# NMFS SMALL BOATS WORKSHOP

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# SUMMARY REPORT

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# 1 INTRODUCTION

NOAA Fisheries often deploys at-sea observers onto commercial fishing vessels to perform a variety of data gathering tasks, including the collection of detailed information necessary for the assessment of the status of exploited fish stocks. Of the 143 fisheries managed by NOAA Fisheries, observer programs currently cover 29[1]. Most regions have several distinct programs. For example, in the southeastern United States, there are three: shrimp trawl, pelagic longline, and bottom longline for sharks. In other areas, such as the North Pacific, there is a single program that covers all observed fisheries. Each program is distinct in its priorities, goals, and sampling methods.

In light of recent management focus on accounting of bycatch in US fisheries, there is increased interest in placing observers on vessels, such as small boats, that to date have not had observers deployed on them. Small fishing boats operate in domestic fisheries off all coasts of the US. While they may take less of the targeted catch per vessel[2], combined numbers of smaller vessels can catch a significant portion of the targeted catch and bycatch.

Observer programs nationwide are currently exploring the possibility of covering small boat fleets, which present unique deployment obstacles.

In order to explore potential new approaches to observing small boats, NOAA Fisheries convened a workshop in Seattle March 18-20th 2003. The purpose of the workshop was to gather together representatives from observer programs, the marine insurance industry, US Coast Guard, fishing industry, commercial observer providers and others that could lend insight on solving issues associated with data gathering on small vessels.

The participants recognized at the outset that the focus of the workshop was on monitoring fishing vessels that are hard to observe using conventional observer deployment strategies. In this context it was noted that monitoring goals and objectives could potentially be achieved using alternative methodologies that do not require the physical location of observers on board. While the deployment of observers is still seen as one of the most effective approaches, there are other options that should be considered. For example, recent advances in technology, such as digital video and imaging, have made remote electronic monitoring (EM), a viable alternative in some cases. Other methods that can contribute include Vessel Monitoring Systems (VMS) full retention of all catch, and development of mitigating self-compliance measures (such as pingers to avoid marine mammals interactions).

[1] Current as of Summer 2003.
[2] To date, recreational fisheries in the US have not been subject to observer coverage.

## 2 "SMALL BOAT" FLEETS IN THE US

There is no broadly accepted definition of a small boat[3]. This is largely because it is a relative term. A boat the same size as one that is considered to be small (in terms of placement of observers) in one region is not necessarily considered to be small in another region. For example, a 59ft boat in the Pacific halibut fleet in Alaska is considered to be small. The North Pacific Groundfish Observer Program does not currently deploy observers onto vessels less that 60ft LOA. However, in the West Coast Groundfish fishery boats described as small are in the region of 18 ft LOA. Table1 summarizes the composition of the major fisheries in the US that include small boats. Many of the issues associated with deploying observers in these fisheries are similar, but there are also quite distinct problems to be overcome in each case.

**Table 1 Composition of small boat fleets in the US that are in need of monitoring for bycatch and total catch.**

| Region | Fishery | Number of boats | Average vessel length/range | Observer deployment issues |
|---|---|---|---|---|
| **Alaska** | Pacific halibut longline | ~2,000 | All less than 60' | bycatch of seabirds and groundfish in the halibut longline fishery; no observer coverage of vessels < 60' |
| | Kodiak salmon | ~180 permits | Mostly 25' to 30', | Alaska Marine Mammal Observer Program places observers on board to monitor take of marine mammals in salmon set gill nets; fishery is seasonal but relatively easy to predict |
| **Northwest** | Limited entry trawl | ~275 permits | 60' average | Total catch and discard estimates |
| | Limited entry fixed gear | ~200 permits | 45' average | Total catch and discard estimates |
| | Nearshore (< 3 miles) | ~1,000 | 22' | Total catch and discard estimates |

[3] The Code of Federal Regulations (46 CFR 24.10-17(a)) does, however, define uninspected commercial boats for US Coast Guard purposes as follows:
a. Any motorboat less than 16 feet in length;
b. Any motorboat 16 feet or over and less than 26 feet in length;
c. Any motorboat 26 feet or over and less than 40 feet in length;
d. Any motorboat 40 feet or over and not more than 65 feet in length.
These vessels are propelled by machinery (permanent or attached). These different lengths of vessels fall under different regulations depending their size, the distance offshore and the temperature of water in which they operate, ("cold" water is defined as $59^0$ F or lower). For example, a 24' vessel operating within 12 miles off Newport, OR would need to carry an immersion suit for everyone on the vessel. However, if that same vessel were operating south of Pt Reyes, CA the minimal requirement is for a Type 1 PFD (USCG, 2001).

