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on

FISH AGGREGATING DEVICE (FAD)

SITE SURVEYS FOR YAP STATE,

FEDERATED STATES OF MICRONESIA

26 March to 9 April 2000

by

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This field report forms part of a series compiled by the Fisheries Development Section of the Secretariat of the Pacific Community's Coastal Fisheries Programme. These reports have been produced as a record of individual project activities and country assignments, from materials held within the Section, with the aim of making this valuable information readily accessible. Each report in this series has been compiled within the Fisheries Development Section to a technical standard acceptable for release into the public arena. However, they have not been through the full Secretariat of the Pacific Community editorial process.

In March 2000 the Capture Section became the **Fisheries Development Section**, to better reflect the actual work undertaken by the Section. At that time, the 'Unpublished Reports' produced by the Capture Section ceased, and this new series of '**Field Reports**' commenced. The names have changed, the Section, the reports and the functions continue.

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SUMMARY

Yap State (Federated States of Micronesia) requested that SPC's Fisheries Development Section provide technical assistance in fish aggregating device (FAD) site surveys, FAD rigging, and FAD deployments. The request was part of a larger request involving the states of Pohnpei and Kosrae. SPC's Fisheries Development Advisor, Lindsay Chapman, visited Yap during November 1999 to plan a project to be undertaken by a Fisheries Development Officer. Fisheries Development Officer, Steve Beverly visited Yap from 26 March to 9 April 2000 to carry out the project. Due to unforeseen difficulties, only the FAD site survey portion of the project was carried out in Yap. The Pohnpei and Kosrae components of the project will be reported in separate documents.

Three FAD site surveys were conducted using SPC supplied electronic equipment and Yap Fresh Tuna's longline vessel, F/V *Marwel*. The surveys were conducted following guidelines in SPC's FAD Manual Volume III. Bottom contours were drawn by hand and by computer programme as well. Three FAD sites were chosen. Draft versions of the bottom contour drawings with FAD sites were left with Yap Fishing Authority.

Yap Fishing Authority should be able to rig and deploy three FADs around Yap proper using the information in this report and by following guidelines in SPC's FAD Manuals Volumes II and III.

RÉSUMÉ

L'État de Yap (États fédérés de Micronésie) a demandé à la section Développement de la pêche de la CPS de lui fournir une aide technique pour la réalisation d'enquêtes sur les sites se prêtant au mouillage de dispositifs de concentration du poisson (DCP), ainsi que pour la fabrication de ces dispositifs et leur pose. Cette demande s'inscrivait en fait dans le cadre d'une requête plus large associant les États de Pohnpei et de Kosrae. Le conseiller pour le développement de la pêche, Lindsay Chapman, s'est rendu à Yap en novembre 1999 pour planifier un projet dont devait se charger un chargé du développement de la pêche, Steve Beverly, qui s'est rendu à Yap en mars et en avril 2000 pour l'exécuter. Toutefois, en raison de difficultés imprévues, seule la partie du projet concernant l'enquête sur les sites de mouillage des DCP a été menée à Yap. Il sera rendu compte des composantes du projet qui se sont déroulées à Pohnpei et à Kosrae dans des documents distincts.

Trois enquêtes sur les sites de mouillage des DCP ont été réalisées au moyen de matériel électronique fourni par la CPS et du thonier-palangrier de Yap, le F/V *Marwel*. Les enquêtes ont été réalisées suivant les directives énoncées dans le volume III du manuel sur les DCP réalisé par la CPS. Les tracés des fonds ont été établis à la main ainsi que par ordinateur. Trois sites de mouillage des DCP ont été retenus. Les ébauches de tracés des fonds indiquant les sites de mouillage de DCP ont été remises au service des pêches de Yap.

Ces autorités devraient être en mesure de fabriquer et de poser trois DCP à proximité de Yap en se fondant sur les renseignements contenus dans ce rapport et en suivant les directives données dans les volumes II et III du manuel sur les DCP de la CPS.

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ABBREVIATIONS USED

° C—degrees Centigrade
kHz—kilo Hertz (cycles per second)
km—kilometre
kW—kilo Watt
m—metre
mm—millimetre
nm—nautical mile
VDC—volts direct current

1. INTRODUCTION AND BACKGROUND

1.1 Federated States of Micronesia

The Federated States of Micronesia (FSM) consists of over 600 islands spread out over 2,780,000 km² of the western and central Pacific Ocean. The chain of islands runs east and west, and was formerly called the Caroline Islands (Figure 1). FSM lies between the equator and 14° N latitude, and between 135° E and 166° E longitude. The islands range from high volcanic islands to low lying coral atolls. The total land area is only 700 km² and only about 60 of the islands are inhabited. The climate is tropical with relatively uniform annual temperatures of 27° C. Most of FSM has a definite wet season and dry season with annual rainfall varying from 2,700 mm in the west to 6,500 mm in the east (Smith, 1992).

