Pacific Islands Region
FAD Issues and Priorities Workshop
NOAA Service Center, Pier 38, Honolulu, Hawaii
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Title: The Commonwealth of the Northern Mariana Islands' Division of Fish & Wildlife FAD Program

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A) Introduction

(Provide a brief history and status of your FAD program)

The Commonwealth of the Northern Mariana Islands (CNMI) consists of the 14 island archipelago including the 3 Southern islands—Saipan, Tinian, and Rota ranging from approximately 14°N to 20.5°N, 145°E. In 1980 the Pacific Tuna Development Foundation out of Honolulu, Hawaii deployed 5 FADs—2 near Saipan, 2 near Tinian, and 1 near Rota using a 3-drum NMFS design. Within months, all FADs were lost and the 3-drum design was replaced with a 1-drum design. FAD designs evolved over the years from bell buoys to spar buoys. Today the Division of Fish & Wildlife (DFW) Fisheries Research Section (FRS) uses a ~7 foot spar buoy that is tapered on the bottom for stream-lining and a 1 inch keel to keep the buoy from spinning. The keel and stream-lined buoy has improved the lifespan of the FAD significantly, however, more research into longevity is needed.

B) Program overview

Agency and manpower support

The Commonwealth of the Northern Mariana Islands' Division of Fish & Wildlife under the Department of Lands and Natural Resource

-4 Fisheries Biologists

-4 Fisheries Technicians

Funding source and funding level

US Fish & Wildlife Dingell-Johnson Sportfish Restoration Act Grant awarded the CNMI DFW approximately $102,000 for FY2012.

Number and location of FADs (include figures or maps)

There are currently 10 FAD sites with 2 active FADs near Saipan. DFW put out a bid to redeploy 10 FADs to replace inactive sites this year.

This map is not intended for navigational use.

