

**Morro Bay/Port San Luis Exempted Fishing Permit Electronic Monitoring Pilot Project  
Progress Report for the Pacific Fisheries Management Council**

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**1. Introduction** – This pilot Electronic Monitoring (EM) project is utilizing the technology of an EM-based video monitoring system onboard commercial fishing vessels that records video and sensor data and is testing both the components of this EM-based system and compliance from captain logbooks for accuracy in reporting of fishing activities and overall catch accountability. The goals of this pilot project are to determine if this EM technology can accurately capture and record fishing activity and examine whether or not captains can maintain accurate logbooks to increase individual compliance. These two data components will then be compared to human observer data collected using WCGOP protocols to verify the level of accuracy and a final report will be given at the April 2011 PFMC meeting.

Between April 6 and September 30, 2010, 110 fishing trips have taken place under the EFP. The EM pilot project commenced after July 1, 2010, and EM systems were installed aboard 6 commercial fishing vessels shortly thereafter. In addition to implementing this pilot project for the EFP in July 2010, locally based field services were established to help assist with technical support and aide in reviewing video data which resulted in work for six local staff, of which two were newly established positions as a result of this project. This new development serves as an indication that locally based field and technical services can be developed to help support the development of this technology and project and serve to be a cost effective means to reduce the overall costs for running this project.

**1.1. Project Context of TNC EFP** – The Nature Conservancy (TNC) received an Exempted Fishing Permit (EFP) from the National Marine Fisheries Service (NMFS) that provides the authority and exemptions from the regulations governing federal limited entry trawl permits (LEPs) under which this project operates. Specifically, this EFP is testing whether establishing a cooperatively managed, Community Fishing Association (CFA) that employs commercial trawl permits to use longline, trap, pot, and hook-and-line gear off the central California coast, under shared aggregate catch limits for target and bycatch species, can provide several important economic, social and environmental performance benefits.

TNC has formed partnerships with individual fishermen, fishing organizations, fishing communities, conservation organizations, and governmental agencies. The 2010 EFP project is the third consecutive year this project, which has licensed or leased six TNC-owned federal limited entry trawl permits (LEPs) to up to six local fishermen who have agreed to utilize the

fishing privileges under a community based fishing association (CBFA) that are subject to several constraints.

**1.2. Background Information of IFQ for Trawl Sector** – Many fishing port communities along the US Pacific West Coast have experienced a dramatic reduction in landings and an erosion of fishery infrastructure (processors, buyers, related services, boats, physical infrastructure, etc.) throughout the 1990s and 2000s as a result of increasing fishery regulations and stricter catch limits aimed at rebuilding overfished species populations. The migration and reduction of fishery infrastructure for port communities in central California coupled with increasing restraints from fishery regulations led to the decline of the economic viability of the traditional bottom trawling sector for this region. As a result the west coast trawl sector began to see consolidation due to participants either moving their operations to regions with better infrastructure, lower associated business costs, or participants who decided to sell their permits during the federally supported industry buy-out program.

The Pacific Fishery Management Council (PFMC) is currently in the process of transitioning the trawl sector of the groundfish fishery to an Individual Transferable Quota (ITQ) management system in response to many of the challenges and obstacles that this sector of the fishery has faced over the past two decades. From a large scale perspective, the ITQ has been designed to provide solutions to address many of the interrelated economic and environmental problems that have been plaguing this fishery. Although several components of this ITQ system have been designed to offer solutions for many of the larger scale coast-wide problems, concerns have been expressed by representatives from smaller scale fishing communities that an ITQ structure could potentially cause declines for these regions by displacing small-scale harvesting operations, disrupt coastal processing, escalate entry costs, and lessen fishing activity in ports that were historically reliant on the groundfish fishery. Chief among these is the expected cost of 100% human observer coverage and the potential impacts of that cost on small scale operations and gear switched vessels in particular...

**1.3 Reason to Conduct a Pilot EM Project** – As part of the terms and conditions of the EFP, and with the transition to an IFQ fishery, all fishing trips must carry a human observer onboard to record fishing catch and effort information. TNC has funded observers for this EFP since 2008. Upon implementation of the IFQ, which is slated for January 1, 2011, NMFS has set aside appropriation funds to cover 90% of the costs for observer coverage during the first year of transition. In year 2, the subsidy is expected to drop to 50% and in year 3 it is expected to drop to 25%, after which monitoring costs will be shifted entirely to the industry.

