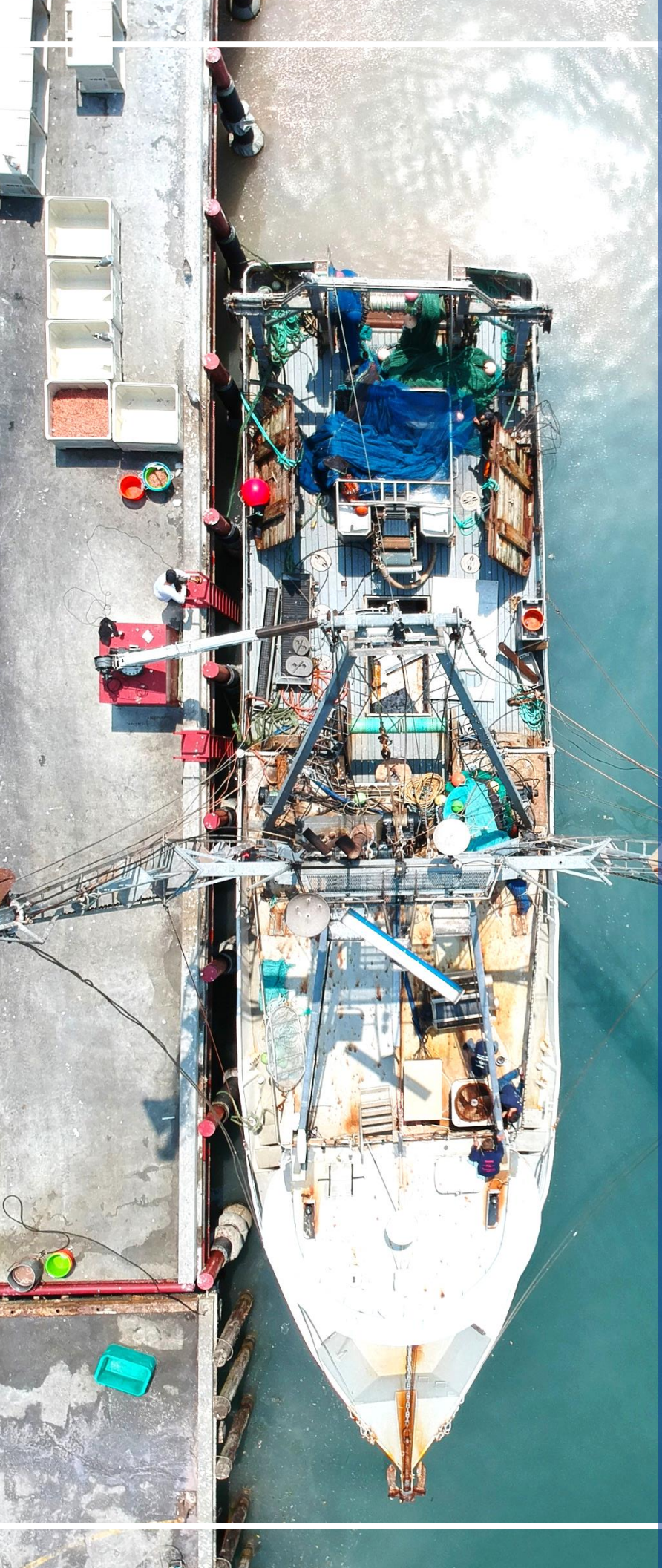

Electronic Technologies and Data Policy for U.S. Fisheries:

Key Topics, Barriers, and Opportunities

July 2020

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Introduction

Electronic monitoring (EM) and electronic reporting (ER) programs could significantly improve accountability in fisheries and provide more real-time collection of data for science, management, and business operations. While EM/ER programs are being implemented around the world, this white paper focuses solely on the policy context within the United States. Unlike the rapid growth of electronic vessel tracking systems, the uptake of EM/ER across the United States has occurred more slowly over the past decade and a half since the first EM pilot project in 2004. While ER is becoming much more widespread, only a few EM programs have scaled due to barriers to wider implementation such as concerns about costs, questions about the confidentiality of data, and uncertainties around key design features like video review rates and storage requirements.

Getting EM/ER policy right is crucial because failing to do so would enshrine cost inefficiencies, outdated technology, and burdensome requirements on the fishing industry. These impacts could prevent pilot projects from scaling and dampen enthusiasm from fishermen who might otherwise be interested in using EM/ER. In addition, a lack of clarity regarding how existing policies apply to EM programs can delay implementation. The National Marine Fisheries Service (NMFS) only recently began facilitating collaboration more broadly amongst regions to share best practices and lessons learned.

Further, stakeholders can now use data collected by EM/ER systems for more purposes such as bycatch avoidance, adaptive management under changing ocean conditions, and traceability programs. The ability of fishermen and their communities to use these data and maximize their value depends on the design of the EM/ER programs, as design choices at key points of the data flow process have different legal and policy implications.

This white paper explores current EM regulatory approaches and key data issues including storage, transmission, ownership/access, confidentiality, and sharing. In these contexts, it discusses the main laws governing fisheries data, including the Federal Records Act (FRA), the Freedom of Information Act (FOIA), the Magnuson-Stevens Act (MSA), and the Marine Mammal Protection Act (MMPA).

Through well-crafted policies and clear communication about how they will be interpreted and applied, fisheries managers can facilitate the advancement of these promising technologies. These policies and practices provide the foundation for significant improvements in science, fisheries management, and economic performance, ultimately supporting sustainable and profitable fisheries.

Key Findings and Recommendations

1. **Allow flexibility in regulations for EM programs and emphasize cost effectiveness in program design.** By taking a less prescriptive approach to regional rulemaking and using performance standards that describe a desired outcome but don't dictate specific technology, NMFS can help to foster innovation in EM programs. In addition, key design elements like video review rates and data storage protocols greatly affect costs. Keeping costs down will help ensure they will be sustainable over the long run and will scale to other fisheries/regions.
2. **Increase collaboration amongst stakeholders and regions by sharing best practices and technical guidance.** By sharing best practices for EM programs, regions that are developing new programs can learn from existing programs. Guidance on common EM program issues such as video review protocol (including review rates) can help regional managers overcome technical challenges and take advantage of lessons learned and innovation in other regions. Involving key stakeholders like fishermen and EM service providers early in the design process can help ensure EM programs are designed to meet the needs of users and providers.
3. **Establish national performance standards for EM programs.** Creating national performance standards for key aspects of EM programs (e.g. data type/quality/integrity/transmission) may help streamline EM implementation at a regional level. However, certain aspects of an EM program—including its goals—will likely be unique to its fishery, so national performance standards may not be appropriate for every EM program element.
4. **Revise the existing national storage schedule for EM video footage.** Currently, data storage costs represent a significant portion of EM program costs. By working with the National Archives and Record Administration (NARA) and clarifying storage procedures, NMFS can reduce data storage costs and create helpful guidance for regions. The agency is working on these revisions, and NGO and fishermen engagement on the proposed timeline can ensure that data are not stored any longer than necessary.
5. **Create guidance on when EM data will become a Federal record.** The definition of agency "record" under the FRA pertains to all information "received" by a Federal agency, but it is currently unclear how this term is interpreted in EM programs. Guidance—with the intention of limiting what becomes a federal record in order to reduce data storage costs—is needed for regional EM program managers.
6. **Reframe "data ownership" as "data access," and employ clear agreements in order to define rights.** Many stakeholders refer to "ownership" to describe who has the right to access, use, and share data, but there is a lack of background law on any clear "ownership" of data. Clear agreements between collaborating entities like fishermen, the federal government, NGOs, and scientists are crucial for defining data access and control. These access rights can be defined through regulations, MOUs, contracts, or other instruments.
7. **Revise data confidentiality policies for EM data and create consistent guidance across the agency.** Current confidentiality provisions are outdated and lack clarity on how they apply to EM programs, which has created confusion and significant discussion within NMFS. Updating the relevant provisions in the MSA and creating clear implementing regulations could facilitate quicker implementation of EM programs. In addition, ensuring that fishermen feel that their data will be protected (through national policy guidance or contracts with third-party operators) would help to avoid resistance to EM programs.
8. **Create guidelines for releasing EM data per a FOIA request.** By establishing appropriate privacy safeguards when responding to FOIA requests for EM information (e.g. blurring faces in photo/video data, removing sound files associated with videos, etc.), the agency may be able ease fishermen concerns.
9. **Implement NMFS's data modernization recommendations and provide robust funding for electronic technologies and data modernization.** NMFS's recently released recommendations for modernizing its information systems across the country. Following these recommendations would help to provide the staffing, coordination, governance, and system upgrades needed to meet today's data needs. Congress can support this work by providing funding to advance the recommendations, and for regional EM/ER implementation.

Current Operational EM Programs

EM programs can be designed to achieve different goals and therefore produce different types and quantities of data.[2] Currently, EM programs are typically categorized by two broad functional goals:

1) to monitor compliance, and/or
2) to collect data for science and management.

