SOUTH PACIFIC COMMISSION

# UNPUBLISHED REPORT No. 21

# REPORT ON PHASES I, II, AND III OF FISHING TRIALS IN THE NORTHERN MARIANA ISLANDS

23 September 1988–17 December 1988

25 August 1989–25 February 1990

13 April 1990–13 August 1990

by

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This unpublished report forms part of a series compiled by the Capture Section of the South Pacific Commission's Coastal Fisheries Programme.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 Capture Section to a technical standard acceptable for release into the public arena. However, they have not been through the full South Pacific Commission editorial process.

On 6 February 1998 the South Pacific Commission (SPC) became the **Pacific Community**. The Secretariat of the Pacific Community (retaining the acronym SPC) is now the name for the body which administers the work program of the **Pacific Community**. The names have changed, the organisation and the functions continue.

This report was prepared when the organisation was called the South Pacific Commission, and that is the name used in it. Please note that any reference to the South Pacific Commission, could refer to what is now the Secretariat of the Pacific Community, or, less likely, to the Pacific Community itself.

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## SUMMARY

The South Pacific Commission's Deep Sea Fisheries Development Project (DSFDP) visited the Commonwealth of the Northern Mariana Islands during three periods of time: 23 September 1988 to 17 December 1988, 25 August 1989 to 25 February 1990, and 13 April 1990 to 13 August 1990. The first phase was under the supervision of SPC Masterfisherman Paxton Wellington, while the later two phases were under the direction of SPC Masterfisherman Peter Watt.

Priority activities included conducting training courses in deep bottom droplining and longlining techniques, use of depth sounder and navigation skills, fish stock assessment surveys, and exploration of potential new fishing grounds. Other related activities included open-water trolling and shallow water handlining.

A total of 71 fishing trips yielded 3,731.1 kg and 69 different species. All fish were donated to either fisheries staff, trainees, the hospital or the home for the aged.

The various techniques contributed to the catch as follows: deep bottom longlining 35.1 kg on 8 trips totalling 72.1 line hours for an average catch per unit of effort (CPUE) of 0.49kg/10 hooks/hour, deep bottom droplining 2815.9 kg on 59 trips totalling 605.5 line hours for a CPUE of 4.65 kg/line hour, and open-water trolling 880.1 kg on 37 trips totalling 391.5 line hours for a CPUE of 2.25 kg/line hour.

A total of 61 individuals participated in training sessions in deep bottom droplining and longlining. The majority of the trainees were trained on the Fish and Wildlife vessel or a chartered vessels from Saipan. Also five participants were trained on the F/V *Sun*, a 60 foot pelagic longline vessel.

Exploratory surveys, in conjunction with the training programme, were completed in the Saipan, Tinian and Rota area. Five pinnacles were located and fished; also reefs and banks in the surrounding area were explored. Two surveys, one to Pagan Island and the other to Esmeralda Reef, to collect fish stock data were completed. The purpose was to compare the CPUE of relatively unexploited fishing areas with those surrounding Saipan and Tinian.

The Masterfisherman, Peter Watt, also advised on aspects of future management of the commercial fishery in regard to limiting the number of commercial vessels participating in the deep bottom fishery. It was cautioned that the fishing grounds surrounding Saipan and Tinian are suffering from sustained fishing pressure and the other unexploited islands should be protected in the future.

It was concluded that deep bottom droplining was the most effective method for exploiting the resource. Bottom longlines proved to be ineffective, time consuming and expensive. Also the techniques taught in the training programme would improve the catch rates of the local fishermen.

## RÉSUMÉ

Dans le cadre du projet de développement de la pêche au demi-large, les agents de la Commission du Pacifique Sud ont effectué trois missions aux Îles Mariannes du Nord : du 23 septembre au 17 décembre 1988, du 25 août 1989 au 25 février 1990 et du 13 avril au 13 août 1990. La première mission a été supervisée par le maître de pêche Paxton Wellington et les deux suivantes par le maître de pêche Peter Watt.

Ces missions ont pricipalement consisté à donner une formation sur les techniques de pêche profonde à la ligne à main et à la palangre, l'utilisation de l'échosondeur et les compétences en matière de navigation, les enquêtes d'évaluation des stocks de poisson et la prospection de nouvelles zones de pêche potentielles. Parmi les autres activités connexes, figuraient la pêche à la traîne et la pêche à la ligne à main en eaux peu profondes.

Les 71 sorties en mer effectuées ont permis de rapporter 3 731,1 kg de poisson de 69 espèces différentes. Il a été fait don de tout le poisson aux agents du service des pêches, aux stagiaires, à l'hôpital ou au foyer pour personnes âgées.

La production s'est répartie comme suit en fonction des techniques utilisées : pêche à la palangre au grand fond : 35,1 kg en 8 sorties représentant 72,1 lignes/heure pour une prise moyenne par unité d'effort (PUE) de 0,49 kg/10 hameçons/heure; pêche à la ligne à main par grande profondeur : 2 815,9 kg en 59 sorties représentant 605,5 lignes/heure pour une PUE de 4,65 kg/ligne/heure; et pêche à la traîne en mer libre : 880,1 kg en 37 sorties représentant 391,5 lignes/heure pour une PUE de 2,25 kg/ligne/heure.

Au total, 61 personnes ont participé aux séances de formation à la pêche à la ligne à main par grande profondeur et à la pêche à la palangre. La plupart des stagiaires ont reçu leur formation sur le navire du service des pêches et de la faune ou sur des navires affrétés venant de Saipan. Cinq autres participants ont reçu leur formation sur le *Sun*, un palangrier de pêche pélagique de 60 pieds.

Des missions exploratoires ont été effectuées en liaison avec le programme de formation dans la région de Saipan, de Tinian et de Rota. Cinq pitons sous-marins ont été localisés et des essais de pêche y ont été effectués; les récifs et les rivages de la zone avoisinante ont aussi été explorés. Deux missions de collecte de données sur les stocks de poisson ont été menées à l'île de Pagan et sur le récif Esmeralda. Leur objectif était de permettre une comparaison entre les PUE réalisées dans des zones de pêche assez peu fréquentées et celles obtenues à proximité de Saipan et de Tinian.

Le maître de pêche Peter Watt a aussi évoqué la gestion future de la pêcherie commerciale et suggère que le nombre de navires commerciaux pratiquant la pêche au grand fond soit limité. En effet, les zones de pêche entourant Saipan et Tinian souffrent de l'exploitation intensive à laquelle elles sont soumises; il importerait aussi de protéger à l'avenir d'autres îles encore inexploitées.

La conclusion d'ensemble est que la pêche à la ligne de main par grande profondeur constitue la méthode la plus efficace d'exploitation de la ressource. Les palangres de fond se sont révélées inefficaces et coûteuses et entraînent, en outre, une perte de temps considérable. Enfin, les techniques enseignées devraient permettre aux pêcheurs locaux d'améliorer leurs taux de prises.

## ACKNOWLEDGEMENTS

The South Pacific Commission acknowledges with gratitude the support and assistance afforded the Masterfisherman by the individuals associated with the Deep Sea Fisheries Development Project while in the Commonwealth of the Northern Mariana Islands. The following individuals are deserving special thanks; Arnold Palacios, Chief of the Division of Fish and Wildlife, for his assistance in setting up and implementing the Project programme, the staff of Fish and Wildlife in Saipan Calistro Falic, Asinto Taman, David Aldan, Richard Seman, John Gourley, Larry Ilo, and Ernie Eugenio for assistance in the field and collection of data. As well, Tony Borja, Ken Larson and Stan Taisacan for assistance in off island field trips.

Particular thanks to the Government of the Commonwealth of the Northern Mariana Islands for its co-operation during the visit.

**CONTENTS**

# 1. INTRODUCTION

The South Pacific Commission's Deep Sea Fisheries Development (DSFD) Project is a mobile, village-level development project which operates in the Pacific Islands at specific Government request, and which has the following broad objectives:

– To promote the development or expansion of artisanal fisheries throughout the region, based on fishery resources which are at present under-utilised, in particular the deep-bottom resources of the outer reef slope;

– To develop and evaluate new simple technology, fishing gear and techniques suitable for the use of village fishermen, which will enable fishermen to substantially increase catches while reducing dependence on costly imported fuel; and

– To provide practical training in appropriate fishing techniques to local fishermen and government fisheries extension workers.

The South Pacific Commission was requested to send a Masterfisherman to conduct deep bottom fish training and explore potential new fishing grounds by the Division of Fish and Wildlife, Commonwealth of the Northern Mariana Islands (CNMI). Paxton Wellington arrived in Saipan on 23 September 1988 to begin the project. For three months local fishermen were trained in deep bottom dropline fishing with the Samoan handreels and the use of the `self-hauling' anchor gear. The outer banks and reefs around Saipan and Tinian were explored as potential bottom fishing grounds. This phase was completed on 17 December 1988.

A further request was made to investigate the potential for bottom longline fishing in CNMI to open new opportunities to local fishermen and to conduct deep bottom fish technical training. SPC Masterfisherman Peter Watt arrived in Saipan on 25 August 1989 to begin Phase II. For six months experimental bottom longline trials were made on the reefs surrounding Saipan and Tinian. Local fishermen were trained in various technical aspects of bottom fishing including bottom longlines, use of Samoa handreels, self-hauling anchor gear, basic navigation, and the use of a depth sounder. Phase II was completed on 25 February 1990.

The overwhelming interest by local fishermen for the training programme, the desire for experimentation with alternative bottom longlines other than those used in Phase 11, and the need for the collection of bottom fish data to access the resources in the Northern Mariana Islands prompted a further request for assistance. SPC Masterfisherman Peter Watt returned to Saipan on 13 April 1990 to begin Phase III of this Project for four months. During this period, a survey was conducted on Pagan Island for two weeks and Esmeralda reef for five days, to compare fish catches with those of the Saipan and Tinian area, Also the training programme was continued from Phase II. Phase III was completed on 13 August 1990.

# 2. BACKGROUND

## 2.1 General

CNMI consists of sixteen islands in the North-western Pacific region (Figure 1). Five of the islands are permanently inhabited. Saipan has the largest population with over 30,000 residents, followed by Rota with 1,500 and then Tinian with 1,000. The other two islands, Alamagan and Agriman, have only 20 residents or less on each. Presently half of the population is indigenous Chamoro and Carolinian and the other half is a combination of Filipino, Japanese, Korean, American and other Pacific islanders. The common languages used are English, Chamoro and Carolinian by indigenous residents.

The CNMI is experiencing rapid growth due to the expanding tourist industry. Thousands of tourists visit the CNMI every year and the number is increasing at an unprecedented rate. In 1988, a total of 233,000 tourists visited, an increase of over 20,000 from the previous year. In addition there has been an increase in the resident and alien population, primarily to meet the needs of the expanding tourist industry.

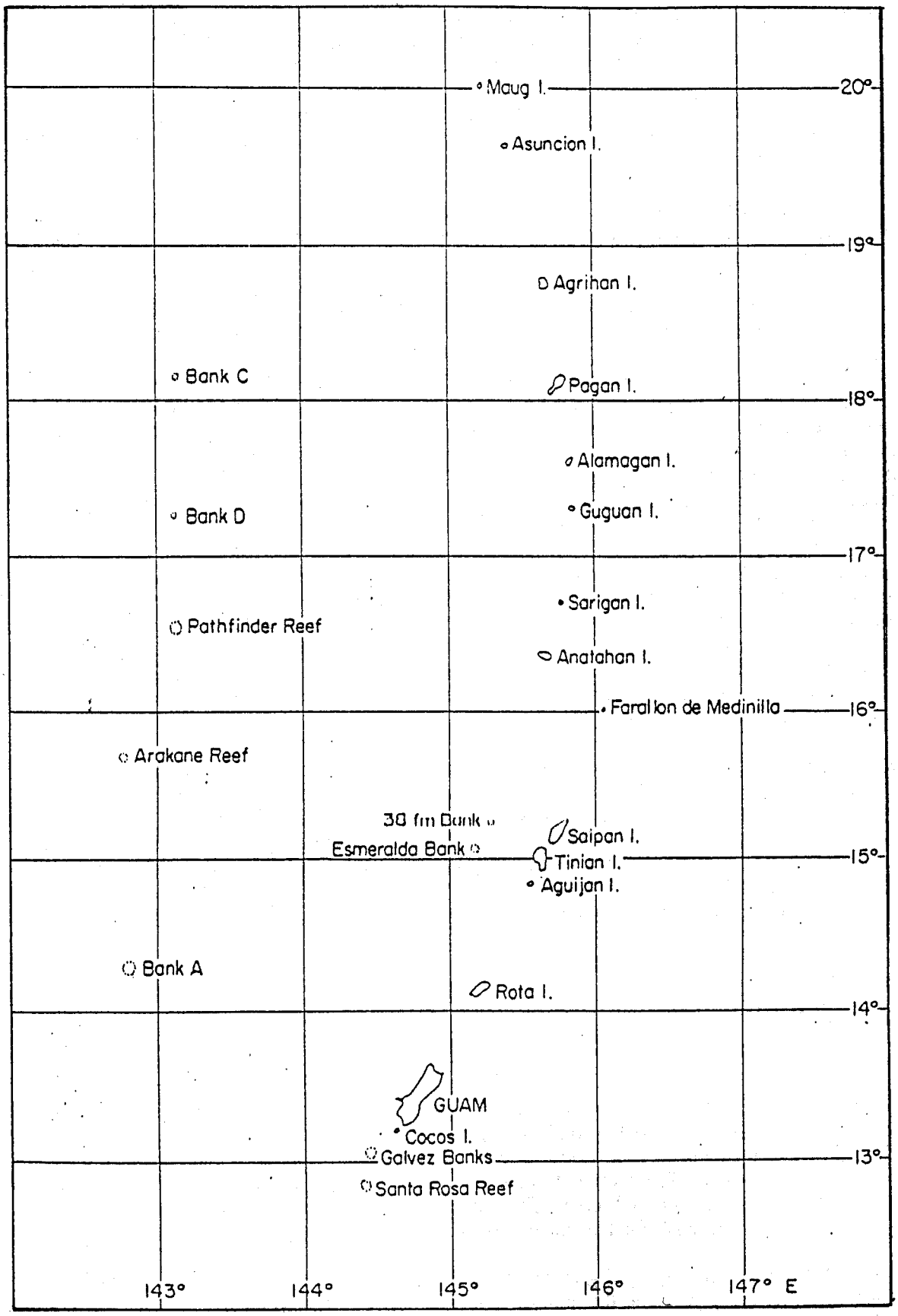



**Figure 1: The Marianas Archipelago showing the 22 islands and banks in the area**

Approximately 75 per cent of the tourists originate from Japan. Japanese people are well known for their love of quality seafood. Local hotels and restaurants that cater to these tourists have difficulty in obtaining sufficient quantities of fresh fish to meet the demand. They are forced to import fish from neighbouring countries. There is also a great demand from the resident population. The majority of residents being Pacific islanders and Filipinos, consider fish to be one of the main staples of their diet. Local fish markets that sell to residents find it necessary to import fish also.

## 2.2 Existing fisheries

The majority of the southern islands have narrow fringing reefs, however only Saipan has a well developed lagoon that stretches for ten miles on the western side of the island. There are a number of off-shore reefs and pinnacles that follow the island chain from the southern to northern limit of the Northern Mariana Islands. The outer reef slopes of the islands, in most instances, tend to be of moderate gradient until a depth of approximately 160 meters then drop off dramatically.

Fishing is an important part of the indigenous residents life in terms of food for subsistence and recreational activities. For local consumption most of the fish are shallow-water species caught in nets, fish weirs, handlining or spear. Pelagic species are caught by trolling with speed boats. The hotels and restaurants that cater to the Japanese tourists demand a variety of bottom fish and pelagic fish for sashimi and sushi.

Throughout the Northern Mariana Islands there are over 500 boats that are involved in fishing in one form or another. There are also three fishing tournaments which are major social events every year.

Commercial fisheries are recognised as an important component of the economy of CNMI. The fishery is basically carried out in areas that are within a 15 mile radius of the three most populated islands, Saipan, Tinian and Rota. Occasionally fishing trips to the northern islands are carried out by three or four of the larger fishing vessels. The commercial fishing fleet is comprised largely of recreational vessels which most often fish part-time, although there are some operating full-time. Presently on Saipan there are 41 full-time, 70 part-time, and 95 subsistence vessels that are used for fishing purposes. All the vessels with the exception of two are constructed of fibreglass, aluminium or plywood, and 5–8 m long, with high-powered outboard gasoline engines. The two other vessels are approximately 10 m in length and have inboard diesel engines.

Pelagic species are the main target of all commercial fishing boats. Fish are mainly harvested by trolling with handlines and sports fishing reels. Recently, some other methods have been introduced, specifically ika shibi and longline. Total landings of pelagic species for 1989 were 104,285 kg with a total value of US $300,075 (Table 1).

Bottom fish species represented only 3.9 per cent of the total commercial fish landings for 1989. Few vessels are engaged in the bottom fishery, with only four vessels considered to be full-time. The vessels that bottom fish usually drift fish, rarely anchoring, using handlines, manual or electric reels. Recently, bottom longlining methods have been introduced but with little success because of the steep reef contours surrounding the islands. Few of the vessels have depth sounders or navigational equipment. Fishing grounds are found by trail and error using landmarks to determine the exact fishing location. Total bottom fish landings for 1989 were 8,887 kg with a total value of US $41,405 (Table 2).

**Table 1: Commercial landings of pelagic species in CNMI in 1989**

| Species | Catch weight (lbs) | (kg) | Price (US $) (per lb) | (per kg) | Revenue–US $ based on lb price |
|---|---|---|---|---|---|
| Troll fish | 249 | 113 | 1.60 | 3.52 | 398 |
| Barracuda | 137 | 62 | 1.38 | 3.04 | 189 |
| Dolphin fish (mahi mahi) | 5,856 | 2,662 | 1.48 | 3.26 | 8,667 |
| Marlin | 4,563 | 2,074 | 1.33 | 2.93 | 6,069 |
| Rainbow runner | 142 | 65 | 1.75 | 3.85 | 249 |
| Wahoo | 1,257 | 571 | 1.56 | 3.43 | 1,961 |
| Skipjack tuna | 206,162 | 93,710 | 1.28 | 2.82 | 263,887 |
| Dogtooth tuna | 2,974 | 1,352 | 1.65 | 3.63 | 4,907 |
| Yellowfin tuna | 8,087 | 3,676 | 1.70 | 3.74 | 13,748 |
| **TOTAL** | **229,427** | **104,285** | | | **300,075** |

**Table 2: Commercial landings of bottom fish species in CNMI in 1989**

| Species | Catch weight (lbs) | (kg) | Price (US $) (per lb) | (per kg) | Revenue–US $ based on lb price |
|---|---|---|---|---|---|
| Mixed bottomfish | 12,713 | 5,779 | 1.82 | 4.01 | 23,138 |
| Gindai (flower snapper) | 805 | 366 | 1.96 | 4.31 | 1,578 |
| Grouper | 450 | 205 | 2.36 | 5.19 | 1,062 |
| Onaga (red snapper) | 1,982 | 901 | 4.39 | 9.66 | 8,701 |
| Opakapaka (pink snapper) | 430 | 195 | 2.10 | 4.62 | 903 |
| Mafute (emperor) | 3,170 | 1,441 | 1.90 | 4.18 | 6,023 |
| **TOTAL** | **19,550** | **8,887** | | | **41,405** |

Reef fish species represented 49.9 per cent of the commercial fish landings for 1989. Methods used to harvest the fish are gill nets, fish weirs or spear fishing. Handlining or spearfishing from small boats on the reef edge is also done.

There are a number of local fish markets located on Saipan and numerous hotels and restaurants that offer a ready market for the sale of fresh fish. Vendors along the side of the main road also sell fresh fish from the local commercial vessels. On Tinian and Rota fish are sold on a ‘door to door’ basis and any surplus is sent air freight to either Saipan or Guam.

