Report

Workshop on Remote Electronic Monitoring with Regards to Bycatch of Small Cetaceans

Steering Group: Meike Scheidat & Sara Königson

1. Short Summary

The ASCOBANS North Sea Group and the ICES Working Group on Bycatch of Protected Species (WGBYC), have both highlighted gaps in knowledge regarding bycatch estimates for small cetaceans in European waters. Reliable bycatch estimates are needed to determine if current bycatch levels of small cetaceans in fisheries conducted in the ASCOBANS area constitute a conservation risk. Members of the ASCOBANS North Sea Steering Group suggested that Remote Electronic Monitoring (REM) could also be a cost-efficient and reliable way to monitor bycatch on fishing vessels, in particular where there are practical limitations to using dedicated at-sea observers on board.

The aim of this workshop was to discuss the current status, potential shortcomings and new developments of remote electronic monitoring (REM) techniques that could be used to help improve cetacean bycatch monitoring. The workshop was attended by 26 participants from Denmark, Finland, France, Germany, the Netherlands, Poland, Sweden, and the United Kingdom. Seven presentations were given on topics including stakeholder involvement, statistical survey design and data collection and analysis. A list of participants and presentation abstracts are provided at the end of this document.

We would like to thank the ASCOBANS Secretariat and the Dutch Ministry for Economic Affairs (EZ) for their invaluable help in organizing the workshop as well as Marije Siemensma and Eunice Pinn for acting as rapporteurs.

One of the main conclusions of the workshop was that from a technical perspective REM could be used successfully to monitor small cetacean bycatch, but decisions whether REM was the best and most cost-effective option would depend on the specific situation. This was influenced by the type of monitoring being conducted, the fishing fleet that was targeted as well as personnel and technical costs which could vary greatly between countries. If a large proportion of the effort in a certain fleet was to be monitored, new solutions might have to be found with regards to lowering the costs for the REM systems and developing a more flexible system that, for example, could be used by multiple boats. In some cases it might be useful to apply different methods simultaneously, such as observers and REM systems, as the data collected could be of complementary value. It was clear that in some cases for very small vessels (without a wheelhouse or a hard structure for mounting) the current REM systems were not suitable right away and the boats needed modification to adjust for cameras on board or alternative REM systems might need to be developed.

There were discussions about including monitoring of small cetaceans bycatch in the EU Data Collection Framework (DCF). Our conclusion was that the DCF, in its current form, was not adequate for monitoring small cetacean bycatch, mainly because most sampling effort (fleet, gear-type, area) under the DCF was currently targeted at fisheries (mainly demersal trawls) where small cetacean bycatch was not likely to be a major concern. In addition DCF sampling protocols were not designed to quantify the bycatch of large non-commercial species, and in particular those that sometimes fell out or were removed from the net outside the vessel. If monitoring bycatch of cetaceans was to be included in the DCF, these shortcomings needed to be addressed. REM techniques and other additional techniques could be a way forward in collecting cetacean bycatch data along with data on commercial catches.

When considering a new REM project, a number of key points need to be considered. These include stakeholder involvement, sampling design, data collection and analysis as well as the use of the most appropriate technique for addressing the questions being asked. In this report we have summarized the outcomes of the discussions that took place during the workshop in the form of a list of best practical advice. This report is a first step and cannot cover this broad and fast changing field in all aspects. Nevertheless we hope that it will provide a useful reference point for when planning REM projects to monitor small cetacean bycatch and also highlight areas were more work is needed to improve the current approaches.

2. Best Practice Advice

1. Stakeholder involvement

When starting up your REM project, involve the fishing industry in the process as early as possible and maintain close communication throughout the project; make the fishing industry a partner in order to help solve a common problem and try to identify how participation in the REM project can be of value to industry itself.

Good relations

- The REM data to be collected are fishery dependent, which requires reliable links with the industry.
- There is a need to have open conversations including technique, incitements, data collection, confidentiality and more before a project can move forward. It needs to be recognized that different stakeholders have different expectations and perspectives. Communication with potential fisheries partners and the organizations representing the fisheries involved is required from the very beginning.
- Initially, try to meet potential participants informally beforehand, for example on board their boat; at a later stage have formal meeting settings at the right time and use a step-by-step approach to develop solutions for problems together.
- Keep a close contact between all project members throughout the project.
- Try to involve fishermen who are not initially willing to participate. This will require a longer lead-in process but can be helped by asking participating fishermen to share their own experiences of the project.
- Respect and take into account the expertise and knowledge of fishermen involved.

