

Monday, 29 Aug 2016

11:00 - 12:00:

**Panel - What Can We Learn From Observer Programs
Around The World?**

Paper 167: Strengthening the U.S. National Observer Program

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¹ NMFS

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NOAA Fisheries has deployed human observers and at-sea monitors to collect fisheries-dependent data from U.S. commercial fishing and processing vessels since 1972. Observers monitor fishing activities on all U.S. coasts, collecting data for a range of conservation and management issues. Approximately 79,000 days at sea in 53 fisheries were observed in 2015. The National Observer Program (NOP) coordinates 11 regional observer programs. It supports enhanced observer safety and training and improvements in data collection of fishing effort, biological samples, commercial fisheries catch, and bycatch of non-target fish, marine mammals, sea turtles and seabirds. Integration of these data with other research data into stock assessments provides fishery managers with the scientific information necessary to manage marine resources. The NOP has initiated several investigations in 2016 to improve observer safety and health, improve observer retention, implement electronic technologies, develop a tool to prioritize species for estimating release mortality, and optimize budget allocations to support regional observer programs.

Paper 160: Pacific Island Forum Fisheries Agency Observer Programme

Philip LENS¹

¹ Pacific Island Forum Fisheries Agency

The Pacific Islands FFA is an inter-government agency established in 1979 to facilitate regional co-operation and co-ordination on fisheries policies between its member(s) states. This is to achieve conservation and optimum utilization of living marine resources, in particular highly migratory fish stocks, for the benefit of the peoples of the region.

FFA observer programme role is to provide support to its member's national observer programmes in terms of national capacity building, observer administration strengthening, and trainings as well as policy guidance.

The FFA Observer Programme ensure effective administering of the US treaty observer programme in coordinating and placement of observer on US purse seiners fishing in the region. The welfare of the Pacific Island observers who are placed on US fleets are also closely monitored as far as safety is concern. Observer are sourced from national programme around the region to be placed on US purse seiners

FFA maintain close collaboration with the regional science providers, the Pacific Community (SPC) as far as observer data is concern. SPC plays that important role to analyze all FFA observer trip data including national programmes trips and provide the scientific advice to FFA and the member states. The FFA observer programme in collaboration with the Pacific Community (SPC) provides trainings using the Pacific Island Regional Fisheries Observer (PIRFO) training standards.

The FFA observer programme is certified by the Western and Central Pacific Fisheries Commission Regional Observer Programme (WCPFC-ROP) after meeting the WCPFC-ROP minimum standards to provide observer service in the WCPFC conventional area.

The emerging technology advancement has encouraged some national programmes in the region to start trialing out the electronic reporting using the android Tablet and Delorme device to collect and submit data near real time. Few national programmes are embarking onto trialing out the video monitoring on tuna longline fishing vessels. There are approximately around more than 800 trained and certified observers in the region and employed by their national governments.

Paper 140: Broadening the Scope - challenges ahead for New Zealand's Ministry for Primary Industries observer programme

Alexander WOODS¹

¹ Pacific Networks Limited

The New Zealand fisheries observer programme is about to embark on its most ambitious development since the inception of the programme in 1986. Observer duties have traditionally included sea-going observation and data collection tasks. Observers record accurate and reliable data relating to vessel catch and processing. They also monitor the environmental impact of fishing activity. Under new proposals, it is Ministry's intention to broaden the scope of sea-going observation to include the working hours and living conditions of fishers, compliance with the new Health and Safety at Work Act 2015, vessel safety and information related to food safety.

These new functions can be attributed to several factors. The Ministry for Primary Industries (MPI) is a "super ministry" whose responsibility includes food safety and biosecurity on top of fisheries (and all of New Zealand's other primary industries). The Ministry for Business, Innovation and Employment is keen to enforce the hours worked by crew on fishing vessels. Following a Commission of Inquiry into the activities of the foreign charter vessel fleet, these vessels are required to be New Zealand-flagged. As such, their activities at sea now come under New Zealand law. Maritime New Zealand is keen to see vessel safety checks carried out while at sea and MPI would like to be reassured that New Zealand food safety laws are obeyed at sea. The responsibility for gathering all this information is now going to be given to the person on the spot - the observer.

These additional functions could impact on the attractiveness of the job to potential recruits. It will change the selection criteria and extend the duration of training and may affect the retention of existing staff. It is likely to change industry's perception of the observer and could make the observer's role more difficult. If such potentially negative perceptions are to be avoided, care will need to be taken in recruitment and in the way that observers go about carrying out these new functions.

Paper 135: HAS THE FUTURE ARRIVED YET FOR THE SCOTTISH INDUSTRY OBSERVER PROGRAMME

Kenny COULL¹

¹ Scottish Fishermens Federation

In 2008, Scotland embarked upon a new way of managing its fisheries within the context of the EU management regime. Under new EU regulation, Member States were given the opportunity to manage days at sea for their own vessels under a block allocation of kilowatt-days. Scotland as part of the UK chose to manage its fisheries in this way and in doing so was able to begin creating incentives for fishermen to engage in extra conservation measures.

A cooperative management body was formed, known as the Conservation Credits Steering Group (CCSG) made up of government, scientists, environmental NGOs and industry. This group, along with sub-groups dealing with matters such as technical measures for more selective fishing gear, cooperated on the management of the Scottish fleet. Measures introduced by the CCSG include a programme of seasonal and real-time closed areas which help to protect aggregations of cod, various selective gear measures including the "Orkney trawl", larger square mesh panels and larger mesh cod ends. In return for adopting selective gear methods, fishermen were rewarded with increases in the days at sea allocation. This led to the creation of an observer programme managed by the Scottish Fishermen's Federation (SFF) to provide both policy and science managers with the degree of confidence required to support measures introduced.

SFF presented on the evolution of the Industry led Observer Programme to the International Fisheries Observer and Monitoring Conference (IFOMC) in Chile in 2013. In completing the presentation, reference was made to "The Future of the SFF Onboard Observer Scheme" and highlighted four specific aims; wider use of data in stock assessment, collection of biological data in support of the European Union Data Collection Regulation, provide information on data deficient stocks, training of fishermen in self-sampling techniques.

In 2016, SFF will take the opportunity to inform IFOMC on achievements against the stated aims and highlight the issues that arose and how they were addressed.

Paper 54: Pre-requisites matter: An examination of applicant qualifications and performance

Gwynne SCHNAITTACHER¹

¹ **NOAA/NMFS/AFSC/FMA**

Fisheries in Alaska are quota managed in near-real time. This is possible due to the high quality data and timeliness by which data are collected and submitted to the National Marine Fisheries Service by fisheries observers. The misidentification of fish and crab species has the potential to influence quota management and possible fishery closures.

While observers are rigorously trained prior to deployment and all data are subjected to an intensive post-deployment quality control process, it is essential that qualified candidates are selected for the program. National minimum eligibility standards for marine fisheries observers require specific educational standards allowing for a consistent baseline with robust scientific backgrounds across programs nationally. In addition to the basic national standards, the North Pacific Observer Program has an additional regulatory prerequisite that at least one of the mandatory biology courses include the use of dichotomous keys. The ability of observers to use dichotomous keys in the field is essential to the successful performance of observers in our program.

To ensure a high standard of species identification and data collection in the field, the program requires annual fish and crab species identification testing for all observers. Fish exam performance results have been maintained and tracked for 11 years. Using these data and along with other applicant information and deployment performance, this study will examine if an individual's experience coming into the observer program can influence how they perform during their initial training and subsequent deployments.

Validation and consideration of the applicant pre-requisites can have implications for new and emerging programs in regards to high quality in-season data collection and management, developing qualification metrics for applicants, and establishing efficiencies in recruitment and retention practices.

Paper 103: Implementation of Discard Research Programs in Chilean Fisheries

Luis COCAS¹

¹ Undersecretariat for Fisheries and Aquaculture, Chilean Government

Aware that increased levels of fishing mortality due to unaccounted bycatch and discards threaten the long term sustainability of fisheries, Chile amended its Fisheries Act in 2012, introducing definitions on discards and bycatch, and establishing sanctions and control measures for those incurring in such practices.

However, before penalizing, the new law required the development of research programs to identify and quantify these (until then) unmonitored topics, recognize their causes, and propose mitigation measures.

Previous legislation just banned and heavily sanctioned discarding, which added to difficult enforcement, converted discards (while still occurring) in a taboo topic within fishermen. Therefore, these studies involved technical and cultural challenges because for a first time, discards and bycatch were going to be assessed with the consequent fears on the outcome.

Thus, to obtain (behaviorally) unbiased information, during the execution of these programs, sanctions on discards were suspended. However, all other fishing regulations had to be complied.

Originally, the information had to be collected exclusively by fisheries observers, but because of coverage restrictions for a vast fleet, fishermen were also incorporated through self-reporting.

This scenario required strengthening the observer programs through improved regulation on working conditions, training, safety, infrastructure, and data collection. In addition, an intense socialization and communication work, lead by observers, was deployed to introduce these programs and achieve the fleet's commitment.

Species identification guides for fishermen, posters, workshops, and field meetings, along with a strong injection of budget for discard research, reaching US \$2 M in 2016, were also provided.

By 2016, two programs have been concluded and the respective mitigation proposals will be discussed within specific Management Committees, these include measures, technological media, a surveillance, control, and vigilance program, training, and codes of conduct. Once approved will become binding through Mitigation Plans.

Since Chilean observers do not have jurisdiction on compliance, Electronic Monitoring Systems (EMS) will monitor and control discards onboard any vessel longer than 45 feet. Concurrently, fishery/gear based regulations, that consider these results, must be enacted during 2016 to regulate the use of EMS.

Monday, 29 Aug 2016

13:30 - 15:00:

**Panel - How Do We Train And Prepare Observers,
Provide Opportunities For Personal Growth And Reward
Performance?**

Paper 173: Preparing for Life on the High Seas...In an Office

Benjamin DUFFIN¹

¹ NMFS/Gavleston Observer Program

For many aspiring biologists, fisheries observing is an irreplaceable boon providing an opportunity to learn about a new job and create life experiences not common elsewhere. But some of these experiences can be a real shock to the uninitiated, so to best prepare observers for life in the field, the Galveston Observer Program employs an intensive three week training course that keys in on instruction, simulation, and testing.

The first week of our training is entirely devoted to the safety, starting with the introduction to the seven steps to survival that are emphasized continually. Each subject is presented in a way that will prompt a group activity or mock emergency that must be dealt with. Once response protocols have been established for fire, flooding, man overboard and abandon ship; this week culminates in drills run on a shrimp fishing vessel followed by a comprehensive test.

After completing safety training, observer protocol training begins. Covering multiple fisheries translates to covering a lot of different sampling protocol. After the forms and technical aspects of a particular fishery are covered, group simulations are used to exhibit the real-life application. Artificial catch is used so everyone has a chance to sort, weigh, measure, and record data just as they would in the field. Real fishing gear is used so that you can show just how exactly to measure the leading edge or flap overlap on a turtle excluder device (TED). These simulations are followed by several paper and pencil "trips" and a practical exam.

All the while, time is put aside each day to cover species identification. Initially, families of fish and their common constituents in our area are introduced. Distinctive characteristics are pointed out and keys are walked through. As everyone becomes more comfortable, hundreds of fresh frozen specimens are prepared for observers to identify on their own, culminating in a final hands on test where observers must identify thirty to forty fish to the species level.

Given the small amount of time available to train observers, hands on learning and running simulations has proven to produce field ready observers.

Paper 156: How the Pacific Community trains and prepares observers, and provides opportunities for professional growth

Siosifa FUKOFUKA¹

¹ Pacific Community (SPC)

Dating back to 20 years ago, a handful of Fisheries Observers were trained each year with one or two training courses conducted each year by the Pacific Community (SPC) and Pacific Islands Forum Fisheries Agency (FFA). Both SPC and FFA are the two regional bodies responsible for overseeing, providing technical assistance and training to their member countries in the Pacific region. It is worth noting that tuna purse seine, longline and pole and line vessels are present and fish in one of the world's richest tuna ground, where the four main target tuna species include: skipjack, yellowfin, bigeye and albacore.

In light of the scope and potential for fisheries in the Western & Central Pacific Ocean and noting the need to sustain fish stocks, the Pacific Islands Regional Fisheries Observer (PIRFO) training standards were endorsed by Pacific island states and put in place in 2008 to cater for the Western & Central Pacific Fisheries Commission (WCPFC) conservation and management measures (CMMs), including 100% observer coverage on all tuna purse seiners and 5% observer coverage for tuna longliners that fish in Pacific Island waters, where over 60% of world tuna catch is harvested.

PIRFO has been developed into an observer career path where it provides for employment opportunity for young Pacific Islanders. What is being seen now is that Pacific Islanders start as an observer and over the years acquire the skill set, gain experience from sea days thus making them eligible to be trained up as observer debriefers and later observer trainers. Experienced observers are also now moving into differing fields like office observers for electronic monitoring data review.

At present, there are 760 PIRFO observers and 80 observer debriefers from 15 programmes trained under the PIRFO. They are the eyes and ears of fisheries science and management, observing, noting, recording, and reporting back to base all that they have seen when it comes to fishing in Pacific Island Exclusive Economic Zones (EEZ). This fishery independent data is the baseline needed to inform policy and decision makers.

Paper 67: Resolve This! Skills to train observers in conflict negotiation

Christa COLWAY¹

¹ NOAA, Northwest Fisheries Science Center, West Coast Groundfish Observer Program

Conflict is unavoidable. This is especially true for fisheries observers who face constantly changing work environments and situations. The National Observer Program has provided a broad standard for training observers which includes identifying the major personality types and the conflict resolution techniques that work best with each. However, there are no standardized, uniform conflict resolution techniques or training materials. Fisheries observers face difficulties at sea beyond those typically covered in training materials for workers in an office setting. They work independently on other people's vessels often in tight quarters for days, weeks, or months at a time. Knowledge of personality types and communication styles may offer little help to the observers finding themselves offshore and alone in a confrontation.

Observers need specific conflict management skills that they can draw on to quickly de-escalate a tense situation, take control of the conversation, and lead to a successful negotiation. I've combed through a sea of materials and will share in this presentation the skills I've found in my search which may be the most useful.

Paper110: Establishing A Reliable And Well Trained Former Longliners To Increase Survival Rate of Chelonia Mydas, Lepidochelys olivacea, Eretmochelys imbricata, Dermochelys coriacea, Natator depressus, and Caretta caretta In Hindia and Pasific Ocean

Wahyu Teguh PRAWIRA¹

¹ WWF-Indonesia

The issue of Endangered, Threatened, and Protected (ETP) marine animals (Sea Turtles, Sharks, Marine Mammals, and Sea Birds) bycatch in fishing activities becomes a significant global concern. The presence of on-board observers as mandated by Food and Agriculture Organization (FAO) of the United Nations and Indonesian government is considerably needed, aside from the efforts to change the fallacious image of the observers among the observed parties, primarily to cooperatively solve bycatch issues. There were at least 17.61% ETP marine animals; sea turtles and sharks, during 2006 - 2014 which were unintentionally in tuna fisheries activities and later as a result of improper post-caught treatment. Creating qualified and well-trained observers genuinely aims to reduce the mortality rate of the animals and improve the quality of the tuna longline fisheries data. To attain a qualified observer, the candidate must be reliable and certified. In its practice, some approaching strategies is principally needed to engage the candidate especially who has graduated from marine and fisheries vocational school or those who has a background in operating longline vessel such as captain and deck crew. Selected candidate will participate in a week training to build their capacity in collecting data and treating bycaught animals on longline vessels which are based in Bena Harbour. During 2006-2014, there were at least 61 observers who was placed in 75 longline vessels from three major fishing port in Indonesia; Bena, Bitung, and Muara Baru joined 218 fishing trips with total 5717 *setting* number. The efforts of treating sea turtle by catch which is done by the on-board observers by using steps as directed in the Better Management Practices for sea turtle handling, has been proven to improve life release of sea turtles until 96.57%.