Compliance monitoring through EM involves the use of video footage to ensure that specific requirements are met—which could include full retention requirements, catch composition, and volumetric requirements—and validating self-reported data through logbooks (catch monitoring).[3] The collection of data for management and science purposes primarily involves documenting target and non-target (i.e., bycatch) catch (i.e., full catch accounting). Data collected via EM for catch accounting systems can help provide near real-time data for managing quota allocations in catch share programs. Further, EM data are valuable for stock assessments. (See Appendix 1 for EM goals in programs across the country.) Based on program goals, resources and regional/institutional culture, regions have taken widely varying approaches to EM program design. The agency has established three types of regulatory approaches to guide EM programs:

1) **prescriptive requirements,**
2) **performance standards, and**
3) **provider approval requirements.**

Defining key terms used in this paper:

"POLICY" in this paper refers to provisions in federal statute, rulemakings published in the Federal Register (i.e., regulations), or national policy guidance through policy or procedural directives.

"EM PROGRAM" refers to the entire structure for implementing EM in a fishery, including the goals, policies, and supporting technology.

"EM SYSTEM" refers more narrowly to the hardware, software, and data processes.

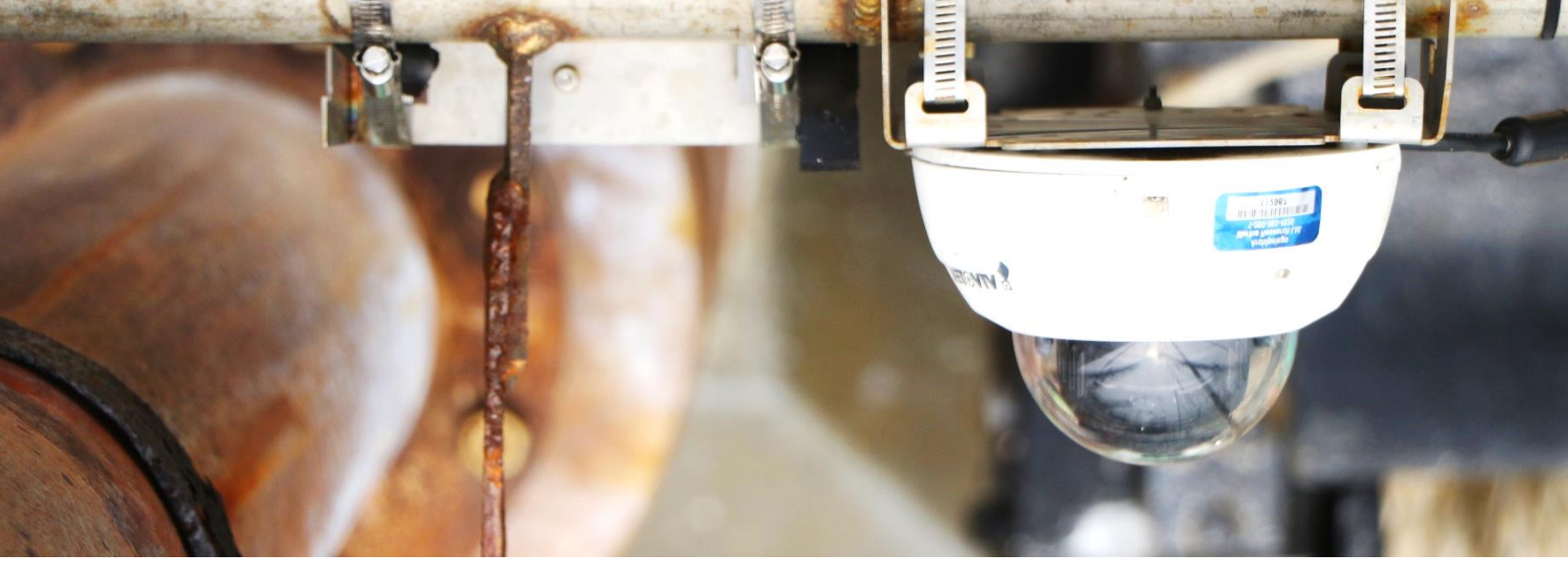
"EM DATA" can include all raw and processed data, including video, images, or other sensor data collected by an EM system during fishing operations, as well as associated metadata.[1]

These approaches are not mutually exclusive. Most of the fully implemented programs have used one or more approaches in rulemaking. Each approach comes with its own implications and tradeoffs, as discussed below, with examples from around the country.

[1] For these key term definitions, we are attempting to maintain consistency with NMFS policy directives and with a background document created by Kate Wing, Emilie Franke and Joe Sullivan for an EM Data Sharing Workshop held in June 2019. Kate Wing, Emilie Franke & Joe Sullivan, EM Data Sharing Workshop Background Document (2019), https://em4.fish/our-library/em-video-data-management-workshop-background-document-meeting-summary/

[2] Includes fully-scaled, fleetwide programs and voluntary programs with only a portion of the fleet participating.

[3] The word "audit" can have multiple meanings in EM programs. Audit (as first described in Stanley et al. 2011) can refer to reviewing a percentage of the video data, as opposed to a census approach where 100% of the EM data are reviewed. More recently in US programs, audit can refer to a secondary review an EM service provider to ensure compliance with program requirements. Both the terms audit and validation can describe cross-checking EM data other data sources like logbooks. To avoid confusion and maintain consistency with others who have written on this topic, we have used validation for comparing video data with self-reported data.



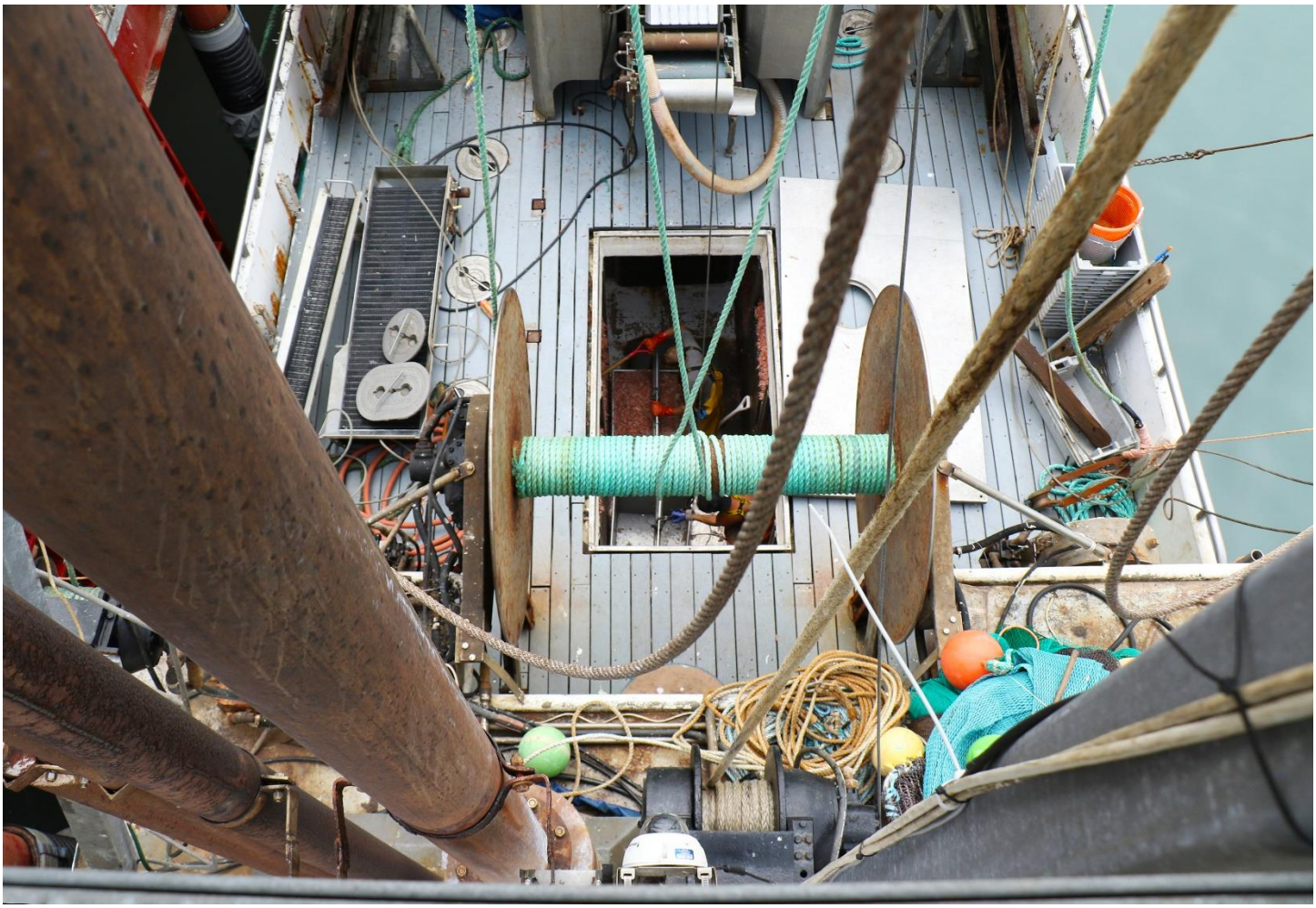
EM in the Atlantic and Gulf Pelagic Longline Fishery: An Agency-Driven Model with Prescriptive and Performance Requirements

