NET GAINS ALLIANCE

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Current and Potential Use of VMS Data

Spatial information about economically and ecologically important fishing areas is critical to maintaining sustainable fisheries in a changing world. Fishing is one of many activities competing for ocean space. The National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service (NMFS) collects, provides, and uses spatial tracking data collected from commercial fishing vessels through Vessel Monitoring Systems (VMS). However, VMS data are difficult to access and underutilized as a result. If VMS data products were more widely available, they could provide valuable insights for management, conservation, business analytics, and science. The Net Gains Alliance recently released a set of recommendations and actionable steps the National Marine Fisheries Service could take to improve the findability and accessibility of VMS data products.

VMS data are primarily used to enforce management measures, such as time-area closures, and to manage and analyze fishing activity near sensitive and protected areas, like marine sanctuaries. Because fishing activity details can be interpolated from the time and location data, VMS data have also been used for broader fisheries monitoring, management, and research as well as safety at sea. VMS data can be used to support NMFS' operational needs, for example monitoring activity and arrivals in port to plan for sampling, supporting catch share programs, and tracking fishery observer placement.

VMS data provide vital insight into the decisions fishermen make in response to complex factors including management decisions, individual preferences, profitability and efficiency, weather, environmental and oceanographic conditions, and stock distribution. Observing how fishing fleets change target locations from month to month and year over year can illuminate how fisheries and communities may respond to change, including directional climate change impacts such as distribution shifts as well as short-term disruptions such as marine heat waves, oil spills, and harmful algal blooms. Spatial information about fishing effort helps assess the tradeoffs of different management measures and area restrictions and develop models to explore future scenarios and responsive management strategies.

Uses of VMS data products include:

- Fisheries management support: NMFS' Alaska Regional Office maintains a catch-in-areas database that links catch data from the region's Catch Accounting System with observer and VMS data for spatial analyses to support fisheries management.

- Economic analysis: The Rhode Island Department of Environmental Management's Marine Fisheries Division used VMS, VTR, and landings data to conduct a spatiotemporal and economic analysis of fishing activity in wind energy areas.[1]

- Siting ocean activities: VMS data can inform the siting of ocean activities to identify and minimize conflicts with areas that are important to fishing. NOAA used VMS data to identify potential Aquaculture Opportunity Areas in the Gulf of Mexico.[2]

- Evaluating the impact of management changes: VMS data can be used to assess changes in fishing behavior before and after the implementation of a change in management. Watson et al 2018[3] use VMS data to examine changes in fishing behavior and efficiency following implementation of a catch share program in the Gulf of Mexico.

- Understanding the impacts of disruption: VMS data can help evaluate and model the impacts of environmental disruption to fisheries and communities. Cockrell et al 2019[4] used VMS data to examine drivers of resilience of the commercial reef fishery impacted by closures related to the Deepwater Horizon oil spill, and Berenshtein et al 2019[5] used VMS as part of a spatial examination of how future oil spill closures could impact fishery-dependent communities.

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[1] Livermore J. 2017. Spatiotemporal and economic analysis of vessel monitoring system data within wind energy areas in the Greater North Atlantic. Providence (RI): Rhode Island Department of Environmental Management Division of Marine Fisheries. http://www.dem.ri.gov/programs/bnatres/fishwild/pdf/RIDEM_VMS_Report_2017.pdf.

[2] Riley KL, Wickliffe LC, Jossart JA, MacKay JK, Randall AL, Bath GE, Balling MB, Jensen BM, Morris JA Jr. 2021. An Aquaculture Opportunity Area Atlas for the U.S. Gulf of Mexico. NOAA Technical Memorandum NOS NCCOS 299. 545 p. DOI:10.25923/8cb3-3r66

[3] Jordan T. Watson, Alan C. Haynie, Patrick J. Sullivan, Larry Perruso, Shay O'Farrell, James N. Sanchirico, Franz J. Mueter. Vessel monitoring systems (VMS) reveal an increase in fishing efficiency following regulatory changes in a demersal longline fishery. Fisheries Research, Volume 207, 2018, Pages 85-94, ISSN 0165-7836. https://doi.org/10.1016/j.fishres.2018.06.006.

[4] Marcy L. Cockrell, Shay O'Farrell, James Sanchirico, Steven A. Murawski, Larry Perruso, Andrew Strelcheck. Resilience of a commercial fishing fleet following emergency closures in the Gulf of Mexico. Fisheries Research, Volume 218, 2019, Pages 69-82, ISSN 0165-7836. https://doi.org/10.1016/j.fishres.2019.04.017.

[5] Berenshtein, I., O'Farrell, S., Perlin, N., Sanchirico, J. N., Murawski, S. A., Perruso, L., and Paris, C. B. Predicting the impact of future oil-spill closures on fishery-dependent communities—a spatially explicit approach. – ICES Journal of Marine Science, https://doi.org/10.1093/icesjms/fsz138

- Examining tradeoffs: VMS data can provide deeper insight into the conflicts and tradeoffs across conservation and management objectives. Samhouri et al 2021[6] used VMS data to consider the overlap of Dungeness crab fishing activity with habitat utilization and distribution of whales on the west coast during marine heat wave events, and the potential for management strategies to mitigate conflict.

- Augmenting other fishery-dependent data sources: VMS data can be used to fill data gaps, calibrate, and test assumptions about other fishery-independent data streams including observer and AIS data. Suter et al 2021[7] used VMS data to develop an approach to identify (and thus possibly correct for) differences between observed and unobserved trips in partial observer coverage fisheries.

[6] Samhouri JF et al. 2021. Marine heatwave challenges solutions to human–wildlife conflict. Proc. R. Soc. B 288: 20211607. https://doi.org/10.1098/rspb.2021.1607

[7] Jenny M. Suter, Robert T. Ames, Brett Holycross, Jordan T. Watson. Comparing observed and unobserved fishing characteristics in the drift gillnet fishery for swordfish. Fisheries Research, Volume 256, 2022, 106456. https://doi.org/10.1016/j.fishres.2022.106456.