Motivation

- Participation of fishermen in an REM project can be voluntary or due to a need to comply with current or future regulations. Incentives can be helpful to develop a good relationship and encourage participation, but may not always be needed.
- Stakeholder involvement can be improved if fishermen understand that their participation can help them in the long term by providing accurate data to develop appropriate science-based regulations. It is advisable to treat the fishermen as partners (cooperation vs stakeholders) in solving a (common) problem together.
- Investigate how participating fishermen can use an REM project to better market their products (e.g. Marine Stewardship Council).

Working together

- Develop formal agreements with all partners, clearly describing individual duties and obligations to ensure that the REM system works appropriately. If necessary, agree on when the video data will be discarded and how the data will be disseminated.
- When asking for additional data collection from the fishermen themselves, respect their work schedules and workloads. Once protocols are established, change them only if absolutely necessary.
- Placement of cameras on the vessels needs to be done in close agreement with fishermen to ensure that their privacy is guaranteed (but wherever possible without compromising data quality).
- It is important to provide feedback to fishermen on what data are collected, how their data are analyzed and how they are used to support management decisions. Provide clear positive messages when things are going well.
- Motivate fishermen to take any bycaught specimen to shore so the animals can be investigated through necropsies, while preventing as much as possible a situation which can lead to negative publicity. Involve other stakeholders (NGOs, general public) to make sure they support the fishermen in this undertaking and ensure that all appropriate licenses are provided and kept up to date.

2. Sampling design

Ensure that your sampling design is adequate to answer your research question. Take into account that you will have to plan and conduct your project with a number of constraints regarding the selection of a sample of the fishing fleet and its representativeness of the overall fishing effort.

Statistical power:

- Ensure to develop a proper sampling design (e.g. power analysis) and select the most appropriate fishermen considering constraints such as available vessels, fishing periods, known bycatch rates or population estimates.
- Power analysis can be used to calculate how many days and what proportion of the REM footage you would need monitored to get a reliable and unbiased estimate (taking into account effort and density of cetaceans and that bycatch rates can be highly variable). All available sources of data on porpoise density and bycatch rates should be consulted, including published scientific reports of survey or telemetry data, pilot studies and/or interviews with fishermen or other vessel operators.
- Involve fisheries stakeholders in sampling design, this includes the selection of vessels, as participating fishers might be able to provide useful information not readily available from logbooks.
- If you are conducting DCF (i.e. discard) sampling using REM, the monitoring of Protected Endangered and Threatened species (PETs) should be included wherever possible. An assessment should be made of whether data is sufficient to estimate cetacean bycatch adequately (see data collection section).
- One of the main shortcomings of currently available data on fishing effort is that they do not always include information on soak time and net length. To estimate overall bycatch levels, only data that are available for the fleet as a whole and the selected vessels (e.g. fishing effort in days at sea) can be used.

Selection of vessels:

- Take into account the likely limitations on the number and types of vessels that can be used in an REM project, due to a number of different reasons (voluntary participation, opportunities for installation and de-installation). It is important to consider the spatial and temporal coverage of the fishing effort as well as the fishing gear used by the participating vessels. To some degree, past information from logbooks can help to provide an idea on how representative the selected fishing vessels are.
- In order to detect potential emerging issues, the coverage of the fleet should also include areas that have unknown but suspected bycatch.

3. Data collection

Installing REM systems on small fishing vessels has a number of logistical challenges that will require individual solutions. The collection of additional data on top of the REM footage can be very valuable and should be encouraged where possible.

Installation of REM cameras:

- Currently available REM systems ideally need a wheelhouse and a 12V or 24V power supply. To mount the cameras you will need hard structures, ideally high up and overlooking the deck.
- It is important to have at least one camera filming the point where the net leaves the water. It has been shown that porpoises (and other cetaceans) do fall out from the net at the surface and may be missed by the fishers.
- Try to ensure “fool-proof” positioning of cameras to avoid unintentional blockages or missed bycatch observations.
- Consider that the type of gear being used on a single vessel might change and, thus, camera placement might need to be adapted.