The National Marine Fisheries Service (NMFS) and Archipelago Marine Research Ltd. (“Archipelago”) carried out a pilot study in 2008 testing a technology based monitoring option for this fishery using video based electronic monitoring (EM). The study results showed a lot of promise and TNC is continuing to test EM, with the aim of developing a lower cost alternative to 100% human-based observer monitoring to ease the financial burden on the fishing industry. In

order to accomplish this goal it will require extensive testing of various components of the EM system itself and ensuring that fishermen keep accurate logbooks and communicate properly with EM technical support staff to report problems in a timely and efficient manner. Successful completion of these steps will be very critical towards developing an audit system in which video reviewers will only have to review a portion of the data to make EM cost effective.

Given the high costs associated with 100% human observer coverage and the potential of this cost to drive smaller scale fishing operations out of the fishery, it is crucial that the fishery explore the potential use of this or similar technologies to achieve catch accounting requirements and/or help supplement some level of observer coverage lower than 100% to make it more economically viable for smaller scale fisheries to continue to operate. Similarly it is also important to have the components for any EM system have a high degree of accuracy for catch accountability and be applicable to develop an appropriate system that is relevant for any fishery. The ultimate responsibility will be required by fishermen in that they must keep accurate logbooks and report any technical issues that may arise in a timely fashion to make sure those EM systems are running smoothly and accurately recording fishing events.

**1.4. Study Objectives** – The overall goal of this EM pilot project is to test the feasibility of a video-based electronic monitoring system for vessels that are fishing with fixed gear in the EFP. Specific objectives of the project are as follows:

- Expand on the scope of the original study that was conducted in 2008 to include a longer time frame of 6 months with more vessels involved;
- Expand on earlier 2008 comparisons between EM and observer monitoring results with more data, broader species coverage, and a specific focus on horizontal longline and pot gear;
- Work to develop an audit process comparing fishermen logbooks and EM data to provide timely, accurate, in-season catch data; and,
- Develop locally based project support to assist in field and data analysis services.

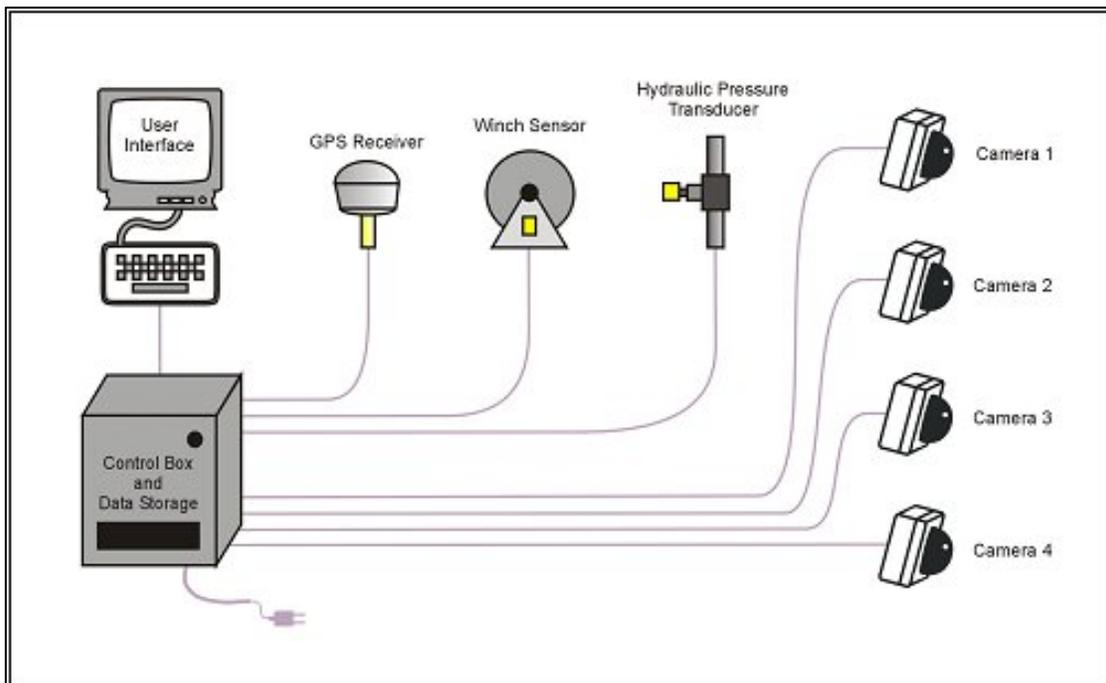
In addition to these overall goals it is important to highlight the core EM components that this pilot project is testing, which include things that would be relevant to the development of any future EM program for this fishery. These components include:

- Captain compliance with EM protocols (maintaining accurate logbooks, reporting technical issues to EM support staff in a timely manner, complying with full retention of rockfish and other overfished species, etc.);
- Cameras ability to determine species to the lowest possible taxonomic level; and,
- Timely data collection from vessels and monthly downloading of EM data by support staff.

This pilot project is testing these key functions of the EM system for this fishery which will result in data and information that can be instrumental for future efforts to develop an EM system.