In the United States, EM was first fully implemented in 2015 in the Atlantic and Gulf pelagic longline fishery solely to monitor bluefin tuna bycatch. The program was developed in conjunction with an innovative Individual Bluefin Quota catch share initiative. Because the program is managed directly by the Secretary of Commerce (who delegates authority to the NMFS's HMS Division) and not through the regional fisheries management council process, the Atlantic and Gulf of Mexico HMS fisheries are regulated in a more top-down style than the fisheries managed by councils. Additionally, the EM program is currently fully subsidized by the federal government. NMFS covered the costs of the hardware on all 113 vessels and contracted with two third-party service providers: Saltwater Inc. for the installation and maintenance of hardware and Earth Research Institute for processing, reviewing and storing footage.[4]

While the top-down, fully subsidized nature of the program helped it to scale quickly, some fishermen were hesitant of the EM program for several reasons, including concerns about costs eventually shifting to fishermen and technical failures. Some fishermen are now embracing the accountability and level playing field EM has helped create for bluefin tuna. However, fishermen are largely not accessing their data/video footage and the full benefits EM can provide, including supply chain traceability, innovative marketing, and bycatch hotspot mapping.[5] The EM program expanded in 2018 to verify the status of shortfin mako sharks, which must be dead at haulback to allow fishermen to retain them.[6] In the future, EM, in conjunction with other conservation measures, could provide the level of accountability required to gain access to areas currently closed to fishing in order to gather data to evaluate current management and inform future decisions.

[4] NOAA Fisheries, National Electronic Monitoring Workshop 12 (2020).
[5] Vessel owners can request access to their footage via email by using their unique code for the IBQ program to verify their identity. However, only a couple of fishermen have asked for their footage, which they used for insurance purposes. Tom Warren, NMFS Highly Migratory Species (HMS) Management Division, Personal Comms. July 2020.
[6] 50 C.F.R. § 635.21.

The regulations to monitor bluefin tuna under the EM program in the Atlantic and Gulf are prescriptive. NMFS implemented detailed regulations that include technical specifications for EM system elements, including the cameras, hydraulic and drum rotation sensors, a system control box and monitor, the GPS receiver, and the power source. In addition to these very specific technical requirements, the regulations include performance standards (e.g., “there must be lighting sufficient to illuminate clearly individual fish”). Vessel owners must also have a written Vessel Monitoring Plan (VMP), an operational plan with procedures relating to the vessel's EM system, and they are required to mail the removable EM system hard drives within 48 hours of completing a fishing trip.[7] Because of the prescriptive approach taken, changes to the EM systems and overall program will require amending the existing regulations, making both minor updates to current requirements (e.g., recording multiple trips on one hard drive) and more significant upgrades (e.g., testing and implementing more innovative EM platforms) significantly more difficult.



[7] 50 C.F.R. § 635.9.

EM in the Pacific Groundfish Individual Fishing Quota (IFQ) Fishery: Performance Standards and the Third-Party Model

Since 2011, the IFQ sector of the Pacific groundfish fishery (fixed, whiting, mid-water, and bottom trawl gears) has required 100% monitoring of at-sea fishing activity, as well as 100% dockside monitoring. For the first several years of the program, NMFS partially subsidized the cost, but in 2015, the full burden of monitoring shifted to industry. Facing high monitoring costs and observer shortages in some ports, the industry advocated strongly for EM as an additional monitoring option. EM represented an opportunity to reduce costs, improve flexibility by reducing the burden associated with carrying human observers, and create another monitoring option for ports having difficulty accessing observers as needed.

While the EM regulatory program was being developed (2012-2019), EM systems were tested through research projects and later through exempted fishing permits (EFPs). The EFPs allowed participating vessels to use EM in lieu of human observers. The Pacific States Marine Fisheries Commission (PSMFC)—an interstate agency funded by NMFS for data collection, research, and monitoring—administered key aspects of the developing EM program including video review and data storage, as well as direct feedback with EFP vessels to improve EM system and program performance. Results of the EFPs demonstrated that EM data could be used to validate fishermen discard logbooks. The EFPs also lead to the first regional council rulemaking process to establish a multi-species regulatory EM program.[8]

To implement the program, NMFS is requiring a “third-party model,” in which EM service provider companies apply and become certified by NMFS to offer various EM services to the fleet (e.g., hardware, installations, software, analysis, etc.). Similar to paying for observers, and as directed by a NMFS policy directive on cost allocation,[9] industry will be required to pay for EM “sampling costs” through private contracts with providers. NMFS estimates that EM will cost less than the current cost of human observers, with cost savings varying by gear type, among other factors.[10] However, since

[8] Melissa Mahoney, West Coast Groundfish EM Program at a Crossroads, EM 4 Fish (Dec. 6, 2019), https://em4.fish/west-coast-groundfish-em-program-at-a-crossroads/

[9] Brett Alger, Cost Allocation in Electronic Monitoring Programs for Federally Managed U.S. Fisheries (2019), https://www.fisheries.noaa.gov/webdam/download/90619752.

[10] NMFS, NMFS Report on EM Costs (2019), https://www.pcouncil.org/documents/2019/11/agenda-item-h-3-a-supplemental-nmfs-report-6-electronic-monitoring-cost-estimates.pdf/.

this estimate is based on a single government provider system and there is no market for EM service providers at present, the actual costs of the third-party model are currently unknown. Many EM stakeholders are concerned that costs would initially be as high, or higher, than observers. However, most believe the cost of EM will eventually be much less than human observers since technology will likely become less expensive over time.

There are also costs for NMFS to administer EM programs. Since the Pacific groundfish fishery is a Limited Access Privilege Program (LAPP), cost recovery fees will cover a portion of NMFS's costs for implementation and monitoring functions. Because of this, Pacific groundfish IFQ fishermen will absorb a significant portion of the costs for the EM program. However, open market competition to provide the EM services may lead to innovations, efficiencies (including lower costs), and new ways to leverage data and other technologies to benefit their businesses (e.g., traceability, creative marketing, and ensuring seafood quality).

The rulemaking process for the groundfish trawl EM program was split into two rules. The first rulemaking covers the fixed gear and whiting sectors where the application of EM was viewed as less complex. The second rulemaking (set to be published later this year) will govern the mid-water and bottom trawl sectors. The agency developed draft EM program guidelines, a VMP template and a manual with protocols for video review, and auditing procedures. During the review process, many stakeholders expressed concerns about some of the requirements, including onerous auditing for service providers and additional review of steaming time that is likely to increase the cost of the program. NMFS is expected to finalize the EM program guidelines this year, and strong collaboration with stakeholders will be needed to resolve program design issues and ensure adequate participation from industry and third-party EM providers in the regulatory program. The effective date of both rules is January 2021. However, the Pacific Fishery Management Council has initiated an amendment process that would include delaying implementation until January 2022 to allow ample time for consultation on key design components related to cost and efficiency. This amendment will also allow the agency time to roll out the new program, including certification of EM service providers.

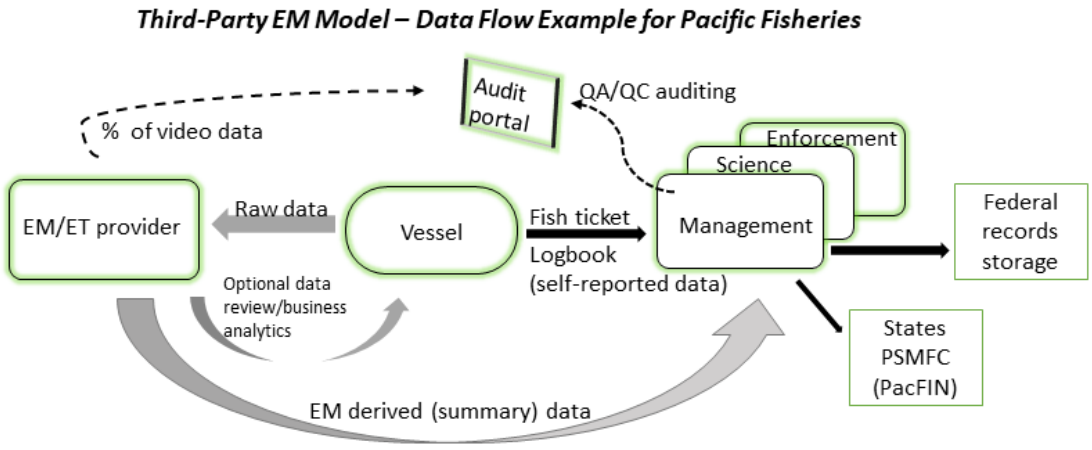


Figure 1: Third-party Model. In this model, the EM provider collects the raw data from the vessel and reviews the data, submitting a summary to the agency for management, science and enforcement purposes. In one version of this model, the agency could access a portal to validate a portion of the raw data. The EM provider may also send processed data to the vessel owner.