Keyword: *Bycatch, Observer, Tuna Longline, Survival Rate*

Paper 107: Strengthening capabilities and encouraging on board observers of the programme “Programa Bitacoristas de Pesca (PBP)” of Perú

Marilú BOUCHON¹

Julio LIMACHE¹, Gersson ROMAN¹, Cecilia PEÑA¹, Sofia RIVADENEYRA¹

and Manuel OCHOA¹

¹ Instituto del Mar del Perú (IMARPE)

Currently the on board Observer Programme PBP of the Instituto del Mar del Peru (IMARPE) has 40 professionals, including biologists, fisheries Engineers, Technologists and Technicians who has years of experience in the field. The number of on board observers over time has varied mainly for budgetary reasons.

In the beginning the PBP had a main goal that was collecting information on different measures of effective effort to estimate relative abundance indices of Peruvian anchovy. Later, new objectives were added to convert the program into a medium capable of monitoring both biological, population and behavior of pelagic fish and top predators as the dynamics of the fishing fleet, becoming a scientific platform of Peru for ecosystem management. To achieve this new goal was necessary a hard work bringing training and incentives to the observers, which generates valuable information for the decision making in the scope of the fisheries management and many other studies. Our goal is to inform the international scientific community about the observers continuous training in favor of their personal and professional development.

They acquire knowledge of biology (reproductive and biometrical sampling), fisheries (echo sounder lectures), fishing effort, ecology, sightings of top predators and oceanography (temperatures and water sampling), and also about the input of the obtained information into a scientific communication system through a mobile device and on the IMARPE's database called IMARSIS. The best observers are encouraged to participate in other scientific activities: Research Cruises, Eureka's, Surveys, etc., where they learn about the design and methodology of each activity. Thanks to this training and experience in fisheries, observers have been able to move into other jobs either in fishing companies, Ministerio de la Produccion (PRODUCE) or IMARPE for their good performance

Paper 57: Observers as the At-Sea Scientist: Our Experiences with Fisheries Research

Jennifer CAHALAN¹

¹ Pacific States Marine Fisheries Commission

The North Pacific Observer Program (Observer Program) is often involved in fisheries research activities, studies that are conducted within the Observer Program as well as research sponsored by outside scientists. As a result, our observers are regularly asked to conduct research data collection activities in conjunction with their regular catch sampling duties. Because of their experience as fisheries monitors collecting scientific data onboard commercial fishing vessels actively engaged in fishing, observers 1) have a distinctive skill set that includes knowledge of sampling, fisheries, and vessel operations, 2) are well trained to evaluate situations and determine the best methods to achieve data collection goals, and 3) bring a unique perspective to the research environment due to their involvement with the industry and their knowledge of vessel operations. Precisely because of their skill set and because of their unique perspective, observers can be an important component of research projects that are conducted on commercial fishing vessels.

Involving observers in research activities benefits the Observer Program beyond simply completing the research project. By increasing the diversity of duties and providing additional opportunities for observers to gain experience, observer retention may be increased, increasing the strength of the Observer Program overall.

For the observer, these research opportunities provide them with training and experience beyond standard data collection activities that can further enhance their knowledge and background. Not only does this increased depth of experience enhance their potential for other professional opportunities should they choose to leave observing, it keeps the observer involved in the growth of the Observer Program as it constantly adapts sampling methods to changes in fisheries operations and management.

In this presentation we will discuss our experiences conducting fisheries research studies on fishing vessels actively engaged in commercial fishing.

Paper 64: From Deck Sheets to Spreadsheets; Integrating Observers Beyond Data Collection

Lindsey NELSON¹

¹ North Pacific Groundfish Observer Program

Observers are highly trained college graduates who possess an array of qualities such as creativity, adaptability, physical stamina, and diligence. Their role as data collectors is the foundation for fisheries management decisions that have economic, biological, and political consequences, but their position is often perceived as "biological technician" rather than "biologist" which at times undervalues the scope of the title. In order for observers to exhibit professionalism, take pride in their work, and grow as scientists, it is important to offer integration into different levels of the management process. Here, we will discuss: 1) how the observer programs and management personnel may include observers in more aspects of data analysis, writing, and presentation of findings, 2) ways for observers to highlight their professionalism and showcase skills for future employers, and 3) outreach and increasing public awareness of observer presence on commercial fishing vessels.

Monday, 29 Aug 2016

15:30 - 17:00:

**Panel - How Can Fisheries Observers Improve The
Quality, Diversity And Use Of Fisheries Dependent
Information?**

Paper 41: Applying Rigorous Random Sampling Techniques in a Commercial Fishery Environment

Brian MASON¹

¹ North Pacific Observer Program

The use of rigorous and statistically valid randomly sampling techniques is critical for making meaningful inferences about a population, particularly when the population is total catch of fish and the estimate will be used for management of a commercial fishery. Often the focus of data collection is to obtain a census of the population; however, the many logistical challenges presented by a commercial fishing operation often prevent an accurate census from being achieved. Unfortunately, an incomplete census prevents uncertainty estimates from being calculated and the resulting biases may not be recognized by the data user. Carefully designed random sampling procedures produce unbiased data when accurately implemented which produce estimates that can be evaluated and resulting in a more robust decision process.

On commercial fishing vessels, observers routinely sample catches to obtain data used in catch estimation (quota management) and stock assessments. Sampling from this population in the chaotic environment of active commercial fishing is challenging with multiple logistical constraints that need to be overcome. However, even within that environment, the basic elements of rigorous randomized sampling can be used to collect unbiased data that allows for estimation of statistical properties of the estimates.

This presentation looks at the simple steps required for applying random sampling methods. The differences in target and sample populations will be reviewed along with examples of how observers in the North Pacific Observer Program identify and chose sample units in a repeatable manner. Throughout, we will share our experiences training and using this approach, including successful methods observers have implemented in some of the most difficult sampling situations they encounter.

Paper 55: Scientific Data Collection in a Fishery Dependent World: Have Your Hake and Eat it Too

Vanessa TUTTLE¹

¹ NOAA Fisheries

Everybody knows that if you don't collect a piece of data while you have a fish in hand, the chance will pass, never to be had again. Observers provide fisheries managers with the necessary data to manage fisheries, but there is also great opportunity for observers to contribute to science. The At-Sea Hake Observer Program (A-SHOP) and the West Coast Groundfish Observer Program (WCGOP), which operate off the U.S. West Coast, are testing the limits, collecting as much data as possible, from as many different aspects of fishing as possible. Recent additions to data collection protocols include expanded genetic sampling at the species level, environmental DNA sampling, cephalopod collections to contribute to life history and marine mammal diet studies, expanded maturity and fecundity sampling from several species, and a directed research study on seabird interactions with trawl cables. This is all in addition to the typical species composition samples, routine biological sampling, and enhanced data collection on protected species, which make up the core data collections for the A-SHOP. Harnessing the opportunity that is presented from having a human at sea to collect data is our goal, all the while remaining cognizant to not overburden the observers in the process. Time management training, use of priority lists, and occasionally even just saying no to requests for data collections are several of the tactics we use to ensure a successful and happy observer cadre.

Paper 133: Successful fisheries management requires a thorough understanding of fishers behaviour - what can observers do?

Ruben VERKEMPYNCK¹

Marloes KRAAN¹, Brita TRAPMAN¹ and Michiel DAMMERS¹

¹ Wageningen IMARES

Successful fisheries management requires a thorough understanding of fishers behaviour; what we define as the collective set of decisions made every day on board of fishing vessels by fishermen. Sudden and drastic changes in fisheries management, as e.g. the current implementation of the landing obligation in European waters, confronts us with the following question: is our current knowledge of fishers' behaviour sufficient to prepare for changes in fisheries? For now, most will agree that it is unclear how fishers will respond to new rules and regulations.

At sea observers spend a week (in Dutch demersal fisheries) on board of fishing vessels and do their work collecting catch data alongside the skipper and crew. In some aspects they participate in the lives of the fishermen, eat together, sleep together, talk, joke and process fish. They in fact also are the eyes and ears of our research institute (or the ambassadors) and can potentially bridge the gap between science and fishing practice. They hear many stories, observe behaviour, are the first to experience changes in the environment, etc. From a social science perspective they sit on a gold mine.

Unfortunately not a lot is done with this information. One of the reasons for this is that this information is not recognised as valuable and subsequently is not collected. Would that however be done, this would result in valuable information that might give a better understanding of fishers behaviour and fisheries practice. In a transdisciplinary project focussing on getting a better understanding of fishers' behaviour, IMARES will develop a protocol for at sea observers to gather more data whilst they are on board anyway, in relation to fishers' behaviour. This will be done together with the sea-going observers, fishermen and scientists in the institute. The observers will be trained in social science methods such as interviewing and observing, and ethical issues will be discussed with fisher crew, observers and researchers.

Paper 25: Using Observer Data To Quantify The Effectiveness Of Eulachon Smelt Bycatch Reduction Devices In The U.s. West Coast Pink Shrimp Fishery.

Bo WHITESIDE¹

Jason JANNOT¹ and **Ryan SHAMA**¹

¹ **WCGOP**

In 2015, the U.S. West Coast pink shrimp (*Pandalus jordani*) fishery landed a record breaking 46,667 metric tons of shrimp generating over \$110 million in revenue for the U.S. states of Washington, Oregon, and California (PacFIN 2016). However, with all fisheries comes the potential for bycatch, and one particular bycatch species of concern in the pink shrimp fishery is the southern Distinct Population Segment (DPS) of eulachon smelt (*Thaleichthys pacificus*), which was listed as threatened under the Endangered Species Act (ESA). In addition to record breaking pink shrimp landings in 2015, a large number of vessels in the pink shrimp fleet also adopted the use of a new bycatch reduction device (BRD) to reduce the amount of eulachon smelt bycatch. This BRD is a series of light-emitting diodes (LED) secured along the main fishing line above the ground line, which are believed to illuminate escape routes for the smelt. Testing of this BRD by a state agency suggested that there were substantial reductions in bycatch of eulachon, juvenile rockfish, and juvenile flatfish (Hannah and Jones 2014). These tests were controlled scientific experiments and the news of these initial findings spread quickly throughout the fleet. As a consequence of this news, most vessels participating in the fishery implemented light BRDs in 2015. At the same time, the West Coast Groundfish Observer Program (WCGOP) began collecting data on the use of light BRDs in the pink shrimp fleet. Approximately 200 trips were observed with this BRD in place. We will compare the 2014 bycatch of eulachon, juvenile rockfish, and juvenile flatfish in the pink shrimp fishery before the fleet adopted light BRDs to 2015 bycatch when the fleet used light BRDs. Understanding how light BRDs reduce bycatch in the fishery will provide managers with insight into how best to incorporate light BRDs into the regulations and will also act as an example for other programs in the U.S. and around the globe.

Literature Cited *removed for word count

Paper 30: Beneficial trends in catch monitoring

Julian HAWKINS¹

¹ Integrated Quota Management Inc

Existing observer programs often realize their regulatory and sustainability objectives but at the expense of the economic health of the fishing industry. Yet fishers understand, and frequently welcome, a systematic regulatory structure where clear rules help limit outliers and protect livelihoods. Successful monitoring programs are typified by strong industry-regulator interaction, non-disruptive procedural changes and a plan to reduce the economic impact to fishermen. As modern, established fishery observer programs seek to improve capability and reduce costs, so too developing world and artisanal fishery monitoring programs are growing in number. Both disparate trends are seeking to leverage cost and capability improvements brought by new technology and yield better value to the fishermen and processors for verifiably ethically and sustainably caught fish. This trend to verify aspects of each fish caught satisfies regulators, retailers and consumers beyond what was previously acceptable - yearly paper or spot audits - and signals a trend to improved fishery reputation and vitality.

Paper 97: CREW-BASED OBSERVER PROGRAMME OF WWF-PAKISTAN: A POSSIBLY DEPENDABLE SYSTEM OF OBSERVERS ON SMALL SCALE FISHERIES OF INDIAN OCEAN COUNTRIES

Muhammad Moazzam KHAN¹

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¹ WWF-Pakistan

There are about 700 gillnetters that operate in Exclusive Economic Zone (EEZ) of Pakistan and in the Area Beyond National Jurisdiction (ABNJ). According to Indian Ocean Tuna Commission (IOTC) requirements, observers have to be placed on these vessels. After a number of failure to appoint observers on tuna gillnetters, WWF-Pakistan initiated a crew-based observer program in 2012. Under this program, the one of the crew member (preferably the skipper) is trained to act as an observer and collect required data and information. Initially only 4 observers were posted on the tuna gillnetters, however, considering the program to be a success, the number of observers is raised to 31 which will be further raised to a level of 105 (15 % coverage of the fleet).

The observers collect data about details about gillnets (length, breadth, mesh size) location at which the gillnet is placed in water, soak time, retrieval location, number of specimens of each tuna species, commercially important bycatch species, turtles, sharks, whale sharks, mobulids, dolphin and cetacean (live or dead). They also record length frequency of 3 specimens of each tuna species, as well as length of each bycatch species. These observers keep photographic record of each haul which helps in verifying the data collected.

Considering that a large number of protected, endangered and threatened (PET) species are entangled in the gillnet, these observers were trained to safely release live species. This turned out to be successful story, as so far about 15 mobulids, 28 whale sharks, 3 dolphins, 1 whale, 5 sunfishes and thousand of turtles (mainly olive ridley and green turtles) have been successfully released. The clips of these successful releases are recorded by observers.

The information about entanglement and mortality of PET species, commercial catch and bycatch composition was not available for the any gillnet fisheries of the Indian Ocean. Through crew-based observer program of WWF-Pakistan, these much needed information is now regularly been collected and documented. Considering the success of this observer program, a number of countries in the region are considering to initiate similar program for their gillnet fisheries.

Paper 175: Seabird intensive observer training programme of BirdLife International

YUNA KIM^{1,2}

Bronwyn MAREE^{1,2}, **Cleo SMALL**³ and **Ross M WANLESS**^{1,4}

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Tuna fisheries in the Areas Beyond National Jurisdiction (ABNJ) are managed by five tuna Regional Fisheries Management Organizations (RFMOs). The RFMOs requires longline vessels operating below 25°S to implement at least two of three measures; bird-scaring line, night setting and line weighting. Observers can play important roles to facilitate, support and strengthen the use of best practice seabird bycatch mitigation measures by fleets. However, many national observers are not well skilled in taking the roles yet. Therefore, BirdLife International, as a part of Food and Agriculture Organization's Common Oceans programme, funded by Global Environment Facility, developed an intensive, seabird-relevant observer training course to deliver to observers from key tuna fishing countries. The observer training programme is comprised of lectures covering the biology of seabirds, best practice for seabird bycatch mitigation, scientific approaches to conducting experiments at sea, and practical sessions on seabird identification and demonstrating various seabird mitigation measures. The programme enables observers to conduct at-sea trials to test the effectiveness of bycatch mitigation measures. The training has been provided to Korean observers and multiple at-sea trials to test line weighting options have been successfully conducted. Participation of different national fleets in at-sea trials is expected and this will enable tuna RFMOs to measure and improve the effectiveness of seabird bycatch mitigation measures. Ultimately, our goal is to increase best practice mitigation measures implementation of vessels operating in tuna RFMO's areas by 40%. Increasing observer coverage rate and implementing electronic monitoring systems will be necessary to achieve the goal.

