



Secretariat of the Pacific Community

FIELD REPORT No. 11

on

FISH AGGREGATING DEVICE (FAD)
FISHING SKILLS WORKSHOPS IN THE
COMMONWEALTH OF THE NORTHERN
MARIANA ISLANDS — WITH NOTES ON
DIVISION OF FISH AND WILDLIFE'S
FAD PROGRAM

10 April to 4 June 2001

by

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Units used

°C—degrees Centigrade
HP—horsepower
kHz—kilohertz (cycles per second)
km—kilometre
kW—kilowatt
m—metre
mm—millimetre
nm—nautical mile
VDC—volts direct current

SUMMARY

The government of the Commonwealth of the Northern Mariana Islands (CNMI) requested technical assistance from the Fisheries Development Section of the SPC to assist the development of small-scale fisheries in the country. The objectives of the assistance were to: work with and train the skipper and crew of Department of Fish and Wildlife's (DFW's) vessel to undertake FAD site surveys and locate suitable FAD sites; train staff in correct FAD construction and deployment techniques, depending on availability of materials; conduct fishing trials around FADs using mid-water fishing techniques such as vertical longlining, palu-ahi and drop stone handlines, and single hook drift lines; hold workshops to introduce mid-water fishing techniques around FADs to interested local fishermen on Saipan, Tinian, and Rota, including some trial fishing from their vessels; and provide advice to local fishermen wishing to set up for tuna longlining, and if vessels and gear were available, undertake some trial longline fishing.

The range of objectives was ambitious given the time available for the project and the materials on hand in CNMI. Because there were no FAD materials available at the time, no FAD rigging or deployment was undertaken during the project. Also, no potential longline fishermen or vessels were identified so no longline activities took place.

The project focused on the introduction of mid-water fishing techniques through the running of four workshops, two on Saipan, and one each on Tinian and Rota. A total of fifty fishermen and DFW staff attended the four workshops. During the workshops, six monofilament and four rope vertical longlines were made up and used during practical fishing trials. In addition, six palu-ahi lines were made.

The mid-water fishing techniques were trialled both around FADs and along reef edges and near seamounts. Catches varied by location, with the FAD off Tinian being unproductive on most trips. Fishing in other locations around Tinian and Saipan proved to be unproductive. When working off Rota, catches greatly improved with the best catch being six yellowfin tuna on one monofilament vertical longline taken in the evening close to one FAD. The combined catch rate for all vertical longline fishing trials was 23.5 kg/100 hooks (51.7 lb/100 hooks).

After the workshops and practical fishing trials, the Fisheries Development Officer accompanied DFW staff on one of their regular data collection trips to Farallon de Medinilla, which lies about 50 nm north-northeast of Saipan. Two vertical longlines were set and allowed to drift along the reef while other fishing activities were undertaken. When the lines were hauled, 13 yellowfin tuna averaging about 15 kg (33 lb) each were caught on just 40 hooks in a four-hour period. This was by far the best catch and catch rate achieved during the project.

Training was provided to the skipper and crew of DFW's vessel in FAD site survey techniques. One FAD site was surveyed and one FAD site was selected. Advice was also provided on the present FAD program underway in CNMI. Recommendations on the FAD program and future training in mid-water fishing techniques are also provided in this report.

RÉSUMÉ

Le Commonwealth des Îles Mariannes du Nord a sollicité l'assistance technique de la section Développement de la pêche de la CPS au profit du développement de la pêche artisanale dans ce pays. Cette mission d'aide avait les objectifs suivants : collaborer avec le patron de pêche et l'équipage du navire du département des pêches, de la faune et de la flore (Department of Fish and Wildlife – DFW) et les former aux fins de la réalisation d'études de site pour le déploiement de DCP, initier le personnel à la fabrication et au mouillage de DCP avec le matériel disponible; faire des essais de pêche autour des DCP en utilisant des techniques de pêche à mi-profondeur, telles que la palangre verticale, le palu ahi, la pierre perdue, et la ligne dérivante munie d'un seul hameçon; organiser des ateliers afin de présenter les techniques de pêche à mi-profondeur autour des DCP aux pêcheurs de Saipan, Tinian et Rota intéressés et réaliser des essais de pêche à bord de leurs navires; et, conseiller les pêcheurs locaux désireux de s'équiper pour la pêche thonière à la palangre et, au cas où des navires et des engins seraient disponibles, faire des essais de pêche à la palangre.

Ces objectifs se sont avérés trop ambitieux, compte tenu du temps imparti pour mener à bien cette mission et du matériel disponible aux Îles Mariannes du Nord. En effet, les éléments d'accastillage n'étant pas disponibles au moment de la mise en œuvre du projet, aucun DCP n'a été mouillé ni monté. En outre, en l'absence de tout pêcheur ou navire, aucune opération de pêche à la palangre n'a pu être entreprise.

Le projet, axé sur l'initiation aux techniques de pêche à mi-profondeur, a consisté en l'organisation de quatre stages : deux à Saipan, un à Tinian, et un à Rota, auxquels ont participé, en tout, cinquante pêcheurs et membres du service des pêches. Six palangres verticales à monofilament et quatre lignes japonaises ont été fabriquées et utilisées lors des essais de pêche pratique. En outre, six lignes de palu ahi ont été montées.

Les stagiaires ont expérimenté les techniques de pêche à mi-profondeur autour des DCP, le long des récifs et à proximité de monts sous-marins. Les prises ont varié selon les sites, les DCP mouillés au large de Tinian et Saipan s'étant révélés improductifs lors de la plupart des sorties. Par contre, au large de Rota, la pêche a été bien meilleure puisque six thons jaunes ont été capturés sur une palangre verticale à monofilament, le soir, à proximité de l'un des DCP. Le taux de prise, tous essais de pêche à la palangre verticale confondus, a été de 23,5 kg/100 hameçons.

Après les stages et les essais de pêche pratiques, le chargé du développement de la pêche a accompagné le personnel du service des pêches lors de l'une des sorties habituelles de recueil de données à Farallon de Medinilla, situé à 50 milles nautiques au nord-nord-est de Saipan. Là, les stagiaires ont mouillé deux palangres verticales qu'ils ont laissées dériver le long du récif pendant qu'ils se livraient à d'autres activités de pêche. Au relevage des lignes, treize thons jaunes d'un poids moyen de 15 kg chacun avaient été pris sur quarante hameçons à peine, en l'espace de quatre heures. Ces prises et ce taux de prise ont été de loin les meilleurs enregistrés pendant la réalisation du projet.