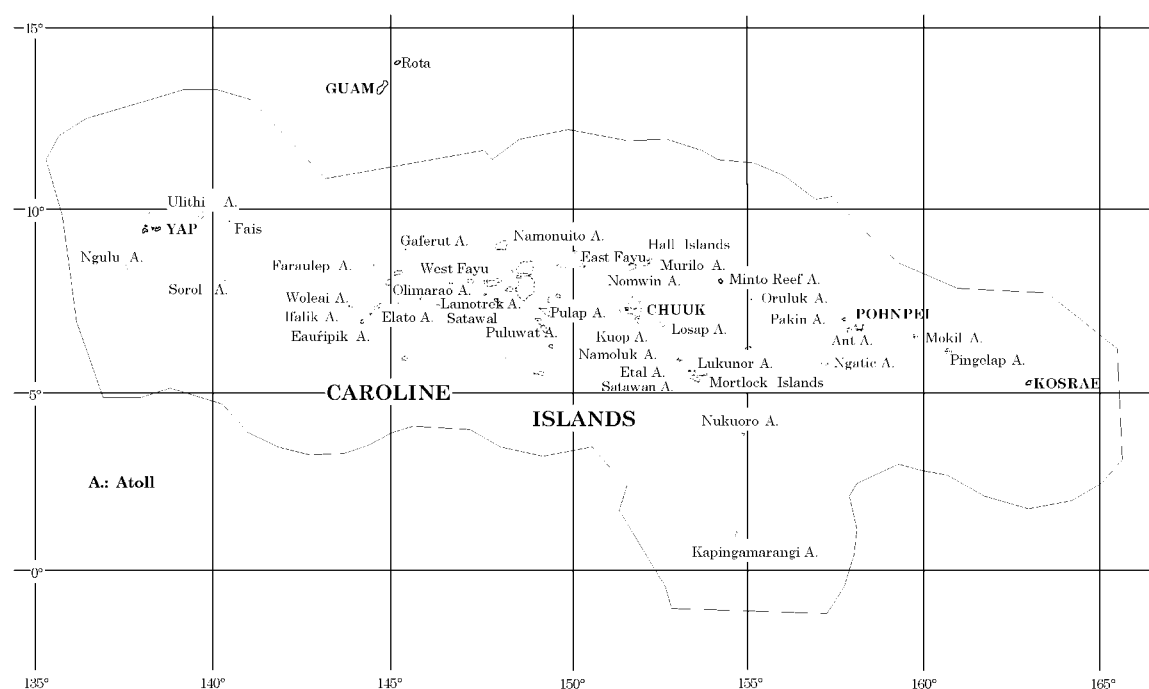


Figure 1: Federated States of Micronesia (FSM) showing the boundaries of its EEZ

Politically FSM consists of four states. From west to east the states are Yap, Chuuk, Pohnpei, and Kosrae. The administrative head of FSM is in Palikir on Pohnpei. There are three levels of government in FSM, the National, State, and Municipal. Each state has a marine resources division or a fisheries division, all of which fall under the National Fisheries Section, which comes under the Department of Economic Affairs.

Three states in the FSM—Kosrae, Pohnpei, and Yap—requested assistance from the Secretariat of the Pacific Community in developing a FAD programme. Chuuk was not included in the requests. SPC's Fisheries Development Advisor, Lindsay Chapman, visited FSM during 1999 to make arrangements for a Fisheries Development Officer to conduct FAD site surveys, FAD riggings, and FAD deployments in the three states. The visit to Yap was the first leg of the ensuing project. The Kosrae and Pohnpei components of the project will be discussed in separate documents.

1.2 Yap

Yap State consists of Yap proper (Figure 2), which includes four closely associated high islands (Yap, Gagil-Tamil, Maap, and Rumung) and several smaller ones, all surrounded by a barrier reef, and 15 outer islands and atolls spread out over 40 per cent of FSM's EEZ (Smith, 1992). Tamil Harbour and the main centre of commerce

on Yap are located in Colonia. Yap Fishing Authority (YFA), located in Colonia, is a semi-autonomous government agency that is responsible for the development of commercial fisheries and has some fisheries management responsibilities including foreign licensing and surveillance of near-shore fisheries out to the 12 mile limit. YFA was the counterpart organisation for the FAD project. Yap Fresh Tuna (YFT), located next to YFA, is a government-owned tuna processing and transshipping facility that recently acquired a reconditioned longline vessel from Japan, F/V *Marwel*, which was used as the survey vessel during the project.

