Research Prior to 2017 Hurricane Season Provides Glimpse into FAD Efficacy

Marine recreational fishing in Puerto Rico provides tens of millions of dollars in sales impact to local businesses across the island every year. Recognizing the value of marine recreational fisheries to the island, the Department of Natural and Environmental Resources initiated the Puerto Rico FAD System to achieve three main goals: (1) increase catch and decrease time and money spent searching for fish; (2) provide saltwater recreational fishing opportunities for Puerto Rican and visiting anglers; and (3) shift fishing effort from coastal habitats to offshore waters. This program was modeled after the highly successful and extensive Hawaii FAD program. Beyond Our Shores, Inc., received funds to design and implement a collaborative FAD research program to assess whether these main goals are being met. In this article, we provide preliminary results that suggest they are.

Since June 2015, the Department of Natural and Environmental Resources has established and maintained the Puerto Rico FAD System. With support from Sport Fish Restoration Program of the Fish and Wildlife Service, FADs have been deployed from Manati to Fajardo. At the time of writing, 2 FADs are currently active. Four are pending redeployment. Fundación Legado Azul, the non-profit hired to build and deploy the FADs, has been very busy, and has a full schedule to deploy more in the immediate future (see more below).

In order to begin to quantify the impact of FADs on fisheries in Puerto Rico, 20 boat captains agreed to collaborate and provide high resolution catch and GPS data. The GPS data provide time and location, which along with catch allow us to calculate fishing effort as, catch per unit
effort on a spatial scale relative to FAD locations. To date, we have collected two years of catch and effort data from participating captains for nearly every outing they embarked upon. The captains represent major charter, recreational, and commercial anglers from around the island. The first captain that agreed to participate was Captain Luis Lagrandier of Puerto Rico Sportfishing Charters, who routinely takes local and international clients fishing aboard his boat Makaira. When we started tracking Makaira’s catch and effort on October 25, 2016, all of the FADs were in place (See Fig 1 upper panel). Preliminary analysis of Makaira’s activity, show that while there was roughly equal catches at the FAD versus away, there was actually more time spent away from the FAD to get that catch, indicating that catch per unit effort is actually higher at the FAD. As the season progressed, FAD E was lost on November 28, 2016, and FAD F was lost on January 17, 2017, and this influenced Makaira to shift fishing effort toward FAD G, the next closest FAD to its home port, Dorado (See Fig 1 lower panel). With FAD E and F not in place, Makaira altered its fishing pattern, increasing both its average time and distance covered per trip. In addition, Makaira’s fishing grounds increased by approximately 106 square kilometers, which meant the vessel trolled a greater area in search of fish. Makaira’s shift toward FAD G, however, did seem to pay off, having caught 4 times more dorado at FAD G than caught elsewhere. Interestingly, Makaira’s catch away from the FAD included a more diverse array of pelagic species, which may be related to the propensity for some species (e.g., dorado) to show high fidelity with the FADs while others do not. Makaira’s case study is one of several compiled by our team and highlights the value of collaborative research to describe FAD-vessel dynamics. Collectively, data indicate that FAD presence can influence catch, effort, and fishing costs.

One of the key management decisions to install FADs in Puerto Rico was to increase sport fishing opportunities and to shift recreational fishing activity from stressed coastal habitats offshore. In order to investigate whether this goal was being met, in January 2017, we began monitoring the
Collaborative FAD Research
March 2018

catch and effort of vessels that predominantly fish nearshore. **Captain Luis Burgos** of the Caribbean Fishing Academy (**CFA**), a predominantly light-tackle nearshore fishing charter that operates in San Juan Bay is the example described here (Fig. 2). **CFA** embarked upon 88 trips, with the majority of the outings taking place throughout coastal habitats in and around San Juan Bay. Proximal to the mouth of San Juan Bay are FAD C and D, 5.44 and 4.95 miles offshore, respectively. After analysis of 88 trips, 19 of those (or 21.5%) were taken offshore to fish the. While Offshore, **CFA** caught dorado, billfish, and tuna; while inshore, **CFA** caught 17 different species but predominantly tarpon, crevalle jack, snook, and guavancha. Because we do not have **CFA**'s catch and effort before the FADs were installed, we cannot determine if the FADs influenced **CFA** to move offshore or whether those trips were more successful. Nonetheless, the data and preliminary analysis do show that offshore catch and effort was highest immediately adjacent to FADs, which suggests they provided **Captain Burgos** with more fishing options and a more diverse array of sport fishing opportunities to his clients.