Le patron de pêche et l'équipage du bateau du service des pêches ont été formés aux techniques d'étude de sites de DCP. Ils ont ainsi étudié les conditions offertes par un site et ont sélectionné un site. Le chargé du développement de la pêche a également fourni des avis sur le programme de mouillage de DCP actuellement mis en œuvre au Commonwealth des Îles Mariannes du Nord. On peut lire, dans le présent rapport de mission, les recommandations qu'il a émises sur le programme de DCP et sur la formation à fournir, à l'avenir, concernant les techniques de pêche à mi-profondeur.

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1. INTRODUCTION AND BACKGROUND

1.1 The Commonwealth of the Northern Mariana Islands

The Commonwealth of Northern Mariana Islands (CNMI) consists of a string of 14 islands in the Mariana Archipelago (Figure 1) running north and south along the 145° line of longitude from 14° N to 21° N (Hammetal. 2000). There are over 68,000 inhabitants living on Saipan, Tinian, and Rota. The other islands are mostly uninhabited. Tourism is the biggest industry in CNMI, followed by garment manufacturing. The exclusive economic zone (EEZ) of CNMI extends from 11° to 24° N and 141° to 149° E (Figure 2). The EEZ shares borders with Japan's Bonin Islands to the north and the other Mariana island, Guam, to the south, and is 777,000 km² (291,800 square miles — SPC 1999) in size.

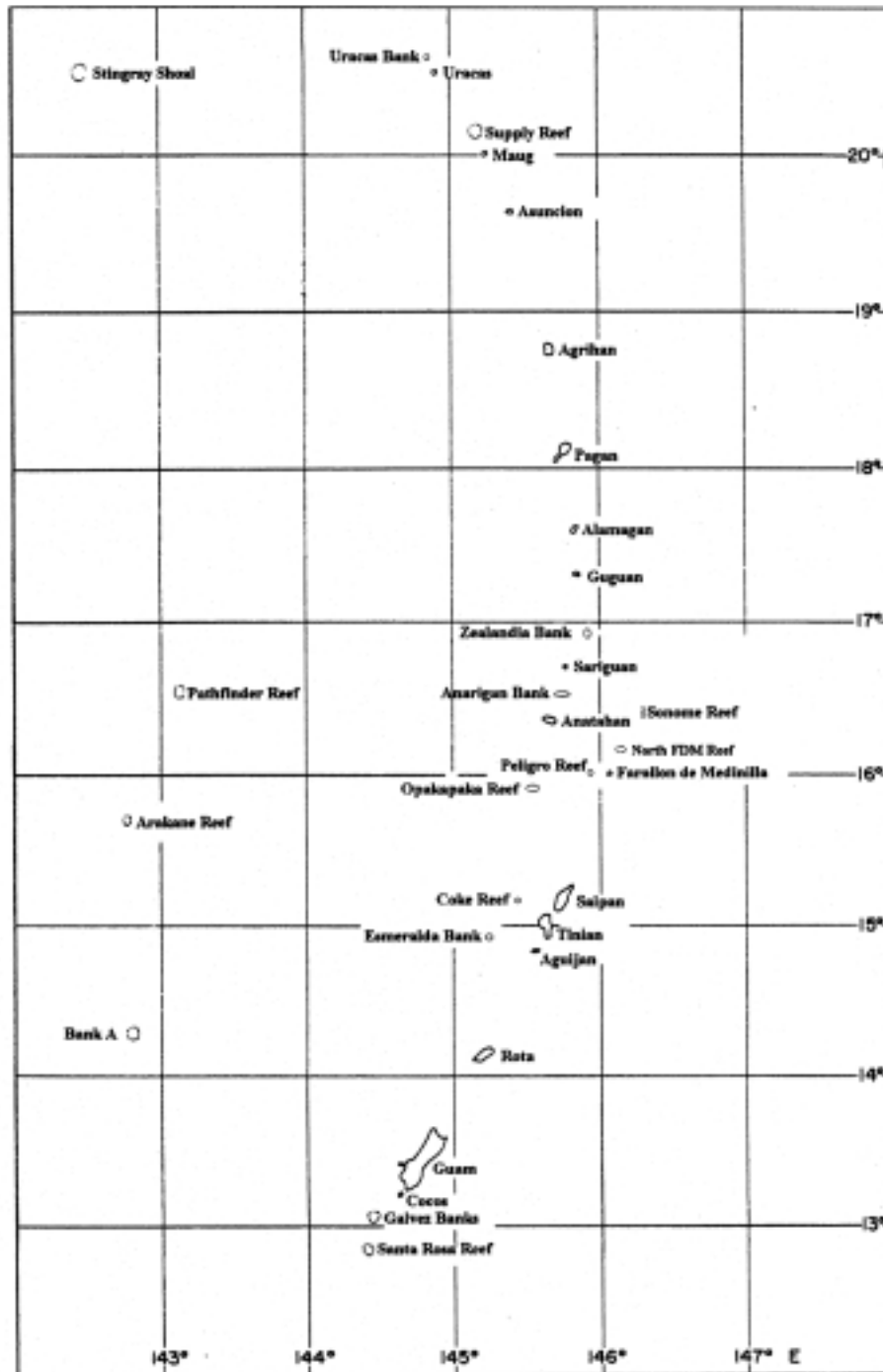


Figure 1: The Mariana Archipelago

There is currently no commercial pelagic fishing allowed in CNMI's EEZ (SPC 1999) by distant water fishing nations (DWFN). Longline fishing effort and catch for tunas can be looked at by examining data from the DWFN fleet, however, as records have been made of effort and catch by DWFNs in five degree squares in the vicinity of CNMI. Since the declaration of the EEZ, annual longline effort has been consistent at about 1,500,000 hooks and catches of yellowfin and bigeye tuna have been stable at about 250 mt in the vicinity of CNMI's EEZ. These figures are only approximations but can give some indication of likely catch per unit effort (CPUE) that might be expected of any longline fishing venture in the vicinity of CNMI. Based on these numbers, combined CPUE for yellowfin and bigeye tuna for CNMI would be 16.6 kg/100 hooks. This is fairly modest compared to CPUEs for other Pacific island countries and territories.