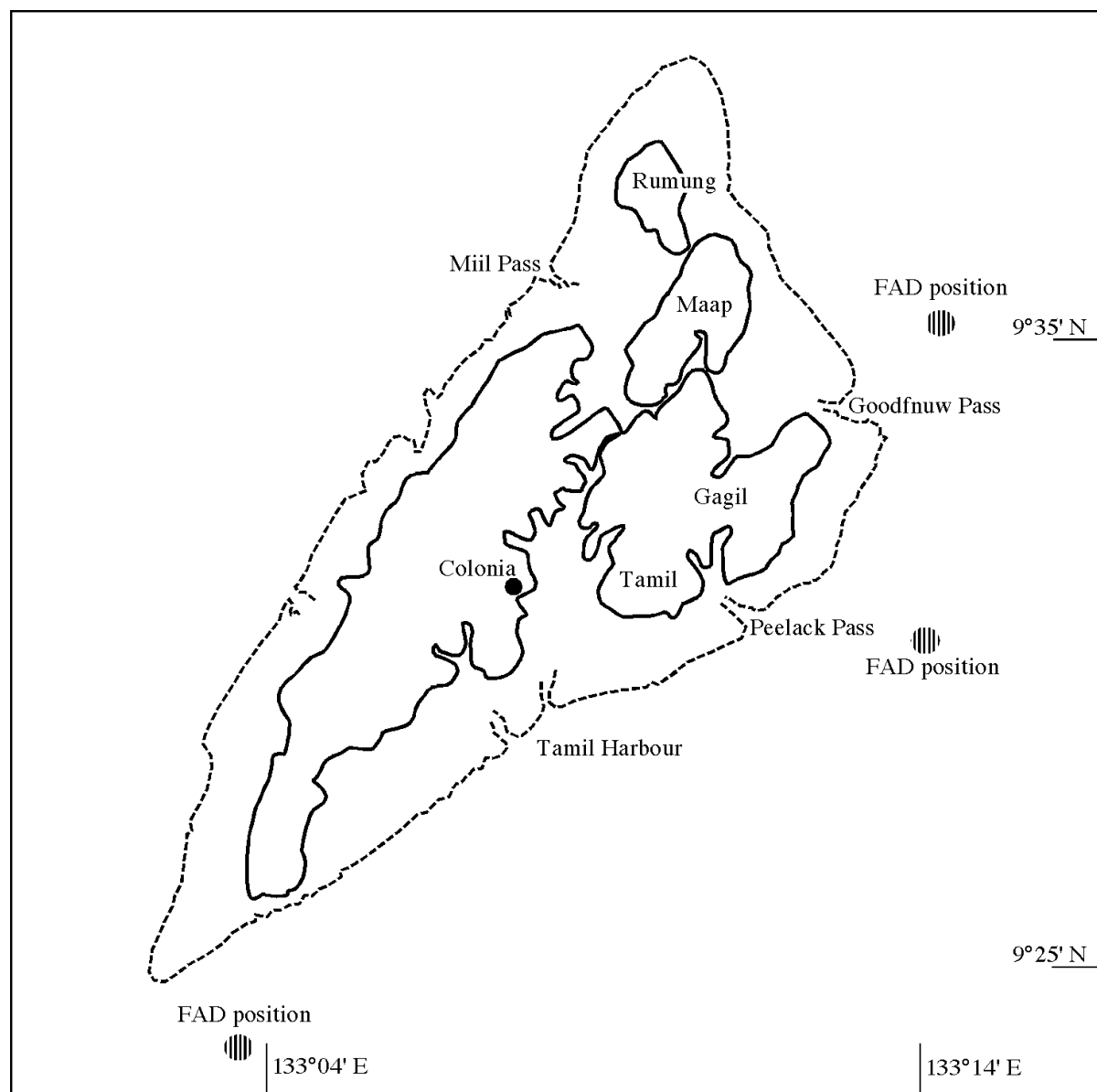


Figure 2: Yap proper showing proposed sites for FAD deployments

1.3 Previous FAD programme in Yap

SPC Masterfisherman, Lindsay Chapman, visited Yap during 1984/85 to rig and deploy FADs, and to conduct fishing trials around the FADs (Chapman & Cusack, 1997). A total of five FADs were deployed around Yap proper following guidelines for rigging given in SPC's original FAD handbook (Boy & Smith, 1984). No bottom surveys were carried out, however, other than echo sounding for suitable depths and gradient. Table 1 gives dates of deployment, depths, and positions for the five FADs. The length of time the FADs stayed on station varied, with two lost, one after 52 days and the other after 143 days. The remaining three FADs were on station at the end of the project, with the longest having a duration of 239 days. The distance from shore ranged from 2.4 km to 6.4 km and averaged 5.0 km. A total of 67 fishing trips were conducted around the five FADs, yielding a total of 2,024 kg of saleable fish caught during 242 line-hours of trolling.

Table 1: SPC FAD deployments around Yap proper during 1984/85

	FAD 1	FAD 2	FAD 3	FAD 4	FAD 5
Date deployed	08/08/84	06/09/84	12/09/84	19/09/84	20/02/85
Latitude	09° 27' N	09° 31' N	09° 38.5' N	09° 20.5' N	09° 37' N
Longitude	138° 14' E	138° 04' E	138° 08.5' E	138° 00' E	138° 14' E
Depth (m)	1,170	1,097	1,371	1,024	1,188
Duration from when deployed to close of project (04/04/85)	239 days and on station	52 days when lost	143 days when lost	197 days and on station	43 days and on station

A sixth FAD was deployed offshore of Ulithi Atoll by local counterpart fisheries officers. It was deployed at 10° 02.5' N and 139° 50.0' E in 1,133 m on 14/03/85. This FAD was on station for 21 days at the end of the project.

Several improvements have been made in FAD site survey techniques and in FAD designs and rigging since the 1980s. Survey techniques and recommended FAD mooring designs for this project follow methods and specifications outlined in SPC's two practical FAD manuals (Gates et al., 1996 and Gates et al., 1998). In addition, a computer programme was used to generate bottom contour drawings.

2. FAD SURVEY TECHNIQUES

2.1 The survey vessel

The vessel used for the three FAD site surveys was F/V *Marwel*, a 22 m Japanese longliner that had recently been donated to Yap Fresh Tuna Inc. as part of a Japanese (Overseas Fisheries Cooperation Foundation) grant in aid program (Figure 3). F/V *Marwel* came equipped with the usual array of electronics found on-board longliners, including a GPS with plotter and an echo sounder. The echo sounder, however, was a high frequency (200 kHz) model with capabilities of sounding to depths of 500 m only. F/V *Marwel* was also equipped with an autopilot, which was useful for doing FAD site surveys. During the surveys, the Yapese captain and Japanese fish master operated the boat until it reached the survey grounds. The Fisheries Development Officer operated the vessel during the survey work.



Figure 3: Vessel used for the site surveys, F/V Marwel

2.2 Electronic equipment used in the FAD surveys

SPC supplied the main electronic equipment for the FAD site surveys: an echo sounder and a GPS with plotter. The echo sounder was a JRC (Japan Radio Corporation) model JFV-120 (24 VDC, 3 kW) that was equipped with a 28 kHz transducer. The echo sounder was capable of sounding to depths of 3,000 m. The transducer for the echo sounder was mounted on a portable housing that consisted of a streamlined aluminium box attached to a galvanised steel pipe (Figure 4). The pipe was bolted using U-bolts to a piece of 50 mm x 400 mm timber 3 m long, which was then lashed to the starboard side of F/V *Marwel* using polypropylene rope stays going fore and aft and a guy line going under the hull (Figure 5). The monitor for the echo sounder was mounted in the captain's cabin in the wheelhouse where it could be seen easily by the operator.

