The Impact of Moored Fish Aggregation Devices (FAD) on the Artisanal Marine Fishery in Southeast Haiti

El Impacto de Dispositivos de Concentración de Peces (DCP) Anclados sobre la Pesca Artesanal Marina del Sudeste de Haití

L'Impact des Dispositifs de Concentration de Poissons (DCP) Ancrés sur la Pêche Marine Artisanale du Sud-est d'Haïti

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EXTENDED ABSTRACT

Fish Aggregation Devices (hereafter FAD) are man-made objects deliberately placed in the sea to attract marine fishes so as to facilitate their capture by fishers (Dempster and Taquet 2004). A moored FAD is generally made of a surface (or sub-surface) floating component that is attached to an anchoring structure placed on the sea bottom to prevent the device from drifting away. In the Caribbean, moored FADs allow access to large oceanic pelagic fishes such as large tunas, dolphinfish and billfishes, which are difficult to reach otherwise using the small vessels typical of Caribbean artisanal fisheries (CRFM 2015). Since the 1990's, there has been a rapid increase in moored FAD use by Caribbean artisanal fishers, raising questions about the long-term biological and socio-economic sustainability of the fishery (CRFM 2015, Sadusky et al. 2018). In that regard, there is a general recognition of the paucity of moored FAD fishery data across the region that could serve to guide management and assess the biological and socio-economic impact of this incipient fishery (CRFM 2015).

Haiti is one of the Caribbean island states where moored FAD fishing is practiced. Moored FADs were introduced in Haiti in the 1980s and have steadily gained popularity among artisanal fishers as well as among government and non-government agencies with programs aimed at improving the livelihoods of fishers (Vallès 2016). A recent study estimated that about 10% of fishers in the southern half of Haiti engaged in FAD fishing (Vallès 2016). With a population of approximately 65,000 artisanal fishers (MARNDR-USAI 2018) and a National Programme for the Development of the Marine Fishery that explicitely supports moored FAD fishing (MARNDR 2010), there is great urgency in assessing the socio-economic impact that FADs are currently having in the different parts of Haiti.

Here, we provide (for the first time) quantitative data on the incipient moored FAD fishery in the southaeast department of Haiti and we compare these data with those of the traditional (non-FAD) fishery. Between 2007 and 2014, fishers from the southeast department of Haiti benefited from a government project aimed at improving the livelihoods of fishers by, among others, supporting the development of a moored FAD fishery (Macías 2014). This project involved donating a number of fiberglass boats equipped with outboard engines to selected fishers' associations along the 150 kms of coastline of the southeast department. It also involved deploying a number of semi-heavy moored FADs (sensu Dempster and Taquet 2004) along the same coastline between early 2011 and 2012. This project also funded and oversaw the deployment of data collectors who were tasked with regulary monitoring fishing trips at the most important landing sites between late 2007 and early 2014. The monitoring of the landing sites started prior to FAD deployment and continued thereafter, thus it provided an opportunity to assess the impact of FADs using a pseudo Before-After-Control Impact (BACI) design with traditional (non-FAD) fishing trips before FADs were available serving as the baseline "Before treatment", traditional (non-FAD) fishing trips when FADs were available serving as "Control treatment", and FAD fishing serving as "After treatment". More than 1,000 FAD and 3,200 traditional (non-FAD) fishing trips were haphazardy monitored between 2007 and 2014 at twelve landing sites where FAD fishing was adopted by groups of fishers. Data collected on each fishing trip included:

i) Total landed wet weight,
ii) Total fuel costs,
iii) Total revenue, and
iv) omposition of the catch (in weight).

These data were compared among the three aforementiond fishing treatments by aggregating the data by landing site over time and assessing across sites the degree and consistency of differences between fishing treatments. Further details on this monitoring and data are given in Vallès (2018). For the purpose of this study, traditional (non-FAD) fishing data were pooled across all the different traditional fishing gears.

Overall, we found tangible increases in the proportion of fishing trips recorded that made use of FADs (from 0% to ≥10%) at the twelve landing sites when these became available in early 2011. FAD fishing relied almost mainly on donated fiberglass boats with outboard engines at all landing sites, whereas (non-FAD) fishing continued to rely mainly on privately

