fisheries

Grinnell M, Canada

Commercial fishing is an inherently dangerous profession, as repeatedly found by the United States' Department of Labor. While many recognize the dangers of working in northern temperate waters, such as the North Atlantic or the Bering Sea, there may be a complacency regarding safety in the Gulf of Mexico (GOM). This could be due to numerous factors such as: warmer waters, lack of survival suit requirements and the predominantly smaller size of vessels that have no head facilities on board. In order to complete their duties and come home safely, observers must be prepared and knowledgeable about fishing fatalities. Using figures from the United States Coast Guard, fishing vessel loss and fatalities were reviewed in the GOM versus other designated districts from 1992-2007. During this time period, the GOM ranked second highest in numbers of lost fishing vessels and fatalities. Water exposure was the highest cause of death overall. Of the 934 documented deaths, 23% were due to man-overboard incidents. The GOM has had the highest rate of falls overboard throughout the stated time period, accounting for 35% of total falls overboard. The GOM is the only district to report falls overboard every year, which should cause concern for personal safety. When going out on deck, one should inform others before going out and staying away from gunwales as a simple precaution to avoid an incident. The need to be diligent at all times is necessary for an observer during their deployment. Proper use of standard issued safety equipment, such as a PFD and survival suit, are essential in helping an observer complete their duties properly and safely.

Session 3: Using fishery monitoring information in assessments and management

Panel Leader: James Nance, National Marine Fisheries Service, USA

Use of observer-based surveys in monitoring and assessing environmental conditions imposed on developing fisheries

Gray C, Australia

Strict environmental conditions often regulate the development of new fisheries. Conditions imposed often include defined limits on the composition and quantities of targeted catch, by-catch (by-product) and discards, habitat interactions, interactions with rare and threatened species and ecosystem impacts. Observer-based surveys can be used to monitor and assess new fisheries in accordance with environmental conditions and to assist the development of longer term management plans for sustainable fisheries. Two examples are provided from eastern Australia where observer-based programs are being used in the development of new small-scale fisheries: (1) a coastal line fishery for sandbar sharks and (2) an estuarine seine fishery for penaeid prawns. The initial management strategy for each fishery mandates that observers, port monitors and fishers collect vital information to assist environmental assessments. A synopsis of the rationale and logistics of each program, industry and management involvement, preliminary results and on-going developments is provided.

Sea turtle bycatch in U.S. Mid Atlantic gillnet gear: characteristics, magnitude, and opportunities

Murray K, USA

From 1995-2006, Federal fisheries observers deployed aboard commercial fishing vessels in the U.S. Mid-Atlantic region reported a total of 41 loggerhead, 5 green, 5 leatherback, 8 Kemp's ridley, and 13 unidentified turtles incidentally caught in gillnet gear. Data collected by these observers were used to characterize sea turtle bycatch in sink gillnet gear, including the temporal and spatial distribution, fishing characteristics, species composition, and sizes of turtles captured. In addition, these data were used to develop a Generalized Additive Model to evaluate and predict bycatch rates of sea turtles. These rates were applied to commercial gillnet fishing effort over the same time period to estimate total bycatch of loggerheads in sink gillnet gear. Total bycatch of other turtles was not estimated due to the small number of observed takes.

Loggerhead captures occurred from south of Cape Cod (41° N) to North Carolina (34° N) in all months except January, in depths ranging between 1.8 and 76.8 m (mean = 28.0 m), and in surface water temperatures (SSTs) ranging between 8.6 and 27.8°C (mean = 17.2° C). Bycatch of green and Kemp's ridley turtles occurred south of 36°N from March through December in waters 2-38 m deep, in SSTs between 12.2 and 26.9°C. Bycatch of leatherbacks occurred north of 39°N from July to December, in waters 18-68 m deep and at SSTs between 12.2 and 21.1°C. Mesh sizes of nets capturing loggerheads ranged between 7.6 and 30.5 cm, with most (n = 25) of the observed captures in 30.5 cm nets targeting monkfish. Bycatches of other turtle species occurred in nets having mesh sizes between 3.3 and 30.5 cm.

Sizes (curved carapace length [CCL] from notch to tip) of the observed loggerheads ranged between 52 and 101 cm (n = 12 turtles, mean = 65.3 cm). Sizes of the observed Kemp's ridleys ranged between ~28 and 44cm, and the size range of observed green turtles was between ~28 and 38cm. Observers did not measure any of the observed leatherbacks. Turtles were captured alive (52%), dead (40%), and in unknown condition (8%) when observers could not adequately see the turtle.

Predicted bycatch rates on commercial gillnet trips ranged between 0.0 and 5.2 loggerheads/ton landed. Higher bycatch rates occurred in southerly latitudes, and increased with increases in SST and mesh size. From 1995-2006, the average annual bycatch estimate of loggerheads was 350 turtles (C.V.= 0.20, 95% CI over the 12-year period: 234-504).

This study contributes information on the magnitude, species, mortality levels, and size classes of sea turtle bycatch in Mid-Atlantic sink gillnet gear to help improve future population-level assessments of loggerhead sea turtles. It also characterizes the distribution of commercial trips with high predicted bycatch rates to help focus the times, areas, and mesh sizes considered in conservation measures. This study identifies mesh sizes and times and areas for consideration for conservation measures, in addition to those already enacted in the Mid-Atlantic region.

Panel Session Abstracts

The evolution of discard policy in Europe

Borges L, Belgium

The European Commission, as the executive body of the European Union, has the mandate of proposing future policies in fisheries management. In European waters the practice of discarding part of the catch at sea is presently legal, and in some circumstances compulsory. However, discards have become more important in the public eye, increasing pressure for the EC to propose measures to, if not banned altogether, to at least reduce discards significantly. Since 2006 specific EC initiatives were taken to consult stakeholders in order to shape a future discard policy. The proposal that followed was based on a progressive reduction of discards by fishery, where specific discard reduction targets were set over a period of time. However, an international incident increased public awareness on discards and, together with the slow pace of implementation of the above approach, significantly increased the political pressure for the EC to deal quickly with this issue. At the same time, some Member States argued for increases in Total Allowable Catches in order to decrease discards of commercially sized species. These events resulted in a rethink of the future discard policy, but more importantly it highlighted the difficulty of protecting a unique strong year class of stocks under severe fishing pressure and in poor state. The issues associated to the new discard policy in data quality, control and enforcement and its effectiveness in protecting a strong year class are presented and discussed in this paper.

The Peruvian Anchovy Fishery Observer Program and its role in monitoring interactions with top predators

Van Oordt F, Peru

The Logbook and Onboard Observer Program (LOOP) monitors the Peruvian Anchovy Industrial Fishery by placing observers on the industrial purse seine fleet and gathering information on fishing effort, biology and interactions with other species. This industrial purse-seine fleet operates along the Peruvian coast from 0.5 to 105 nautical miles from northern Peru at 3º S to 18º S, comprising the Northern Humboldt Current System. Since 1996, observers have been trained to record the presence of top predators during the fishing operations. At first the program recorded interactions only with marine mammals, then incorporated seabirds and later sea turtles. Interactions with those species are of great importance for conservation due to their role in ecosystems and their decreasing population levels in some systems. Peruvian anchovy is the key species in the Humboldt Current System and supports most of the predators present. Many of these predators are protected or endangered species and their interaction with fisheries resulting in mortality are of utmost importance. These anchovy fisheries data represent a unique source of information that puts together the occurrence of predators and prey information for a large fleet that covers areas and times otherwise unobserved by researchers, and are thus an excellent platform for much scientific work and research.

Fisheries observers and bycatch reduction research

Benaka L, USA

This presentation briefly describes NMFS's Bycatch Reduction Engineering Program and then provides examples of how fisheries observers provide critical contributions to bycatch reduction research in New England. Specifically, this presentation highlights contributions of fisheries observers to the success of a project to test the ability of experimental gillnets to reduce marine mammal-fishery interactions. This presentation also highlights the contributions of fisheries observers to the success of a project to test experimental scallop dredges to reduce sea turtle-fishery interactions. Finally, this presentation describes how the need for fisheries observers is factored into long-term planning and budgeting efforts for the Bycatch Reduction Engineering Program.

Fisheries Observer Program in Sierra Leone and its implications for fisheries management

Bangura AA, Sierra Leone

Sierra Leone has abundant fishery resources. Current data suggest a standing stock of nearly 300,000 metric tons, pelagic fish constituting about 90% of the estimated biomass. Commercial fisheries production is estimated at 130,000 metric tons, with the clupeids constituting over 75%. Sierra Leone currently operates about 45 industrial fishing vessels. About 55% of these are shrimp trawlers, 16% are tuna longliners and 29% are demersal finfish trawlers. The decline in the Sierra Leone industrial fishing fleet is as a result of a prolonged war, and inadequate surveillance capability. The Ministry of Fisheries and Marine Resources is responsible for the management of fisheries. This paper tries to evaluate the status of the observer program in Sierra Leone, by looking at existing fisheries regulations, observer data collection methods using fisheries log books, and commercial data analysis using the surplus production model. The quality of shrimp data was evaluated using the biomass dynamics model (BIODYN) with environmental effects, implemented in an excel spreadsheet using the solver routine. Investigations show that the legal framework for fisheries management in Sierra Leone is the 1994 Fisheries Management and Development Act complemented by the 1995 Fisheries

Regulations, and the fishery products regulations in 2007. The assessment of commercial fisheries heavily relies on data collected by Fisheries Observers. The fisheries regulations stipulates that all licensed industrial fishing vessels should carry Fisheries Observers onboard and they should be allowed to record statistics of fish catch and effort. Information on fishing days, number of hauls, and fishing position is put into a specially designed logbook. As means of verification, these data are also transmitted by radio to the office on a daily basis and further checked during transhipments in the Port of Freetown. Other important information recorded includes total discards and fishing positions, and bycatch of endangered marine megafauna such as sea turtles. Current average level of sea turtle bycatch in the industrial shrimp and demersal trawl fishery is over 10 turtles per vessel per month. Observers also enforce mesh size regulations, biological control measures such as the no-take regulation for berried lobsters, and area limitations such as the Inshore Exclusion Zone. Fisheries Observers also serve as first sanitary Officers onboard fishing vessels, to enforce auto control measures for general hygiene situations and onboard handling and storage of fish. The current Fisheries Observer Program covers the shrimp and demersal finfish fishery only. There are about 85 Fisheries Observers, only about 10% of this number is paid by Government, the rest are paid by fishing companies. The industrial shrimp fishery is covered 100% by the observer program, demersal finfish fishery is covered by 100%, and the tuna fishery, mainly the longliners is covered by only 1%. Observed species include *Katsuwonus pelamis* (skip jack tuna), *Euthynnus alletteratus* (little tunny), *Thunnus albacores* (yellowfin tuna), *Thunnus thynnus* (bluefin tuna), and *Sarda sarda* (atlantic bonita). Although Sierra Leone is willing to cooperate with ICCAT conservation and management measures, the non availability of the observer program will limit cooperation. This will have negative fisheries management implications. A major constraint for shrimp data collection is the difficulty in the identification of the different species of shrimp. There is still a large quantity of shrimp categorized as Penaeidae because the observers cannot identify species beyond color characteristics. This had an implication on the current assessment of shrimp stock using the biomass dynamics model. Previous assessment for the pink shrimp (*Penaeus notialis*) in 2007 suggested that the stock of *Penaeus notialis* was moderately exploited, while the 2008 model did not fit well to the data. It was discovered that the landings used previously from 1991 to 2003 was reported for all species of shrimp, and extrapolations made in 2008 to account for a large quantity of unidentified shrimp usually referred to as Penaeidae, using an assumption from experience that 60% of the Penaed shrimp in Sierra Leone is *Penaeus notialis* cannot be very reliable. This underlines the importance of accurate observer data collection. The inadequate observer coverage and limited capacity for data collection in the industrial fisheries is undermining fisheries management in Sierra Leone