The regulations for the West Coast groundfish fishery primarily rely on provider approval and performance standards. Fishermen will have to declare their intent to use EM and select a NMFS-approved EM service provider who has submitted an EM service plan detailing how the company will provide NMFS with the information needed for fisheries management. Fishermen must also have a NMFS-approved VMP and must obtain certification that their system meets performance standards. These standards include easy and complete viewing and identification of catch, continuous vessel location monitoring, recording the time/data/location of any haul/set or discard event, prevention of radio frequency interference, prevention of tampering or ability to show evidence of tampering, and easy integration of data for analysis.[11] Regulating through performance standards allows for different types of EM systems to be used as long as they achieve the desired function.

A Variety of Functions, Approaches to Regulation, and Fisheries Using EM in Alaska

The Alaska region has been at the forefront of EM development. Alaska now has almost 170 vessels with EM aboard to meet monitoring and data collection needs.[12] Fixed gear (pot and longline) vessels, trawl vessels, catcher-processors, and mother ships use EM either for catch accounting or for compliance monitoring.

Trawl and longline catcher-processors and motherships use EM for compliance monitoring to supplement 100% observer coverage. EM equipment is paid for by the industry, and video is requested and reviewed by NMFS via validation protocols or targeted enforcement requests.[13] EM is also being used in a new voluntary program through an EFP exploring the use of EM to ensure compliance with salmon bycatch restrictions on Bering Sea and Gulf of Alaska shoreside pollock catcher vessels.[14] In this program, vessels carry human observers while also employing EM. PSMFC will review video data to determine the feasibility and efficacy of EM.[15]

For small fixed gear catcher vessels targeting sablefish, Pacific cod, and/or Pacific halibut in Alaska, EM is used for catch accounting (estimating catch retention and discards). Vessels may opt into the EM program and, if accepted, use EM in lieu of observer coverage. Industry pays for EM equipment and services through a landings fee. PSMFC reviews video under review protocols established jointly by PSMFC and NMFS.[16] The pot cod fishery uses a model in which one provider, Saltwater Inc., collects data on fishing effort and catch composition. Saltwater personnel, all of whom are current or prior NMFS-certified fishery observers, review the data. Observers rotate between reviewing EM data onshore and observing at sea, providing valuable insights and refinements to the data review process.[17]

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[11] 50 C.F.R. § 660.600-4.
[12] Jennifer Ferdinand, Fisheries Information System National Observer Program FY 2020 Project Proposal (June 11, 2019), https://www.st.nmfs.noaa.gov/pims/main/public?method=DOWNLOAD_PROPOSAL&record_id=3692.
[13] Jennifer Ferdinand & NOAA Fisheries, Overview of Electronic Technology in Alaska (2018).
[14] Ruth Christiansen, Projects in the Field: Implementing EM for Compliance Monitoring in the Bering Sea & Gulf of Alaska Shoreside Pollock Catch Vessel Fisheries, EM 4 Fish (May 7, 2019), https://em4.fish/implementing-em-for-compliance-monitoring-in-the-bering-sea-gulf-of-alaska-shoreside-pollock-catcher-vessel-fisheries/.
[15] NOAA Fisheries. National Electronic Monitoring Workshop Document (2020).
[16] Jennifer Ferdinand & NOAA Fisheries, Overview of Electronic Technology in Alaska (2018).
[17] Nancy Munro, Projects in the Field: Electronic Monitoring for Alaska's Pot Cod Fishery, EM 4 Fish (May 28,2019), https://em4.fish/projects-in-the-field-electronic-monitoring-for-alaskas-pot-cod-fishery/.

Managers in Alaska take several approaches to set policies for EM programs. The regulations in place for EM programs include both prescriptive requirements and performance standards. Managers use prescriptive requirements to require specific types of equipment (i.e., 16-bit or better color monitor) if a performance standard would be overly complicated. However, if multiple equipment configurations can achieve the same goal, managers outline performance standards to give fishermen and EM providers flexibility in designing a system.[18]

Potential Role of National Performance Standards and Certification Programs

Every EM program is designed for its unique fishery, and EM service providers currently do not have clear and consistent standards and applications across regions. The lack of a consistent set of minimum performance standards has been a barrier for scaling EM as NMFS has largely approached program design regionally. Certain aspects of EM programs and data requirements may be appropriate to set at the national level, such as key functionalities and specific data quality, security and interoperability requirements.[19] Creating such standards at the national level may help regions to design EM programs more consistently, providing more clarity for EM service providers in developing their software/hardware and services and helping to control costs.

Because EM programs have different goals and each fishery is distinct, national standards need to be designed in a way that still allows the regions to create programs that meet their specific goals. By focusing on performance/function, managers can develop standards that do not inhibit future innovation or lock-in outdated technologies. Allowing meaningful participation from EM service providers and fishermen in the creation of regional or national standards would ensure that the appropriate aspects are considered, and the right level of specificity is implemented.

Used in conjunction with performance standards, VMPs describe how an EM system is specifically configured on a vessel and how fishing operations will be conducted to effectively achieve the goals of the monitoring program. VMPs can also give managers more confidence in a performance standard approach because they provide detailed information about each vessel's protocols for complying with the requirements of the EM program. Additionally, VMPs can help mitigate any issues with EM that arise because they often require captains and crew to identify roles and responsibilities, design catch handling protocols, and create troubleshooting guidelines.[20,21]

NMFS has also required certification for EM service providers. For example, in the Pacific groundfish fishery, the agency will require EM service providers to meet certain requirements to become a

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[18] NOAA, Amendment to the Alaska Region Electronic Technologies Implementation Plan, NOAA Fisheries (Sept. 1, 2018), https://www.fisheries.noaa.gov/resource/document/amendment-alaska-region-electronic-technologies-implementation-plan.
[19] The draft NMFS document "Electronic Monitoring and Electronic Reporting: Guidance & Best Practices for Federally-Managed Fisheries" includes a discussion of aspects to consider for minimum standards. NOAA et al., DISCUSSION DRAFT Electronic Monitoring and Electronic Reporting: Guidance & Best Practices for Federally-Managed Fisheries (2013), https://www.fisheryfacts.com/docs/em_er_discussion_draft_august_2013.pdf.
[20] Rod Fujita, Christopher Cusack, Rachel Karasik & Helen Takade-Heumacher, Designing and Implementing Electronic Monitoring Systems for Fisheries (2018), http://fisherysolutionscenter.edf.org/sites/catchshares.edf.org/files/EM_DesignManual_Final_0.pdf.
[21] NOAA, Draft Electronic Monitoring Program Vessel Monitoring Plan Guidelines, https://archive.fisheries.noaa.gov/wcr/publications/fishery_management/electronic_monitoring/draft_vessel_monitoring_plan_guidelines.pdf (last visited Jul. 7, 2020).

certified provider. If regional or national standards can be created and met by providers, having pre-approved EM service providers may help regional managers deploy EM more quickly, as opposed to requiring approval for providers fishery by fishery.

ER programs often use “type-approval” regulations in which fishermen can choose hardware from a list of pre-approved products, like the way NMFS regulates Vessel Monitoring System (VMS) technologies. The type-approval approach of certifying specific products has yet to be used for EM programs. More research and collaboration are needed to assess whether specific technologies would facilitate the uptake of EM or would just lock in technologies that may quickly become outdated.

Table 1. Tradeoffs between regulatory approaches to EM and ER.

	Prescriptive Regulations	Performance Based Regulations	Provider Approval Regulations	Type Approval Regulations
Description	Define exactly how to conduct activities or what equipment is to be used (e.g., hardware specifications)	Specify a standard for the desired outcome and do not deliberately constrain how compliance is to be achieved	Create a process to approve certain EM provider(s) that can meet specific requirements	Create a process to approve a product that meets a minimum set of regulatory, technical, and/or safety requirements
Pros	• Clearly articulate specific requirements	• Allow for innovation • Can help to set industry wide standard if used in many fisheries	• Put the responsibility on the provider to meet certain standards • Process for approval clearly defined	• Create a process for approval that is clearly defined
Cons	• Can lock in specific technologies that may become outdated	• Can be overly complicated for certain EM aspects; sometimes easier to include a specification (e.g., 16-bit or better color monitor)	• Need clarity on program requirements and potentially time to develop a competitive market	• Can lock in specific technologies • Can potentially be a slow process to get products approved • Would still need a third-party to provide ongoing service for EM programs

Data Storage and Transmission

Data storage and transmission can be among the highest costs for the agency in managing EM programs. Three key elements influence data storage costs: 1) method of storage, 2) length of time data is required to be stored, and 3) amount and type of data stored. Keeping these costs down is crucial for the economic viability of these programs and will impact their likelihood of spreading to new fisheries.