After the passage of Hurricane Maria many of the devices we had on boats were damaged, but I am pleased to report that most boats are back online providing additional data. These preliminary results provide insights into the fishery and fish dynamics surrounding San Juan’s FAD array that could not have been acquired without the collaboration of boat captains around the island. Collectively, this information can be used to help justify the importance of FADs to the charter and recreational fleet, to the local economy, and for tourism; it can also provide valuable information on species-FAD interactions which can be used to sustainably manage the placement, number, and density of future FADs around the island. For more information on how to participate in our ongoing research please contact the PR FAD Program at prfadsystem.com/contactenos/. To learn more about the research being conducted in Puerto Rico’s FADs click here. Please contact me directly if you have any questions or want to get involved: wess@beyondourshores.org

Fig 2 CFA’s Catch and Effort 2017 (click for larger view)
PR FAD Program Post Maria Report and Future plans

March 2018

By Dr. Alfredo Torruella,

Greetings to all FAD fishermen, sports and commercial alike!

The Puerto Rico FAD Program lives on, despite the onslaught of hurricanes Irma and Maria last September. Prior to the passage of the hurricanes, FADs A, D and K had been impacted (and ruined) by barges. Plans for replacement of these three FADs, as well as for one additional deployment between Humacao and Vieques were set into motion before the storms made landfall. Since then, the Foundation constructed the four FADs, which are currently ready for deployment. Unfortunately, deployment delays have occurred, initially due to funding issues (see below), and later due to the impact of the storms. We expect to complete these deployments during the upcoming season.

As we all know, the effects of hurricane Irma, and even more so hurricane Maria, were devastating to the island of Puerto Rico and to its fishing community. We are proud to report that all FADs impacted by hurricane Irma survived. The effects of hurricane Maria, a more direct hit by a monster storm, resulted in the loss of FADs E and F, and in the stripping of the lights, radar reflectors, and even the paint off the remaining FADs (See Figure 1). Nonetheless, the fact that some FADs (FADs B, H, and L) were able to survive these two storms at all is a testament to the quality design, materials and construction methods used in the current generation of FADs.

Figure 3. Image of a FAD after the passage of Hurricane Maria. Note lack of light, radar reflector and even lettering!
During project year 2016-2017, the Foundation engaged in an analysis of the formula being used for execution of the FAD Program, with the goal of making the process more efficient and effective for 2017-2018. The main issues identified were:

- Repeated incidents of FADs impacted by barges, despite the FADs being clearly labeled on nautical charts, and being equipped with lights and radar reflectors.
- The need for the extension of the FAD program to the south and west coasts of Puerto Rico.
- Delays in purchasing, manufacturing and deployment phases of FADs due to a lengthy reimbursement process from the Department of Natural and Environmental Resources (DNER) for each phase prior to the commencement of the next phase.

The Foundation has begun various initiatives to address these issues, including but not limited to the following:

- Research and development continues into designing better FADs, and into exploring possible alternate designs altogether, such as submerged FADs (especially for high commercial traffic areas).
- We have requested that the DNER initiate FAD permits for the south and west coasts (they oversee the permitting process), and are exploring deployment options for these areas.
- Fundraising activities have been planned to generate a cash reserve so that the Foundation can order parts, manufacture and deploy FADs without having to wait for reimbursement from the DNER in between each step. Progress has been made in this area already, thanks to a generous $25,000 donation by Mr. Nick Prouty and Carolina Corral, the owner and CEO, respectively, of Marina Puerto Del Rey.