### 2.3 Deep bottom fishery

Formal training in deep bottom fishing techniques had not taken place in the Northern Mariana Islands (NMI) until the South Pacific Commission was requested to send a Masterfisherman in 1988. Local fishermen in the region have deep bottom fished for many years, drift fishing with their boats whilst handlining. Most of the local fishermen lack the skills that have developed over the last twenty years to make their fishing trips more efficient and productive. There are no records of fish landings before 1980, therefore it is difficult to determine how long fishermen have been deep bottom fishing in the region. The NMI were under Japanese administration until the end of World War II, before coming under the control of the United States of America. During the Japanese administration there were over 100,000 people living in NMI. At that time there was an extensive fishing fleet that not only serviced the local residents but also exported fish to Japan. Pelagic fish were the main species caught by these vessels. Whether deep bottom fish were also a part of the catch is not known. There are no records documenting the fish catches during that time. It seems likely that the Japanese fishing fleet did target bottom fish being that all species of fish are a major part of the Japanese diet. Possibly the skills for catching deep bottom fish were passed on from the Japanese to local fishermen.

In 1973–1974 a Masterfisherman from Okinawa was hired by a private entrepreneur, David Sablan, to operate a fishing vessel and train a local crew. The Masterfisherman mainly caught long-tail red snapper (*Etelis coruscans*) and other deep bottom fish. Apparently he had very good catches on the reefs surrounding Saipan and Tinian. Three local fishermen were trained in the skills of deep bottom fishing, the use of a depth sounder, and basic navigation.

After 1974, and until 1988, deep bottom fishing was carried out by local fishermen who either fished with one of the fishermen who trained with the Okinawan or learned the skill by trial and error.

An extensive bottom fish survey, 'The Resource Assessment Investigation of the Mariana Archipelago, (RAIOMA)', was undertaken to assess the distribution and sustainable yield of insular fishery resources with commercial potential. The insular resources were assessed by a field survey programme which consisted of six cruises, each of 40 days, using the NOAA ship *Townsend Cromwell* from May 1982 through June 1984. On these cruises a systematic survey was conducted to measure geographic and seasonal variation of deep water bottom fishes and shrimps around 22 islands and banks within the Mariana Archipelago. At each island and bank, an attempt was made to conduct a systematic survey of the bottom fish community in the 125–275 m depth range. Bottom fish species were caught with handline gear baited with strips of squid.

## 3. PROJECT OPERATIONS

### 3.1 General

The Deep Sea Fisheries Development Project in CNMI began in September 1988. The project was comprised of three phases that were completed in August 1990. Figure 2 shows the approximate location of fishing activities for all three phases.

Phase I, which lasted three months, consisted of training local fishermen in deep bottom fishing techniques and exploring new fishing grounds around Saipan and Tinian. Eight trainees participated in the training programme. Deep bottom droplining was the primary method used to catch fish. Two portable Samoan handreels were constructed due to the project being carried out on a number of chartered boats. Bad weather and problems with charter boat owners limited the number of fishing trips to ten. Table 3 summarises the activities conducted during Phase I, whilst detailed trip records presented in Appendix 1a.

**Table 3: Summary of project activities during Phase I**

| Dates | Fishing locations | Activities |
|---|---|---|
| 27/09/88 | 53 | Bottom reel |
| 12/10/88 | 53 | Bottom reel |
| 20/10/88 | 45 | Bottom reel |
| 03/11/88 | 68 | Bottom reel, Trolling |
| 08/11/88 | 46 | Bottom reel |
| 15/11/88 | 46 | Trolling |
| 23/11/88 | 43 | Bottom reel, Trolling |
| 20/11/88 | 37 | Bottom reel |
| 01/12/88 | 37 | Bottom reel, Trolling |
| 05/12/88 | 44 | Bottom reel, Trolling |

Phase II, which lasted six months, consisted of experimenting with bottom longlines, deep bottom droplining, training local fishermen and exploring new fishing grounds. Eight fishing trips were made using 30 hook longlines with various snood attachments. A total of 41 fish were caught weighing 35.1 kg. Two electric reels or two Samoan handreels were used for deep bottom dropline fishing. Twenty deep bottom dropline fishing trips yielded 430 fish and weighed 434.6 kg.

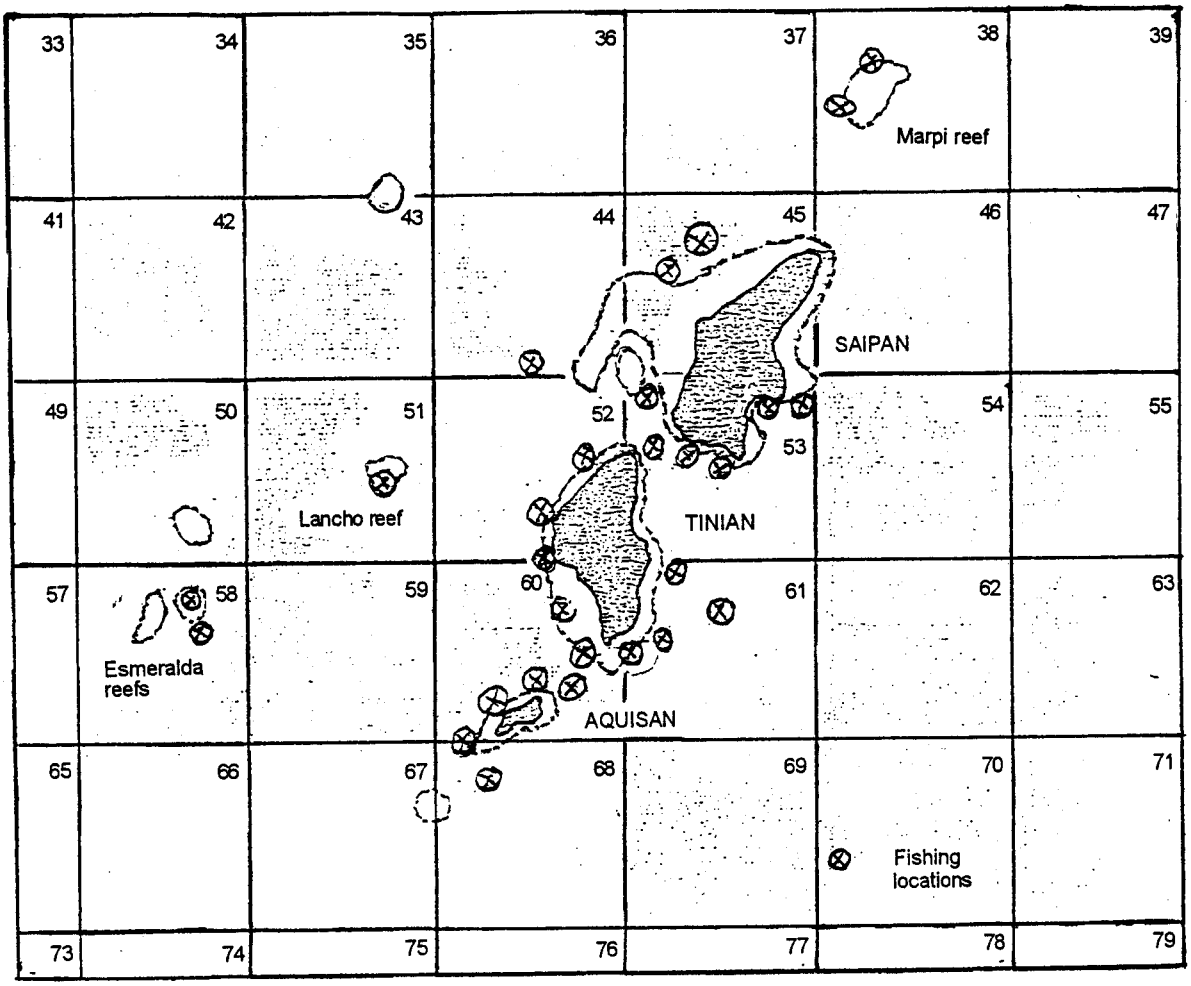



**Figure 2: Locations of fishing operations for all three phases**

Trolling methods for pelagic fish were also used on route to and from the bottom fishing grounds or to catch bait. Eighteen trips yielded 78 fish weighing 315.6 kg. Fourteen trainees were given instruction in deep bottom longlines, droplining, basic navigation and anchoring.

Weather conditions were generally poor for the entire six month period. A number of tropical storms made it impossible to fish for weeks at a time. Table 4 summarises the Projects fishing activities during phase II with detailed trip records presented in Appendix 1b.

**Table 4: Summary of project activities during Phase II**

| Dates | Fishing locations | Activities |
|---|---|---|
| 18/09/89 | 44 | Longline |
| 19/09/89 | 53 | Longline, Trolling |
| 24/09/89 | 38 | Longline |
| 26/09/89 | 68 | Longline, Bottom reel, Trolling |
| 02/10/89 | 38 | Bottom reel, Trolling |
| 12/10/89 | 60 | Longline, Bottom reel |
| 19/10/89 | 68 | Bottom reel |
| 31/10/89 | 61 | Bottom reel |
| 18/11/89 | 95 | Trolling |
| 21/11/89 | 95 | Bottom reel |
| 29/11/89 | 95 | Bottom reel |
| 30/11/89 | 95 | Bottom reel, Trolling |
| 01/12/89 | 95 | Bottom reel, Trolling |
| 06/12/89 | 44 | Trolling |
| 07/12/89 | 44 | Bottom reel |
| 12/12/89 | 44 | Bottom reel, Trolling |
| 14/12/89 | 44 | Bottom reel, Trolling |
| 15/12/89 | 44 | Trolling |
| 16/12/89 | 44 | Bottom reel |
| 21/12/89 | 44 | Trolling |
| 02/01/90 | 37 | Trolling |
| 03/01/90 | 44 | Longline |
| 04/01/90 | 44 | Trolling |
| 05/01/90 | 44 | Longline |
| 22/01/90 | 44 | Trolling |
| 23/01/90 | 44 | Bottom reel, Trolling |
| 24/01/90 | 44 | Bottom reel |
| 25/01/90 | 44 | Trolling |
| 02/02/90 | 61 | Trolling |
| 07/02/90 | 60 | Longline, Bottom reel |
| 08/02/90 | 60 | Bottom reel, Trolling |
| 13/02/90 | 60 | Bottom reel, Trolling |
| 16/02/90 | 44 | Bottom reel |
| 17/02/90 | 44 | Bottom reel |

Phase III consisted of deep bottom fish training, exploration of new fishing grounds and collection of data to assess the fish stocks on the NMI reefs. A two week fish survey was taken to Pagan Island, now uninhabited, to compare the CPUE with that of Saipan and Tinian areas. Ten fishing trips were conducted around Pagan Island and a total of 1,030.7 kg of fish were caught. Another five day fishing trip was taken to Esmeralda Reef located approximately 30 miles west of Tinian to collect more comparative data. A total of 245.7 kg of fish were caught. Two new pinnacles were found, one being one mile off-shore of south-west Saipan and the other four miles east of south-east Tinian. These pinnacles produced good catches. Extensive training courses were carried out on both Saipan and Tinian. A total of 39 people were trained. Data was collected on every fishing trip. Fisheries information was sufficient for the Division of Fish and Wildlife to assess the fish stocks for management purposes.

Table 5 summarises the project fishing activities during Phase III with detailed catch records presented in Appendix 1c.

**Table 5: Summary of project activities during Phase III**

| Dates | Fishing locations | Activities |
|---|---|---|
| 24/04/90 | 61 | Bottom reel, Trolling |
| 25/04/90 | 52 | Trolling |
| 27/04/90 | 52 | Bottom reel |
| 01/05/90 | 60 | Bottom reel |
| 02/05/90 | 61 | Bottom reel |
| 22/05/90 | 01 | Bottom reel |
| 23/05/90 | 01 | Bottom reel |
| 24/05/90 | 01 | Bottom reel, Trolling |
| 25/05/90 | 01 | Bottom reel, Trolling |
| 27/05/90 | 01 | Bottom reel, Trolling |
| 28/05/90 | 01 | Bottom reel, Trolling |
| 29/05/90 | 01 | Bottom reel |
| 30/05/90 | 01 | Bottom reel, Trolling |
| 31/05/90 | 01 | Bottom reel, Trolling |
| 01/06/90 | 01 | Trolling |
| 12/06/90 | 58 | Bottom reel |
| 13/06/90 | 58 | Bottom reel |
| 14/06/90 | 58 | Bottom reel |
| 15/06/90 | 58 | Bottom reel |
| 27/06/90 | 60 | Bottom reel, Trolling |
| 28/06/90 | 61 | Bottom reel, Trolling |
| 02/07/90 | 52 | Bottom reel |
| 26/07/90 | 60 | Bottom reel |
| 27/07/90 | 61 | Bottom reel, Trolling |
| 31/07/90 | 45 | Bottom reel |
| 01/08/90 | 52 | Bottom reel |
| 03/08/90 | 45 | Bottom reel |
| 06/08/90 | 45 | Bottom reel |
| 07/08/90 | 52 | Bottom reel |
| 09/08/90 | 45 | Bottom reel |

### 3.2 Boats and equipment

The Division of Fish and Wildlife made available the 27 foot 'Farallon' design vessel during Phases II and III. The boat was not used during Phase I as it was under repair. Local fishing boats were chartered out, unfortunately this proved to be an unreliable method as many of the charters were cancelled by the boat owners.

The 'Farallon' design, a fibreglass hull boat, was equipped with an electric line hauler and two bottom fishing reels. Originally two new electric bottom fishing reels were fitted on the boat, but after a short period of time they broke down and two wooden Samoan type reels (Figure 3) replaced them. There were also two sports fishing rods and two handlines for trolling. The boat was powered by a V8 Super Charged Detroit Diesel engine. Deck layout of the boat is shown in Figure 4.

A colour video depth sounder was used to locate the proper fishing depths and bottom fish. Anchor gear was used when ever possible for deep bottom droplining trips. This gear consisted of 500 m of originally 15mm nylon anchor line, later changed to 12 mm polypropylene, a simple welded steel reinforcing bar Japanese style anchor, a 5m length of 12mm galvanised chain and two inflatable 'Polyform' buoys 200 cm in circumference, (Figure 5).

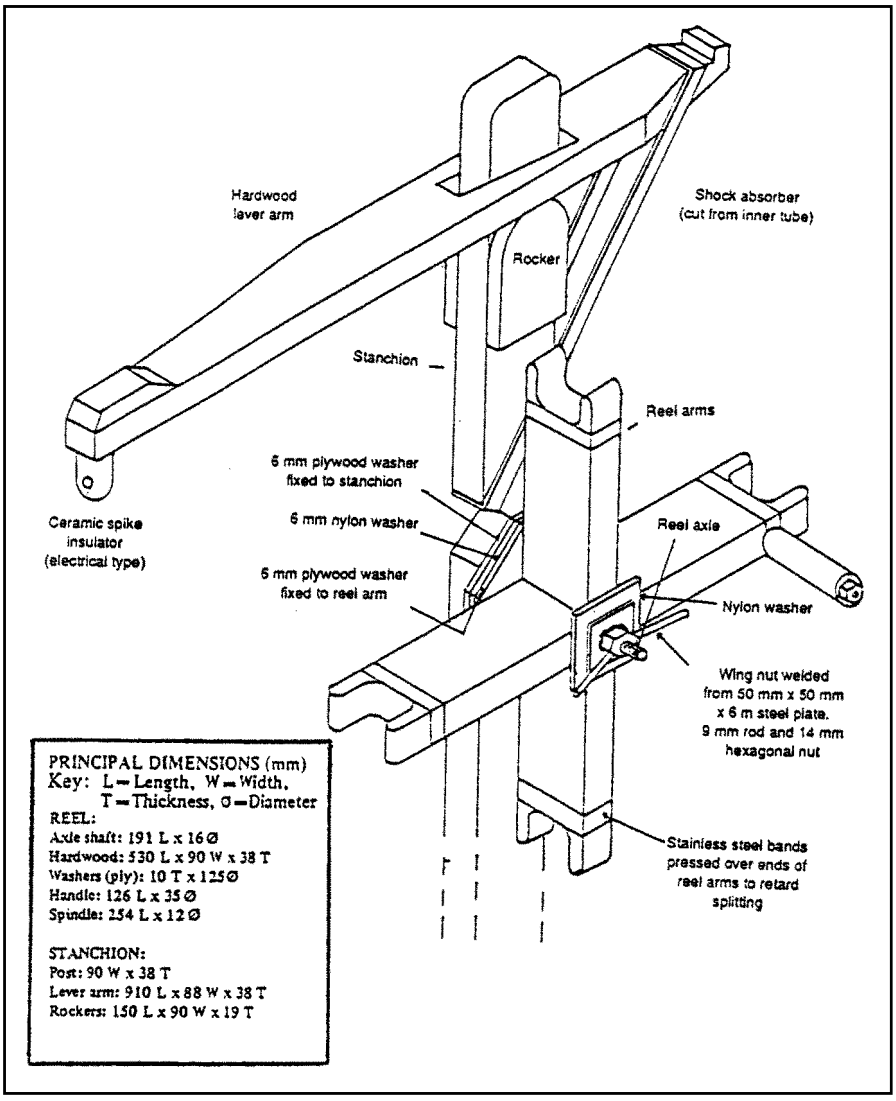



**Figure 3: Samoan type wooden handreel used by the project**

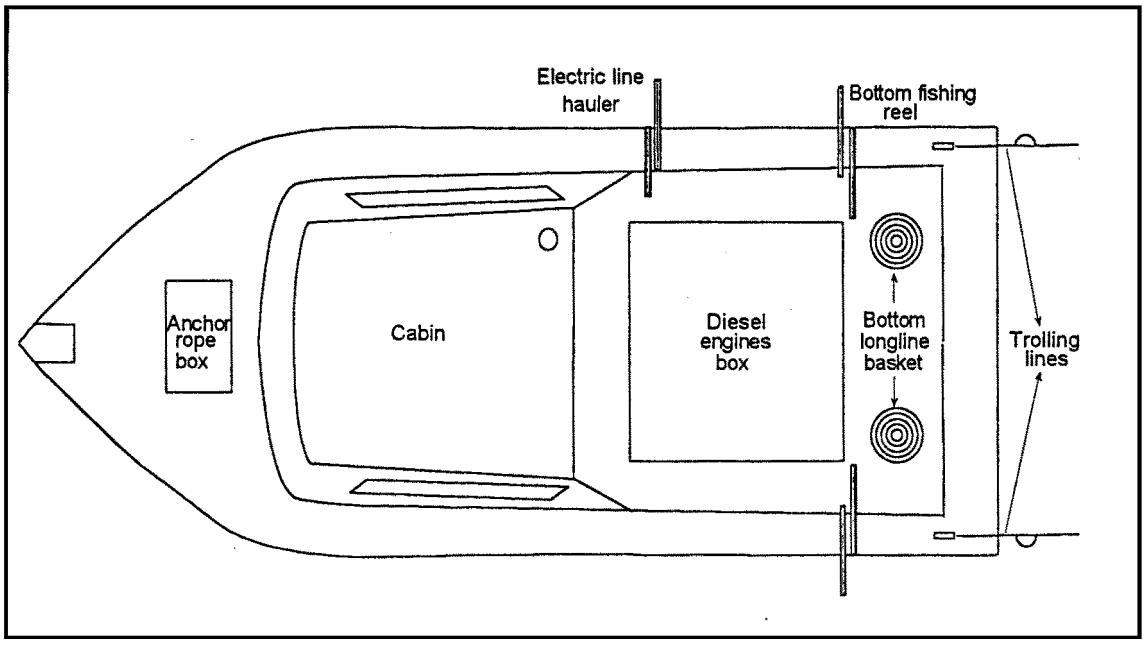



**Figure 4: Deck layout of 'Farallon' style vessel used during the project**

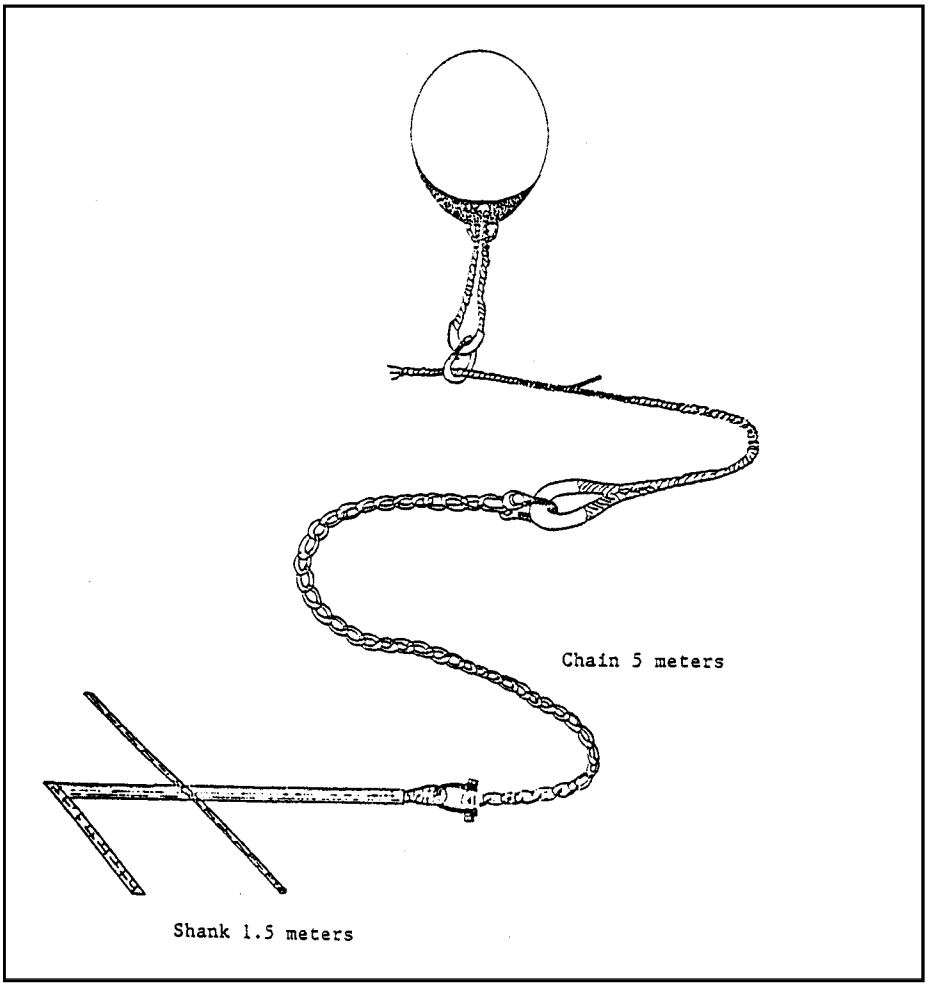



**Figure 5: Anchor gear used during the project**

Two methods were utilised to catch bottom fish:

(a) Manual—Samoan type, or electric 'Tiger' reels loaded with 175 kg toto lines fitted with a 100 kg breaking strain monofilament terminal rig carrying from three to nine Mustad tuna circle hooks on monofilament attached to three-way swivels. The rig terminated with a sinker of around 1.0 kg and had a chum bag attached to the top of the terminal rig (Figure 6).