Method of Storage

The costs of EM data storage can vary significantly depending on certain factors, such as the frequency of access and level of redundancy. In some cases, storing data offline with a low frequency of access can be maintained at roughly $20-30/TB. However, costs increase significantly when data sets need to be accessed more frequently and if full redundancy is required offsite (i.e., datasets are stored in two locations). For cloud storage, published prices can vary between $12 to $500 for 1TB of cloud storage annually, but these prices do not include access costs. The frequency of access is the most significant driver for cloud storage costs.[22,23] However, transmission costs can be significant both for transmitting to the cloud from the vessel and downloading from the cloud to the data analyst.

Data storage and transmission are intrinsically linked. For example, on the U.S. West Coast fishermen mail (the “transmission” method) removable hard drives to PSMFC, who then insert them into a server array. These data are then backed up onto another array. In this case, because the data transmission process requires internal storage servers that can accept hard drives, the additional infrastructure needed to store the data is just an additional storage server. However, if data are transmitted wirelessly from the vessel to the cloud, this approach negates the need for any significant storage infrastructure at the agency or contracted parties. In addition, activity recognition software paired with cloud-based tools can streamline data review and adjust file sizes (resolution) in accordance with predicted importance.

The three main methods of transmitting data wirelessly include satellite, cellular via existing data networks, and long range private Wi-Fi networks. The preferred method depends on several factors, such as the number of vessels, the amount of data, how quickly the data is needed, and existing infrastructure. Satellite transmission is costly for large amounts of video data, but smaller packets of information such as image thumbnails, ER data, and system health checks can be transmitted economically and with little geographical restriction. Cellular data transfer can efficiently upload large video files if 4G (or 5G) networks are available, but this method typically requires proximity to land (within a few miles). Costs of cellular transfer continue to decline, making it feasible for widespread use soon. Long range Wi-Fi systems can transmit large amounts of data extremely quickly, but vessels need to be within a few hundred yards from the router to be effective. Significant investment

[22] Jared Fuller, Saltwater Inc., Personal Comms. April 2020.

[23] Amazon Web Services Inc., AWS Announces the General Availability of the Amazon S3 Glacier Deep Archive Storage Class in all Commercial AWS Regions and AWS GovCloud (US), Amazon Web Services (Mar 27, 2019), https://aws.amazon.com/about-aws/whats-new/2019/03/S3-glacier-deep-archive/.

in port infrastructure is required, but transmission costs for individual vessels are negligible, which may result in cost savings if many vessels use the system.

Given that factors such as the method of storage, frequency of access, archival standards, and redundancy requirements greatly affect cost, NMFS and stakeholders need to consider the relative value of these requirements during the EM program design process. By providing regional staff with additional information on best practices for designing EM information infrastructures, NMFS can make design decisions that are both cost-effective and meet science and management goals. Frequently updated best practices from NMFS will be particularly useful as EM technologies and associated data storage options continue to evolve. By identifying the least expensive storage option that permits the access necessary for program administration and has appropriate security, managers can reduce costs and optimize program effectiveness. The private sector may play a key role in providing these services.

Required Length of Time for Data Storage

Generally, shorter time requirements for storing data will reduce costs, and the optimal storage length may vary according to the intended purpose of the data. Storing data consistent with the needs of the relevant scientific analysis (such as a stock assessment) or management action (such as catch accounting) would ensure its utility in that context. Storing data for the duration of any applicable statute of limitations would allow it to be used for enforcement. While other statutes like the MMPA may be relevant here, the main law to consider is the MSA, which has a statute of limitations for enforcement actions of five years.[24] For MSA enforcement and litigation purposes, five years would be the maximum time data would need to be stored.

The Federal Records Act (FRA) plays a key role in the length of data storage as well. Under the FRA, NMFS must retain any EM video data it "receives" for a time period stipulated by the records schedule established by the agency and approved by NARA.[25] Photos and videos collected by EM systems are considered "observer information" according to the MSA, and the agency has designated this information to fall under series 1513-10(c), a specific data storage schedule that is required to be retained indefinitely (See Appendix 5).[26] Data from EM programs includes raw video footage, so storing these data indefinitely contributes to high costs that would continue to grow as additional EM programs come online.

NMFS is working to create new and amend existing record items. The agency plans to create a new item for EM data (making the distinction between raw video footage and derived data) that will have a limited timeline for storage based on the objectives the data are intended to serve. Creating a new schedule for EM data will help the agency reduce storage costs, especially if the agency creates very limited timelines for raw footage that is the most expensive to retain. NARA will have a 45-day public comment period for the new EM data storage schedule when it is proposed, and EM stakeholder

[24] 28 U.S.C. § 2462.
[25] 36 C.F.R. §1220.34(g).
[26] NOAA, NOAA Records Schedules Chapter 1500 – Fishery and Living Marine Resource Functional Files (2018), https://www.corporateservices.noaa.gov/audit/records_management/schedules/chapter-1500-marine-fisheries.pdf.

engagement will be crucial to ensure the agency sets an appropriate timeline for the various types of data.[27]

NMFS has yet to clarify its interpretation of how the keyword "received" applies to EM data in the FRA's definition of a federal record.[28] Would a file that is downloaded and opened for review by agency staff be considered "received" by NMFS and, therefore, must become a federal record? How about notes taken by agency staff during the process of reviewing video footage? Would the act of accessing a file through a web portal create a "received" record? Providing more guidance on how the agency interprets the FRA definition of a federal record in relation to EM data would provide more clarity and direction to regional managers as they establish data storage protocols. Limiting data considered to be a federal record would reduce storage costs, especially under the existing data storage schedule applicable to EM files, which requires indefinite storage.

NMFS recently created a policy directive for EM data stored by third-party providers (i.e., data not considered to be agency records). The agency will require that an EM service provider retain fisheries-dependent EM data for a minimum of 12 months.[29] Under this procedural directive, EM data would have two basic stages: 1) the fishing and monitoring period and 2) a 12-month minimum retention and storage period (see Figure 2). The directive does not create a fixed time period for the fishing and monitoring period (including the review and analysis that occurs after a fishing season has concluded). Instead, NMFS recommends that the regions define this timeframe.[30] The requirement to store data for one year after the fishing and monitoring period is a vast improvement over the previous requirement to store data indefinitely, though further efficiencies and shorter storage timelines may be achieved in the future. The length of time EM/ER data must be stored may become less relevant as storage costs decrease.

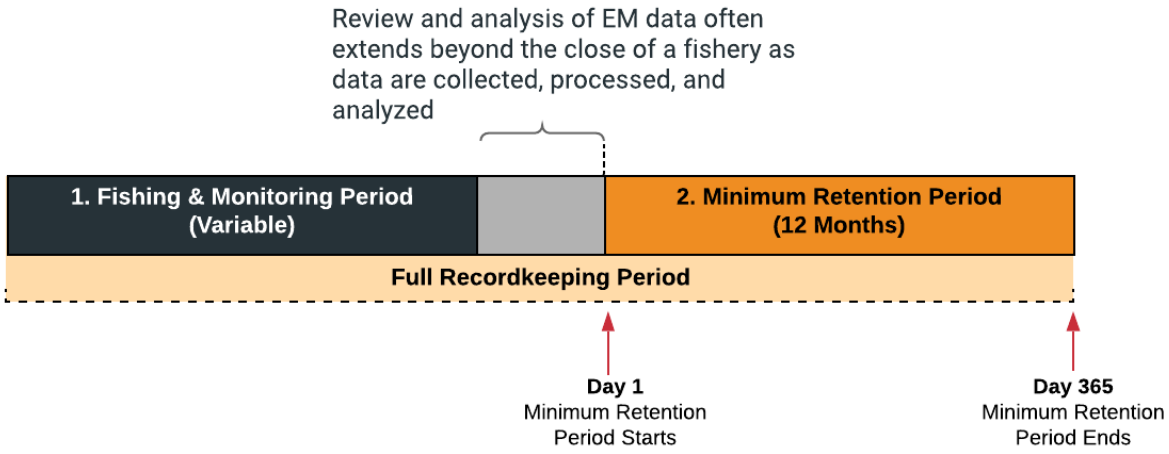

Figure 2. NMFS data storage timeline[31]

[27] Brett Alger, Electronic Technologies Policy Development (2019), https://bit.ly/2VMpXHB.
[28] 44 U.S.C. 3301.
[29] The final rule for the West Coast groundfish fishery requires that data be stored for three years. See 50 C.F.R. § 660.603(m)(6).
[30] Brett Alger, Third-Party Minimum Data Retention Period in Electronic Monitoring Programs for Federally Managed U.S. Fisheries (2020), https://www.fisheries.noaa.gov/webdam/download/105724046.
[31] *Id.*

Amount and Type of Data to be Stored

The amount of data required to be stored is critical for cost considerations as well. Storing summary data is significantly less expensive than storing photos or videos. Having a clear understanding of the goals of EM will help evaluate the tradeoffs associated with key program design choices, such as which data are stored. EM service providers are also experimenting with applying AI to identify relevant segments of the huge amount of mostly non-relevant video collected, removing the need for human reviewers to do this time-consuming task. Providers are also working to find ways to do some video processing on the vessel to reduce the amount of data to be transmitted, reviewed and stored, ultimately reducing the cost of EM programs.

