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Electronic Monitoring: A Key Tool for Global Fisheries

How governments and RFMOs can better monitor high-seas fleets

Overview

Each year, thousands of commercial fishing vessels ply the world's high seas, hauling in catch ranging from sardines to giant tunas. In 2014, the most recent year for which data are available, vessels operating in these areas beyond national jurisdiction caught 4.4 million metric tons of fish, valued at $7.6 billion.[1] To ensure that fishing on this scale is sustainable, regional fisheries management organizations (RFMOs) must be able to accurately track this catch and other vessel activities in the areas they oversee.

But monitoring fisheries is challenging, especially when boats operate far from shore. In an effort to collect complete data on fishing, many RFMOs have mandated that observers be onboard all purse seine vessels. But managers, scientists, and other stakeholders increasingly recognize that more coverage is needed on other vessel types to gather more information on catch, bycatch, fishing effort, and compliance with regulations.

Electronic monitoring (EM) is a proven way for RFMOs to expand coverage of their fishing fleets. EM systems have already been installed on a variety of vessels and have shown that they can generate high-quality, cost-effective monitoring data. Implementing a well-designed EM program that collects and then analyzes data on a fleet's catch, fishing effort, and discards will help RFMOs gauge the status of fish stocks and make appropriate decisions for managing them, such as adopting sustainable harvest strategies, and create stronger enforcement tools.

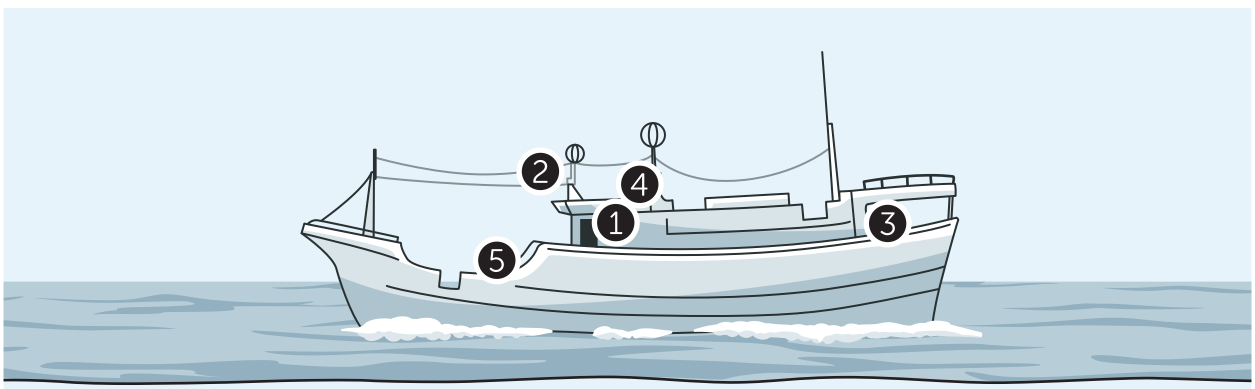
Electronic monitoring

Onboard fisheries observers have traditionally been the primary way to collect independent information on a vessel's activities and catch. However, when faced with the possibility of having to increase coverage, fishers often note that placing more observers on vessels can create challenges due to the additional cost and space required onboard.

Electronic monitoring offers an efficient and cost-effective alternative. The systems—usually a central computer attached to gear sensors and video cameras—allow authorities to monitor and record a vessel's activity in real time. And installing and using EM systems that cover all fishing activities has been demonstrated to be considerably cheaper than placing observers on vessels. While savings estimates vary based on fishery size and type, a 2018 study in Peru estimated that an EM system cost half that of human observers;[2] for pot cod vessels out of Alaska, costs were estimated at 27 percent to 41 percent less than observers;[3] and for commercial gillnet vessels out of Denmark, they were estimated at 15 percent less.[4]

Figure 1

Electronic Monitoring Uses Technology To Collect Timely and Verifiable Catch Information



1 **Control center** monitors electronic sensors, records data, and displays a system summary.

2 **Video camera** records gear hauling.

3 **Video camera** records gear setting.

4 **Vessel monitoring system (VMS)** unit tracks the vessel's route and pinpoints fishing times and locations.

5 **Hydraulic and drum-rotation sensors** monitor gear usage to indicate fishing activity.