Paper 26: New forms of on board observer scientific vessels for monitoring the "El Niño" events

Manuel OCHOA¹

Cecilia PEÑA¹, Marilú BOUCHON¹, Gersson ROMAN¹, Noel DOMÍNGUEZ¹ and

Julio LIMACHE¹

¹ Instituto del Mar del Perú (IMARPE)

The Humboldt Current Ecosystem off the west coast of South America is a system of high variability due to the occurrence of warm events like "El Niño" which occurs naturally at different scales of time and space of singular importance for their impacts in Peru and globally.

The Instituto del Mar del Peru (IMARPE) together with institutions Interdepartmental Committee El Niño, which forming the ENFEN, participates in a Budgeting for results Program -called "Vulnerability Reduction and Disaster Emergency Care," which gives timely scientific information, monitoring results and forecasts of El Niño for an effective management to prevent and mitigate the impacts in Peru.

Within this activity, IMARPE performs monthly bio-oceanographic monitoring , in which an observer is included for sighting of birds and mammals (top predators) as a biological indicator for forecasting El Niño events.

The observer plays an important role achieving during the last event El Niño 2015-2016 to determine the significant migration of some bird species from ecuatorial and oceanic zone towards the central - southern Peruvian coast, making possible to analyze the impact which generated that event.

Tuesday, 30 Aug 2016

09:00 - 10:30:

Panel - Reducing Risk In A High Risk Job

Paper 168: Fisheries Observer Programs and Safety: Comparisons between the United States, New Zealand, and Australia

Brianna BOWMAN¹

¹ North Pacific Groundfish and Halibut Observer Program (Partial Coverage)

The United States, New Zealand, and Australia have long-standing, well-established fisheries observer programs. Besides large scale differences, such as management regulations and region specific issues, there are differences that exist that are relevant to the day-to-day life of an observer. This poster will focus on safety issues within the respective observer programs, and will highlight the 1st theme outlined by the IFOMC: "What can we learn from observer programs around the world?".

This discussion of safety will explore safety issues in the past and how these issues were dealt with and resolved. Current safety concerns will also be addressed, as well as recent incidents. The poster will also look at differences in required safety equipment for vessels in these different countries and how well these requirements are enforced. Safety training for the different programs will be compared and contrasted. Observers from various programs will be encouraged to share their personal experiences as well.

Observers and others employed by observer programs from these countries will be contacted, and asked to fill out questionnaires (anonymously), and may also be personally interviewed (will also remain anonymous). Other information will be supplied by published documents provided by the observer programs.

Paper 13: It's Never Going to Happen to Me....Until it Does: A Summary of Safety Related Incidents Encountered by Observers in the Northeast Fisheries Observer Program

Lauren CARROLL¹

Mike TORK¹

¹ NOAA Fisheries

The National Oceanic and Atmospheric Administration (NOAA) has adopted minimum safety training standards that have been deemed critical in preparing observers for the hazards associated with commercial fishing operations. These standards include risk awareness, emergency response, CPR/first aid, a comprehensive pre-trip safety checklist and at-sea survival training. This training is the most important aspect in preparing an observer for the job. However, it does not guarantee immunity from encountering emergencies while at sea. Since 2010, the United States Coast Guard (USCG) has documented over a thousand casualties, including 36 deaths, which have occurred in the northeast commercial fishing industry. A summary of the Northeast Fisheries Observer Program (NEFOP) data shows that observers have reported 165 safety related incidents between 2010 and 2016. These include safety concerns (weather, unsafe vessel operation, etc.), flooding, fire, collisions, groundings and injuries. The actions demonstrated by observers when responding to these incidents highlight that the skills acquired during their NEFOP safety training play an integral role in mitigating emergency situations at sea. With this, we can surmise that safety culture and safety at sea in the commercial fishing industry may be enhanced by the presence of fisheries observers.

Paper 137: Sexual Harassment - Prevention and Education

Jaclyn SMITH¹

Julie DALE²

¹ National Marine Fisheries Service Office for Law Enforcement, ² Standing Together Against Rape

Part of the National Marine Fisheries Service (NMFS) Office for Law Enforcement (OLE) mission is to investigate sexual harassment of observers. NMFS OLE has partnered with Standing Together Against Rape (STAR), a local Alaskan advocacy group, to address the sexual harassment that observers may face while on assignment. Together NMFS OLE and STAR are fighting sexual harassment by increasing their efforts on prevention and education.

There are three main groups that NMFS OLE and STAR are focused on. Observers are now being trained to recognize potential threats, and to handle conflicts that may arise due to personality conflicts. NMFS staff, including OLE, is being trained to provide support to observers and establish rapport with them in the field to develop a higher level of trust. Fishing industry tailored training will focus on improving the work environment, and will also address victim blaming culture. With the addition of prevention and education on sexual harassment, NMFS OLE and STAR are hoping to help develop a working environment observers can feel safe and secure in, and ultimately eliminate the risk of sexual harassment.

Paper 12: Reducing risk in a high risk job.

PHILIP BROWN¹

¹ Pacific Island Observer Program, MNFS

I intend to present an informative and educational video slide show using publicly available information and anecdotal stories. I will touch on sanitation, isolation and general lifestyle tips which could help keep health issues and problems from arising. I also intend to address these inevitable problems, relating how this information can benefit observer well being or minimizing them when trouble does arise. I will also mention how the typical observer personality, mentally strong and independent could work against them in an emergency. These strong willed individuals could, and historically have had a difficult time knowing when they should ask for help and how to act on it. I will then present optional plans to take action when necessary to prevent observers from waiting until a problem has reached a critical point, putting the observer and trip at risk. I will present several scenarios when wrong or delayed action could result in death or disfigurement. I will touch upon available options including communication with the Captain, Coast Guard advice, medication and rescue.. Time permitting I will also touch upon mental well-being and maintaining a positive mental attitude at sea. In closing I close with summarizing my presentation.

Exploring workable solutions and recommendations on how to proceed towards a healthier sailing environment for all hands. Mention would be made on how to upgrade training to reflect the MERSA threat and it's symptoms. Possibly followed by question and answers with hand outs to reference health options and resources.

Paper 158: Reducing risk in a high risk job - a Pacific Islands perspective

Peter GRAHAM¹

¹ Pacific Islands Forum Fisheries Agency

Fisheries Observers play a critical role in fisheries management, in that they gather fundamental scientific information and data and also serve an indispensable role in the monitoring and compliance and should be able to do so in an environment free from obstruction, harassment, intimidation or assaults and any hindrance due to the condition of the fishing vessels in which they are deployed.

Discussions about this being high risk job have been around for many years, and this Conference it is a great opportunity to share ideas and experience of how best to mitigate those risks.

Pacific Islands observers are faced with similar risks as other observers... poorly maintained longline fishing vessels, dilapidated deck and work areas, communication difficulties with Master and crew, and on occasion's, unpredictable weather.

Inspections of the fishing vessels prior to licensing, plays a big part in ensuring that the vessel would be suitable to accommodate an Observer when required. The focus of the inspections are the deck and work areas, wells and freezers, galley, and sleeping quarters noting that many Pacific Islands observers are a lot bigger than the area built for the smaller Asian crew member.

The difficulties posed by the lack of communication because the Master and crew speak a different language to the Observer, has caused confrontational situations to arise. Involving the vessels' Company Agent, who usually has good command of English, in the pre-fishing inspection and observer placement briefings goes part of the ways towards mitigating the language barrier. Even when asking such basic things as where are the vessels safety gear and enquiring about basic emergency procedures, can cause offense if not properly communicated, therefore having the Agent present and translating helps. It also means that if an issues with the safety of the vessel arises or becomes evident, he has first-hand knowledge.

Understanding cultural sensitivities helps and forms part of the Pacific Islands observers training. It is introduced and drummed into the observers during their initial training and they are reminded again during debriefing sessions.

Paper 26: Recent Actions in the WCPFC to Improve Observer Safety and Security

Karl STAISCH¹

Bubba COOK²

¹ Western and Central Pacific Fisheries Commission, ² World Wide Fund for Nature

As the Regional Fisheries Management Organization (RFMO) charged with managing the single largest tuna fishery on the planet, the Western and Central Pacific Fisheries Commission (WCPFC) depends heavily on observers, who perform a critically important job in the fisheries management process by providing fundamental scientific information, serving an indispensable role in monitoring compliance, and being the eyes and ears for their country and the region. Following recent incidents involving the death or disappearance of observers in the Pacific Ocean, the WCPFC took swift action in 2015 to better address observer safety and security. As a dual step, the WCPFC introduced and approved a proposal specifying that: (1) Each observer program shall ensure that observers from their program be provided an approved independent two way communication satellite device and a waterproof personal lifesaving beacon before any boarding for a trip; and (2) Each observer program will ensure that they have an "Emergency Action Plan" (EAP) in place to respond to reported observer safety issues.

The two provisions must work in concert to be successful. The technology must be effective and reliable, with transmission capability 24 hours a day and 365 days a year around the globe. Additionally, the technology is only as good as the response that follows an emergency notification, which requires having a robust EAP in place.

Karl Staisch of the WCPFC will provide the first part of this presentation, which will address the implementation of the adopted measures to date, including any challenges or obstacles faced. Bubba Cook of the World Wide Fund for Nature (WWF) will present the second part of the presentation, which will address some of the technological tools available that potentially meet the requirements of the measure.

Tuesday, 30 Aug 2016

11:00 - 12:30:

**Panel - Can Observers Effectively Perform Scientific AND
Compliance Functions**

Paper 141: The collection of compliance related data by CCAMLR Scientific Observers

Isaac FORSTER¹

¹ CCAMLR

Scientific Observers in CCAMLR fisheries collect data under the protocols developed by the Scheme of International Scientific Observation (SISO). The scheme provides independent scientific data that supply crucial parameters for the assessment of target and by-catch fish species. However SISO observers also collect data that are invaluable in the implementation and effectiveness of management measures, such as the reduction of incidental mortality associated with fishing, the monitoring of waste discards and measures to reduce marine pollution, and reporting on sightings of IUU vessels and gear.

Fisheries in the CCAMLR region take place in remote areas, and depending on the fishery SISO observers may not be of the same nationality as the vessel operator. Therefore to reduce potential conflict with vessel crews, and to improve safety for observers, a SISO appointed observer is never tasked with a dedicated compliance role, and cannot enforce compliance measures directly with vessel operators. Data collected by SISO observers is reviewed annually, and any compliance issues with CCAMLR Conservation Measures are resolved at the annual Commission meeting in October each year. Considerable numbers of compliance issues are raised through observer reported data, thus ability of SISO observers to collect and report this information forms an important component for the responsible management of CCAMLR fisheries.

Paper 91: Connecting the dots: Lessons from the establishment of the PNA Observer Agency

DUNCAN SOUTER¹

David BYROM¹ and Transform AQORAU²

¹ MRAG Asia Pacific, ² PNA Office

In September 2013 the Parties to the Nauru Agreement (PNA) Observer Agency (POA) commenced operation, with its main task to coordinate observer placements on purse seine vessels fishing under the Federated States of Micronesia Arrangement (FSMA). Around 85 vessels are currently licensed under the FSMA, which allows them to fish in any of the EEZs of the eight south Pacific members of the PNA - an area almost 40% bigger than continental Europe. Vessels are subject to 100% observer coverage requirements, as well as a range of regional (Western and Central Pacific Fisheries Commission; WCPFC) and sub-regional (FSMA) observer nationality restrictions. Since its establishment, the POA has successfully coordinated close to 40,000 observer sea days covering over 1400 trips.

The POA operates in a geo-politically complex and dynamic developing-world environment with considerable logistical, administrative and communications challenges. The program is coordinated across multiple countries, involving multiple layers of governance, and across multiple currencies, cultures and timezones. Successful operation of the Agency requires compliance with a complex suite of regional (WCPFC), sub-regional (PNA) and national regulations, as well as extensive coordination with regional and national fisheries administrations, the fishing industry, observers and logistical service providers throughout the Asia Pacific region.

This presentation will review the main challenges faced by the POA in its early years, as well as some of the creative solutions and systems developed to address them. In particular, the presentation will highlight the main lessons learnt and discuss their wider applicability to other observer programs operating in logistically challenging environments.

Paper 9: Finding A Balance Between Scientific and Enforcement Data Collection

Andrew WHATLEY¹

¹ NOAA Southeast Observer Program

Observers can be an effective tool for enforcement (compliance), however, regional variations between programs and safety should be acknowledged when determining the scope of responsibilities. The number one job for any observer in any region is to safely collect scientifically unbiased data reflective of a fishery. The most important compliance duties should be prioritized to prevent compromising data collection responsibilities and be consistent among programs. Some examples of compliance that would qualify based on these guidelines are documenting MARPOL violation data, blatant fishing violations (usually gear related), compliance with observer's work and safety, and violations of the Marine Mammal Protection Act and Endangered Species Act.

Additional compliance duties for observers on a regional and program basis can be problematic. For example, the Southeast United States (SEUS) consists of eight distinct bodies of State Waters and two separate Federally Managed Waters. It would be very difficult to require observers know all of the laws and regulations throughout this area. To solve this problem, the SEUS observer programs collaborated with enforcement to create a list of priority issues within the region that are beneficial to all parties.

Another possible issue with increasing observer's enforcement duties is observer safety. Individuals or vessels with documented violations could potentially retaliate against the observer who reported them. Current protocol in the SEUS allows the captain and/or owner to have limited personal information such as the observer's full name, private cell phone number, vehicle type and license plate number. To compound the issue, if the vessel and observer's home base are located in the same locale the opportunity for retaliation may be more likely. With today's technology, even living multiple states away doesn't lessen the chance of retaliation with an increase in compliance reporting.

In summary, I believe there are universal violations that observers can report for all regions. However, each region has their own set of unique problems/obstacles and should be allowed to develop an observer's role in enforcement. As an Observer Program the question becomes, when do observers stop being field scientists and become an arm of enforcement?

Paper 10: The synergistic relationship between compliance monitoring and scientific data collection in the North Pacific Observer Program

Melanie RICKETT¹

¹ National Oceanic and Atmospheric Administration (NOAA)

Certified observer sample stations on catcher-processor vessels are common place in the North Pacific Observer Program (Observer Program). Since 1992, the addition of a designated observer sample station in the catch processing factory has increased the observer's ability to collect high quality scientific data. In 2009, new regulations incorporated real time video monitoring into the sampling station, allowing the observer to conduct data collection and compliance monitoring simultaneously. Video monitoring systems widen the visual scope at the sampling station, allowing observers to watch for species of interest being removed from the catch prior to sampling, which prevents one source of bias in the catch estimate. Historically, this type of sample bias resulted in a decrease in data quality, increased intimidation, and sometimes hostile work environment for observers. While observers use the real time monitoring for scientific data collection, the Office of Law Enforcement (OLE) and the Alaska Regional Office use the hard drive video backup for compliance monitoring. The real time view provides observers the ability to report potential violations and compliance issues. Additionally, OLE and the regional office can request video from the hard drive to monitor for compliance without directly implicating the observer. Detecting these kinds of biases can allow the observer to notify vessel personnel, Observer Program staff, OLE, and sometimes industry to resolve compliance issues quickly before situations escalate. The regulations that have integrated video monitoring into the certified observer sample station have created a synergistic effect between scientific data collection and compliance monitoring that increases the effectiveness of both.