| Region | Fishery | Number of boats | Average vessel length/range | Observer deployment issues |
|---|---|---|---|---|
| **Southwest** | Pelagic longline | 25 vessels | 60' | Observers monitor take of marine mammals and seabirds; |
| | Drift gill net | 75 vessels | 55' | 20% of sets observed; 15-20% of vessels unobservable |
| | Small mesh set gillnet | 20 vessels | | only 5 vessels can accommodate observers |
| **Hawaii, Pacific Islands** | Pelagic longline | ~100 vessels | 60' | |
| | American Samoa | ~70 vessels | 25' - 39' | open boats, working long distances offshore (up to 200 miles); difficult to place observers |
| | HI Bottomfish | 9 permits | 30' - 50' | |
| **Southeast** | 6 person charter boats | undetermined, in the 1,000's | 23' - 42' | Acceptability of having observers on "recreational" fishing vessels |
| | Headboats | undetermined, in the 1,000's | 27' – 60' | Acceptability of having observers on "recreational" fishing vessels |
| | Pelagic Longline | ~125 vessels | 40' to 55' | Mandatory, but vessels choose when to take an observer |
| | Shark bottom longline | ~40 vessels | 30' - 50' | Mandatory program, but problems with compliance with observer placement requirements; safety |
| | Shark drift gill net | ~8 vessels | | Funding high cost (fully funded since 2001)<br>Observer retention (seasonal)<br>Limited time to sample directed catch and bycatch |
| **Northeast** | Gill net, pots, longline, trawl | N/A | 70' | Voluntary observer program |
| | Day boats | N/A | all <50' | |

# 3 USING OBSERVERS TO MONITOR HARD-TO-OBSERVE FISHERIES

## 3.1 Issues to consider when designing observer programs for hard-to-observe fleets

Currently, observer programs in each region tend to provide higher levels of coverage for larger vessels in the fleet. Larger vessels generally pose fewer problems for deployment of observers. There are fewer of them (making them easier to track down) and once on board, there is more room to work, and accommodations are usually more easily provided. In addition, an observer on a large vessel is likely to cover a larger portion of the total directed catch than if that person were placed on a small vessel. Large vessels have therefore, by default or by design, been the primary focus of observer deployments. Nevertheless, small vessel fleets do take substantial catches of both target and non-target species. Observers deployed on them can collect substantial valuable data.

Rather than attempting to define "small boats", the workshop participants focused instead on the features of fisheries and vessels that make them difficult to monitor using observers. The length of a vessel alone may not provide a good indication of the difficulties involved in deploying an observer on board, nor whether there is room enough for an observer to record information and sample the catch. To base a decision to deploy observers or not solely on vessel size is unwise because many other factors should be taken into consideration (Table 2).

**Table 2 Factors identified during the Workshop that can make fisheries hard to observe using conventional observer deployment techniques.[4]**

| Factor | Detail |
|---|---|
| 1) distance from shore | distance a vessel goes from shore to fish; can change safety gear requirements and time at sea |
| 2) type of gear/ fishing method | longline, net, etc.; can increase exposure to observer or decrease space on deck |
| 3) size of fish | large (sharks, swordfish, etc.); can decrease space for observer on deck |
| 4) capacity of fish hold | how much fish can a vessel hold; can increase time out fishing |
| 5) weather | weather of a day the observer is to deploy; can prevent deployment |
| 6) accommodations | adequate observer berthing space; can they sleep in a safe, escapable location |
| 7) economic issues | cost of carrying the observer to the industry; can limit scope of program industry vs. program costs |
| 8) goals of the observer program | the objects of a program; will affect how vessels are covered |
| 9) length of seasons/ time and area closures | derby style, long seasons, closure of inside areas; will dictate when and where the vessels will fish |

[4] For this exercise, it was assumed the observer programs would be fully funded and regulations governing the placement of observers would be in place

| Factor | Detail |
|---|---|
| 10) seasonality | does the season take place during the winter or summer months; can have an affect on observer deployment |
| 11) size of vessel | the length and width of a vessel; can be an indicator if space may be available for an observer |
| 12) maintenance of vessel/ age of vessel | the general upkeep, seaworthiness and age of the vessel |
| 13) work space | the amount of deck space available for an observer to sample |
| 14) power of vessel | the horsepower of the engine; vessel can be limited in number of crew/ observer by horsepower |
| 15) fleet characteristics | are there a small number of large vessels and the rest small or vice versa? |
| 16) crew/ captain experience | judging the captain's skippering or the crew's deck abilities |
| 17) crew size | maximum capacity of vessel vs. average crew size |
| 18) length of trip | day trip vs. multiple day trips |
| 19) observer feedback | the feedback of observer about vessels |
| 20) insurance carried by the vessel | insurance level and rates; does the addition of the observer increase the cost or cancel the vessel's coverage |
| 21) observer personal safety issues | is the personal safety of the observer endangered by a culmination of issues |

The Workshop participants noted that it was not necessarily just one of the items listed in Table 2 that would cause a vessel to be difficult or impossible to deploy an observer onto. Often it is the interaction between one or more of these factors that results in the problem – e.g. size (11) and length of trip (18).

In addition to the factors in Table 2, deploying an observer on board may have a greater effect on a small vessel's pattern of fishing and economic situation than it would on a larger vessel. An observer on a small vessel may represent a greater disruption to the activities of the crew because they have to work in close proximity, perhaps displacing a crew member from their normal workstation. In some cases, a crew member may have to be left ashore to enable the vessel to take the observer. There is a question regarding who should bear the cost of the disruption caused by the observer, especially when on small vessels this may be a substantial amount compared to the income derived from fishing.

Cutting across many of the factors in Table 2 is the issue of observer training. The difference between an observable and an unobservable vessel is not clear-cut and may relate to one or more of the factors in the list. In particular, observers need to have sufficient education and experience to be able to recognizing unsafe conditions. Training should include information on the risks and dangers associated with working on small boats and familiarization with vessels on the dock. Rookie observers should have a chance to learn the basics on 'safer' vessels first. Mentors, experienced observers/program staff and/or ex-fishers, could also provide valuable support for newer observers. They could help them in addressing safety questions, and making balanced and sound judgments.

