Caribbean FAD Fisheries: Status, Trends, and Drivers

Pesquerías de DAP en el Caribe: Estatus, Tendencias, e Incentivos

Le Pêche DCP dans le Caraïbes: Statut, Tendances, et Incitations

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EXTENDED ABSTRACT

The use of fish aggregating devices (FADs) in the Caribbean has increased dramatically in recent decades (Sadusky et al. 2018, CRFM 2015). Pelagic FADs, primarily used by industrial purse seine fisheries, have been promoted as a means to increase fishing efficiency and food security in developing areas and shift fishing pressure off of degraded inshore areas (Gentner et al. 2018, Mathieu et al. 2014). Moored FADs tend to be artisanal in nature and are used primarily by small-scale hook-and-line fishers. These moored FADs are common in the Greater Caribbean region, where they been adopted and have quickly proliferated in certain areas (Figure 1). For example, rapid adoption of FAD fishing has led to more than 400 estimated FADs deployed around the island of Guadeloupe (Guyader et al. 2017) and as many as 2500 off the southeastern coast of the Dominican Republic (Gentner et al. 2018). While FADs have been widely introduced across the Greater Caribbean, existing FAD fisheries vary dramatically even amongst neighboring islands in terms of participation, construction techniques, placement, longevity, fishing practices, and catch. Despite the recent expansion of Caribbean FAD use and current efforts to further promote them, there has been limited research investigating the extent of Caribbean FAD fisheries and the variation in these fisheries across islands.

In this study, we integrate gray literature, academic studies, and interviews to comprehensively document inter-island differences as well as temporal trends in FAD use and practices among islands in the insular Caribbean. We draw heavily on country- and program-level reports that have estimated FAD numbers, participation, and construction and deployment methods, and use key informant interviews to address gaps in available literature. Our review highlights the prevalence of

