

FishLAT (Fisheries Location Assessment Technology): Approaching the Offshore Energy Transition from a Fisheries Perspective

FishLAT (Tecnología de valoración de ubicación pesquera): Acercarse a la transición energética en alta mar desde una perspectiva pesquera

FishLAT (Technologie d'évaluation de la localisation des pêches): Aborder la transition énergétique offshore du point de vue de la pêche

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EXTENDED ABSTRACT

The Gulf of Mexico (GOM) has become the flagship for offshore energy development with hundreds of oil and gas platform (O&G) installations and concurrent decommissioning operations occurring in both federal and state waters. Over time, many of these structures have developed thriving reef ecosystems that provide habitat for commercially valuable fish species and a critical resource for fisheries across the northern GOM. However, as society begins to shift away from petroleum-based energy and towards renewables, offshore O&G platforms are either removed or repurposed as reefs; and at the same time, Wind Energy Areas (WEA) have been identified for the installation of offshore wind turbines in the GOM – all with significant impacts to fisheries.

The anticipated removal of O&G platforms, as well as the upcoming installation of offshore wind turbines, has created uncertainty in how the loss or gain of artificial reef habitat will affect marine ecosystems and fisheries resources. For example, traditional decommissioning involves the complete removal of platform infrastructure from the seafloor, resulting in loss of habitat and destruction of the marine ecosystems that have colonized the structure over its operational lifespan. In the early 1980s, concerns were raised regarding the potential negative implications that the removal of these structures could have on fisheries stocks.

In response to these concerns, the Bureau of Safety and Environmental Enforcement (BSEE) and the National Marine Fisheries Service (NMFS) initiated several studies whose objectives were to develop a national policy that recognized O&G platforms as artificial reef habitat. With the establishment of a reef-permitting system, decommissioned O&G platforms could be transformed into artificial reefs through the Rigs to Reefs (RtR) program. RtR is a process whereby O&G companies may choose to modify a platform so that it may continue to support marine life as an artificial reef. However, not every platform makes a good RtR candidate. Considerations for the platform's location, water depth, stability, structural complexity, and age, among other features, (e.g., implications to stakeholders), must be assessed on a case-by-case basis to holistically determine the reefing viability of any platform candidate.

FishLAT, Fisheries Location Assessment Technology, is a web-based spatial planning tool that identifies and assesses the impacts that the removal, reefing, or installation of offshore energy infrastructure will have on marine ecosystems and ocean stakeholders, like fisheries. Currently, FishLAT is focused in the GOM, where offshore O&G development and decommissioning is occurring at one of the highest rates in the world. FishLAT's data sources consist of the most recent scientific studies, open and closed-source data, and partnerships with the National Oceanic and Atmospheric Administration (NOAA), Louisiana Department of Wildlife and Fisheries (LDWF), Global Fishing Watch (GFW), and LGL Ecological Research Associates to obtain fisheries data and platform-specific fish abundance and presence data (n = 60) (Galloway et al. 2021).

Fish presence data were used to obtain metrics like probability of species presence and species richness estimates on O&G platforms across the northern GOM. The counts of species observations in the platform dataset were converted to presence (1) and absence (0) for each respective species. Given the binary form of the dependent variables, a logistic model was developed to predict the probability (or likelihood) of occurrence at platform locations without species observations (Beger & Possingham 2008). To ensure a more robust model outcome, the logistic regression model was applied to only those species that had at least 15 occurrences across the 60 platforms in the dataset. There were 17 species that met this qualification.

Building on previous studies which estimated species richness (Dai et al. 2020), a Generalized Linear Model (GLM) with a Poisson distribution was developed and applied to the presence data. The species-specific presence estimates were modeled using Logistic regression to account for the bimodal structure of the data (Lewis et al. 2019). All models were developed in Python and implemented using the GLM and Logistic functions from the Statsmodel library. Second, a receiver operator curve (ROC) for each species was also generated along with a calculated area under the curve (AUC)

value. The ROC is another performance metric that indicates how well the model does at separating the two classes (0, 1) in the data. Finally, species-specific likelihood predictions were made at each platform using the respective species models. The predictions were left as likelihoods (probabilities) of occurrence to be integrated into FishLAT's models.

To quantify fishing activity around O&G platforms, spatial models included hotspot analyses, space time pattern mining, and proximity analyses were conducted within 700 meters (m) of each platform. This distance was selected to include the area immediately surrounding the platform (< 500 m) as well as outside of the immediate area of the platform. Additionally, suitability modeling was conducted using model outputs from fisheries and ecological datasets to create the valuation criteria for each platform as a ranking of that platform's suitability as a RfR candidate. Once data were obtained and models were run, outputs were transformed into spatially explicit layers in GIS and converted for interactive mapping functionality within FishLAT's web-app.

On the FishLAT web-app, users can interact with platform-specific ecological and fisheries data, such as which economically valuable fish are likely to be present on a particular platform, where a platform is located in relation to other artificial reef sites, and what fisheries are operating near specific platforms in the GOM. Additionally, users may request a full report for a platform, which will include an evaluation of that platform's suitability as a reef site compared to surrounding habitats and other platforms. Ultimately, FishLAT ensures that regulators, operators, and other ocean users have access to the best available science and data to help them make decisions regarding platform reefing or removal, and decisions on future wind energy development, siting and installation. Just as important, FishLAT also highlights existing data gaps and therefore serves to inform regulators of future studies that may improve our understanding of platform ecology and mitigative solutions to environmental impacts.

KEYWORDS: Rigs to Reefs, Fisheries, Offshore Energy, Offshore Wind, Spatial Planning

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