Documenting Status and Mapping Suitability of Caribbean Moored Fish Aggregating Device (MFAD) Fisheries

Documentando el Estado y Mapeando las Oportunidades de las Pesquerías con Dispositivos Agregadores de Peces (DAP) en el Caribe

Documentation sur le Statut et Cartographie Opportunités de le Pêche DCP dans le Caraïbes

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EXTENDED ABSTRACT

Moored Fish Aggregating Device (MFAD) fisheries in the insular Caribbean have expanded dramatically over the past several decades. The use of MFADs has the potential to enhance fisher incomes, improve food security, and provide an alternative to less sustainable forms of fishing (Gentner et al. 2019, Bell et al. 2015, Taquet 2013). However, there are concerns regarding insufficient management, environmental impacts, and conflict among fishers due to the weak property rights assigned on the MFADs (Sadusky et al. 2018, FAO 2018, Guyader et al. 2017). As MFAD fisheries continue to be promoted and expand throughout the region, it is critical that we better understand the current status of Caribbean MFAD fisheries as well as the various factors that influence MFAD fishery success. This study addresses significant knowledge gaps around the growth of MFAD fisheries in the Caribbean and develops a framework for assessing the social and biophysical suitability of MFAD fisheries throughout the region.

From June of 2019 to present, we conducted a survey of fisheries officials and other key informants regarding the current status of MFAD fisheries across the Caribbean islands. Informants have provided estimates of current numbers MFADs, vessels engaged in MFAD fishing, and vessels engaged in all forms of artisanal fishing, as well as information regarding several components of MFAD regulations and enforcement. Figure 1 presents current estimates of MFAD numbers from our key informant interviews as well as gray literature in contrast to estimates reported in the WECAFC Fish Aggregating Device working group held in 2001 (FAO 2002). Both the number of islands engaged in MFAD fishing and the number of MFADs deployed among islands has increased dramatically within the past two decades.

In the second component of this study, we integrate social, ecological, and oceanographic datasets to evaluate the average cost of MFAD deployment, MFAD governance capacity, and potential nutritional benefits and market access of MFAD products. To calculate MFAD deployment costs we first conducted a spatial analysis that defined potential MFAD deployment areas based on depth, currents, distance from shore, shipping traffic, species distributions of *Thunnus alba-*

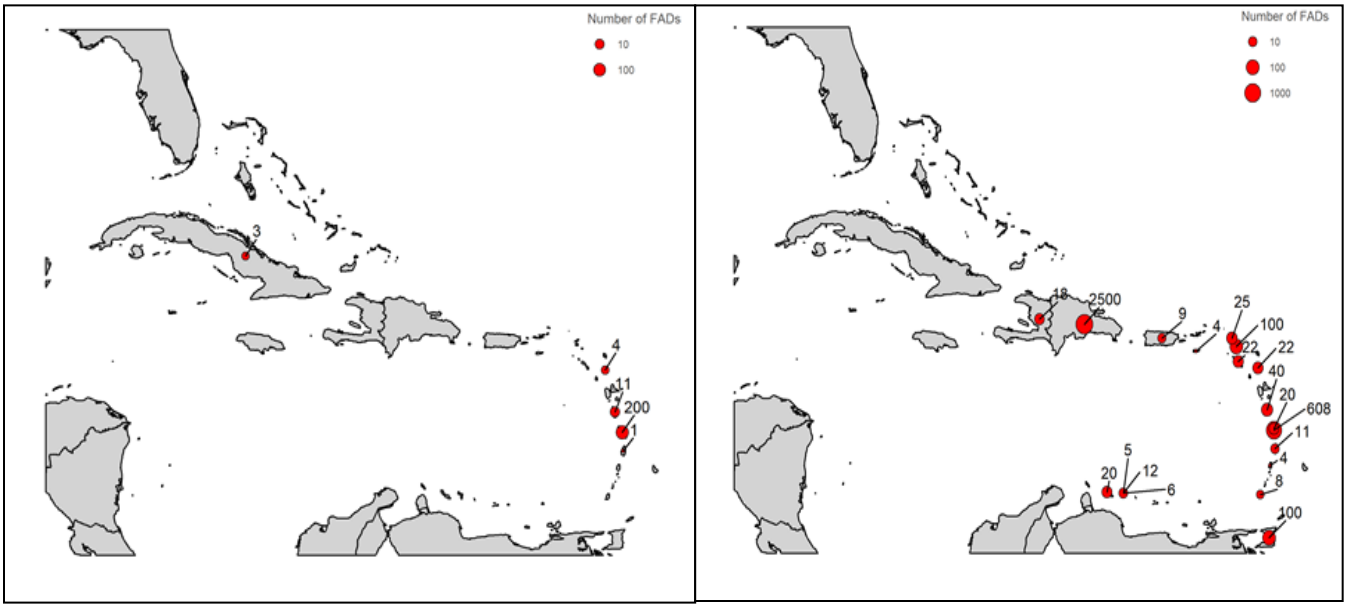

Figure 1. Estimated numbers of MFADs deployed across the insular Caribbean in 2001 (left) and 2019 (right).

cares, *Coryphaena hippurus*, and *Acanthocybium solandri*. Within these potential MFAD deployment areas, MFAD deployment costs in any given spatial cell were calculated based on fixed costs of anchor block and buoys and variable rope costs determined by depth and current. We used an IFREMER MFAD design with floating and sinking rope (Pers. Comm. Lionel Reynal, 2018), as these MFADs are considered relatively durable, and used material prices from Guadeloupe as a proxy for the rest of the region. The median of MFAD costs across spatial cells within an island's EEZ was used to estimate MFAD deployment costs for a given island.