Flexibility to Accommodate Data Transmission Innovations on the Horizon

Because new EM systems are coming on the market that can transmit data wirelessly, it is critical that outdated or overly prescriptive requirements are not locked into regulation. For example, the HMS program specifically requires fishermen to mail hard drives.[32] In contrast, the regulations for the Pacific groundfish fishery maintains the flexibility to allow systems that transmit data through cellular or satellite networks, as well as the more traditional hard drives.[33]

[32] 50 C.F.R § 635.9(e)(4).
[33] 84 Fed. Reg. 31149.

Data “Ownership,” Access, and Control

Although many stakeholders refer to who “owns” the data collected via EM/ER, legal ownership of data is a matter of intellectual property and contract law principles and, where applicable, specific data privacy laws. However, these legal norms do not apply readily to EM/ER data. For example, copyright law does not protect information, but only specific, non-obvious arrangements of information (and even then, only from copying of the entire unique arrangement and not the information itself).[34,35]

Instead of focusing on “ownership” of EM/ER data, the key question is who has the right to use and control those data. In the absence of specific statutory or regulatory directives regarding the collection and use of the data, those questions are usually and most effectively addressed via contract between the collecting, managing, and other interested parties.

Without an agreement between parties, the norm is generally “whoever has it can use it” when it comes to data. For example, if captains collect data and then transfer it to another entity (private or public) absent an agreement, that transferee would then control who gets to use and access the data. Who paid for the device that collected the data or where it was collected (e.g., “my boat, my data”) does not control in the absence of contractual arrangements or specific guidance in laws or regulations. Therefore, it’s important to clearly define access and control needs via a binding legal agreement, which may take the form of contract or regulation.[36]

The nature of that agreement depends on the goals of the monitoring program. For example, if captains are transmitting data to a private third-party, the agreement should spell out whether the compiler must transmit the data and/or any product that is made from it (such as a map) back to the captains. Clearly articulated agreements can help all parties meet their needs in both the short and long term.

[34] Cornell University, Introduction to intellectual property rights in data management, Research Management Service Group, https://data.research.cornell.edu/content/intellectual-property (last visited Apr. 28, 2020).
[35] Despite the lack of a legal foundation for fisheries data ownership, NMFS asserts in the final rule for West Coast Groundfish that it “considers EM data and related records that a vessel owner stores with its EM service provider as owned by the vessel owner.” 84 Fed. Reg. 31152.
[36] Any entity in possession of the data generally would be obligated to release certain data in the event of a subpoena or other legal process, but in such circumstances, courts may impose limitations on what data is released and how such data can be used in order to protect confidentiality, depending on the nature of the data and the applicable state and federal laws governing the release of the data.

Data Confidentiality and Sharing

Data Confidentiality per the Magnuson-Stevens Act and Other Policies

Guidance on data confidentiality comes from the MSA, existing regulations, and interpretive documents. However, the current policies governing data confidentiality lack consistency and clarity, and many of these policies were crafted years before an EM pilot even hit the water. The main issues include a lack of clarity on the types of data subject to MSA confidentiality provisions, how these provisions apply to third-party providers, and cumbersome policies on data sharing.

This current definition of "observer information" in the MSA explicitly includes "any information" from an electronic monitoring system, which can include video, still images, and tabular data.[37] The Secretary must maintain the confidentiality of any observer information except in an "aggregate or summary form that does not directly or indirectly disclose the identity or business of any person who submits such information"[38] and a few other exceptions discussed below (see Appendix 6). However, this definition was created before any EM program had been fully implemented on the water. From this definition and the existing provisions, it is unclear whether the entire raw video footage is subject to MSA confidentiality requirements or just applicable video clips or processed data from the video footage (i.e., tabular data).

In addition, neither the statute nor any regulations address third-party companies, so it is not clear how exactly the existing statute applies to them. Because "observer information" includes data from EM systems that must be kept confidential, one could conclude that third-party providers must abide by the confidentiality requirement of the MSA. However, in the final rule in the West Coast groundfish EM Program, NMFS clarified that an EM service provider and its employees may release a vessel's EM data and related records to other persons if authorized by the vessel owner or their authorized representative.[39] By allowing this release, it appears that the agency has interpreted that the MSA data confidentiality provision does not apply to third parties in this context.[40]

Another important aspect of the MSA confidentiality provision is how, when, and with whom data can be shared. As mentioned, the MSA stipulates that observer information is confidential, and, as with other types of confidential data and information, cannot be shared. There are a few exemptions under which disaggregated data and information submitted to the agency can be disclosed, including if required by a court order or as authorized by the person submitting the material. Otherwise, data are generally not shared outside NMFS offices unless three or more records can be aggregated within a certain spatial and temporal level to disguise individual "identity or business" details such as fishing locations. This practice is known as "the rule of three." Often, data is only shared at a much higher level, such as annual landings data across ports and fisheries.

[37] 16 U.S.C § 1802.
[38] 16 U.S.C § 1881a(b)(3).
[39] 50 CFR § 660.603(n)(3).
[40] However, EM service providers must show that they have polices for data access, handling, and release in order to receive a permit to operate. 50 C.F.R. § 660.603(b)(1)(vii).

The existing policies for data sharing affect the agency and other collaborators such as NMFS consultants, state partners, and fishermen who want access to their own data to participate in cooperative projects. Under existing language, data must be kept confidential except "when the Secretary has obtained written authorization from the person submitting such information to release such information to persons for reasons not otherwise provided for in this subsection, and such release does not violate other requirements of this Act."[41] To gain access to data, state partners, contractors, and fishermen must sign nondisclosure agreements or set up Memoranda of Understanding (MOUs) to work with individual records, such as landing receipts. In practice, executing such agreements to share data with states, contractors for NMFS, and fishermen has proven to be challenging and cumbersome.[42,43]

In addition, NMFS goes to significant lengths to comply with the rule of three. Some argue that the costs of this policy may exceed the benefits, not only for managers but also for fishermen. In a paper assessing data privacy and confidentiality, two advocates state, "In the near future, real value of fisheries data will not come from simply hoarding that data to protect prior year fishing locations, but instead in being able to interpret the data to better plan future year hauls in a way that maximizes profits (i.e., fish out of the water) and minimizes expenses (e.g., fuel costs, trip days)."[44] Other approaches may be available to protect fishermen privacy and confidential business information while meeting modern day fisheries data needs.

Updating the MSA confidentiality provision and producing new implementing regulations would provide more certainty and clarity for EM stakeholders. An assessment from a third-party agency (such as the Government Accountability Office) could also shed light on how current practices can be improved. These assessments can also provide relevant examples of best practices from other agencies/sectors that collect, use, and store confidential data such as the National Institutes of Health, the Internal Revenue Service and the Department of Agriculture. This study, together with extensive dialogues with fishermen, technology providers, NGOs, scientists, state representatives, and others could help pave the way to more effective data confidentiality policies and practices.

[41] 16 U.S.C. § 1881a(b)(1)(F).
[42] Magnuson-Stevens Act: Hearings on the Reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act: Fisheries Science Before the Subcomm. on Oceans, Atmosphere, Fisheries, and Coast Guard of the S. Comm. on Commerce, 115th Cong. 2 (2017) (statement of Karl Haflinger, Sea State, Inc.).
[43] Matt Merrifield et al., eCatch: Enabling Collaborative Fisheries Management with Technology, 52 Ecological Informatics 82 (2019).
[44] Monica Medina & Scott Nuzum, Electronic Reporting and Monitoring in Fisheries: Data Privacy, Security, and Management Challenges and 21st-Century Solutions 49 Envtl. L. Rep. News & Analysis 10670, 10696 (2019).

Data Sharing per the Freedom of Information Act

The Freedom of Information Act (FOIA) is also important to consider in relation to EM video, photos, and other data. Under FOIA, any person can request the right to access existing, unpublished agency records on any topic. However, the law specifies nine categories of records that may be exempted from disclosure. At least three of the exemptions may apply to fisheries data. These include Exemption 3 for information that is prohibited from disclosure by another federal law, Exemption 4 for trade secrets or commercial or financial information that is confidential or privileged, and Exemption 6 for information that would invade another individual's privacy.[45,46] Disputes over the accessibility of requested records are often addressed by federal courts.