**2. Project Methodology** – The electronic monitoring (EM) systems being used in this study consist of a control box, a suite of sensors that may include a GPS, hydraulic pressure transducer and winch rotation sensor and up to four waterproof dome style closed circuit television (CCTV) cameras (Figure 1). The control boxes are configured to continuously record sensor data, monitor performance and control imagery recording according to programmed specifications, as well as provide continuous feedback on system operations through a user interface. The sensors provide information about when and where fishing activity takes place and allows the cameras to start recording the catch handling activity taking place on deck.

Each EM system is capable of receiving video inputs from up to four CCTV cameras at selectable frame rates (i.e., images per second), ranging from 1 to 30 fps (motion picture quality). Using a frame rate of 5 fps the data storage requirement is approximately 60–100 MB per camera per hour, equating to a system capacity of around 80 days of continuous recording when using three cameras and a 500 GB hard drive.



**Figure 1.** Schematic diagram of the electronic monitoring system, which can record video data from up to four cameras per vessel.

**2.1. Field Operations** -Six boats are involved in this study: four longline boats and two pot trap boats. Having EM systems installed allows captains the opportunity to go fishing when it is convenient for them and not have to be dependent on the scheduling of others. For easier

comparisons between EM and fishing log data, participating captains have agreed to use slightly modified fishing logs to record catch information. The data collection component of the study began in the mid July 2010 and is scheduled to continue through the end of December 2010. An Archipelago senior EM technician installed the EM systems on all six participating vessels and trained locally subcontracted staff from Tenera Environmental Ltd. in San Luis Obispo, CA, to carry on EM service technician duties throughout the remainder of the project. The EM service technician's responsibilities include data retrieval every month, archiving and shipping of all EM data and troubleshooting EM systems at the dock. EM service technicians are on call to attend service events and contact senior staff at Archipelago if any system problems arose.

Service events so far have been limited to a camera failure and power supply issues. On one of the longline boats, two cameras had been mounted on a swing arm mount to properly view the fish as they passed the roller. When the swing arm was folded in one direction, it rubbed against the roof of the wheelhouse and compromised the seal on the camera. This was noticed and fixed at the next download and the second camera on the mount was fortunately in a good enough position to gather the needed data on fishing operations. On a different longline boat, there were problems initially with fluctuations in the power supply. As this was an older boat, the technicians and the boat captain worked together to upgrade some of the wiring and the system performed normally afterwards. Strengthening feedback to captains on data quality is an important part of the process.

**3. EM Data Interpretation and Analysis** – Staff at Tenera Environmental Ltd. and Archipelago Marine Research Ltd. both interpreted the sensor and video data gathered during this project. Data interpretation protocols were designed and communicated to the data technicians involved in the study before any of the data were processed and were based on the study's objectives, project methodology talks during the project planning stage, and experience accumulated from similar studies carried out in the past. The data technicians involved in data interpretation were also asked to record relevant feedback into a database to aid in data analysis.

EM sensor data interpretation is being facilitated using EM Interpret, proprietary software created by Archipelago for this purpose. Vessel speed and hydraulic pressure often correlate uniquely for various activities such as transit, setting, and hauling. The spatial plot provided a perspective on the various activities in relation to one another and was useful to help associate specific setting and hauling events. Setting and hauling events were matched to each other by interpreting physical proximity and timing. When displayed in this manner, the analyst reviewed the trip, interpreted vessel activity, and made annotations in the sensor record for haul and setting events. Haul start and end times from sensor data interpretation provided an initial reference for accessing image data.

**3.1. Data Presently Collected** - Data for the first month of the project includes more than one trip for every boat in the study. Most trips are very complete except for a large gap in Trip 2 for the Dorado (due to the camera failure) and the Janus which had lots of gaps on the first 4 trips

(due to the power supply problems) but in both cases the EM systems have been restored to fully operational status. Sensor data collection has been robust on all the participating boats since we have not seen issues with GPS, drum, or pressure sensors that have resulted in difficulties interpreting fishing activity.

**Table 1.** Data collected during the first month (July) of the study.

| Vessel Name    | Vessel ID | Gear type | Trips | Hauls | Comments   |
|----------------|-----------|-----------|-------|-------|--|
| Dorado         | Vessel A  | Longline  | 5     | 11    |  |
| Janus          | Vessel B  | Longline  | 5     | 4     | Only 3 trips have fishing data.<br>2 of the 4 hauls incomplete |
| Morning Light  | Vessel C  | Longline  | 2     | 11    |  |
| Nikki J        | Vessel D  | Longline  | 4     | 10    |  |
| Moriah Lee     | Vessel E  | Trap      | 4     | 3     |  |
| Salmon Stalker | Vessel F  | Trap      | 2     | 28    |  |

**4. Accomplishments to Date** – Data have been downloaded from each of the vessels on a monthly basis, resulting in a total of three complete cycles of data that have been collected through the end of September. One of these cycles has been completely analyzed and staff is currently working on the second cycle. The cameras on board the vessels have been functioning properly and are able to identify and count fish from each of the fishing events. Video reviewers have been able to identify fish species to the lowest possible taxonomic level where footage allowed.