General logistical challenges:

- When planning your data collection, think about the constraints of location and resources (e.g. fishing communities can be based on remote islands etc.) and what this may mean in terms of installation of systems, maintenance and data retrieval.
- REM can be suitable for small vessels however the power supply for some (in particular small) fishing vessels might not be adequate to run an REM system in addition to the vessels own power requirements and hence might require adaptation. It is vital to investigate such needs prior to the project start, so that they can be adequately budgeted for.
- Even for small vessels REM systems can be installed if the support structure of the vessel is appropriate. If this is not the case, there are often possibilities to alter the vessel in a way to allow REM installation and operation.

Data retrieval:

- There are two different ways how collected data can be retrieved – either via hard disks that are collected from the vessel or via an electronic link that allows data to be uploaded. An upload might be more practical and cheaper, but can be problematic in areas where there is no good satellite connection.

Collection of additional data:

- If you are aiming at collecting any bycaught cetaceans, provide fishermen with permits to land carcasses if needed (e.g. CITES) and consider and address any potential legal as well as health and safety issues. Whilst not ideal, it should be recognized that it is not always feasible to take a bycaught animal onboard.
- If carcasses cannot be kept on board and landed, consider marking the bycaught animals (e.g. tags) if they are discarded at sea to enable assessment of potential recaptures and to investigate stranding patterns.
- Consider additional forms of data collection that would increase overall data quality/quantity, such as the use of RFDI (radio-frequency identification) tags to ensure collection of, for example, position of fishing gear and soak time.

4. Analysis

Current REM data analysis requires manual review of footage by observers. Good training of these observers and a quality control method are important aspects to be implemented.

Detection of bycatches:

- Make sure to include a training programme for the observers that review the REM footage and implement a way of assessing their competence.
- To quantify how many animals are missed during the review of the footage, consider a meta-analysis. This involves having a sub-sample of the dataset analyzed independently to quantify any errors during the analysis stage.
- Because of the relatively rare occurrence of cetacean bycatch, it is advisable to watch 100% of all collected footage that is suitable for analysis.

Additional data analyses:

- The data collected throughout the project could also be used (if agreed with all project partners) beyond the REM monitoring. For example, to provide a better measure of fishing effort such as net length and soak time, definition of high risk bycatch areas, and the collection of freshly bycaught animals for further study (genetics, diet, pathology etc.).
- During analysis it is important to also include the records from fishers on observed bycatch (that should be noted in the logbook) to investigate the effectiveness of the REM system and any possible discrepancies between crew observations and REM, which may bias estimates in one direction or the other.

5. Techniques

The current REM systems need to be adapted or new methods need to be developed to allow for adaptable, representative monitoring of bycatch on small fishing vessels. REM techniques in use include among other things cameras, recording devices, hard drives for storage and in some cases Wi-Fi modules for wireless transfers of data. These set-ups needs electricians when installing them. When it comes to data analysis, the developments of automated detection software for cetacean bycatch should be a priority.

General challenges:

- Major problems were encountered on smaller vessels, as their power supply was often not sufficient to run systems which lead to increased installation costs.
- Although there are promising developments underway for automatic detection of fish species using Image Recognition Software, for cetacean bycatch a number of challenges still exist. Among them, the camera placements to monitor the net leaving the water may vary greatly between vessels, making it difficult to have the same type of standardized footage as can be obtained when detecting fish on sorting belts or tables. Hence it would be useful to invest time and effort to develop a "cetacean algorithm" that would allow automatic detection of bycaught cetaceans. This could significantly reduce the time/cost of data analysis from REM systems.

Future improvements:

- Existing REM systems could be improved for cetacean monitoring, especially for small vessels. New developments should include:
  - REM systems at lower costs (including costs for maintenance, data retrieval, etc.), which would allow more vessels to be monitored;
  - systems adapted for smaller vessels that might not have a wheelhouse (and thus no guaranteed dry space) or no hard frame (to attach the cameras);
  - self-contained systems with their own power supplies that would run as long as possible, but could be swapped between vessels with no/low cost of installation and de-installation. This would mean that the systems could be used with more flexibility than is currently achieved;
  - Existing REM analysis software needs to be updated and improved to be more tailored for marine mammals, e.g. to more easily record net soak time.
  - Alternative methods should still be considered and investigated, either as stand-alone options or as a complementary method to REM. Alternative methods could include self-sampling, e.g. logbooks or technical tools such as specially developed APPs for mobile phones.