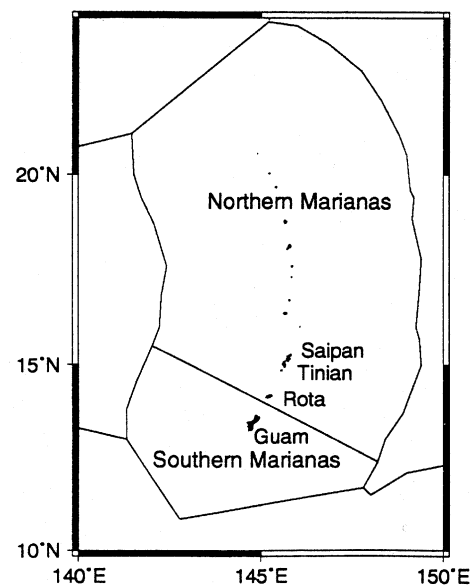


Figure 2: CNMI EEZ

The chief domestic commercial fishery in CNMI is small boat day trolling (Hamm 2000). Most boats are 3.5 to 7 m (12 to 24 ft) in length and are powered by outboards. A charter fleet is developing. During 1998 there were 24 vessels registered as charter fishing boats. Also in 1998, there were 131 small boats registered as commercial fishing boats. Another 143 boats were registered as part-time fishing boats. Trolling is the most important fishing method but bottom fishing and reef fishing are also important. Some larger boats bottom fish in the north. The majority of the catch is consumed locally but some fish have been exported to Guam, Hawaii, Korea, and Japan. Some reef fish are imported. Yellowfin tuna quarter loins (reject fish from the DWFN longline fleet) are imported from Guam by hotels and restaurants (pers. comm. Arnold Palacios). There is no domestic longline fleet in CNMI.

Skipjack tuna is, by far, the predominant species caught by the small boat fishery. April to August are the best fishing months, with average landings of 5900 kg (13,000 lbs), while the other months average 4550 kg (10,000 lbs). According to the Western Pacific Regional Fishery Management Council's fishery statistics (Hammetal. 2000), 1998 landings for CNMI included the following troll caught species:

- 9330 kg (20,529 lbs) of mahi mahi
- 2290 kg (5039 lbs) of wahoo
- 1006 kg (2213 lbs) of tunas (other than skipjack, dogtooth, or yellowfin)
- 60,827 kg (133,819 lbs) of skipjack tuna
- 6557 kg (14,426 lbs) of dogtooth tuna, and
- 5,298 kg (11,656 lbs) of yellowfin tuna.

A recent study of the economic potential of the domestic fishery in CNMI (Miller 2001) has concluded that the small boat fishery in CNMI is generally profitable for a large majority of participants but that the high cost of fuel cuts into profits. The report also states that development of a larger-scale domestic pelagic fishery is unlikely because of several existing constraints including lack of infrastructure, competition from Guam, conflicts with the tourism sector, and the fact that such operations are currently struggling in the region. Finally, the report concludes that CNMI government should focus its efforts on promoting the existing small boat pelagic fleet. Increased activity in that fishery does not appear to be constrained by regulations, finance, infrastructure, or labor. The primary constraints are the limited market and competition from imports.

1.2 CNMI's FAD program: past and present

The Pacific Tuna Development Foundation (PTDF), which operated out of Honolulu, Hawaii during the 1970s and 1980s, had several FAD projects in US Pacific island territories, including American Samoa, Guam, Palau, and CNMI (Anon 1980a). A total of five steel drum type FADs were deployed in CNMI during February and March 1980, including two near Saipan, two near Tinian, and one near Rota. The planned positions of these FADs were as follows:

- Buoy 1: 15° 16.8' N – 145° 40.6' E (Saipan)
- Buoy 2: 15° 11.5' N – 145° 33.6' E (Saipan)
- Buoy 3: 15° 05.5' N – 145° 32.7' E (Tinian)
- Buoy 4: 14° 57.1' N – 145° 33.7' E (Tinian)
- Buoy 5: 14° 12.5' N – 145° 10.4' E (Rota)

All of these sites are on the leeward, or protected, sides of the islands. According to PTDF's quarterly report for April to June 1980 (Anon 1980b), none of the FADs were deployed in the actual intended sites. This occurred because the deployment vessel did not have radar or echo sounder equipment. PTDF's Program and Projects report (Anon 1982) reported that all but one buoy was lost by August 1980. Even so, local boats caught over 1455 kg (3200 lbs) of fish near the FADs including 1136 kg (2500 lbs) of skipjack and yellowfin tuna.

The CNMI Fisheries Development Plan (Anon 1981) for fiscal years 1981 to 1985 included a Fish Aggregation Project (Project # 11). The project called for surveying potential FAD sites and fabrication of various designs of FADs, which were to be installed around Saipan, Tinian, Aguigan, Rota, Alamagan, Pagan, and Agrihan. The project was to be an extension of the PTDF FAD program.

In 1987 the Army Corps of Engineers issued ten FAD site permits to Division of Fish and Wildlife (Anon 2000). During the years 1990, 1991, and 1992 eight FADs were deployed in waters adjacent to Saipan, Tinian, and Rota on these sites. Two FADs were deployed in August 1997 but were lost in October 1997 because of typhoons that passed the Marianas Archipelago. The ten permitted FAD sites are as follows:

- FAD # 1 – 15° 17.19' N – 145° 41.33' E – 585 m or 325 fa (Saipan)
- FAD # 2 – 15° 19.319' N – 145° 41.33' E – 1825 m or 1014 fa (Saipan)
- FAD # 3 – 15° 14.904' N – 145° 29.777' E – 1290 m or 717 fa (Saipan)
- FAD # 4 – 15° 09.849' N – 145° 28.242' E – 1667 m or 926 fa (Saipan)
- FAD # 5 – 14° 12.7' N – 145° 10.8' E – 407 m or 226 fa (Rota)
- FAD # 6 – 14° 05.8' N – 145° 09.2' E – 311 m or 173 fa (Rota)
- FAD # 7 – 15° 04.6' N – 145° 32.94' E – 794 m or 441 fa (Tinian)
- FAD # 8 – 14° 59.9' N – 145° 27.7' E – 1224 m or 680 fa (Tinian)
- FAD # 9 – 15° 05.4' N – 145° 45.8' E – 511 m or 284 fa (Saipan)
- FAD # 10 – 14° 59.5' N – 145° 43.9' E – 522 m or 290 fa (Saipan)

During October 1994, two Division of Fish and Wildlife staff, Mr Jacinto Taman and Mr Juan Taitano, attended SPC's Second Regional FAD Workshop, which was held in Palau. Instruction was given in all phases of FAD theory, survey, rigging, deployment, and maintenance. One FAD was rigged and deployed in an area surveyed during the workshop. During the workshop, Mr Taitano presented a Commonwealth Report in which he stated that DFW had deployed five FADs around Saipan and Tinian and two around Rota in 1993. These were identified as FADs # 1, 2, 3, 4, 5, 6, and 8.

More recently, DFW contracted a private company (Cap'n Rick's) to conduct surveys, fabricate anchor blocks, and deploy FADs at the ten permitted FAD sites. FAD buoys were constructed by Micronesian Marine in Saipan following a DFW design (Figure 3). FAD moorings were ordered from Continental Western Rope in Seattle, Washington USA, to pre-cut lengths. In March 2000 two FADs were deployed around Rota and during July 2000 eight FADs were deployed around Tinian and Saipan. At the time of the FAD fishing workshop the only remaining FADs were the two around Rota (FAD # 5 and # 6) and the FAD off the east side of Tinian (FAD # 10). FADs # 1 and # 7 were reported missing in September 2000. One of the lost FADs (FAD # 1) was recovered and it was determined that it was lost due to shark bite on the nylon rope portion of the mooring. The position of the ten FADs relative to Saipan, Tinian, and Rota is given in Figure 4.