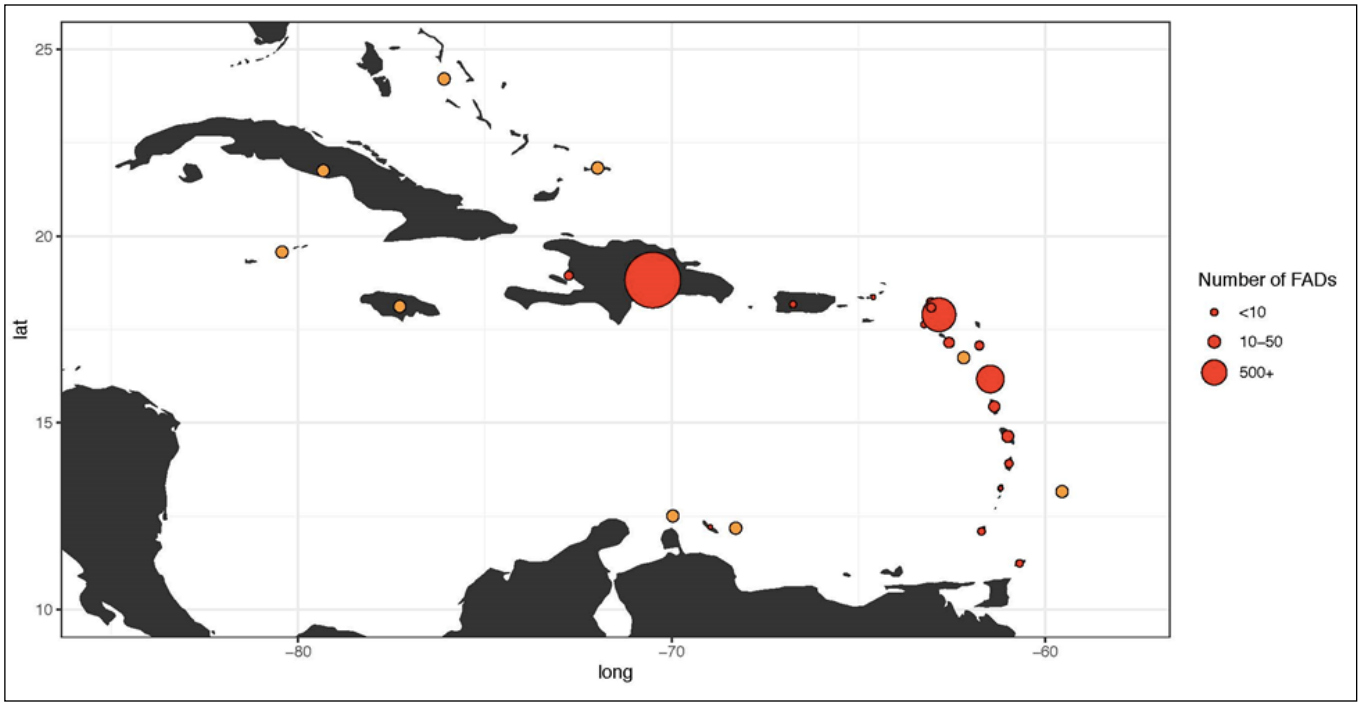

Figure 1. Map of estimated FAD prevalence throughout the Caribbean, as of 2018. Yellow dots represent islands with no known active moored FAD fishery as of 2018. Data are preliminary.

FAD use and diversity in FAD practices across the Caribbean region. While formal FAD introduction programs have been initiated across the region as early as the late 1960s, FAD adoption and growth has varied among islands. Existing FAD fisheries vary greatly in the total number of FADs deployed. For example, it is estimated that there are currently 4 FADs in Saint Vincent & the Grenadines (CRFM 2013) while there are over 2500 in the southeastern portion of the Dominican Republic (Gentner et al. 2018). The number of participating fishers and/or vessels, and the average number of FADs per fisher also vary, ranging from < 0.1 FADs per fisher in Dominica vs. nearly 10 in the Dominican Republic. Additionally, there is variation in the contribution of FAD fishing to total fleet size and annual catches. For example, FAD fisheries make up 7% of the fleet in Grenada (CRFM 2013) and 80% in Saint Lucia (George 2007) (Table 1). Some differences in FAD number can be attributed to the utilization of private vs. public or community FADs. Governments or international aid organizations will typically sponsor the deployment of a single or small number of FADs to be shared among a group of fishers, sometimes requiring a license or fee to obtain fishing rights (e.g. Gentner et al. 2018, Tamura et al. 2018). Islands utilizing primarily public

Table 1. Characteristics of existing Caribbean FAD fisheries. Data are preliminary.

Island	Active FADs?	Num. of FADs	Num. of Fishers	Num. of Vessels	Owner-ship	Data Sources
Anguilla	No					Sadusky et al. 2018, CRFM 2015
Antigua & Barbuda	Yes	20 (2018)	26 (2013)	-	Mixed	CRFM 2013, N. Psihoyos, pers. com., Oct. 25, 2018
Aruba	Yes	-	-	-	-	Sadusky et al. 2018
Bahamas	Yes	-	-	-	-	Sadusky et al. 2018
Barbados	No[1]					Sadusky et al. 2018, CRFM 2015
Bonaire	No[2]					Y. DeVries, pers. com., Nov. 5, 2018
British Virgin Isl.	Yes	-	-	-	-	Sadusky et al. 2018
Cayman Islands	No					Sadusky et al. 2018
Cuba	No					Sadusky et al. 2018, CRFM 2015
Curacao	Yes	4 (2018)[2]	-	40 (2018)	Mixed	B. Rosheuvel pers. com., Nov. 2, 2018
Dominica	Yes	40 (2013)	338 (2013)	200 (2013)	Mixed	CRFM 2013, Mathieu et al. 2014
Dominican Republic	Yes	>2500[3] (2018)	500 (2018)	258 (2018)	Private	Gentner et al. 2018
Grenada	Yes	11 (2018)	-	85 (2018)	Mixed	Gentner et al. 2018
Guadeloupe	Yes	>400[4] (2013)	-	300 (2010)	Private	Guyader et al. 2017
Haiti	Yes	21[5] (2015)	450[5] (2015)	136[5] (2015)	Public	Vallès 2015
Jamaica	No					Sadusky et al. 2018, CRFM 2015
Martinique	Yes	>20 (2018)	-	300 (2010)	Mixed	L. Reynal, pers. com., Nov. 7, 2018
Montserrat	No					Sadusky et al. 2018, CRFM 2015
Puerto Rico	Yes	8 (2018)	-	-	Public	Merten et al. 2018
Saba	Yes	7 (2018)	7 (2018)	7 (2018)	Private	A. Izioka, pers. com., Nov. 5, 2018
San Andrés & Prov.	No					Sadusky et al. 2018, CRFM 2015
Saint Barthelemy	Yes	800 (2018)	-	40 (2018)	Private	J. LaPlace, pers. com., Nov. 2, 2018
Saint Eustatius	Yes	2 (2018)	5-10 (2018)	<20 (2018)	Mixed	K. Kitson-Walters, pers. com., Nov. 5, 2018
Saint Kitts & Nevis	Yes	35 (2013)	41[6] (2013)	16[6] (2013)	Mixed	CRFM 2013
Saint Lucia	Yes	15 (2015)	1000 (2015)	500 (2004)	Mixed	CRFM 2015
Saint Martin	Yes	20 (2018)	-	7 (2018)	Private	J. LaPlace, pers. com., Nov. 2, 2018
Saint Vin. & Gren.	Yes	4 (2013)	-	-	Public	CRFM 2013
Trinidad & Tobago	Yes	>11[7] (2004)	100[8] (2013)	-	Mixed	CRFM 2013
Turks & Caicos	No					Sadusky et al. 2018, CRFM 2015
U.S. Virgin Islands	Yes	4 (2018)	-	-	Public	USVI Fish and Wildlife 2018