Studies tracking the performance of EM over more than 25,000 fishing days at sea have proved that the systems improve the accuracy of onboard logbooks; reduce illegal, unreported, and unregulated fishing; increase data collection on bycatch species for biodiversity and conservation concerns; and expand authorities' ability to monitor compliance with regulations.[5]

Benefits of Electronic Monitoring

When standardized and implemented properly, electronic monitoring can increase:

- **Cost savings**, particularly in cases when using observers is expensive.
- **Employment**, by hiring people to review data and maintain systems.
- **Transparency**, by allowing vessel owners or fishing companies to monitor catches and activities on their vessels to ensure their legality.
- **Compliance**, by helping to document conformity with conservation and management measures and international obligations.
- **Quality of life at sea**, by reducing the number of observers needed on vessels with limited space.
- **Climate resiliency**, by capturing widespread data on fish populations and habitat conditions to better inform adaptive management.
- **24/7 coverage.** EM is not affected by differences in working times or weather and is less intrusive than accommodating an extra person onboard.
- **Scalability.** Despite the upfront cost, once minimum standards are in place, EM becomes a scalable option for RFMOs to implement on various gears/vessel types.
- **Data integrity.** EM is not susceptible to observer and deployment effects, bribery, intimidation, coercion, or other forms of human bias.

Most important, electronic monitoring can be used to supplement low observer coverage and help managers ensure compliance with sustainable policies.

For these reasons and more, many countries have already embraced these technologies, and more are likely to follow.

Types of electronic monitoring

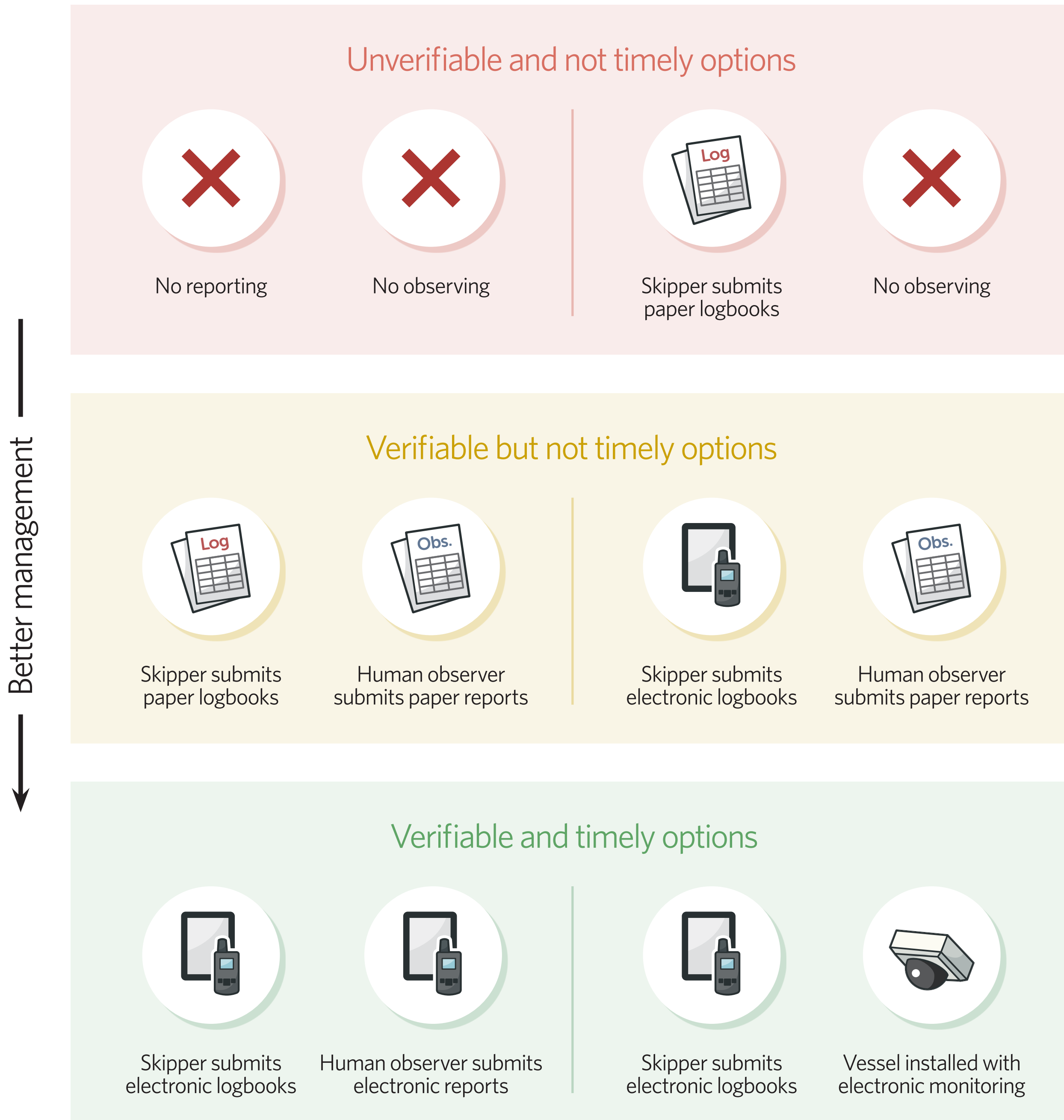
Different combinations of electronic monitoring technology can be used to meet regulators' needs and make the best use of available resources. Vessels can use the systems to supplement onboard observers, capture the data needed for science, and/or monitor compliance with regulations.[6]