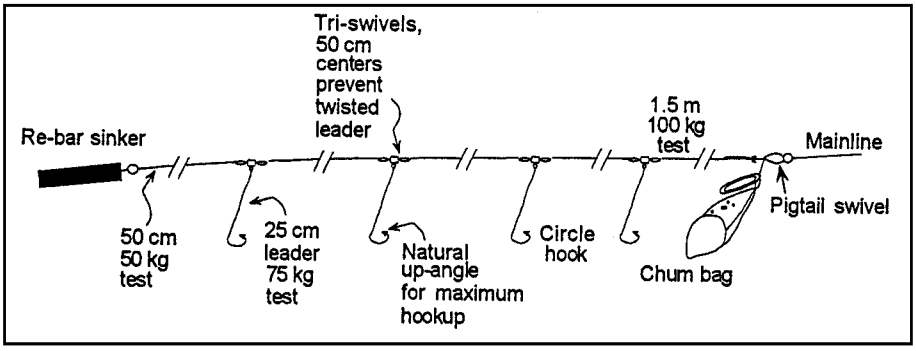



**Figure 6: Monofilament terminal rig used for bottom droplining**

(b) Bottom longline gear (Figure 7) was used sporadically during Phase II and a description of this gear is provided below. Experimentation with various types of longline gear was originally the main focus of the Phase 11 project but poor catches due to limited bottom fishing grounds and inclement weather forced the project into use droplines, a more productive method of bottom fishing.

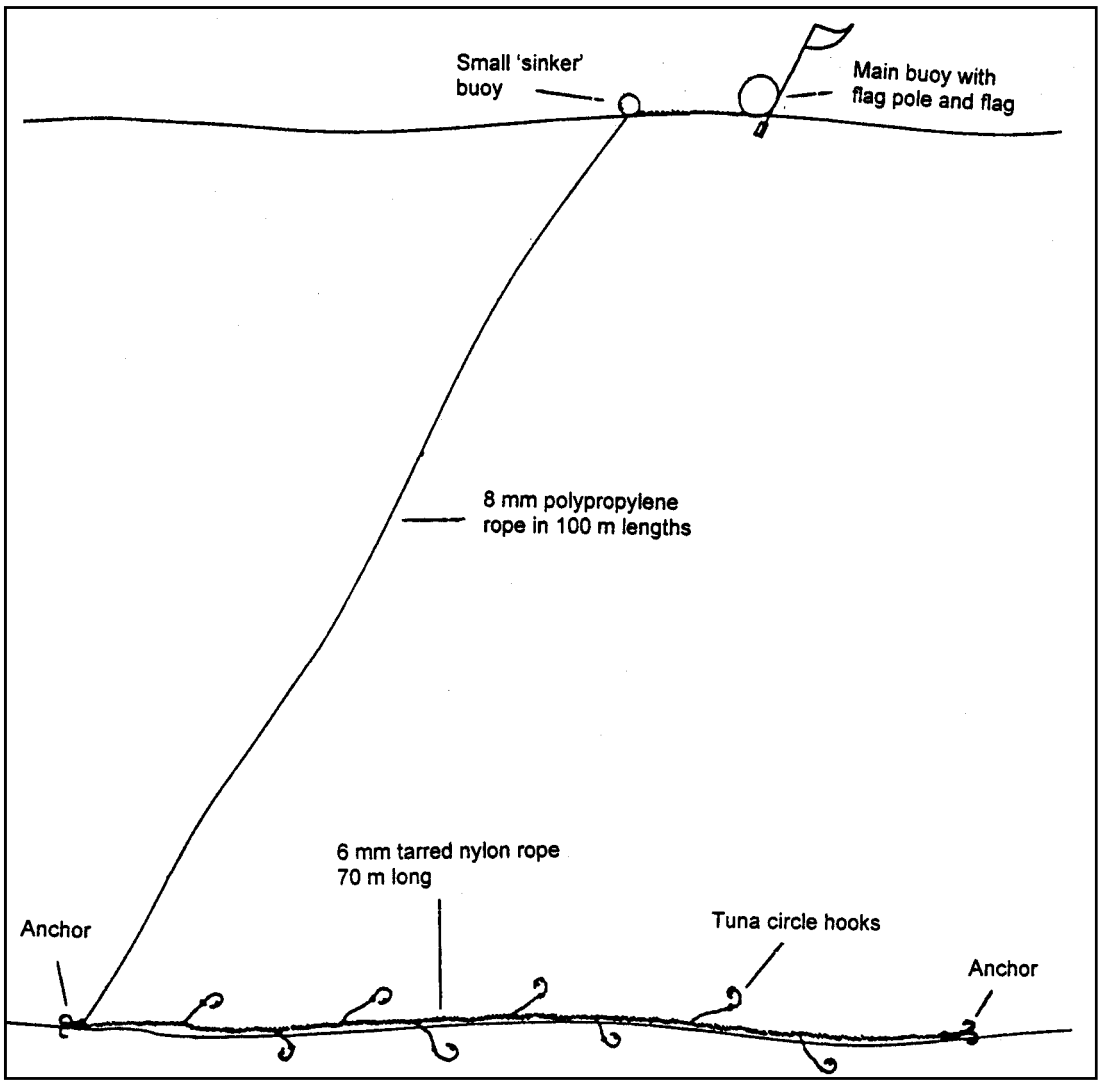



**Figure 7: Configuration of bottom longlining gear trialed by the project**

The following description outlined the construction of the bottom longline gear trialed by the project including three different snood attachments to the mainline.

*Flag pole buoy*

Figure 8 depicts the flag pole and buoy system used on the bottom longline. To make up this gear the following materials are needed: one 150 cm circumference inflatable rubber buoy; one 50 cm circumference inflatable rubber buoy; a 4 m length of bamboo; three pieces of 2.5 mm diameter reinforcing rod (re-bar) 20 cm long each; one 7 m, one 1 m and one 2 m length of 8 mm diameter polypropylene rope; one rubber tire inner-tube; and one piece of cloth.

To construct the flag pole and buoy system the three re-bar weights are lashed or bound to the base of the 4 m length of bamboo using strips of rubber cut from the inner-tube. The 7 m length of rope has an eye splice made at one end (with a eye of around 30 cm) and a back splice made at the other end. The 1 m length of rope is then spliced into the 7 m rope around 2 m from the eye splice. The smaller buoy is then attached to the other end of the 1 m length of rope and acts as a 'sinker buoy'. The larger buoy is then attached to the flag pole using one end of the 2 m length of rope, with an eye splice made in the other end where the back-spliced end of the 7 m length of rope is attached. The loose end of the 2 m length of rope where it is attached to the flag pole is then wiped to the pole using strips of rubber from the inner-tube. Lastly, the cloth is attached to the to the top of the bamboo to make a flag.

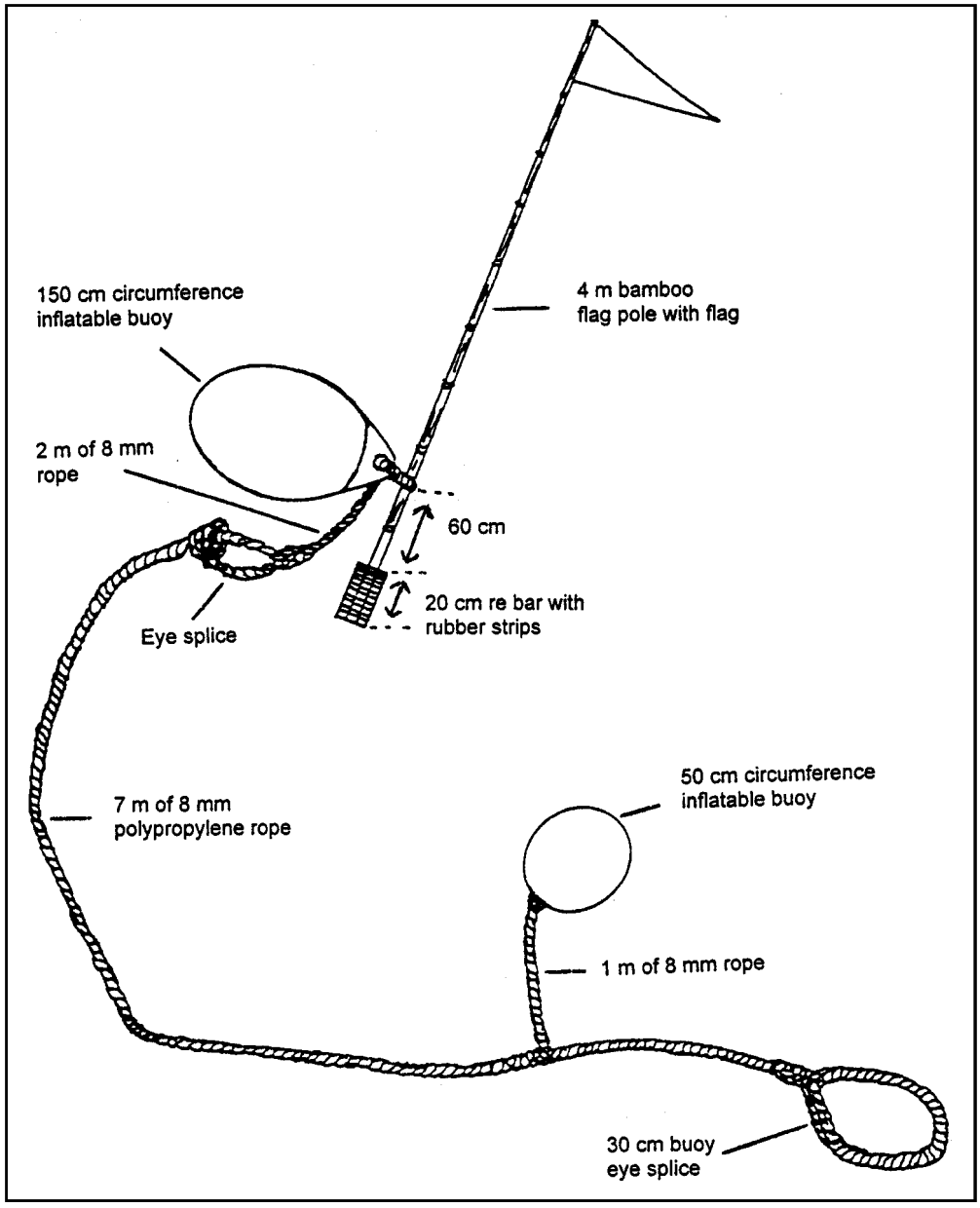



**Figure 8: Construction of the flag pole and buoy system used in bottom longlining trials**

*Buoy line*

The buoy line is constructed form 100 m lengths of 8 mm polypropylene rope with an eye splice made at both ends. The reason for the 100 m lengths is to allow different depths to be fished by joining the required number of lengths together. Note that extra rope is needed to allow for the drag caused by current. To join the ropes, the eye of one rope is passed through the eye of a second rope and tying two half hitches (one on the eye splice and the other back on the rope itself) as depicted in Figure 9.

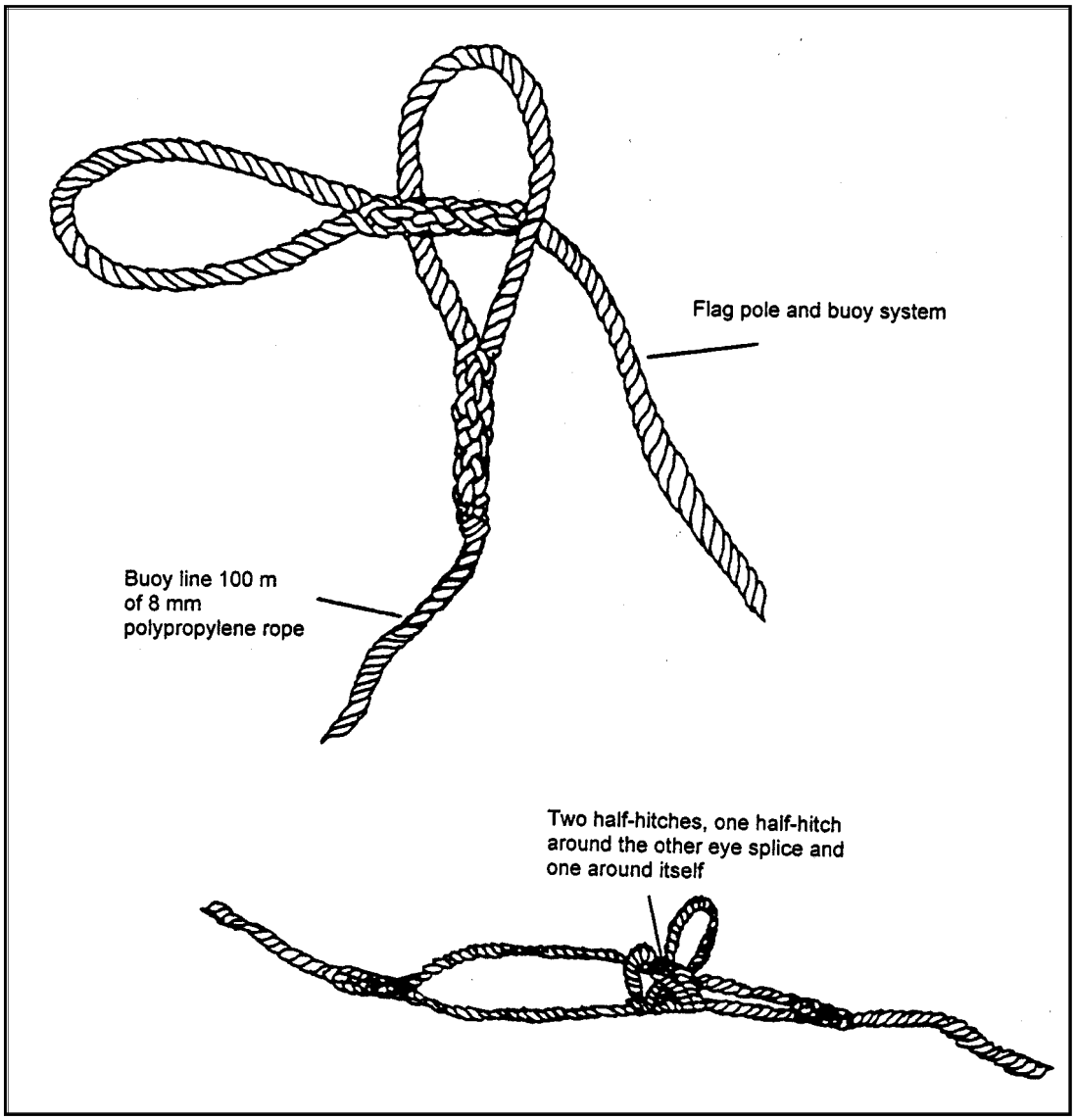



**Figure 9: Details of rope connections for buoy line**

*Ground line*

The materials needed to make up a ground line are: 70 m of 6 mm tarred nylon rope; different breaking strain monofilament (25 kg, 35 kg, and 50 kg test) cut into either 60 cm or 150 cm lengths (depending on type of snood); 30 pieces of black braided nylon twine each 40 cm or 60 cm long; 30 barrel swivels size 4/0 or 6/0; 30 Mustad tuna circle hooks size 16 or 18 or 22; and two 1 m high plastic garbage containers.

The 70 m length of rope has an eye splice made at each end, forming eyes around 20 cm long each. On one end an anchor will be tied, with the buoy line and an anchor attached at the other end. Every 2 m along the ground line a snood with hook will be attached so that the line has 30 hooks. Three different snood constructions were used as follows:

(a) Every 2 m along the ground line a 4/0 barrel swivel is secured by passing the nylon twine through one eye of the swivel and around the ground line itself (Figure 10). The 40 cm lengths of nylon twine have a loop tied in each end. By passing the loop at one end over the swivel and then passing the other end through the eye of the swivel and pulling it through, the nylon twine is attached to the swivel. The 60 cm lengths of monofilament have a circle hook attached to one end (size depends on species being caught or targeted) and a loop formed at the other end. The loop in the nylon twine and the loop in the monofilament are joined by passing the loop in the twine through the loop in the monofilament, then passing the hook through the eye in the twine and pulling the monofilament through as shown in Figure 10.