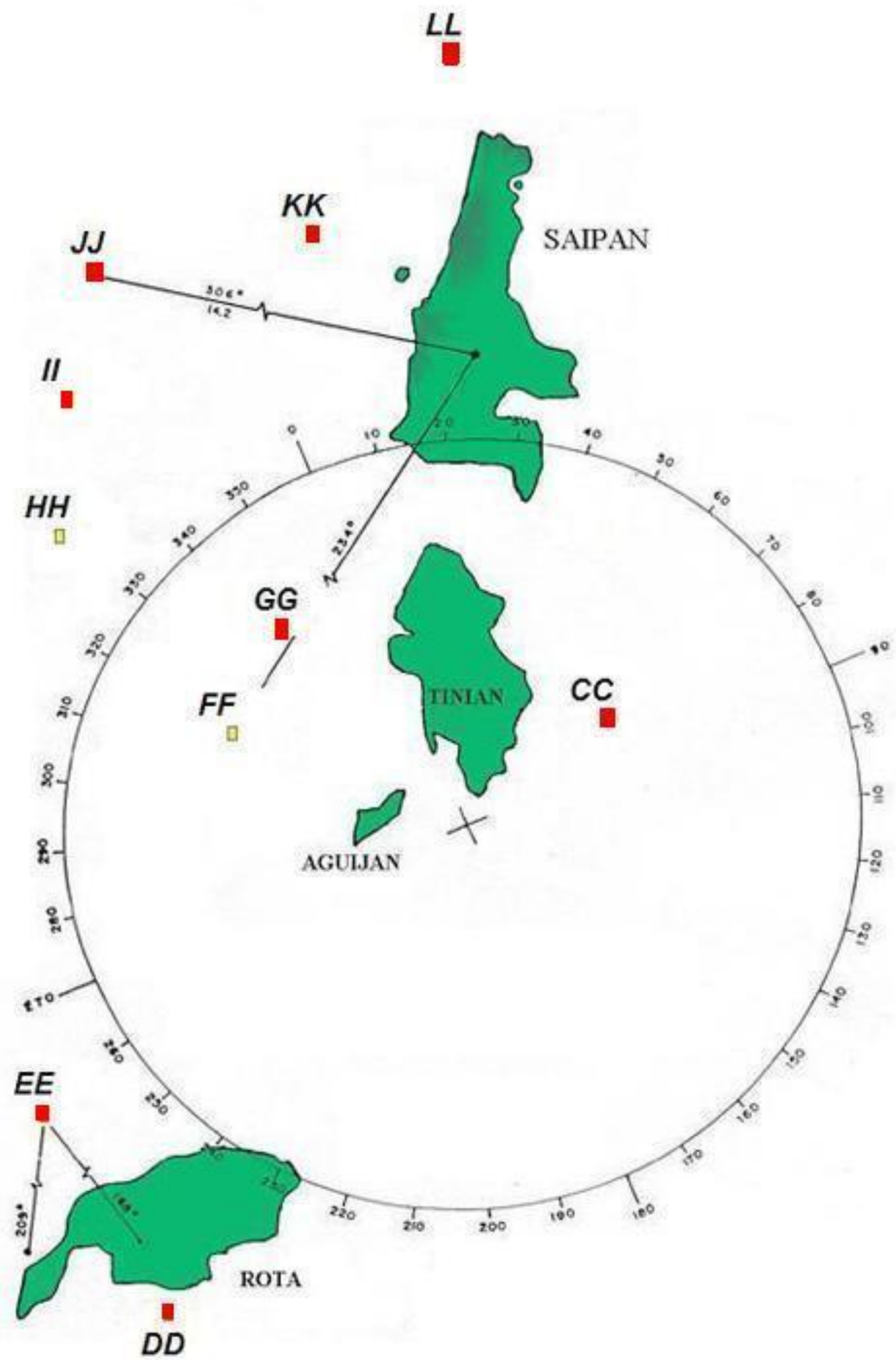


Figure 1: Illustrated positions of FADs with position markers as of February 11, 2013. Yellow represents active FADs. Red represents missing FADS.

Deployment depth range (ft/m)

Table 1: Bottom Depth of CNMI FAD Sites. Coordinates are set in WGS84 datum. Units are in Degrees, Minutes, and Seconds. Buoys have a drift range of 0.5 nautical miles from coordinates.

SITE	Latitude (D/M/S)	Longitude (D/M/S)	DEPTH (feet)	Depth (meters)
CC	14' 59 30N	145' 43 48E	1740	530.35
DD	14' 05 48N	145' 09 12E	1038	316.38
EE	14' 12 42N	145' 10 48E	1356	413.31
FF	14' 59 54N	145' 27 42E	4080	1243.58
GG	15' 04 36N	145' 32 56E	2646	806.50
HH	15' 09 51N	145' 28 15E	5556	1693.47
II	15' 14 54N	145' 29 47E	4302	1311.25
JJ	15' 19 19N	145' 32 20E	6084	1854.40
KK	15' 17 11N	145' 41 20E	1950	594.36
LL	15' 20 45N	145' 46 00E	1974	601.68