Estimating by-catch and discards from observer data in tropical tuna purse-seine fisheries: the case study of silky shark (Carcharhinus falciformis) in the Indian Ocean tuna purse-seine fishery

Amande JM, Cote d' Ivoire

Since their introduction in the early-1980s in the Indian Ocean, the importance of the purse seiners in the skipjack Katsuwonus pelamis, yellowfin Thunnus albacares and bigeye Thunnus obsesus tuna fisheries has constantly increased to reach about 250,000 t in the recent years. More than 50 non-targeted marine species including billfishes, selaceans, turtles, cetaceans, and several finfishes can be taken as incidental bycatch in the tuna purse-seine fisheries of the Indian. By-catch are either discarded at sea because they have no commercial value, retained aboard fishing vessels for consumption by the fishing crew, or sometimes sold on local fish markets because they can not be processed by tuna canneries. A large dataset of about 5,000 observations collected through several observer programs conducted since the mid-1980s aboard Soviet and European tuna purse seiners was used to estimate silky shark (Carcharhinus falciformis) by-catch and discards in the Western Indian Ocean. Such data display many zeros and typical long-tailed distributions and therefore require appropriate statistical methods. A zero-inflated negative binomial (ZINB) regression model was fitted to the data with Bayesian methods to identify the major factors affecting silky shark by-catch and extrapolate the results to the entire fishery. Results showed that silky sharks were mainly caught under fishing aggregating devices while free school-associated fishing generated very few ones. There was a strong spatial and seasonal variability in silky shark by-catch and significant differences between fishing fleets. The extrapolation of our results to the entire fishery is discussed relative to the particular distribution of by-catch data, the sampling design and associated coverage rate. Our analysis provides useful insights to understand the effects of fishing in open-sea ecosystems and could help to move progressively toward an ecosystem approach to fisheries.

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Session 4 : How can fishery monitoring information be used to ensure compliance with fisheries regulations?

Panel leader: Mark Showell, Department of Fisheries and Oceans, Canada

Northeast Fisheries Observer Program: facing challenges in a changing program

Wetmore S, USA

The Northeast Fisheries Observer Program (NEFOP), traditionally a science-based program, has historically provided fish and protected species bycatch data for use in stock assessment analyses. Over the past several years the program has expanded to include an in-season quota monitoring data collection component. This transition, including development of an Industry Funded Scallop Observer program, has had significant impacts on Northeast fisheries observers, and the program in general. We investigated several years of observer data and observer performance and describe the influences of regulatory and program complexities and their effects on training, retention, data quality, and overall achievement of program goals.

An introduction of the IATTC Tuna Transshipment Observer Program. (Are we looking at a real solution to a worldwide problem?)

Arceneaux S*, USA
Adams M, USA

In June 2008 at the 78th meeting of the Inter-American Tropical Tuna Commission (IATTC) a resolution was passed to establish a program to monitor transhipment activities: Resolution C-08-02 Resolution on Establishing a Program for Transhipments by Large-Scale Fishing Vessels. This resolution replaces the earlier C-06-04. The resolution comes into force on January 1st, 2009 and applies to all carrier vessels of each IATTC party and cooperating non-party that tranship at sea. The formative concerns are outlined in the preamble, and included below: Taking account of the need to combat illegal, unregulated and unreported (IUU) fishing activities because they undermine the effectiveness of the conservation and management measured already adopted by the IATTC; Expressing grave concern that organized tuna laundering operations have been conducted, and a significant amount of catches by IUU tuna longline fishing vessels have been transhipped under the name of duly licensed vessel; In view therefore of the need to ensure the monitoring of the transhipment activities by large-scale longline vessels in the Convention Area, including the control of their landings; the IATTC transhipment observer program is based on the Regional Observer Program (ROP) of the International Commission for the Conservation of Atlantic Tunas (ICCAT). The Pacific Islands Regional Observer Program of NOAA Fisheries Service in Honolulu, Hawaii hosted the training. Using ICCAT's pre-existing ROP as the model for the IATTC's program (and the IOTC), is a step towards implementing a consistent standard. Transhipment observers would be able to be deployed wherever the need in whichever oceanic region. MRAG accessed a pool of trained observers with experience in identifying tunas caught in pelagic longline operations. The PIRO observer training staff had access to two subject matter experts in the area of tuna transhipment, Ebol Rojas and Ethan Browne.

The accuracy of yelloweye rockfish catch estimates from British Columbia Groundfish Integration Project.

Workman G, Canada

The British Columbia fishing industry and the Department of Fisheries and Oceans Canada introduced 100% monitoring of the commercial groundfish hook-and line fisheries in April 2006. The monitoring system was introduced as part of a three year pilot integration project. Among other elements, the system includes cameras and GPS-linked winch sensors mounted on all boats, 100% dockside monitoring of piece counts and weights, and 100% retention of all rockfish. Using catches of yelloweye rockfish as an example, this study examines the accuracy of the catch estimates produced by the monitoring program from April 2007-March 2008. The monitoring provides two separate official estimates of total catch in pieces (retained and discarded) by adding the catches for all trips as recorded in either the fisher logs or validated during dockside monitoring. We derived a third and independent catch estimate from the data output of the random review of the video footage. This review process randomly selects 10% of the events from each trip and enumerates the catch of each species in these events. Originally intended as an audit check on the veracity of the fisher logs, the review data can be used to provide an unbiased estimate of mean and the variance of catch per event which can then be expanded to total catch since the total number of event sis known. Since the data are collected at the moment of capture, unlike the official estimates from fisher logs or dockside monitoring, the video-based estimate is unaffected by misreporting of discards or dumping. Fortunately, the analysis indicated close agreement among the three estimates. This allows managers and industry to assume that the official

estimates, which are essential for the day-to-day accounting in the fishery, provide reasonable estimates of catch and that there is negligible unreported discarding and dumping overall. The video-based estimate provides an unbiased catch estimate, rare in fisheries monitoring, which can capture the extent to which official catch accounting systems might be biased.

The observer's role has both a scientific and enforcement function

Walker G*, USA
Adams M, USA

The focus of his presentation is on three topic areas: (1) the evolution that I have witnessed in Alaska regarding the way that observers are *perceived* by the Agency and by the monitored fleets; (2) the current cooperation between the North Pacific Groundfish Observer Program (NPGOP), the Office of Enforcement and NOAA General Counsel, and; (3) the latest issue of protecting the confidentiality of observer data. These three topic areas provide a "past, present and future" perspective of some issues associated with the observer's role as both a scientific and enforcement function. If I have any piece of advice to pass to observers and developing observer programs it would be to not run from the fact that it is impossible to separate the observers' scientific observations from observations that might form the basis for an enforcement action. Rather, observer programs need to acknowledge and plan from their inception that the observer's role has intrinsically both a scientific and an enforcement function.

Enforcing observer victim crime

Lagerway N, USA

There have been several harassment, sexual harassment, and/or assault cases on observers in Federal fisheries off Alaska over the past few years, some resulting in jail time. Observer victim crimes have occurred in many forms such as harassment, sexual harassment, assault, interference with duties, tampering with equipment & personal effects, sample bias, and requiring observers to perform crew duties. Such cases are investigated by the Alaska Enforcement Division of NOAA Enforcement (AKD) under Magnuson Act or MMPA authority. Harassment of fisheries observers during deployments on fishing vessels and in shore side processors is a phenomenon that can have widely varying effects on an individual ranging from little affect to severe personal trauma. Fishery managers, personnel managers, and budget planners need to consider the tangible and intangible costs of this issue in implementing their programs. Careers can be cut-short by the physical and psychological damage to a victim. Severe penalties can be levied on vessel owners & operators, in addition to jail sentences imposed on defendants. Finally, crucial data collection planned for all or part of a deployment can be lost or compromised with great detriment to in-season management and scientific programs. In 2007, there were 688 individual observers certified by the North Pacific Groundfish Observer Program (NPGOP) who worked 36,761 days on vessels and in processing plants in Alaska. For the past several years, AKD has dedicated law enforcement support to NPGOP to reduce observer victim crime and mitigate its impact. This support has been in the form of investigation, prosecution, victim support, partnerships, education & outreach. Following the principles of Community Oriented Policing & Problems Solving

(COPPS), partners and stakeholders are educated on observers' role and prevention of misconduct towards observers. This partnership addresses the issue for the Alaska region. The intent of this presentation is to showcase this partnership, its lessons learned, and its future, with the hope it can serve as an example to other RFMO's for minimizing the negative impact of observer harassment to their personnel and in their program planning.

Law enforcement concerns in international observer programs

Dubois T, USA

Regional Fishery Management Organizations (RFMOs) require high quality, unbiased observer data to conduct stock assessments and make appropriate fishery management decisions. The NOAA Offices of Law Enforcement and General Counsel for Enforcement and Litigation (Enforcement) play a critical role in the development of the U.S. position on the international observer schemes at the RFMOs to which the United States is a party. In this capacity, Enforcement has been advocating for the adoption of provisions that provide for the safety of observers, protect data integrity, and ensure that observers are not prevented from carrying out their duties. As has been the case with many domestic observer programs, many international observer programs have struggled with balancing their scientific data collection and compliance monitoring roles. At the same time, RFMOs have increasingly begun to adopt conservation measures (e.g., bycatch mitigation measures, move-on rules, etc.) for which compliance can only be effectively monitored through the use of observers. This increasing reliance on observer data to meet a myriad of science, management and compliance needs creates incentives to circumvent the observer and introduce sample bias (e.g., through mechanical or physical pre-sorting) or otherwise impede an observer's ability to carry out his/her duties (e.g., through harassment, interference, etc.) and emphasizes the importance of including a law enforcement perspective when designing international observer schemes. Regardless of the overall compliance role of observers in any given observer program, law enforcement

personnel must be allowed access to observer data. Through the involvement of law enforcement and legal counsel in the development of international observer schemes, instruments can be drafted that support the intent and goals of the observer program and fishery managers while providing adequate protections for observers and for the integrity of the data that they collect. The recent amendments to the Scheme of Scientific Observation adopted by the Commission on the Conservation of Antarctic Living Marine Resources (CCAMLR) reflect a trend towards modernizing international observer schemes by increasing accountability for both vessels and observers and recognizing the role of observer data in compliance monitoring. The increasing importance of partnerships between observer programs and law enforcement in the RFMO context would benefit from a dedicated workshop on "Legal issues in Observer Programs" at a future International Fisheries Observer Conference. Workshop topics could include domestic and international law, international fisheries treaties, privacy laws, confidentiality of observer collected data, legal uses of observer data, consequences of observer involvement in court proceedings, development of sampling protocols that support compliance measures, evidentiary uses of observer information and protection of observers at sea.