In some cases, there have been problems placing females on small vessels due to lack of bathroom facilities. Representatives from all of the observer programs agreed that there can be no discrimination in deploying male or female observers on any vessel. However, industry concerns should be taken into consideration and balanced with the regulations regarding observers. Communication and outreach with industry is essential. Part of this is understanding the "rules of engagement" between the program and the vessels required to take observers.

### 3.2 A procedure for developing observer programs on hard-to-observe boats

During the workshop, the participants discussed a procedure for incorporating the 21 items in Table 2 into the design and development of an observer program. Key components were discussed that could be applied when considering placement of observers on any vessel, regardless of size. This procedure is illustrated in Figure 1.

The process starts with the recognition of a problem for which fisheries monitoring is part of the solution. For example, a fishery may be interacting with marine mammals, with a potential for injury or death. At the earliest stage, the goal of the monitoring program may be to find out the scope of the problem itself; for example how many marine mammals are being injured or killed?

Once the program goals and objectives have been established, there next needs to be an allocation of resources to enable design of the program to proceed. At this stage it is also appropriate to communicate with impacted parties that an observer program is under consideration. Closely associated with the program design is the undertaking of one or more feasibility or pilot studies. It is at this stage that many of the factors listed in Table 2 will be first considered. For example, do the characteristics of the fishery, such as distance from shore, the type of fishing method and vessel accommodations make deployment of observers on board a viable option?

Whatever the source of the problem/issue, it is important to allocate funds and staffing to determine

1) What type of monitoring will best address the issue and
2) What type of monitoring program will minimize the impact (and therefore the effect) on the fishery participants?

It is also very important to involve all potentially impacted parties in the design phase in order to minimize problems at the program implementation phase. The design phase should include consideration of logistics issues, study such as mobility of fleet, multiple ports, isolation of ports, variability of fleet behavior, communications (between program staff and observers and observers/staff and fishers), etc. The design should also be proactive rather than reactive. Flexibility built into the program will aid in adjusting to instantaneous fishery changes. Having direct industry funding and involvement may lessen many logistical problems associated with deploying observers on vessels in remote, hard to reach locations.

In moving from the design to the implementation phase, there are some very important decisions to be made about the allocation of resources and whether the program will be voluntary or mandatory. For example, the perspectives of the government and industry participants can be substantially affected by the source of funding for the program. Will it be government funded, industry funded or a mixture of both? If it is industry funded, how will the issue of conflicts of interest be addressed? With specific regard to small boat fleets, the deployment of an observer onto a small boat, if funded by the industry, may place a substantial financial burden on the fishery, especially if vessel coverage is high. Regarding whether the program is mandatory or not, evidence from programs around the US suggests that it is very difficult to implement a satisfactory sampling regime when vessels selected for coverage have the capability to refuse to take an observer.

After full development of the program design, regular and frequent communication with the fishery participants and internal reviews, the monitoring program should be implemented. The implementation will be the first full real field test of the program and is likely to result in a need for fine-tuning the original design (hence the two-way arrow between these phases in Figure 1). A key component of communication with the involved parties is the explanation of how the data collected will be incorporated or used in the management of the fisheries. Once the program has started to produce data and these data have been analyzed, there is a further potential feedback all the way to the problem recognition. Problems to be addressed by the program may become better defined, or change radically as a result of the data that the program collects initially.

### 3.3 Safety issues

Safety is of paramount importance when deploying observers at sea. Safety issues are even more crucial when dealing with small boats. Factors that affect safety and make fisheries hard to observe are listed in Table 2. USCG is responsible for monitoring the safety equipment and standards on board fishing vessels onto which observers are to be deployed. However, an observer program can actually be useful in this regard. Distribution of material, contacts, etc. can be helpful to both the fishers and the USCG. “Living to Fish, Dying to Fish” is a 1999 report produced by the USCG that highlighted many ways to give incentives to vessels to bring their vessels up to the minimum level of safety. However, even at this minimum level, a vessel could still not be considered ‘seaworthy’.

Collecting data at-sea by observers will always have inherent risk associated with it. Therefore, observer programs must be able to adequately assess all risks associated with observer deployment, especially in a highly variable environment as on smaller vessel. Risk/ benefit ratios should be explored during the develop process of any program. If the risks are too high after efforts are made to minimize them, alternative data collection methods are a wiser direction.