C) FAD Mooring System description

Overview

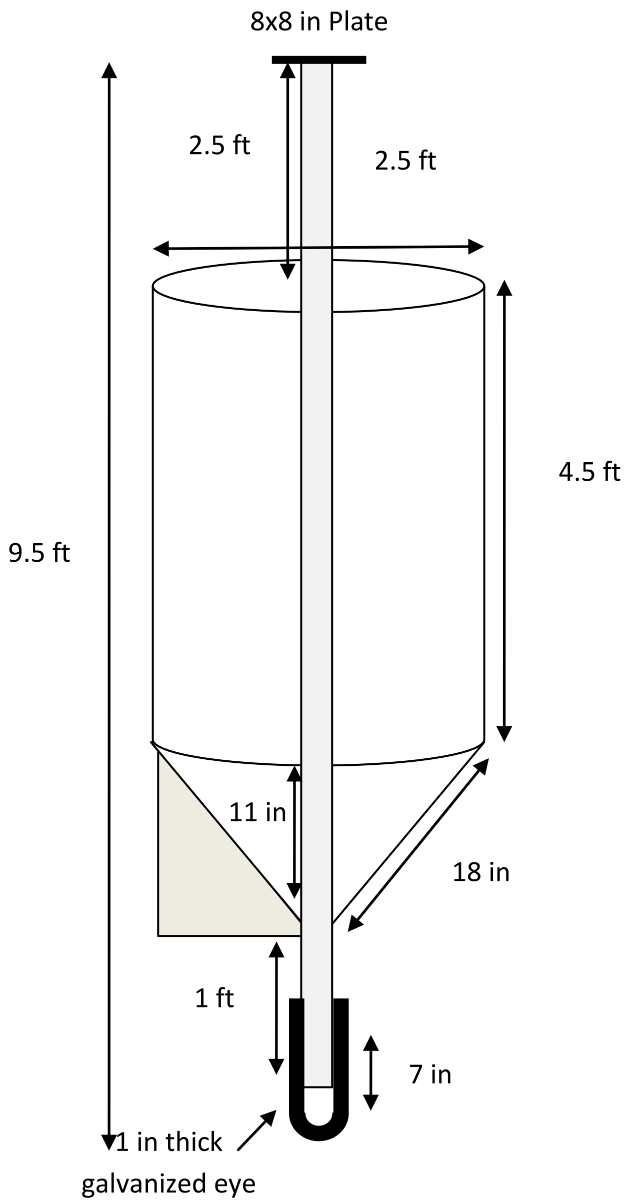
In the past the CNMI used 3-drum NMFS buoys, 1-drum buoys, bell buoys, nun buoys, spherical buoys, and spar buoys. Previous buoys had a lot of drag, thus prompting the Fisheries Research Section to develop a more stream-lined spar buoy that included a keel to prevent the mooring rope from twisting. The stream-lined FAD also suggested that a lighter anchor (2 tons to 1 ton) would be enough to keep the system in place. The anchor was originally cylindrical in shape, but later evolved to a square-based pyramid shaped anchor.

Float type and construction

(Provide a detailed description of any portion of your FAD system that is ABOVE water, i.e. light, radar reflector, mast, floats, metal buoy, fiberglass raft, etc.)

Figure 2 shows the current CNMI FAD design with keel. A contractor fabricated this buoy using 5-ply fiberglass filled with marine foam. The internal structure of the buoy includes a 9 foot, 3 inch diameter galvanized pipe with two angle bars welded and crossed to the galvanized pipe (figure 3). An 18 inch by 18 inch metal support plate is used to replace the 2 in by 2 in plate to fit inside the cylinder. An 8 in by 8 in plate is positioned on the top for the Carmanah marine navigational light model M650 white.