Paper 66: Highlights from a Marriage of Science and Compliance in the North Pacific

Nathaniel LAGERWEY¹

Jaclyn SMITH¹

¹ NOAA Office of Law Enforcement

Staff from the Alaska Division of the NOAA Office of Law Enforcement (OLE) and the North Pacific Observer Program (Observer Program) work together daily to accomplish goals of observer protection, data collection, and resource management in the North Pacific. The OLE utilizes compliance data collected by observers to support the Observer Program and shared resource management objectives. This presentation will focus on some mechanics of this collaboration and approaches used by the OLE.

The presentation is intended for Theme 5. Can observers effectively perform scientific AND compliance functions? It will be structured to share ideas from the North Pacific and to seek ideas from other programs. The goal is to strengthen the understanding of science and compliance roles in fisheries and to demonstrate a successful marriage of those roles.

Presenter, Nathan Lagerwey, is the Deputy Special Agent in Charge for the OLE in Alaska. He began his career as an observer prior to beginning 16 years in fisheries law enforcement. Lagerwey is a trainer on observer topics and his investigations have focussed on cases that directly impact observers and/or observer data.

Paper 102: How Transparent Reporting Helps Keep Observers Safe

Elizabeth MITCHELL¹

Simione CAGILABA¹

¹ Association for Professional Observers

Commercial fishing is considered to be one of the most dangerous jobs in the world. Fisheries observers collect critical independent information that allows fisheries managers to make decisions that are based on sound scientific data. Observers work primarily at sea, alongside commercial fishermen in a demanding and unforgiving environment. In addition to facing the same difficult and dangerous work conditions as fishermen, observers sometimes face obstacles and interference from those same fishermen in completing their duties. This interference is due, in part, from observer responsibilities to report on compliance to fisheries regulations that cannot be collected by any other means. Additionally observers collect biological information on commercial catches that could impact future operations and profitability of the vessel. This interference can manifest in the form of threats, intimidation, bribery attempts, harassment and even violence toward the observer.

This dynamic adds further pressure to an already psychologically and physically stressful job. However, with adequate observer support and transparency with the information that observers report, along with enforcement follow-up, observer program and fisheries management authorities can impart the necessary confidence to the observer community and the public to ensure that observers may continue to successfully report on this critical information. If observers lack confidence in the system that is supposed to represent and protect them, they cannot be expected to do their job appropriately or effectively. Likewise, without transparency, the public will not have confidence in the veracity of the monitoring program. Securing the confidence of the public, and of the observers reporting the information, can only be achieved through an open and transparent reporting system.

We will discuss: the benefits of transparency in reporting on observer complaints and compliance monitoring and the obstacles observers face with compliance monitoring in the absence of transparency.

Tuesday, 30 Aug 2016

13:30 - 15:00:

**Panel - What Are The Latest Technology Trends For
Fisheries Monitoring Programs?**

Paper 81: ELECTRONIC EYE PLUS: ELECTRONIC MONITORING TRIAL FOR TROPICAL TUNA PURSE SEINERS

Iñigo KRUG¹

Jon RUIZ¹, **Oscar GONZALEZ**² and **Greg HAMMANN**²

¹ AZTI Tecnalia, ² Marine Instruments

Monitoring needs for the tropical tuna purse seiners in the Atlantic and Indian Oceans have been increasing considerably. Scientific monitoring, and mainly control requirements, such as the so-called "verification of best practices", have pressed the industry to move towards 100% observer coverage, making it necessary to find cost-effective alternatives or compliments to human observers. The Electronic Eye (EE) Plus is an electronic monitoring system based on the automatic recording of high definition photographs and gear sensor data developed by Marine Instruments S.A. This system is an updated version of the first EE, which was adapted to the actual monitoring necessities of the tropical tuna purse seine fleet.

The overall objective of this study was to test the use of EE Plus on tropical tuna purse seiners, and determine its effectiveness to reliably document fishing effort, set-type, catch by set, and to verify implementation of the "best practices", understood as the correct handling of the bycatch and the utilization of non-entangling FADs (Fishing Aggregation Devices). To achieve these objectives, EE Plus and an experienced observer were deployed simultaneously on a complete fishing trip for later comparison of the collected data.

Results showed that EE Plus is a valid tool to monitor most of the data needs without significant differences compared to human observers. Finally and based on this experience, the authors defined the electronic monitoring "minimum required standards" for the tropical tuna purse seine fleet before operational certification on a per vessel basis.

Paper 32: Trialling smartphones for improved fisheries data collection and monitoring - lessons learned from Madagascar

Victoria JEFFERS¹

Frances HUMBER¹

¹ Blue Ventures

Fisheries and aquaculture support the livelihoods of at least 10 percent of the world's population, yet 75 percent of fish stocks are either fully exploited or overexploited, with severe population declines reported for many elasmobranch species. Reversing this collapsed fisheries trend requires improved management, which depends on accurate stock status data. Yet, the majority of fisheries, in particular small-scale fisheries in the developing world, are unmonitored.

Recent advances in technology, coupled with the rapid extension of mobile networks in Africa have seen new data collection systems being utilised via open access software.

In Madagascar traditional fishers (Vezo) depend heavily on small-scale fisheries for their livelihoods. This study reports results and lessons learned from the first trial (2013-2015) using mobile phones as data collection tools, in the data deficient, traditional elasmobranch fishery of SW Madagascar.

A network of 13 community data collectors, along 40 km of remote coastline, were trained to record shark landings data using mobile phones. At the end of the trial period, data were being successfully collected by community members and sent directly to an online database. Once online data can be accessed instantly, facilitating quick analysis and sharing of data, providing both the community itself, and other stakeholders such as governments, fisheries organisations and research institutions with an almost real-time view of local resource use.

The main challenges encountered were the lack of infrastructure e.g. transport and mobiles networks, as well as poor levels of education and prior knowledge of technology within the community. The project has worked closely with community members to modify and develop suitable mobile data collection and training tools.

The project demonstrates that mobile technology can empower fishers and other stakeholders to collect important data to support adaptive fisheries management and conservation, and the potential for this approach to be adapted to broader-scale multi-species fisheries.

Paper 132: Sector ASM Data Entry Android Application for the Northeast Fisheries Observer Program and At-Sea Monitoring Program

Erin KUPCHA¹

¹ DOC/NOAA/NMFS/NEFSC/FEMAD/FSB/Northeast Fisheries Observer Program

The Fisheries Sampling Branch's (FSB) Northeast Fisheries Observer Program provides training and certification for observers and at-sea monitors (ASMs) to collect scientific, management, compliance and other fishing related data while on board vessels in the New England multispecies groundfish fishery. In the groundfish fishery, fishermen may form cooperative units to pool their allocated quota, termed "sectors". Electronic data collected and uploaded by observers is then edited and audited, loaded to Oracle tables and provided on a daily basis to NOAA's Greater Atlantic Regional Fisheries Office and sector managers.

Observers and ASMs need cost-efficient, durable and rugged hardware that is equipped with on demand data communications such as GPS and Wi-Fi. Once the observer gets back to port, regulations require near real time observer data for catch reporting, which are used for calculating remaining in-season quota allocations. It is critical for the data entry software to have an easy to use interface for quick data entry with built in data quality checks to provide accuracy.

Since August 2014, the FSB has deployed a rugged Android tablet with a single, stand-alone native application, SectorASM, which collects all data needed for the sector program. SectorASM is designed and written to be target device-independent, permitting ease of deployment for future generation platforms. SectorASM utilizes integrated accessories, such as a GPS receiver and built-in camera, to encourage interactive data collection while collecting ancillary data in an error reduced, automated manner. Wi-Fi connectivity is used to facilitate timely transmission of the data upon landing. The FSB has incorporated a rugged digital camera with a Wi-Fi enabled SD card which transfers media directly from camera to tablet while at sea. The FSB continues to explore new and innovative ways to collect fisheries data, providing data and accommodating change at a faster rate without compromising quality or safety.

Paper 5: Electronic Monitoring as a Compliance Tool in the U.S. West Coast Groundfish Catch Share Fishery

Courtney DONOVAN¹

Dave COLPO¹

¹ Pacific States Marine Fisheries Commission

The U.S. West Coast groundfish trawl fishery, consisting of approximately 100 vessels, transitioned to an Individual Fishing Quota (IFQ) fishery starting in 2011. As a regulatory requirement, 100% at-sea human compliance monitoring was implemented to monitor discards of IFQ species for vessel quota debiting. Human monitors may reduce flexibility in the fishery, increase costs, decrease safety and sometimes eliminate the opportunity to fish if monitors are not available on short notice.

As an alternative, Pacific States Marine Fisheries Commission (PSMFC) and the NMFS West Coast Regional Office, working with the fishing industry and Archipelago Marine Resources, Ltd., began pre-implementation exploration of an Electronic Monitoring (EM) program in 2012. In 2014 the Pacific Fishery Management Council (PFMC) approved four Exempted Fishing Permits applications to allow participating vessels to fish with EM equipment on board in lieu of compliance monitors in the 2015-2016 fishing seasons. Based on the success of this work NOAA Fisheries expects to publish the final rule for EM use in the fixed gear and whiting fleets in the fall of 2016 with regulations in place in 2017.

This presentation provides more detailed background information including cost and methodologies of the EM program.

Paper 86: The use of commercial and recreational vessels as marine data collection platforms: Opportunities, constraints and solutions

Amos BARKAI¹

¹ Olrac SPS Silvermine House, Steenberg Office Park, Tokai

Every day, countless numbers of vessels, from cargo ships to passenger carriers, recreational yachts to commercial fishing vessels, roam the oceans from the Arctic to the Antarctic. Collectively, these vessels are exposed to a myriad of environmental conditions and observe enormous amounts of marine life. The collective data-gathering potential of these vessels is gargantuan.

Our vision is that each one of these vessels could become a data collection platform, relying predominantly on localised "on-the go" observation data collected on a ground-roots level with a strong focus on spatial and temporal distributions. The author and his team of programmers have developed such a data collection platform (eLog) that has the capacity to transform this vision into reality.

The eLog system is made of two components, a vessel unit named Olrac Dynamic Data Logger (OlracDDL) and a web server named Olrac Dynamic Data Manager (OlracDDM) which has the capacity to store and manage data from any number of vessels on one integrated platform. The technology developed facilitates the gathering function, storage, management and analysis of data, all through an intuitive user interface. This will allow any type of vessel to become a sophisticated data collection platform with the use of an entry level PC and without the need of technical skills and with minimal training. The data collected can include GPS data, numeric and alphanumeric fields, images, video clips, tables and free text. The Olrac eLog is presently widely used in the commercial fishing sector and the authors are now looking for opportunities to extend the scope and reach of this technology to other marine sectors.

The main power of the Olrac eLog system is its ability to ensure that all data are collected in a precise and uniformed manner. We hope that these data, once stored on a common platform, will be accessible to users all around the world for commercial or environmental purposes, but without the intention of promoting a specific agenda, be it ideological, commercial or political.

Paper 90: Affordable real-time satellite data for fishery observer technology: a case study examining the development and at-sea testing with the Pacific Islands Regional Observer Program (PIROP) eReporting Project.

Mathieu DAVID¹

¹ CLS America

THORIUM is a satellite data communications solution that provides a fast, reliable, cost effective link for onboard fisheries observers to send and receive data using Iridium Short Burst Data (SBD) technology.

THORIUM was developed by CLS America, which has been in business for more than 30 years providing innovative solutions to fisheries and administrations around the world (including NOAA).

The system is used at a large scale to monitor catches, gather positions, and ensure the sustainable management of fisheries resources by providing a real-time reporting platform.

CLS America worked closely with the Pacific Islands Regional Observer Program (PIROP) to implement a full electronic solution for their data reporting needs. The pilot project adapted a full set of paper forms into 32 unique electronic forms. By working directly with experienced observers, THORIUM was developed to augment the onboard observer data collection and workflow processes; and time-consuming and cumbersome steps (GPS location, timestamps, list look-up, etc.) have been simplified, thus improving the quality and timeliness of observer data. During the pilot project, 4 observers did a full trip using THORIUM and in all instances reported that they would prefer THORIUM to traditional paper-based data collection.

SBD technology allows for fast and affordable transmission of the electronic data. Having the forms sent in real-time reduces errors, and removes a lot of the post-trip validation and debriefing work (which provides a source of cost savings to programs). If a debriefer has a question about an observer's submissions, they can at any time contact the observer to get more information directly through THORIUM. The observer is also able to easily get in touch with NOAA in cases of a security issue, which can profoundly increase at-sea observer safety.

The new THORIUM X product is an all-in-one satellite tablet, easy to manipulate, and offers the full SBD capability. During its design process, CLS America took into consideration the specific needs of onboard fishery observers. Utilizing innovate satellite technology is the future of fisheries dependent data collection.

Paper 136: In Reach satellite communication device in the IATTC Observer Program

BRYAN BELAY¹

¹ **MRAG Americas**

MRAG Americas Inc. currently operates the IATTC transshipment observer program, first established in 2009. The Program was introduced to monitor transshipment operations between carrier vessels and Large Scale Tuna Longline Vessels (LSTLVs) on the high seas within the IATTC Convention Area (eastern Pacific). MRAG has recently started issuing IATTC Transshipment Observers with the InReach satellite communication device to enable independent observer communications from the vessel. The inclusion of the InReach devices in the observer's safety gear provides the ability for the observer to communicate directly with MRAG staff in real time using the Iridium satellite network.

Previously, IATTC Transshipment Observers relied on their host vessel's facilities to communicate with MRAG and IATTC during deployments. Apart from the obvious concern about sending sensitive information that might implicate a vessel being observed, we had concerns about routine messages not being transmitted in a timely way. In addition, the combination of an ageing fleet of Longline and carrier vessels and a diversification of flag states participating in the fishery has raised additional safety and regulatory concerns.

This presentation provides overview of the InReach device's capabilities, how we use them and summarizes the benefits they have brought to the IATTC Transshipment observer program. We highlight resultant changes to program safety and effects on observer deployment logistics and provide some insight into potential future uses of the devices.

Tuesday, 30 Aug 2016

15:30 - 17:00:

**Panel - What Are The Challenges With Integrating
Electronic Monitoring / Electronic Reporting Technology
Into Fishery Monitoring Programs?**

Paper 166: Implementation of Electronic Monitoring in the U.S., 2016 - 2018

Jane DICOSIMO¹

Farron WALLACE¹

¹ NMFS

NOAA Fisheries has invested approximately \$22M in 50 studies that have tested and/or implemented electronic monitoring in U.S. commercial fisheries. While electronic reporting is widely implemented in fishery-dependent data collections, electronic monitoring has been implemented for compliance monitoring in only five fisheries as of 2015. Focus is now on more widely implementing technologies that are both cost-effective and appropriate for recording the data needed for monitoring federal fisheries. Six regional electronic technologies implementations plans identify, evaluate, and prioritize implementation of cost-effective electronic technologies that improve our knowledge of the fisheries and empower fishermen and other citizens to become more actively involved in data collection. Details of several new electronic monitoring programs to be implemented between 2016 and 2018 for compliance monitoring and catch accounting will be summarized.