The type of fishing gear a vessel uses often influences an EM system's effectiveness. Studies on longline vessels have been largely positive, as static cameras can easily capture data on fish that are brought onboard one at a time.[7] An Australia-based study that sampled data from both gillnet and longline vessels found that "on average, catches reported by the EM analyst and by fishers in their logbook were more similar for longline than gillnet fishing gear."[8] But EM has been shown to be effective on a variety of gears, including trawlers and seiners.

EM systems do have some limitations. They cannot collect biological data and also may not capture compliance with mitigation measures that don't happen on deck, such as steps to reduce bycatch and discards. And the technology requires basic maintenance by the crew, such as making sure that cameras are powered and their lenses are clean. However, many of these challenges can be addressed by careful camera placements and crew training, in addition to dockside collection of biological samples, such as otoliths and gonads.

Figure 2

Electronic Monitoring Means Better Management



Electronic monitoring standards

A well-designed EM program should incorporate more than the technology onboard a vessel. Because many high-seas vessels fish in multiple jurisdictions, effectively monitoring them electronically will require agreement on standards—comparable to the standards that regional observer programs use—to ensure that the information collected is accurate and consistent. For programs to be effective and efficient, RFMOs should develop standards to accurately and consistently record data that is similar to that collected by observers and ensure that the information is shared, reviewed, and audited in a uniform way.

Conclusion

Advances in electronic monitoring technology offer many possibilities for improving fisheries management and increasing transparency and accountability, which would benefit authorities, fishers, and other members of the supply chain. But significant work by RFMOs remains if they are going to implement effective electronic monitoring programs.

To improve monitoring and increase transparency on the high seas, Pew recommends that RFMOs:

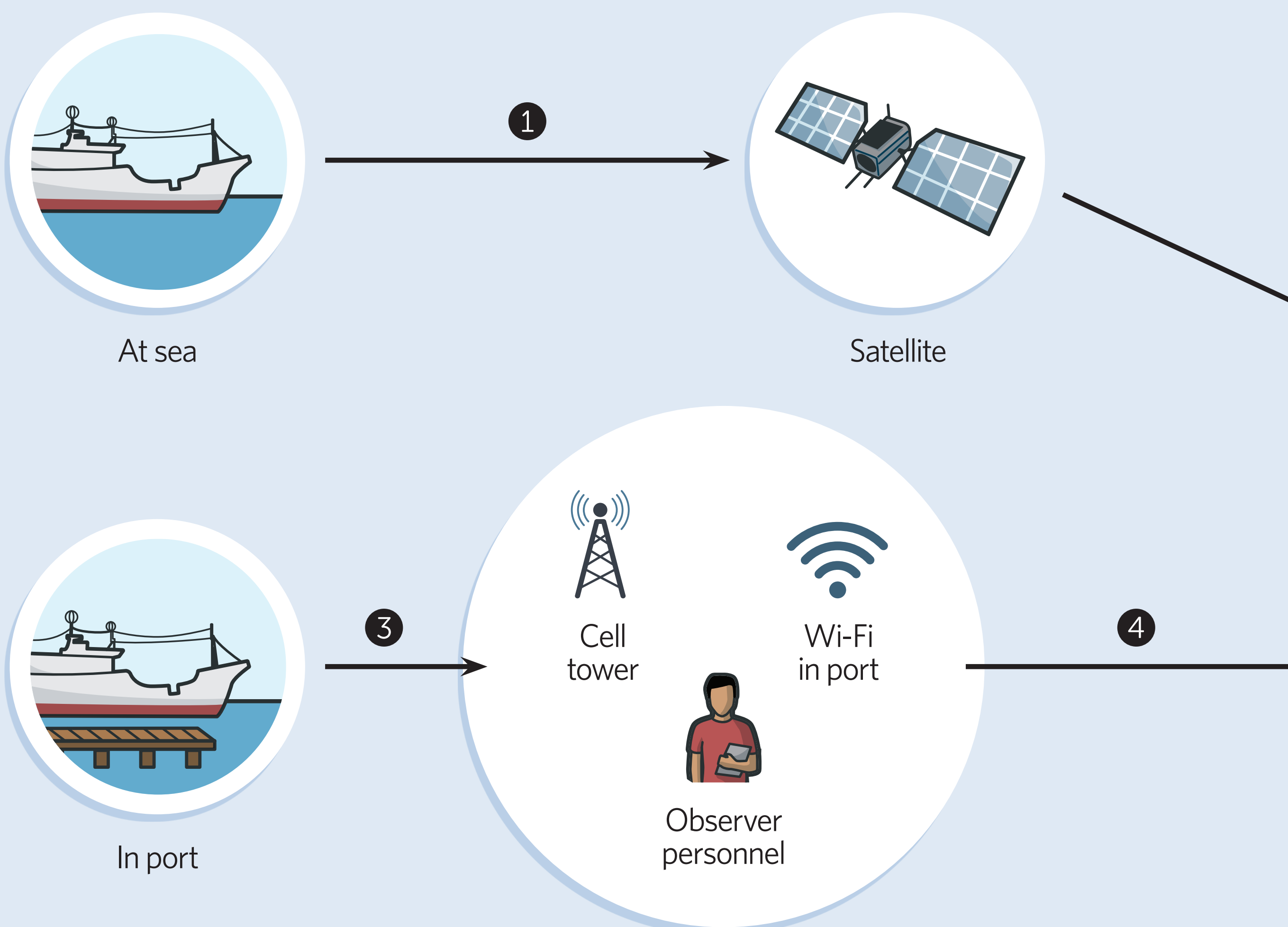
- Adopt standards, specifications, and procedures and fund the appropriate infrastructure to enable implementation of electronic monitoring and harmonization with existing reporting and observing programs.
- Require 100 percent observer coverage on vessels by complementing onboard human observer programs with electronic monitoring.