When considering releasing information under FOIA, the interpretation of information deemed to be "agency records" is important. While FOIA does not define "agency records," the courts have made case-by-case determinations through a two-part test. Agency records are 1) either created or obtained by an agency and 2) under agency control at the time of the FOIA request. When determining whether any agency exercises "control" over a record, courts have identified four relevant factors: the intent of the record's creator to retain or relinquish control over the record; the ability of the agency to use and dispose of the record as it sees fit; the extent to which agency personnel have read or relied upon the record; and the degree to which the record was integrated into the agency's recordkeeping system or files.[47] Given these court interpretations, EM data, including video, photos, and summary data, could be subject to release under FOIA. The possibility of video footage or photos being released to the public in a way that casts the fishing industry in a negative light is one reason some fishermen are hesitant to adopt EM.

Under FOIA, the burden of proof to access government information follows a "right to know" principle where the federal government must prove that there is a need to keep the information secret. In instances when full disclosure is not possible, agencies must also consider whether partial disclosure of the information is possible and take reasonable steps to release information not subject to any exemptions. For example, if an entity requests access to data, NMFS could choose to provide still shots of a video and redact parts of the imagery. Establishing guidelines for how the agency will respond to FOIA requests that include privacy safeguards (e.g., redacting parts of images, blurring faces in photo/video data, removing sound files associated with videos, etc.) could help to ease fishermen concerns.

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[45] 5 U.S.C. § 552(b)(1)-(9).

[46] Individual fishermen have expressed concerns that having cameras onboard where they work/live is an invasion of privacy. While this white paper does not address the legal background and policies related to privacy specifically, building in appropriate privacy safeguards for fishermen is important to consider when designing EM programs. *See supra* note 44 for more background and analysis on privacy issues and EM programs.

[47] U.S. Dep't. of Justice, Treatment of Agency Records Maintained For an Agency By a Government Contractor for Purposes of Records Management, OIP Guidance (Aug. 22, 2014), https://www.justice.gov/oip/blog/foia-post-2008-summaries-new-decisions-july-2008.

Data Confidentiality per the MMPA

The MMPA also applies to fisheries management and therefore needs to be considered when developing EM/ER programs. The MMPA includes several data provisions that may have implications for EM/ER programs. The MMPA requires a specific level of monitoring (between 20 and 35 percent) of fishing operations in fisheries with frequent incidental takings of marine mammals. It also allows for the Secretary of Commerce to establish an "alternative observer program," which could include direct observation of fishing activities from vessels, airplanes, or points onshore. The data collected through this monitoring—and as required by several other parts of the Act—shall remain confidential and can only be disclosed to relevant federal, State or tribal employees when there is an agreement, when it is required by court order, or the data is given to Regional Fishery Management Council employees. Like the confidentiality provision in the MSA, NMFS is required to publicly release information in aggregate, summary, or other form which does not directly or indirectly disclose the identity or business of any person.[48]

[48] 16 U.S.C. § 1383a.

Modernizing Information Systems

The successful implementation and operation of EM/ER programs depends on effective data governance more broadly at NMFS, including a modern information infrastructure and workforce, as well as the ability to assess and adopt innovative tools and technologies across the agency. The management of many U.S. fisheries still relies on inadequate data availability, outdated and fragmented data management systems, and legacy systems not designed to meet current objectives.[49] Updates to internal practices and processes, expanded and enhanced information technology and management capacity, and upgrades to existing information systems would help the agency unlock additional value. These updates can turn data into actionable information by improving the timeliness, availability, efficiency, and power of data systems, enabling policymakers to meet today's fisheries management and science needs.

In September of 2019, the NMFS Office of Science and Technology conducted a workshop with the goal of building consensus on fishery information management challenges and developing recommendations to strategically modernize their information systems. They convened 75 subject experts to critically examine integrating and streamlining NMFS's fishery-dependent and fishery-independent data, as well as the information flow processes of all NMFS fishery, environmental, and socioeconomic data.[50]

The recommendations developed during the workshop will help NMFS make significant progress in modernizing its information systems. The actions identified by the participating subject experts focus on four key areas: 1) providing sound data governance, 2) coordinating the development and adoption of policies and procedures (including topics discussed in this paper like data confidentiality), 3) modernizing NMFS's information management workforce, and 4) facilitating the development and application of state-of-the-art technologies.[51] Congress can support the implementation of these recommendations by providing robust funding for data modernization efforts, as well as for efforts to implement EM/ER programs.

[49] Fishing Data Innovation Taskforce, Improving Net Gains: Data Driven Innovation for America's Fishing Future (2017), https://fishingnetgains.files.wordpress.com/2017/05/netgainsreport-rv-singlepages_lowres.pdf.
[50] NOAA, NOAA Fisheries Information Management Modernization Workshop Summary and Next Steps (2019).
[51] Fisheries Information Management Modernization, Fisheries Information Management Modernization Workshop Recommendations (2020).

Conclusion

The successful implementation of EM/ER programs will depend on whether they can help the agency meet fisheries science and management goals in a cost-effective way that also incentivizes fishermen to be active participants. Well-designed policies and programs can help reduce monitoring costs while meeting agency obligations and fostering innovation. Clear policy on issue areas such as data storage requirements, data confidentiality, and data sharing could help managers when designing and implementing EM/ER programs. In addition, performance standards at the national level may facilitate the more rapid development of EM programs in the regions and warrant further exploration in collaboration with EM service providers and fishermen. By implementing the key recommendations in this paper, the agency can move towards maximizing the value of fisheries data for the benefit of populations of fish, the marine environment, and those who depend on these resources.

Appendix 1: Types of Data Collected EM EFPs/Programs

Location	Species targeted	Gear	EM Approach	Program objective(s)	Data Collected
Atlantic and Gulf of Mexico	Swordfish, tuna (yellowfin and bigeye), mahi	Longline	Compliance monitoring (catch monitoring)	Validate logbooks to verify Atlantic bluefin tuna catch; ensure that retained shortfin mako sharks are dead at haulback	Monitor and verify bycatch of Atlantic bluefin tuna, compliance with shortfin mako shark regulations, effort data
Hawaii	Swordfish, tuna	Longline	Compliance monitoring (catch monitoring)	Validate logbooks	Interactions with protected species, counts of target species/bycatch and release condition
West Coast	Groundfish	Trawl, Fixed gear	Compliance monitoring (catch monitoring)	Validate logbooks; verify max retention requirement	Total catch and discards by species, confirm fishing only in legal areas, verify maximized retention of catch
New England	Groundfish	Trawl, gillnet	Compliance monitoring (catch monitoring)	Validate logbooks	Total catch and discards by species, length estimates for discarded fish

New England, Mid-Atlantic	Herring, mackerel	Midwater trawl	Compliance monitoring and catch accounting	Compliance with discarding rules, catch retention, full catch accounting	Total catch and discards by species, confirm catch retention for portside sampling, and verify compliance with slippage restrictions
Alaska	Halibut, sablefish, Pacific cod	Fixed gear (longlines and pots)	Catch accounting	Provide independent estimates of catch amounts and composition	Total catch and discards by species
Alaska	Groundfish	Trawl, catcher/processor	Compliance monitoring	Ensure catch is not sorted and scales aren't tampered with	Video/digital imagery and sensor data to provide surveillance of catch and equipment
Alaska	Bering Sea/Aleutian Island pollock	Trawl, catcher/processor or during offload	Compliance monitoring	Verify that salmon bycatch has been sorted and store properly	Confirmation of compliance with sorting and storage requirements
Alaska	Central Gulf of Alaska Rockfish	Trawl, catcher vessel	Compliance monitoring	Ensure catch is not sorted	Confirmation of compliance with sorting requirements

Appendix 2: Regulations for EM Programs in the United States

Region	Program	Status	Fishery Amendment	Link to Regulations
Atlantic and Gulf of Mexico	HMS	Final rule	Amendment 7 to the HMS FMP	https://www.govinfo.gov/content/pkg/FR-2014-12-02/pdf/2014-28064.pdf
North Pacific	Bering Sea/Aleutian Island Groundfish	Final rule	Amendment 114 to the BSAI Groundfish FMP	https://www.federalregister.gov/d/2017-16703
North Pacific	Bering Sea/Aleutian Island Groundfish (Chinook salmon bycatch in BSAI pollock fishery)	Final rule	Amendment 91 to the BSAI Groundfish FMP	https://www.federalregister.gov/d/2010-20618
North Pacific	Gulf of Alaska groundfish	Final rule	Amendment 104 to the GOA Groundfish FMP	https://www.federalregister.gov/d/2017-16703
North Pacific	Bering Sea/Aleutian Islands longline (catcher/processor) Pacific cod	Final rule	Rule that modifies equipment and operational requirements for C/Ps named on License Limitation Program (LLP)	https://www.federalregister.gov/d/2012-23721