Towards the integration of new technologies based on molecular biology, genetics, chemistry and forensics into a European framework for fisheries monitoring, control and surveillance

Martinsohn JT, Italy

Monitoring, Control and Surveillance (MCS) are inherent to sustainable fisheries and constitute a key component of the European Union (EU) Common Fisheries Policy (CFP). Moreover the implementation of rules underlying fisheries management schemes rely on efficient means to guarantee enforcement in the case of non-compliance. The importance of efficient MCS schemes is highlighted by the issue of Illegal, Unreported and Unregulated (IUU) fishing. IUU fishing is a global problem, posing a severe threat to marine ecosystems and having a grim impact on sustainable world fisheries. The magnitude of IUU fishing is exemplified by its value amounting worldwide to an estimated 10-20 billion annually, which is more than twice the value of total landings by the EU fleet. While MCS of fishing activities by remote sensing technologies is well established and anchored in the EU legislation, a corresponding EU-wide infrastructure based on new technologies derived from the fields of molecular biology, genetics, chemistry and forensics, in support of MCS, is not available. Such technologies are ideally suited to fight illegal fishing activities and to support sustainability, fairness and transparency in the fisheries sector. Moreover they are highly valuable for traceability systems; ensuring species and origin verification of fish throughout the food supply chain (fish to fork). We argue that the current rapid progress in research and technology development (RTD), particularly in the field of molecular biology, provides a major opportunity for a transfer approach of new technologies to MCS applications. This was also emphasized in a recent proposal brought forward by the European Commission for a CFP control scheme reform [1]. In this presentation, potential and value of new technologies for MCS will be summarized and put into the context of fisheries MCS. The focus will be on species identification and origin assignment of fish. By depicting examples, it will be demonstrated that in many cases new technologies have already been successfully applied for MCS purposes, often as a result of fruitful collaborations between governmental control bodies and academic institutions. Also numerous international initiatives, such as FishBol, FishTrace and FishPopTrace do provide support to MCS based on new technologies. We argue however that to take full advantage of already existing resources, and to successfully integrate new technologies into an elaborate and coherent EU or international MCS framework, cooperation between all relevant stakeholders such as RTD consortia, regulation and control bodies as well as international organisations has to be established. As part of this strategy we would like to make use of the forum provided by the IFOM conference, to expose our ideas, and to discuss comments and suggestions together with the attending audience.

Panel Session Abstracts

Session 5 : What factors should be considered when addressing access to fishery monitoring information?

Panel Leader: Dennis Hansford, Office of Science and Technology, National Marine Fisheries Service, USA.

Public access to fishery observer data as a critical component of management.

Fleming R , USA

Federal fisheries resources are public resources. The public has a right to know how its resources are being managed and to participate in management decisions. The availability of fisheries data is critical to effective participation and sound management. Inclusion of new language on fishery observer data confidentiality in the Magnuson-Stevens Reauthorization Act (MSRA) may create long-term management problems, depending upon the nature of the implementing regulations crafted by NOAA Fisheries. In the absence of such regulations, this language has already created serious short-term problems for stakeholders because NOAA Fisheries apparently placed a freeze on data releases. While some data has recently begun to be made available again, that data is aggregated in a why which severely limits the ability of stakeholders to participate in the management process effectively. A compelling example of these problems may be found in New England and will be illustrated and explored. In November 2007 the New England Fishery Management Council (NEFMC) undertook a re-examination and overhaul of the monitoring system in the Atlantic herring fishery. Shortly thereafter and also in November 2007, the Cape Cod Commercial Hook Fishermen's Association (CCCHFA), a long-time participant in this management plan, requested comprehensive observer data in order to undertake analyses of the existing program as a necessary precursor to designing new measures. NOAA Fisheries initially approved the data request, but subsequently rescinded approval prior to delivery of the data. The agency finally delivered limited data in January 2009. In the meantime, significant work had been done on the new monitoring package and stakeholders like CCCHFA have had to rely on internal analyses by NOAA Fisheries which are valuable, but also incomplete relative to those CCCHFA would undertake. We recommend that NOAA Fisheries take the following steps: 1) recognize that the data is in large part paid for with public funds and that making it publicly available is critical to good management, 2) if not already done, lift the freeze on data releases and expeditiously process data requests so that stakeholders can effectively participate in management processes, 3) make the deliberations over new confidentiality regulations transparent and subject to a definite timeline, and 4) recognize that any data which will not be made public must be subject to rigorous outside auditing in some fashion including audits with specifications designed by the public.

Access to and storage of confidential fishery monitoring information

Bond S, Canada

In 2001 Science managers in the Department of Fisheries and Oceans Canada (DFO) approved the Management Policy for Scientific Data developed by the National Science Data Management Committee. Scientific data are a valuable national resource that has been acquired through decades of investment. One of the basic principles of the Policy is to obtain maximum benefit to DFO and the user community at large, scientific data must be made available in a timely manner with full and open access. DFO recognizes that 1) the privacy of individuals must be maintained when providing access to data 2) to obtain access to international data that are pertinent to Canadian needs, Canada must be able to exchange its data with other parties 3) to avoid improper use or misinterpretation of the data a knowledgeable contact person should be identified. The Scotia-Fundy Observer data are a rich source of scientific data collected over thirty years from a wide variety of fishing activities. In keeping with the Policy DFO provides appropriate subsets of these data upon request to NGOs, consultants, universities, and other researchers. The provision of these, and other scientific data, further enriches the understanding of the Marine environment to the ultimate benefit of all Canadians.

When it rains it pours– a program's struggle to balance data collection with data dissemination

Van Atten A, USA

The Northeast Fisheries Observer Program (NEFOP) is a multi-purpose program, providing observer coverage in over 30 different fisheries in eleven states from Maine through North Carolina. NEFOP data are used to monitor real time quota catch levels, evaluate bycatch patterns of declining fish stocks, sea turtles, sea birds, and marine mammals, and other protected species, and collect basic information to assess the status of marine resources. During times of regulatory change with significant actions that impact fishing communities and the marine environment, observer data becomes of particular interest. During these times, there tends to also be Congressional interest to increase observer coverage. Observer Programs can quickly become overwhelmed as they are tasked with additional funds, as they must coordinate

additional training and certification of observers, modify contracts, recruit more debriefers, respond to more compliance issues, process more data, and respond to additional data inquiries. One recent regulatory change was the Standardized Bycatch Reporting Methodology (SBRM) Omnibus amendment that requires an annual discard report based on NEFOP data to be prepared by the Northeast Fisheries Science Center (NEFSC) and provided to the Fishery Management Councils. The annual discard report includes: (1) the number of observer sea days scheduled for each fishery, by area and gear type, in each quarter; (2) the percent of total trips observed, by gear type, in each quarter; (3) the distribution of sea sampling trips by gear type and statistical area in each fishery; (4) the observed catch and discards of each species, by gear type and fishery, in each quarter; and (5) the observed catch and discards of each species, by gear type and fishery, in each statistical area. Another recent change was with the Magnuson-Stevens Reauthorization Act (MSRA) amended Section 402(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) to require the confidentially of observer information. This authorizes NMFS to release confidential information in "any aggregate or summary form that does not directly or indirectly disclose the identity or business of any person". The Agency is working on standardizing the release of observer data.

In the last two years, there have been significant regulatory actions in the Scallop Fisheries Management Plan requiring the development of an Industry Funded Scallop Program, the Herring Management Plan, the Multispecies Groundfish Management Plan, and the Squid, Mackerel, Butterfish Plan all relating to monitoring needs. The NEFOP must balance staffing needs to meet coverage requirements, reporting requirements, respond to hundreds of specialized requests for data summaries, research interests, and sample collection projects, and further develop automated processes for allowing access to observer data, while trying to minimize the total costs of observer programs. Regular funding to support long-term employment of data analysts and computer programmers can help to ensure specialized training and skills to meet sophisticated data warehousing and web-supported access that meets the confidentiality regulations.

A case study in agency implementation of statutes– The confidentiality requirement and associated exceptions under the Magnuson– Stevens Fishery Conservation Act

Hagg K, USA

Under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), NMFS must maintain the confidentiality of any information submitted in compliance with the Act and any observer information. The Act includes exceptions that allow for the disclosure of confidential information if certain conditions are satisfied. In some cases, application of these exceptions will result in release of confidential information to the public. In addition, the Act authorizes NMFS to publically release confidential information in an aggregate or summary form that does not directly or indirectly disclose the identity of any person who submits such information. The first step in implementing statutory language is to determine whether the language is clear on its face or ambiguous and subject to interpretation. For aspects of the statutory language that are ambiguous, courts will defer to an agency so long as its interpretation is reasonable. In interpreting and implementing ambiguous aspects of the MSA's confidentiality requirement, exceptions to the requirement, and the authorization to release information in aggregate or summary form, NMFS considers various – and often divergent – interests including those expressed within the agency, the fishing industry, non-government organizations, research institutions, and federal and state law enforcement among others. Factors to consider include legal constraints, protection of proprietary information, the need for release of information to advance law enforcement, scientific research, and transparency in NMFS implementation of other provisions of the Act, and the importance of consistency when responding to requests for information.

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Panel Session Abstracts

Session 6: What are the major factors impacting fisheries observers?

Panel Leader: John Lafargue
Northwest Fisheries Science Center, National Marine Fisheries Service, USA

Minimizing the risk to observers from foreign charter vessels operating in New Zealand's EEZ

Woods A, New Zealand

The New Zealand government supports the use of Foreign Charter Vessels (FCVs) but that use must occur in a way that protects the integrity of the fisheries management regime while ensuring that Ministry of Fisheries (MFish) staff and contractors are provided with a safe working environment. This includes a Standard setting out the minimum acceptable level of food, accommodation and amenities which must be provided for observers onboard vessels greater than 46m in length. Vessel operators (both domestic and foreign flagged) have 12 months (ending 1 July 2009) to ensure that their vessels fully comply with all aspects of the standard. The NZ government also proposes to adopt a risk-based approach to observer coverage. This will see an increased level of observer cover on vessels deemed to be "high risk" and will also ensure that those vessel operators that ensure their vessels pose only a low level of risk, be rewarded with less observer coverage and lower costs. This presentation aims to provide more details on the approach taken and highlight some of the successes and failures of such an approach from both the stand-point of the Ministry of Fisheries and a selection of commercial stakeholders.

Description and logistics of the U.S Gulf of Mexico Reef Fish Observer Program

Pulver JR, USA

A mandatory observer program in the reef fishery was initiated in the Gulf of Mexico in July of 2006. Almost all the vessels in the fishery have never had to carry an observer in the past and were unfamiliar with observer programs. The challenges of initiating such a program are large due to location, vessel size, trip length, and gear type. The vessels selected depart from ports ranging from Brownsville, TX to Key West, FL a driving distance of over 1500 miles. The vessels range from approximately 25 to 70 feet in length with trips on these vessels varying from 1 to 20 days in length. This makes living conditions on board the vessels highly variable, as many are not able to accommodate an observer without some compromise with the crew. There are currently four different gear types utilized in the fishery. These gear types are longline, bandit, handline and spearfishing. Each gear type requires a different sampling protocol for the observer. Also each gear type can be very different depending on what the vessel is targeting, such as the red snapper compared with the grouper fishery. All of these obstacles were dealt with in various ways to implement a successful reef fish observer program.

Observer safety in the Gulf of Mexico

Walia M, USA

Commercial fishing is an inherently dangerous profession, as repeatedly found by the United States' Department of Labor. While many recognize the dangers of working in northern temperate waters, such as the North Atlantic or the Bering Sea, there may be a complacency regarding safety in the Gulf of Mexico (GOM). This could be due to numerous factors such as: warmer waters, lack of survival suit requirements and the predominantly smaller size of vessels that have no head facilities on board. In order to complete their duties and come home safely, observers must be prepared and knowledgeable about fishing fatalities. Using figures from the United States Coast Guard, fishing vessel loss and fatalities were reviewed in the GOM versus other designated districts from 1992-2007. During this time period, the GOM ranked second highest in numbers of lost fishing vessels and fatalities. Water exposure was the highest cause of death overall. Of the 934 documented deaths, 23% were due to man-overboard incidents. The GOM has had the highest rate of falls overboard throughout the stated time period, accounting for 35% of total falls overboard. The GOM is the only district to report falls overboard every year, which should cause concern for personal safety. When going out on deck, one should inform others before going out and staying away from gunwales as a simple precaution to avoid an incident. The need to be diligent at all times is necessary for an observer during their deployment. Proper use of standard issued

safety equipment, such as a PFD and survival suit, are essential in helping an observer complete their duties properly and safely.