-owned unmotorized traditional wooden boats. Overall, median landed weight per fishing trip (approx. 29 kg) was ≥ 3-fold higher for FAD fishing than for traditional (non-FAD) fishing before or after FADs became available (Figure 1a). However, this overall finding masked considerable variability among sites (up to approx. 8-fold) in FAD fishing landed weights, with sites in the center of the southeast department (CJ1-CJ3) showing the lowest FAD fishing landings (Figure 1a). Catches on FADs yielded proportions of oceanic pelagic fishes such as large tunas and dolphinfish that largely exceeded those of traditional (non-FAD) fishing before or after FADs became available and this was consistent across all landing sites. Overall, median total revenue (before fuel costs) per fishing trip was ≥3-fold higher for FAD fishing (approx. 65 USD) than for traditional (non-FAD) fishing before or after FADs became available. However, again, this overall finding masked considerable variability among sites in FAD fishing total revenue (up to approx. 6-fold), with sites near the center of the southeast department (CJ1-CJ3) showing relatively low FAD fishing total revenue. Overall, FAD fishing resulted in a considerable increase in median fuel cost per fishing trip across all landing sites, since traditional (non-FAD) fishing rarely involved outboard engine use, irrespective of whether FADs were available or not. When fuel costs were deducted from the total revenue per fishing trip (i.e. net revenue), overall, median net revenue per fishing trip was ≥2-fold higher for FAD fishing (~36 USD) than for traditional (non-FAD) fishing before or after FADs became available (Figure 1b). However, again, this overall finding masked considerable variability among sites in net revenue for FAD fishing (Figure 1b). Most notably, sites in the center of the southeast department (CJ1-CJ3) showed relatively low FAD fishing net revenues, which were similar or even lower than those from traditional (non-FAD) fishing (Figure 1b). An examination of the spatial distribution of the landing sites in relation to the location of the FADs revealed a statistically significant negative relationship between net revenue and distance to the nearest FAD (Pearson r=-0.73, df=10, p<0.05), highlighting the impact of the location of FADs and landing sites on profitability, and partially explaining the observed low profitability at the central sites (CJ1-CJ3; Figure 2). Overall, this study shows that FAD fishing can be more profitable than traditional (non-FAD) fishing in southeast Haiti by facilitating unprecedented fisher access to large oceanic pelagic fishes. However, as Haiti continues to support the development of the moored FAD fishery, careful consideration of the location of moored FADs in relation to fisher communities, along with adequate biological and socio-economic monitoring, will be required to ensure a self-sufficient and profitable sustainable fishery.

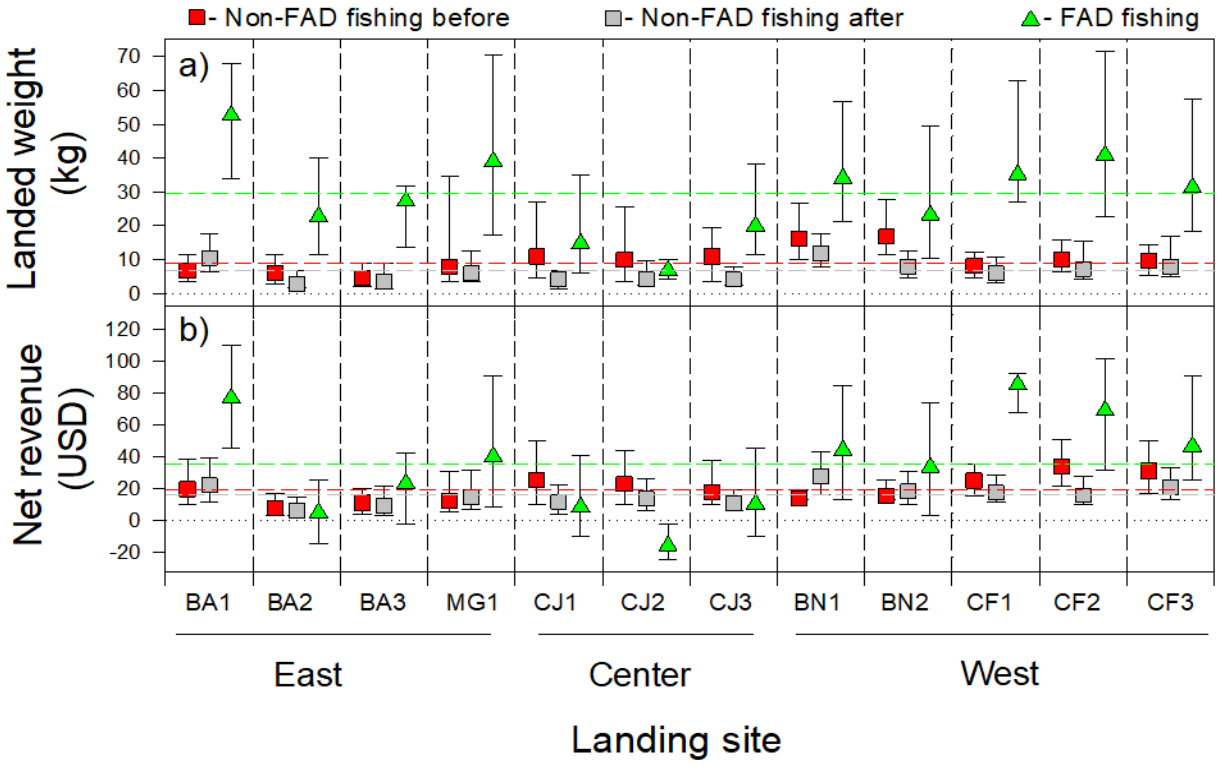

Figure 1. Comparison of median values (± 1st and 3rd quartiles) in total landed weight (**a**) and net revenue (i.e. total revenue minus fuel costs) (**b**) between FAD fishing trips and traditional (non-FAD) fishing trips before and after FADs were available at twelve landing sites in the southeast department of Haiti. Sites are ordered (from left to right) from the east to the west along the southeast coastline.