BUOY SPECIFICATIONS



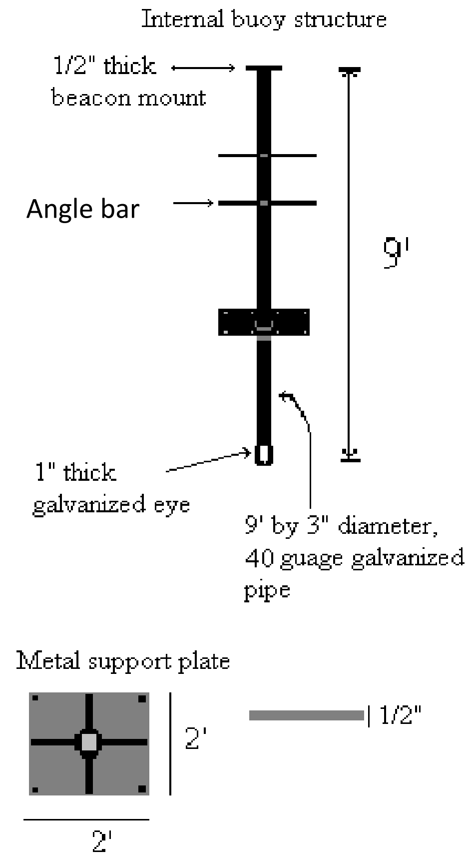


Figure 2: Galvanized pipe and foam filled 5-ply fiberglass buoy

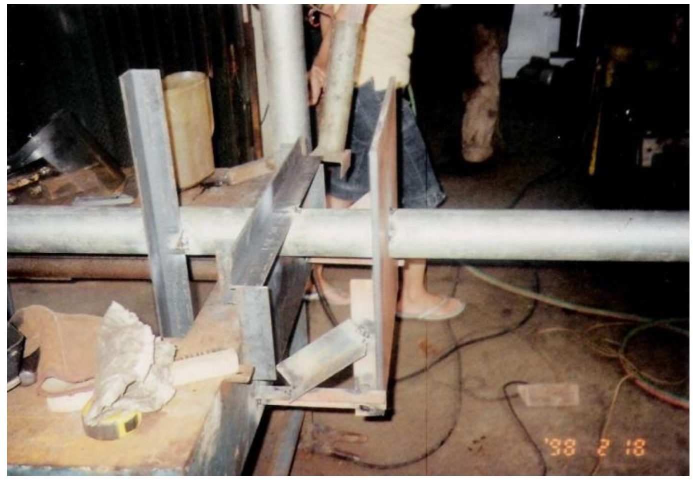


Figure 3: Internal buoy structure with 9 foot, 3 inch diameter pipe and two angle bars for support. The yellow panel is the keel (left).

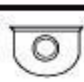
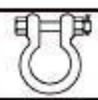
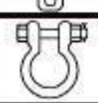
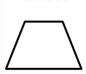
Mooring system description and fabrication

(Describe basic components of your FAD system, referring to a figure or diagram. Describe who constructs the FAD system, how many people are involved and approximately how long it takes to put a FAD system together)

The basic mooring components are adopted from the South Pacific Commission Fish Aggregating Device Manual Volume II Steel spar buoy system components table. Table 2 corresponds to the Figure 4 diagram with few exceptions. Long-link chains were recommended by the SPC FAD manual; however, procuring the recommended 19mm long-link chains proved to be a difficult task. The FRS continues to look for the long-link chains, but also uses a 20 mm open-link chain in replacement. After the improvement of the new FAD designs, the FRS decreased the length of the chain component to decrease the weight on the FAD buoy. Shackle and swivel sizes were increased from ¾ inch hardware to 7/8 inch and 1 inch hardware. Component #12 in Table 2 is eliminated if the shackle fits through the eye and eye swivel.

Two to three fisheries technicians work together in assembling the components and splicing the ropes. It could take half a day to one full day to splice, assemble, and spool one FAD system. FAD buoys are contracted for fabrication and can produce possibly 3 buoys a week, but because it is a contracted they sometimes take up to a month. FAD anchors are also contracted for fabrication and can be ready in 1-2 weeks. The anchors are 16 sq. ft. at the base, 4 sq. ft. at the top, and are 2 and ½ feet tall. They are reinforced with ½" rebar for strength. Each anchor weighs approximately 1 ton (2,000 lbs) and has a 1 ¼" thick anchor eye rebar.

Table 2: CNMI FAD components

Components		Description	Size	Material
1		Safety shackle with stainless steel (SS) cotter pin	25 mm 1 in	Hot-dip galvanised low-carbon steel (Hdg-lcs)
2		Safety shackle with SS cotter pin	22 mm 7/8 in	Hdg-lcs
3		Long-link chain		Hdg-lcs
4		Safety shackle with SS cotter pin	22 mm 7/8 in	Hdg-lcs
5		Forged swivel (eye and eye)	25 mm 1 in	Hdg-lcs
6		Safety shackle with SS cotter pin	25 mm 1 in	Hdg-lcs
7		Rope connector (*Samson*; size 3)	19 mm 3/4 in	Nylite
8		Sinking rope, 8–12 strand, plaited	19 mm 3/4 in 47 kg/220 m 14.3 lb/100 ft	Nylon
9		Buoyant rope, 8–12 strand, plaited	22 mm 7/8 in 45 kg/220 m 13.7 lb/100 ft	Polypropylene
10		Rope connector (*Samson*; size 4)	22 mm 7/8 in	*Nylite*
11		Safety shackle with SS cotter pin	25 mm 1 in	Hdg-lcs
12				
13		Forged swivel (eye and eye)	25 mm 1 in	Hdg-lcs
14		Safety shackle with SS cotter pin	22 mm 7/8 in	Hdg-lcs
15		Long-link chain		Hdg-lcs
16		Safety shackle with SS cotter pin		Hdg-lcs
17		Anchor	900 kg 2000 lb	Concrete block