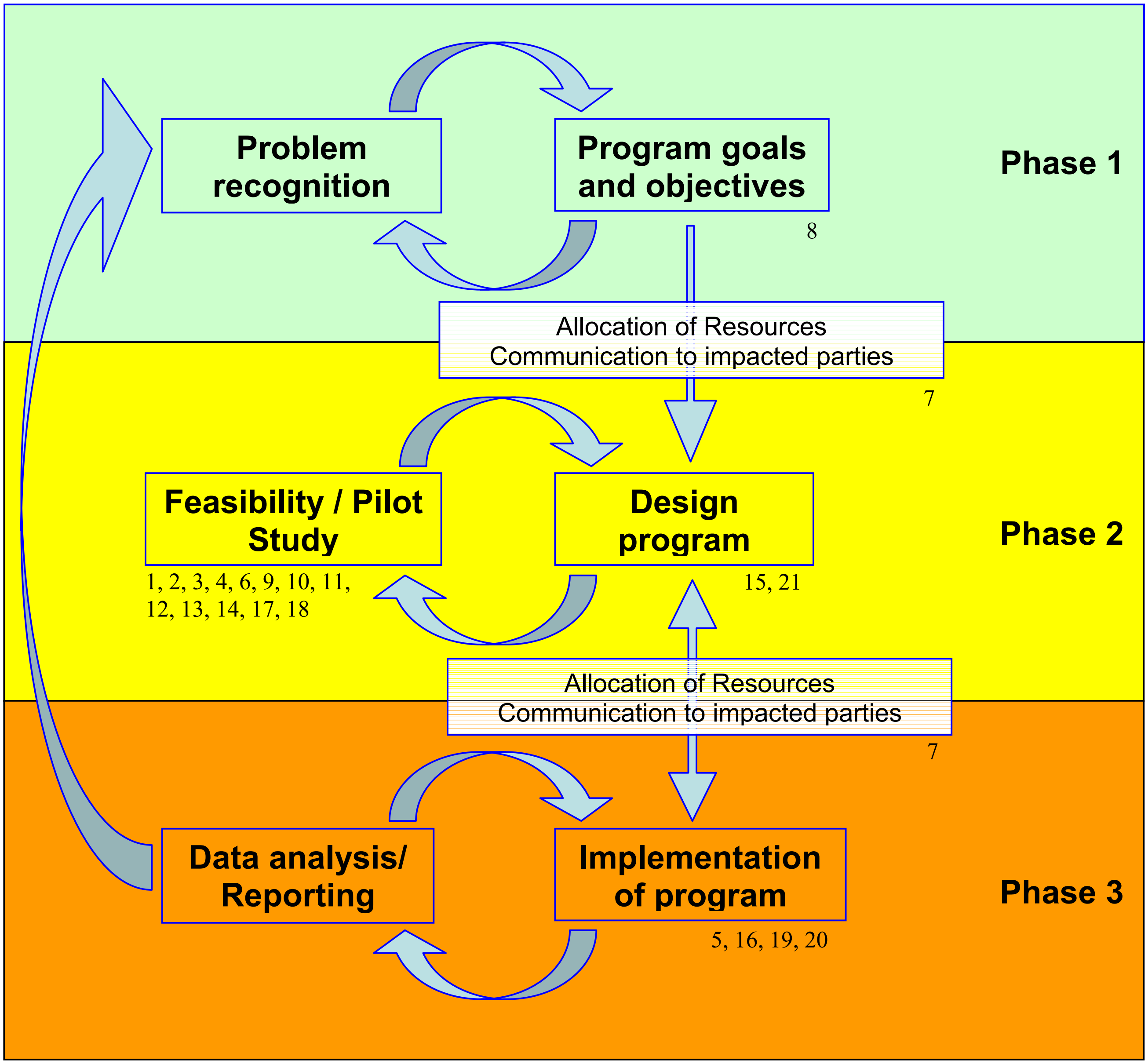


**Figure 1 Diagramatic representaiton of the stages involved in developing an observer program, showing at which stage the factors listed in Table 2 should be first considered. Factors from Table 2 are indicated by numbers adjacent to boxes (see below).**

1) distance from shore
2) type of gear/ fishing method
3) size of fish
4) capacity of fish hold
5) weather
6) accommodations
7) economic issues
8) goals of the observer program
9) length of seasons/ time and area closures
10) seasonality
11) size of vessel
12) maintenance of vessel/ age of vessel
13) work space
14) power of vessel
15) fleet characteristics
16) crew/ captain experience
17) crew size
18) length of trip
19) observer feedback
20) insurance carried by the vessel
21) observer personal safety issues

### 3.4 Liability, legality and cost of insurance

Insurance of commercial vessels and observers who board them has always been a complicated issue. Due to the various service delivery models and the as-yet-to-be-defined status of observers on commercial vessels (i.e. are they seamen under the Jones Act, maritime employees under the Longshoremen's Act, etc.), the insurance coverage that is required and whose responsibility it is to provide it remains unclear. As a result, observer provider companies carry insurance that covers observers under the varying compensation acts protecting maritime workers and vessels commonly carry additional insurance with an observer onboard. Often, minimal levels of insurance are outlined in the contract between an observer provider and NMFS. An observer may be legally entitled to sue a vessel on which he or she is injured, especially if the injury is attributable to negligence or willful misconduct.

Currently, US observer programs have no standard approach to insurance. Some programs reimburse the vessels for liability riders on top of existing insurance, some offer an umbrella policy for vessels covered by their observer program, and others offer no additional insurance beyond what the observer provider company has in place for its employees.

The Fisheries Observer Compensation Act (FOCA) has been developed to clarify and solve these ambiguous issues. If passed by Congress, FOCA would create an umbrella insurance compensation for employed observers. There would be no question as to what act (Jones Act, Workmen's Compensation, etc.) they would turn to for compensation in case of accident, injury or death. The cost for observer providers would decrease, as coverage under all the differing acts would no longer be needed. Therefore, available funds for observer programs could be used for more productive purposes such as additional sea days.

Other avenues can be explored such as how is insurance handled for FDA inspectors, USCG inspectors, police and fire personnel when they enter private areas/vessels?

## 4 CASE STUDIES OF SMALL BOAT OBSERVER PROGRAMS

### 4.1 Alaska Marine Mammal Observer Program

**Presented by Amy Van Atten, NMFS**

The Alaska Marine Mammal Observer Program (AMMOP) is an on-going program that cycles through the Category I and II fisheries of Alaska to monitor them for marine mammal interactions. Generally, the program observes gillnets in remote locations on small boats (15'-30') and usually within three miles of shore. Amy Van Atten who oversaw the program during 2002 operations provided an overview of the program and its operations for the workshop.