Multi-resistant bacteria: Concerns for observer programs and their field staff

Gulak SJB, USA

Since the introduction of antibiotics into clinical use, bacteria have protected themselves by developing resistance mechanisms. Hospitals provide a selective environment with intensive use of antibiotics and lower immune response of patients, where monoclonal outbreaks may lead to endemicity. Currently, the most important resistance problems on a global scale are caused by methicillin-resistant *Staphylococcus aureus* (MRSA). This bacterium is now being passed throughout communities on a regular basis, earning the classification of Community-associated MRSA by the United States Center for Disease Control and Prevention. The observer programs in the southeastern United States have a history of covering small fishing operations. The majority of vessels are not larger than 21 meters, with many less than 15 meters. With the reduction of catch quotas and increase in trip expenses (from fuel and stagnant fish prices) fishers are forced to downsize. Round the clock fishing, cramped living conditions and inadequate hygiene facilities increase the susceptibility to infection of all those onboard, including the observer. Once MRSA has boarded a vessel, Staphylococcal life characteristics hinder disinfection and allow subsequent reinfection as a trip progresses. If passed to the observer, resistant bacteria can survive indefinitely in the nasal passages and allow for future infection after return from deployment, when medical compensation is not afforded. Anecdotal evidence from observer infections between 2006 and 2008 was collected. Best practices and implications for safety protocol will be discussed.

Anger management much? Using video dramatizations and hands on drills to desensitize observers with conflict and teach them how to resolve it successfully

Vieria S, USA

Conflict is a familiar occurrence in the interpersonal communications between observers and fishing vessel crew. Unresolved conflicts can lead to an uncomfortable or unsafe environment for observers. Handling both minor and major conflicts quickly and effectively is fundamental to maintain the important communication lines between observer and crew. It is important for programs to train observers how to recognize different levels of conflict and techniques on how to reach a resolution. Teaching observers how to read and recognize both verbal signals and body language will help them understand the premise of a potential conflict and allows the observer to choose a technique to best handle the dispute amicably. It is equally important for observers to practice various scenarios and to utilize roll playing in order to gain experience and build confidence. Practicing different scenarios will help observers avoid a conflict in the first place. Observers may be able to assess the principle reason for the conflict, clarify the concern and return the environment to a safe and acceptable workplace for the observer and crew. In the West Coast Groundfish Observer Program staff take ample time to teach the observers how to recognize a conflict, show different techniques to resolve the conflict and then have the observers practice by acting out a conflict scenario with fellow observers and staff. This year the WCGOP has added a training video taken with a WCGOP observer and a groundfish fishing captain. We were able to show in this video how quickly a conflict scenario approaches and then show different versions of reaction from the observer, how to and how not to handle the situation. We would like to share with the IFOMC attendees our experience on how this newest piece of training material has added value to our conflict resolution training and how one may be able to implement the experience in their own training course.

Panel Session Abstracts

Assisting observers in bridging the gap

Lengares J, USA

General public surveys, online forums, and informal newsletters are various tools that could be used to bridge the gap between the general public's understanding of the fishing industry and the reality of the industry and stocks. Observers are constantly fielding questions regarding fish consumption as they are often seen by the public as an inside link to understanding fish stocks and smart consumer choices. Information coming from unbiased scientific data can prove to be more effective and valid than information being pumped through media outlets. Resources like Fish Watch are the first step in educating the public, but more tools are needed to assist observers in bringing updated accurate information to consumers. Establishing the current knowledge base of the general public and advancing resources like online forums and informal newsletters are essential for continuing to spread a greater understanding of the fishing industry.

Observer support mechanisms

Patten J, Canada

Archipelago Marine Research Ltd. currently employs 40 to 60 at sea observers throughout the year in order to meet the at sea monitoring requirements of British Columbia's groundfish fishery and its dynamic fishing activity patterns. The monitoring requirements for British Columbia's groundfish fishery present a complex level of duties for observers. Observers are collecting data for use by fisheries management, compliance and enforcement branches and fisheries scientists. Vessel sizes, processing methods, working space and crew cooperation are diverse and directly impact an observer's ability to effectively collect the required data. These factors combined with the challenges of uncertain work scheduling, potential safety issues, fatigue and observer personal issues create a unique combination of issues that must be addressed through training and on-going support. Archipelago has developed a number of training initiatives and programs that are designed to help observers deal with the host of complex issues being faced both on the job and in their personal lives. Conflict resolution and communications training is provided as a core component during an observer's initial three week training. A Critical Incident Stress (CIS) program that uses a peer team in conjunction with and external service provider was developed to help observers who require assistance outside the scope of their regular day-to-day duties. A number of adaptable scheduling models and compensation/benefit programs are also used to allow an observer to choose a schedule that is best suited to his or her needs, and allows individuals to pursue other professional and/or personal goals.

The art and science of juggling the increasing complex observer work load

Donovan C*, USA
Tuttle V, USA

Recent developments in the at-sea Pacific hake fishery have led to restrictions on several bycatch species which have changed the nature of this fishery and therefore the At-Sea Hake Observer Program (A-SHOP). Additionally, interest has increased about the type and quantity of data being collected by the observers and this has driven changes as well. The result is an increasingly complex work load, which now requires the observers to be more involved in making minute-by-minute decisions about their sampling, and to prioritize and manage their time. This increase in data collection has created new challenges for the observers and has required the program to make changes in the sampling protocols, as well as to modify the actual training of the observers. Historically the observers have collected vessel and haul information, species composition samples, marine mammal and endangered species samples and sighting data, and biological data on the target species. Recent additions to the data collection include a 20% increase in species composition sample sizes, biological data on an additional seven species, coded wire tag data and samples from salmonids, genetic samples on two different species, and occasional special projects for additional data. The A-SHOP is continually evolving and changing to help the observers adapt to this increased sampling demand and to help ensure that the highest quality data is collected, along with a reasonable maximum amount of data without causing observer fatigue.

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Session 7: How can self-reported data by the fishing industry be improved for use in assessments and management?

Panel leader: Lisa Borges, European Commission, Directorate General for Maritime Affairs and Fisheries, Belgium

Fishery management by fisherman for fisherman The area a crab association taking a lead role

McElderry H*, Canada
Scheer J, Canada

The Area A Dungeness crab fishery on the north coast of British Columbia has taken a lead role in involving industry in fishery data collection and management. Over time, there has been an increase in the amount of data required to effectively manage the fishery at the same as reductions in resources, both money and manpower, from the Department of Fisheries. The fishers formed the Area A Crab Association to represent the interests of all the licences in the Area. The Association adopted an Electronic Monitoring Program in 2000 and developed a soft-shell monitoring program in 2001 to meet the changing needs of fishery management. With the Area A Crab Association owning the data, they provide their own fishery data through their service provider (Archipelago Marine Research Ltd.) which is used in management decisions. The soft-shell sampling program collects biological data from the fishery in order to move away from fixed opening and closure dates towards shorter closure periods which are based on the biology of the crab population. This data is self-reported and the Association has worked with the Department on sampler selection, training and ensuring consistency and credibility in the data. The fishers in Area A have been able to move forward with these data and management initiatives due to the collective efforts of their Association which provides organization, leadership, communication and motivation. The Area A fishers understand the value of utilizing the data that is collected, keeping in mind future requirements of the data while ensuring the integrity of the data such that the Department and others have confidence in the information collected by the fishery. The Association is working to set and maintain standards based on science that can be applied across any fishery. Future increased data requirements for stock assessment, stock dynamics and MSC certification have left the Association with the challenge of funding these important data requirements while continuing with a sustainable and economically viable crab fishery.

Good communication: the key to reliable results from self sampling

Quirijns F, Netherlands

In the Netherlands, fishers carried out a mesh size experiment to provide information to discussions on the reduction of plaice discards. This joint fisher's and researcher's project has been considered a success, as it resulted in reliable data that were used directly in fishery management discussions. The factors leading to this success were a good communication plan, thorough instruction of participating fishers and onboard checking of the methodology by observers. Fishers want to reduce their plaice discards, as one of the major problems in the Dutch beam trawl fishery is seen as "too many discards". Other parties, i.e. managers, nature conservationists and fishers from other fleets, suggested increasing the minimum mesh size from 80 to 90 mm in order to reduce discards. This suggestion raised the questions "Would that be a solution to the discard problem?" and "How would increasing the mesh size affect catch compositions?" Instead of using a desk study or a scientist only approach, which had the potential to answer the questions, beam trawl fishers wanted to carry out an experiment that reflected their own experience and methods. Also by finding a fisher's solution from the industry, it was likely to be supported by fishers from other fleets. It was clear that communication was a key component to the approach. Together with researchers, the fishers designed an experimental set-up and work plan; carried out the research; monitored quality and eventually drew up conclusions together. The joint research approach led to results that were supported by the industry as a whole. These results have been used directly in discussions about discards in the beam trawl fishery, with staff from the European Committee and with the North Sea RAC (Regional Advisory Council).

Ensuring accurate reporting: Examining incentive structure in fisheries management

Chen F*, USA
Martens B

While it is widely recognized that self-reporting data is vital to successful fisheries management, this criterion alone cannot ensure effective management. Self reporting is the simplest way to manage fisheries but in many management systems the incentives exist for individuals to harvest beyond the biological optimal limit—putting the long term health of the resource at risk. At-sea monitoring has been shown to be an effective deterrent against unwanted discarding while increasing accurate reporting. This paper addresses the need for an incentive structure in commercial fisheries that takes into account the negative externalities inherent in the exploi-

tation of common property resources, while providing positive motivation for compliance with management, focusing extensively on comprehensive monitoring. We will compare fisheries with successful frameworks for this approach such as the Danish fisheries and British Columbia's groundfish fishery, with New England examples, in the sea herring fishery and groundfish fishery, which are moving towards more comprehensive monitoring.

Fisher– based audit system in the BC Groundfish Fishery

Fedoruk A, Canada

Management of the several groundfish longline and trap sectors in British Columbia is based on the use of catch information from fisher-completed logs. Key to the use of these data is a system to monitor or Audit the data being provided. After each trip, the weight of landed and discarded catch has to be deducted from the vessel's current quota holdings for each quota-managed species by Species Area Group (SAG). This information is summarized on a Quota Status Report (QSR) issued to the vessel. QSRs are generated using landed catch data which are allocated to quota areas using the catch area percentages. The default data source for the catch area percentages and any relevant released catch information is the fisher-completed Fishing Log. In order to assess whether or not the Fishing Log is complete and accurate enough to be used for catch management purposes, industry and Fisheries and Oceans have collaborated on the design and implementation of a number of tests of the fishing log data. This set of tests is what is referred to as the program Audit: a technical assessment of the data quality of the Fishing Log. The Audit's primary purpose is to test the accuracy of the Fishing Log data against the catch data from the Dockside Monitoring Program and a percentage of the catch and spatio-temporal data from vessel-based electronic monitoring (EM) systems. If the data match within certain standards, the Fishing Log is used for the catch allocation and represents the at sea catch reporting for that trip. If the Fishing Log does not meet the current standards, the Trip is sent to a review board which may chose to use the Fishing Log Data as is, require further testing, or require further processing of data. In some cases, the data from the EM System supplants those from the Fishing Log. A review of the Audit process is provided, including descriptions of data sources, testing protocols, and results. Data from the first two years of the program reveal a high degree of agreement between fisher data and that collected in the DMP and EM program for the majority of species and tests completed.