Mooring system diagram

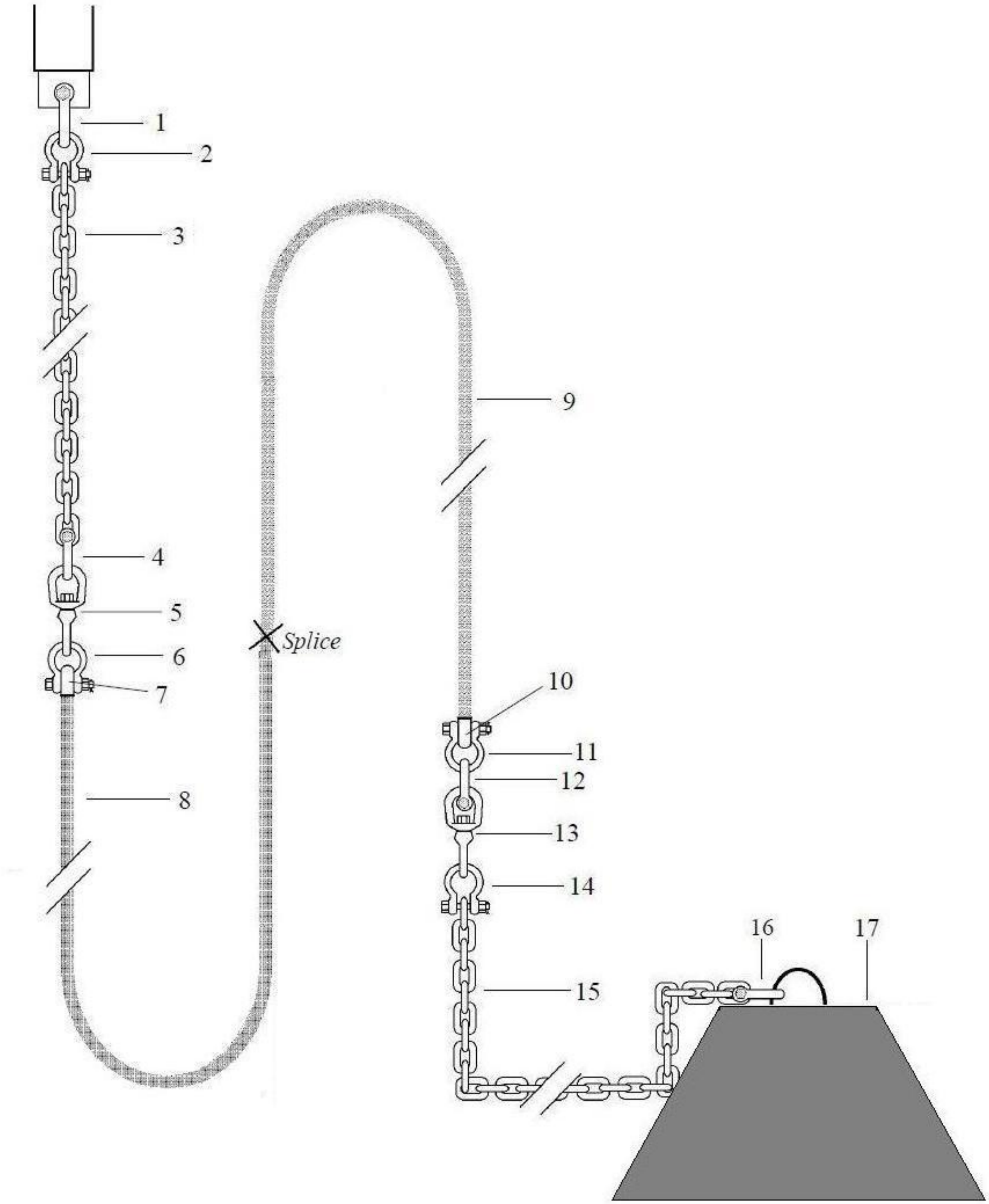


Figure 4: Illustrated mooring system

Component table (Excel Spreadsheet)

(Fill in the Excel spreadsheet supplied with the components necessary for an anchored FAD deployed at depth of 6000 feet (1829 m). Use whatever lines on the spreadsheet that are useful for your system or make your own. Include costs per item or category. For example, you can note total cost of rope, total costs of all hardware, cost of anchor, etc. Tally the total cost for FAD construction at bottom.)