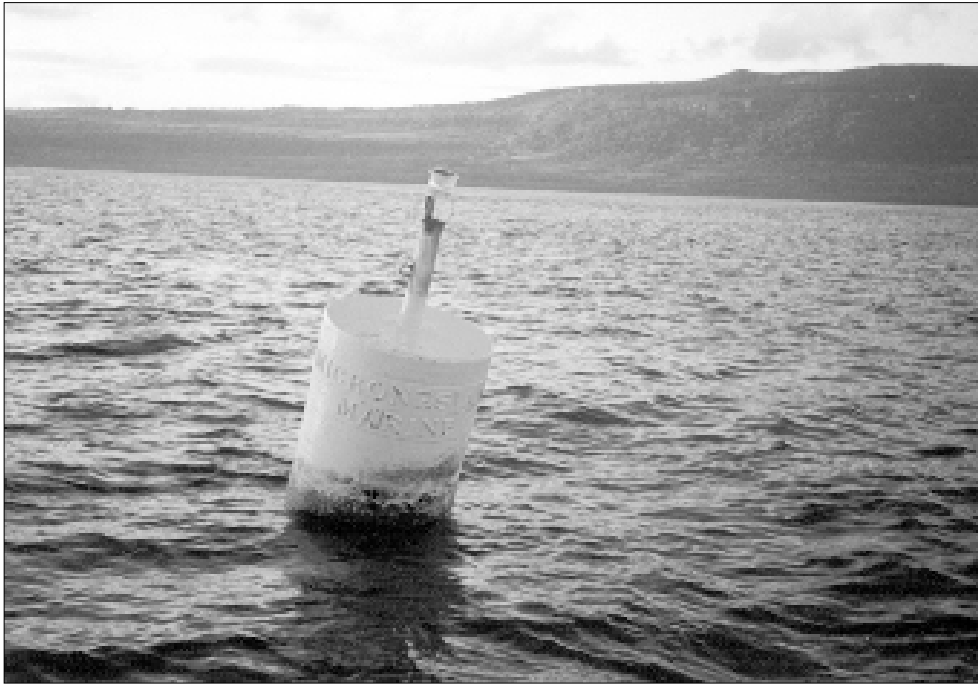


Figure 3: DFW FAD buoy

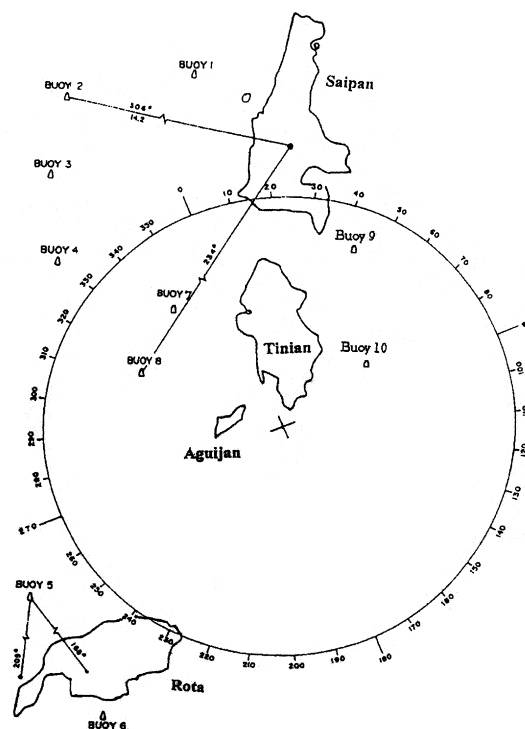


Figure 4: FAD locations around Saipan, Tinian, and Rota

Although CNMI's FAD program, both past and present, has had limited success, there is a lot of interest by the local small boat fishing fleet to see the program continue. In response to the open-ended question 'Do you have any suggestions concerning how CNMI fisheries should be developed, managed, or studied?' asked during interviews of local fishermen conducted on Saipan, Tinian, and Rota (Miller 2001), an overwhelming number of fishermen stated that CNMI needs more FADs.

1.3 Previous SPC visits to CNMI

SPC Masterfisherman, Mr Peter Watt, visited Saipan three times between September 1988 and August 1990 (Watt and Chapman 1998) as part of SPC's Deep Sea Fisheries Development Project. Activities included training courses in deep bottom fishing techniques including droplining and bottom longlining. A total of 71 fishing trips yielded 3731 kg (8208 lb) of fish. In all, 61 fishermen participated in the training. It was concluded that dropline fishing was more effective than bottom longlining, and it was recommended that fishing effort should be restricted by limiting entry into the fishery.

1.4 Project initiation and objectives

CNMI's Department of Land and Natural Resources and the DFW requested assistance from SPC's Fisheries Development Section to improve DFW's FAD program through counterpart training and by conducting FAD fishing workshops. The objectives of the ensuing project were to:

- Work with and train the skipper and crew of DFW's vessel to undertake FAD site surveys and locate suitable FAD sites;
- Train staff in correct FAD construction and deployment techniques, depending on availability of materials;
- Conduct fishing trials around FADs using mid-water fishing techniques such as vertical longlining, palu-ahi and drop stone handlines, and single hook drift lines;
- Hold workshops to introduce mid-water fishing techniques around FADs to interested local fishermen on Saipan, Tinian, and Rota, including some trial fishing from their vessels; and
- Provide advice to local fishermen wishing to set up for tuna longlining, and if vessels and gear are available, undertake some trial longline fishing.

Because there were no FAD materials on hand, the second objective could not be met. There was no FAD rigging or deployment undertaken during the project. Also, no potential longline fishermen or vessels were identified so no longline activities took place. The last objective was not met. All of the other objectives, however, were carried out.

2. FAD FISHING SKILLS WORKSHOPS

Two FAD fishing skills workshops were held on Saipan during April and May, one for DFW staff (Saipan and Tinian staff) and the other for interested fishermen on Saipan. During May, one workshop was held on Rota and one on Tinian. A total of fifty fishermen and DFW staff attended the four workshops (Appendix A). In addition, training was provided to the skipper and crew of DFW's vessel in FAD site survey techniques. One FAD site survey was conducted and one FAD site was selected.