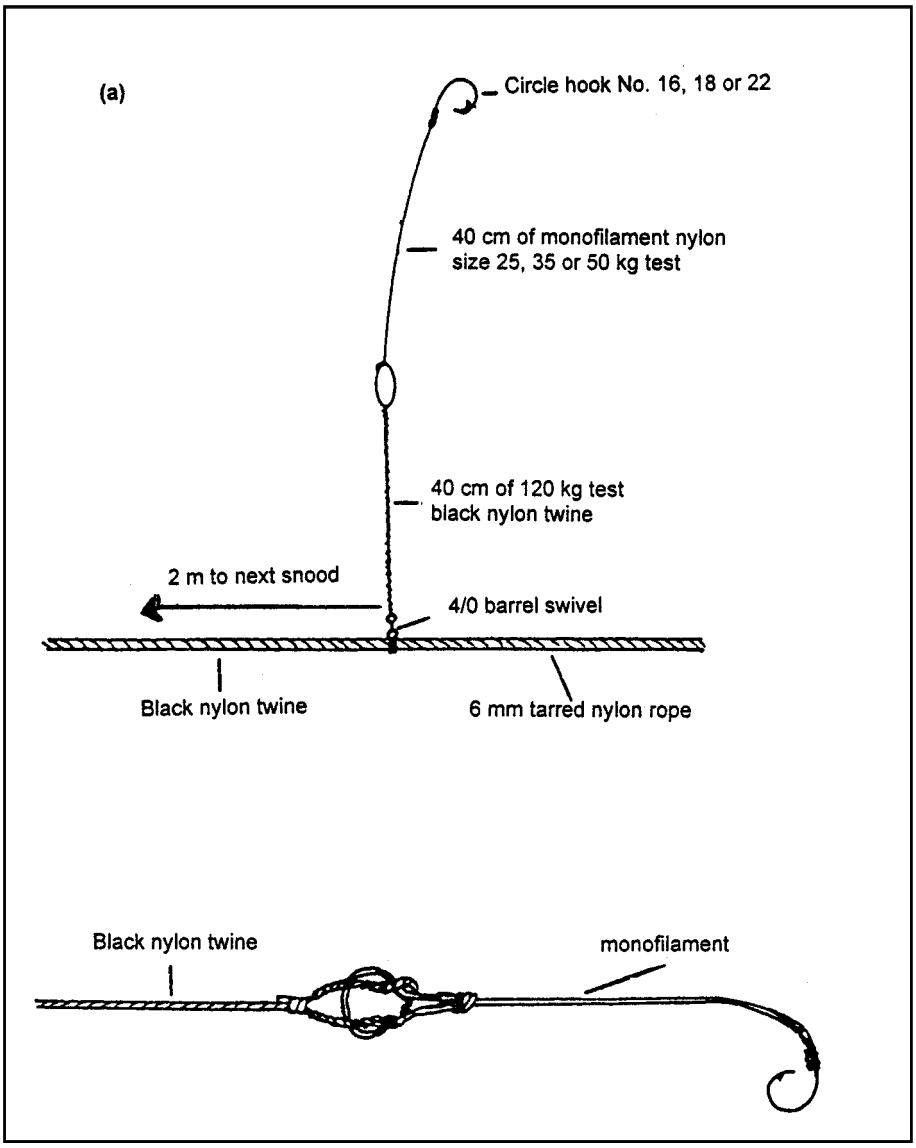



**Figure 10: Method (a) for making up snoods and attaching them to the ground line**

(b) The construction of the snood is exactly the same as for (a) above from the hook to the swivel, although a larger, 6/0 swivel is used. The difference is that the swivels are threaded onto the ground line by passing the ground line rope through one eye of the 6/0 swivel. Note the swivels need to be threaded on before the splice is made on the end of the rope. The swivels are then spaced out at 2 m intervals. Nylon twine is then wiped around and through the ground line on either side of the swivel about 2.5 cm apart (Figure 11). This allows the swivel with attached snood to swing freely around the ground line without it being able to slip along the ground line.

(c) This method of construction is very simple. A 1 m length of monofilament has a circle hook attached at one end and the other end of the monofilament is tied through and around the ground line. The spacing of the snoods is also 2 m.

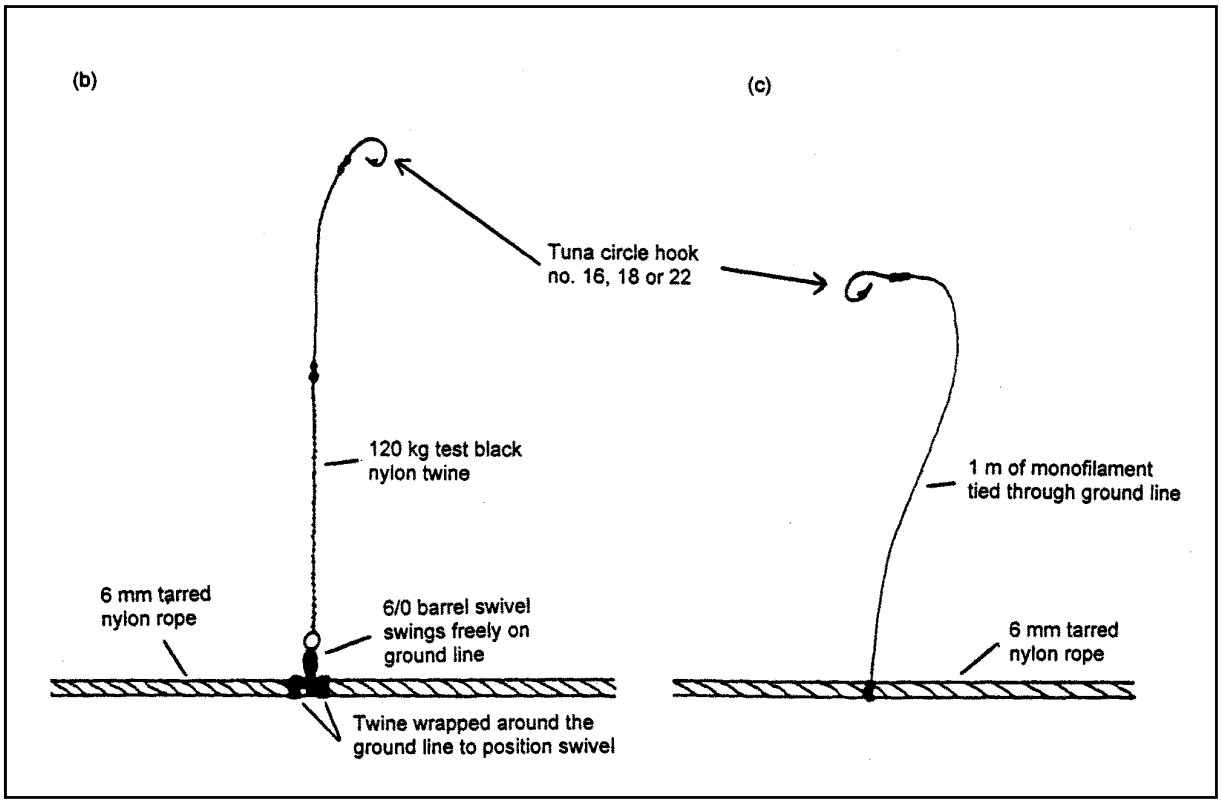



**Figure 11: Methods (b) and (c) for making up snoods and attaching them to the ground line**

*Advantages and disadvantages of each snood system*

Construction (a) allows the snood to swing in one direction from the ground line. It prevents the fish from twisting itself off the hook as long as the snood itself does not get wrapped around the ground line. This snood is time consuming to make compared to snood (c), and it is more expensive.

Construction (b) is the best system as the snood can swing freely around the ground line and swings sideways if there is a fish on the snood. This minimises the chance of the snood wrapping around the ground line. This style of snood is the most time consuming to make up—the whipping of the twine on either side of the swivel is labour intensive. The use of the 6/0 barrel swivels and the twine makes this the most expensive system to make.

Construction (c) is the fastest and simplest to make and the least expensive. But the snood wraps around the ground line and if a fish is on the snood it twists the monofilament and can come off the hook easily.

### 3.3 Data collection

SPC requires the use of a standard logsheet (Appendix 2a) to record catch, effort and other data, and detailed notes of daily activities.

During Phase II additional data was required by the Division of Fish and Wildlife. A new logsheet was drafted (Appendix 2b) to make the recording of this additional data easier. To make the data collection and data entry easy for computer analysis, a system of codes was developed to cover locations fished, species caught, sex and maturity, depth fished, sea state, wind speed and direction, cloud cover, and bottom current. Appendix 3 lists the different codes used in association with the new logsheet.

On every fishing trip, both the SPC and Fish and Wildlife logsheets were utilised for recording data as each listed different information. The SPC logsheet was orientated towards commercial fishing in terms of amount of fuel used, numbers of fish caught at certain times during the day, whereas the Division of Fish and Wildlife's logsheet focused more on biological information.

### 3.4 Training activities

Intensive training was carried out during all phases. The training courses consisted of a one day fishing trip where the trainees underwent instruction in the techniques of basic navigation, rigging of gear, utilisation of depth sounder and anchoring method in deep water. The majority of training courses took place on Saipan and Tinian; trainees were also taken on the Pagan and Esmeralda Reef Fish surveys. Rota was also included in the training Programme but no interest was shown by local fishermen during the three week survey. A total of 61 people underwent formal training, 38 from Saipan, 18 from Tinian and 5 from other areas.

### 3.5 Disposal of the catch

All fish caught on the 'Farallon' style vessel were distributed to Fish and Wildlife staff, trainees, the hospital or the home for the aged. Due to the nature of the project, fish were not to be sold as this could be considered as competition with commercial fishermen.

The fish catches on the surveys to Pagan and Esmeralda Reef were split 50–50 with the F/V *Sun*. This was part of the charter agreement to help pay for the wages of the vessel's crew. The fish were sold to local hotels and restaurants.

## 4. FISHING ACTIVITIES AND RESULTS

### 4.1 Bottom longline

The bottom longline gear, described in Section 3.2, was designed to be set from boats between 6–8 m in length. The simple 30 hook longline was set in depths from 50–300 m. A number of sets were made in shallow water (50–160 m) to focus on catching Lethrinus species. Sets were also made in deep water (200–300 m) for Pristipomoides, Etelis and Epinephelus species. During bottom longlining operations suitable fishing areas were located using a depth sounder. Limited grounds were located to set longlines surrounding the Saipan and Tinian area. The bottom contour was too steep in most locations making it impossible to set longline gear. Areas that were suitable for setting the gear were generally over-exploited by local fishermen due to accessibility.

The bottom longline gear was used in the following way. The ground ropes with attached snoods and hooks were coiled into a 1m high plastic garbage container with the top lip cut off. The thin lip was cut around the circumference of the container making 60 cuts 1cm deep, 30 on each side between the handles (Figure 12). As the ground rope was coiled into the container each snood's hook was slipped consecutively into one of the cuts on the top of the container. Each container was able to accommodate two ground lines. The ends of the ground ropes were left outside the container with enough length to tie the anchors and buoy lines. Also the ends of each ground line were marked with different coloured twine wiped into the eye slices to help identify each ground rope.

After the ground ropes were coiled into the container an anchor was tied to the last eye splice. A buoy line and flag pole and buoy system was tied to the eye splice on the other end of the ground rope. When the bottom longline was set the first anchor was dropped overboard and the boat motored forward. The rope was slowly uncoiled pulling each baited hook consecutively out of the container. When all the

hooks were in the water the last anchor with the buoy line attached was thrown overboard. The boat then speed forward in a long arch while the buoy line was paid out. When the buoy line was completely paid out the flag pole and buoy system was thrown in the water and the crew marked the location by taking land marks.

Hook sizes were changed according to the depth of water and species of fish targeted. A combination of squid, skipjack tuna and mahi mahi were used for bait.

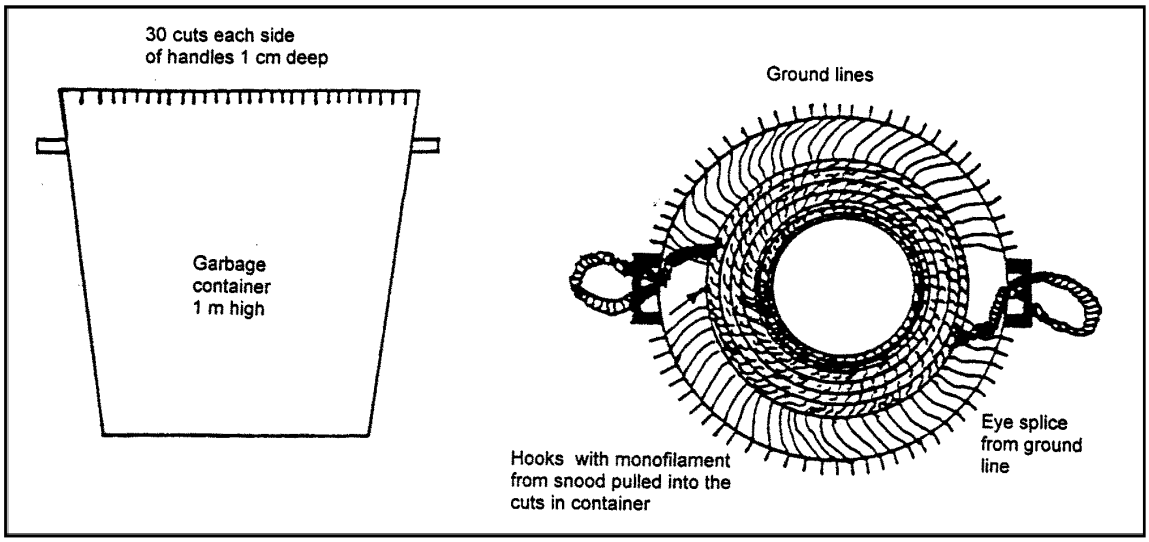



**Figure 12: Storage of two ground lines in one plastic container**

Catches were very poor especially in shallow water due to either the baits being eaten by small fish or lack of fish in the area. Catches were better in deeper water but still not productive enough to consider using this method for commercial purposes. Presumably, catch rates would be higher in unexploited areas. However, these areas are either too far for a small fishing craft to travel safely or the contour of the bottom would make it impossible to set the gear effectively.

Overall, 24 hours were spent utilised bottom longlining gear over eight trips, with a total catch of 35.1 kg recorded. The CPUE for this method was 0.49 kg/10 hooks/hour. Appendix 4a provides detailed records for bottom longlining activities.

### 4.2 Deep bottom droplining

Deep bottom droplining was the method solely used during Phase I. Due to the poor catch rates with the bottom longlines in Phase II, deep bottom droplining was implemented to locate sufficient fish stocks in suitable areas to experiment with the bottom longlines. Suitable fishing areas were located using the depth sounder with a target depth range of 150–300 m.

The Japanese style anchor (see Figure 5) was dropped in shallow water, especially when fishing on pinnacles with steep drop-offs, so the prevailing wind or current would carry the boat to the desired fishing depth as the anchor warp was paid out. Inflatable plastic buoys were attached to the anchor rope as it was paid out to keep the line close to the ocean surface, stop a direct pull on the anchor from the boat, and simplify hauling the anchor especially if a large amount of anchor rope was paid out to reach a desired depth.

To retrieve the anchor after fishing a simple technique was used, which reduced the effort involved in hauling (Figure 13). All surface rope was retrieved and then the boat was motored rapidly forward breaking out the anchor and towing it until the anchor rope streamed behind the boat. While under way, two free-running inflatable buoys attached together were shackled onto the rope and released. The buoys then forced back along the rope by the boat's forward motion until it became trapped by the `no-return' barb close to the chain and anchor. The boat then retrieved the line floating on the surface. The anchor, chain, and buoy suspended on the surface were then hauled aboard the boat.

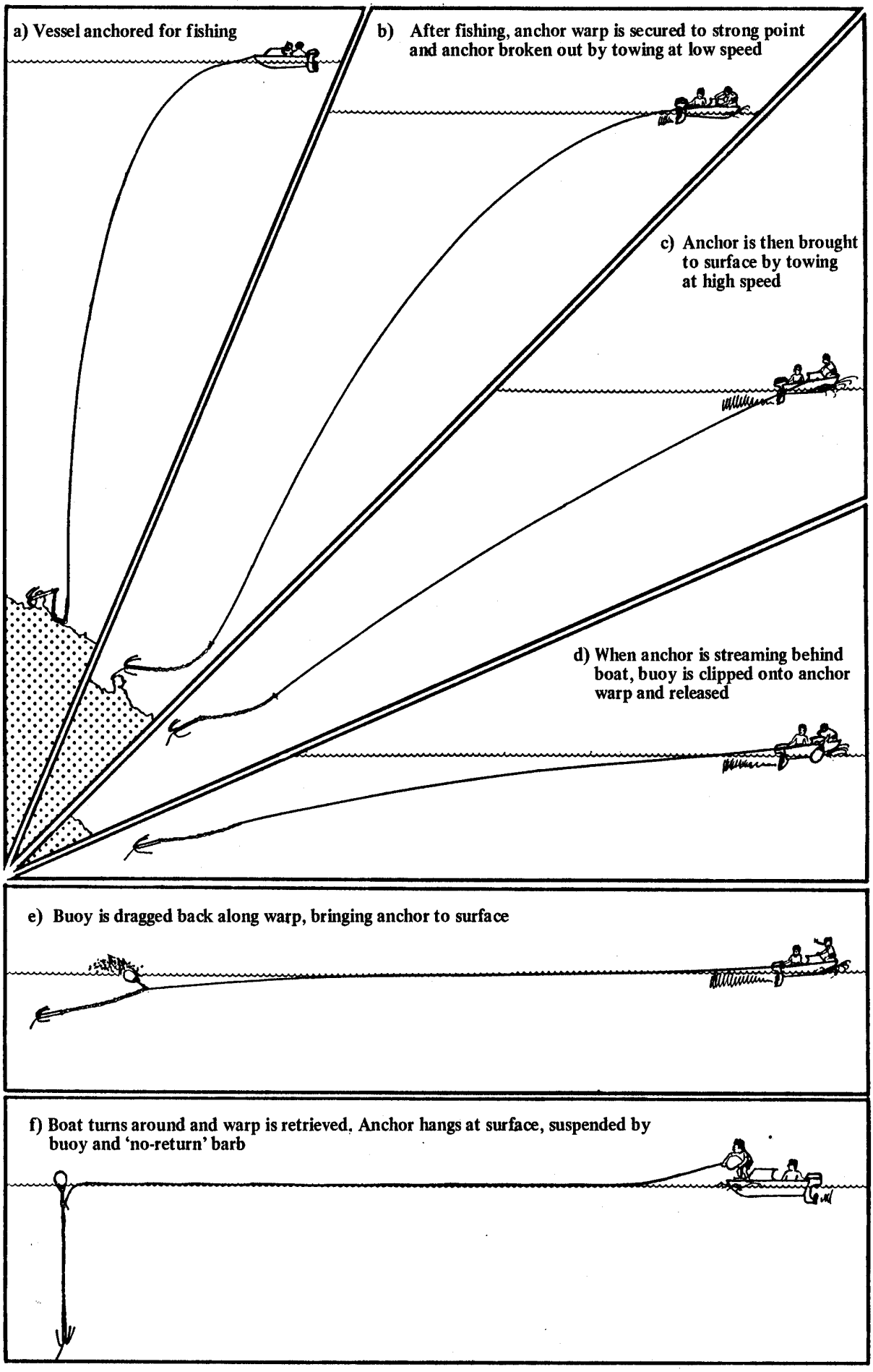



**Figure 13: Anchor retrieval method**

A combination of skipjack tuna, squid and mahi mahi were used for bait. The hook size varied according to the depth of water and targeted species of fish (usually number 18 to 25 Mustad circle).

Primary target species of fish for this method were Pristipomoides, Etelis, and Epinephelus, although there were a variety of other species taken. Droplining proved to be a more productive method of fishing than bottom longlining. It was possible to fish on grounds where bottom longlines were impossible to deploy due the steep bottom contours or current. It was also much more economical in terms of gear expense, time and effort.

The most successful fishing trips were in locations which were unexplored or difficult for local fishermen to exploit using their present method of drift fishing. These grounds or small pinnacles, would decline quickly in catch rate with a sustained fishing pressure due to limited exploitable area.

Phase III compared to Phases I and II, generally had higher catch rates. The reasons for this were:

(a) The weather conditions from April to September are favourable for bottom fishing. The trade winds blow from the north-east for the remainder of the year. Due to the shape and size of the Northern Mariana Islands there is little protection from these winds.

(b) Familiarity with the fishing grounds surrounding Saipan and Tinian. Fishing grounds shown on the charts which indicated favourable deep bottom fishing locations proved to be over-exploited in Phases I and II. Small pinnacles difficult for local fishermen to exploit with present fishing techniques were located and became the main focus of fishing effort.

(c) Fishing surveys were made to Pagan Island and Esmeralda Reef. These fishing grounds were basically unexploited as they were out of reach for most local fishing boats.

Overall, 605.5 line hours were recorded using deep bottom droplining over 59 trips, with a total catch of 2,815.9 kg being recorded. The CPUE for this method was 4.65 kg/line hour. Appendix 4b provides detailed records for deep bottom droplining activities.