[1]Active flying fish FAD fishery, but not moored FAD fishery
[2]Pending additional installations in 2019
[3]Estimated from only three of 12 coastal provinces (San Pedro de Macoris, La Romana, La Altagracia)
[4]stimated to include unsurveyed region east of Guadeloupe
[5]Estimated from surveys in southern region
[6]Nevis only
[7]Underestimate, does not include private FADs; Tobago only
[8]Tobago only

FADs tend to have fewer FADs shared among fishers (e.g. Saint Vincent & the Grenadines, Puerto Rico) as compared to private FAD fisheries (e.g. Dominican Republic, Saint Barthélemy, Guadeloupe) where fishers are incentivized to each set multiple FADs to increase personal catches.

Caribbean FAD fisheries also vary greatly in construction methods and expenses. For example, most FADs in the Dominican Republic are constructed with simple and inexpensive materials such as bamboo, palm fronds, Styrofoam, and paint cans cast with cement (Gentner et al. 2018). In Puerto Rico, a government-sponsored project has installed eight industrial FADs constructed with large spherical steel surface buoys and navigation lights (Merten et al. 2018, prfadsystem.com). Construction materials and methods likely affect FAD longevity, which has implications not only for catch benefits, as longer lasting FADs tend to accumulate more fish, but also marine debris contribution. Construction costs and techniques can be influenced by available funding, local capital resources, private vs. public ownership, and local oceanographic and marine traffic conditions. Tradeoffs between cost and longevity will vary based on the aforementioned fishery and socio-economic dynamics.

FAD fisheries also vary greatly in the deployment depths and distances from shore. In many cases these are driven by distinctions between public and private FADs, where public FADs are typically placed close to shore to increase accessibility to fishers in small boats, reduce transportation and construction costs, reduce construction and deployment costs, and facilitate maintenance (CRFM 2015). Private FADs, on the other hand, are typically deployed at increasing distances from shore as fisheries develop to reduce chance of discovery by other fishers and avoid overcrowded areas.

This review seeks to contribute to our understanding of FAD prevalence throughout the Caribbean region, as well as the diversity of trends and practices across islands. While we have provided a summary of available data from numerous islands, information on the prevalence and typologies of FAD fisheries are limited for many other islands in the region. Additionally, we often found discrepancies between information reported from fisheries officials and information obtained from fishers. In the next stage of this work, we will use additional key informant interviews to fill in data gaps as well as corroborate existing data. We will identify influential socioeconomic and oceanographic factors that have shaped FAD fishery development in various islands and use these factors to develop a spatial analysis of FAD feasibility and risk of FAD overproliferation throughout the Caribbean region. As FAD fisheries continue to develop rapidly throughout the Caribbean, it is critical that we understand their extent as well as the various conditions that drive different types of FAD fisheries. With this knowledge we can help guide future FAD development towards ecologically and socially sustainable practices.

KEYWORDS: Fish aggregating device, pelagic fisheries, social ecological systems

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