3. Presentations

Marije Siemensma

Title: Stakeholder involvement – A matter of perspective - Experiences from the Dutch REM project on harbour porpoise bycatch

IMARES Wageningen UR and Marine Science & Communication started a Remote Electronic Monitoring project in December 2012 to investigate bycatch of harbour porpoises by the Dutch gill net fishery targeting sole, sea bass, cod, turbot and brill. The project will continue until 2016 and includes the monitoring of 10 to 12 vessels. The project did face several challenges in terms of stakeholder involvement and the installation on board relatively small vessels but these were largely overcome. The project is funded by the Dutch Ministry of Economic Affairs.

Allen Kingston

Title: Stakeholder Involvement – Insights from the UK Bycatch Programme.

A monitoring and mitigation programme focusing on the bycatch of Protected, Endangered and Threatened (PET) species has been conducted in the UK since the mid 1990s. All the data collected are fishery-dependent so the programme relies heavily on maintaining good links with industry. In this short talk Mr Kingston provided a brief background to the programme and why it is required, explained the basic approach to working with industry and provided two examples from UK fisheries where close industry/science collaboration has led to significant reductions in cetacean bycatch rates.

Lotte Kindt-Larsen

Title: Experiences from Danish CCTV trials, problems and solutions

To investigate the potential of closed-circuit television cameras to document bycatch of marine mammals, six Danish commercial gillnetters (10 to15 m in length) operating under the Danish catch quota management system were equipped with REM systems. The REM systems provided video footage, time and position of all net hauls and bycatches of marine mammals.

Comparisons between REM results and fishers' logbooks showed that the REM system gave more reliable results, since fishers, in many cases, did not observe the bycatch while working on the deck because the bycatch had already dropped out of the net before coming on board. Furthermore, very high coverage percentages at low cost, compared to on-board observers, could be obtained with REM. Alternative means of conducting the video analysis were tested; they were, however, not found to be very efficient.

Grant Course

Title: Electronic Monitoring – Recent trials on the West Coast Scottish Inshore Fishing Fleet and Lessons Learned"

Seascope was recently involved in pilot projects that used EM systems to verify self-reported data on landings, discards and fishing effort, and to provide data for data-deficient shellfish stocks. This was the first time that this equipment had been used on creel vessels to gather this data. Mr Course provided an overview of the project and some information on lessons learned, interactions with protected species and some thoughts on how we would approach undertaking a long-term, large-scale cetacean bycatch monitoring programme.

Coby Needle

Title: Scottish applications of REM including automated image analysis

Mr Needle presented a brief overview of his experience of implementing and running a scientific REM discard estimation system since 2007, including an introduction to some recent (and ongoing) work with the University of East Anglia on automated image analysis. The focus was on the estimation of fish discards from commercial Scottish trawlers, but the methods would be transferable to the estimation of cetacean bycatch.

Brian Cowan

Title: From Installation to Analysis with Anchor Lab's BlackBox system

An introduction to Anchor Lab's BlackBox system, showing its potential to be used as part of a monitoring strategy for cetacean bycatch. The BlackBox system has been developed to be flexible and can be tailored to the specific requirements of individual fisheries. The benefits of automatic upload of captured video and sensor data to enable near real-time analysis capabilities were highlighted. Live remote access verified, controlled and configured the onboard hardware to ensure optimal data capture, and presenting potential future developments.

Bram Couperus

Title: Looking for a needle in a hay stack or a dolphin in a fish basket: Monitoring of Protected, Endangered and Threatened Species in the DCF

The monitoring of PETS (Protected, Endangered and Threatened Species) – including small cetaceans – should be combined with the sampling of other taxa. Given the rareness of bycatch events, it is unrealistic to send observers to sea without giving them additional tasks.

The most realistic option is to incorporate the monitoring of PETS in the Data Collection Framework (DCF) which is under review. The sampling schemes under the current DCF are not designed to sample incidental catches, although this will be implemented in the new DCF.