### 4.3 Trolling

Opportunistic coastal trolling to and from bottom fishing grounds in open water was the majority of recorded trolling data. On all trips a combination of sport fishing reels and handlines were used. Overall, 391.5 line hours were recorded trolling over 37 trips, with a total catch of 880.1 kg being recorded. The CPUE for this method was 2.25 kg/line hour. Appendix 4c provides detailed records for trolling activities.

## 5. SPECIES COMPOSITION OF THE BOTTOM CATCH

The focus of this project was on bottom fishing to collect information on catch rates and species composition. Table 6 summarises the species composition, with the groupings based on a combination of taxonomy, fishing location, and number of fish.

**Table 6: Species composition of the deep bottom catch in various locations**

| Species | Location | Number of fish | Species | Location | Number of fish |
|---|---|---|---|---|---|
| *Epinephelus faciatu* | 1 | 7 | *Pristipomoides filamentosus* | 1 | 1 |
| | 60 | 15 | | 38 | 27 |
| | 61 | 2 | | 44 | 1 |
| | | | | 46 | 4 |
| *Epinephelus septemfasiatus* | 1 | 3 | | 52 | 1 |
| | 45 | 3 | | 58 | 108 |
| | 51 | 1 | | 60 | 1 |
| | 53 | 2 | | | |
| | 58 | 3 | *Pristipomoides flavipinnus* | 1 | 3 |
| | 95 | 1 | | 38 | 56 |
| | | | | 44 | 2 |
| *Etelis carbunculus* | 1 | 64 | | 45 | 14 |
| | 38 | 10 | | 51 | 2 |
| | 44 | 28 | | 52 | 2 |
| | 45 | 87 | | 53 | 3 |
| | 46 | 1 | | 60 | 18 |
| | 51 | 35 | | 61 | 7 |
| | 52 | 91 | | 95 | 3 |
| | 53 | 15 | | | |
| | 58 | 4 | *Pristipomoides zonatus* | 1 | 221 |
| | 60 | 20 | | 38 | 10 |
| | 61 | 2 | | 44 | 52 |
| | 95 | 6 | | 45 | 40 |
| | | | | 46 | 4 |
| *Etelis coruscans* | 1 | 17 | | 52 | 5 |
| | 44 | 2 | | 53 | 8 |
| | 45 | 16 | | 58 | 5 |
| | 51 | 16 | | 60 | 25 |
| | 52 | 19 | | 61 | 21 |
| | 53 | 13 | | 95 | 1 |
| | 58 | 1 | | | |
| | 60 | 3 | *Pristipomoides multidens* | 1 | 4 |
| | | | | 38 | 5 |
| *Pristipomoides auricilla* | 1 | 38 | | 58 | 5 |
| | 38 | 14 | | 60 | 17 |
| | 44 | 104 | | 61 | 3 |
| | 45 | 17 | | 95 | 1 |
| | 52 | 1 | | | |
| | 53 | 4 | | | |
| | 58 | 4 | | | |
| | 60 | 30 | | | |
| | 61 | 14 | | | |
| | 95 | 13 | | | |

The species composition of the deep bottom catch is also presented graphically below for the 12 main areas fished, being: Pagan Island (Figure 14); locations 38 (Figure 15), 44 (Figure 16), 45 (Figure 17), 46 (Figure 18), 51 (Figure 19), 52 (Figure 20), 53 (Figure 21), 58 (Figure 22), 60 (Figure 23), 61 (Figure 24, and 95 (Rota—Figure 25). The locations mentioned here are taken from Figure 2.