Use of aggregators or other enhancements

(describe any streamers or other appendages that are attached to your mooring system, noting the material, time to apply, cost, longevity and if any studies have been done to determine their effectiveness)

Aggregators were used in the past; however, recent deployments did not include aggregators because of NOAA section 6 concerns. The Fisheries Research Section will look into using natural aggregators such as coconut palm leaves to be attached to the mooring chain.

D) Deployment of FADs

Vessel or anchor floating description

Various vessels have been used to deploy FADs over the years. Anchors are deployed off of large vessels to minimize danger. The most recent deployment contract was awarded to a 62 ft fishing vessel the Tenshou II capable of transporting over 6 tons. This vessel is able to deploy up to 2 systems at a time. Before the Tenshou II, the Micronesian Marine was used for deployment. This vessel has a cargo platform and is able to deploy 4-6 at a time. Deployment vessels are also required to have an equipped depth finder and GPS unit for accurate positioning and deployment.

FAD Gear, rope and anchor preparation and loading

The FRS prepares the rope onto spools to reduce entanglement and for safety issues. The contracted deployment company transports the FAD system from the FRS warehouse to the vessel. The Tenshou II had anchor platforms in the center of the boat, with the buoys secured in the lower deck (Fig. 5). The Micronesian Marine secured the anchors at the stern with the buoys and ropes secured on the deck (Fig. 6). Buoys and anchors are attached onboard the vessel.

Figure 5: The 2010 deployment on the Tenshou II

Figure 6: The 2006 deployment on the Micronesian Marine

Site survey

(Describe how FAD sites were selected and how the area is surveyed prior to deploying the anchor)

Sites were selected using bathymetric maps and areas were surveyed with a depth sounder prior to deployment. Current locations are not resurveyed when replacing FAD systems, but when a depth sounder is available the depth of the site is verified.

Deployment system

(Describe the actual process of deploying the FAD float, chain, line and anchor)

The FRS first confirms the site depth with the 27' Whaler. The FAD buoy is deployed first and towed until the 75% marker, which is tied to the mooring rope, reaches the deployment site. The FRS staff then radios the vessel to release the anchor into the water.

E) Expenses (not including hardware)

Fabrication costs

FAD anchor materials $530 each

FAD buoys net cost was $2580 per buoy

Labor costs

FAD anchor labor for 2 people at 168 hrs was $420 each and $840 total for labor.

Deployment costs

Average deployment cost is $3800-$6026 per buoy according to the 2013 deployment bid.

Other expenses

Include any additional FAD related costs not otherwise included, i.e. gear storage, maintenance, etc.)

Inspecting the FADs by boat can be costly especially if it is unable to be located or lost. Boat inspections are also dependent weather conditions. A contract for aerial surveys with the local helicopter company is in place to quickly locate FADs. $5000 is good for ~3-4 surveys.