Paper 116: Implementing EM in the West Coast Groundfish Trawl Fishery-- Working the Process and Partnerships

Melissa HOOPER¹

Stephen FREESE¹

¹ NOAA Fisheries

In 2010, the Pacific Fishery Management Council implemented a catch share program in the West Coast groundfish fishery that included a requirement for industry to obtain and pay for 100-percent dockside and at-sea observer coverage to ensure full accountability for all catch of allocated species. In the first years of the program, NOAA Fisheries (NMFS) subsidized the cost of observers for industry, but this aid has been declining and in 2015 industry took on the full costs of observers. The industry has been increasingly concerned about monitoring costs and looking at electronic monitoring (EM) as an alternative. For several years, the industry and West Coast fishery managers have been developing EM as a potential alternative to observers that would allow vessel owners the flexibility to choose the monitoring system that would make the most operational and economic sense for their individual business. In 2015, NMFS, the Pacific States Marine Fisheries Commission, and industry and NGO partners, deployed EM systems in the groundfish fishery on an operational scale to test the full functionality of this monitoring tool for catch accounting. NMFS and industry participants negotiated rules and procedures, catch handling protocols, and integrated the program into the monitoring system for the catch share program. The results of the project showed that EM can be an effective tool for monitoring a commercial fishery and the program became the first in the US to use EM data for catch accounting. The Pacific Fishery Management Council and NMFS used the project results to inform regulations that will make EM an option for a portion of the fleet in 2017 and all vessels in 2018. This talk will discuss the program design and results, the successes and challenges, and the partnerships that made it possible.

Paper 75: Electronic Monitoring in Northeastern Fisheries

Brett ALGER¹

Nichole Rossi ROSSI²

¹ NOAA, NMFS, Greater Atlantic Regional Fisheries Office, ² NOAA, NMFS,

Northeast Fisheries Science Center

Electronic monitoring (EM) has been used for catch monitoring and reporting compliance in fisheries worldwide. After years of pilot projects and workshops, implementation of EM has been limited in the United States. Understanding legal requirements, data integration, coordination among stakeholders, and costs are some of the challenges. Despite challenges, interest in EM remains high and the National Marine Fisheries Service (NMFS) in the Northeast Region continues to explore EM as a monitoring tool, working collaboratively with the industry to investigate EM for both the Atlantic herring mid-water trawl and groundfish fisheries.

The Atlantic herring fishery may have limited discarding when the contents of the net are pumped directly from the codend in the water, along chutes, and into the hold of the vessel. Therefore, the operation of the fishery lends itself to using EM to verify all catch are retained. NMFS has developed a project with the goal of deploying EM on mid-water trawl vessels and establishing technical specifications, required data elements, and roles and responsibilities of various program entities.

There are two uses of EM in the groundfish fishery currently being explored. The "audit" model uses EM to verify industry reported discards on vessel trip reports, while the "maximized retention" model requires vessels to retain select fish species (e.g., allocated groundfish stocks), while discarding others (e.g., protected species), and EM is used to ensure discard/retention compliance. We are working with The Nature Conservancy, the Gulf of Maine Research Institute (GMRI), and groundfish sectors to explore the audit model in 2016 using 20 day-trip vessels. We are working with the Environmental Defense Fund and GMRI to explore the maximized retention model in 2017 using larger offshore trip vessels.

NMFS is focused on program design and infrastructure, including; data integration, reporting, catch methodologies, data alignment, efficiencies in species identification, performance standards for EM providers, data storage requirements, cost drivers, and to address legal and logistical hurdles associated with an operational program. Our exploratory work will help inform the New England and Mid-Atlantic Fishery Management Councils, and NMFS, in the EM approval and implementation processes.

Paper 15: Development of video electronic monitoring system to estimate smalltooth sawfish and other protected species interactions in shrimp trawl fisheries

John CARLSON¹

Elizabeth SCOTT-DENTON¹

¹ NOAA Fisheries Service

NOAA Fisheries began placing at-sea observers on commercial shrimping vessels in 1992 in the US southeastern region to identify and minimize the impacts of shrimp trawling on federally managed species. Analysis of bycatch data relative to smalltooth sawfish, a federally-listed endangered species, indicated the level of take was higher than mandated. However, the level of "take" of smalltooth sawfish had high levels of uncertainty due to the rarity of sawfish captures combined with low levels of observer coverage. A priori analysis indicated the sample size required to observe a sawfish with a coefficient of variation (CV)=0.3 was 11,380 tow hours/year that results in a cost of about \$1,000,000 to increase observer coverage in the eastern Gulf of Mexico. In light of the costs associated with observer coverage and given the rare event of capturing a smalltooth sawfish, increasing observer coverage to refine the take estimates of smalltooth sawfish may not be practical. We explored the use of electronic monitoring to provide a valid alternate to increased observer coverage. Preliminary testing on a contracted commercial shrimp trawl vessel found the system performed well in capturing video for a total of 109 hauls over 62 days at sea. The hardware held up for the duration of the trips with no water ingress to the deck components and there were only one significant gap that may have been caused by a system component malfunction. While no sawfish were observed, many sightings of dolphins occurred which suggests interactions with other protected species could be captured with these systems. Pairwise comparison of video vs that collected by observers found little difference in monitoring of larger species of teleosts and elasmobranchs. Despite some positive preliminary results, in order for implementation to occur there is a need to further test this system and expand coverage to areas outside southwest Florida.

Paper 29: Addressing some of the barriers to acceptance of Remote Electronic Monitoring in European Fisheries

Helen MCLACHLAN¹

¹ **WWF - UK**

In 2014 the new European Common Fisheries Policy (CFP) came into force and with it the landing obligation, or discard ban. This requires fishers to land, retain, record and count against quota, all commercial fish species, and is being phased in over the period 2015-19. This represents one of the biggest operational shifts in European fisheries and will present a number of challenges including the details of how it is applied, and then monitored for effectiveness. Both will be key for the landing obligation to be successful. Flexibilities will likely be adopted, which will require monitoring systems to be capable of supporting these and providing evidence of where things are working - or not.

To inform the debate and to address some of the commonly held misconceptions held about Electronic Monitoring, such as cost and how data is collected and reviewed, WWF commissioned the report, *Electronic Monitoring in Fisheries Management*. The report reviews the alternative methods available for monitoring and enforcement and compares the cost and coverage of the different methods, using the UK as a case study. The report concludes that only a remote electronic monitoring (REM) system equipped with video technology (CCTV) can provide high levels of assurance of effective monitoring of activities at sea. It also concludes that this technology offers the cheapest option for effective monitoring at sea and that it can offer higher coverage levels than others, at a lower cost. If adopted widely REM would create a uniform European approach to monitoring and importantly a level playing field for fishermen. It would also have the additional benefits of increased data and the ability to demonstrate real problems, and best practice.

WWF released the report throughout Europe and are currently in dialogue with different European countries' on their actions to meet the landing obligation and their views on monitoring and enforcing it effectively. This presentation will provide an outline of the report, the advocacy surrounding it and some of the challenges experienced in gaining acceptance for REM in European fisheries.

Paper 42: MAN V's MACHINE - MONITORING AUSTRALIAN FISHERIES 2016

Chris BURNS¹

¹ Australian Fisheries Management Authority

The Australian Fisheries Management Authority (AFMA) has independently monitored inshore and offshore fisheries using human observers since 1979. Over the past 7-8 years the development of technologies as well as the evolving data needs prompted AFMA to investigate the potential for Electronic Monitoring (EM) to be used alongside human observers to meet the data collection needs. EM technology was trialled in Australia's prawn trawl, tuna longline, shark gillnet and demersal longline fisheries between 2010 and 2015. The results of these trials identified that EM could provide an effective monitoring tool to complement existing observer functions. From July 2015 AFMA implemented an EM program in the tuna longline and shark gillnet fisheries with EM systems now installed on 75 fishing boats.

Throughout history fears inevitably arise when human functions are threatened by technology. The Australian experience highlights that despite the total shift from human observers to EM in two of AFMA's larger fisheries the need for a human based observer program remains crucial. The driving force for monitoring in the tuna and shark fisheries is wildlife interactions and logbook data validation which is highly suited to EM. A fundamental need for human observers remains in fisheries where management decisions are underpinned by biological information.

The implementation of EM has proven to present many challenges around access to video footage by third parties, identification of previously unknown issues and identifying and linking common events across different data sources. There are significant opportunities for observers to play a greater role in supporting EM including data review and undertaking more engaging sampling and extension roles as EM covers some of the more mundane binary monitoring functions.

Key challenges for the future monitoring programs include clearly defining data needs and integration with other data sources such as vessel monitoring system (VMS) data and electronic logbooks. Careful planning of monitoring and data requirements are required to balance EM and human observer program integration.

Paper 138: The Challenge of Electronic Monitoring Integration: Understanding the data and data exchange myths and challenges.

Andrew FEDORUK¹

¹ Archipelago Asia Pacific

Electronic Monitoring technology and capability is evolving and being customised to an ever increasing range of needs that are being requested by regulators, science, and industry. The author examines the challenges of developing and integrating electronic monitoring data into the historical data sets of existing monitoring programs. This examination focuses on the need for natural intuitive and logical keys to facilitate data alignment and cautions against forensic matching and interpretation. An integral part of the Electronic Monitoring data integration becomes the design of the data model and then the data exchange mechanisms and architecture that allow compliance with regulatory agency data security requirements and respects the privacy concerns of stakeholders. There is also the need to appreciate that an ever expanding wish list of data has very real data model and therefore cost implications.

Paper 118: Comparing the Costs of Human versus Electronic Monitoring: Issues, Case Studies, and Economic Analysis

Gil SYLVIA¹

Michael HARTE¹ and **Christopher CUSACK**¹

¹ Oregon State University

There are growing efforts to substitute electronic fisheries monitoring for human monitoring in order to reduce costs, especially when the fishing industry must bear the majority of the costs. Decisions, however, to select the best approach are complicated by a range of factors including: the goals of the monitoring program; the type of fishery; which organization bears specific costs; the distribution, forecasts, and uncertainty over future costs; the effect of scale on costs; and, the efficiency of the relevant institutions and collaboration of the participating organizations. In order to address these questions we are conducting a study to understand the issues and costs of human observers and electronic monitoring systems. The study includes a review of the fishery monitoring and observing literature, interviews with selected organizations, and case studies featuring key aspects of economic and financial costs. The background research and data collection are being used to design a financial "tool" to compare costs of human observers versus electronic monitoring systems. The tool incorporates major cost categories including administration, training, data collection, storage, and analysis. The model is organized according to the category of costs (e.g., fixed, annual, or variable including trip, and/or haul). The tool allows the user to allocate costs across time to various sectors (e.g., government, industry, private organizations), to use scale factors for selected cost categories, (e.g., volume equipment purchase discounts), to make alternative predictions for future costs, and to build in considerations of "opportunity costs" associated with real world fisheries. A number of base scenarios are being built as well as a range of assumptions that can be adjusted to reflect specifics of a given fishery. The graphical and tabular outputs allow the user to compare the total costs over a five to ten year period as well as annual and trip or haul costs, and ratios of key cost categories. We will present our preliminary research findings as well as the design and use of the economic model and will encourage conference participants to share ideas for improving the value and usefulness of this approach.

Thursday, 1 Sep 2016

09:00 - 10:30:

Panel - How Do We Best Monitor Recreational And Pay-for-hire (charter) Fisheries?

Paper 154: How do we best monitor recreational and pay-for-hire (charter) fisheries?

Samuel BEAR¹

¹ IAP/NOAA

Monitoring of recreational fisheries presents numerous challenges significantly different from those of commercial fisheries. Recreation fishermen are often not required to report their catches to any monitoring agency and the logistics of implanting a system of monitoring can be difficult due to the randomness and unpredictability of the fishing schedule of recreational fishermen utilizing their private watercraft. For-hire recreational charter fisheries also present a challenge for monitoring, although significantly less so than private recreational fisheries.

Monitoring of for-hire charters could be achieved most effectively in either of two methods depending on the situation. Smaller vessels with limited space for persons on board could be monitored via cameras that could be placed in a strategic location as to be able to get a clear view of the fish that are captured and perhaps even record interactions with wildlife such as birds, dolphins, sea turtles, etc. The species and condition of the fish upon capture and release could be determined by trained persons who would review the recordings. On the boat, a type of measuring board with incremental markings could be used by placing the fish on it and the persons reviewing the recordings could determine an accurate estimate on the fish's length. This would be effective for fish that are released. For fish that are retained, a biologist could meet the boat when it returns to port to obtain accurate measurements and collect biological samples. For larger "party-boat" style charters, it would be feasible for a trained observer to accompany the boat on trips to obtain accurate data and catches, wildlife interactions, locations, environmental conditions, gear used.

Collecting data from private recreation fishermen would be more difficult. Observers could collect from fishermen by interviewing them and taking measurements of retained catches with permission of the fishermen. Observers could also be stationed at public fishing piers to monitor catches, wildlife, interactions, and fishing efforts. Coordination and cooperation with local enforcement agencies could also be utilized in acquiring data from recreational fishermen.

Paper 123: Canada's Internet Recreational Effort and Catch ("iREC") Survey: 3 Years In

Rob HOUTMAN¹

David O'BRIEN¹

¹ Fisheries and Oceans Canada

In 2012, Canada initiated the 'iREC' survey, an internet survey to provide estimates of recreational effort and catch in tidal waters of Canada's Pacific Region. Recreational monitoring methods used up to that point (creel survey and logbook) did not cover all areas or months and only cover angling from a boat. Other fishing methods not covered by these methods include angling from shore, shellfish trapping by boat and from shore, beach digging and hand picking, and very rare methods such as fishing while diving. The primary objective of the iREC survey was to provide reasonable quality effort and catch estimates with complete coverage, representing total effort and catch by month, management area, fishing method, species and fate (kept vs released). Each month, a new random sample of licence holders is selected and contacted by email explaining that they are required (by licence condition) to complete the survey regarding their personal catch and fishing activities, as well as that of any juveniles (fishers < 16 yrs of age) fishing with them, in that month. Participants are provided a personal survey link that allows multiple entries throughout the month, and prompts fishers after month end for confirmation that all fishing information has been reported or for confirmation that the participant did not fish. Personalized survey links support analysis that is stratified by licence type; licence types are distinguished by residency (Canadian or not), age category (adult or senior), and licence term (annual, 1d, 3d, or 5d). Methods and results from the first three years of the survey will be presented.

Paper 144: Public Private Partnerships in Fisheries Data Collection

Stefan SAWYNOK¹

¹ INFOFISH AUSTRALIA

In the past only government had the resources to collect large scale data on any fishery. Now thanks to technology, particularly mobile and echo sounder technology the private sector is catching up and will streak ahead in the coming decade.

There are public-private partnerships in the infrastructure industry to build roads and other key public infrastructure. Fisheries managers should consider a similar approach.

Recreational fishers are voluntarily collecting data at an ever increasing rate with ever increasing sophistication. In fact, the most successful private sector operations - FishBrain and Insight Genesis rely on crowdsourced data to drive their business model. The former tracking fishing spots and the later underwater topographical maps. With new entries such as ScreamingReel (social network for fishers) and Track My Fish (real time monitoring of fisheries) the data collection space in recreational fishing is only going to get more competitive in the years ahead.

One of the advantages of the private sector networks is they are building a global footprint. They can track fishers not just in a region but across state and country borders. While this technology is new the amount of data collected is growing very rapidly as almost all of these technologies have a payback to the fisher. If they didn't fishers wouldn't use them.

There are some challenges to integrating private sector data into public sector applications, including data quality, coverage and sampling methods. These are largely addressable through either tweaking of the technology or education of the fishers. There are other issues such as privacy considerations but again these are addressable through a variety of means.

As an example of what is coming, in the 2015 Net Free Zone debate in the Fitzroy River (Central Queensland, Australia) both recreational and commercial fishers relied on data collected by fishers over government sources in forming their arguments. Both sides felt the data was not only more credible it was more useful.

There is a real chance that recreational fishers will end up knowing more about the status of an area than government. Public-private partnerships can potentially help fisheries managers keep up.