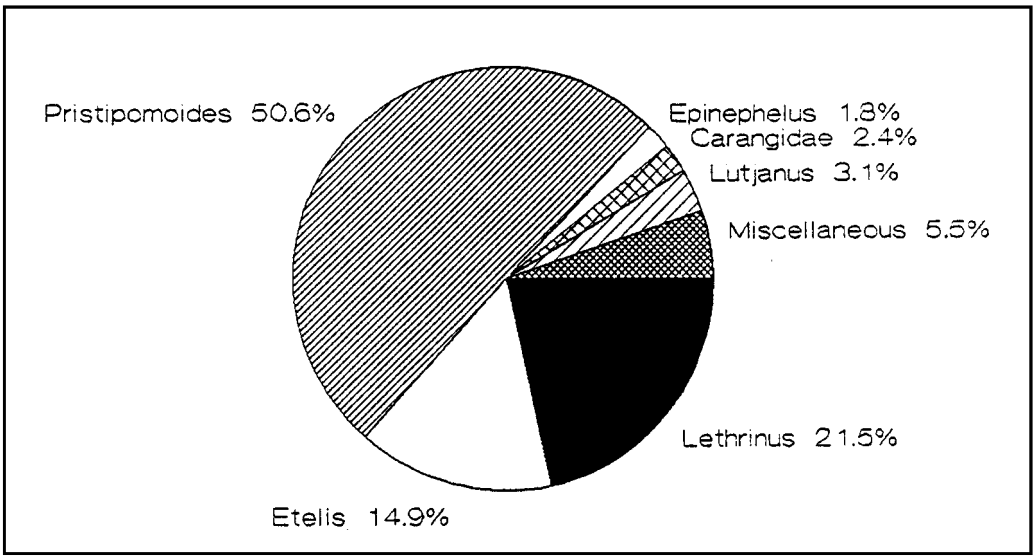



**Figure 14: Catch composition at fishing location 1—Pagan Island**

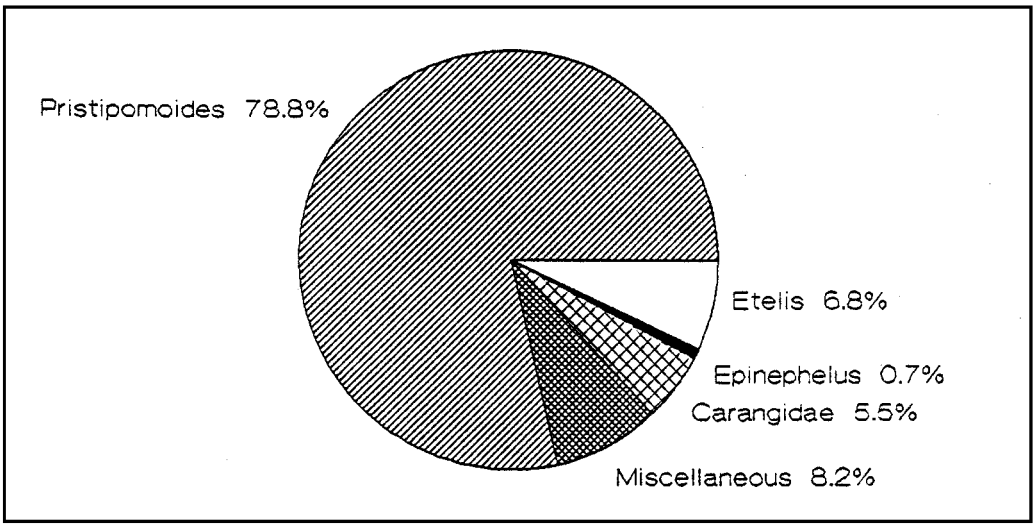



**Figure 15: Catch composition at fishing location 38**

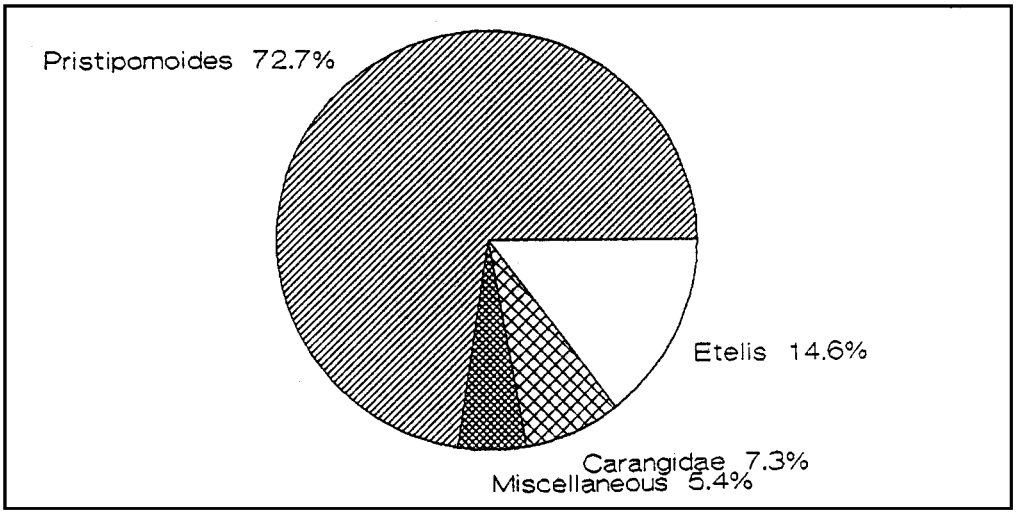



**Figure 16: Catch composition at fishing location 44**

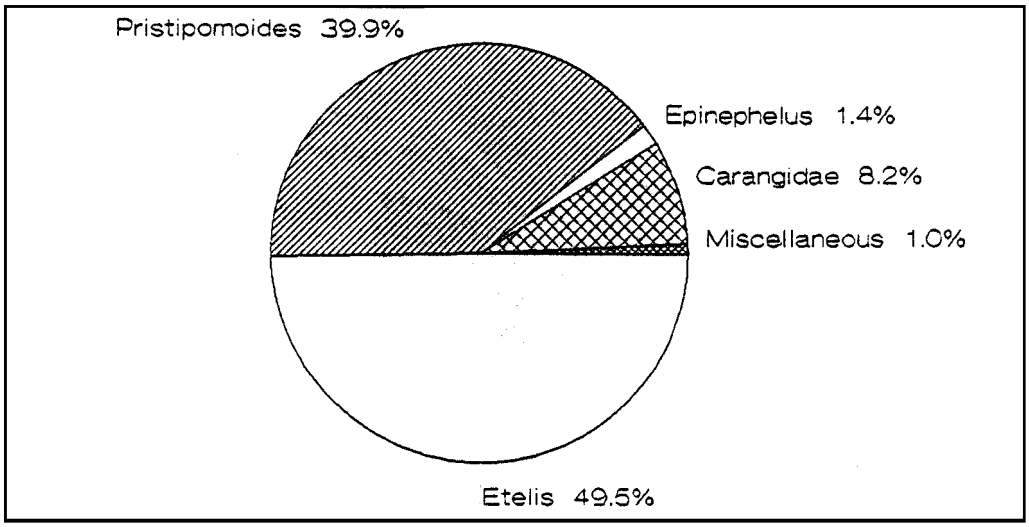



**Figure 17: Catch composition at fishing location 45**

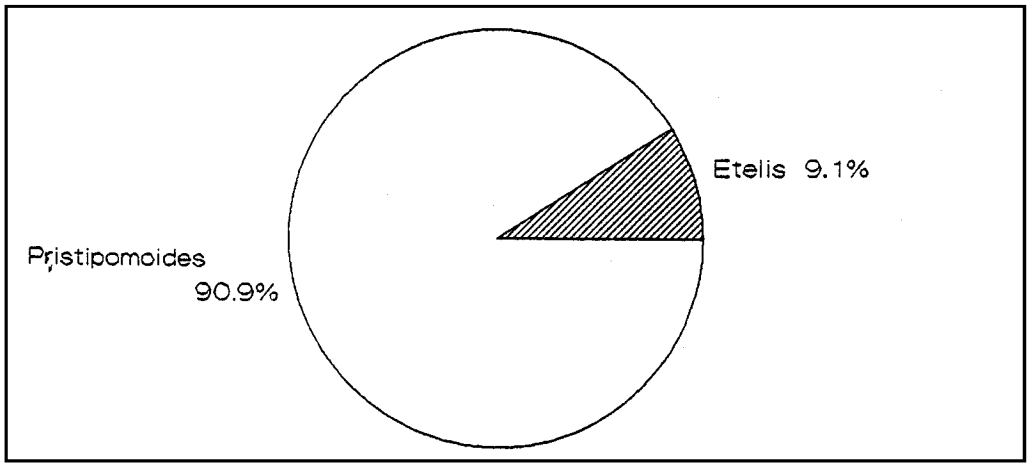



**Figure 18: Catch composition at fishing location 46**

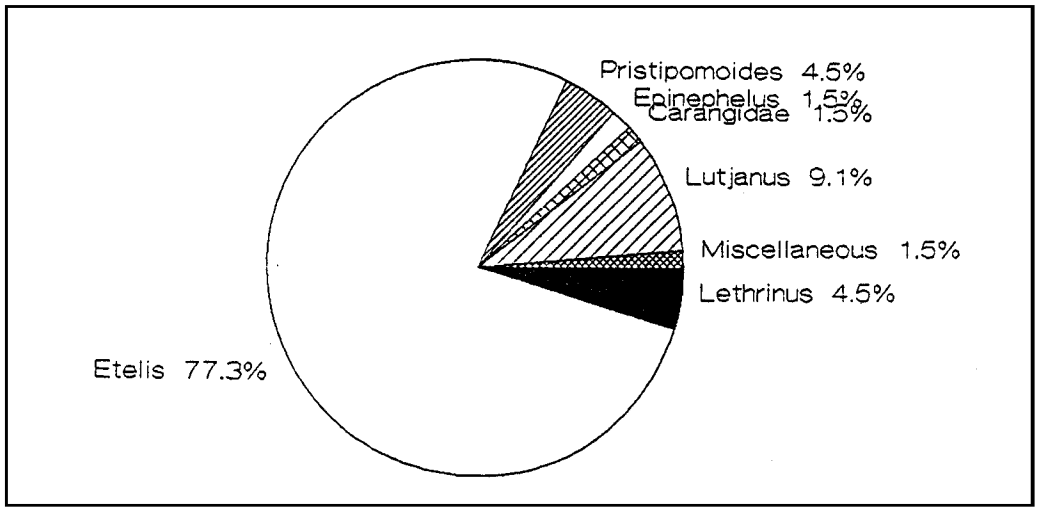



**Figure 19: Catch composition at fishing location 51**

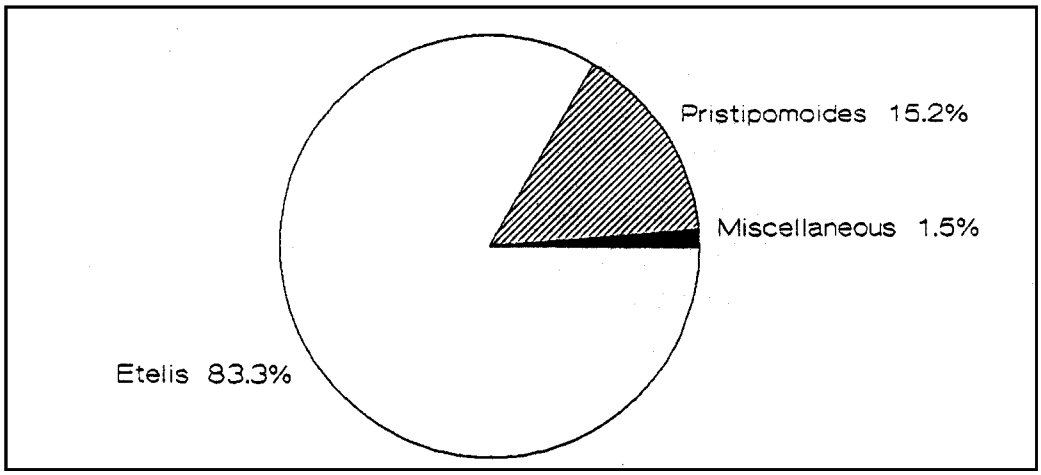



**Figure 20: Catch composition at fishing location 52**

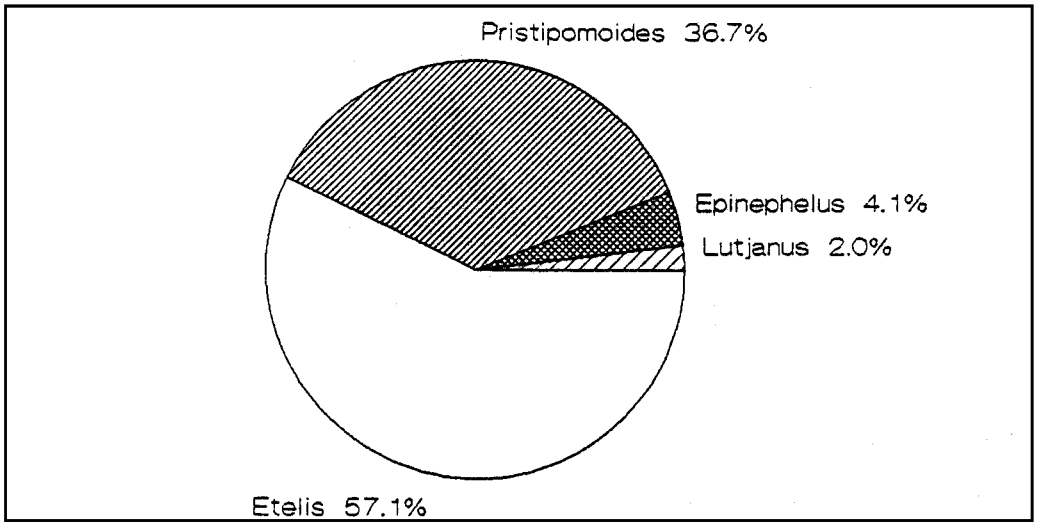



**Figure 21: Catch composition at fishing location 53**

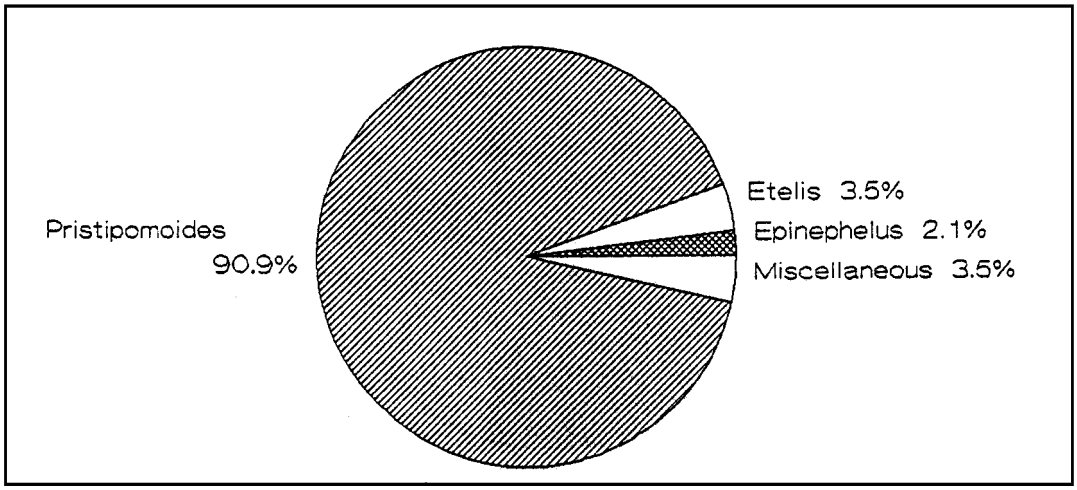



**Figure 22: Catch composition at fishing location 58**

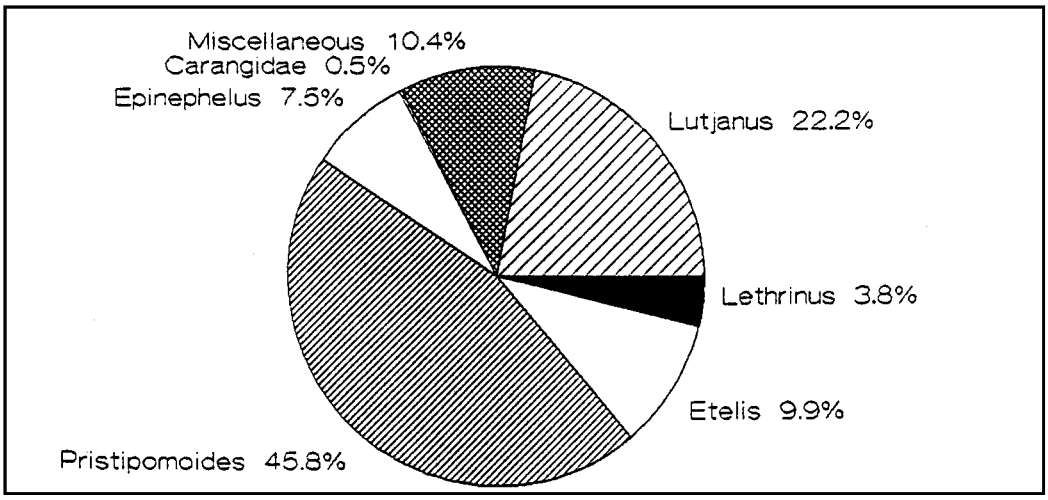



**Figure 23: Catch composition at fishing location 60**

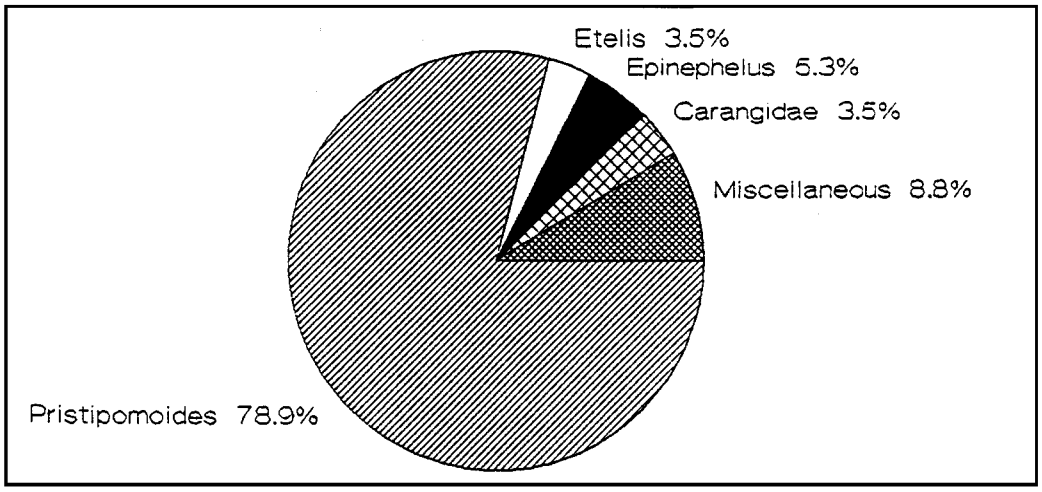



**Figure 24: Catch composition at fishing location 61**

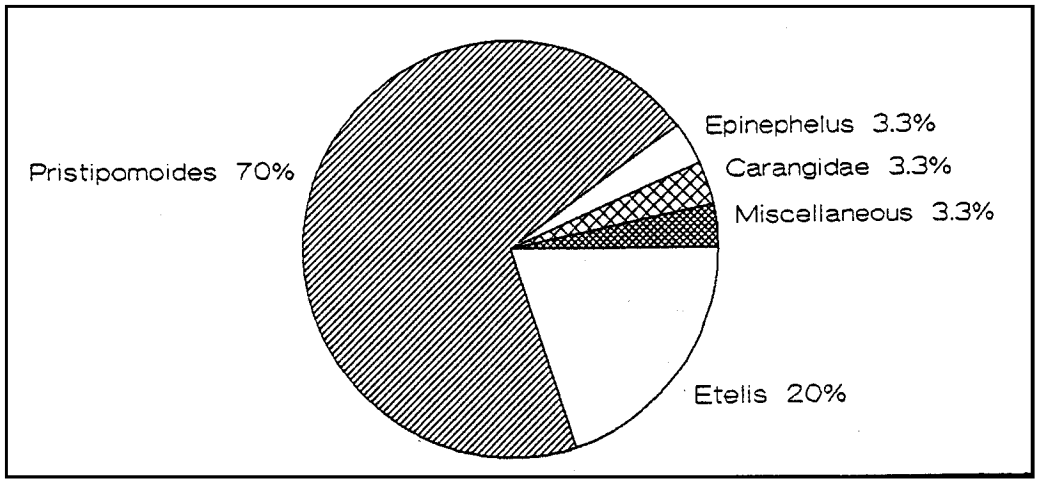



**Figure 25: Catch composition at fishing location 95—Rota**

## 6. FISHING RESULTS OF VARIOUS LOCALITIES

### 6.1 Saipan and Tinian

Saipan and Tinian were the main areas focused upon for the deep bottom fishing project. Both islands are relatively small in land mass; Saipan being a total 46 square miles and Tinian 40 square miles. Saipan is mountainous, with a rugged coastline on the eastern side and a 12 mile long lagoon on the western side. Tinian is relatively flat with narrow fringing reef only on the southern part of the island. There is also a small island south of Tinian, Goat Island, with reefs stretching out from the north and south ends of the island. Off shore from the islands are a number of reefs, pinnacles and banks that are suitable for bottom fishing. Catches and catch rates are detailed in Table 7 by location (refer Figure 2), whilst Appendix 5 provides the catch and activities by fishing location.

| Location | Number of fish | Line hours | Weight (kg) | CPUE |
|---|---|---|---|---|
| 38 | 115 | 95.5 | 159.6 | 1.67 |
| 43 | 50 | 41.5 | 105.9 | 2.55 |
| 44 | 347 | 209.0 | 483.2 | 2.31 |
| 45 | 192 | 84.5 | 532.7 | *6.30 |
| 52 | 90 | 48.0 | 146.7 | 3.05 |
| 53 | 175 | 62.0 | 422.0 | *6.80 |
| 60 | 103 | 91.5 | 149.2 | 1.63 |
| 61 | 96 | 77.0 | 255.3 | 3.32 |
| 68 | 125 | 76.0 | 77.9 | 1.02 |
| **Total** | **1,293** | **785.0** | **2,332.5** | **2.97** |

* Note: Locations 45 and 53 with the high CPUEs were the areas where pinnacles were found

### 6.2 Pagan Island

A two week trip was taken to Pagan Island (Figure 26), which is 180 miles north of Saipan, to collect data to assess fish stocks. The Division of Fish and Wildlife wanted to implement a comparative study of the CPUE in areas that are relatively unexploited to the Saipan and Tinian areas. Pagan Island (location 1 in catch records) is a mountainous island with an active volcano on the northern end. It is approximately 20 square miles in land mass. There is no fringing reef surrounding the island and the bottom contour drops off dramatically. This made it impossible to anchor the boat on the outer slope and drift fishing was the method used to catch fish. During the two weeks, 180 line hours were recorded and 590 fish landed weighing 1,030.9 kg. This gave a CPUE for this area of 5.73 kg/line hour. Appendix 5 provides the catch and activities by fishing location.

### 6.3 Esmeralda Reef

Five consecutive days were spent on Esmeralda Reef (Figure 27) to collect data to assess fish stocks. Esmeralda Reef (fishing location 58) is an extensive area 28 miles due west of Tinian Island. The reef is comprised of five separate pinnacles, one is an active under-water volcano. Main fishing effort took place on the northern pinnacle which rises to 78 fathoms, and has an extensive flat area on the surface before the contour drops dramatically. Attempts were made to fish the other pinnacles but fishing was very poor close to the active volcano and the other pinnacles dropped off too rapidly for anchoring the boat properly. During the five days fishing, 32.5 line hours were recorded and 147 fish landed weighing 245.7 kg. This gave a CPUE for this area of 7.45 kg/line hour. Appendix 5 provides the catch and activities by fishing location.

**Note Rota fishing trips (location 95) not considered because of poor weather conditions.**

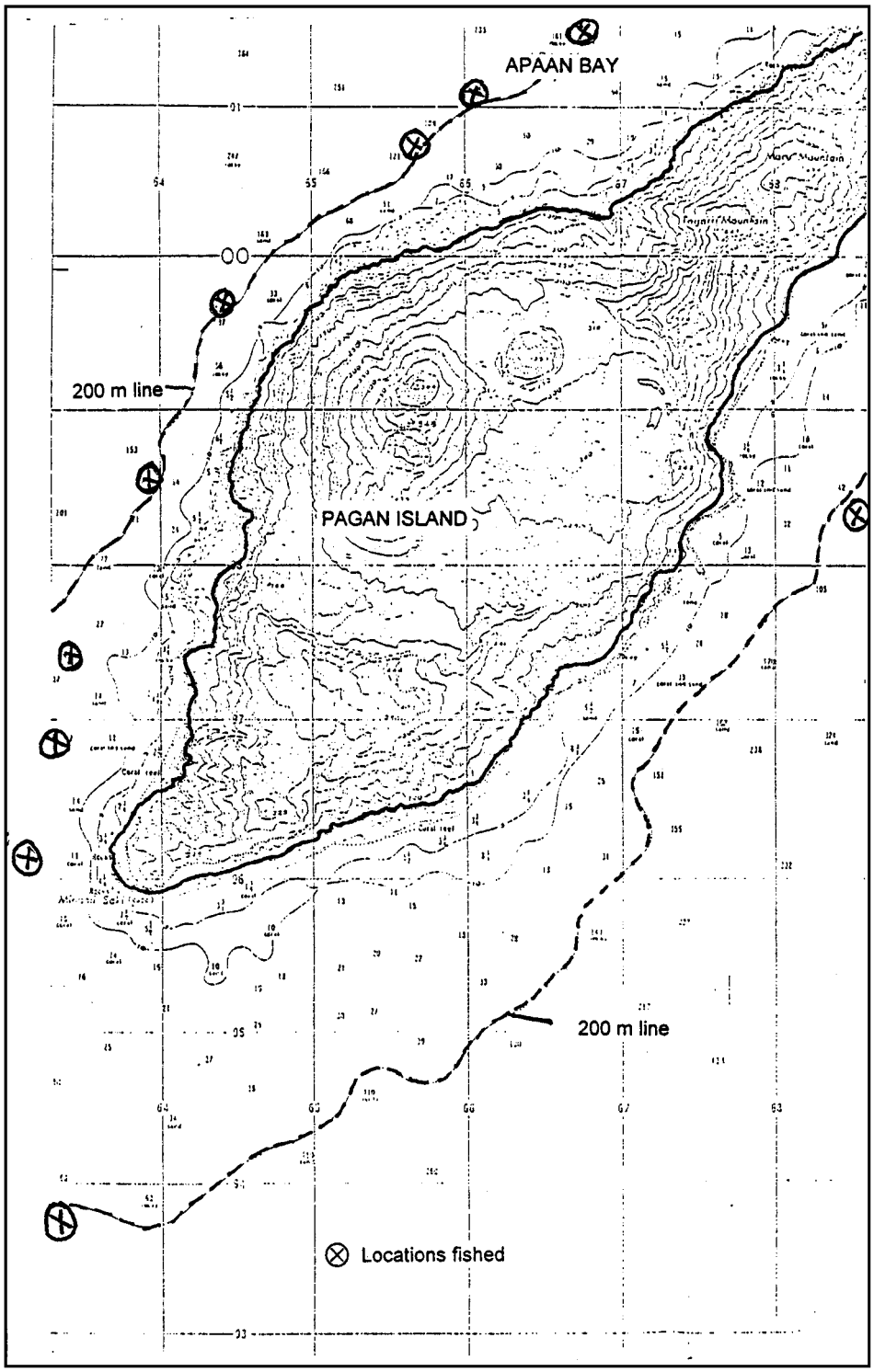



**Figure 26: Pagan Island with the areas fished by the project**

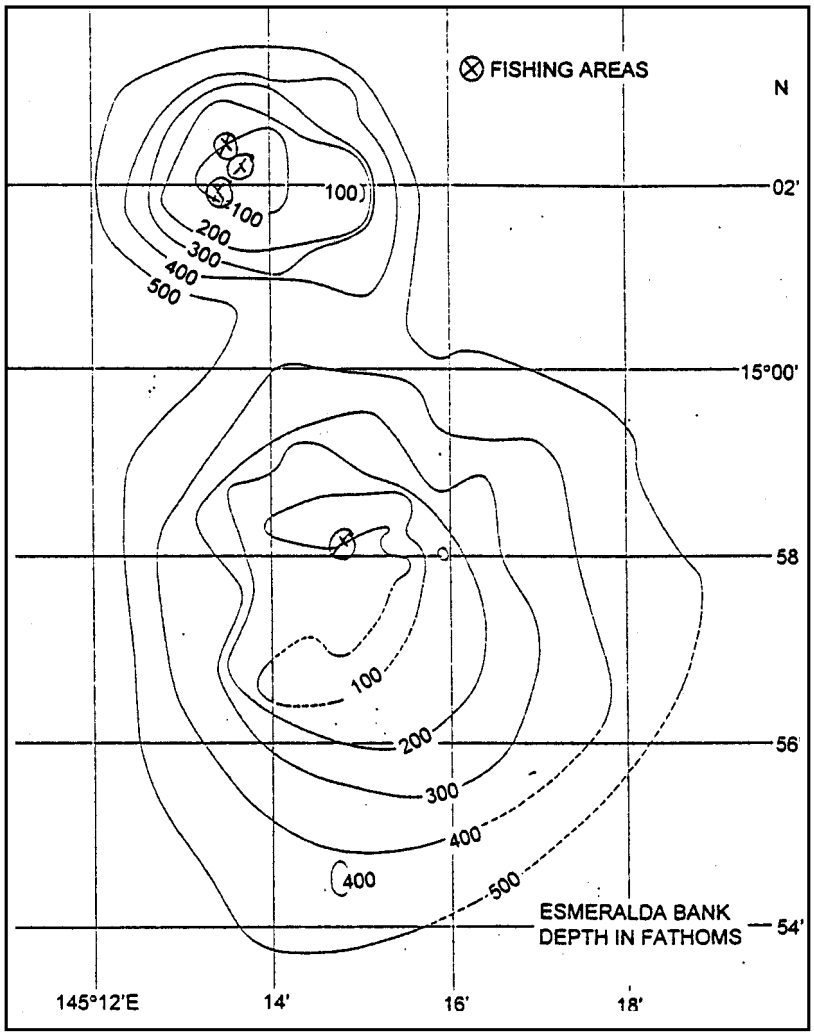



**Figure 27: Esmeralda Bank showing areas fished by the project**

## 7. CONCLUSIONS AND RECOMMENDATIONS

### 7.1 General

The results of deep bottom fishing activities at various locations in the Northern Mariana Islands indicate that there is potential for a limited commercial fishery. The catch rates from the Saipan and Tinian areas indicate that the deep bottom resource has suffered from sustained fishing pressure. Only a few small pinnacles and reefs that are difficult for the local fishermen to exploit using the existing techniques (previous to the SPC bottom fishing training project) have sustainable stocks. Fish stocks would also rapidly decline in these areas with sustained fishing pressure. Charts showing the bottom contour of Saipan, Tinian and the banks and reefs in the surrounding area indicate there is a limited sea-floor area for deep bottom fishing.

The chain of ten islands stretching north of Saipan, and the reefs and pinnacles between the islands, are largely unexploited by local fishermen. A few vessels make periodic trips to these fishing grounds but distance and lack of protected harbours prohibit fishing on a regular basis. The fishing survey on Pagan Island indicates there is certainly a substantial resource. But catch rates would decline dramatically with sustained fishing pressure as the sea-floor area for bottom fishing is limited. Results from the RAIOMA survey indicate that there are also extensive fish stocks on the other northern islands. But the charts showing the bottom contour of the other islands, reefs and pinnacles also indicate that there is a limited sea-floor area suitable for sustained bottom fishing.

Parallel to the Northern Mariana Islands, approximately 120 nm due west, is a chain of reefs and banks. These areas are unexploited by local fishermen due to the great distance from the populated islands. Catch rates recorded on the RAIOMA survey indicated that the CPUE on these reefs and banks was higher than those of the northern and southern islands. But catch rates would decline rapidly with sustained fishing pressure due to the limited sea-floor area suitable for bottom fishing.

The majority of vessels in use are suitable for fishing only within a 15 mile radius of their home port. Long distance trips are prohibitive due to the limited size of the vessels and extensive fuel consumption. Most vessels also lack adequate stowage space, cooling facilities and carrying capacity to engage in multiple-day, long distance fishing trips.

Vessels intending to exploit the northern islands and western reefs and banks should be at least 10 m in length, have proper navigational equipment, preferably be powered with a diesel engine to conserve on fuel consumption, and have refrigeration to store fish for multiple-day trips.

### 7.2 Recommendations

A consideration of the present level of commercial fisheries in the Northern Mariana Islands and the results of work undertaken during the SPC Project visit prompt the following recommendations:

(a) The present deep bottom fishing effort in the Saipan and Tinian area should not be increased. Catch rates on the fishing grounds within the area indicate that the resource is suffering from sustained fishing pressure. These areas should be limited to vessels engaged in recreational, subsistence or part-time fishing.

(b) A limited-entry licensing programme should be introduced for all vessels over 10 m intending to engage in the deep bottom fishery. A maximum of 10 vessels should be allowed to be licensed and be encouraged to fish the areas outside the 15 mile radius of Saipan and Tinian. Due to the limited sea-floor area suitable for deep bottom fishing on the remaining islands, banks and reefs sustained exploitation of the resource by a greater number of vessels would be detrimental.

(c) Fishermen intending to purchase larger commercial fishing vessels should be encouraged to have a U.S. Coast Guard licensed captain aboard.

(d) Consideration should be given to the design and construction of larger fishing vessels (over 10 m) suitable for exploiting the resources of the entire Marianas Archipelago.

(e) Research into the deep bottom fishery should be continued to gain a broader understanding of the species diversification, taxonomy, resource and biology of bottom fishes.

## 8. REFERENCES

Polivina J., Moffit R., Ralston S., and Shiota p. (1985) **Results of the Resource Assessment Investigation of the Marianas Archipelago**. Honolulu, Hawaii USA. Southwest Fisheries Centre

Polivina J. (1985) **Variation in Catch Rates and Species Composition in Handline Catches of Deepwater Snappers and Groupers in the Mariana Archipelago.** Honolulu, Hawaii USA. Southwest Centre.

Donaldson T., Gourley J., and Seman R. (1990) **Fisheries Statistics of the Commonwealth of the Northern Mariana Islands.** Saipan, CNMI. Division of Fish and Wildlife.