Fixed lens cameras affixed to the forward rigging of a bottom trawler.

Figure 3

Electronic Monitoring from Start to Finish

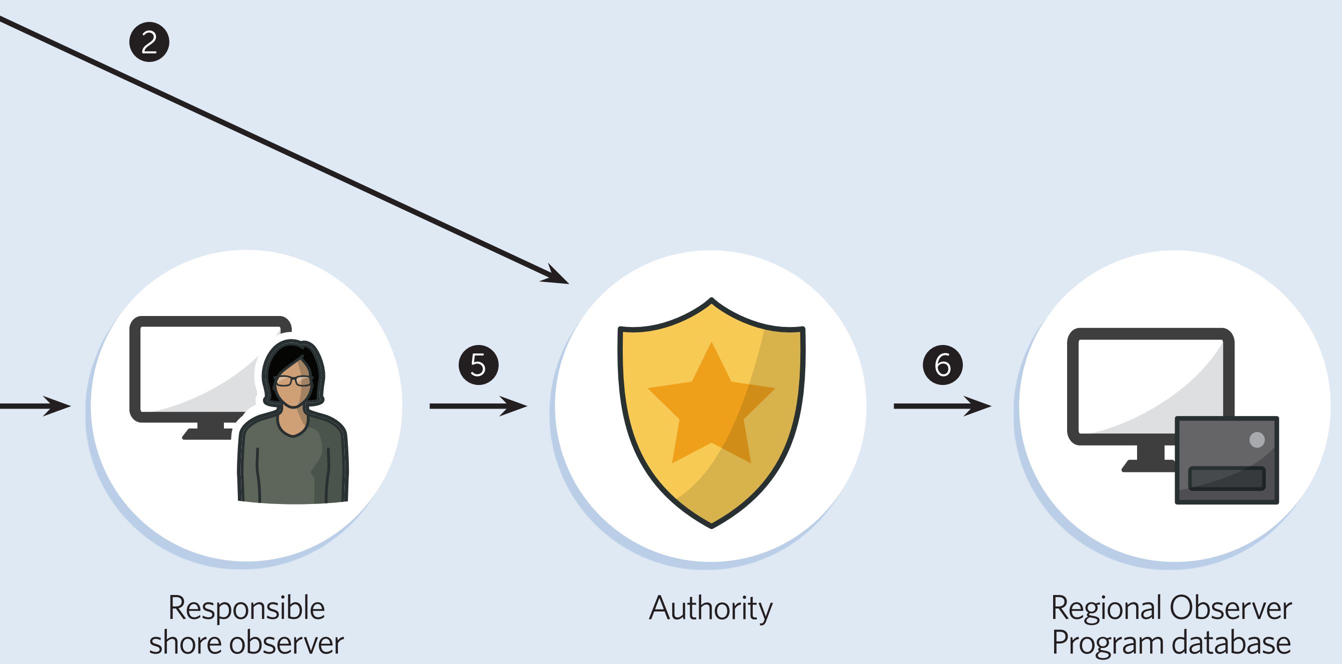
Data reach authorities through various channels from sea to port and beyond



1. To ensure compliance, authorities can remotely contact vessels to ensure in near real time that camera lenses are clear or to monitor sensors for unreported fishing activity.

