Five Recommendations for Better Utilizing VMS Data to Enhance Fisheries Management

As the oceans become busier and climate change upends our expectations of stability, information about where and when fishing happens is vitally important. Location data is critical to achieving NMFS' fisheries conservation and management mission and for planning for a sustainable ocean future. However, there is limited spatial information on fishing areas to support science, management, and business; and data products that do exist are difficult to find and access.

NMFS should take proactive steps to improve the availability of spatial data about fisheries. In addition, managing data as an asset—a commitment of NOAA's Data Strategy–depends on making data findable, accessible, interoperable, and reusable.

The Net Gains Alliance (NGA) is a non-partisan initiative that supports modernizing fishery information systems. This report lays out recommendations for one source of spatial fisheries data: Vessel Monitoring Systems, or VMS. While the recommendations are our own, they are based on conversations with NMFS and Regional Fishery Management Council staff, researchers, and other partners in the fisheries community who use and understand the potential applications of VMS data products. Increasing the impact of VMS data requires both improving the VMS data program itself and improving the findability and accessibility of VMS data products by data users.

NGA is not advocating for greater access to real-time, individually identifiable location data used for enforcement and compliance purposes. NGA's recommendations support continuing to protect the identity of individual vessels and business entities required to provide VMS data, including guidance and safeguards to avoid unintended and inappropriate use of the VMS data. In all of our recommendations we are referring to increased accessibility of VMS *data products,* referring to data that has been synthesized, aggregated or edited, such as a map layer that shows fishing tracks from multiple boats across a fishing season, and never raw data.

Recommendations

1: NMFS should release summarized VMS data products publicly and regularly, as well as publishing metadata about available data and data products on platforms like InPort and noaa.data.gov.

2: NMFS' development of updated confidentiality rules and policies should support a more streamlined and functional data sharing process within the fisheries science and management community as well as public access to summarized VMS data products.

3: NMFS should develop a standardized request process for access-restricted VMS data products. Products should be provided with citation guidelines so VMS data products are properly credited in publications and presentations.

4: NMFS should support a community of practice for VMS data users both within NMFS and across the broader fisheries science and management community. This should include sharing code on sites like Github, developing best practices for data QA/QC, and methods for engaging industry to help ground-truth analyses.

5: In order to achieve these recommendations, NMFS should move the VMS Program from the NOAA Office of Law Enforcement to the NMFS Office of Science and Technology.

Recommendation 1

NMFS should release summarized VMS data products publicly and regularly, as well as publishing metadata about available data and data products on platforms like InPort and noaa.data.gov.

While not all fisheries use VMS, where VMS is used it provides a verifiable source of spatial data. Aggregated and summarized maps of VMS activity are already made public on platforms like the Marine Cadastre and the regional ocean data portals, but they are not updated on a regular schedule and those products are generally made on request, not through a standardized release and updating cycle from NMFS. When NMFS proactively provides data products, metadata, and product descriptions it establishes trusted data provenance and can clarify data limitations and use restrictions, if any. Posting data products to existing, well-used public platforms like noaa.data.gov (which pulls from InPort) improves findability and creates a single source of truth.

Recommendation 2

NMFS' development of updated confidentiality rules and policies should support a more streamlined and functional data sharing process within the fisheries science and management community as well as public access to summarized VMS data products.

Improved access to VMS data products could be facilitated through updated rulemaking[1] and policy guidance to clarify confidentiality procedures for data and information. The agency announced it intends to initiate a rulemaking process in mid-2023. The policy development phase following rulemaking will be a valuable opportunity to include data users and stakeholders in identifying the confidentiality issues that would benefit from further guidance, and the potential pathways for addressing each. Some topics may be appropriate for formal agency guidance through the Policy Directive System, while other issues could be explored effectively by NMFS supporting a stronger community of practice among VMS data users (Recommendation #4)

The current lack of clear, consistent guidance on acceptable procedures for meeting confidentiality requirements is an obstacle to wider use of VMS data products for fisheries science and management. Procedures are currently developed on a case-by-case basis, and interpretation may vary across regions, fisheries, and purposes. While some flexibility is appropriate to accommodate regional differences, the lack of consistent guidance can undermine the confidence of staff, analysts, and other research partners in working with VMS data and act as a deterrent to collaboration and data sharing.

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[1] In 2012 NMFS issued a proposed rule regarding confidentiality issues raised in the two most recent reauthorizations of the Magnuson-Stevens Act. However, the agency withdrew the proposed rule in 2017.

Greater consistency could also be a cost and time-saving measure. VMS data users describe developing confidentiality procedures for each data request (such as acceptable data visualizations) as a time-consuming process that may involve discussions among NMFS and Council staff, interdisciplinary Fishery Management Plan development teams, and multiple NOAA offices. Data users also identified opportunities for streamlining; for example, pre-authorizing a set of products or analyses to avoid the need for multiple data requests to accommodate small changes as a project evolves.

Recommendation 3

NMFS should develop a standardized request process for access-restricted VMS data products for fisheries scientists and managers. Products should be provided with citation guidelines so VMS data products are properly credited in publications and presentations.

NMFS' Office of Law Enforcement (OLE) controls VMS data access and handles all requests for data and data products. When NMFS staff need data access, they email the lead OLE staffer with an explanation of why the data are needed and how data will be used. Staff from other NOAA offices, such as the National Ocean Service, and staff from other federal agencies can also follow this process, as can agency staff from states with a joint enforcement agreement in place with NMFS. However, not all staff are aware of this process, and non-government data seekers including academic scientists not collaborating with a NMFS researcher, need to submit a request through the [Freedom of Information Act (FOIA) portal](#). This requires knowing that the data exist and enough about VMS data attributes to file a request. We heard most VMS data users find the process unclear, difficult and inefficient.