**APPENDIX 1a**

## Catch records for Phase I

| MONTH | DAY | YEAR | LOCATION | DEPTH | LINE HOURS | NUMBER FISH | NUMBER HOOK/LINE | WEIGHT | CPUE | METHOD |
|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 27 | 88 | 52 | 200-220 | 7.0 | 34 | 2 | 18.5 | 2.64 | BOTTOM REELS |
| 10 | 12 | 88 | 52 | 190-210 | 9.0 | 22 | 2 | 21.6 | 2.40 | BOTTOM REELS |
| 10 | 20 | 88 | 45 | 170-340 | 14.5 | 35 | 3 | 73.1 | 5.04 | BOTTOM REELS |
| 10 | 20 | 88 | 45 | 000-000 | 7.0 | 6 | 2 | 21.0 | 3.00 | TROLLING |
| 11 | 3 | 88 | 60 | 130-280 | 12.0 | 11 | 2 | 17.1 | 1.43 | BOTTOM REELS |
| 11 | 8 | 88 | 44 | 000-000 | 20.0 | 31 | 4 | 14.5 | 0.73 | TROLLING |
| 11 | 15 | 88 | 45 | 220-300 | 6.0 | 2 | 2 | 2.0 | 0.33 | BOTTOM REELS |
| 11 | 15 | 88 | 45 | 000-000 | 12.0 | 1 | 4 | 0.5 | 0.04 | TROLLING |
| 11 | 23 | 88 | 43 | 140-400 | 19.5 | 37 | 3 | 81.3 | 4.17 | BOTTOM REELS |
| 11 | 23 | 88 | 43 | 000-000 | 22.0 | 13 | 4 | 24.6 | 1.12 | TROLLING |
| 11 | 29 | 88 | 38 | 140-350 | 12.0 | 53 | 2 | 69.2 | 5.77 | BOTTOM REELS |
| 11 | 29 | 88 | 38 | 000-000 | 18.0 | 1 | 5 | 0.5 | 0.03 | TROLLING |
| 12 | 1 | 88 | 38 | 140-320 | 8.0 | 19 | 2 | 24.0 | 3.00 | BOTTOM REELS |
| 12 | 1 | 88 | 38 | 000-000 | 27.5 | 13 | 5 | 25.1 | 0.91 | TROLLING |
| 12 | 5 | 88 | 44 | 180-300 | 10.0 | 24 | 2 | 28.0 | 2.80 | BOTTOM REELS |
| | | | | | 204.5 | 302 | | 421.0 | | |

**APPENDIX 1b**

## Catch records for Phase II

| MONTH | DAY | YEAR | LOCATION | DEPTH | LINE HOURS | NUMBER FISH | NUMBER HOOK/LINE | WEIGHT | CPUE | METHOD |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 21 | 89 | 44 | 000-000 | 6.0 | 6 | 2 | 12.6 | 2.10 | TROLLING |
| 12 | 16 | 89 | 44 | 160-300 | 12.0 | 45 | 2 | 27.3 | 2.28 | BOTTOM REELS |
| 12 | 15 | 89 | 44 | 000-000 | 12.0 | 7 | 4 | 10.5 | 0.88 | TROLLING |
| 12 | 14 | 89 | 44 | 160-300 | 7.0 | 32 | 2 | 90.7 | 12.96 | BOTTOM REELS |
| 12 | 14 | 89 | 44 | 000-000 | 2.0 | 5 | 2 | 10.4 | 5.20 | TROLLING |
| 12 | 12 | 89 | 44 | 160-300 | 10.0 | 41 | 2 | 27.5 | 2.75 | BOTTOM REELS |
| 12 | 12 | 89 | 44 | 000-000 | 2.0 | 4 | 2 | 9.9 | 4.95 | TROLLING |
| 12 | 7 | 89 | 44 | 160-300 | 10.0 | 19 | 2 | 34.9 | 3.49 | BOTTOM REELS |
| 12 | 6 | 89 | 44 | 000-000 | 12.0 | 19 | 2 | 33.2 | 2.77 | BOTTOM REELS |
| 12 | 1 | 89 | 95 | 160-300 | 2.5 | 6 | 2 | 2.8 | 1.12 | BOTTOM REELS |
| 12 | 1 | 89 | 95 | 000-000 | 2.0 | 2 | 2 | 7.7 | 3.85 | TROLLING |
| 12 | 30 | 89 | 95 | 160-300 | 10.0 | 16 | 2 | 21.5 | 2.15 | BOTTOM REELS |
| 11 | 30 | 89 | 95 | 000-000 | 4.0 | 4 | 2 | 7.2 | 1.80 | TROLLING |
| 11 | 29 | 89 | 95 | 160-300 | 10.0 | 5 | 2 | 3.6 | 0.36 | BOTTOM REELS |
| 11 | 21 | 89 | 95 | 160-300 | 7.0 | 3 | 2 | 1.6 | 0.23 | BOTTOM REELS |
| 11 | 18 | 89 | 95 | 000-000 | 36.0 | 4 | 4 | 77.6 | 2.16 | TROLLING |
| 10 | 2 | 89 | 38 | 160-300 | 5.0 | 13 | 2 | 17.6 | 3.52 | BOTTOM REELS |
| 10 | 2 | 89 | 38 | 000-000 | 4.0 | 2 | 2 | 4.7 | 1.18 | TROLLING |
| 10 | 31 | 89 | 61 | 160-300 | 22.0 | 25 | 2 | 34.5 | 1.57 | BOTTOM REELS |
| 10 | 19 | 89 | 68 | 100-300 | 37.0 | 71 | 2 | 49.0 | 1.32 | BOTTOM REELS |
| 10 | 12 | 89 | 60 | 120-140 | 12.0 | 3 | 12 | 1.7 | 0.14 | BOTTOM LONGLINE |
| 10 | 12 | 89 | 60 | 200-310 | 12.0 | 14 | 2 | 24.2 | 2.02 | BOTTOM REELS |
| 9 | 26 | 89 | 68 | 100-120 | 12.0 | 7 | 12 | 8.1 | 0.68 | BOTTOM LONGLINE |
| 9 | 26 | 89 | 68 | 090-120 | 16.0 | 45 | 2 | 16.5 | 1.03 | BOTTOM REELS |
| 9 | 26 | 89 | 68 | 000-000 | 11.0 | 2 | 2 | 4.3 | 0.39 | TROLLING |
| 9 | 24 | 89 | 38 | 140-140 | 9.0 | 4 | 9 | 1.6 | 0.18 | BOTTOM LONGLINE |
| 9 | 19 | 89 | 53 | 120-130 | 12.0 | 1 | 12 | 1.5 | 0.13 | BOTTOM LONGLINE |
| 9 | 19 | 89 | 53 | 000-000 | 4.0 | 3 | 2 | 8.5 | 2.13 | TROLLING |
| 9 | 18 | 89 | 44 | 050-120 | 12.0 | 2 | 12 | 1.1 | 0.09 | BOTTOM LONGLINE |
| | | | | | 312.5 | 410 | | 552.3 | | |

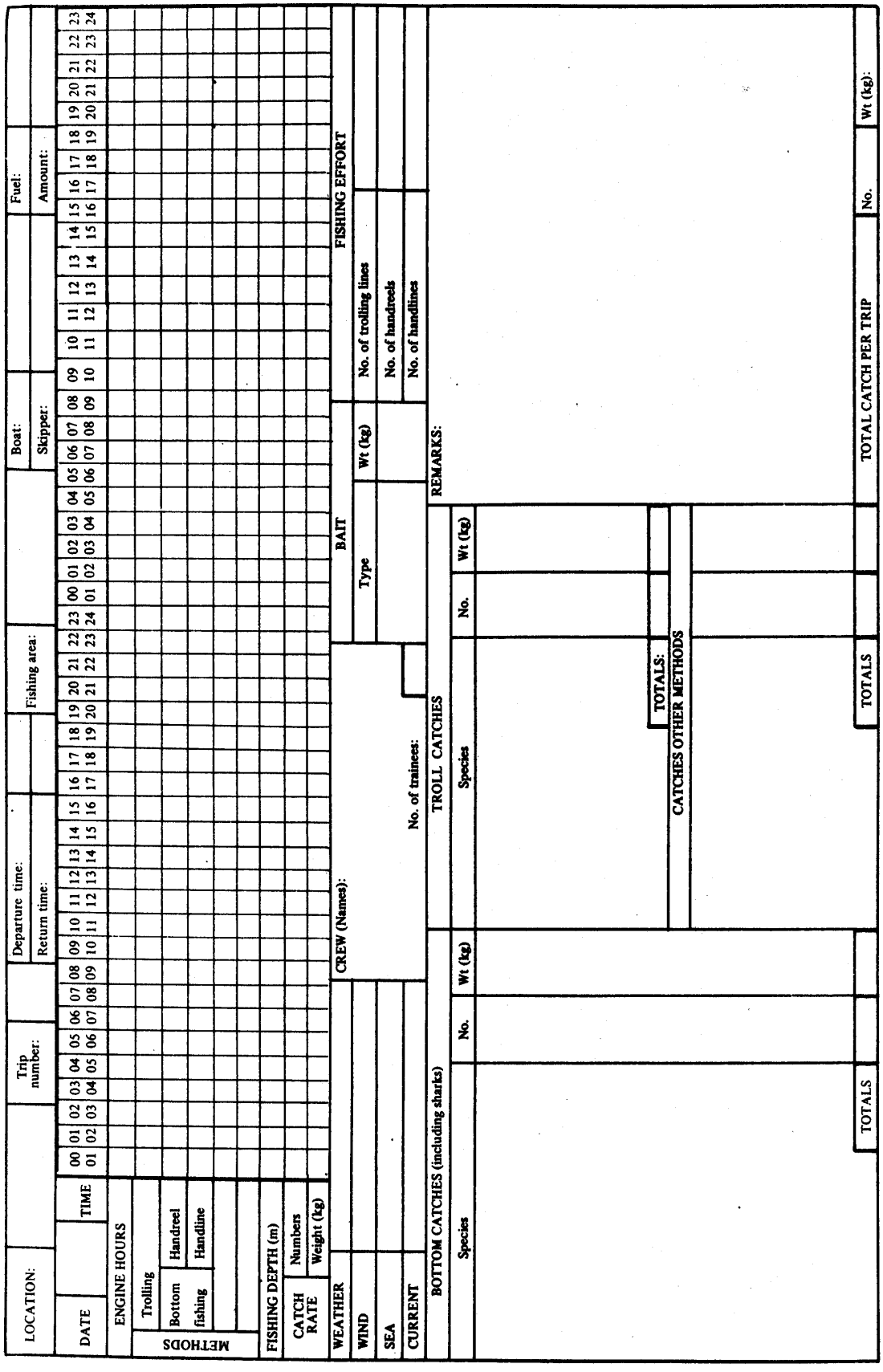
**APPENDIX 1c**

## Catch records for Phase III

| MONTH | DAY | YEAR | LOCATION | DEPTH | LINE HOURS | NUMBER FISH | NUMBER HOOK/LINE | WEIGHT | CPUE | METHOD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5 | 90 | 44 | 280- | 3.0 | 7 | 6 | 10.0 | 3.33 | BOTTOM LONGLINE |
| 1 | 4 | 90 | 44 | 000-000 | 12.0 | 5 | 4 | 9.3 | 0.78 | TROLLING |
| 1 | 3 | 90 | 44 | 140-280 | 9.0 | 15 | 9 | 10.6 | 1.18 | BOTTOM LONGLINE |
| 1 | 2 | 90 | 38 | 000-000 | 12.0 | 10 | 4 | 16.9 | 1.41 | TROLLING |
| 1 | 22 | 90 | 44 | 000-000 | 6.0 | 1 | 2 | 10.0 | 1.67 | TROLLING |
| 1 | 23 | 90 | 44 | 220-240 | 5.5 | 6 | 2 | 1.9 | 0.35 | BOTTOM REELS |
| 1 | 23 | 90 | 44 | 000-000 | 10.0 | 2 | 4 | 8.0 | 0.80 | TROLLING |
| 1 | 24 | 90 | 52 | 240-260 | 3.0 | 11 | 1 | 6.5 | 2.17 | BOTTOM REELS |
| 1 | 25 | 90 | 44 | 000-000 | 16.0 | 9 | 4 | 21.5 | 1.34 | TROLLING |
| 0 | 2 | 90 | 61 | 000-000 | 18.0 | 7 | 3 | 63.0 | 3.50 | TROLLING |
| 2 | 7 | 90 | 60 | 260-280 | 3.0 | 2 | 6 | 0.5 | 0.17 | BOTTOM LONGLINE |
| 2 | 7 | 90 | 60 | 260-260 | 6.0 | 5 | 2 | 2.5 | 0.42 | BOTTOM REELS |
| 2 | 8 | 90 | 60 | 110-220 | 4.0 | 8 | 2 | 2.4 | 0.60 | BOTTOM REELS |
| 2 | 8 | 90 | 60 | 000-000 | 6.0 | 3 | 2 | 20.8 | 3.47 | TROLLING |
| 2 | 13 | 90 | 60 | 240-280 | 6.0 | 10 | 2 | 12.3 | 2.05 | BOTTOM REELS |
| 2 | 13 | 90 | 60 | 000-000 | 7.5 | 2 | 3 | 12.7 | 1.69 | TROLLING |
| 2 | 16 | 90 | 44 | 170-300 | 11.0 | 19 | 2 | 16.5 | 1.50 | BOTTOM REELS |
| 2 | 17 | 90 | 44 | 160-280 | 8.0 | 22 | 2 | 11.2 | 1.40 | BOTTOM REELS |
| 2 | 22 | 90 | 44 | 000-000 | 13.5 | 26 | 3 | 83.6 | 6.19 | TROLLING |
| 4 | 24 | 90 | 61 | 220-240 | 9.0 | 8 | 2 | 5.2 | 0.58 | BOTTOM REELS |
| 4 | 24 | 90 | 52 | 000-000 | 9.0 | 7 | 3 | 30.6 | 3.40 | TROLLING |
| 4 | 25 | 90 | 52 | 000-000 | 20.0 | 16 | 4 | 69.5 | 3.48 | TROLLING |
| 4 | 27 | 90 | 53 | 280-280 | 9.0 | 28 | 2 | 162.8 | 18.09 | BOTTOM REELS |
| 5 | 1 | 90 | 60 | 280-300 | 10.0 | 23 | 2 | 29.3 | 2.93 | BOTTOM REELS |
| 5 | 2 | 90 | 61 | 200-300 | 6.0 | 14 | 2 | 4.0 | 0.67 | BOTTOM REELS |
| 5 | 22 | 90 | 1 | 160-360 | 13.0 | 47 | 3 | 77.3 | 5.95 | BOTTOM REELS |
| 5 | 23 | 90 | 1 | 160-360 | 8.6 | 71 | 2 | 158.6 | 18.44 | BOTTOM REELS |
| 5 | 24 | 90 | 1 | 160-320 | 16.4 | 36 | 4 | 60.3 | 3.68 | BOTTOM REELS |
| 5 | 24 | 90 | 1 | 000-000 | 4.0 | 10 | 4 | 43.6 | 10.90 | TROLLING |
| 5 | 25 | 90 | 1 | 000-000 | 16.0 | 14 | 4 | 54.6 | 3.41 | TROLLING |
| 5 | 25 | 90 | 1 | 100-300 | 12.0 | 110 | 4 | 77.6 | 6.47 | BOTTOM REELS |
| 5 | 27 | 90 | 1 | 040-300 | 18.0 | 92 | 3 | 62.4 | 3.47 | BOTTOM REELS |
| 5 | 27 | 90 | 1 | 000-000 | 12.0 | 13 | 3 | 38.5 | 3.21 | TROLLING |
| 5 | 28 | 90 | 1 | 000-000 | 4.0 | 1 | 4 | 9.5 | 2.38 | TROLLING |
| 5 | 28 | 90 | 1 | 160-300 | 12.0 | 14 | 3 | 19.9 | 1.66 | BOTTOM REELS |
| 5 | 29 | 90 | 1 | 160-300 | 15.0 | 62 | 3 | 194.0 | 12.93 | BOTTOM REELS |
| 5 | 30 | 90 | 1 | 160-300 | 5.0 | 7 | 3 | 10.4 | 2.08 | BOTTOM REELS |
| 5 | 30 | 90 | 1 | 000-000 | 4.0 | 3 | 4 | 19.5 | 4.88 | TROLLING |
| 5 | 31 | 90 | 1 | 160-300 | 16.0 | 93 | 3 | 93.4 | 5.84 | BOTTOM REELS |
| 5 | 31 | 90 | 1 | 000-000 | 8.0 | 8 | 4 | 57.0 | 7.13 | TROLLING |
| 6 | 1 | 90 | 1 | 000-000 | 16.0 | 9 | 4 | 54.3 | 3.39 | TROLLING |
| 6 | 12 | 90 | 58 | 160-300 | 7.0 | 51 | 3 | 54.4 | 7.77 | BOTTOM REELS |
| 6 | 13 | 90 | 58 | 160-300 | 12.0 | 80 | 3 | 179.0 | 14.92 | BOTTOM REELS |
| 6 | 14 | 90 | 58 | 160-280 | 7.5 | 9 | 3 | 5.5 | 0.73 | BOTTOM REELS |
| 6 | 15 | 90 | 58 | 160-160 | 6.0 | 7 | 3 | 6.8 | 1.13 | BOTTOM REELS |
| 6 | 27 | 90 | 60 | 200-220 | 2.0 | 5 | 2 | 1.7 | 0.85 | BOTTOM REELS |
| 6 | 27 | 90 | 60 | 000-000 | 4.0 | 10 | 2 | 13.8 | 3.45 | TROLLING |
| 6 | 28 | 90 | 61 | 200-220 | 9.0 | 28 | 2 | 79.6 | 8.84 | BOTTOM REELS |
| 6 | 28 | 90 | 61 | 000-000 | 2.0 | 1 | 2 | 2.0 | 1.00 | TROLLING |
| 7 | 2 | 90 | 53 | 280-280 | 12.0 | 54 | 2 | 144.1 | 12.01 | BOTTOM REELS |
| 7 | 26 | 90 | 60 | 200-300 | 7.0 | 7 | 2 | 10.2 | 1.46 | BOTTOM REELS |
| 7 | 27 | 90 | 61 | 200-300 | 9.0 | 11 | 2 | 65.2 | 7.24 | BOTTOM REELS |
| 7 | 27 | 90 | 61 | 000-000 | 2.0 | 2 | 2 | 1.8 | 0.90 | TROLLING |
| 7 | 31 | 90 | 45 | 260-280 | 11.0 | 51 | 2 | 73.2 | 6.65 | BOTTOM REELS |
| 8 | 1 | 90 | 53 | 280-310 | 13.0 | 48 | 2 | 41.8 | 3.22 | BOTTOM REELS |
| 8 | 3 | 90 | 45 | 280-310 | 12.0 | 35 | 2 | 161.1 | 13.43 | BOTTOM REELS |
| 8 | 6 | 90 | 45 | 260-280 | 12.0 | 29 | 2 | 174.8 | 14.57 | BOTTOM REELS |
| 8 | 7 | 90 | 53 | 280-300 | 12.0 | 41 | 2 | 63.3 | 5.28 | BOTTOM REELS |
| 8 | 9 | 90 | 45 | 270-280 | 10.0 | 33 | 2 | 27.0 | 2.70 | BOTTOM REELS |
| | | | | | 552.0 | 1358 | | 2757.8 | | |

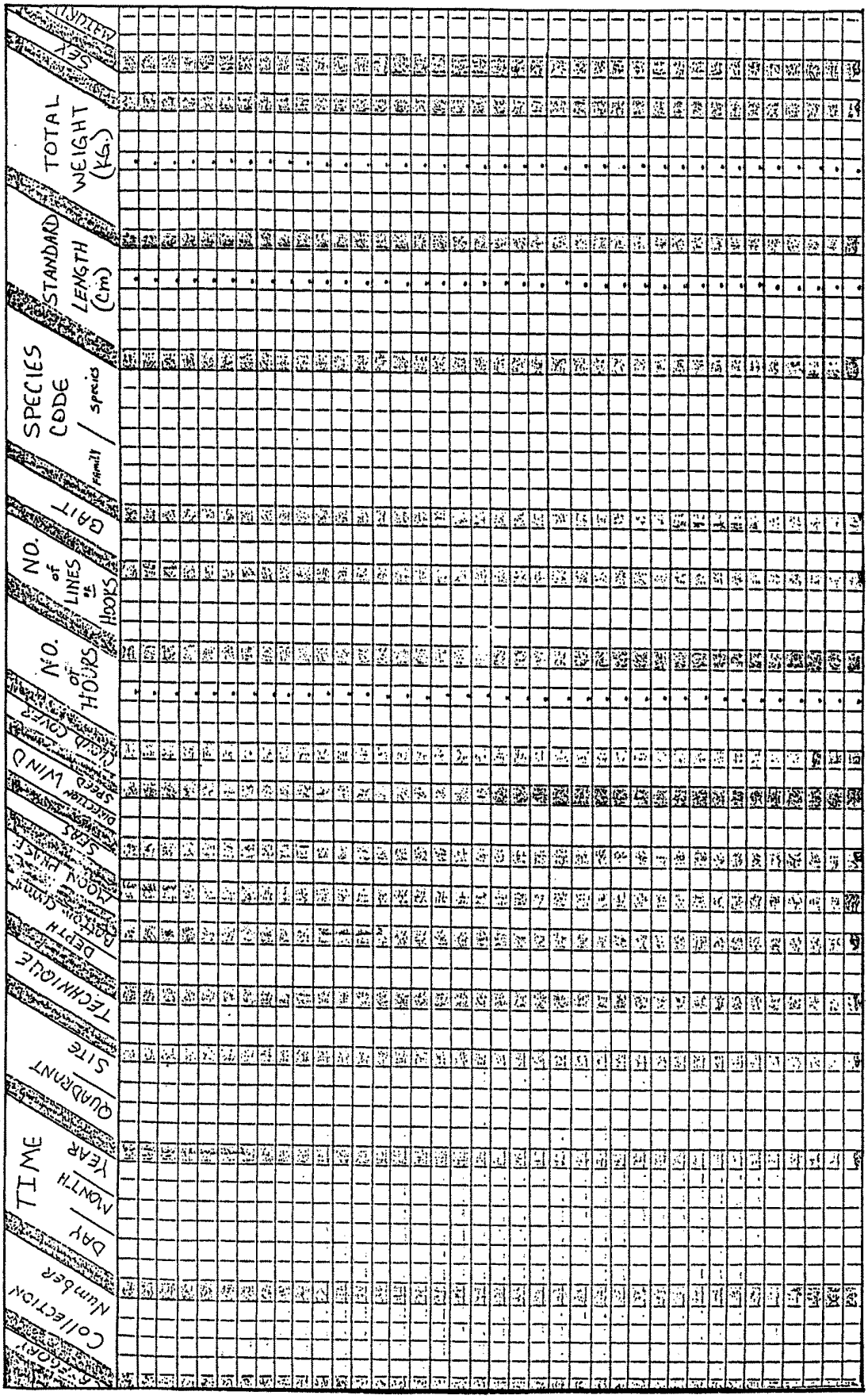
**APPENDIX 2a**

## Standard logsheet used for data collection



**APPENDIX 2b**

**New logsheet developed for the project in the Northern Mariana Islands**



**APPENDIX 3**

**Species codes associated with the new data logsheet**

Belonidae (Needlefishes) ..... 034
- Ablennes hians ..... 0182
- Platybelone argalus platyura ..... 0183
- Strongylura incisa ..... 0184
- S. leiura leiura ..... 0185
- Tylosurus c. crocodilis ..... 0186