2.1 Making the fishing gear

Before the workshops were conducted six wooden handreels were constructed following plans in SPC Handbook No. 25 (SPC 1985). All materials for the handreels were pur-

chased locally at Ace Hardware in Saipan. The wood consisted of 50 x 100 mm (2 x 4 in) and 25 x 100 mm (1 x 4 in) Philippine mahogany. The hardware was all galvanized mild steel as no brass or stainless steel was available. After the reels were completed, a set of wood templates was made with leftover pieces of 25 x 100 mm (1 x 4 in) mahogany. The templates will be available at the DFW office to anyone who wishes to build a reel.

Two of these wooden reels were mounted on DFW's 8 m (27 ft) Boston Whaler (Figure 5), one on either side of the boat. During the workshops (two on Saipan and one each on Tinian and Rota), monofilament vertical longlines were made and loaded onto the reels. A total of six monofilament vertical longlines and four rope vertical longlines were made during the four workshops. In addition, six palu-ahi handlines were made. All of the fishing gear was put together according to specifications in SPC's FAD fishing manual (Preston et al 1998). All of the material for the fishing gear was purchased from Pacific Ocean Producers, Hawaii. Complete sets of gear (one monofilament longline with branchlines, floats, and floatlines; one rope vertical longline with branchlines, floats, and floatlines; and one palu-ahi line) were left with DFW staff on Tinian and Rota. The other sets of gear remained at DFW headquarters on Saipan.



Figure 5: DFW's Boston Whaler

The monofilament vertical longlines were made with 2.0 mm monofilament nylon and 12/0 Crane swivels. All connections were made with D size sleeves and Flemish eyes. The lines consisted of a top section of 90 m (50 fa), 20 sections of 9 m (5 fa) for branchline connections, and a bottom section of 9 m (5 fa) for attaching the weight. Weights were made from 19 mm anchor chain (four links). Floatlines were made from 6.4 mm tarred polyester rope and were 9 m (5 fa) long with a swivel snap at one end and an eye splice at the other. Floats were rigged with 1 m (0.5 fa) of tarred rope and a swivel snap. Reflective tape was added to all floats. Bamboo flagpoles were rigged to attach to the floats. Strobe lights were attached to the flagpoles for night sets. Branchlines for the monofilament vertical longlines consisted of 4 m (2 fa) of 1.5 mm monofilament with a 3.6 Japan tuna hook or a 15/0 tuna circle hook at one end and a mini swivel snap at the other. Branchlines were stored in plastic laundry baskets rigged with a piece of 2.0 monofilament for hanging the snaps (Figure 6). The monofilament vertical longlines were stored on the wooden handreels, from which they were set and hauled. Figure 7 shows the components of one vertical longline.



Figure 6: Branchlines stored in basket

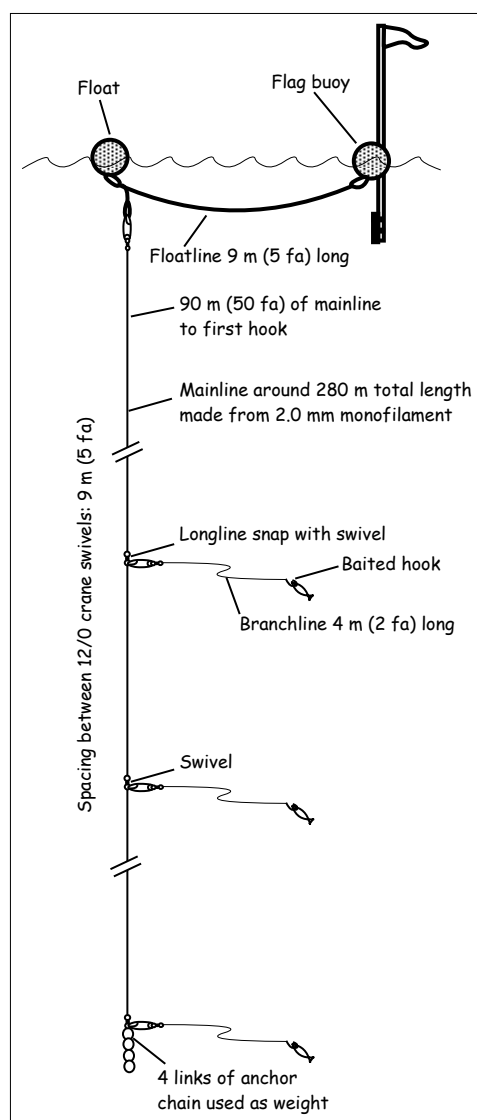


Figure 7: Components of a vertical longline

Rope vertical longlines were made using 6.4 mm tarred polyester rope. They consisted of a top section of 9 m (5 fa), 15 or 20 sections 9 m (5 fa) apart for attaching branchlines, and a bottom section of 9 m (5 fa) for attaching the weight. Swivels were attached to the rope lines in two ways: they were spliced onto the line to form attachment points for the branchlines or they were held in place by two overhand knots so they could rotate freely around the mainline. Floatlines were the same as for the monofilament vertical longlines. Extra floatlines were made to get the rope vertical longlines deeper. Branchlines were made from 2.0 mm monofilament. They consisted of 4 m (2 fa) of monofilament, a heavy-duty swivel snap, and a 3.6 stainless steel Japan tuna hook. The rope vertical longlines were stored in plastic tubs and were set and hauled by hand from the tubs.

Palu-ahi lines were made from 500 m (275 fa) of 135 kg (300 lb) test gray dacron line, with a 6 m (3 fa) trace of 1.0 mm nylon monofilament. Figure 8 shows the main components of the palu-ahi gear made up during the project.

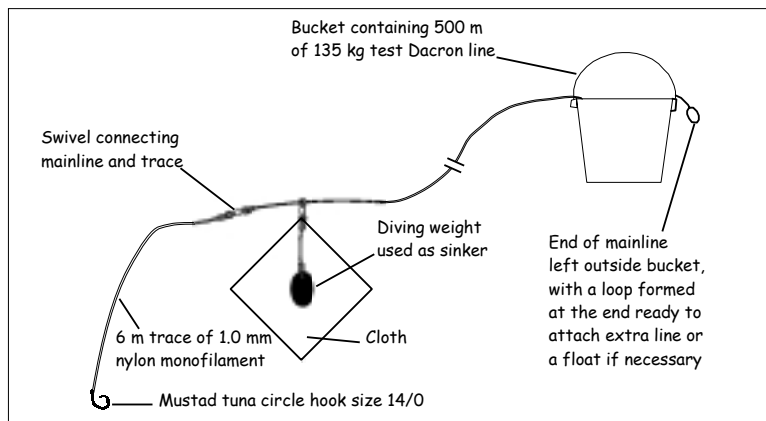


Figure 8: Main components of a palu-ahi line

2.2 Fishing trials

After the fishing gear was completed, fishing trials were conducted in the vicinity of FAD # 10, east of Tinian, and on FADs # 5 and # 6 around Rota. Because FAD # 10 proved to be unproductive, several trips were made to other areas around Tinian and Saipan. These proved to be unproductive as well. On each day of fishing, two monofilament longlines and one rope vertical longline were set to drift past the FADs or near a seamount or reef, whatever the case. During the soak of the vertical longlines, two palu-ahi lines were also fished. Most trips were made in the morning but several trips were also made in the evening. During the evening trips, the rope vertical longlines were not set. The bait for vertical longline fishing and for palu-ahi fishing was frozen *Decapterus* sp (mackerel scad, opelu, muro aji) that had been purchased from a longline supply company in Guam (Pacific Network, Inc.). Fresh skipjack tuna that was caught on troll lines near the FAD was also used on occasion for the palu-ahi fishing.