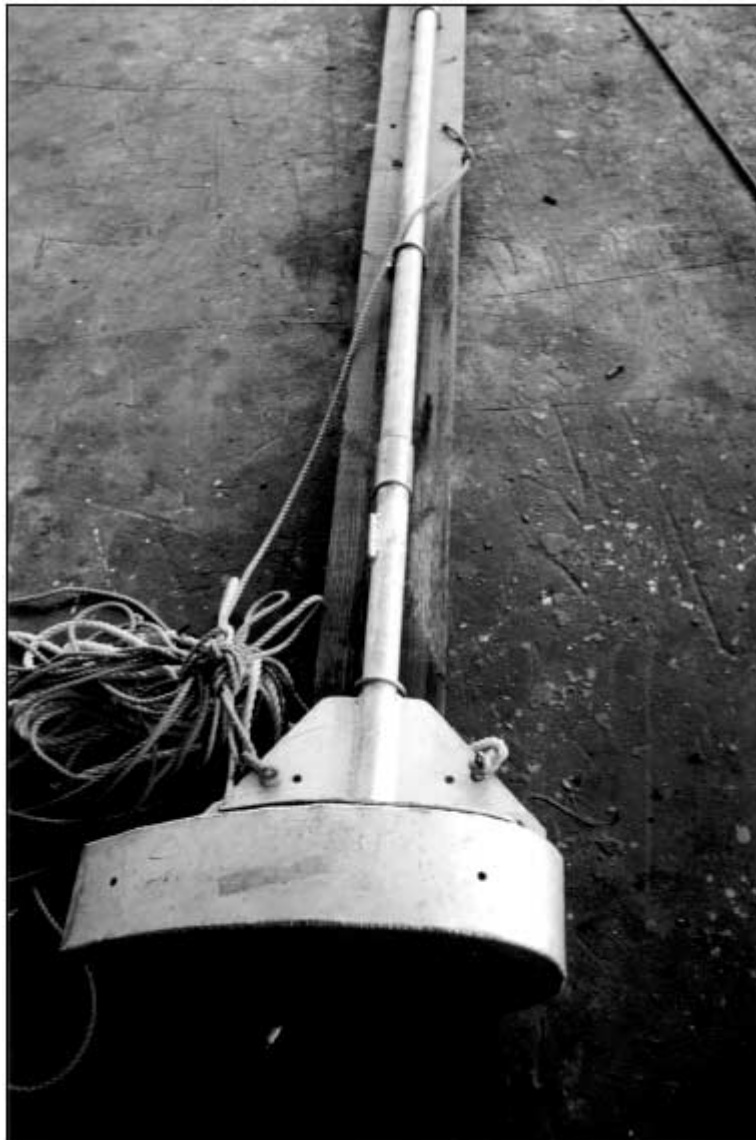


Figure 4: Echo sounder transducer mounted on a portable housing



Figure 5: Echo sounder transducer housing mounted on the side of F/V Marwel

The GPS unit was identical to the unit found on F/V *Marwel*. It was a Furuno model GP-1610CF GPS with colour plotter that Fisheries Development Section at SPC recently purchased for doing FAD site survey work. The GPS proved to be perfectly suited for the job as it provided digital readouts of latitude and longitude as well as a plot of survey lines. The unit was mounted where the original GPS had been mounted in F/V *Marwel*'s wheelhouse and was connected to the existing power supply and antenna.

2.3 Survey techniques

The techniques used to conduct the site surveys were identical to those outlined in SPC's FAD Manual Volume III (Gates et al., 1998). Once the vessel was in the survey zone, it was set on a course going in an east-west direction following lines of latitude in 0.25 nm increments. At every interval of 0.25 nm of longitude along the latitudinal transect, a depth sounding was read and then recorded next to the appropriate position in a logbook. For example, at the position of 09° 30.00' N latitude and 138° 14.00' E longitude in the Peelack Pass survey area, the depth was 1,033 m. Approximately 100 readings were taken for each survey area.

After several square nautical miles of area had been covered, the depth data were plotted using a sheet of A3 graph paper as plotting paper. Isobath lines (lines connecting places with the same depth) were drawn at every interval of 100 m. One hundred metre intervals were interpolated from adjacent numbers on the plotting sheet. For example, for two adjacent positions in one survey the depth readings were 890 m and 951 m. The 900 m interval would fall somewhere between these two positions but closer to the 890 m reading. After all of the points were drawn for one interval, the dots were connected to make a smooth contour line. One of these contour lines was drawn for each 100 m isobath.

After all the isobath lines were plotted, a suitable FAD site was selected. The most suitable FAD site, considering depth only, is in an area where the depth is approximately 1,000 m, and where the isobaths are wide apart, indicating a relatively flat and uniform bottom.

In addition to plotting the contours by hand, and as a reference to verify the hand-drawn contours, all position and depth data were entered into a computer programme (see below).

3. FAD SURVEY AREAS, BOTTOM CONTOURS, AND FAD SITE SELECTION

3.1 Peelack Pass

The Peelack Pass area was selected because it is relatively close to the main harbour on Yap, Tamil Harbour in Colonia. It is also close to Peelack Pass, which is about 5nm north of the main channel to Tamil Harbour and is used by artisanal fishermen for access to the open sea. A FAD located in this area would be within range of the artisanal fleet that operates out of both passes. Patrick Peckalibe indicated that the selected survey area is frequently visited by small trolling boats searching for tuna and other pelagics. Also, a study of the isobath lines on chart BA 1485 showed the likelihood of a gradual drop-off in this area and, thus, a flat bottom.

The area surveyed was bounded by 09° 28.50' N to 09° 30.75' N latitude and 138° 12.00' E to 138° 15.00' E longitude. Depths ranged from 400 m to 1,300 m over this area. A relatively flat area was found near the centre of the survey area. A FAD site was selected that lies between the 1,000 m and 1,100 m contours in 1,013 m (Figures 6 and 7). The FAD site was close to the ideal, while some compromises had to be made for the other two areas (see below).