Validation of study fleet data collected through the SMAST study fleet program

Roman S, USA

Study fleet programs offer a complementary source of fisheries dependent data for use in fisheries management and stock assessments. The SMAST study fleet program collects environmental and catch data in collaboration with the New Bedford offshore groundfish fleet. The project objectives include: 1) obtaining fisheries data with high spatial and temporal resolution; 2) involving the fishing industry in the collection of fisheries data and management of the resources; 3) developing methods for training commercial fishermen to record scientifically acceptable data during normal fishing operations; and 4) characterizing the effects of environmental conditions and fishing operations on spatial and temporal patterns in catch statistics. Study fleet data were compared to vessel trip reports, dealer landings data and NMFS observer data for nine trips over a data collection period from April 2006 to April 2007. Data were evaluated on multiple levels: trip, effort, catch, and landings. Despite the few observed trips, comparisons were generally favorable for most catch records, but also defined some minor systemic differences. Validation of self reported data is an important aspect of assessing the credibility of data before information can be incorporated into a scientific or management program.

The representativeness of the reference fleet data and how it is biased by changes in the dynamics of Norwegian Purse Seine Fishery

Huse I, Norway

The peak period and the fishing area of the Norwegian mackerel purse seine fishery has changed considerably due to market situations. The Norwegian reference fleet was established to get better and continuous sampling from all the Norwegian fisheries. A total of 34 vessels are contracted and the crews are trained to conduct sampling of the catches. The fleet includes both offshore and coastal vessels, and since 2003, the number of purse seine vessels has increased from one to five. In order to investigate if the changes in the mackerel fishery will affect the representativeness of the data from the reference fleet we use data from the vessel monitoring system, landing statistics and sampled data from the reference fleet. We compare the landings per trip of the total fleet with the reference fleet, and look at the spatial and temporal overlap for the time period 2006-2008.

Comparison of self-reported logbook data with at- sea observations in the recreational head-boat fishery in Florida and Alabama

Sauls B, USA

Headboats are large passenger vessels that charge a per-person fee to take people on recreational fishing trips. There are approximately 100 such vessels operating throughout Florida and Alabama. Headboat captains have reported their fishing activities on standardized logbook reports to the National Marine Fisheries Service Southeast Headboat Survey since the 1970's. In 2004, a pilot at-sea observer program was initiated in Alabama and the program was extended to Florida in 2005 to collect more detailed information on discards in the recreational fishery. For many regulated and highly exploited fish stocks, the numbers of fish discarded by recreational anglers in the south Atlantic and Gulf of Mexico region greatly exceeds recreational harvest, and fishing mortality attributed to the discard portion has become increasingly important in stock assessments and fisheries management. For this analysis, self-reported harvest and discard data from headboat logbook reports were compared to at-sea observer data simultaneously collected during selected trips. Paired t-tests were used to test for significant differences between numbers of fish reported and numbers of fish by species counted by at-sea observers. For most species, the number of harvested fish reported on logbooks was not significantly different that what was counted by observers; however, there were highly significant differences in the number of reported discarded fish for some very important managed species.

Self Monitoring System: An indigenous system developed by Sri Lankan fisherman-a case study in Southern Sri Lanka

Patabendi P, Sri Lanka

Sri Lanka has a population of 18.5 million. To satisfy its fish protein requirements it needs 270,000 t of fish per year, 220,000 t of which is taken from its own waters, the rest is imported. The marine sector contributes 202,000 to the total fish catch; the balance comes from inland waters. Coastal waters contribute 80% of the marine catch; the balance comes from the deep sea and offshore areas. The deep and offshore catches are mostly tuna, tuna-like fish, bill fishes and sharks the majority of which spend their young days in coastal waters before they move out to the deep. Long before any scientific understanding of fish stocks, fishermen were aware of the reduction in abundance caused by over fishing. They knew that over fishing has to be dealt by collective action which later became the written fisheries law. They also aware of the value of protecting the females and young animals by means of non-fishing seasons such as the breeding seasons or prohibition of fishing for young fish, and later these traditions were added to their laws. But now this indigenous system collapsed with the introduction of the license to fish in the Sri Lankan waters by foreign fishing vessels. They harvest fish by using all sorts of techniques harmful and destructive to the sustainability of the fishing industry in Sri Lanka. There are lots of initiatives at the southern coastal belt to regenerate the indigenous system that leads to sustainable fishery. Sustainable Fishery program has been working with the poor fishermen in Southern coastal belt whose income is below the poverty line to empower them to face this new challenge. This paper analyses the advantages of the indigenous system used for almost 2500 years and the difficulty to practice it with the foreign fishing vessels in the absence of formal monitoring mechanism by the government authorities.

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Session 8: What specific issues are important to the fishing industry regarding fishery monitoring?

Panel Leader: Amy Sierra Van Atten Northeast Fisheries Observer Program, National Marine Fisheries Service, USA

After Four Years; A fisherman's experience with the British Columbia Groundfish Integration Pilot Project.

Boyes D, Canada

In 2006 BC groundfishermen began to fish under a new management system whereby vessels were individually responsible for all their catch, and any mortality associated with at-sea releases. All vessels were required to carry either observers (the large, trawl fleet) or video cameras (the smaller hook and line and trap fleet) and to fill out detailed logbooks. Fish quotas became transferrable between species licence categories, under negotiated trading rules, so that vessels had access to the fish they needed. Since the beginning of this program, all species have been fished within annual TACs.

An inaugural case study in groundfish sector monitoring

Brazer E, USA

Sectors offer communities of fishermen the opportunity to manage their own quotas of fish. Fishermen are given more control over their businesses, the chance to increase their profits, opportunities to rid themselves of trip limits, and the satisfaction of knowing that they won't be forced to discard fish. In return, they agree to operate more responsibly and to live within the rules. Further, they agree to stop overfishing and to develop a monitoring program that ensures this goal. The Cape Cod Commercial Hook Fishermen's Association (CCCHFA) has developed a monitoring program for one of the only two Sectors in New England: the Georges Bank Cod Fixed Gear Sector (Fixed Gear Sector). Through the use of innovative video monitoring systems, trained data collectors, and the Sector members themselves, CCCHFA and the Fixed Gear Sector have advanced a credible and viable program for their fishing community. Additionally, this work is intended as a blueprint for the 17 additional Sectors, representing a majority of the ground-fishermen in New England, to use when they are approved in 2010. The key to an optimal and successful Sector program is the ability to accurately know how many fish are being removed from the ocean; without it, guesswork, extrapolations, and assumptions will continue to drive fisheries and fishermen to extinction. Robust monitoring brings more accurate data; more accurate data leads to more effective management; and more effective management leads to more fish and more profit for fishermen. Only through a robust and accurate catch monitoring program will any catch share program, including Sectors, allow fishermen to achieve optimal yield while not exceeding the biological limits of our prized fish populations.

Development of Fishtrax, a reporting tool designed by fishermen for groundfish sectors.

Giacalone V, USA

A monitoring system should be designed to provide real and measurable long-term benefits for a fishery. To be embraced by commercial fishermen, the effort put toward data collection should enhance fishing flexibility, eliminate reporting redundancies, reduce scientific uncertainty and improve the economic viability of the fishery. The Northeast Seafood Coalition in partnership with Geek Gene, Inc. developed a software system called Fishtrax to accomplish these objectives.

Importance of safe and sound monitoring programs from a Fishery Management Council member.

Avila R, USA

Rodney is a member of the New England Fishery Management Council and serves on the Safety and Enforcement Committee among others. He is a career commercial fisherman out of New Bedford Massachusetts. Rodney also works with IMP as a safety drill instructor helping to improve the safety aboard commercial fishing vessels.

Panel Session Abstracts

New handling and accounting procedures on deck to reduce halibut mortality rates while improving catch accounting

Gauvin J, USA

At the Electronic Monitoring Workshop sponsored by the Alaska Fisheries Science Center workshop last June, I stated that for larger scale fisheries in Alaska, Electronic Monitoring should be developed to replace human observer coverage for compliance monitoring applications wherever possible.

My opinion is that the skills and training of human observers are better utilized for biological data collections and other resource management duties. EM systems are capable of being "on duty" 24/7 and with further development and some periodic spot checks by human observers, these systems would free up observers to expand biological data collections such as additional stomach contents sampling or gonad collections, or even some baseline ecosystem monitoring data collections. The crux of this matter turns on development of EM systems that are sufficiently robust and improvements in cost effectiveness of EM, particularly in the review of EM data. After I made this pronouncement I showed a short video of crew members crew members in Alaska sorting Pacific halibut from a net brought on board, prior to the prohibition on sorting catch on deck (sorting halibut from tow net that was not selected for observer sampling). The purpose of the clip was to illustrate a potentially challenging application for EM. Many who had agreed with my opening statement about using EM for purely monitoring tasks approached me after my talk. They wondered if EM could really be effective for monitoring based on conditions on deck in the video. To them I replied that if the industry's approach were simply "business as usual" then EM will probably not work or might be so expensive (particularly in the data review phase) that it would be cheaper to keep to the present system that results in very high halibut mortality rates and high observer coverage costs. So in my short talk in Portland, I'd like to describe progress since last June in the development of new handling and accounting procedures on deck to reduce halibut mortality rates while improving catch accounting. We are currently gearing up for a field study this summer under an EFP to assess potential for reducing halibut mortality rates on flatfish vessels through changes in fish handling procedures. These procedures are not "business as usual" in terms of how fish and handled on deck and in the processing area. The objective is to engage in a paradigm shift to use the industry's knowledge of how to sort and get accurate accounting of catches at sea in a collaboration that is working to facilitate monitoring and accounting of catches while reducing bycatch mortality rates for halibut. The first phase of our pilot study is primarily focused on estimating the potential for reduction of halibut bycatch mortality rates but will incorporate an EM system to evaluate potential for monitoring of the new catch handling procedures. In the next phase of this study, we hope to continue working with the Alaska Fisheries Science Center to evaluate how to strike an appropriate balance between human observer coverage and electronic monitoring. Preliminary results for the field work should be available in time for the International Observer Conference in Portland in late July.

Fishermen and the University of the Azores working together to observe the tuna fishery.

Neves E, Portugal

Tuna Producers Association of the Azores (APASA) was created in 1985 in order to represent the professionals that harvest tuna and similar species in the Azorean waters. The association focused on fisheries related issues but also in trade questions since a considerable part of tuna was exported and consumed abroad. In the 1990's, it became clear for APASA and other parties, that there was an urgent need to be fulfilled in the tuna fishery – the dolphin safe certification. Tuna export was seriously conditioned by this fact, since the Azores had a strong traditional whaling history. In 1998, after some unsuccessful attempts, the regional administration, the Institute of Marine Research (IMAR), APASA, Industry Association and Earth Island Institute (certification body) agreed in the establishment of a Program that would be independent, managed by the University of the Azores (through IMAR), and that would be responsible to place observers onboard APASA tuna fishing vessels associates - the Azores Fisheries Observer Program (POPA). Since then, Dolphin Safe certification was assured every year, with collected data demonstrating that there was no mortality of dolphins or other cetacean in the Azorean tuna fishery. Besides that, a large amount of information regarding tuna fishery and associated species started to be systematically collected by the observers. As a consequence of the data collection program, the Friend of the Sea certification (a broader certification for sustainable fisheries) was granted to this fishery in 2001. After 11 years of cooperation between parties, POPA data is frequently requested by administration and researchers (eg: for management purposes) but also by fish-

ermen that can beneficiate from information collected in previous years. Presently, APASA and IMAR/University of the Azores are trying to establish closer cooperation based on POPA and other projects data in order to provide more information about tuna abundance and their relation with environmental factors such as primary production and surface temperature.

Developing a monitoring program in the U.S.

Tooley MB, USA

The Atlantic herring fishery in US territorial waters on the northeast continental shelf has come under tremendous scrutiny in recent years due the nature of this volume fishery that is not well understood by many stakeholders. Having recovered from a major decline in biomass in the late 1970s and early 1980s, the resource has fully recovered and fishing mortality remains low on a robust stock. However, a major criticism of the fishery by some stakeholders is the perception of an inadequate monitoring program for both catch and bycatch in the fishery. The industry is working with fisheries management agencies and advisory bodies to develop a more vigorous monitoring program. Industry has identified the need for development of a fisheries code of conduct and a cooperative relationship with the NMFS Northeast Observer Program. As proposals move forward on monitoring alternatives for the fishery the industry has been active in seeking funding for monitoring, establishing standards for sampling and catch estimates; and has conducted numerous education and outreach meeting for captains and the observer program to foster greater understanding of the goals of the monitoring program and the needs of the fishery.