In all, during 17 trips on DFW's Boston Whaler (refer Figure 5) and two trips on Cap'n Rick's Boston Whale, 16 yellowfin tuna (*Thunnus albacares*), three grey reef sharks (*Carcharhinus* sp), one hammerhead shark (*Sphyrna* sp), and two pink snapper or opakapaka (*Pristipomoides flavipinnis*) were caught on the vertical longlines on a total of 960 hooks and two palu-ahi lines. Most of the fish were caught around FAD # 6 off the south side of Rota during the workshops there. The best catch during the workshops was six yellowfin tuna on one monofilament vertical longline fishing near FAD # 6 in the evening. One yellowfin tuna was caught on a palu-ahi line, also near FAD # 6. Only two yellowfin tuna were caught near FAD # 10. No yellowfin tuna were caught on the seamount or reef fishing areas during the workshops. The two opakapaka were caught when one of the vertical longlines drifted into shallow water at Marpi Reef, north of Saipan. Combined CPUE for all of the workshops for the target species only (yellowfin tuna) was about 1.6 fish per 100 hooks or approximately 23.5 kg/100 hooks (51.7 lb/100 hooks — weights were estimated nominally at 15 kg (33 lb) per fish). Figures 9 to 12 show sequence of setting and hauling vertical longline.



Figure 9: Setting the line

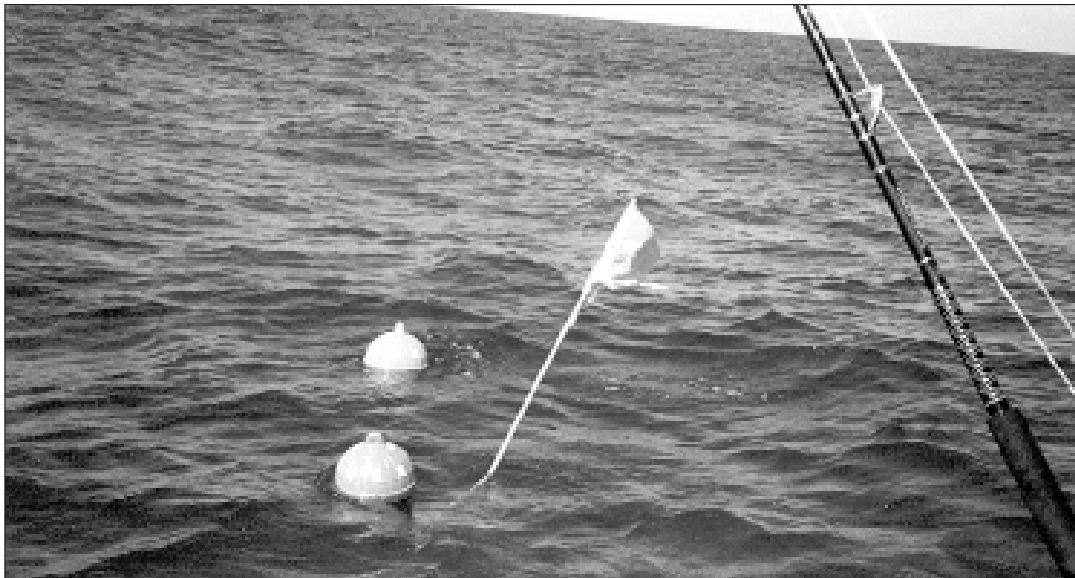


Figure 10: The floats and flagpole (the lead float is heavy, indicating a good catch)



Figure 11: Hauling in the line and gaffing a yellowfin tuna



Figure 12: Part of the catch at FAD # 6 off Rota

Generally, the vertical longlines were allowed to soak from two-and-a-half to three hours before hauling. On occasion, they were hauled and set again in order to keep them near the FAD. The lines were set up-current of the FAD or up-current of the desired fishing area (if other than near a FAD). During the soak time, the palu-ahi lines were fished. On most days, however, current and wind conditions caused the boats to drift too fast for the palu-ahi lines to be effective. If bird piles were spotted during the soak time, the boats trolled for skipjack tuna (*Katsuwonus pelamis*) and occasionally rainbow runner (*Elagatis bipinnulatus*) were caught as well. On one trip to a bank west of Tinian, two electric reels were used for deep bottom fishing on the bank while the vertical longlines soaked in deeper water just off the bank. The point made was that vertical longline fishing can be supplementary to other fishing techniques.

2.3 Fishing trials after the workshops

On 30 May, after completion of the four workshops, the Fisheries Development Officer accompanied DFW staff on one of their regular data collection trips to Farallon de Medinilla, which lies about 50 nm north-northeast of Saipan. Farallon de Medinilla is uninhabited and is used by the US military as a bombing target. There is an extensive bank surrounding the island that harbors a rich fauna. The main purpose of the DFW trip was to catch mafute, or redgill emperor (*Lethrinus rubrioperculatus*), for an ongoing stock assessment study. The mafute were caught using electric bottom fishing reels with squid for bait. After collecting the required number of specimens, two monofilament vertical longlines were set on the drop-off about 4 nm to the east of the island and offshore of the bottom fishing grounds. The lines were set at one o'clock in the afternoon and hauled back at five o'clock. During the soak, more bottom fishing was carried out on the bank surrounding the island. Several more bottom fish were caught during this time including onaga (*Etelis coruscans*), amberjack (*Seriola dumerili*), jobfish or uku (*Aprion virescens*), yellow-spotted trevally (*Carangoides orthogrammus*), lyretail grouper (*Variola louti*), gindai (*Pristipomoides zonatus*), black-tipped grouper (*Epinephelus fasciatus*), and blue-lined snapper (*Lutjanus kasmira*).

The vertical longlines, however, provided the best catch of the day. One line had eight yellowfin tuna and the other had five yellowfin tuna. Thirteen fish, averaging about 15 kg (33 lb) each were caught on just 40 hooks in a four-hour period. The CPUE for this day for the vertical longlines was 32.5 fish/100 hooks or approximately 487.5 kg/100 hooks (1073 lb/100 hooks), which is quite phenomenal.

