DRAFT Theme Session N – Technologies for Monitoring Fishing Effort and Observing Catch

Conveners: Bill Karp (USA) and Kjell Nedreaas (Norway)

The session consisted of 12 oral papers and 6 posters, prepared and presented by both scientists and managers. Each of these papers and posters fell into one or more of the following categories:

- VMS and related technologies (4 papers and 3 posters)
- Electronic monitoring with video cameras (2 papers)
- New technologies for monitoring and sampling (2 papers and 2 posters)
- Cooperative approaches (3 papers)
- Data management and integration (3 papers and 1 poster)

VMS (satellite based vessel monitoring systems) have been used to track fishing vessels since the early 1990s. This technology was developed primarily as a compliance monitoring tool but the scientific community has started to use VMS data in recent years. Researchers and managers have focused on developing techniques for characterizing fishing effort as well as monitoring fleet behaviour. O'Shea and Thompson (N:11) provided an excellent overview of the technology and its evolution as a compliance monitoring tool. Salthaug (N:06) and Zimmerman and Ulleweit (N:16) presented examples of approaches that integrate VMS and logbook data to better characterize fishing effort and fleet behaviour, and Salthaug and Johannessen (N:07) described a successful attempt to estimate age-1 abundance of North Sea sandeels using CPUE estimates derived by integrating VMS and landings data. However, Alfonso-Dias *et al.* (N:19) and Pinto *et al.* (N:20) described the most advanced computer application currently available for integrating VMS, logbook and/or landings data (see Figure 1). Lemoine *et al.* (N:02, presented by H. Doerner) demonstrated an innovative approach for obtaining high-resolution information on individual vessel movements in localized areas by combining data obtained from orbiting SAR satellite sensors (VDS or vessel detection system) with conventional VMS data. Through this approach it is possible to detect IUU-fishing vessels (i.e. those not transmitting VMS data), and it might also be possible to quantify the catch taken by these vessels. The discussion of this topic focused on possible enhancements to VMS (e.g. increased polling rates, ability to transmit data from hydraulic sensors in order to separate fishing activity from other activities, ability to transmit catch data) and on the need to reconcile differences in perspective among those responsible for compliance monitoring, fishery management, and research.

McElderry (N:14) provided an excellent overview of the use of video camera for monitoring fisheries. His examples included monitoring of vessels for compliance with discard restrictions, monitoring of a crab fishery for possible illegal fishing, and use of video, together with logbooks and landings reports to monitor groundfish fisheries off Western Canada (see Figure 2). Williamson et al (N:10) described the successful use of video cameras in support of observer sampling aboard a factory trawler. By monitoring a video display observers were able to track vessel operations and prepare for sampling efficiently. They were also able to monitor for possible illegal biasing of samples by the crew. Video (or electronic monitoring) systems are often integrated with other types of sensors to address specific science or compliance monitoring information needs. The technology can be used successfully to address certain types of information needs, but cannot yet be used for automatic species identification. Labour requirements for reviewing video record may be high, but random or directed (linked to fishing events) subsampling may improve cost-effectiveness.

Svellingen et al (N:03, presented by J-T Øvredal) described an application of advanced technologies for identifying fish on a conveyer-belt. This CatchMeter takes multiple still digital photographs of each fish under controlled lighting conditions. Multiple measurements of each image are extracted and the system is trained to recognize individual species. Information on dimensions (including length) are also extracted. Initial results from a prototype system are promising and further research and development are planned. Karp *et al.* (N:09) described development and evaluation of a system for automatic selection of random subsamples from trawl catches. This system relies on hardware and software modifications of the vessel's motion-compensated flowscale to select random samples and divert them to the sample processing area in the factory.

Several of the studies presented during this session relied on cooperation between researchers and the fishing industry. Of particular interest in this regard was the presentation by Nedreaas et al (N:05) which described the Norwegian reference fleet. This consists of several offshore fishing vessels (more recently supplemented by a number of coastal vessels). Personnel on these vessels are trained in scientific sampling and data collection techniques and the vessels report information on catch quantity and composition, and biological characteristics of the species caught, on a regular and frequent basis. Helle (N:17) used data from the reference fleet to improve the quality of the CPUE estimates used to track changes in the ling and tusk populations.