KEYWORDS: FAD, fisheries, Haiti

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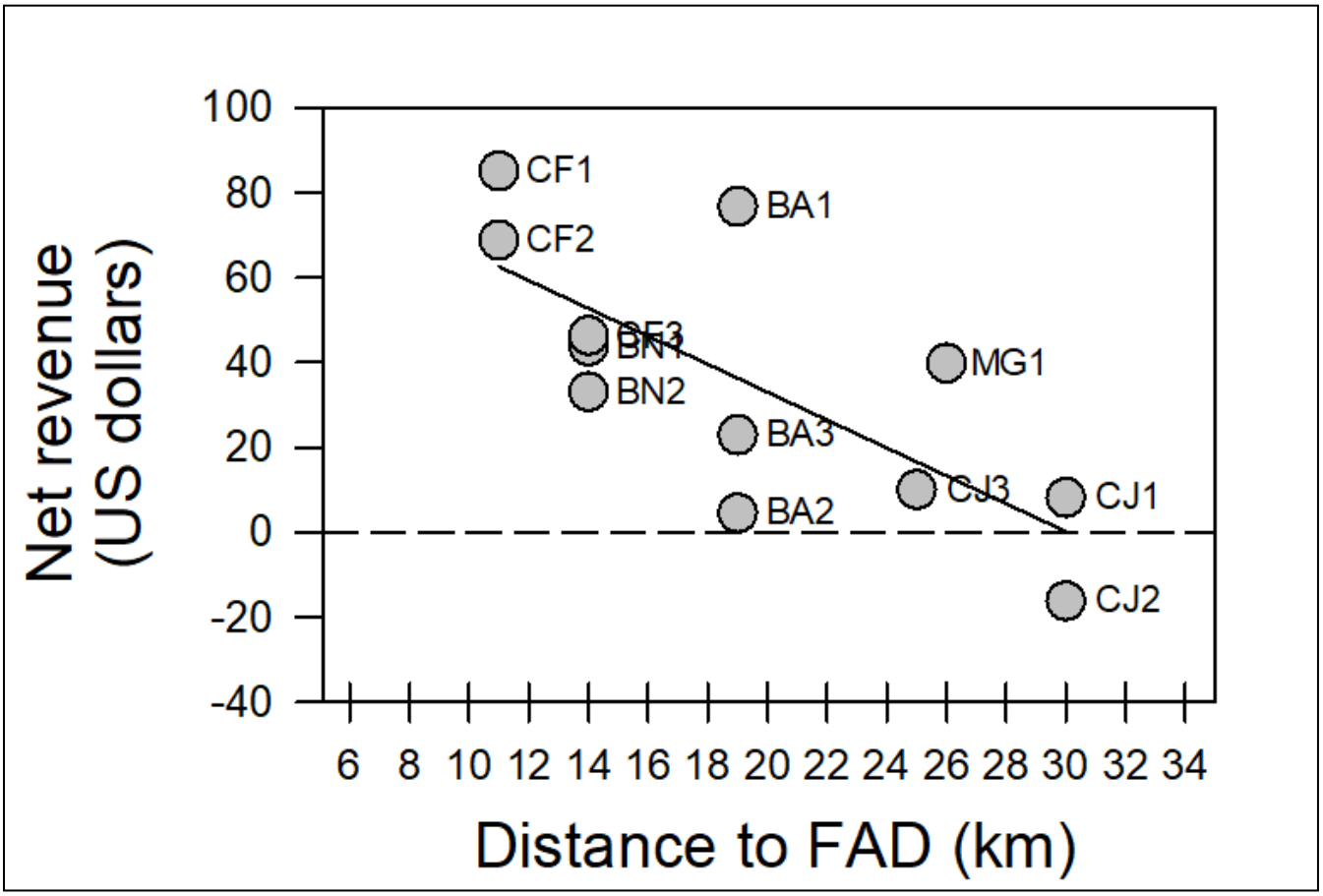

Figure 2. Relationship between distance (in km) of twelve landing sites to the nearest available moored FAD and median net revenue (i.e. total revenue minus fuel costs) per fishing trip for trips involving FAD fishing.