2.4 Summary of effort and catch

Table 1 provides a summary of all fishing activity undertaken during this project. As can be seen from the table, many trips resulted in no catch. However, combining the catches for all vertical longline fishing yields a CPUE of 2.8 fish/100 hooks or 42 kg/100 hooks (92 lb/100 hooks).

Table 1: Summary of effort and catch for all fishing activities during the project

Date	Position	Fishing hours	VLL hooks	Number of fish	Catch and effort	
					Palu-ahi lines	Number
25.04.01	FAD #10	2.5 hrs	60	no fish	2	no fish
26.04.01	FAD #10	6 hrs	60	2 Yellowfin tuna	2	no fish
01.05.01	FAD #10	4 hrs	60	no fish	2	no fish
02.05.01	Puntan Naftan	2 hrs	60	no fish	2	no fish
02.05.01	FAD # 10 (Capt Rick)	4 hrs	60	no fish	2	no fish
02.05.01	Tatsumi Reef	2 hrs	60	no fish	2	no fish
03.05.01	Marpi Reef (2 boats)	12 hrs	120	2 Sharks, 2 Deep-water snapper	4	no fish
08.05.01	FAD #5	2 hrs	60	no fish	2	no fish
08.05.01	FAD #5	2 hrs	40	no fish	0	no fish
09.05.01	FAD #6	2 hrs	40	11 Yellowfin tuna	0	no fish
10.05.01	FAD#6	2 hrs	60	2 Yellowfin tuna	2	no fish
10.05.01	FAD #6	2 hrs	40	no fish	1	1 Yellowfin
22.05.01	FAD #10	2 hrs	40	no fish	2	no fish
23.05.01	Aguijan	2 hrs	60	1 Hammerhead shark	2	no fish
23.05.01	Tatsumi Reef	2 hrs	40	no fish	0	no fish
24.05.01	Seamount west of Tinian	4 hrs	60	no fish	0	no fish
25.05.01	FAD #10	2.5 hrs	60	no fish	2	no fish
31.05.01	Farallon de Medinilla	4 hrs	40	13 Yellowfin tuna	0	no fish

3. NOTES ON CNMI's FAD PROGRAM

3.1 Present program

DFW's present FAD program has relied on contracting the private sector, not only to fabricate anchor blocks, but to conduct site surveys and to deploy and maintain the FADs. As a result, the present program is among the most expensive in the region in terms of cost per unit. The total program for deployment of ten FADs during 2000, not counting time and effort supplied by DFW staff, cost CNMI over USD 150,000. The cost per FAD was, therefore, just over USD 15,000. Considering that most of the FADs disappeared in less than one year, some important questions need to be asked.

A breakdown of the individual costs of materials and services (obtained by examining copies of invoices) shows the following:

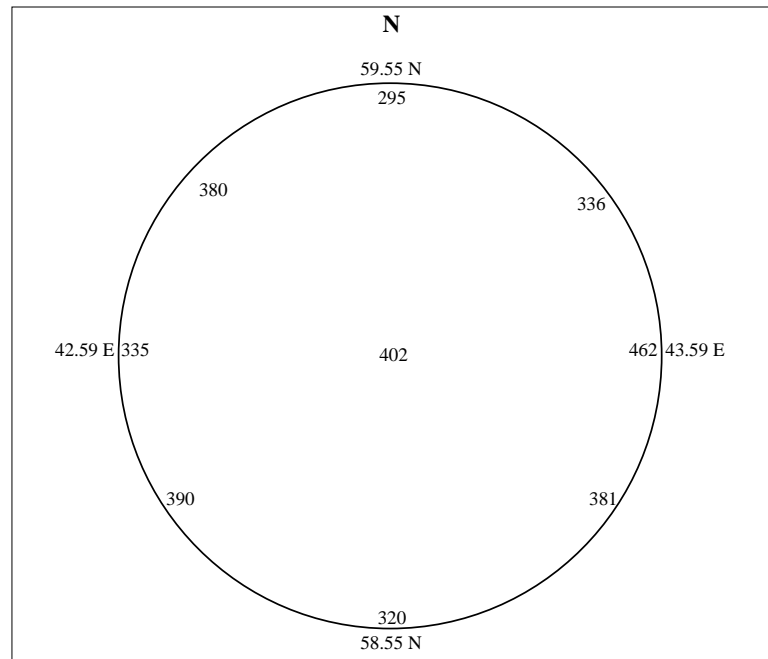
- Ropes and hardware for ten moorings (Continental Western Corp, Seattle, Washington) — USD 46,932;
- Ten FAD rafts (Micronesian Marine, Saipan, CNMI) — USD 23,900;
- Pipe assembly for ten rafts (Seafix Inc, Saipan, CNMI) — USD 4800;
- Ten solar lights (Scottco Distributors Inc, Hayden Lake, Idaho) — USD 2235;
- Site surveys for ten FAD sites (Cap'n Rick's, Saipan, CNMI) — USD 10,000; and
- Rigging and deployment of ten FADs, including anchor block fabrication (Cap'n Rick's, Saipan, CNMI) — USD 64,900

The actual total cost for ten FADs was USD 152,767 or USD 15,277 for each FAD.

DFW's Sportfish Restoration Research Program Annual Progress Report for 1998–99 (Anon 2000) details the scope of work to be carried out by the local contractor. Among other things is a requirement that the contractor provide, *"Depth contours for ten (10) pre-selected offshore sites; to include providing depth contours for a 0.5 mile radius from selected sites..."*. (These sites are the same ones that were selected in 1987 by the Army Corps of Engineers). The same document shows all of the surveys submitted by the con-

tractor (Figure 13). Although the contractor did take some depth readings adjacent to a 0.5 nm radius of each site, only one sounding was taken within the radius and no bottom contours were drawn. Survey techniques as outlined in SPC's FAD Manual Volume III (Gates et al. 1998, pages 14–17) were not followed. Depth readings should have been taken every 0.25 nm in every direction within the survey zones, and contours drawn using these data (see Section 3.2 below).

Figure 13: Example of FAD survey done by local contractor



Six of the ten pre-selected FAD sites are in depths less than 1200 m (648 fa). All of these FADs should have had supplementary buoyancy added to the floating rope section of the mooring (refer to SPC's FAD manual Volume II, page 37, Gates et al. 1996). FAD moorings using the reverse catenary system depend on the floating section of rope to lift at least three metres of bottom chain off the bottom. Without this lift, the rope section may drag on the bottom and eventually wear through, causing loss of the FAD. FADs anchored in depths of at least 1200 m have enough floating rope to lift three metres of bottom chain. Shallower FADs need to have extra flotation added in the form of pressure buoys attached to the floating, or polypropylene, rope. FADs # 1, 5, 6, 7, 9, and 10 all should have had supplementary buoyancy added.