There was a substantial period of planning and organization prior to the inception of the observer program, which operated in Kodiak for the 2002 season. An extensive one-year feasibility study was conducted to get an overview of the fishery through aerial surveys, preview data gathering options (observer on a remote alternate platform with binoculars vs. being onboard the fishing vessel), conduct outreach, and gather contacts for possible charters, etc.

All applicable regulations were confirmed and funding for the observer provider was set up. The goals and tasks of the program were laid out. The goal of the program was to monitor the interactions with the marine mammals and provide data to determine whether the fishery should be classified as a Category I, II, or III fishery. The sampling methodology, including the required level of coverage, was established. Outreach was conducted to explain the program to the industry included brainstorming sessions to gather ideas from the fishers and local biologists.

Of the issues listed in Table 2, the main ones facing this fishery were the remoteness of the location (similar to item 1, distance from shore), and the small size of the vessels (item 11).

As the fishery operates in large remote areas of Kodiak, logistics were daunting. Given the extensive area that needed to be covered, limited transportation, and the inability of an observer both to operate a vessel (alternate platform) and complete the observing tasks, the strategy was to tap into local expertise and seek skiff operators from the industry. In order to observe as many of these locations as possible, the program operated these skiffs from a land-based camp and off two larger chartered purse seine vessels that were used as transportation platforms for observers and observer gear. About 90% of observed trips were based from these 'motherships'. All 103 active fishing permits were covered at a sampling level of between 5 and 9%. The observed level of marine mammal interaction was very low (six individuals were caught, four of which were released alive), however sea bird entanglements were more common (35 were caught, three of which were released alive)(Manly et. al, 2003).

Using the larger chartered vessels, observers could be transported to areas selected at random for observer coverage. The sampling unit was length of net pulled per hour. Self-reporting was discounted as an option as rare occurrences such as marine mammal takes could not be accurately assessed. Video monitoring was considered but not explored in detail as the staffing level was too low and more time would have been needed.

In the future, the program would approach some items differently. The burden of checking the vessels for safety decals (e.g. the USCG dockside examination certificate) would be on the contractor rather than NMFS. The cost of the program to NMFS might be less over the longer term if NMFS owned its own vessels (both the 'motherships' and the skiffs), rather than using chartered vessels. During the 2002 season, the cost per observer day was approximately $2,400. This cost includes observer pay, supplies, lodging, insurance, transportation, training, data entry, statistical analysis, and all management staff salaries and overhead.

Regarding the high cost of the program, the same options for reducing the cost were considered. Placing observers directly on commercial vessels rather than on a chartered platform would result in a substantial cost saving. It was noted that the small size of the vessels often makes this difficult, and safety is a major concern, but some skiff operators have actually expressed a preference for taking the observer on board rather than having an additional skiff in close proximity. Also, the probability of detecting a marine mammal entanglement seems to be higher if the observer is viewing from an alternative platform rather than being in the commercial skiff.

## 4.2 Southeast Australia Estuarine Commercial Fishery Observer Program

**Presented by Charles Gray, New South Wales Department of Fisheries**

Observer-based surveys of the retained and discarded catches of several small-scale estuarine fisheries in NSW, Australia, have been completed. These include the seine fishery for penaeid shrimp and the multi-species beach-seine and gillnet fisheries. Approximately 750 fishers are endorsed to use these gears in up to 80 estuaries throughout the state (~ 1500 km of coastline). The fishery lands approximately 3,500 tonne of finfish and 200 tonne of shrimp, valued at ~ US$8 million per annum. These fisheries are a major component of the larger Estuary General Restricted Fishery, which is managed by the NSW state government using input controls, notably an array of complex spatial and temporal fishing closures, gear restrictions including minimum and maximum mesh sizes and lengths of nets. Minimum legal length (MLL) restrictions apply to several species of fish. Boats used in the fishery must be < 6 m in length.

Despite the importance of the estuarine fishery to many small coastal towns in NSW, there has been an ever-growing concern among resource interest groups over bycatch and discarding in these fisheries – primarily of undersize commercial and recreational species - with many calls to ban these methods of fishing. The conflicts and concerns expressed by the different user groups concerns have received much media interest. There is also much conflict among different resource user groups over the allocation of the fishing resources between commercial and recreational fishers. In 1998 a group of people took the government to court over allowing commercial fishers to access the resource without undergoing strict environmental assessments. In response to these growing concerns, observer-based surveys were initiated to collect data on the compositions and levels of discarding in the fishery. Industry self-reporting of bycatch and discard levels via logbooks is not used in the fishery. Pilot sampling on several boats was done in quick response to media stories and used to design the larger study.

Observer Program Overview:
Aim - Identify and quantify spatial and temporal variations in the retained and discarded catches taken in estuarine commercial gillnet and beach-seine gears.

Program management – The observer programs were completely managed by scientists at NSW Fisheries; this included responsibility for the design, deployment and management of observers, management and analyses of data, compilation of reports and extension of results and industry liaison. NSW Fisheries employed all observers and The Fisheries Research and Development Corporation (Australian Federal Government) partnered the funding for each program, which cost approximately US$100,000 for each gear type.