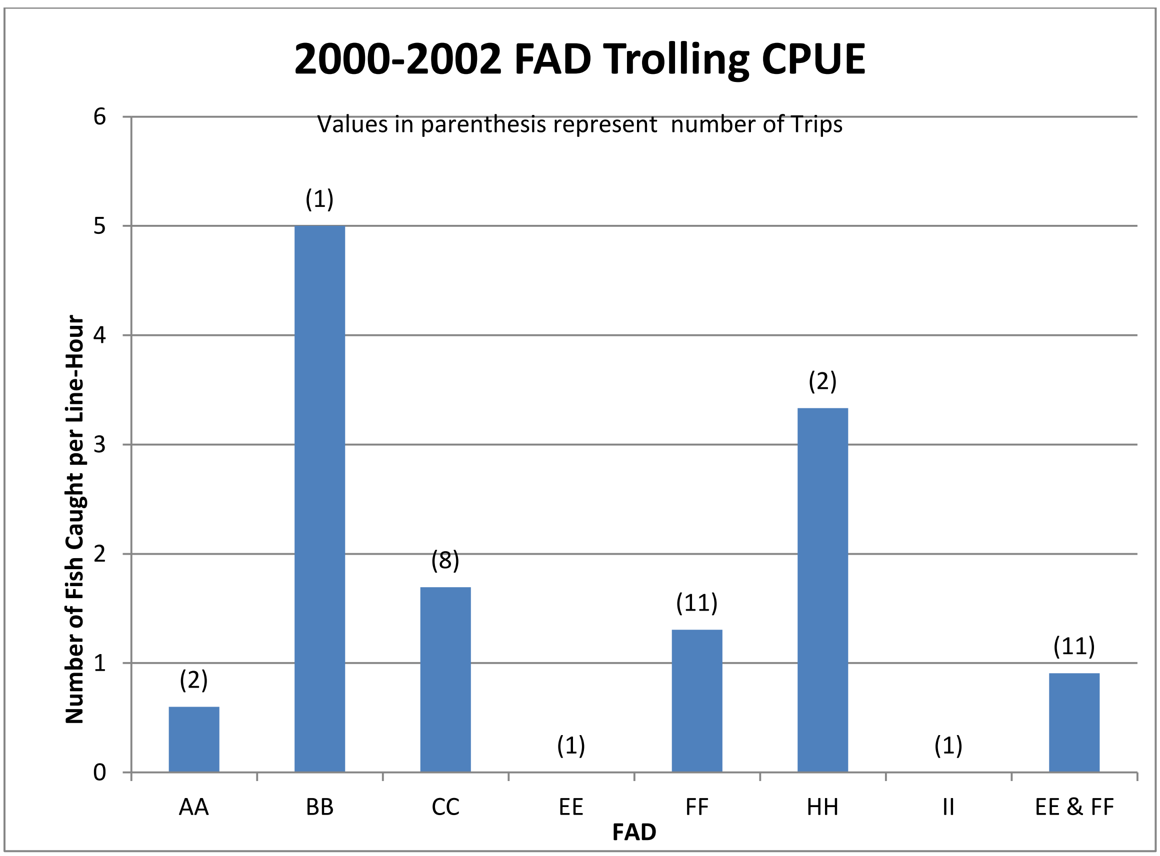
F) Data collection (Describe any past or present efforts to collect FAD specific catch and effort data. Discuss issues, problems, solutions)