Paper 127: Potential roles for Observers in the Recreational and for Hire Fisheries

Patrick CARROLL¹

¹ iap world service/noaa fisheries south east Galveston

The recreational and for hire fisheries are a challenge for current fisheries assessments. Observers may be utilized to collect information on these fisheries in a number of ways. It would be possible to place observers on charter vessels, in an initially voluntary program, to teach the vessels how to collect data on their chartered fishing trips. This course could be reduced to minimalized but useful information that could be easily collected, and reported to the fisheries managers. A program could be developed that would include the parties who charter the vessel to assist in data collection of the vessel and rewards them with recognition such as t-shirts. This method could be grown to make data collection a positive thing and fun for the charter vessels as well as their customers.

Roles for observers in the recreational fishery could be similarly designed to disseminate information and data collection packets to individual recreational fishers. A voluntary program could be developed that place observers on recreational vessels to instruct the fishers on how to collect accurate but minimal data useful to fisheries managers. This could be developed in conjunction with the various recreational fisheries groups, to popularize the idea of self-reporting information from fishing trips, much like the self-reporting of biological data of deer hunting in many states. People are concerned about the health of the fisheries and marine environment. Allowing citizens to take part in its management would be a powerful tool that certainly should be developed, and the use of observers in its development would be wise.

Paper 121: Canada's Internet Recreational Effort and Catch ("iREC") Survey: Next Steps.

David O'BRIEN¹

Robert HOUTMAN¹

¹ Fisheries and Oceans Canada

After three years of continuous operation, the iREC survey has demonstrated that an internet-based survey can produce reasonable estimates of effort and catch in a large recreational fishery for a fraction of the cost of alternative methods. An internal review of iREC methods in 2015 highlighted two key next steps for the program: the use of concurrent creel survey estimates to bias-correct the iREC estimates and research to evaluate the influence of non-response bias in iREC data. In this paper, we first describe methods to estimate bias-correction parameters based on statistical relationships between concurrent creel and iREC estimates. We have found that the bias-correction parameters vary across years and discuss potential issues influencing these relationships as well as describing our planned approach for determining appropriate spatial scales for bias-correction in the future. Second, we present a telephone survey of iREC survey non-respondents and comparisons of their reported fishing behaviour to that of iREC respondents. In general, we found little evidence for non-response bias from our telephone survey in terms of fishing activity or catch. Finally, we briefly discuss some of the challenges of implementing a new catch monitoring tool in an established fisheries management context.

Paper 177: Surveying Angler Expenditures for Commercial Passenger Fishing Vessel trips in Non-US waters from San Diego.

Charles VILLAFANA¹

James HILGER² and **Rachel MAHLER**³

¹ NOAA Fisheries West Coast Region, ² NMFS Southwest Fisheries Science Centre, La Jolla, ³ NMFS Southwest Fisheries Science Center, La Jolla, CA.

San Diego is home to a large fleet of Commercial Passenger Fishing Vessels that primarily target Tuna, yellowtail, dorado, and wahoo outside of the United States EEZ. These trips range from day trips to over 14 days away from port. The anglers on these trips come from all over the world to Southern California. Every five years the National Marine Fisheries Service conducts a National Angler Expenditure survey to estimate the economic contribution of recreational fishing in all coastal states. However, since this is typically a survey of State fishing license holders, the anglers on these trips are not included. (No California fishing license is required if the trip only fishes in Mexican waters). Developing a survey to estimate the expenditures of this sector of the recreational fishery has been a challenge. In 2015, partnering with the Sportfishing Association of California, National Marine Fisheries Service conducted a pilot study on various methods to survey these anglers. In 2016, NMFS is conducting a year round survey using in person interviews to gather information on angler expenditures in the Non-US CPFV fleet.

Thursday, 1 Sep 2016

11:00 - 12:30:

**Panel - How Do We Observe And Monitor Artisanal
Fisheries?**

Paper 49: Satellite monitoring and safety for artisanal fisheries

ETIENNE KLEIN¹

¹ CLS

CLS, a leading satellite-services provider and subsidiary of the CNES (French National Space Agency), IFREMER (French Research Institute for Exploitation of the Sea) is presenting its new, innovative solution for small-scale fisheries: **the INO beacon**.

INO is light, portable, compact, autonomous, water resistant and fills four major needs:

1) Assistance

The rarefaction of fish force fishermen to go further and further from shore, thus exposing them to more and more threats: sudden change in weather, piracy, bigger vessels. Lacks of security and communication equipment lead to several death every day. With its distress button, ability to receive acknowledgment from the shore and a list of predefined messages, INO allows direct contact with authorities through cheap and reliable satellite communication.

2) Communication

A messaging interface includes predefined and free text (emails, SMS) to with authorities and the shore. The fisherman can exchange information (like fish catches, weather...) with fishermen, customers, shipowners, family. Thanks to its ergonomics, ruggedness and small size it has never been easier to communicate, even in the high seas.

3) Navigation

INO includes a GPS navigation interface similar to enter way points, follow a route, and know distance to destination. No more lost nets and traps, the fisherman will easily find his fishing gear and even his preferred fishing areas. In addition, the recorded GPS tracks could be used to prove the origin of the catches and introduce traceability into the small scale fishery. INO leads to accurate and reliable navigation, improved efficiency, safety & savings in time and fuel.

4) Tracking

INO integrates a satellite tracking function similar to VMS with the flexibility of adjusting the frequency to monitor small scale fishery in existing FMC.

INO meets the needs of fishermen, pictograms replace text. Offers 30 days autonomy and numerous mounting accessories, floating case, body holster. It can be adapted to each country (language, symbols, predefined messages, contacts...).

If you think these solutions are appropriate in your country and you are interested in launching a pilot project, please contact us. We will be pleased to test these solutions with local fishermen associations.

Paper 11: The Challenging of observer in industrial scale and artisanal scale fisheries in Indonesia

dwi ARIYOGAGAUTAMA¹

Wahyu Teguh PRAWIRA¹

¹ **wwf-indonesia**

Indonesia as an archipelago country have been depending in fisheries within many centuries. Almost 90% of total vessel were artisanal fisheries and the others are big scale that control by fisheries industries. To support stock assessment and compliance of fisheries practices, Indonesia have release an observer regulation in 2013, but it still coverage vessel above 30GT with coverage from 12 mill to open seas. This regulation not mandatory to artisanal fisheries that less than those gross ton.

Logbook mechanism have been implemented in both scale, but have low compliance to be implemented. Information gap in artisanal fisheries become serious issues to be solved by government and research institution. Lack of regulation for observer program in artisanal fisheries , and monitoring for observer and logbook practice have been the main problem that have to be solved.

Other threat for Endangered, Threatened and Protected species such sea turtle, sharks juvenile, and marine mammals have a high potential in coastal fisheries. The need for implemented onboard observer in artisanal fisheries to coverage information, not just for fisheries data but also information for bycatch of ETP species.

I and my partner have been manage observer program since 2006 until now. We focus on tuna longline fisheries in 3 big fishing port in Indonesia which is Benoa fishing port, Niza Zachman muara baru fishing port and Bitung fishing port. We also doing pilot testing for observer program in gillnet fisheries in Paloh, Sambas district, West Borneo since 2014. The lesson learn to get comprehensive information from both scale of fisheries were really different. It needs different approach to make sure the compliance of observer are higher. Within join in 8th International Fisheries and Observer Monitoring Conference, I hope I could share our lesson learn from our work and study more from other participant experience to support our responsible fisheries in Indonesia.

Paper 95: Collective fish counting and democratic conservation trials in Vembanadu backwaters (S.India)

Joseph Sebastian PAIMPILLIL¹

¹ Kerala University of Fisheries and Ocean studies

The Vembanadu (Ramsar site) fish count aims of creating awareness about the state of fishery resources of the lake and to institute a deliberative governance system for it with the cooperation of various stakeholders, Government Departments, NGOs and academic institutions. This is an activity planned mainly to bring the fisher community closer to fisheries experts, and the general public. To make any conservation intervention a success, one has to first gain the confidence of the traditional stakeholders, the fisher folk. The main intention behind the fish count was to create awareness about the state of fishery. The fish count mainly is an awareness campaign about the state of fishery resources. The fish count operates in three cruises, each covering different parts of the lake in such a way that the entire lake gets covered. 30-60 people are assigned to each cruise team. Each team has a captain and includes fisheries experts, fisheries students. Along each cruise route, observers count fish at five pre-decided points using three different methods - cast net, gill nets and hand nets and also collect data from the fish landing centres. During 1979-1984 periods the lake had more than 150 fish species. The first count was conducted in 2008. Fish counts have shown that fish diversity has reduced dramatically to 70 species now. There is a decline in the carnivorous fishes and there has been an increase in omnivores. There has been a gradual reduction in freshwater puffer fish since the first count. There has been a recent proliferation of the freshwater sponge, a climate indicator. On the positive side, the surveys have documented some rare species. During the recent survey, two fin fish species were recorded . Five exotic species were also recorded. Two rare fishes were recorded for the first time.

Paper 62: Rockfish Wanted, Dead or Alive: An Overview of the Oregon Nearshore Fishery

Scott LEACH¹

¹ PSMFC

The Oregon (OR) Nearshore Fishery is covered by observers deployed in the West Coast Groundfish Observer Program (WCGOP) Non-Catch Share program. The OR Nearshore fishery comprises two permits; OR Blue/Black Rockfish and OR Blue/Black Rockfish Nearshore Endorsed. This fishery supplies nearshore fish to interstate markets, both live and fresh. The OR Nearshore fishery is diverse in many aspects including vessel size, gear type, target species, and port configuration. Thus, this fishery presents unique challenges to both fishermen and observers. Small vessels, bar crossings, surf launches, weight, space and crew size, the unpredictability of nearshore markets and USCG regulations all contribute to making this a challenging fishery to observe. In the OR Nearshore fishery, observers and associated program staff must work closely with local fishermen to foster trust and mutual respect in order to successfully obtain fishery-dependent data while supporting fishing efforts.

Paper 94: FROM INDUSTRIAL TO ARTISANAL FISHERIES: A CHALLENGE FOR THE PERUVIAN ON BOARD OBSERVERS PROGRAMME “PROGRAMA BITACORAS DE PESCA (PBP)”

Gersson ROMAN¹

MARILU BOUCHON¹, **JULIO LIMACHE**¹, **SOFIA RIVADENEYRA**¹, **CECILIA PEÑA**¹ and **MANUEL OCHOA**¹

¹ INSTITUTO DEL MAR DEL PERU (IMARPE)

In the beginning, the goals of the on board Observer Programme PBP of the Instituto del Mar del Peru (IMARPE) was the recording of the Peruvian anchovy industrial purse seine fleet only. Nevertheless, since 2009, with the maximum catch limit by vessel law (individual quotas), the government improved the fisheries management regulation for the direct human consumption of Peruvian anchovy, encouraging the artisanal fishermen to capture the resource, which create the necessity of monitoring the fleet.

Given the experience of the observers gained with the years, they started to cover the artisanal purse seine fleet applying the same methodology created by Bouchon et al. (1998), registering biological and fishing information as fishing trips, behavior of the fleet, etc. The aim of this work is to describe how the PBP has changed and improved the on board observations techniques on the artisanal fleet.

The hardest part was getting the acceptance of the artisanal fishermen of include a observer on their vessels. The tactic to achieve this goal was the friendship and family ties between observers and fishermen, in order to solve the problem. Also it was possible to identify some inconvenients within the collection of data, like difficulty to set the geographical position, to biological sampling, the increase of target species different from anchovy. These issues have found their solution in technological devices (GPS), continuous training and others.

Paper 172: Challenges and lessons learned in assisting in the development of observer programs in Central America

Sandra ANDRAKA¹

Alvaro SEGURA¹ and Michael OSMOND²

¹ EcoPacific+, ² WWF US

The recognition of the importance of observer programs and their contribution as a valuable source of consistent data has been recognized by fisheries management agencies around the world. The requirement for effective implementation of these programs is becoming more widespread, including fisheries in Developing countries. This is the current situation for Central American countries that are Member and cooperating non-Member (CPCs) of the Inter-American Tropical Tuna Commission (IATTC) that are required to have a minimum 5% observer coverage of the fishing effort made by its longline fishing vessels greater than 20 meters length overall. Beginning with these fleets and expanding to smaller vessels in length overall, this requirement presents an opportunity to developing observer programs in fisheries with lack of data. Nevertheless, the development and implementation of a national observer program in those countries is complex due to capacity of fisheries management agencies, legal and financial issues, and the conditions of the fisheries, among others challenges. This paper presents the main challenges to developing the ability to implement observer programs that can operate on a self-sustaining basis in Central America countries, and lessons learnt in this process. Recommendations are made to guide these efforts in an effective and efficient manner according to the conditions in this Region.

Paper 170: Development of Low Cost Electronic Monitoring Systems

Mike OSMOND¹

John WANG² and **Jacob ISAAC-LOWRY**³

¹ WWF, ² NOAA, ³ Flywire Cameras

Overfishing and bycatch are two major problems faced by many global fisheries, particularly small-scale fisheries (SSF) in developing countries. To date, a variety of approaches have been developed and employed to help address these concerns. As a first step, fisheries managers attempt to quantify catch rates and bycatch interactions by placing observers on commercial fishing vessels. The implementation of observer programs carries with it a range of issues including funding, observer availability, safety concerns, and sea time. Some nations have less-strict standards for their observer programs, while fisheries in other nations have no observer coverage at all. Many developing countries lag in the capacity to gather catch data, especially for small-scale coastal fisheries. As a result, management agencies struggle to make informed decisions.

To address these issues, the use of electronic video recording systems to monitor vessel catches is becoming more widespread and sophisticated. Along with increased sophistication comes substantial cost, resulting in an advancement that can be very difficult and challenging to implement in developing countries and associated SSF. This project has developed a low cost technological solution for monitoring vessel catches in small-scale fisheries, with the goal of contributing to informed fisheries management. The solution could also be used to supplement onboard observer coverage where lack of capacity and cost is a major obstacle.

A pilot program initiated in 2015 provided a promising start. WWF's collaboration with NOAA Fisheries and Flywire Video Systems resulted in the development of an electronic monitoring system (EM) specifically aimed for use by small-scale, coastal fisheries. This initial design was tested in Indonesia and in the Gulf of CA in Mexico. Using gillnet fisheries, a test between onboard observers and the EM systems provided impressive results. There was no statistically significant difference between the catch data or bycatch data recorded by an onboard observer and that determined from later examination of the video recording. The overall time spent to obtain catch data with the EM system was 60% less than using an onboard observer and this includes the time spent reviewing the video footage. The cost per unit is around \$750.

Thursday, 1 Sep 2016

13:30 - 15:00:

**Panel - How Much Observer Coverage And Monitoring Is
Enough? Methods For Reducing And/or Incorporating
Biased Data Collection**

Paper 114: Using statistical methods to improve regional catch sampling

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During the last couple of years the focus on commercial fisheries sampling programs in the European Union (EU) has been on statistically sound sampling designs as opposed to a more ad-hoc design commonly used in many European countries. To achieve a more cost effective sampling program focus has also been changing from the present national to a more regional approach. This study is part of a pilot project financed through an European grant (MARE/2014/19), where one of the goals were to suggest a future regional sampling designs for stocks caught in the North East Atlantic.

Four economically important pelagic stocks (herring, mackerel and sprat) caught in the North East Atlantic were used in a simulation study to compare various regional sampling designs. 11 counties in the EU provided data from logbook and sales note at trip level from 2013 and 2014. To optimize the sampling designs different stratification scenarios were tested e.g. countries, port size and vessel length. The present sampling effort was kept as a starting point however in some of the scenarios redistributed according to landed weight. Different sampling effort was applied to attain the level where uncertainty was not decreasing although the level of samples increased.