To estimate MFAD governance capacity among islands, we first calculated an overall governance capacity score by averaging six World Governance Indicators (Kaufmann et al. 2010; www.govindicators.org). This indicator will eventually be averaged with an MFAD governance capacity indicator generated using our MFAD survey data, though at present our results only include governance estimates from WGI scores. To estimate market access, we averaged a domestic market and international market indicator (FAO 2017). Our domestic market indicator was generated by averaging annual tourist numbers (per Seigel et al. 2019) and annual imports of pelagic fish, both scaled from 0 to 1 before combining. Our international market indicator was generated using scaled annual exports of all fish products by island. Our nutrition potential score was calculated by averaging a seafood reliance indicator (percent of both calories and protein obtained from seafood sources; Smith et al. 2016,

https://dataverse.harvard.edu/dataverse/GENuS)

and a malnutrition indicator (scaled energy adequacy values for each island; FAO 2019).

Figure 2 presents the preliminary results of our cost, governance, market, and nutritional scores. As demonstrated here, most islands are considered to have medium-to-low governance capacity, with many of the low capacity islands also having relatively low biophysical costs to deploying MFADs. These islands are of particular concern

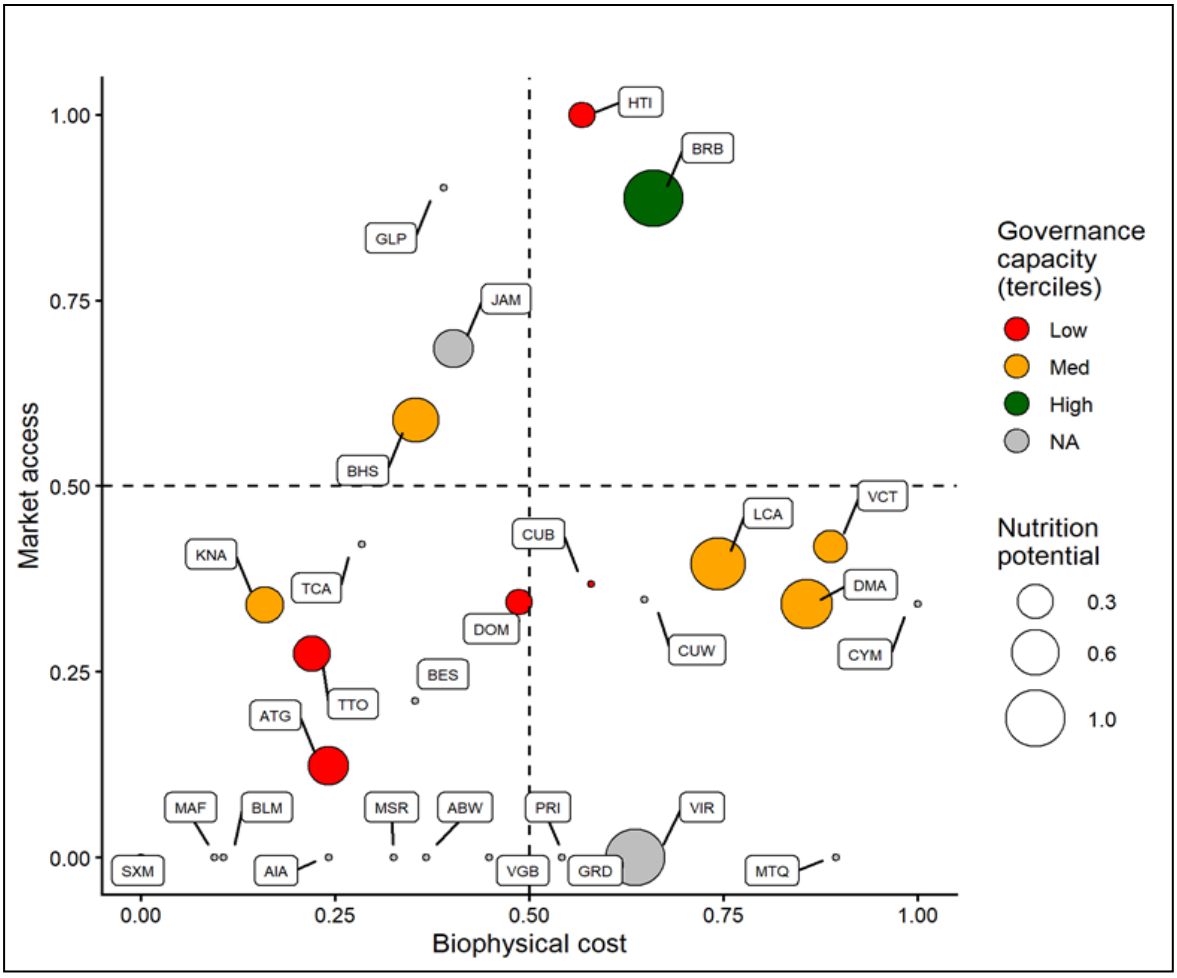

Figure 2. Preliminary results of MFAD deployment costs, market access, governance capacity, and nutrition potential across the insular Caribbean islands. Islands listed as having 0 market access are those without market access data, while those in gray or in the smallest size category are missing governance or nutrition data, respectively.

as they may be prone to developing unregulated MFAD fisheries. Market access appears relatively limited in many islands, suggesting increasing the marketability of products should be prioritized in ongoing and future projects. As MFAD fisheries continue to grow throughout the Caribbean, it is critical that we assess and optimize local biophysical, governance, market, and nutritional conditions to ensure responsible and sustainable MFAD fishery development.

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