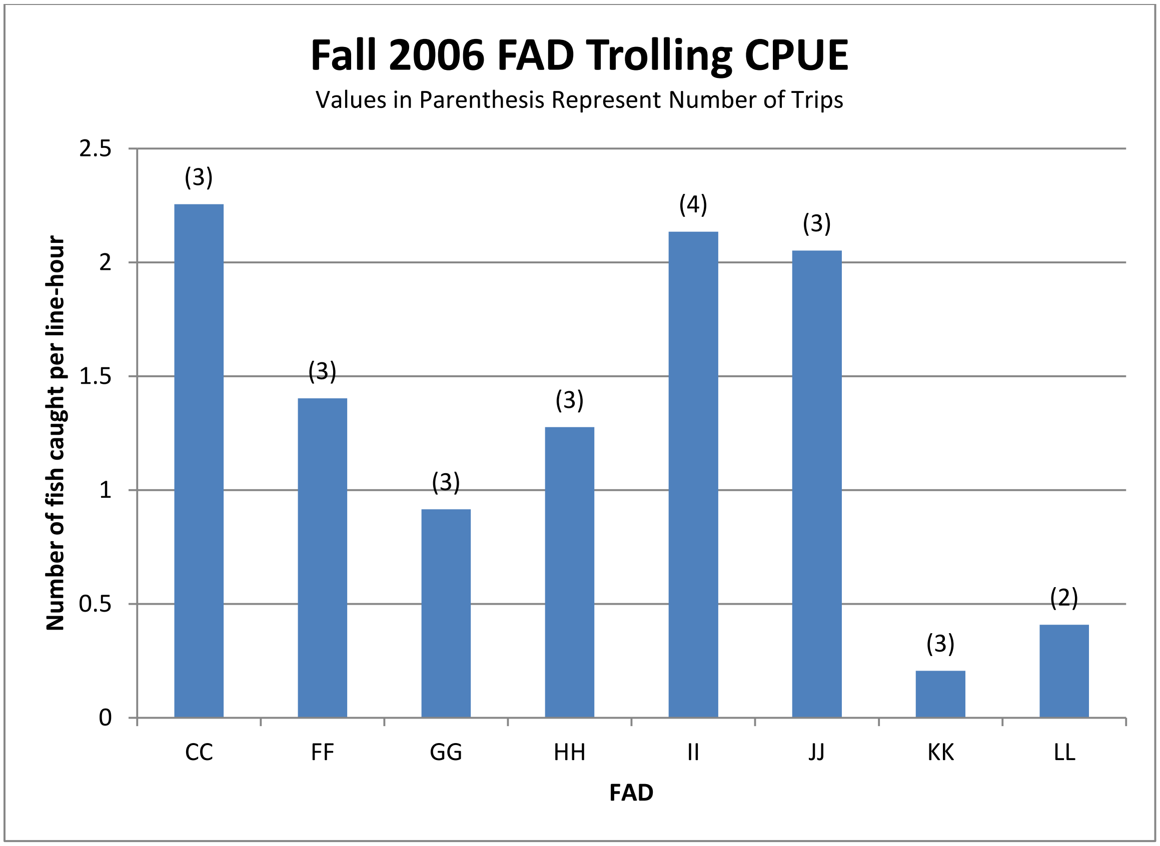
Minimal current effort is focused on data collection. Brief trolling of squid lures is conducted prior to in water visual surveys of FAD buoy and riggings. Catch is recorded. Also visual surveys yield species present in the immediate vicinity of FAD and rigging. Also the DFW boat-based creel survey includes questions about FAD use while fishing.

G) Catch Efficiency (Include available information on catch rates, species, etc.)

Recent data collection on catch efficiency has not been collected; however, effort and catch data was collected by the Fisheries Research Section and SPC personnel in 2001. The CPUE of the combined catches for the vertical long-line was 2.8 fish/100 hooks or 42 kg/100 hooks according to the 2001 Field Report by Steve Beverly, the Fisheries Development Officer.

There was CPUE data recorded in 2000, 2001, 2002 and 2006 (see graphs below). CPUE could also be calculated from the appropriate creel survey participants from 2005 on. This data has not been analyzed yet.





H) Issues, problems, concerns and future prospects (Describe any problems or particular concerns related to the conduct or future of your FAD Program)

The CNMI is dependent on external products, with a majority of its materials being imported. It's location within the region also contributes to the significantly high cost of services and products. Increases in shipping costs ultimately results in increased costs to the consumers. The construction of FADs requires materials that are not readily available in the CNMI. As a result, most of the materials needed for the construction of FADs are ordered from off-island. The CNMI has few vendors who are able to offer services for the procurement of FAD materials. Additionally a majority of them are limited in their abilities to perform the tasks required by the project. The services these vendors offer are usually costly, which consequently forces us to explore services outside the CNMI. A pressing issue in the CNMI is that government payments have been a sluggish, prolonged process which has resulted in many of the vendors being reluctant to offer services to government entities. Additionally, it has also led to the increase in service costs to cover the time it takes for the government to pay its obligations. (DFW Fisheries Research Section 2011-12 Report)

Another issue with our FADs program is that deployment costs continue to increase each year. Companies who are familiar with the deployment process increased their prices. In contrast newer companies who aren't familiar with the deployment process bid low which can force the program to award the cheaper, unskilled company; in the past this resulted in a few lost FADs.

To possibly help alleviate the increased costs of deployment, the FRS will continue to research for new buoy designs for prolonged lifespan of FAD systems and remote satellite tracking of FADs. The use of remote monitoring using GPS integrated technology could possibly cut costs for aerial or boat surveys.