For the monitoring of small cetacean bycatch, this means a huge increase of the monitoring coverage. However, the monitoring effort needs to be shared with other species: fish and other PETS. In the daily practice, this means that the observer has to take account of when and where he/she looked. On a larger scale, fishery managers have to decide which metiers and areas need sampling/monitoring.

List of Participants

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Agenda

1. Introduction and Background
   - 1.1. Welcoming Remarks
   - 1.2. Aims of the Workshop

2. Background Presentations and discussion on working papers
   - 2.1. Stakeholder involvement

     Marije Siemensma, Title: Experiences from Danish CCTV, in particular stakeholder involvement

     Allen Kingston, Title: Stakeholder Involvement – Insights from the UK Bycatch Programme

     Discussion
   - 2.2. Case studies of REM use including Sampling Design, Data Collection and Analysis

     Lotte Kindt-Larsen, Title: Experiences from Danish CCTV Trials, Problems and Solutions

     Grant Course, Title: Electronic Monitoring – Recent Trials on the West Coast Scottish Inshore Fishing Fleet and Lessons Learned"

     Coby Needle, Title: Scottish Applications of REM including Automated Image Analysis

     Discussion
   - 2.3. Techniques

     Brian Cowan, Title: From Installation to Analysis with Anchor Lab's BlackBox System

     Discussion
   - 2.4. Challenges and experiences when including PETs in overall monitoring

     Bram Couperus, Title: Looking for a needle in a hay stack or a dolphin in a fish basket: Monitoring of Protected, Endangered and Threatened Species in the DCF

     Discussion

3. Conclusions and Best Practice recommendations
   - 3.1. Stakeholder involvement
   - 3.2. Sampling design
   - 3.3. Data collection
   - 3.4. Analysis
   - 3.5. Best practice summary

4. 16:30 Wrap-Up

Terms of Reference for an ASCOBANS Workshop on Remote Electronic Monitoring with Regards to Bycatch of Small Cetaceans

1) Background

The ASCOBANS North Sea Steering Group, as well as the ICES Working Group on Bycatch (WGBYC), have both highlighted a large gap in knowledge regarding bycatch estimates, and concluded in the 2014 report that current bycatch levels of harbour porpoise in the North Sea may exceed sustainable limits.

Members of the North Sea Steering Group suggested that Remote Electronic Monitoring (REM) could be a cost efficient and reliable way to monitor bycatch on fishing vessels, in particular where there are practical barriers to using dedicated observers. This would help address monitoring gaps and thus reduce uncertainty over bycatch estimates.

2) Expected Result

A report providing an overview of: the current status of REM techniques in use; common implementation problems/concerns and solutions to these; the identification of new techniques that can be used to monitor bycatch in the future; the proposal of a best practice protocol on implementing REM for protected species monitoring.

3) Participation

- Small workshop (about 30 participants)
- Anyone currently involved in using REM, in particular those working on cetacean and fisheries monitoring
- Representatives of countries that are interested in starting REM monitoring for cetacean bycatch
- Managers in relevant Parties which already implement REM monitoring
- Companies working with video surveillance

4) Approach

A one-day workshop will be held in 2015 to address three main tasks:

1. Provide an overview of the current status of REM techniques used for cetacean bycatch monitoring
    - Exchange of knowledge and experiences of those that have applied this method
    - Available techniques, future techniques
    - Technical/practical issues of installation – barriers to adoption
    - Involvement of stakeholders
    - Effective sampling design
    - Analyses of data (watching of the films/photos, how to calculate error, low bycatch occurrence, ...)
    - Use of software, future software qualifications, training programmes and opportunities for continuing information and knowledge sharing

- Challenges when including other PET (protected, endangered, threatened) species or as part of a discard fishery

2. Identify new techniques that can be used in future bycatch monitoring undertaken in vessels of less than 10m in length
    a. Consider EM use on smaller vessels where the current set up is not practical (no space for computer, no dry space)
    b. Consider whether there are alternative techniques that can be used
3. Produce an outline on best practice based on the current state of knowledge

5) Workshop Steering Group

The Workshop Steering Group comprises Meike Scheidat and Sara Königson.