The FAD position is 09° 30.00' N and 138° 13.75' E

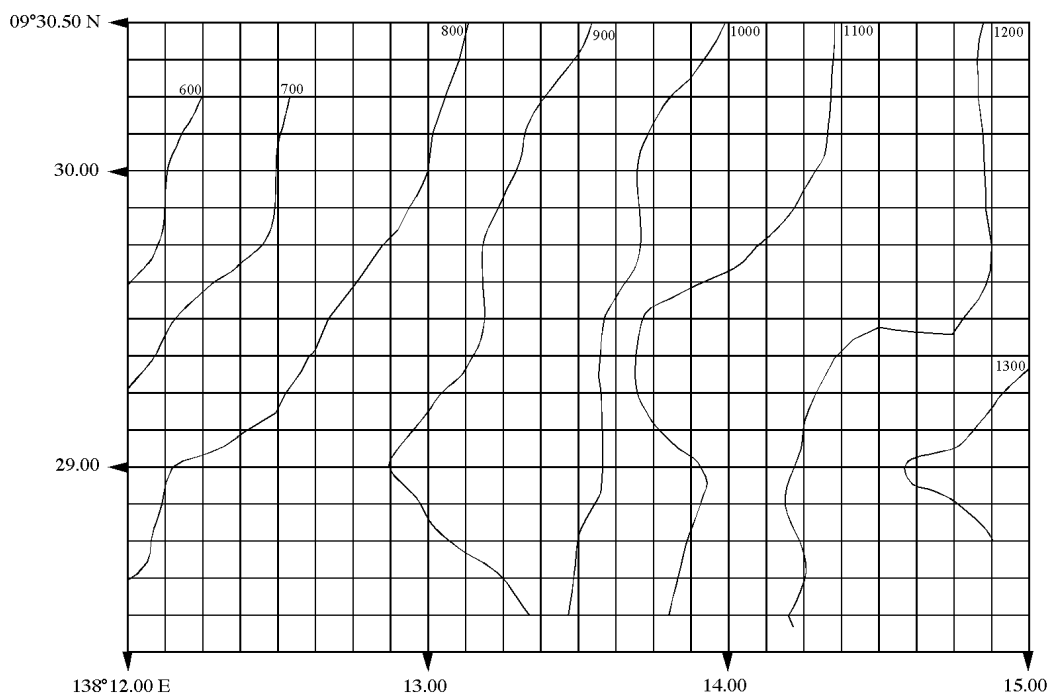


Figure 6: Bottom contours and FAD site for Peelack Pass survey (hand-drawn)

