Feasibility of video monitoring seabird interactions on small domestic tuna longliners

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1. Introduction

The idea of using time lapse video monitoring equipment on board domestic tuna vessels was first discussed at a meeting between the Department of Conservation and pelagic longline fishers held in Tauranga in September of 1998. Small domestic vessels are sometimes unable to carry official observers without modification, re-survey, or displacing a member of the regular crew. The low observer coverage on this class of vessel has meant that full understanding of interactions between seabirds and vessels in this fishery has not been possible, and the true extent of incidental seabird mortality can not be accurately quantified. It was proposed that some data collected by observers could possibly be collected using time lapse video monitoring.

2. Technology available

The technology exists to create a system that will be able to cope with the extreme conditions that are experienced on a fishing vessel, and provide good quality, high resolution images in a convenient storage format.

2.1 MOUNTING OF THE CAMERA

The camera needs to be in a position that will allow the best view of the fishing operation without influencing or affecting it. Placement of video cameras on vessels will depend on the construction and layout of each individual vessel, but likely points for mounting would include positions on the mast or gantry region.

2.2 SALT BUILD-UP ON LENS

The lens can be kept free of salt build-up using a freshwater spray supply and wiper system. A video monitoring system is in place at Wellington Airport which similarly receives a great deal of wind-forced salt spray and uses this system to keep clean.

2.3 POWER SUPPLY

Many of the fishing vessels have generator sets that supply 230 V power for some appliances and lighting, but these are often unreliable, with an inherent risk of power surges and a high degree of cyclic variation. Video equipment power supply would therefore need to be buffered, and probably run off the vessels' more reliable 12/24 V system.

2.4 AUTOMATIC OPERATION OF CAMERA

The camera will need to automatically turn off and on, so that this task does not fall to the skipper or crew. The camera can be set up so that it only operates when the spool is in operation and could be triggered to turn on during either the set or the haul by synchronising it with the rotation of the spool in a given direction.

2.5 TAMPER PROOFING

The data collection and storage systems will need to be protected from deliberate or accidental tampering. Stainless steel casings and protective coverings are available for this purpose, and are successfully used in other surveillance and monitoring systems.

2.6 DATA STORAGE SYSTEM

Either an analogue or digital system could be used for data storage. Analogue systems, though readily available and relatively inexpensive, are limited by lower resolution, and with the basic VHS cassette tape as the unit of storage have a relatively low capacity for image storage. The frequency of tape replacements is unknown at this stage, but there could conceivably be several changes required in the space of a fishing year. Analogue storage systems are less flexible than their digital counterparts, as are the images themselves. For example, digital imaging systems are much easier to manipulate, and could conceivably be set up to automatically highlight and separate those frames with a higher likelihood of containing birds (i.e. by containing objects of a certain size, colour, etc.).

Furthermore, advances in digital recording technology have meant that it is now possible to store up to 60 Gb of data on a single, inexpensive, re-usable Digital Video format tape. What this means in real terms is that some 6.5 million high-resolution pictures could be stored on a single tape. At an average of 8 hours of recording at 1 image per second, this translates to some 225 days of coverage on a single tape. This time frame would probably represent close to a full year of fishing for a single vessel.

The technology is now available to achieve very high resolution using a digital video camera. The only real limitation is budget. High-resolution images could conceivably be used to study and assess seabird species abundance and behaviour, fish catch, bycatch, weather information and much more, dependent on the position of the camera and the field of view.

The use of analogue technology for the purpose of surveillance and monitoring is declining as digital technology takes its place. Research and development is almost exclusively focused on the advancement of a relatively young digital technology rather than on analogue systems. As a result, an analogue system and the technology that it employs is likely to be nearing the end of its technological lifespan, and may be rapidly made obsolete.

3. Costing for the project

Quotes were requested from two security firms and a marine electronics broker. Only the two security firms were able to give quotes on pricing for both analogue and digital systems. Costs ranged from around $NZ12,000 for a high-resolution colour analogue system, up to $NZ20,000 for a high-specification (at time of writing) digital system. These prices may vary depending on equipment quality and function, but represent the cost of the purchase and installation of a video monitoring system on each vessel. It should also be noted that as advances in digital technology continue, it is likely that prices for this or similar equipment will drop.

An ongoing cost would be incurred in reviewing information collected on tapes. A single day of footage, although shot at a speed of one frame per second over 5-8 hours, would still be a time-consuming task if every frame had to be examined. Again, if digital images were used, a system could be developed to automatically highlight those frames that contain particular colour or shape cues. A system such as this would minimise unnecessary time spent monitoring empty frames. Obviously, comprehensive tests would need to be carried out to ensure that any system employed picked up any cues accurately.

Replacement of the recording media, such as digital videotapes, would also be an ongoing cost, as would the standard maintenance and upkeep of video surveillance equipment.

4. Use of data

There will need to be agreement between stakeholders and DOC on how data collected using this technology are interpreted.

Issues surrounding ownership and subsequent release of the information obtained using this method will need to be addressed. According to the Privacy Act (1993), DOC would need to ensure that all reasonable efforts are made to ensure the security of the information and safeguard it against loss, modification, or disclosure except with the authority of the Department.

5. Conclusion

The technology is available to provide very high quality images that could potentially be used to record setting or hauling data on domestic fishing vessels. Analogue systems, although relatively inexpensive, are subject to severe

limitations in storage capacity, image quality, and subsequent interpretation of the images collected.

The use of a video monitoring system would allow coverage of small vessels, or vessels that are not surveyed to allow an extra person without displacing a member of the crew. The use of this system would, therefore, have minimal effect on the day-to-day fishing operation. Furthermore, coverage would not be restricted by the 12-hour working day maximum that observers are subject to. A camera could also be installed on a single vessel for a long period, which would mean that there is a greater likelihood that information collected on these smaller vessels will be accurate.

There needs to be agreement on how data collected are interpreted, and controls to ensure the integrity and security of the data. The wider management issues of the perception of fishers to the concept and the potential to collect other kinds of data using a video monitoring system will also need to be considered.

While costs of individual units seems high, these costs will no doubt decline as technology progresses. There may also be some savings through the bulk purchase of some components. Costs should also be considered against the cost of using observers, particuarly in light of the shore time that will need to be covered between trips. Video monitoring may be the only option for coverage of small vessels, unless vessels are resurveyed to carry an official observer.

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