One of the suggested regional designs was based on self-sampling of catches at-sea. There are great benefits of self-sampling small pelagic at-sea compared to sampling by observers on-shore. If well designed it can be a very cost effective way to sample. Further the samples can be frozen directly after the catch and thus obtained on a haul by haul basis and not on a trip level which a harbour sample most likely will be. It may be noted that control samples will be needed in addition to ensure independent data to evaluate and control biases.

The main findings in this study were that with a relatively simple stratification and present regional sampling effort it would be possible to achieve a very effective regional sampling design. This highlights the benefits of using statistical method to evaluate sampling designs before implementation.

Paper 59: Is it always safe to assume normality when constructing the confidence limits for the bycatch estimates?

Yong-Woo LEE¹

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Fisheries bycatch data collected by onboard scientific observers from commercial fishing fleets are the cornerstone of bycatch estimation in many fisheries across the globe. Ratio estimator approach is widely used to estimate the bycatch rates and hence total bycatch amounts of a fish species. The variance for the point estimate of bycatch ratio, as a measure of uncertainty, is generally estimated based on a large-sample variance approximation. With assumed asymptotic normality of ratio estimates, the estimated variance is then used to construct the conventional symmetric confidence limits around the ratio and hence around total bycatch estimates. Because observer coverage is sometimes low (< 10%), the large-sample approximation and asymptotic normality assumption should be evaluated over varying levels of observer coverages. Based on the 100% observed bottom trawl catch shares fishery data from the U.S. West Coast, a resampling technique was used to simulate bycatch observations for the several groundfish species selected for their bycatch levels (high vs low). Bycatch ratios were then estimated out of 2,000 simulated data, at a given level of coverage, to examine the accuracy and the distributional features of the estimates. These simulations were conducted over a wide range of observer coverage rates, 10% - 90%. The results indicated that the bias in bycatch estimation became negligible in most cases when the coverage rate was more than 10%. However, the distributions of bycatch estimates were often highly skewed to the right at the lower coverage rates (< 30%), especially for the rare encountering species, leading to a conclusion that the upper confidence limit could be potentially underestimated if limits are estimated based on asymptotic normality assumption. In addition, because of the symmetric feature of assumed normality, lower limits of confidence interval are often estimated to be negative, which is unrealistic for a ratio value. Given these findings, a bootstrap-based estimation method is recommended when constructing the confidence limits for the bycatch estimates.

Paper 20: How does variation in observer coverage influence our estimates of fishery dependent mortality?

Jason JANNOT¹

Yong-Woo LEE¹, Marlene BELLMAN¹, Jon MCVEIGH¹ and Kayleigh SOMERS¹

¹ Northwest Fisheries Science Center

Fishery-dependent data from monitoring programs are critical to accurately estimate at-sea discard mortality, which can be a large component of total fishing mortality of a species. The percent of fishing vessels monitored by on-board observers (i.e., observer coverage) will determine the proportion of catch sampled which is used to estimate discard mortality. Thus, observer coverage has a direct effect on the accuracy and precision of mortality estimates. Using resampling, we investigate how variation in observer coverage influences estimates of discard mortality and uncertainty around mortality estimates. We resampled data from a U.S. west coast groundfish fishery (2011-13) when observer coverage was 100% (complete census) at lower coverage rates (0.05-0.95). We then estimated at-sea discard mortality and precision of those estimates for a wide variety of species within different management categories. We predicted that discard estimates should reflect true discard amounts at relatively low coverage rates. Furthermore, we predicted that increasing observer coverage should reduce uncertainty around estimates. We show that discard estimates approach the known mortality at relatively low observer coverage rates. However, even though coverage rates significantly influenced uncertainty, the main drivers of discard uncertainty in this fishery were (a) small amounts of discard and (b) species differences primarily due to rarity in the catch. This suggests that discard uncertainty is driven more by species-specific catch rates and fisher behavior and that increasing observer coverage might not alleviate uncertainty in discard estimates. This work provides guidance to both monitoring programs and fisheries managers for identifying minimum necessary observer coverage to meet scientific standards and goals.

Paper 130: Evaluating bias in an observer and self-sampling discard programme

Michiel DAMMERS¹

Ruben VERKEMPYNCK¹, Chen CHUN¹ and Edwin VAN HELMOND¹

¹ Wageningen IMARES

Sampling bias in selecting discards samples is an issue in self-sampling. To gain insight in variations and possible bias in sorting of discards by fishermen, a co-sampling programme has been set up in the Dutch demersal fleet since 2011. During each observer trip on a vessel in the reference fleet two samples are sampled by the fishermen as they would during the self-sampling. This paper analyses the performance of both the observer and the self-sampling discard programme for bias.

From an unbiased estimator the variance of haul effect and fish residuals is estimated from the variance components. Results show that scientific observers overlook a number of fish species (mean=7.0, $p < 0.01$). The most frequently detected species in both programmes is lemon sole and plaice. The mean lengths are compared for several target and bycatch species that are found in the samples. The length measurement of each individual fish is decomposed into grand mean, haul effect and residuals.

An unbiased estimator is used to estimate the grand mean, and variance of haul effect and fish residuals can be estimated from the variance components. Non-parametric bootstrapping method is used to estimate the mean difference of mean length and variance components. Results show that self-sampling exhibits an average of 1.2cm (95%CI 0.34-2.1cm) shorter plaice than observer samples, while for lemon sole no difference is detected (-0.1, 95%CI -0.7-0.5cm). This result suggests bias in sampling of plaice from the discards fraction. Self-sampling programme yields a smaller sampling variance of mean length than observer (0.07 vs. 0.20cm² for plaice, 0.10 vs. 0.12cm² for lemon sole). The estimated population variance of haul and fish are 3.10 and 11.29cm² (plaice), 2.04 and 8.7cm² (lemon sole). The next step is to include non-co-sampled hauls and trips and conduct a variance component analysis.

Additionally, the differences in raised discard estimates based on both the observer and self-sampling discard programme will be presented in terms of their consequences for assessment and advice.

Paper 159: All or None. How Partial Coverage is a Bias in Itself

Rand ROMAS¹

¹ NPGOP

Various types of sample bias occur in both full and partial coverage fisheries observer programs. When comparing the two, it's easy to see that partial coverage fisheries have significantly more sources of potential sample bias. Working as an observer in partial coverage fisheries for the state government of North Carolina as well as full-time coverage for the Federal government in Alaska I can say with certainty that partial coverage observer programs yield for less accurate and more biased data. Typical forms of sample bias that can be seen in all fisheries observer programs can include; catch sampling, changes in fishing behavior, and the inability to access a certain sampling area due to space and safety concerns. Being assigned to a vessel as a full-coverage observer in the North Pacific Groundfish Observer Program (NGPOP), eradicates multiple sources of sampling bias that one may see while working partial coverage fisheries on the East Coast, such as the North Carolina Division of Marine Fisheries Observer Program (NCDMF). NCDMF observer programs offer percent coverage monitoring for multiple fisheries in which inclement weather, vessel size, the inability to contact fishermen to set up trips, drastic changes in the amount of gear being fished, and changes in fishing location act as immediate and profound sources of sample bias.

Full coverage observer programs carry forms of sample bias, however, when assigned to full coverage fishing vessels, changes in fishing effort, fishing location, and inclement weather affect the livelihood of every person on board. Partial coverage programs allow a certain percentage of fishing operations to go unmonitored and more importantly, it gives the industry the opportunity to show the observer programs the data they want seen instead of the real world, unbiased data collection that should be pursued.

In order to minimize sampling bias and collect more meaningful and accurate fisheries data, we need to implement more full coverage programs that allow for complete transparency in all aspects of fishing, or at the very least start to implement electronic monitoring on smaller, partial coverage fisheries.

Paper 58: The EU landing obligation and its impact on discard data

Lisa BORGES¹

¹ FishFix

The recent reform of the Common Fisheries Policy of the European Union introduced a Landing Obligation (LO) for all EU fishing vessels for certain species and fisheries starting from 2015. It was envisaged that with the introduction of the LO more discard data would become available as the catch that was otherwise discarded would be landed and easily available to be sampled. However, this assumed that the LO is or will be fully implemented, i.e. is monitored at sea at significantly high levels. If the obligation is only partially or not implemented as recent evidence suggests, the potential for biased discard data is significant as skippers will have a major additional incentive to change fishing behavior while they are being observed. Furthermore, as the quota system changed to account for discards, so too has the scientific advice changed to specifically address discards, increasing the need for accurate data. At the same time, the incentive to misreport discards by the industry has also risen as an attempt to secure higher fishing opportunities. The paper presents and discusses the impact of the LO on discard data availability and quality, based on the structure and results of two previous recent studies (Borges, 2014; Borges, 2016).

Keywords: discards, landing obligation, management policy, European fisheries

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Thursday, 1 Sep 2016

15:30 - 17:00:

**Panel - Can Data From The Fishing Industry Be Used To
Monitor Fisheries Compliance, Seafood Traceability
And/or Fisheries Certification?**

Paper 150: Fisheries Information Management System

David KARIS¹

¹ National Fisheries Authority

David Karis serves as the Manager of the Vessel Monitoring System(VMS) at National Fisheries Authority(NFA) - Papua New Guinea(PNG), he also oversees and guides much of the development of the integrated Fisheries Information Management System(iFIMS), the system used by NFA in management of their fishery. David has a Diploma in Management, and Certificates in Tropical Fisheries and Information Technology and has attended numerous courses on fisheries management subjects ranging from VMS and GIS, to Fisheries Management and Fisheries Investigation and Enforcement. David's 20 year career with NFA includes time as a Prawn and Lobster technician, Tuna Scientific Observer, Tuna Port Sampler, Fisheries Enforcement/Investigations Officer and VMS Manager.

Presentation Summary

The National Fisheries Authority Vessel Monitoring System was upgraded to a comprehensive web based platform known as the integrated Fisheries Information Management System(iFIMS) in 2010. iFIMS was developed "Fit for Purpose" as an integrated platform encompassing monitoring, eReporting, compliance and fisheries management tools. The database development has comprised of a series of projects since commencement, including:

- Vessel Register
- Asset Tracking System (ATS)
- VDS
- Crew Register
- MCS Live access and Photos
- Alerting Visual and Email/SMS
- e- Forms
- Electronic Vessel Register (Licensing)
- Other integration (such as with the FFA regional register)
- Port sampling
- Catch traceability
- Observer management and tracking
- FAD Tracking
- Industry Access
- Flag State Access.

These many interrelated components of the system are integrated and connected to each other. For example, the Observer Management module, includes the functional Observer booking system, but is also integrated to the Asset Tracking System (ATS), Alerting, eForms, Catch Document Scheme (CDS), Licensing and Reporting systems. It is the power of this integration which makes iFIMS so efficient and effective for NFA PNG.

Paper 46: Using Technology to Improve and Verify Fisher Self-Sampling

GRANT COURSE¹

¹ SeaScope Fisheries Research Ltd

The use of self-declared data in fisheries science and management has often been treated with suspicion. These concerns have surrounded the accuracy of the recorded data, the way the data has been collected, and whether the fishermen have introduced bias, either intentionally or accidentally. The cost of using observers or fishery officers to collect biological data or check self-declared catch data in remote locations is often prohibitive, resulting in some stocks and fisheries being excluded from monitoring. However, without reliable and trusted verification, the self-declared data are potentially limited and may be rejected by scientific communities.

In 2015, SeaScope conducted trials on the north west coast of Scotland, using electronic monitoring (EM) to corroborate catch data collected by the fishermen operating small inshore vessels, typically targeting crustaceans and scallops. As part of this project we also investigated the use of technology to provide additional biological and fishing effort data.

EM equipment was installed on 11 small inshore fishing vessels. The crews were instructed to collect retained and discarded catch data and sex ratio data, from a subsample of the catch. Video data was collected for the same voyages and reviewed by a shore-based video analyst and the two data sets were compared. Observers were also sent to sea to collect control data to determine which of the two data sets most reflected the true catch data.

The project also tested several different technological innovations. These included Bluetooth callipers fitted with "sex buttons" to enable quick self-reporting of length data; a modified discard chute fitted with CCTV to enable accurate counting and sexing of bulk discarded crab catches; and RFID tags fitted to individual creels to automatically gather fishing effort (pot count and soak time data, at location).

This presentation will outline some of the key findings from this project and show how all three data sources; fishermen, at-sea observers and EM analysts, can work together to provide trusted, accurate and useful data. It will also provide a brief overview of how using the new technology used can assist in scientific data collection.

Paper 131: The Landing Obligation and MSC certified fisheries

Lisa BORGES¹

Rob BLYTH-SKYRME²

¹ FishFix, ² Ichthys Marine Ecological Consulting Ltd.

The recent reform of the Common Fisheries Policy of the European Union introduced a Landing Obligation (LO) for all EU fishing vessels for certain species and fisheries starting from 2015. Its primary objective is to reduce unwanted catch while at the same time to promote sustainable fisheries by reducing fishing mortality of low commercial value sizes and species. If the LO is fully implemented, including through catches being monitored at sea at significantly high levels, it is likely that fishing operations will change to maximize the use of the space on board vessels and quota available for high value species and sizes. The LO should also drive improvements in data collection through rigorous monitoring of all catches of commercial stocks. In recent years, significant efforts and various consumer-led approaches have also been attempting to drive greater sustainability and legality in European fisheries. The Marine Stewardship Council certification scheme is one of these approaches and has achieved a high level of penetration. However, poor implementation of the LO may undermine progress. Non-compliance with the LO has the potential to introduce illegality into the supply chain, which could lead to the loss of MSC certification and, with it, access to key markets. Evidence to date suggests weak LO implementation, continued discarding and degradation of data quality. This study assesses how the LO interacts with the MSC Standard, based on the review of 25 European Union certified fisheries, highlighting where weak implementation of the LO could lead to problems for MSC certified fisheries.

Keywords: discards, certification, European fisheries

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Paper 79: Credible net to plate traceability and ecolabeling in the tuna sector is possible, but at a cost: Lessons from PNA's MSC Group Chain of Custody scheme

Maurice BROWNJOHN¹

¹ PNA Office

This presentation will examine self-certification, statistical checks and 3rd party observers as used to monitor traceability for the purposes of eco-certification in the fishing industry drawing on experiences from the Parties to the Nauru Agreement (PNA) Marine Stewardship Council (MSC) Group Chain of Custody (CoC) scheme. Traceability arrangements under this scheme support decisions around the final eligibility of product to be sold as MSC-certified from the PNA's free school purse seine skipjack and yellowfin tuna fishery. The scheme relies on catching vessels and carriers maintaining, and documenting, the separation of free school and FAD-caught fish while in their custody, with verification achieved through independent observers. Experience in the first two years of the scheme tells us that it is possible to operate a credible and robust CoC using industry and observer data, but there are many potential pitfalls and commercial incentives for gaming and non-conformance, and adequate checks and balances are required at all stages in the supply chain. The presentation will explore the PNA's Group CoC system, how verification of separation at all stages of the supply chain is achieved, together with the main challenges and lessons learned, using real world examples where possible.