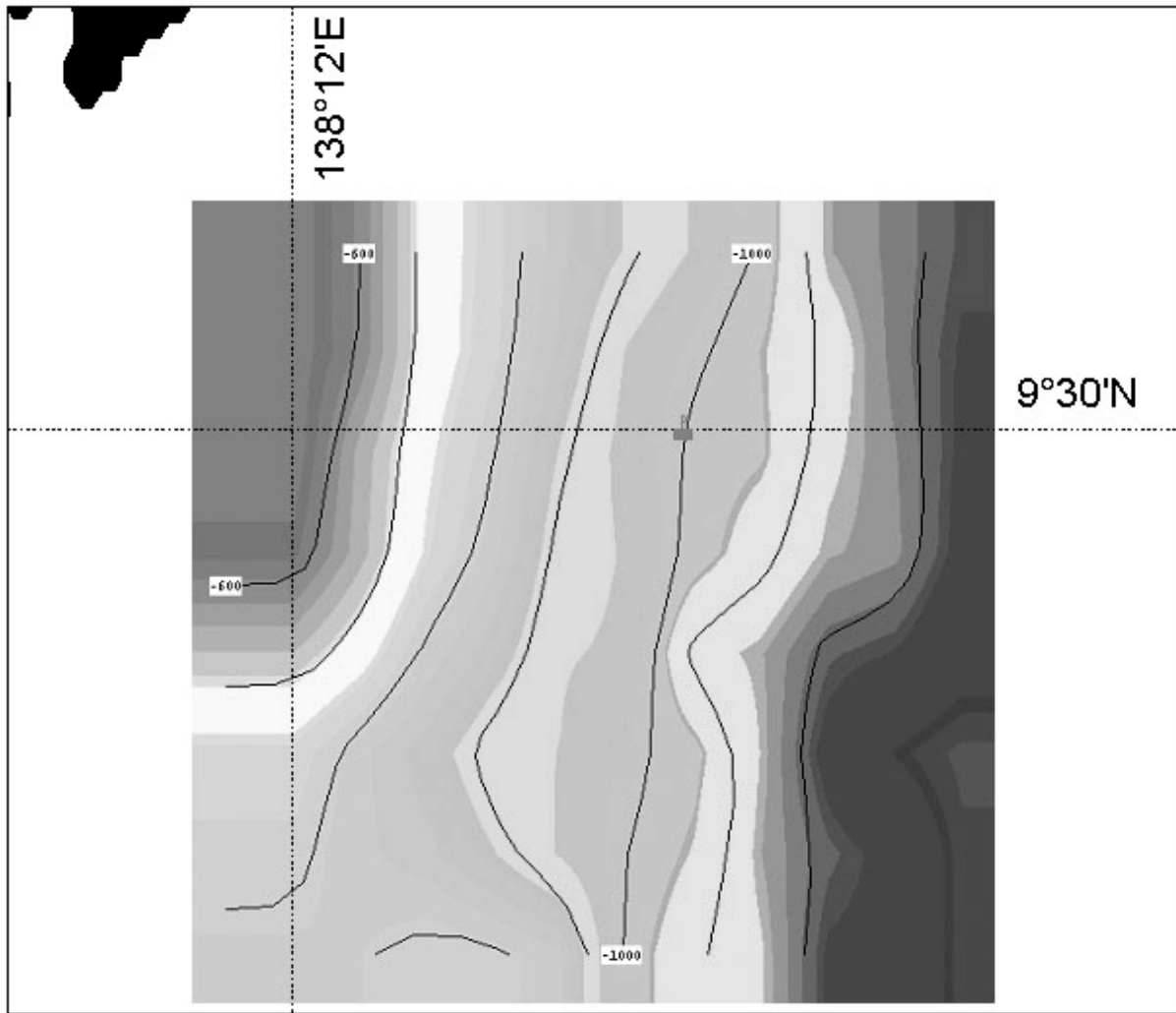


Figure 7: Bottom contours of Peelack Pass survey (computer-generated)

3.2 Goofnu Pass

The Goofnu Pass survey area was selected because of its proximity to a pass in the reef used by artisanal troll fishermen. It was also very close to the site of a previous FAD deployment in 1985 (FAD 5 in Chapman & Cusack, 1997). The area surveyed was bounded by 09° 35.00' N to 09° 38.25' N latitude and 138° 13.25' E to 138° 15.00' E longitude. A small relatively flat area suitable for a FAD site was found in 1,216 m (Figures 8 and 9).

The chosen FAD position is 09° 37.25' N and 138° 14.00' E

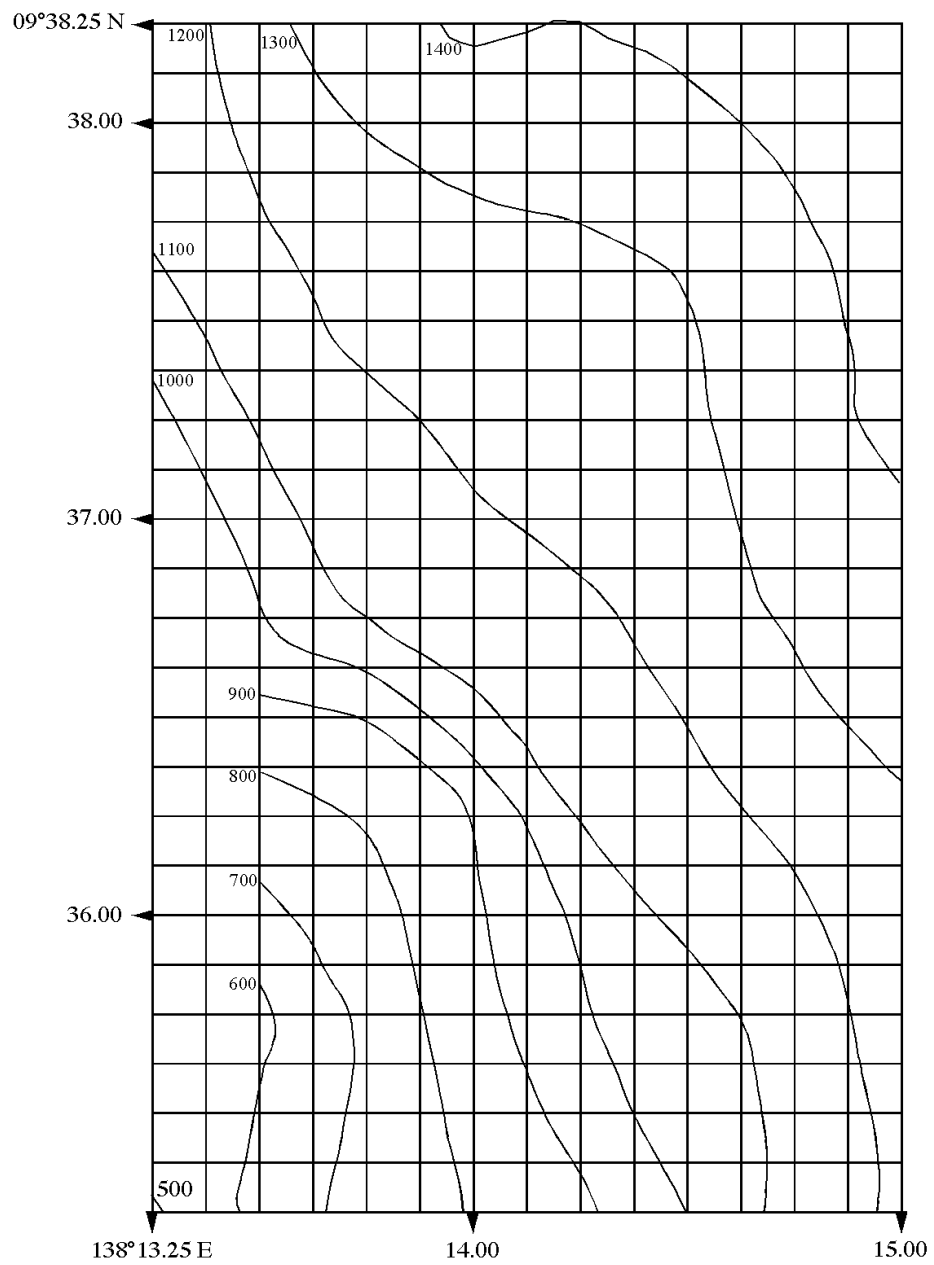


Figure 8: Bottom contours and FAD site for Goofnu Pass survey (hand-drawn)