When data are provided, they may not be appropriately described or credited in work products, including scientific journals and conference presentations. This prevents NMFS from tracking the use and impact of VMS data products. Providing data users with citation guidelines would improve findability and reusability of data products that are released, because due to data sharing restrictions and bespoke nature of each externally shared VMS dataset, NMFS does not create Digital Object Identifiers (DOIs) or easily enable others to do so.

Recommendation 4

NMFS should support a community of practice for VMS data users both within NMFS and across the broader fisheries science and management community. This should include sharing code on sites like Github, developing best practices for data QA/QC, and methods for engaging industry to help ground-truth analyses.

To fully leverage the value of VMS data, NMFS should support a strong community of practice that encourages data users to share experience, build expertise, and capture institutional knowledge. This would also advance the agency's work to promote an institutional culture that values data access and usability. We heard multiple VMS data users express frustration that

there's not a clear pathway to share data best practices or reach out with questions. VMS is also more widely used outside of the United States. Connecting U.S. VMS data users with that network through codesharing platforms like Github allows them both to draw on that expertise and build capacity across coastal nations.

A strong community of practice can build trust in VMS data products by promoting transparency, consistency, and cross-regional sharing of research methods. We also heard VMS data users and fishing industry members emphasize the importance of context. VMS data is most useful in combination with other information sources, and interpreted in the context of how a specific fishery operates. VMS data contributors can provide that context, and industry knowledge can be used to groundtruth and build trust in methods and depictions of fishing effort.

NMFS already recognizes the value of formalizing communities of practice, for example by convening interdisciplinary Professional Specialty Groups to address fisheries-dependent data topics. The agency can support a VMS community of practice by providing resources (e.g., opportunities for virtual and in-person convenings) and by adopting practices that encourage collaboration. In our conversations, agency VMS data users identified the following practices they felt would support their work:

- More consistent use and adoption of Github across NMFS regions
- Sharing statistical packages for working with VMS data (we also heard staff may work in both SAS and R; it's helpful to have everything in both to help onboard new hires and transfer institutional knowledge)
- Sharing tools and approaches for visualizing data without revealing confidential data (also addressed under Recommendation 2)
- Providing resources to help onboard new hires, including providing tools and trainings to capture institutional knowledge and help onboard new hires

Recommendation 5

In order to achieve these recommendations, NMFS should move the VMS Program from the NOAA Office of Law Enforcement to the NMFS Office of Science and Technology.

The national VMS program is best suited to the Office of Science & Technology (OST), which is charged with ensuring the scientific basis for the agency's science programs and conservation and management decisions. While often viewed as an enforcement tool, VMS - like other data collection mechanisms including logbooks and permits - serves a science and management purpose in addition to supporting enforcement and compliance. Housing the VMS program within OST could facilitate the integration of data sources in service of NMFS' mission, and leverage OST's cross-office and external partnerships. There are no legal barriers that have been identified to transferring VMS program functions from OLE to OST.

Should NMFS pursue a relocation of the VMS program to OST, NGA encourages NMFS to release a transition plan that can be publicly discussed. Through our conversations with VMS

data users NGA identified several important issues that would benefit from further discussion and input from diverse perspectives including industry VMS data contributors.

Transition of functions

A transition of VMS program functions would need to meet the agency's dual needs of supporting OLE's enforcement mission, and supporting OST and approved VMS data users with data products in service of science and management. Timeliness is a key issue. While true real-time data access is rarely needed outside of homeland security purposes, law enforcement needs timely access to recent data (e.g. the previous day's data). For other purposes a longer lag of months or even years can be sufficient. A hybrid approach or handoff of responsibilities could be appropriate to meet each office's needs and implement practices for protecting sensitive data. NMFS should anticipate additional staff support will be needed to handle volume of data requests and navigate confidentiality requirements, particularly with the growing demands of offshore wind.

Retention of VMS data

A transition of VMS program functions could involve (would trigger the need to?) defining what data should be retained and for how long under the federal records schedule maintained by the National Archives and Records Administration. NGA heard from VMS data users that VMS data should be retained indefinitely or as long as possible, and that historical spatial data is important for understanding and anticipating impacts of climate change, as well as use for allocation decisions, stock assessments, and monitoring management programs and area designations over time. Long-term data retention also enables innovation, as new questions and uses for spatial data may emerge over time. While there is a cost to data storage, the volume of VMS data records is minimal, especially compared to records like electronic monitoring (EM) video. Some industry members have suggested a compromise, for example retaining individual vessel points and tracks for a period of time and aggregated data thereafter.

The future of VMS

As electronic technologies continue to evolve and provide multiple options for transmitting location data, it's important for NMFS to continually evaluate the role of VMS, to understand where this particular technology adds value as well as to enable innovation and avoid technical debt. Many VMS data users and contributors commented on the security of VMS (direct transmission to NMFS, can't be manipulated like AIS) as an advantage, and felt VMS will continue to be a valuable tool for this purpose. Planning for the future of VMS should also distinguish between the use of VMS for position reporting and the use of VMS for satellite submission of other forms like trip declarations, a legacy function that is becoming less necessary with other tech capable of satellite transmission.