Sampling Design & Methods – Sampling of each gear type was done over 12 months, with observer deployment stratified temporally across fishing seasons and spatially across several estuaries in different geographic regions. Observer coverage accounted for between 5 and 25% of reported fishing effort (days fished) depending on the estuary and gear type. Centrally based scientific staff did most sampling, with some regional-based observers employed to cover some estuaries. Observers did not do any formal training or course, but were trained in general procedures, behaviors etc by scientific staff. Industry participation in the observer program was voluntary.

Observers collected data on total numbers and total weights of each discarded and retained species. Entire gillnet catches were usually sampled as were shrimp seine catches, whereas most beach-seine catches required sub-sampling. The lengths of some important species were also collected along with operational data concerning the fishing gear and place of operation.

Logistic Constraints - In doing these surveys we encountered experimental design and data concerns similar to most studies typically done on larger vessels at sea. There were, however, many unique logistical problems/constraints we had to overcome. These were primarily related to working on very small (<6 m) vessels in highly dynamic regional fisheries subject to much external pressure to change.

The problems – constraints encountered can be summarized as:

- Lack of space to carry an observer – which was true for the smallest (< 4m) of vessels - was often used by many fishers as an excuse not to take an observer.
- Lack of working space – enough room for the observer, but not sufficient space to store sampling gear such as fish boxes and buckets, measuring boards, scales to weigh fish, safety equipment etc – and not enough room to process extra sampling for otoliths and gonads. This made it necessary to take only the minimum gear on the boat, process the discards and do processing of the retained catch once back on shore.
- Insurance – since fishers are owner/operators and due to small size of boats and low capital invested in gear, no operators had insurance. Therefore, liability was a big issue with many fishers and this was used this as an excuse not to take observers. Even though all observers were government employees and covered by its insurance, many fishers did not believe this was sufficient.
- Safety – due to boat size, the observers were in very close proximity to the fishing gear, with greater chance of becoming entangled and also disrupting operation of gear.
- Increased costs to fishers – increased fuel costs due to carrying observer around (extra 50-120kg of weight per person and gear). We did not pay fishers as this would set a precedent.
- Inclement weather and dynamic nature of fishery. Because fishers are adept at switching from one fishing gear to another on a daily basis, it was extremely difficult to commit a fisher to a specific fishing trip. Thus much communication was required between observers and industry, and this often required observers to organize trips with several fishers just in case the first and second choice vessels did not fish on any particular day. Much time was wasted by actually missing designated fishing days. A further complication was that fishers do not always leave from a central point (no actual port, boat ramp, etc.) and observers often had to follow the fisher from leaving home to the departure point for the actual fishing trip. In southern NSW, fishers fished in several estuaries over consecutive days, the decision was weather and catch dependent. Thus organizing a departure point was often determined on the day, meaning observers had to be flexible in arrangements.
- Management & compliance interference – because the industry was being forced into change during the study, there was much angst against observers because they were the face of NSW Fisheries and generally the only face-to-face contact industry had with the department. This meant that observers had to be good communicators and be able to converse with fishers regarding management changes. Also specific compliance

programs in the areas where the observers were operating, caused several fishers to discontinue cooperating with the program.
- Type of observer – we used a mixture of local and distant (centrally-based fisheries research staff) as observers. Mixed response with local observers – positive responses included early good rapport and local knowledge, whereas negative included observers being viewed as too close with the fleet and fishers did not want a local to see where and how they fished. This was highly dependent on the region, the fishers, and the actual observer.

Some contingencies we used to overcome some of these problems included:
- Use of alternate sampling platform. This included use of fisheries vessels which were used to follow commercial fishers, observe their operations, approach upon retrieval of gear and use the research vessel as the platform for sampling the catch. This increased costs due to legal requirement for two persons to be in the research vessel.
- Processing beach-seine samples in water. Because most beach-seine catches are generally sorted directly from the net in waist-deep water, with the discards being allowed to swim out of the net, the observers were required to work in the water. After sub-sampling catches, we held discards in cages in waist-deep water and processed the catch in-situ. This allowed the discards not to undergo extra stress etc due to observer handling and thus reduced discard mortality. Discard mortality was assessed as part of the study. Observers were often required to spend up to 5 hours wading in water processing samples. This generated some safety issues with winter (cold) and summer (sun exposure) being significant (not to mention sharks and crocodiles!!).

The observer program identified the spatial and temporal variabilities in the characteristics of the retained and discarded catches for each gear type. The data collected are being used to help develop alternative fishing gears and practices and to change management arrangements in the estuary finfish fishery. The data obtained also provide a baseline for future monitoring and assessments of catches in these fisheries. In doing this study we learnt that it is imperative to keep up a good dialogue with industry, be honest what the program is about and potential management changes it may lead to. It is best to encourage industry to take some ownership, understand the science used and be proactive in how things need to be changed in the future. Constant communication and feedback is essential to success.

## 4.3 Electronic Monitoring (EM) of British Columbia, Canada's Pacific Halibut Longline Fishery

**Presented by Howard McElderry, Archipelago Marine Research, Ltd. Canada**

Electronic monitoring was introduced into the British Columbia halibut longline fishery to document the bycatch. There are currently 214 permitted vessels active in the fishery that make about 1,000 trips in a season. Vessels range from less than 20 ft up to 79ft, with most being in the range 30 ft – 59 ft. Observers could be placed on some of the vessels, but the smaller boats are a problem. 30% of the fleet is less than 40 ft LOA. The standard questions asked when considering whether an observer can be placed on a vessel are:

- Is there bunk space?
- Is there a head on the boat?
- Is the safety equipment up to specification?