Benefits of cooperative research as seen by the Gulf

Ward W, USA

Will manages a Cooperative Research Project for the Gulf Fishermen’s Association (GFA). GFA is a commercial fisherman’s association promoting environmentally friendly and sustainable fisheries in the Gulf of Mexico.

I currently manage a Cooperative Research Project CRP for Gulf Fishermen's Association. I have seen the myriad of benefits our project has brought to the industry, NOAA'S Southeast Science Center and scientific data collection. It (the CRP) has made a big difference in our fisherman's attitude about scientific collections and given the scientist a hand on view of how we operate.

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Panel Session Abstracts

Session 9: What specific issues are important to non-government organizations (NGOs) regarding fishery monitoring?

Panel leader: Vicki Cornish, Ocean Conservancy, USA

The Association for Professional Observers APO) : Strengthening fisheries monitoring program

Davis K, USA*
Billings A
Rojas E

In May 1995, five Fisheries Observers waiting for vessel assignments out of Kodiak, Alaska - discussing the poor treatment of observers by observer providers in the region - decided to take action by founding the Association for Professional Observers (APO).

The APO is a non-profit, non-governmental organization whose mission is to strengthen observer programs through advocacy and education.

Since its inception, the service of the APO has been centered about influencing positive change to the management, conservation, and science of marine living resources, by:

-Encouraging the recruitment and retention of professional experienced observers
-Outlining tools meant to ensure heightened standards of observer data quality
-Identifying and raising awareness regarding the needs and rights of observers, and the challenges and risks they come to face
-Fostering observer involvement beyond this important ground-level vantage
-Campaigning to influence fisheries management decisions and recommendations
-Disseminating information globally via the APO newsletter, the *Mail Buoy*
-Maintaining the APO website - an important resource for reference materials, emerging research, and publications based on observer data
-Helping to secure funding and the means for observers to attend Conferences
- Ensuring APO representation at all of the six Conferences in the IFOMC series

Recently, with the help of Member feedback and Board discussions, we came to the realization that the outcomes of certain APO projects had historically been presented in such a manner that their usefulness in establishing foundations for future projects to be built upon was limited. Consequently, we identified and initiated a restructuring scheme founded upon four project-oriented "APO Focus Areas" we feel encompass all current and foreseen projects, actions, and outcomes of the APO. Our intention with initiating this restructuring scheme is to:

Accommodate the APO's Mission and visions in a more focused, consistent, and directed manner

Help APO Members become more involved in project outcomes; and,

Optimize the utility of APO resources, to members (as reference material) and to APO Board and Staff (for building off of with future projects).

The four focus areas are: Education and Outreach; Observer Data; Observer Health, Safety and Welfare; and, Observer Labor and Professionalism. Each focus area is coordinated by at least two APO Board member representatives who will manage all activities that fall under that particular area of APO work. Outside involvement is greatly encouraged for all APO Focus Areas, and we anticipate that members, volunteers, and interns will play important roles in the successful outcomes of many focus area projects.

With our new restructuring development towards a Focus Area scheme, we feel that APO Membership must progress along with these changes. Membership should be the engine that drives a non-profit organization, and we hope that our restructuring will help to empower members to be a part of the APO from a variety of independent vantages and involvements.

The application of observer data by NGOs in advancing policies for protected species conservation

Griffin E, USA

Non-governmental organizations (NGOs) play an important role in lobbying for funding for observer programs and using the data collected to hold NMFS accountable for its legal obligation to manage protected species under the Endangered Species Act, Marine Mammal Protection Act, and Magnuson-Stevens Act. Fisheries observer programs collect invaluable data that can be used by advocacy groups to identify fisheries that are likely to compromise the survival and recovery of protected species in U.S. waters. Because this

data is critical to fisheries management, Oceana advocates for additional funding for observer programs in the Congressional appropriations process. From 2002 to 2007, Oceana's focus on observer funding helped to lead to a near doubling of federal funds for this program. Once observer data is collected and analyzed, Oceana utilizes the data to advocate for concrete policy changes for fisheries management and the conservation of sea turtles and marine mammals. For example, in 2008, newly acquired observer data revealed high levels of loggerhead sea turtle bycatch in bottom longline gear in the Gulf of Mexico reef fishery. These takes were nearly 8 times the level authorized in the 2005 Biological Opinion (based on logbook reporting), showing the importance of observer coverage for acquiring adequate estimates of protected species bycatch. Upon receipt of this new information, Oceana began working with other NGOs, commercial fishermen, and the federal government to reduce turtle takes in the Gulf of Mexico reef fish fishery. Furthermore, Oceana serves on several marine mammal Take Reduction Teams (TRTs), which rely on observer data for improving estimates of marine mammal bycatch and mortality, identifying bycatch mitigation options, and monitoring mitigation options to determine effectiveness. Without observer programs, protected species conservation efforts would suffer.

Data Requirements in Marine Stewardship Council Certification

Lugar J, Canada

The Marine Stewardship Council (MSC) was created 10 years ago to empower market forces for the advancement of sustainable fishing practices. Fisheries voluntarily undergo assessment to the internationally developed MSC standard for environmentally sustainable fishing and, if successful, the fishery is then certified and products can be promoted through the use of the MSC label. MSC certifications review three main areas: target stock health, impact on the ecosystem and effectiveness of the fishery management system. Assessments are robust, data-driven and peer reviewed. The assessment process can identify specific areas of strength and weakness within the fishery. Weaknesses become conditions to a certification that are designed to improve performance or to develop and analyze additional data during the life of the certificate. Data quality is a key element in the process.

The significance of the MSC movement is reviewed by highlighting the world-wide presence, outlining the Principles and Criteria and the MSC certification methodology. Independent third parties called certification bodies conduct MSC assessments of fisheries that enter the program. The certifiers investigate the data, its sources and assess its quality during the year long process.

Key elements of MSC assessments of interest here are information sources and their accuracy – independence being an obvious corollary. Conditions to MSC certifications are also often data focused. Some examples are a US North Pacific halibut fishery being required to increase observer coverage in order to improve information for multiple MSC indicators; and a South African hake fishery being required to investigate its incidental take of seabirds. In the latter case a new observer program uncovered a significant problem, mitigation measures were implemented and continued observation has since demonstrated almost total reduction.

The MSC approach leads to a voluntary shift in responsibility by placing onus on fisheries to demonstrate their sustainability practices. Fisheries need quality information to meet the MSC standard. This is business development, in a way, for IFOMC participants. Together we can achieve the MSC objective – employing market forces to improve sustainability in the world's fishery.

Fisheries monitoring in the recreational sector: Challenges and opportunities in the Gulf of Mexico

Robbins C, USA

As amended in 2007, the Magnuson Stevens Fishery Conservation and Management Act (MSA) mandates the use of Annual Catch Limits and Accountability Measures to end or prevent overfishing in U.S. managed fisheries. To implement these new provisions as effectively as possible in the recreational sector, managers need complete, accurate and timely information on fishing mortality. Nowhere is this issue more important than in the Gulf of Mexico where millions of private anglers fish and more than 1,300 hundred federally permitted charter boat operators take individuals fishing. Quota overages in this sector are common for popular species such as red snapper due to sustained high levels of effort but also a time delay where catch estimates reach managers months after a season ends. Aware of these challenges, fishery managers are considering changes to the recreational data collection and monitoring program to produce more precise and timely catch estimates. To help scientists, managers and fishermen best meet the MSA's new requirements in the Gulf and elsewhere, Ocean Conservancy believes several guiding principles should be used to make meaningful changes to the recreational fisheries monitoring program.

Uncertainty created through slippage

Baker P, USA

Slippage on otherwise observed trawl trips probably holds

the paired distinctions of being the most overlooked and most problematic issue in observer programs today. When paired with pre-sorting within the cod-end as is common in pump fisheries, it takes little more than common sense to identify it as a serious bias-producing factor in observer data. This is due to the fact that fishermen can effectively prevent at-sea observers from inspecting catch at their discretion in order to avoid the detection of bycatch, for instance by partially or completely dumping the contents of a given tow without bringing it aboard. Many observer programs rely on good-faith estimates from the captain regarding the size and species composition of these slipped discards, or on visual estimates by the observer of the cod end which is still in and largely under the water. Both estimates are clearly not reliable. The problem is compounded by the presence of size-specific sorting grates or excluders on the fish pump itself. In effect, the fish brought aboard have passed through a strainer designed to prevent larger objects like bycatch, debris, and the cod end mesh itself from entering the fish hose, and they are thus clearly pre-sorted. Most scientific studies of slippage effects have at some point relied upon the same good faith estimates of fishermen regarding the composition of slipped discards to draw their conclusions that the slippage is similar to the pumped catch. This is a flawed assumption and we will present a set of solutions which will ensure that unsampled slippage is eliminated. A case study of these issues will be explored (the New England Atlantic herring fishery). Recent evidence has begun to emerge in this fishery demonstrating that slippage is widespread and does in fact occur in many cases for the specific reason that unwanted bycatch is present in the net. We will demonstrate that this clearly shows the need to examine the catch in these instances. Furthermore, herring fishermen have recently explained that in many cases these events are related to "test tows" and are therefore both necessary and beneficial. We will show how a test tow is essentially impossible without catch examination and therefore how techniques to ensure full examination of cod-end contents will benefit both observer datasets and industry participants. Slippage represents a serious challenge to observers and to monitoring programs and is of particular concern to non-governmental organizations (NGO's) in the conservation community. The Herring Alliance, a project of the Pew Environment Group, has identified this as a major issue and has recently submitted a suite of innovative policy solutions to address it which will be presented.

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Archipelago Marine Research Ltd. is a privately held Canadian Corporation based in Victoria, British Columbia. Among a diverse array of clients, including commercial fishers, resource industry groups, government agencies, and non-government organizations, Archipelago has built a reputation for providing reliable, quality services.

Archipelago's three functional divisions include:
• Electronic Monitoring Services – Technology based, at sea data collection, analysis and reporting for commercial fisheries.
• Observer Services – Certified observers monitor commercial fishing operations, including at-sea observers for monitoring catch, bycatch, fishing effort and other issues; and shore-based observers for monitoring of commercial fish offloading activities (also called dockside monitoring or weigh master programs).
• Marine Environmental Services – Marine habitat surveys and inventories, environmental monitoring and assessments and coastal planning and analysis services.

Much of Archipelago's success can be attributed to our clients' confidence in our third-party objectivity and arm's length relationship with both private industry and government. Archipelago has historically operated on the Canadian West Coast but is now managing a growing project base in continental USA, Europe and other overseas locations.

For further information, refer to our website: www.archipelago.ca.

Bringing Leadership, integrity and innovation to fisheries resource and marine environmental management since 1978

Panel Session Abstracts

Session 10: "How can observer capacity be developed and/or expanded?

Panel Leader: Andrew France, Observer Services, Ministry of Fisheries, New Zealand.

Capacity building in West Africa

Turk T, USA

The passage of the Magnuson Stevens Reauthorization Act in 2006 requires the United States to assist other nations in eliminating illegal, unreported, and unregulated (IUU) fishing and to reduce protected species interactions. US assistance can be in the form of technology transfer and training or other areas of support. One such key topic to reduce and eliminate IUU is the collection of fishery catch and bycatch information and the development of monitoring, control and surveillance information. Observer programs can record a wide range of information at sea that is essential in better management and enforcement of the world's fisheries. Robust and reliable observer programs are critical to solving IUU, reducing bycatch and providing sound and accurate catch statistics to domestic and international stock assessment scientists and managers. The presentation will identify and discuss NMFS's recent assistance in West Africa (Ghana, Senegal) through joint observer training and enforcement exercises, and other forms of assistance. The talk will also address the larger strategic plan to assist the nations of West Africa in conjunction with a wide variety of international and domestic partners including the US Navy.