Many of the presenters noted the importance of data management and integration. Satellite technologies such as VDS and VMS and digital video imaging can generate very large quantities of data rapidly. It may be necessary to integrate this data with information collected by observers or port samplers, and also with data streams provided by physical sensors and other types of observations. Tremblay and Sullivan (N:04) described a comprehensive and ambitious national approach to this data management and integration problem that is now being implemented in Canada. Barkai (N:01) demonstrated a sophisticated and flexible electronic fishery data management system (Olfish) which facilitates management and storage of diverse and extensive data sets. Smith and Steingrund (N:15) described a process for evaluating data quality and resolving errors.

During the discussion, it was recognized that fishery-dependent information needs continue to grow and that the costs of conventional sampling by observers and port samplers may be prohibitive. However, many of the types of data collected by observers and port samplers cannot yet be collected automatically.

Tracking of individual vessels with VMS and other satellite technologies will likely become increasingly important and there is a need to improve the scientific benefits of VMS through integration with sensors and flexibility in sampling rates. VMS data may improve the quality and usability of CPUE time series for use as indices of stock abundance. Development as such data alone or in combination with fish distributions determined from fishery independent surveys can be used for improved characterization of fleet behaviour, which may also facilitate derivation of improved CPUE estimates. The potential for increased application of video was also apparent although the need for careful matching of objectives and sampling tools was emphasized. VMS and video data may be confidential in some countries and some of those present expressed frustration in trying to obtain access to this data for scientific purposes. The role of ICES in this arena may include evaluation of new and improved technologies and provision of guidance on appropriate use and interpretation of data.

Fishery-dependent data in general, and fishery-dependent data derived from electronic monitoring tools in particular, is of interest to scientists, managers, those involved in compliance monitoring, and members of the fishing industry. The needs of each of these groups may not always coincide, and ICES has an important role in encouraging communication among these groups and encouraging solutions that take into account these

differing needs. This is but one aspect of a broader field of interest which might be considered during an ICES Symposium on Collection and Interpretation of Fisheries Dependent Data. Theme session participants, therefore, supported a recommendation that this symposium take place in 2010.

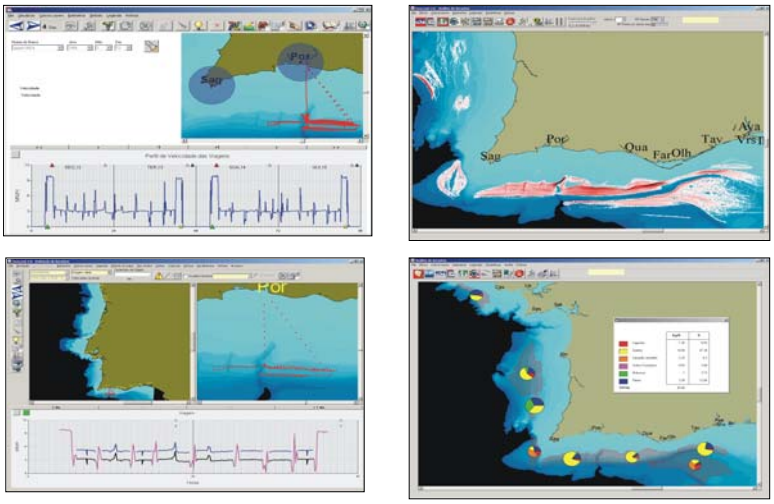

Figure 1. GeoCrust 2.0. A computer application for monitoring the Portuguese crustacean trawl fishery combining VMS, landings- and logbook data automatically and interactively (from Alfonso-Dias *et al.*, N:19)

Figure 2. Examples of still frames obtained from video recordings (from McElderry, N:14)