From other observer programs, such as the North Pacific Groundfish Observer Program, it has been recognized that a higher level of observer coverage may more accurately represent incidences of rare catch (Figure 2). Higher levels of coverage are needed for monitoring rare bycatch species such as some of the rockfish (Sebastes sp.). In addition, there is a high likelihood of observer bias with less than 100% of trips being covered. Using electronic monitoring it is possible to cover all vessels and reduce the potential monitoring cost by half[5]. As this observer program is partly paid for by the fleet, a cost cutting monitoring program acceptable to managers has a great deal of industry support.

A pilot project was set up in 2001 covering about 12 trips. The overall program objectives were to provide position monitoring and catch monitoring. The former was provided by GPS, hydraulic pressure and winch sensors. The latter was achieved through a digital recording of catch retrieval operations (Figure 3). A combination of cameras and lens settings were used to provide detailed imagery of catch species as it came aboard. The monitoring system was designed for autonomous operations and tamper-proof.

In 2002 the project was expanded with a target coverage of 10% of the halibut fishery (~1,600 sets or ~850 vessel days at sea), and included the simultaneous deployment of observers and EM systems. The specific objectives[6] of the expanded pilot study were:

- Evaluating fleet suitability and overall system reliability.
- Comparing Observer and EM data.
- Comparing costs, benefits and operational issues associated with EM and observer methods

In contrast to an observer being on a vessel for 24 hours, the video monitoring system can reduce the time needed to analyze the catch. The average line retrieval (haulback) time was 21% of vessel time and analysis of the video is 70-80% of real time.

Catch estimates from EM during the pilot project were within 2% of observer estimates. The performance of the EM system in species recognition[7] was also evaluated. This is summarized

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[5] The cost of an electronic unit is $6K, but there is an additional labor and analysis component. The estimated overall costs were Can$212 per vessel per day for electronic monitoring and Can$470 per day (Can$330 for the industry and Can$140 for the Government) for observers.
[6] The full report is available at the Department of Fisheries, Canadian Science Advisory Secretariat website: http://www.dfo-mpo.gc.ca/CSAS/Csas/English/Research_Years/2003/2003_042_E.htm.
[7] In this context, "species recognition" is the identification of species by human observers from digital images taken during a fishing trip viewed on shore after downloading a the end of a trip based on recognition of species in the catch, rather then the automatic recognition of species based solely on the digital processing of the images.

in Table 3. In addition, electronic monitoring was found to accurately monitor depth, time, area, utilization and hook count. Regarding the reliability of the system, during the pilot phase, approximately 66% of the trips were successfully monitored. Such failed monitoring attempts will decline with improvements to program operational procedures, improvements to EM system design, and greater fleet familiarity of EM system requirements. The British Columbia crab fishery has had compulsory EM since 1999 and out of a total of 55,000 hours of operation in 2002, there were 105 hours of down time (2%).

A summary comparison of the pros and cons of EM versus observer programs is provided in Table 4 (data quality issues) and Table 5 (programmatic issues). The next steps in the development of the EM program for the halibut fishery involve:

- Further EM Species ID (trips with paired EM and observer)
- Further EM and electronic fishing log testing (video corroboration)
- Integrated EM – observer program, and dockside monitoring program

**Table 3 EM species recognition capability, Archipelago Marine Research Ltd.**

| Performance | Proportion of the catch and number of species |
|---|---|
| Excellent (<5% mistakes) | 92% of catch; 8 species |
| Good (<10% mistakes) | 97% of catch; 13 species |
| Poor (>10% mistakes) | 3% of catch; 12 species |
| Unknown | 0.6% of catch; 23 species |

**Table 4 Comparison of EM with observer programs: Data Quality Issues (Archipelago Marine Research Ltd.)**

| Data Quality Issue | EM | Observers |
|---|---|---|
| Fishing Location | +++ | ++ |
| Fishing Depth | ++ | +++ |
| Time/Date of Fishing | +++ | ++ |
| Number of Hooks/Traps | +++ | ++ |
| Catch - Pieces | +++ | ++ |
| Catch - Disposition | +++ | +++ |
| Species Recognition | ++ | +++ |
| Catch - Species Category | +++ | +++ |
| Catch - Weight | - | +++ |

**Table 5 Comparison of EM with observer programs: Programmatic Issues (Archipelago Marine Research Ltd.)**

| Program Issues | EM | Observers |
|---|---|---|
| Technological Complexity | Higher | lower |
| Versatility | Lower | higher |
| Sampling Complexity | Lower | higher |
| 24/7 Coverage capability | Higher | lower |
| Providing believable data | Lower | higher |
| Intrusiveness | Lower | higher |
| Cost | Lower | higher |
| Industry "Buy In" | Higher | lower |
| Industry Involvement | Higher | lower |