Utilizing observers to collect social data about fishermen well being

Westwood AD, USA

The Magnuson-Stevens Act requires that management measures shall "take into account the importance of fishery resources to fishing communities by utilizing economic and social data" (MSFCMA 2007, Sec.301.104-297 (8)). While social science data of various forms has been collected by observers and considered in fisheries management decisions in the Northeast USA, there have been no directed efforts to measure and understand a crucial social variable: subjective well-being. While often described as difficult to measure, well-being is an important variable with links to many aspects of life and includes satisfaction with one's job, health, opportunities, and access to necessary resources. Using past subjective well-being measures and models from across multiple disciplines, a survey-based method for collecting information about fishermen's well-being has been developed and tested in three prominent New England ports (New Bedford, MA; Point Judith, RI; and Chatham, MA). Observers are uniquely positioned within the fisheries paradigm to collect social data that can help managers, social scientists, and anthropologists to better understand fishermen and fishing community dynamics. The well-being survey can be incorporated into the observer data collection protocols at sea without compromising confidentiality priorities. On a broader scale, well-being measures collected by observers should be considered in policy-making as it lends insight into how management decisions affect fishermen's way of life, behaviors, attitudes, and their communities. This also helps fulfill the requirements under the Magnuson-Steven's Act to take into account social data variables. Exploring appropriate ways for observers to integrate social data collection like well-being should be a high priority for U.S. observer programs.

Fisheries observer program staffing strategies

Orcutt M, Canada

Archipelago Marine Research Ltd., a private marine consulting company, has over 20 years of experience in the delivery of At Sea Observer Programs for a diverse array of fisheries and clients. Archipelago currently employs 40 to 60 at sea observers throughout the year in order to meet the at sea monitoring requirements of British Columbia's groundfish fishery and its dynamic fishing activity patterns. The experience of Archipelago's observer staff ranges from recent recruits to employees with over 10 years of experience in the profession. Archipelago employs a number of strategies to develop and sustain observer staff levels that meet the needs of its client fisheries and the development needs of its observer staff. These strategies include observer recruitment, professional development of existing staff and promotion of observer staff into new work areas either permanently or on a temporary basis. Archipelago uses a number of planning models that consider historic fishing activity patterns, staff availability and retention rates in to plan for recruitment in a proactive manner. This allows for the careful development of new observer staff without compromising the availability of work for existing staff. It also allows program staff to scale observer staff size to meet changes in fishery activity levels and to provide new work opportunities and professional development opportunities to observer staff.

Panel Session Abstracts

Should I stay or should I go? Observer retention and attrition in the WCGOP

Shama R, USA

There are many benefits to retaining experienced observers. There are also many factors which lead to observer attrition. This presentation will discuss aspects of observer retention, as it pertains to data quality, debriefing, fishing industry relations, etc., and will discuss the many factors which lead to observer attrition in general and within the West Coast Groundfish Observer Program (WCGOP) in particular. The WCGOP is unique in that it employs both year round and seasonal observers, offering a side by side comparison of retention and attrition, with all other variables being equal except length of employment. This may be of interest to other programs, hoping to retain experienced observers. Through interview and survey results, common factors leading to observer retention and attrition will be presented. In addition, ideas and concepts the WCGOP has employed to retain experienced observers will be discussed and their results.

Retention of observers in a global market

Belay B, USA

In the current age of limited resources and expanding demand for fishery products, there is an increasing need for fisheries monitoring and observer programs. Retention of quality observers is a key factor in achieving the goals of any observer program. All observer programs rely on quality data and effective monitoring. An experienced team of observers provides more accurate observations, can increase the confidence in the data, and minimizes the use of staff time and logistical costs. There is a diverse array of fisheries observer programs in the world today, which generally fall into four types:

1) Temporary programs require observers for specialized tasks on a one-time or pilot basis.
2) Seasonal programs that reoccur at particular times during the year and require observers for defined periods.
3) Full Time programs that occur year around and require observers continuously.
4) Complex programs that cover multiple fisheries or regions with fluctuating but full time demands.

MRAG Americas will present guidelines for retention of observers in the four program types referenced above using examples from our experience working in a variety of fishery observer programs around the globe. MRAG has experience in Temporary programs such as the Alaska Marine Mammal and New South Wales Ocean Haul Observer Programs. MRAG places observer in Seasonal programs such as the Alaska Department of Fish and Game Shellfish Observer Program and seismic operation in the Arctic Ocean. MRAG has experience with Full Time programs in Hawaii Longline fisheries and the Tuna Transhipment programs. MRAG's experiences in the North Pacific Groundfish Observer Program will provide insight into the issues facing Complex programs.

Retention of observers starts with identifying and recruiting quality observers. There are traits most programs are looking for in a fisheries observer; and identifying and prioritizing these traits when recruiting observers increases the retention of observers. Some observers will not cope with the mental and physical demands of the potentially hostile environment we send them to, and long-term observers are a rare breed. Observer providers can boost observer retention by taking into account the following factors:

1) Adequate logistical support: observers are often reliant on program staff or contractors to provide logistics and contact with the outside world.
2) Timely and competitive pay: observers that are not paid promptly and fairly will often not return
3) Reasonable work responsibilities: data collection requirements and forms should be efficient and practical
4) Streamlined debriefing process: the submission of data should be organized and supportive, observers' input on data collection should be considered.
5) Variety of opportunities: providing diverse observer opportunities will lengthen the career of an observer and attract prior observers from other programs.

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Panel Session Abstracts

Session 11: " What are the monitoring issues with right-based managed fisheries?"

Panel leader: Teresa Turk, Office of Science and Technology, National Marine Fisheries Service, USA

Robust & accurate monitoring is the key to successful catch share management

Sanderson M, USA

Limiting annual fishing mortality through hard TACs and quotas is central to ending overfishing. The Cape Cod Commercial Hook Fishermen's Association (CCCHFA) has been the regional leader in bringing community-based quota management to New England, in the form of Sectors. However, catch shares and quotas are ineffective at ending overfishing if the catch is not accurately quantified. The more uncertainty in the catch numbers, the greater chance there is that quotas will be exceeded and overfishing will continue. None of the past observer data, collected under days-at-sea and trip limits, will be able to estimate discards or catch rates under Sectors. High levels of fishery monitoring create the most accurate, precise, and reliable data. High levels of monitoring prevent necessary assumptions and best-guesses from over- OR under-estimating at sea discards. High levels of coverage protect a fisherman's investment in quota (none is assumed to be discarded before fishing even occurs) and protect the fish from overfishing (all fishing mortality is accounted for in stock assessments). CCHFA has piloted an at-sea sector monitoring program to provide a starting point in developing catch monitoring protocols. If the goal is minimal uncertainty, a sector monitoring program would initially have to contain 100% at-sea monitoring to create a baseline for future discard and catch rate estimates, as well 100% dockside monitoring to ensure accurate landings data. Coverage levels could be scaled back significantly after a baseline of accurate, precise, and reliable data is collected. CCCHFA recognizes the significant cost of high levels of monitoring and believes the fishing industry should not shoulder the entire cost. Until fish stocks are rebuilt, the fishing industry can't afford to pay for a robust monitoring program. Ending overfishing of a public resource benefits everyone and there should be significant financial assistance from the government.

No data, no fishery-the crucial role of catch monitoring in providing access to fish resources

Gislason G, Canada

Sustainability and the precautionary approach are fundamental tenets of current fisheries management. Meeting the sustainability test requires that reliable estimates of total removals or catch - landings plus discards - be available for use in stock assessment and setting TACs, and in gauging adherence to TACs and allocation targets. This in turn requires rigid catch monitoring by independent third parties to provide needed transparency and public confidence in fisheries management. Without third party catch monitoring, fisheries can not prove that they are sustainable and run the risk of having access to fish resources reduced or eliminated. Simply put, catch monitoring of landings plus discards is a necessary condition to sustainable fisheries management. This paper outlines for Pacific Canada the evolution of fisheries management philosophy over the past 25 years, how catch monitoring is now an integral component of current management philosophy, and how third party monitoring has increased TACs and fishing opportunities.

Observers' role in monitoring multi-species individual quota (IQ) programs

Majewski J, USA

Many entities, from environmental NGO's to economists, have advocated for fisheries management based on catch shares and/or individual quotas (IQs). IQ systems usually require total accounting of retained and discarded catch. Therefore, established observer programs may need to make dramatic changes, particularly in coverage levels and possibly in sampling methodology when their fishery moves to individual quota (IQ) management systems. The US West Coast groundfish trawl fishery may be moving to an Individual trawl quota fishery (ITQ) in the near future. As the US West Coast Groundfish Observer Program plans for ITQs, a number of issues/obstacles that affect observers must be overcome. These include:

-At-Sea Observations: what are realistic expectations?

-Accounting for discard of ITQ species

-Dealing with hauls that aren't sampled by the observer-Balancing management and science needs

-Data Turn-around: necessity for near real time data turn-around for ITQ species

-Use of technology (handhelds or water resistant laptops)
-Ensuring quality

Panel Session Abstracts

How new quota systems aimed at stopping overfishing impact observer programs

Faunce C, USA

Individual transferable quotas (ITQ) and cooperative quotas (CQ) have been prominently touted as the management solution to "end the race for fish" and prevent fisheries collapse. National Marine Fisheries Service's Alaska Region manages over 600 quotas for an industry whose ex-vessel value in 2007 was in excess of $1 billion. Two components of the Catch Accounting System are at-sea estimates of catch from observers, and reports from industry. During 2007 NMFS initiated two programs in Alaska which allow vessels operating in the Bering Sea non-pollock trawl fishery and the Gulf of Alaska Rockfish fishery to form cooperatives, and participating vessels were required to carry 100% observer coverage. The new, well intentioned management regimes implemented by NMFS have increased demands on the North Pacific Groundfish Observer Program (NPGOP) to adequately provide trained staff, debrief and edit data, and provide that data to the Catch Accounting System in support of management. This presentation will use specific cases to illustrate how implementation of popular management systems such as IFQ and CQ impact existing observer programs. Cases are drawn from the experiences of NPGOP- the largest program of its kind within the U.S.

How new quota systems aimed at stopping overfishing impact observer programs

Brogan G, USA*
Lowell B
Griffin E
Baumann B
Bilsky E

Individual transferable quotas (ITQ) and cooperative quotas (CQ) have been prominently touted as the management solution to "end the race for fish" and prevent fisheries collapse. National Marine Fisheries Service's Alaska Region manages over 600 quotas for an industry whose ex-vessel value in 2007 was in excess of $1 billion. Two components of the Catch Accounting System are at-sea estimates of catch from observers, and reports from industry. During 2007 NMFS initiated two programs in Alaska which allow vessels operating in the Bering Sea non-pollock trawl fishery and the Gulf of Alaska Rockfish fishery to form cooperatives, and participating vessels were required to carry 100% observer coverage. The new, well intentioned management regimes implemented by NMFS have increased demands on the North Pacific Groundfish Observer Program (NPGOP) to adequately provide trained staff, debrief and edit data, and provide that data to the Catch Accounting System in support of management. This presentation will use specific cases to illustrate how implementation of popular management systems such as IFQ and CQ impact existing observer programs. Cases are drawn from the experiences of NPGOP- the largest program of its kind within the U.S.