2. Authority orders information from the satellite.

3. EM data, which are stored on hard drives on the vessel, are retrieved by observer personnel for processing and analysis. Where port facilities allow, data could be sent by cell or Wi-Fi.



4. EM data are transmitted to the relevant observer program. In a transboundary fishery, data-sharing arrangements may be needed to distribute the information properly.

5. Shore-based observers analyze data and send e-reports—as a human observer would on a vessel—to authorities. EM data are archived for any future use.

6. The information in the reports is then used for science (such as stock assessments) or for compliance and enforcement by the RFMOs.

Endnotes

1 E. Sala et al., “The Economics of Fishing the High Seas,” Science Advances 4, no. 6 (2018), 10.1126/sciadv.aat2504.

2 D.C. Bartholomew et al., “Remote Electronic Monitoring as a Potential Alternative to On-Board Observers in Small-Scale Fisheries,” Biological Conservation 219 (2018): 43, http://www.sciencedirect.com/science/article/pii/S0006320717307899.

3 S. Buckelew et al., “Electronic Video Monitoring for Small Vessels in the Pacific Cod Fishery, Gulf of Alaska” (North Pacific Fisheries Association and Saltwater Inc., 2015), 19

4 L. Kindt-Larsen et al., “Observing Incidental Harbour Porpoise Phocoena phocoena Bycatch by Remote Electronic Monitoring,” Endangered Species Research 19, no. 1 (2012): 75-83.

5 Bartholomew et al., “Remote Electronic Monitoring,” 35-45; T.J. Emery et al., “Changes in Logbook Reporting by Commercial Fishers Following the Implementation of Electronic Monitoring in Australian Commonwealth Fisheries” (Indian Ocean Tuna Commission, 2018); H. Hinz et al., “Video Capture of Crustacean Fisheries Data as an Alternative to On-Board Observers,” ICES Journal of Marine Science 72, no. 6 (2015): 1811-21, https://doi.org/10.1093/icesjms/fsv030; Kindt-Larsen et al., “Observing Incidental Harbour Porpoise.”; J. Larcombe, R. Noriega, and T. Timmiss, “Catch Reporting Under E-Monitoring in the Australian Pacific Longline Fishery” (2016); M. Michelin et al., “Catalyzing the Growth of Electronic Monitoring in Fisheries: Building Greater Transparency and Accountability at Sea” (2018); K.S. Plet-Hansen et al., “Remote Electronic Monitoring and the Landing Obligation – Some Insights into Fishers’ and Fishery Inspectors’ Opinions,” Marine Policy 76 (2017): 98-106; J. Ruiz et al., “Strengths and Weakness of the Data Elements Currently Collected through Electronic Monitoring Systems in the Indian Ocean” (2017); C. Ulrich et al., “Discarding of Cod in the Danish Fully Documented Fisheries Trials,” ICES Journal of Marine Science: Journal du Conseil 72, no. 6 (2015): 1848-60.

6 S. Dunn and I. Knuckey, “Potential for E-Reporting and E-Monitoring in the Western and Central Pacific Tuna Fisheries” (Western and Central Pacific Fisheries Commission, 2013), https://www.wcpfc.int/node/5586.

7 T.J. Emery et al., “Measuring Congruence Between Electronic Monitoring and Logbook Data in Australian Commonwealth Longline and Gillnet Fisheries,” Ocean & Coastal Management 168 (2019): 307-21, http://www.sciencedirect.com/science/article/pii/S096456911830574X; E. Gilman et al., “Precision of Data From Alternative Fisheries Monitoring Sources Comparison of Fisheries-Dependent Data Derived from Electronic Monitoring, Logbook and Port Sampling Programs from Pelagic Longline Vessels Fishing in the Palau EEZ” (working paper, 2018); M. Piasente et al., “Electronic Onboard Monitoring Pilot Project for the Eastern Tuna and Billfish Fishery” (2012).

8 Emery et al., “Measuring Congruence.”

For further information, please visit:
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