North Pacific	Bering Sea/Aleutian Island and Gulf of Alaska groundfish (A80 sector, BSAI trawl limited access sector, CDQ sector)	Final rule	Halibut deck-sorting monitoring requirements on trawl catcher/processors	https://www.federalregister.gov/documents/2020/01/28/2020-00712/fisheries-of-the-exclusive-economic-zone-off-alaska-halibut-deck-sorting-monitoring-requirements-for
U.S. Mid-Atlantic	Herring and mackerel	Operating under an EFP	Proposed rule as part of industry-funded monitoring joint amendment	https://www.federalregister.gov/documents/2018/11/07/2018-24087/magnuson-stevens-fishery-conservation-and-management-act-provisions-fisheries-of-the-northeastern
Pacific	Groundfish	Final rule	Part of Amendment 20 and 21 of the Pacific Coast Groundfish FMP	https://www.federalregister.gov/documents/2019/06/28/2019-13324/fisheries-off-west-coast-states-pacific-coast-groundfish-fishery-electronic-monitoring-program

Appendix 3: The FRA and EM Video Data Storage

The FRA regulates the management of data by federal government agencies. Pursuant to P.L. 113-187, “federal records” are defined in 44 U.S.C. §3301:

> “Records includes all recorded information, regardless of form or characteristics, made or received by a Federal agency under Federal law or in connection with the transaction of public business and preserved or appropriate for preservation by that agency or its legitimate successor as evidence of the organization, functions, policies, decisions, procedures, operations, or other activities of the Government or because of the informational value of the data in them.”[52]

In November 2014, the Presidential and Federal Records Act Amendments of 2014 was signed into law by President Barack Obama. The act expressly expands the definition of federal records to include electronic records, which was the first change to the definition of "Federal record" since the enactment of the act in 1950. Recorded information is defined as “all traditional forms of records, regardless of physical form or characteristics, including information created, manipulated, communicated, or stored in digital or electronic form.”[53]

The broad definition of federal records means that the federal government manages a massive amount of records. The FRA requires the “head of each Federal agency” to “make and preserve records containing adequate and proper documentation of the organization, functions, policies, decisions, procedures, and essential transactions of the agency.”[54] The agencies create a records schedule in consultation with NARA, which includes mandatory instructions for the disposition of records (including the transfer of permanent records and disposal of temporary records) when the agency no longer needs them. All federal records must be included in either an agency schedule or a General Records Schedule.[55] According to federal regulation, an agency can create new or amend existing record items. To do this, NMFS completes Standard Form (SF) 115,[56] a short form requiring the description of the item and proposal for its disposition (i.e., storage requirement).[57]

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[52] 44 U.S.C. § 3301.
[53] *Id.*
[54] *Id.*
[55] 44 U.S.C. § 3303.
[56] U.S. National Archives and Records Administration, Standard Form (SF) 115, Federal Records Management (Feb. 27, 2018), https://www.archives.gov/records-mgmt/policy/standard-form-115.html.
[57] 36 C.F.R. § 1225.12.

Appendix 4: NARA Data Storage Requirement for EM Data - Chapter 1500 – Fishery and Living Marine Resource Functional Files [58]

Observer information is included in Chapter 1500 (Fishery and Living Marine Resource Function Files) of NOAA's Records Schedules. Since observer information, as defined by the MSA, includes video data collected by EM systems, the agency considers this data to pertain to the series 1513-10(c), which is required to be retained indefinitely. Data from EM programs would include raw video footage, so storing these data indefinitely would contribute high costs that would continue to grow as more EM programs come online.

Series #	Records Series Title	Records Description	Disposition Authority	Disposition Instruction
1513-10	Observer Program Files.	Reports, correspondence, and other documents relating to the number of observers in 31 regions, the adequacy of coverage, and similar subjects pertaining to the maintenance and review of an observer network.		
		a. Domestic Observer Program.	N1-370-90-003 (12/9/92)	TEMPORARY. Destroy when six years old.
		b. Foreign Observer Program Records.	N1-370-90-003 (12/9/92)	TEMPORARY. Destroy when ten years old.
		c. Observer Notebooks, Logs, and Reports.	N1-370-90-003 (12/9/92)	PERMANENT. Cut off files annually and transfer to FRC when three years old. Transfer to the National Archives when 20 years old.

[58] NOAA, NOAA Records Schedules Chapter 1500 – Fishery and Living Marine Resource Functional Files (2018), https://www.corporateservices.noaa.gov/audit/records_management/schedules/chapter-1500-marine-fisheries.pdf.

Appendix 5: Data Confidentiality as Defined by the MSA and Regulations

NMFS's guidance on data confidentiality comes from the MSA, existing regulations, and interpretive guidance. The MSA sets forth information confidentiality requirements in section 402(b), 16 U.S.C. 1881a(b). Under the amended Act, the Secretary must maintain the confidentiality of any information submitted in compliance with the Act and any observer information. The MSA includes exceptions to these confidentiality requirements. Some exceptions allow for the sharing of confidential information with specified entities such as federal, council, and state employees and in specific instances (e.g., under a court order, for verifying catch under a limited access privilege program, pursuant to written authorization, etc.).

Largely, the confidentiality requirements were designed to protect information related to the locations of fishermen's preferred fishing grounds, which is regarded as a trade secret. The public can know who owns a vessel, but not the details of a fisherman's catch, such as what, when, or where. The MSA authorizes the Secretary to disclose information that is subject to the Act's confidentiality requirements in "any aggregate or summary form which does not directly or indirectly disclose the identity or business of any person who submits such information."[59]

In 2006, the definition of observer information was amended to account for information collected by electronic monitoring. In 16 U.S.C. 1802 §3, "observer information" is defined as "any information collected, observed, retrieved, or created by an observer or electronic monitoring system pursuant to authorization by the Secretary, or collected as part of a cooperative research initiative, including fish harvest or processing observations, fish sampling or weighing data, vessel logbook data, vessel or processor-specific information (including any safety, location, or operating condition observations), and video, audio, photographic, or written documents." By including information collected by EM systems in this definition, these data must then be treated as observer information, making them subject to the same confidentiality requirements.

Data confidentiality is also addressed in regulations that were drafted long before the 2006 reauthorization. Part 600 regulations in Subpart E describe the types of statistics covered, requirements for the collection and maintenance of statistics, entities eligible for access, controls for safeguarding data, and the release of data.[60] These regulations establish several restrictions and requirements for data access. States cannot access data unless the agency issues a finding that the state has "confidentiality protection authority comparable to the Magnuson Act…"[61] The regulations also do not allow members of Council advisory groups to access confidential data, with the explanation that these groups constitute fishermen who could gain a competitive advantage from access to the data.[62,63]

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[59] 16 U.S.C. 1881a(b)(3).
[60] 50 C.F.R. §600.405-425
[61] 50 C.F.R. §600.415.
[62] 50 C.F.R. §600.425(c).
[63] Monica Medina & Scott Nuzum, Electronic Reporting and Monitoring in Fisheries: Data Privacy, Security, and Management Challenges and 21st-Century Solutions 49 Envtl. L. Rep. News & Analysis 10670, 10686 (2019).

NMFS also relies on the National Oceanic and Atmospheric Administration (NOAA) Administrative Order 216-100, which was created more than twenty-five years ago. It prescribes policies and procedures for protecting the confidentiality of data, informs authorized users of their obligations for maintaining the confidentiality of data received by NMFS, provides for operational safeguards to maintain the security of data, and states the penalties provided by law for disclosure of confidential data.[64] Like the Part 600 regulations, these policies have not been amended since the 2006 reauthorization and lack consistency with the rule of the three (described below), which attempts to protect confidential business information. Conversely, according to the Administrative Order, "individual identifiers shall be retained with data, unless the permanent deletion is consistent with the needs of NMFS and good scientific practices."[65,66]

NMFS established the rule of three through an email sent by Ned Cyr, the Director of the Office of Science and Technology, on July 2, 2009, to NMFS science directors, regional administrators, and office directors. In this policy, information can only be released if there are at least three participants in the fishery in the data set and it is aggregated/summarized at a temporal and spatial level to protect the identity of a person or a business and any business information. The release of information on the incidental takes of marine mammals or ESA-listed species was contingent on meeting an "information threshold." For information associated with the taking of an ESA-listed species or a marine mammal, there must be at least three participants in the relevant fishery.[67]

In 2012, NMFS sought to amend data confidentiality regulations to further limit the existing availability of fisheries information, a proposal that met with strong opposition from environmental NGOs and others.[68] The agency withdrew the rule in 2017, stating that they "would like to reevaluate the proposed revisions to the existing regulations governing the confidentiality of information submitted in compliance with the Magnuson-Stevens Act."[69]

[64] NOAA AO 216-100 (1994).
[65] NOAA AO 216-100 §4b.
[66] Monica Medina & Scott Nuzum, Electronic Reporting and Monitoring in Fisheries: Data Privacy, Security, and Management Challenges and 21st-Century Solutions 49 Envtl. L. Rep. News & Analysis 10670, 10688 (2019).
[67] Ned Cyr, NMFS Interim Guidance on Data Confidentiality, Email (July 2, 2009).
[68] 77 Fed. Reg. 30486.
[69] NOAA, Confidentiality of Information; Magnuson-Stevens Fishery Conservation and Management Reauthorization Act; Withdrawal, regulations.gov (Jan. 13, 2017), https://www.regulations.gov/document?D=NOAA-NMFS-2012-0030-0055.