Rights based management of European Fisheries

Parkes G, UK

The EU has recently undertaken a review and analysis of the fisheries management systems in place in EU coastal Member States providing an overview of rights-based management (RBM) approaches. Rights-based approaches to fisheries management have shown potential for promoting biologically sustainable and economically viable fisheries in several parts of the world. Whilst fisheries management is a Community responsibility, under the framework of the reformed EU common fisheries policy (CFP), economic management of fishing rights is a national responsibility and in practice, many Member States have already implemented RBM approaches in a range of fisheries across the EU. This study analyses the attributes and effects of RBM systems and investigates their degree of success in contributing to achievement of the CFP objectives of sustainability of exploitation of stocks, matching fleet size with available fish resources, and economic viability of the fishing industry.

Using fishery observer data in community-based fisheries management.

Billings A, USA

Community-Based Fisheries Management (CBFM) is a growing trend internationally. Several countries, including the United States, have expressed interest in decentralizing certain aspects of the management of their fisheries. By placing some of the responsibility for planning, decision-making, and implementation of regulations into the hands of the fishing communities, an increase in compliance can be expected. In the United States, one of the main obstacles in executing CBFM is access to adequate data due to current confidentiality requirements. Establishing a link between CBFM and the data collected by observer programs could lead to better local understanding of fisheries and more effective micromanagement of such areas. For example, current state and federal management schemes are based on large-scale sections of the ocean, leading to restrictions or closures that are not warranted for the entire area. Using a finer, location-based scale for bycatch based on observer data can enhance the capability of managers using CBFM to employ an ecosystem approach rather than a species-by-species plan. This talk will first define CBFM and the main reasons for implementing it, followed by detailing the types

of observer data that are used in management and how it could be used in a CBFM system. This presentation will also address potential obstacles specifically present in the United States and offer suggestions to overcome those obstacles.

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Session 12: How can electronic monitoring be used to improve data collection activities?

Panel leader: Howard McElderry, Archipelago Marine Research Ltd, Canada

Electronic monitoring in the Central Gulf of Alaska Rockfish Fishery

Bonney J, USA

Amendment 68 to the Fishery Management Plan for the Groundfish of the Gulf of Alaska established a rockfish pilot program (RPP) for quota-based management of the rockfish fisheries in the Central Gulf of Alaska (CGOA). Under the program, each catcher vessel cooperative is allocated a share of various rockfish species, sablefish and Pacific cod. Additionally, the cooperatives are allocated halibut prohibited species catch (PSC) to allow the prosecution of the fishery. Halibut PSC must be discarded at-sea and, at this time, can only be effectively accounted against the cooperative's PSC quota if there is an observer onboard to estimate the halibut catch in each haul. However, North Pacific Groundfish Observer Program sampling methods were not designed for haul specific catch accounting on individual vessels. In 2005, a pilot study was conducted to evaluate the use of electronic monitoring (EM) to monitor discards in the CGOA rockfish fishery (McElderry et al. 2005). The study evaluated EM to observe fish handling aboard the trawl catcher vessels. The report stressed that if discard was restricted to a single location and discard species were limited to only halibut PSC, the effectiveness of EM would increase. In 2007, an exempted fishery permit study was conducted to determine whether EM could quantify halibut discard if the 2005 study recommendations were followed. In the study, one catcher vessel made six trips targeting rockfish, sablefish or Pacific cod. All catch other than halibut was retained and halibut were discarded through a single discard chute premarked with a measurement grid. All halibut were measured by project staff prior to being discarded. The results showed the video-based length estimates of discarded halibut had a high level of precision and were not biased relative to the at-sea census of halibut. The study supported the use of EM to obtain estimates of halibut PSC catch at the haul level. Questions related to infrastructure needed to support an EM program, costs associated with an EM program, the viability of such a program under real world fishing conditions and the feasibility of using EM for near real-time quota accounting have not been addressed. These questions need to be answered prior to large scale implementation of a comprehensive electronic monitoring program for the Central Gulf of Alaska rockfish pilot program.

Electronic catch monitoring in New England's Groundfish Fishery

Sanderson M, USA

Catch share management, in the form of community-based Sectors, will be implemented in New England's groundfish fishery in 2010, with the intent to end overfishing on many stocks. Accurately accounting for annual quotas will require a regional change in monitoring intensity and has spurred the exploration of alternative monitoring techniques. The Cape Cod Commercial Hook Fishermen's Association (CCCHFA) contracted Archipelago Marine Research on two pilot projects to test the feasibility of using electronic monitoring to quantify catch (landings and discards) on the benthic longline and gillnet dayboat fleets fishing under quota-based management. The pilot studies field-tested EM systems consisting of up to three closed circuit television cameras, a GPS receiver, hydraulic pressure and rotational gear sensors, and a data storage device. At sea observers were deployed on nearly all trips in order to evaluate the quality of EM catch data. Fishing event imagery was examined for species identification, enumeration of catch and verification of fishing times. Participating vessels belonged to the Georges Bank Cod Hook Sector or the Georges Bank Fixed Gear Sector. They began fishing under community quotas for cod in 2004 and 2006, respectively, and will be required to have a robust monitoring plan approved by the National Marine Fisheries Service by 2011. The EM pilots have led the way in exposing New England to the possibility of supplementing human observers with electronic monitoring. In this monitoring application, EM offers a number of advantages over observer programs including lower cost, labor savings, logistical efficiency, fleet suitability, and increased industry acceptance. Issues hindering the implementation of an EM-based monitoring program include expanding fleet awareness of EM program requirements, local infrastructure to support such a program, and solidifying data sharing agreements that specify what information would be collected and how it would be used.

Panel Session Abstracts

Using electronic monitoring to estimate reef fish catch on bottom longline vessels in the Gulf of Mexico: a pilot study

Dyas M, Canada

Archipelago Marine Research Ltd. was subcontracted by MRAG to carry out a study to test the feasibility of developing a monitoring system that would use Electronic Monitoring (EM) to satisfy the data needs of the reef longline fishery in the Gulf of Mexico. EM systems consisted of three closed circuit television cameras, a GPS receiver, a hydraulic pressure transducer, a winch rotation sensor, and a system control box. EM systems were placed on six vessels for a total of over 148 days at sea. EM and observer fishing event and catch data were available for comparison for a total of 218 fishing events. EM system at sea data collection on all participating vessels was virtually complete except for data loss occurring when vessel operators manually turned off the EM systems, resulting in 65% overall sensor data completeness. EM sensor data provided accurate vessel position information and enabled identification of setting and hauling events. In terms of catch, both EM and observer methods were numerically within 2.7%. Catch identification comparisons between observer and EM methods were generally good with 80% of catch pairing comparisons having a positive match on a hook-by-hook analysis. Some species showed identification discrepancies between observer and EM, shark species being predominant. These discrepancies were often offset when results from similar species were grouped, usually within the same genus or family. EM was not able to reliably determine catch discarding due to inconsistent catch handling and limitations from camera views. Overall, results of this study suggest that EM shows promise for collecting fishing activity spatial-temporal data and assessing catch composition and further work is needed to determine if the technology could provide reliable catch disposition data.

Assessing protected species interactions using electronic monitoring technology - A pilot study in New Zealand Longline Fisheries

France A, New Zealand

The New Zealand Ministry of Fisheries (MFish) contracted Archipelago Marine Research Ltd. to evaluate the feasibility of using electronic monitoring (EM) for assessing protected species interactions in demersal and pelagic longline fisheries. The pilot spanned a nine-month period during which EM systems and MFish Observers were simultaneously in place on two pelagic and two demersal longline vessels for a total of 8 trips and 198 fishing events, and about 100 days of vessel time at sea, providing the opportunity for comparison of protected species interactions and catch estimates over a range of conditions. The data recording success of EM systems varied considerably among the four participating vessels. Sensor data, which should be logged continuously from the start to end of the fishing trip, were incomplete on significant portions of fishing trips for all but one vessel. On the basis of individual fishing trips, sensor recording success varied from 8-100% and the average among all trips was 54%. Image data, recorded during setting and hauling events only, were much more complete among all vessels, ranging from 82-100% and averaging 97% among all trips. Unsuccessful data capture from the four EM deployments was primarily caused by the EM system being manually shut off. Time breaks recorded on one of the vessels were generally long in duration and often ended when the observer came on shift. There were no instances of malfunctioning equipment resulting in data failure and the EM systems were considered suitable for all vessels in the study. There were some technical issues encountered such as battery and sensor placements, but these were deemed resolvable and should not detract from the future use of this technology. This conclusion would also apply to the component of the fleet considered too small or not suited for placement of Observers. There were also camera placement issues encountered during the pilot which are also likely resolvable and show promise for the demersal longline fishery. Further study is required to determine applicability for pelagic longline fisheries. In either of the two fleets EM-based monitoring will likely depend on several issues, the main one's being industry support, cost and convenience (as compared with Observers), opportunities for value-adding EM by addressing data needs of industry, and policies governing the use and ownership of data. With regard to demersal longline fisheries, further work is needed to determine appropriate placements for cameras and sensors across a range of vessel configurations. The utility of EM technology for pelagic longline fisheries has yet to be established. The camera configuration is more complicated than demersal longline fishing and further work is needed to determine if cameras can successfully monitor catch retrieval operations.

Panel Session Abstracts

A new approach to monitoring protected species interactions using electronic monitoring technology–a pilot study in New Zealand Longline Fisheries

Rowe S*, New Zealand
Anderson S
Debski I
Pierre J

Over the last ten years, the Conservation Services Programme (CSP) of the New Zealand Department of Conservation has monitored interactions between large trawl vessels (> 28 m in length) and protected species, by placement of government observers on vessels. The data gathered has been key to developing an understanding of the significant risk posed to protected seabirds and marine mammals, and has enabled the development of a number of successful methods to reduce protected species bycatch. However, very little is known on the extent of interactions between smaller inshore vessels and protected species. The logistical constraints of accommodating a human observer, and less predictable fishing schedules, have greatly limited the use of government observers on these vessels. Since January 2007 CSP has placed a limited number of observers on these small vessels for the first time and early results show the potentially large impact they may have on protected species, including albatrosses, shearwaters and marine mammals.

In 2008 CSP started investigating novel ways of increasing monitoring coverage and understanding of the interactions between small inshore trawl vessels and protected species in New Zealand fisheries. This included a six month trial of electronic monitoring (EM) on two small inshore trawl vessels. The key objective of the trial was to evaluate the use of EM for protected species interactions with fishing vessels, and use of associated mitigation methods and other related fishing practices, in inshore trawl fisheries in New Zealand.

The successful deployment of EM in this trial was made possible by the active cooperation of the fishing company involved. Early results have shown the EM systems to be capable of capturing protected species interactions with the vessels and further analysis is underway at the time of writing.

Summary of the North Pacific Electronic Fisheries Monitoring Workshop, July 2008

Loefflad M, USA

A number of electronic monitoring (EM) technologies have evolved and been applied in fisheries monitoring. Given the range of interest in video applications and the various perceptions of its potential use, the National Marine Fisheries Service, the North Pacific Fishery Management Council, and the North Pacific Research Board collectively identified the need to assess the state of the current electronic monitoring technology on both national and international fronts, with an eye toward its future use in the North Pacific, and set up a workshop in July 2008 to discuss these issues. The workshop determined that the methodology is well established with proven technology and successful applications, but that EM is not applicable for all cases. EM has many potential applications for North Pacific fisheries. Incorporating EM into a monitoring program will depend heavily on the objectives of the particular program; two programs that rely on EM to various extents demonstrate the future potential for EM in the US North Pacific. Developers of monitoring programs that use EM should consider the full sampling needs of the program, and combine technology and observers in a way that takes advantage of what observers and EM do best. A substantial amount of research and evaluation is needed before managers and scientists can take full advantage of the benefits of EM.

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