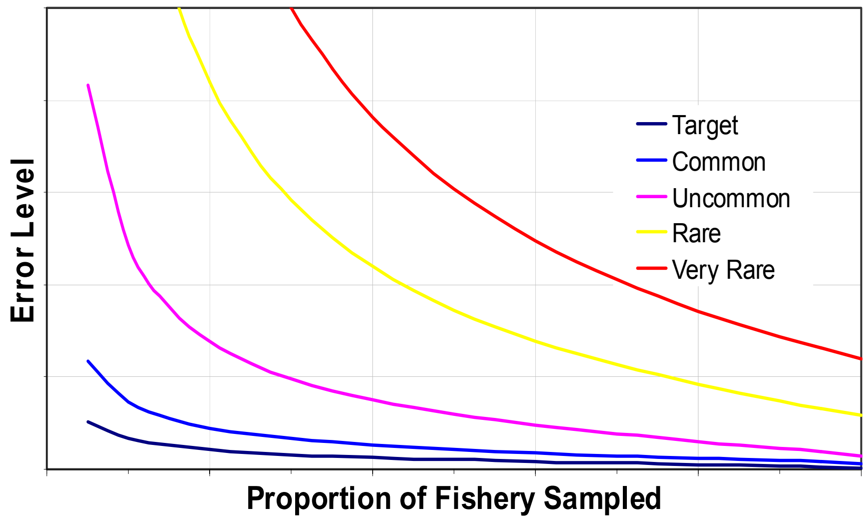


**Figure 2** **Species Occurrence Patterns and Fishery Sampling Levels, Archipelago Marine Research Ltd.**

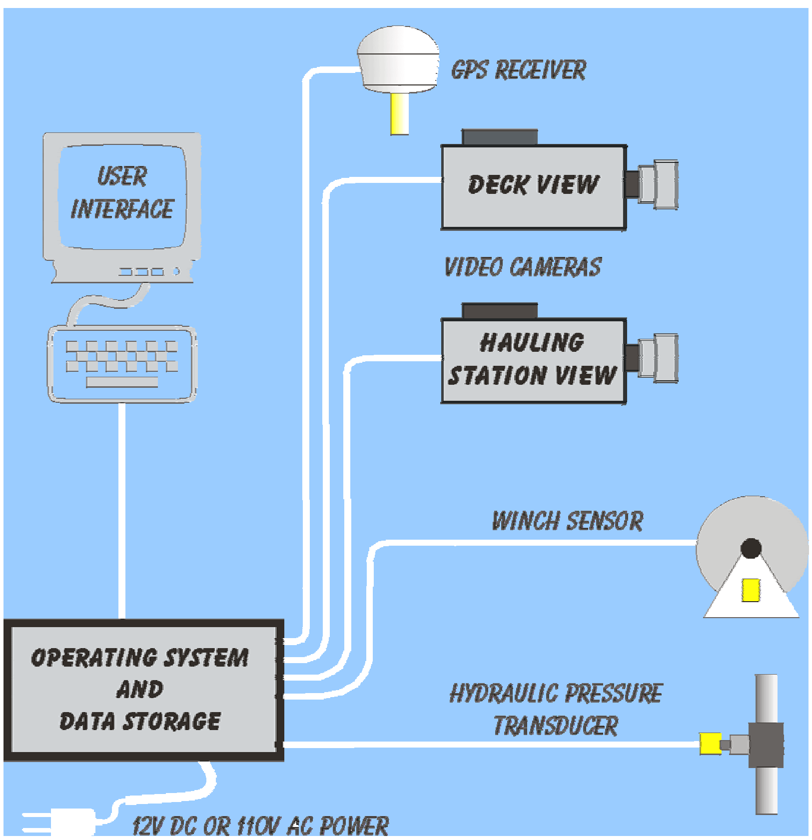


**Figure 3** **Schematic of a typical electronic monitoring (EM) setup, Archipelago Marine Research Ltd.**

## 5 BIBLIOGRAPHY

USCG (United States Coast Guard) 2001. Federal Requirements for Commercial Industry Vessels. Pamphlet published by Coast Guard Headquarters Commercial Fishing Safety (G-MOC-3) Division.

United States Code of Federal Regulations http://www.access.gpo.gov/cgi-bin/cfrassemble.cgi?title=200246
Title 46 – Shipping. This is the register title containing regulations on vessel categories and safety requirements that observer program regulations reference (see footnote 1).

Manly, B.F.J., A. Van Atten, and C. Nations, Incidental Catch of Marine Mammals and Birds in the Kodiak Island Set Gillnet Fishery in 2002, 2003. In review.

NOAA Fisheries Alaska Marine Mammal Observer Program
http://www.fakr.noaa.gov/protectedresources/observers/mmop.htm
Website highlighting the AMMOP.
http://www.fakr.noaa.gov/protectedresources/observers/2003delay.htm contains some results of the first year of coverage.

## 6 OTHER SOURCES OF INFORMATION

NOAA Fisheries National Observer Program: http://www.st.nmfs.gov/st1/nop/nop_regional.html
Information on observer programs around the US.

NOAA Small Boat Program: http://www.sbp.noaa.gov/
Information on small boat safety and multiple links for marine safety and marine safety issues.

United States Coast Guard, Commercial Fishing Safety (G-MOC-3)
http://www.uscg.mil/hq/g-m/cfvs/index.htm
The main HQ office for Marine Safety in the USCG.

United States Coast Guard Districts http://www.uscg.mil/units.html :
The root webpage to get to the district commercial vessels operate in to get contact and region specific USCG information.

United States Coast Guard http://get.to/thefishingreport
"Living to Fishing, Dying to Fish" report link.

United States Coast Guard Auxiliary http://www.cgaux.org/cgauxweb/classes/master.shtml
Listing of USCG Auxiliary boating courses offered across the nation.

International Maritime Organization, Torremolino Protocol http://www.imo.org/home.asp :1977. Updated in 1993, international protocol on fishing vessel safety.

National Research Council, Fishing Vessel Safety http://www.nap.edu/books/0309043794/html/: 1991. NRC publication on a national program for fishing vessel safety.