Paper 47: Marine Stewardship Certification of the South African Hake Trawl fishery – the development of a client-based Observer programme and data collection protocol

Victor NGCONGO¹

Melanie SMITH¹ and David JAPP¹

¹ Capricorn Marine Environmental

In 2004, the Hake Trawl fishery became the first fishery in South Africa to be certified by the Marine Stewardship Council (MSC). The certification has been renewed twice and currently remains the only certified trawl fishery in Africa. The MSC assessment relies heavily on information collected by sea-based observers that was initially provided by the state-funded observer programme, known as the Offshore Resources Observer Programme (OROP). Obtaining MSC certification requires rigorous stock assessment, ecosystem sensitivity and collaborative management. Certification resulted in the setting of conditions and the intensive collection of sea-based information. The client (South African Deep-Sea Trawling Industry Association, SADSTIA) addressed each condition through an "action plan" as required by the certification process. With the demise of OROP on recertification in 2010, SADSTIA implemented an independent observer programme in order to sustain the sea-based data collection necessary for closing out the MSC conditions. CapMarine is responsible for the observer programme and works closely with SADSTIA and the management authority (Department of Agriculture, Forestry and Fisheries, DAFF) to collect the data needed. These data include catch estimations of the target species (*Merluccius paradoxus* and *M. capensis*) to facilitate the stock assessment using a depth-base algorithm. Further, observers are trained to identify bird species, bycatch, discard species and also Endangered Threatened and Protected (ETP) species. Observer data have supported the closing out of several MSC conditions including seabird and trawl warp interactions, habitat impacts and the separation of primary and secondary bycatch species. Data collection of a high quality is vital and the programme with SADSTIA is ongoing. It is now an integral part of the MSC certification of the hake trawl sector. The development of the SADSTIA programme has also had a positive spin-off on other fishery sectors, encouraging the hake longline sector to introduce a collaborative Fishery Improvement Project (FIP) with the World Wildlife Fund (WWF). The long-term objectives of developing observer programmes in the region has had a positive influence on other African fisheries by setting a high standard in observer data collection and increasing the potential for more fisheries in the region to work towards sustainability and possibly MSC certification in the future.

Paper 174: Regional observer program in Western Indian Ocean region

Tokiniaina RASOLOARIMANANA¹

JEROMINE FANJANIRINA¹

¹ Indian Ocean Commission

The Regional Fisheries Surveillance plan (PRSP) set up in 2007 by the states of the IOC (Indian Ocean Commission) to fight against illegal fishing with a regional observer program. This program is based on national observers from each country. A regional accreditation has been issued with an official card which allow them to observe even outside their Exclusive Economic Zone (EEZ)

Each IOC member country has a national observer program run by the country manager. Each country appoints domestic observers to regional vocation and IOC funded scientific high-level training to the appointed observers.

A working group, which brings together national observer program managers has been created since 2014, and meets two times a year. This group plans the deployment of observers, and sharing the information collected on its area, harmonization of procedures briefing, debriefing

Fisheries observer data are trustworthy and address the issue of under reporting, bycatch and discards that are concerns of several IOTC (Indian Ocean Tuna Commission) resolutions and national fisheries legislations

Each observer reports to the country manager at least twice a day, he must remain in permanent contact with their country of origin. The observer uses codes to communicate the manager with information on offenses or other to avoid putting at risk.

The IOC countries use two different databases to record the observed data. But the IOC has set up late 2015 online Starfish program containing a "observers" module that has a connection with the two bases used nationally.

There exist and observe IOTC program for transshipment at sea as per Resolution 14/06 on Establishing a program to monitor transshipment at sea by wide-scale fishing vessels

Every fisheries agreement with the States of the IOC establishes the obligation to carry a fisheries observer.

The IOC region has national and regional VMS that are used in conjunction with other tools for traceability and certification of catch for export

Fisheries monitoring programme must be part of all fisheries management plan to ensure sustainability of the fishery.

Friday, 2 Sep 2016

09:00 - 10:30:

**Panel - How Can Fisheries Monitoring Programs Support
An Ecosystem Based Approach To Fisheries
Management?**

Paper 3: Designing fisheries monitoring programs to meet ecological data requirements for ecosystem-based fisheries management

Eric GILMAN¹

¹ Pelagic Ecosystem Research Group

Fisheries have direct impacts on market and non-market species, can directly degrade habitat, and can have collateral effects on ecosystem structure, processes and stability. Ecosystem-based fisheries management extends - and does not replace - conventional, single-stock, single-fishery approaches to comprehensively address these direct and broader effects of fishing. The presentation will discuss how observer programs can be designed to help meet data requirements to support the implementation of ecosystem-based fisheries management systems that employ ecological risk assessment methods along a continuum from qualitative to model-based quantitative approaches. The presentation will describe monitoring requirements for managing bycatch of at-risk taxa, and present recommendations of the Joint Tuna Regional Fisheries Management Organizations' Technical Working Group on Bycatch to identify minimum data fields and standardized collection protocols for tuna regional fisheries management organizations' longline bycatch observer programs. Findings from an evaluation of the state of performance of regional fisheries management organizations' ecosystem-based governance of bycatch will be presented. Observer methods to collect data on all sources of fishing mortality, including pre-catch, post-release and ghost fishing removals, will be described. Examples of observer data collection fields and protocols that enable assessments of broad, community- to ecosystem-level collateral effects of fishing will be provided. Opportunities to expand data collection to support continued transition to ecosystem-based fisheries management will be highlighted.

Paper 124: What level of fisheries monitoring is required? An ecosystem risk-based approach for identifying required levels of monitoring programs for Pacific Coast fisheries

Katie BEACH¹

Carole EROS² and **Howard STIFF**³

¹ KTBeach Consulting, ² Fisheries and Oceans Canada, ³ Watercolour Consulting

Canada's Department of Fisheries and Ocean (DFO) manages marine fisheries to ensure that harvests are sustainable. Management decisions have historically focused on stock productivity, but recently decision factors have expanded to include assessing ecological impacts. The need to increase understanding of these impacts was spawned by a myriad of ecosystem and economic challenges to existing management regimes. These challenges include: climate change, declining and/or more variable fish stock abundances, reduced economic viability in some fisheries, an evolving global marketplace, heightened competition for aquatic resources, and more consumers interested in ensuring the sustainability of products they consume. Moreover, international and domestic commitments compel DFO to adopt a broader ecosystem-based approach to resource management. Since the early 2000's, DFO has increasingly focused on refining fisheries management by improving reliability of information about the impacts of fisheries on target and by-catch species, and on habitat. In its *Strategic Framework for Fishery Monitoring and Catch Reporting in the Pacific Fisheries* (The Framework), DFO Pacific Region has moved toward ecosystem-based management by basing catch monitoring standards on ecological risk. Since not all fisheries operate the same or have same impacts, the purpose of the Framework is to provide a common understanding and approach to establishing fisheries monitoring and catch reporting standards, and to provide guidance to resource managers and harvesters on how to develop appropriate monitoring programs aligned with ecological risk.

This paper describes a structured risk-based analysis of the impacts of fisheries on species, stocks and habitat. This analysis moves beyond earlier models of fishery management which focused almost entirely on stock productivity to now include biodiversity and habitat integrity. Aside from basic catch data and biological sampling from the target stock, information requirements of this risk assessment include: impacts on releases of target and non-target species (including fish, seabirds, marine mammals, etc.), encounters with species that are not captured but still impacted, and habitat. The risk assessment runs through a scoring process based on the Framework to determine the required level of monitoring and guides the development of catch monitoring programs that respond to diverse information needs and risks as required.

Paper 146: Azores Fisheries Observer Program and COSTA Project: an example of cooperation to achieve sea turtle conservation objectives

Carla DAMASO¹

Miguel MACHETE¹

¹ Institute of Marine Research

The Azores region is recognized to be a key area for juvenile loggerheads that originate mainly from rookeries in the south eastern USA. Surface longline fishing is prominent in the area and is thought to represent a major threat for the sea turtle population passing through the Azores. The COSTA project (COnsolidating SeaTurtle conservation in the Azores) is a collaborative project coordinated by the Institute of Marine Research (IMAR), is funded by the US Fish and Wildlife Service (US) and has several associates (Azores Fisheries Observer Program, Regional Government, Azores Sea Observatory NGO and Portuguese Artisanal Fisheries Associations). The objective of this project is to provide the necessary scientific instruments, and concurrently, with the stimulation and consolidation of longstanding scientific programs, contribute to the local awareness for the conservation sea turtles in the Azores. The aim of the project is therefore to provide the competent regional environmental agencies with a complete assessment of the threats caused by longline fishing by determining bycatch levels and by mapping the spatial distribution of critical areas where turtles and fishing overlap. To this end, we created an observer program for the Portuguese longline fleet, which is coordinated by the Azores Fisheries Observer Program (POPA). Furthermore, we are revitalising, restructuring and consolidating the longstanding research program on sea turtles, in particular the conventional tagging and sampling programs, in coordination with the regional program for stranded turtles. The project is also dedicated to develop outreach activities for the general public and fishermen, in particular by providing information on safe handling and dehooking protocols to the latter.

Paper 87: Interactions between Marine Mammals and Peruvian Purse Seine Fishery: Importance of the on board observers

Sofia RIVADENEYRA VILLAFUERTE¹

Gersson ROMAN AMANCIO¹ and Elisa GOYA SUEYOSHI¹

¹ Instituto del Mar del Peru

According to the International Union for the Conservation of Nature (IUCN), 26 of the 39 species of marine mammals registered in Peru are classified as Data Deficient (DD), which means that given the lack of information, their population status is still unknown. Since 2009 the Instituto del Mar del Peru (IMARPE) on board Programme "Programa Bitacoras de Pesca (PBP)" carries out the record of marine mammals interaction with the anchovy commercial vessels, getting valuable information about resident and migrating species, behavior of the groups involved in the interaction and age and sex of the individuals. This data contributes to the knowledge of the seasonal variability (related to reproductive seasons, environmental changes, etc.), distribution and relative abundance of marine mammals in the Peruvian coast.

By the time, the PBP counts with 40 observers who are mainly distributed along the central - northern coast, because of the size of the fleet. The information registered by the observers indicates that the most seen species is the South American Sea Lion, which occur mostly while the net is enclosing the fish and causes damage to nets and catches. By the other hand, the PBP has reported the presence of humpback whales and common dolphins foraging around the net and feeding on catches into the net. This findings helps to better understand the feeding behavior of cetaceans and its patterns of distribution along the Peruvian Coast.

The on board observers provides of comparable annual data and allows to stablish levels of interaction between marine mammals and the purse seine fleet, seasonal tendencies as well as foraging patterns and its temporal and spacial changes, bringing trustworthy real time information.

Paper 39: Discard Trends in a Rationalized Fishery

Kayleigh SOMERS¹

Jason JANNOT¹ and Jon MCVEIGH¹

¹ NOAA

In 2011, Individual Fishing Quotas (IFQs; a catch share program) were introduced to the U.S. west coast groundfish bottom trawl fishery. IFQs create individual accountability for landings and discards, improving economic stability for fishermen and long-term sustainability for fish stocks. Catch share programs should incentivize ecologically sustainable fishing practices, such as reducing discard of overfished stocks. The few studies examining the ecological sustainability of IFQ programs focus mainly on target and overfished stocks and ignore species outside of the formal IFQ framework, which are rarely accounted for in landings or compliance program data.

In these cases, observer data is often the only data source available to assess the impacts of a fishery at the ecosystem level. We used data from the West Coast Groundfish Observer Program (WCGOP) to take a more holistic, ecosystem-based approach and explore how trends differ between species explicitly managed by IFQs, species managed by the Fishery Management Plan (FMP), and ecosystem component species caught but not managed within the FMP. Specifically, we asked how trends for these groupings differed in terms of discard and retained amounts, rates, and proportions before and during IFQ management.

Overall, discard and discard rates have decreased under the IFQ program. Discards of FMP-managed species decreased by the greatest weight, while non-FMP species decreased by the greatest percentage. Discard rates decreased across each grouping, but the percentage decrease in IFQ species was lower than other groupings.

Species outside of the formal IFQ management framework, although not targeted, are an important part of a healthy ocean ecosystem and a high-yielding fishery. Further, species not directly managed today always have the potential to become a species of interest tomorrow. While IFQs have reduced the percentage of IFQ species catch that are discarded, observer data shows that nearly all non-FMP species encountered continue to be discarded. These results highlight the need to incorporate observer data in the design of additional management techniques for other species groupings for IFQs to function within a truly ecosystem-based framework.

Paper 80: Discard and bycatch research program in the Chilean pelagic purse seine fleets: A work-based approach with fishermen

Rodrigo VEGA¹

Oscar GUZMAN¹

¹ Instituto de Fomento Pesquero

The Discard and Bycatch Research Program in Purse Seine Fisheries of Small Pelagic Fishes is a scientific observer program implemented in Chile since 2014 which aims to collect technical background to be used in the preparation of a national plan to reduce discards of target species and bycatch including seabirds, mammals and marine turtles. In this way, it is intended to advance in the implementation of an ecosystem management-based approach. The methodology considered gathering information through two sources: the data obtained directly from fishermen through a self-report log of each fishing trip and the data obtained on board through fisheries observers in vessels that operate from different ports in the study area.

Unlike traditional monitoring programs that holds the Government of Chile on a number of artisanal and industrial fisheries, the methodological structure was modified, including extensive diffusion work in land, carried out mainly by the same scientific observers. The shift to a human dimension focused on users of the fishery was necessary due to the nature of the study variables and the large-scale fleet that includes more than 500 vessels (semi-industrial) with coastal operation from multiple points of landing between 33° and 40° LS. This fleet has a complex organization system, medium to low educational level of the fishermen, and high distrust in research and fisheries management.

The approach of this program allowed to increase the level of participation with compliance in the delivery of logs which changed from 1.320 (24%) in 2014 to 4.296 (69%) in 2015. A significant difference was also observed in the number of trips made by observers, increasing annually from 1.3% to 2.1% of all fishing trips. This coverage increase is mainly explained by the interaction process that led to build trust and linkages that changed the willingness and availability for receiving observers onboard. The analysis of the results are showing new paths that contribute to propose to the Fisheries Authority, alternative regulatory, operational, cultural, or other changes whose implementation promotes the reduction of discards and bycatch in these fisheries.

Paper 16: Using bite times to adjust longline soak times and increase efficiency while reducing protected species interactions

Matthew DUFFY¹

¹ Galveston Observer Program, Gulf of Mexico

In order to more effectively manage the world's fish stocks, managers must begin looking at the entire ecosystem as opposed to the older method of single species management. This Ecosystem Based Fisheries Management (EBFM) provides many benefits by creating a wider perspective, including creating a more stable foundation, allowing stock that have been and are being overexploited to rebound faster, and reducing the incidental take of protected species and bycatch. The Galveston Observer Program (GOP) spearheaded a study (Foster et al, in preparation)¹ that was used to determine the optimum soak times in bottom longline targeting primarily red grouper (*Epinephelus morio*) while reducing the amount of take of protected species, such as sharks and sea turtles.

A study was performed in two separate phases to determine the average time hooks were bitten after deployment. The first phase ran from September to December of 2010 and the second phase ran from January to May of 2013. These studies discovered a lot of valuable information regarding how selectively a longline fishes based on soak time in the first phase and soak time as well as bait type during the second phase. The research found that relatively shorter soak times were optimal for catching stationary scavengers, like grouper and snapper, while longer soak times wound up catching migratory foragers, like sharks and potentially turtles. In fact, after a soak of 46 minutes, over 90% of the targeted grouper were caught, and the line was almost exclusively catching only migratory foragers (sharks and turtles) after that.

The data collected can easily be used by managers to implement new measures to decrease incidental take, while simultaneously increase the fishers efficiency. Shorter soak times would result in less turtles and sharks being caught, those that were caught would be released relatively quickly (optimally the longest soak time would be 46 minutes), and the fishers could set more lines, more hooks and subsequently catch more fish.

1. Foster, Daniel, Pulver, Jeffrey, Scott-Denton, Elizabeth, Bergmann, Charles, in preparation. Factors Affecting Capture Time for Species Taken in the Commercial Bottom Longline Fishery in the Eastern Gulf of Mexico.