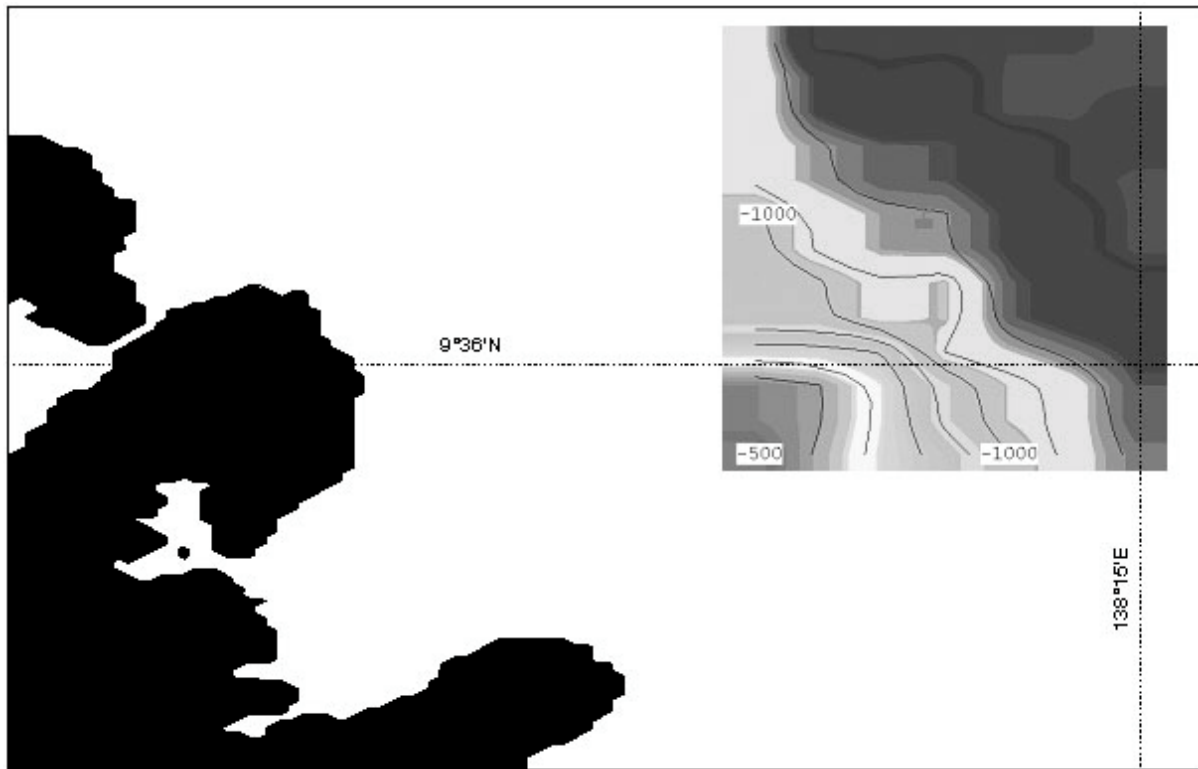


Figure 9: Bottom contours and FAD site for Goofnu Pass survey (computer-generated)

3.3 South of Tamil Harbour

The survey area south of Tamil Harbour was chosen at the request of Patrick Peckalibe, who indicated that this area is very productive and popular with the artisanal fleet. A look at the chart, however, indicated that the bottom drop-off is relatively steep and a suitable FAD site could be difficult to locate. The survey area was bounded by 09° 22.50' N to 09° 24.00' N and 138° 02.00' E to 138° 05.75' E.

The results of the survey confirmed that this area is only marginally suitable for FAD deployments. There is, however, a small relatively flat area on the slope of the drop-off lying between the 1,000 m and the 1,100 m contours. A FAD site was chosen in 1,074 m (Figures 10 and 11).

The chosen FAD position is 09° 23.25' N and 138° 03.75' E

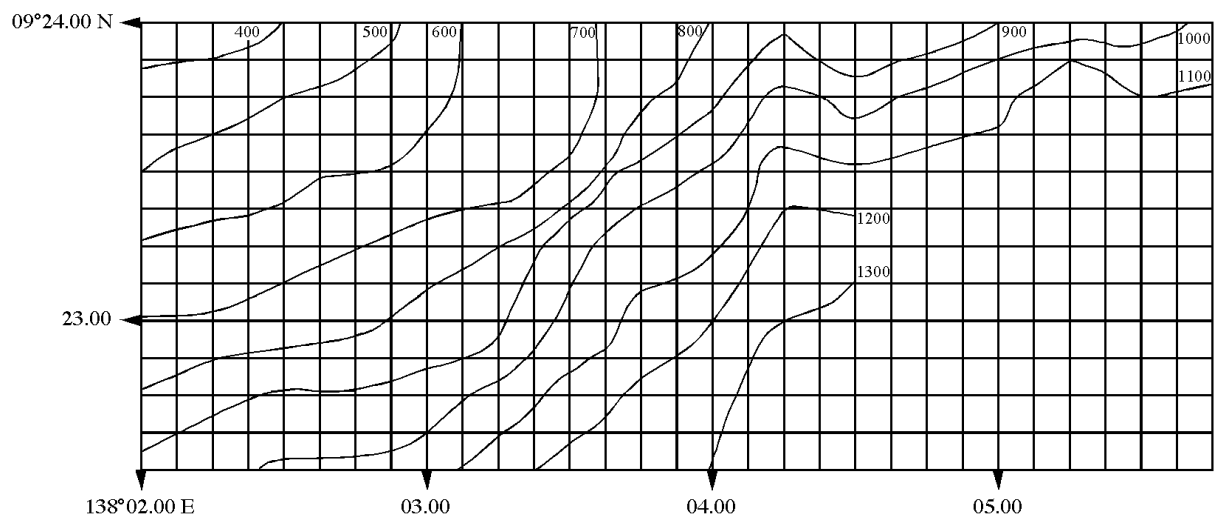


Figure 10: Bottom contours and FAD site for south of Tamil Harbour survey (hand-drawn)