Fundación Legado Azul is eager to commence FAD deployments for project year 2017-2018, and we are currently awaiting the finalization of our contract with the DNER. We expect to begin deploying replacements to the lost FADs and adding additional FADs to the Puerto Rico FAD Program in the east, south and west coasts of the island as soon as the new contracts are signed. We will keep you posted.

Finally, we would like to thank all the folks that have helped the Foundation in its efforts to create a permanent, high quality FAD Program for Puerto Rico. Some, but not all of these are: Mr. Friedel Stubbe, Commodore Joe Vizcarrondo, Club Nautico de San Juan, Mr. Nick Prouty, Ms. Carolina Corral, Marina Puerto Del Rey, Commodore Joey Tavares, Cangrejos Yacht Club, Dr. Nilda Jimenez, DNER.

Happy Fishing!

Dr. Alfredo Torruella
Executive Director
Fundación Legado Azul
In September 2017, Hurricanes Irma and Maria hit the Territory, causing widespread damage and destruction. Unfortunately, not all of the USVI Fish Aggregating Devices (FADs) survived the storms due to the strong winds and rough sea conditions. The table and maps below show the current FAD locations and locations of FADs planned for replacement. As always, if you fish around any of the FADs, please continue to report your landings using our online survey (https://www.surveymonkey.com/r/2CNDD9D). The information you report helps us to improve the FAD program for your benefit!

### CURRENT FAD LOCATIONS

<table>
<thead>
<tr>
<th>FAD</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>T5</td>
<td>18° 36.850’ N</td>
<td>64° 59.130’ W</td>
<td>13 mi N of Outer Brass, STT</td>
</tr>
<tr>
<td>T12</td>
<td>18° 10.206’ N</td>
<td>64° 59.485’ W</td>
<td>8 mi S of Saba Island, STT</td>
</tr>
<tr>
<td>X10</td>
<td>17° 37.944’ N</td>
<td>64° 47.787’ W</td>
<td>4 mi SE of Long Point, STX</td>
</tr>
</tbody>
</table>

The USVI FAD program is 100% funded by the U.S. Fish and Wildlife Service’s Sport Fish Restoration Fund.

Follow our Facebook page for more updates!
www.facebook.com/usvifads

**Redeployment of T12**

FAD T12 broke loose from its location before the storms. Fortunately, the buoy was recovered in Puerto Rico and the FAD was re-deployed on December 12, 2017. We are pleased to announce that the FAD is now available to be fished again.

**Inspection Surveys**

All FADs are surveyed quarterly to document fish communities and repair any worn components. A post-hurricane survey was conducted in Nov. 2017 to inspect and maintain the remaining FADs. The next set of surveys is scheduled to occur in February 2018.

**Planned Deployments**

Two new submerged FADs were constructed and are planned for deployment by March 31, 2018. These buoys will replace FADs T2 and T4 (shown in yellow on the map above), which were lost during Hurricanes Irma and Maria in September 2017.
New T-Shirts Are Available for Purchase

Help support our FAD research by purchasing a program tee. The fantastic logo featured on the shirts was done by Casta Design in San Diego, CA, owned and operated by Dom Castagnola. You could also buy a Dolphinfish Research Program (DRP) tee with a logo done by Guy Harvey, the amazing marine artist and fisheries scientist. Please click here to order a t-shirt.

Donate to Beyond Our Shores beyondourshores.org/donate/

Click here or image to Donate

To Donate by Check, Make Checks out to:

Beyond Our Shores, Inc./FAD Research

Mail to:
Wessley Merten
Beyond Our Shores, Inc.
PO BOX 662
Rockville, MD, 20848
Email: wess@beyondourshores.org
Website: beyondourshores.org

@prfadsystem
@prfadsystem
@prfadsystem

Private Donors and Supporters
Collaborative FAD Research 2018

Jeffrey Lapetina, Guaynabo, PR
Digital Fabrication Consultants, Baltimore, MD
Rafael Gonzalez, Carolina, PR
Manuel Suarez, Carolina, PR

Casta Design, San Diego, CA
Mario Lugo, Toa Baja, PR
Luis Lagrandier, Manati, PR
Manuel Botello, San Juan, PR