3.2 New FAD site survey

At the request of DFW, the Fisheries Development Officer conducted one FAD site survey in an area chosen by DFW staff near Saipan. Instruction was given in survey techniques and in drawing bottom contours based on survey work. An alternate FAD site was selected (Figure 14). The new FAD site is in 593 m (330 fa) depth and is located about five nm northwest of Saipan at:

15° 20.75' N – 145° 46.00' E

The survey was done following the procedures outlined in SPC's FAD Manual Volume III (Gates et al. 1998). DFW's Boston Whaler was equipped with a suitable echo sounder and GPS for conducting FAD site surveys. After arriving in the survey zone, the boat was steered east and west along lines of latitude in increments of 0.25 nm starting at 15° 20.00' N. Depth recordings were made as the boat crossed lines of longitude at every 0.25 nm. The first recording was made at 145° 45.00' E and the next at 145° 45.25' E, and so on until a line two miles long had been traversed (from 145° 45.00' E to 145° 47.00' E). The next line surveyed was 15° 20.25' N. This procedure was continued, working north, until the last line was surveyed — 15° 21.50' N. A total area of 3 nm² was surveyed. A single bottom contour corresponding to a depth of 600 m was identified and drawn in. A suitable FAD site was then selected.

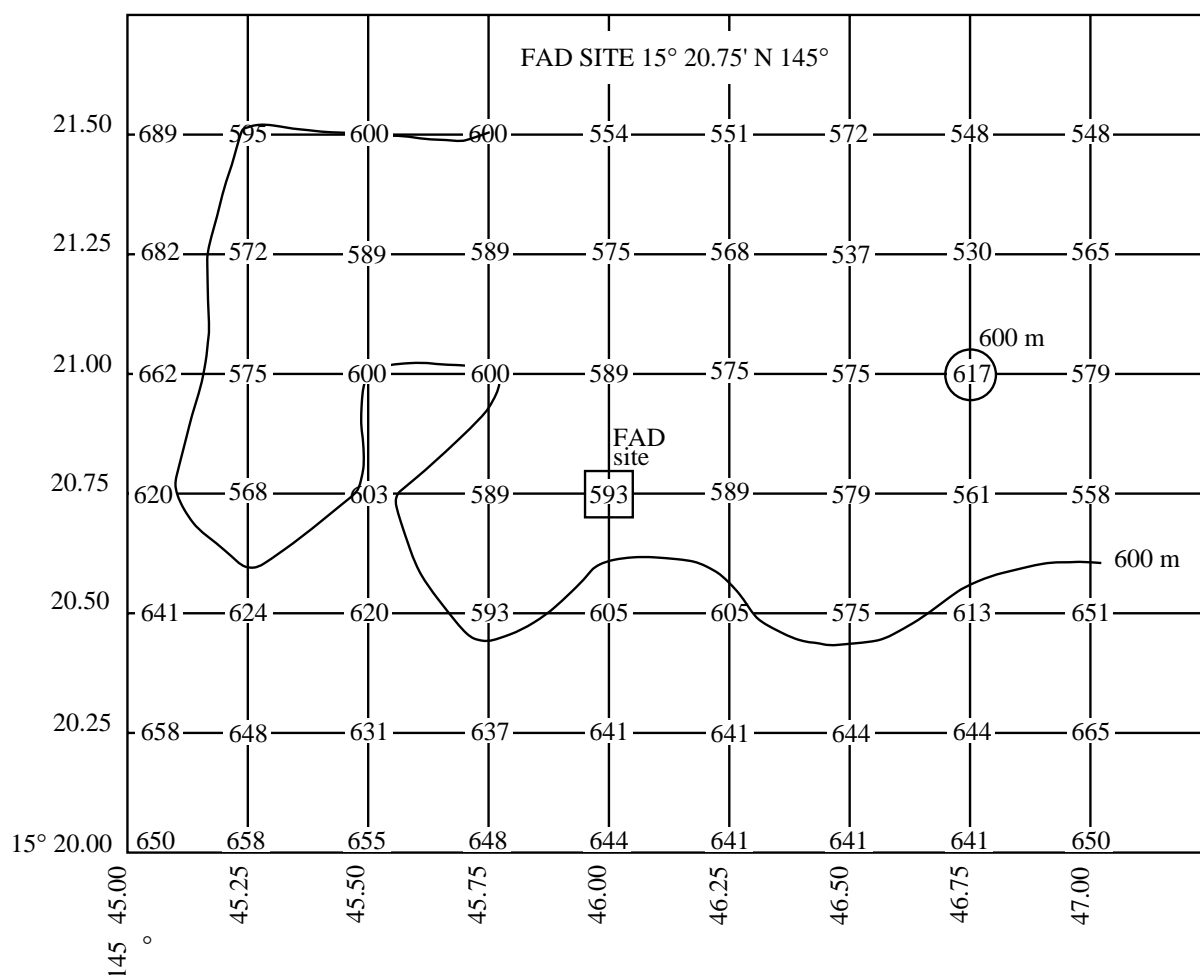


Figure 14: FAD site survey showing bottom contour and selected FAD site

4. RECOMMENDATIONS

DFW's present FAD program is expensive and not without problems. The high cost is aggravated by the fact that most of the FADs were lost before their expected lifespan. The following recommendations may help to cut costs, avoid problems with FAD loss, and make the FAD program more effective. It is recommended that DFW:

- Purchase FAD ropes and hardware in bulk rather than pre-cut for existing sites,
- Request the local contractor to conduct surveys following SPC guidelines and provide bottom contour drawings so that suitability of each site can be determined,
- Conduct more FAD site surveys in new areas,
- Include supplementary flotation on all future FAD deployments for sites with depths less than 1200 m (648 fa),
- Rig and deploy a FAD at the new site surveyed during the FAD fishing workshop,
- Deploy only three to four FADs at a time, rather than deploying FADs in all ten sites at once, and
- Request assistance from SPC's Fisheries Development Section on future FAD deployments,

In regard to future activities, it is recommended that DFW:

- Conduct more FAD fishing training for local fishermen using gear and techniques from the workshops,
- Encourage small boat commercial fishermen to begin using the vertical longline

- method to supplement their catch during trolling or deep bottom fishing trips, particularly on trips to the northern islands,
- Assist local fishermen in fish handling methods with the aim of improving quality (proper gilling and gutting and chilling with ice) to improve quality of landed fish, and
- Explore the possibility of exporting small quantities of high quality fresh tuna to Japan, Hawaii, and US west coast if a small-scale tuna fishery develops.

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