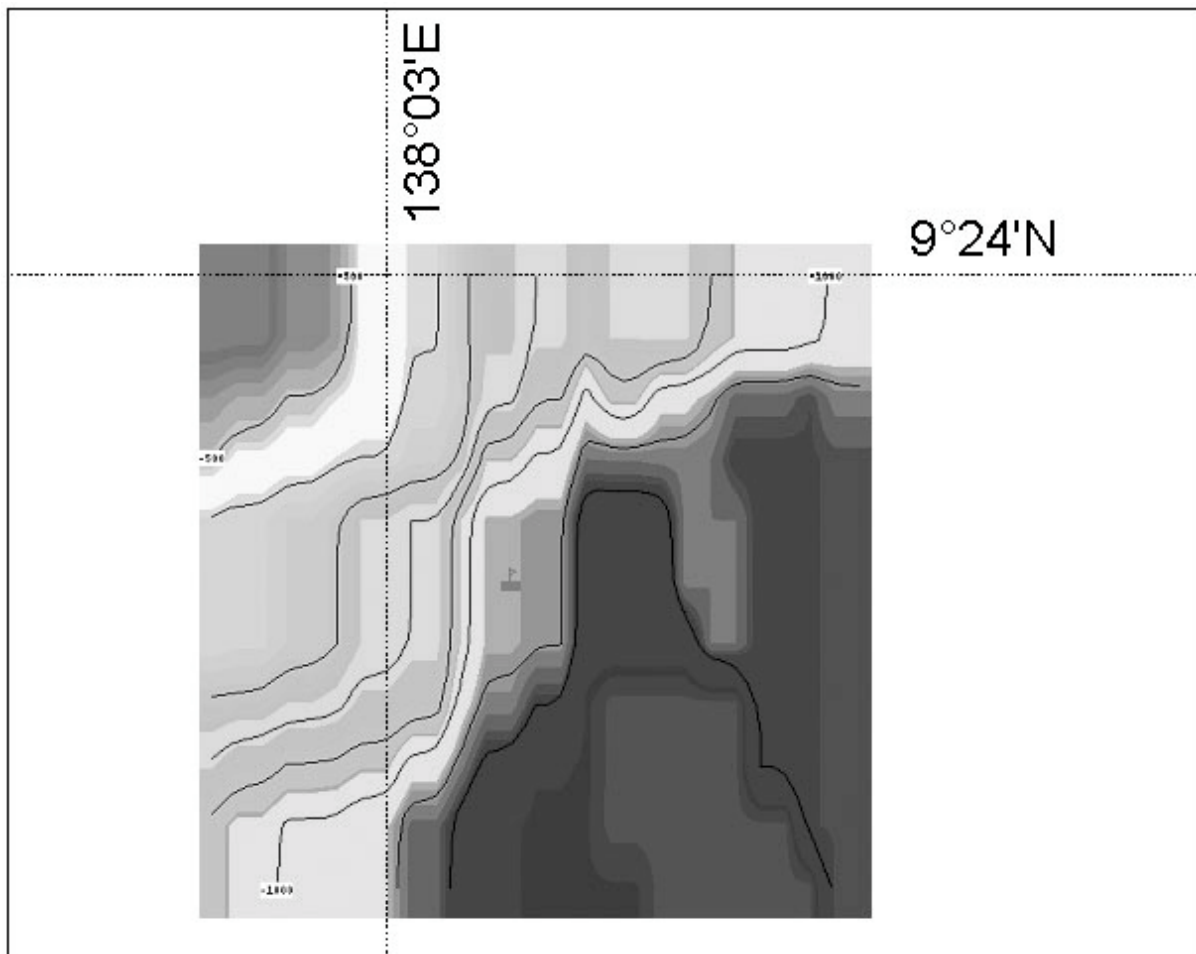


Figure 11: Bottom contours and FAD site for south of Tamil Harbour survey (computer-generated)

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

Because of unforeseen constraints, only the FAD site survey portion of the project was carried out in Yap. There were no FAD deployments and, thus, no counterpart training in FAD rigging and deployment. Using the information reported in this brief field report and following guidelines in SPC's FAD Manuals Volumes II and III, Yap Fishing Authority should be able to conduct up to three FAD deployments around the main island of Yap.

For all three sites it is recommended that SPC guidelines be followed, including the corrigendum in SPC's FAD Manual Volume II calling for a change in the way the terminal eyes are made in the 32 mm steel wire rope with PVC coating. The corrigendum recommends that the PVC coating not be skived away from the wire before the eye is formed. This requires the use of 32 mm cable clamps to form the two eyes rather than the previously called for 16 mm cable clamps.

A FAD deployment at the Peelack Pass site should be fairly simple providing all SPC guidelines are strictly followed. FAD deployments at the other two sites, however, will need more care as there are steep drop-offs fairly close to both sites. An inaccurate deployment of the anchor (into too deep water) could result in the loss of a FAD mooring.

4.2 Recommendations

4.2.1 Peelack Pass

It is recommended that an Indian Ocean type FAD be rigged and deployed using the formula for a 1,000 m depth. Following the guidelines in SPC's FAD Manual Volume II would require using 335 m of nylon rope, 915 m of polypropylene rope, and supplementary buoyancy.

4.2.2 Goofnu Pass

An Indian Ocean type FAD would also be suitable for the Goofnu Pass site. The mooring should be rigged for a 1,200 m site with 375 m of nylon rope and 1,125 m of polypropylene rope but no supplementary buoyancy.

4.2.3 South of Tamil Harbour

An Indian Ocean type FAD rigged for a depth of 1,100 m would be suitable for this site. It should have 355 m of nylon rope, 1,020 m of polypropylene rope, and supplementary buoyancy.

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