In addition to the amount of data collected for the project to date thus far, locally based field services were established to help assist in data collection and analysis efforts and build local infrastructure to help support the development of this project. Archipelago subcontracted with Tenera Environmental Inc., based in San Luis Obispo, to provide locally based field services for this pilot project. The reasons for establishing locally-based services, include the following: improving the timeliness of response, improving the overall quality of EM data collection, reducing overall project costs (as opposed to remotely based services), and establishing a local skill base that may help support future monitoring needs for this fishery. Training was lead by Archipelago staff and this resulted in the creation of work for six local positions at Tenera: two part time field technicians and four video reviewers (of the four video reviews, two were part time and two were newly hired full time positions).

**5. Next Steps** – Data will be collected for the remainder of this study until the end of December. During this time EM systems will be capturing all fishing activity and recording video and sensor data from these fishing events. This information will continue to be collected from each of the vessels on monthly intervals to ensure that operations run efficiently and to identify and solve any problems that may arise in a timely fashion. The data will be compiled and analyzed by Archipelago for a final report to the council for the April 2011 council meeting that will report on results from:

- Comprehensive comparison of fish counts for retained and discarded fish from all 3 data sets: observer, EM systems, and fishermen logbooks;
- Assessment of functionality of EM systems as a method of catch accountability;
- Performance of EM systems tested in this fishery;
- Assessment of locally based EM support technicians;
- Assessment of captain compliance in maintaining accurate logbooks for catch accountability measures and in reporting any technical issues to EM support staff in a timely and efficient manner;
- Developing methods and ways to allow for more timely in season comparisons that can be useful to both project managers and participating fishermen; and,
- Recommendations and next steps needed to continue further development of EM technology for this fishery.

**6. Issues and Challenges** – Due to the great uncertainty surrounding the financial viability of a small groundfish fleet paying for 100% human observer coverage, the EFP project proponents believe it is important to invest in and test alternative monitoring methods. A combination of improvements made to the EFP logbooks in 2009 coupled with not having observers share their information with fishermen created an appropriate setting in which to conduct this pilot project and continue to experiment and test whether EM is a feasible alternative to 100% human observers, or if it could help supplement some level of lower observer coverage.

The development of this pilot project will provide initial information on alternative EM methods for monitoring those trawl vessels who elect to utilize fixed gear through the gear switching components of the catch share program. Another important function of the pilot program has been to identify additional issues and challenges that need to be addressed in order to continue considering further development of this technology for this fishery. Some of the issues that have been identified thus far include:

- Improving the compliance and communication between fishermen and EM technical support to ensure smooth efficient operations;
- Have the components of any EM system be applicable to any fishery and have the ability to adapt to the ever changing needs and requirements for those fisheries;
- The importance of developing an audit based approach verification for vessel data to audit self reported fishermen logbooks and make EM cost effective;
- The importance of testing EM systems without onboard observers present to eliminate any potential bias by either the fishermen or observers- initially this could be done on low risk blackcod or thornyhead trips where these species are easily censured by EM and bycatch of sensitive rockfish species is negligible;
- Consensus among the proponents of any EM system have a clear target that is geared towards the monitoring needs for a particular fishery;

- Establish better communication lines and clearer communication between and among industry, regulatory agencies (NMFS, PFMC, CDFG, etc.), and non-profit organizations to secure the development of this technology for catch accountability and monitoring purposes; and,
- Encourage discussions with NMFS on parts of this fishery where observer coverage could be reduced and supplemented with EM technology.

Meeting these and other challenges will be necessary in order to fully develop and test EM technology's ability to provide a cost effective and reliable alternative to 100% human observers for vessels operating under the trawl IQ program. The development, assessment and potential application of EM technology for this fishery will require the full commitment and engagement of industry, managers and other partners. We look forward to continuing to provide the Council and others with the results of this pilot project as well as participating in the next phase of EM development and testing. We believe that working to develop and utilize technology to provide reliable catch accounting while reducing costs has significant potential to help maintain the diversity of the fleet and fishing communities under catch share management.

*For more information on implementation of this pilot Electronic Monitoring project or the Exempted Fishing Permit, please contact Steve Rienecke (805-771-9234, 805-602-6399, or srienecke@tnc.org) or Michael Bell (805-441-1460 or mbell@tnc.org) or any of the project partners listed on the 2010 EFP proposal.*