Serranidae (Fairy Basslets and Groupers) ... 051
- Aethaloperca rogaa ..... 0350
- Anyperodon leucogrammicus ..... 0351
- Cephalopholis analis ..... 0352
- C. argus ..... 0353
- C. boenack ..... 0354
- C. igarashiensis ..... 0355
- C. leopardus ..... 0356
- C. miniata ..... 0357
- C. polleni ..... 0358
- C. sexmaculata ..... 0359
- C. sonnerati ..... 0360
- C. spiloparaea ..... 0361
- C. urodeta ..... 0362
- Cromileptes altivelis ..... 0363
- Gracila albomarginata ..... 0364
- Epinephelus caeruleopunctatus ..... 0365
- E. chlorostigma ..... 0366
- E. cyanopodus ..... 0367
- E. fasciatus ..... 0368
- E. fuscoguttatus ..... 0369
- E. miliaris ..... 0370
- E. hexagonatus ..... 0371
- E. macrospilos ..... 0372
- E. maculatus ..... 0373
- E. malabaricus ..... 0374
- E. melanostigma ..... 0375
- E. merra ..... 0376
- E. microdon ..... 0377
- E. morrhua ..... 0378
- E. onqus ..... 0379
- E. retouti ..... 0380
- E. septemfasciatus ..... 0381
- E. socialis ..... 0382
- E. spilotoceps ..... 0383
- E. tauvina ..... 0384
- E. (Promicrops) lanceolatus ..... 0385
- Plectropomus areolatus ..... 0386
- P. laevis ..... 0387
- P. leopardus ..... 0388
- P. oligacanthus ..... 0389
- Saloptia powelli ..... 0390

*****CATEGORY*****

1 = PELAGIC FISHING
2 = BOTTOMFISH FISHING

*****LOCATIONS*****

QUADRANTS:

01 = Quadrant 1
02 = Quadrant 2
03 = Quadrant 3
04 = Quadrant 4
05 = Quadrant 5
06 = Quadrant 6
07 = Quadrant 7
08 = Quadrant 8

SITES:

09 = Section 9
10 = Section 10
11 = Section 11
12 = Section 12
13 = Section 13
14 = Section 14
15 = Section 15
16 = Section 16
17 = Section 17
18 = Section 18
19 = Section 19
20 = Section 20
21 = Section 21
22 = Section 22
23 = Section 23
24 = Section 24
25 = 300 Reef
26 = Malakes Reef
27 = Marpi Reef
28 = Tatsumi Reef
29 = Lancho Reef
30 = Diablo Reefs
31 = peligro Reef
32 = Farallon de Mendinilla
33 = Goat Island Reef
34 = Esmeralda Reef
40 = Anatahan
41 = Sarigan
42 = Guguan
43 = Alamagan
44 = Pagan
45 = Agrihan
46 = Asuncion
47 = Maug
48 = Uracas

*****FISHING TECHNIQUES*****

01 = TROLL
02 = BOTTOM, HOOK AND LINE
03 = SURFACE LONGLINE
04 = BOTTOM LONGLINE
05 = SPEAR FISHING
06 = SURROUND NET
07 = GILL NET
08 = IKASHIBI
09 = ATULI
10 = CAST NET
11 = CLIFF FISHING
99 = UNKNOWN

*****BAIT*****

01 = SKIPJACK
02 = MAHIMAHI
03 = ATULI
04 = WHITE TUNA
05 = LITTLE TUNA
06 = COMBINATION OF ABOVE
07 = SQUID
08 = OCTOPUS
09 = LIVE BAIT
10 = ARTIFICAL LURES

*****DEPTH RANGE IN METERS*****

1 = LESS THAN 50 METERS
2 = 50 TO 100 METERS
3 = 101 TO 150 METERS
4 = 151 TO 200 METERS
5 = 201 TO 250 METERS
6 = 251 TO 300 METERS
7 = GREATER THAN 300 METERS

*****SEA STATE*****

1 = CALM
2 = MODERATE
3 = ROUGH AS HELL

*****WIND DIRECTION*****

1 = NORTH
2 = NORTH-EAST
3 = EAST
4 = SOUTH-EAST
5 = SOUTH
6 = SOUTH-WEST
7 = WEST
8 = NORTH-WEST

*****APPROXIMATE WIND SPEED*****

1 = NO WIND
2 = 5 TO 10 MPH
3 = 11 TO 20 MPH
4 = 21 TO 30 MPH
5 = GREATER THAN 30 MPH

*****CLOUD COVER*****

1 = CLEAR (0 to 30%)
2 = PARTLY CLOUDY (30 to 60%)
3 = MOSTLY CLOUDLY (60 to 90%)
4 = OVERCAST (90 to 100%)

*****BOTTOM CURRE1NT*****

1 = NONE
2 = SLIGHT
3 = MODERATE
4 = FAST

*****SEX*****

1 =MALE

2 = FEMALE

3 = JUVENILE: NOT DEVELOPED ENOUGH TO DIFFERENTIATE SEX (THIS CODE IS TO SEPARATE THE JUVENILES FROM THE ADULTS WE CAN'T EX)

4 = HERMAPHRODITE

9 = UNKNOWN

WHEN RECORDING SEX, IF IN DOUBT-RECORD 'UNKNOWN'

*****MATURITY (FOR BOTH SEXES)*****

1 = SPENT * MESENTERY GREATLY ENLARGED WITH LITTLE REPRODUCTIVE PRODUCTS-- IE; FLABBY

2 = RUNNING RIPE * MILT OR EGGS EXTRUDE EASILY WHEN "MODERATE" PRESSURE IS APPLIED TO ABDOMEN. MANY OF THE EGGS IN THE OVARY ARE CLEAR (IE; HYDRATED)

3 = RIPE * ENLARGED GONADS, ABLE TO SEE EGGS EASILY WITH NAKED EYE, OR MILT RUNS FREE FROM TORN TESTES

4 = SEXUALLY MATURE * NOT ENLARGED GONADS, BUT TOO LARGE FOR JUVENILE, "RESTING STAGE"

5 = JUVENILE * GONADS NOT DIFFERENTIATED, CANNOT BE SURE OF SEX WITH NAKED EYE

6 = IMMATURE, GONADS NOT DEVELOPED AT ALL, BUT CAN SEX FISH

9 = UNKNOWN

WHEN RECORDING MATURITY STAGES, IF IN DOUBT-RECORD 'UNKNOWN'

**APPENDIX 4a**

## Catch records for bottom longlining activities

| MONTH | DAY | YEAR | LOCATION | DEPTH | LINE HOURS | NUMBER FISH | NUMBER HOOK/LINE | WEIGHT | CPUE | METHOD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5 | 90 | 44 | 280- | 3.0 | 7 | 6 | 10.0 | 3.33 | BOTTOM LONGLINE |
| 1 | 3 | 90 | 44 | 140-280 | 9.0 | 15 | 9 | 10.6 | 1.18 | BOTTOM LONGLINE |
| 10 | 12 | 89 | 60 | 120-140 | 12.0 | 3 | 12 | 1.7 | 0.14 | BOTTOM LONGLINE |
| 9 | 26 | 89 | 68 | 100-120 | 12.0 | 7 | 12 | 8.1 | 0.68 | BOTTOM LONGLINE |
| 9 | 24 | 89 | 38 | 140-140 | 9.0 | 4 | 9 | 1.6 | 0.18 | BOTTOM LONGLINE |
| 9 | 19 | 89 | 53 | 120-130 | 12.0 | 1 | 12 | 1.5 | 0.13 | BOTTOM LONGLINE |
| 9 | 18 | 89 | 44 | 050-120 | 12.0 | 2 | 12 | 1.1 | 0.09 | BOTTOM LONGLINE |
| 2 | 7 | 90 | 60 | 260-280 | 3.0 | 2 | 6 | 0.5 | 0.17 | BOTTOM LONGLINE |
| | | | | | 72.0 | 41 | | 35.1 | | |

**APPENDIX 4b**

## Catch records for deep bottom droplining activities

| MONTH | DAY | YEAR | LOCATION | DEPTH | LINE HOURS | NUMBER FISH | NUMBER HOOK/LINE | WEIGHT | CPUE | METHOD |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 16 | 89 | 44 | 160-300 | 12.0 | 45 | 2 | 27.3 | 2.28 | BOTTOM REELS |
| 12 | 14 | 89 | 44 | 160-300 | 7.0 | 32 | 2 | 90.7 | 12.96 | BOTTOM REELS |
| 12 | 12 | 89 | 44 | 160-300 | 10.0 | 41 | 2 | 27.5 | 2.75 | BOTTOM REELS |
| 12 | 7 | 89 | 44 | 160-300 | 10.0 | 19 | 2 | 34.9 | 3.49 | BOTTOM REELS |
| 12 | 6 | 89 | 44 | 000-000 | 12.0 | 19 | 2 | 33.2 | 2.77 | BOTTOM REELS |
| 12 | 1 | 89 | 95 | 160-300 | 2.5 | 6 | 2 | 2.8 | 1.12 | BOTTOM REELS |
| 12 | 30 | 89 | 95 | 160-300 | 10.0 | 16 | 2 | 21.5 | 2.15 | BOTTOM REELS |
| 11 | 29 | 89 | 95 | 160-300 | 10.0 | 5 | 2 | 3.6 | 0.36 | BOTTOM REELS |
| 11 | 21 | 89 | 95 | 160-300 | 7.0 | 3 | 2 | 1.6 | 0.23 | BOTTOM REELS |
| 10 | 2 | 89 | 38 | 160-300 | 5.0 | 13 | 2 | 17.6 | 3.52 | BOTTOM REELS |
| 10 | 31 | 89 | 61 | 160-300 | 22.0 | 25 | 2 | 34.5 | 1.57 | BOTTOM REELS |
| 10 | 19 | 89 | 68 | 100-300 | 37.0 | 71 | 2 | 49.0 | 1.32 | BOTTOM REELS |
| 10 | 12 | 89 | 60 | 200-310 | 12.0 | 14 | 2 | 24.2 | 2.02 | BOTTOM REELS |
| 9 | 26 | 89 | 68 | 090-120 | 16.0 | 45 | 2 | 16.5 | 1.03 | BOTTOM REELS |
| 1 | 23 | 90 | 44 | 220-240 | 5.5 | 6 | 2 | 1.9 | 0.35 | BOTTOM REELS |
| 1 | 24 | 90 | 52 | 240-260 | 3.0 | 11 | 1 | 6.5 | 2.17 | BOTTOM REELS |
| 2 | 7 | 90 | 60 | 260-260 | 6.0 | 5 | 2 | 2.5 | 0.42 | BOTTOM REELS |
| 2 | 8 | 90 | 60 | 110-220 | 4.0 | 8 | 2 | 2.4 | 0.60 | BOTTOM REELS |
| 2 | 13 | 90 | 60 | 240-280 | 6.0 | 10 | 2 | 12.3 | 2.05 | BOTTOM REELS |
| 2 | 16 | 90 | 44 | 170-300 | 11.0 | 19 | 2 | 16.5 | 1.50 | BOTTOM REELS |
| 2 | 17 | 90 | 44 | 160-280 | 8.0 | 22 | 2 | 11.2 | 1.40 | BOTTOM REELS |
| 4 | 24 | 90 | 61 | 220-240 | 9.0 | 8 | 2 | 5.2 | 0.58 | BOTTOM REELS |
| 4 | 27 | 90 | 53 | 280-280 | 9.0 | 28 | 2 | 162.8 | 18.09 | BOTTOM REELS |
| 5 | 1 | 90 | 60 | 280-300 | 10.0 | 23 | 2 | 29.3 | 2.93 | BOTTOM REELS |
| 5 | 2 | 90 | 61 | 200-300 | 6.0 | 14 | 2 | 4.0 | 0.67 | BOTTOM REELS |
| 5 | 22 | 90 | 1 | 160-360 | 13.0 | 47 | 3 | 77.3 | 5.95 | BOTTOM REELS |
| 5 | 23 | 90 | 1 | 160-360 | 8.6 | 71 | 2 | 158.6 | 18.44 | BOTTOM REELS |
| 5 | 24 | 90 | 1 | 160-320 | 16.4 | 36 | 4 | 60.3 | 3.68 | BOTTOM REELS |
| 5 | 25 | 90 | 1 | 100-300 | 12.0 | 110 | 4 | 77.6 | 6.47 | BOTTOM REELS |
| 5 | 27 | 90 | 1 | 040-300 | 18.0 | 92 | 3 | 62.4 | 3.47 | BOTTOM REELS |
| 5 | 28 | 90 | 1 | 160-300 | 12.0 | 14 | 3 | 19.9 | 1.66 | BOTTOM REELS |
| 5 | 29 | 90 | 1 | 160-300 | 15.0 | 62 | 3 | 194.0 | 12.93 | BOTTOM REELS |
| 5 | 30 | 90 | 1 | 160-300 | 5.0 | 7 | 3 | 10.4 | 2.08 | BOTTOM REELS |
| 5 | 31 | 90 | 1 | 160-300 | 16.0 | 93 | 3 | 93.4 | 5.84 | BOTTOM REELS |
| 6 | 12 | 90 | 58 | 160-300 | 7.0 | 51 | 3 | 54.4 | 7.77 | BOTTOM REELS |
| 6 | 13 | 90 | 58 | 160-300 | 12.0 | 80 | 3 | 179.0 | 14.92 | BOTTOM REELS |
| 6 | 14 | 90 | 58 | 160-280 | 7.5 | 9 | 3 | 5.5 | 0.73 | BOTTOM REELS |
| 6 | 15 | 90 | 58 | 160-160 | 6.0 | 7 | 3 | 6.8 | 1.13 | BOTTOM REELS |
| 6 | 27 | 90 | 60 | 200-220 | 2.0 | 5 | 2 | 1.7 | 0.85 | BOTTOM REELS |
| 6 | 28 | 90 | 61 | 200-220 | 9.0 | 28 | 2 | 79.6 | 8.84 | BOTTOM REELS |
| 7 | 2 | 90 | 53 | 280-280 | 12.0 | 54 | 2 | 144.1 | 12.01 | BOTTOM REELS |
| 7 | 26 | 90 | 60 | 200-300 | 7.0 | 7 | 2 | 10.2 | 1.46 | BOTTOM REELS |
| 7 | 27 | 90 | 61 | 200-300 | 9.0 | 11 | 2 | 65.2 | 7.24 | BOTTOM REELS |
| 7 | 31 | 90 | 45 | 260-280 | 11.0 | 51 | 2 | 73.2 | 6.65 | BOTTOM REELS |
| 8 | 1 | 90 | 53 | 280-310 | 13.0 | 48 | 2 | 41.8 | 3.22 | BOTTOM REELS |
| 8 | 3 | 90 | 45 | 280-310 | 12.0 | 35 | 2 | 161.1 | 13.43 | BOTTOM REELS |
| 8 | 6 | 90 | 45 | 260-280 | 12.0 | 29 | 2 | 174.8 | 14.57 | BOTTOM REELS |
| 8 | 7 | 90 | 53 | 280-300 | 12.0 | 41 | 2 | 63.3 | 5.28 | BOTTOM REELS |
| 8 | 9 | 90 | 45 | 270-280 | 10.0 | 33 | 2 | 27.0 | 2.70 | BOTTOM REELS |
| 9 | 27 | 88 | 52 | 200-220 | 7.0 | 34 | 2 | 18.5 | 2.64 | BOTTOM REELS |
| 10 | 12 | 88 | 52 | 190-210 | 9.0 | 22 | 2 | 21.6 | 2.40 | BOTTOM REELS |
| 10 | 20 | 88 | 45 | 170-340 | 14.5 | 35 | 3 | 73.1 | 5.04 | BOTTOM REELS |
| 11 | 3 | 88 | 60 | 130-280 | 12.0 | 11 | 2 | 17.1 | 1.43 | BOTTOM REELS |
| 11 | 15 | 88 | 45 | 220-300 | 6.0 | 2 | 2 | 2.0 | 0.33 | BOTTOM REELS |
| 11 | 23 | 88 | 43 | 140-400 | 19.5 | 37 | 3 | 81.3 | 4.17 | BOTTOM REELS |
| 11 | 29 | 88 | 38 | 140-350 | 12.0 | 53 | 2 | 69.2 | 5.77 | BOTTOM REELS |
| 12 | 1 | 88 | 38 | 140-320 | 8.0 | 19 | 2 | 24.0 | 3.00 | BOTTOM REELS |
| 12 | 5 | 88 | 44 | 180-300 | 10.0 | 24 | 2 | 28.0 | 2.80 | BOTTOM REELS |
| | | | | | 605.5 | 1766 | | 2815.9 | | |

**APPENDIX 4c**

## Catch records for trolling activities

| MONTH | DAY | YEAR | LOCATION | DEPTH | LINE HOURS | NUMBER FISH | NUMBER HOOK/LINE | WEIGHT | CPUE | METHOD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4 | 90 | 44 | 000-000 | 12.0 | 5 | 4 | 9.3 | 0.78 | TROLLING |
| 1 | 2 | 90 | 38 | 000-000 | 12.0 | 10 | 4 | 16.9 | 1.41 | TROLLING |
| 12 | 21 | 89 | 44 | 000-000 | 6.0 | 6 | 2 | 12.6 | 2.10 | TROLLING |
| 12 | 15 | 89 | 44 | 000-000 | 12.0 | 7 | 4 | 10.5 | 0.88 | TROLLING |
| 12 | 14 | 89 | 44 | 000-000 | 2.0 | 5 | 2 | 10.4 | 5.20 | TROLLING |
| 12 | 12 | 89 | 44 | 000-000 | 2.0 | 4 | 2 | 9.9 | 4.95 | TROLLING |
| 12 | 1 | 89 | 95 | 000-000 | 2.0 | 2 | 2 | 7.7 | 3.85 | TROLLING |
| 11 | 30 | 89 | 95 | 000-000 | 4.0 | 4 | 2 | 7.2 | 1.80 | TROLLING |
| 11 | 18 | 89 | 95 | 000-000 | 36.0 | 4 | 4 | 77.6 | 2.16 | TROLLING |
| 10 | 2 | 89 | 38 | 000-000 | 4.0 | 2 | 2 | 4.7 | 1.18 | TROLLING |
| 9 | 26 | 89 | 68 | 000-000 | 11.0 | 2 | 2 | 4.3 | 0.39 | TROLLING |
| 9 | 19 | 89 | 53 | 000-000 | 4.0 | 3 | 2 | 8.5 | 2.13 | TROLLING |
| 1 | 22 | 90 | 44 | 000-000 | 6.0 | 1 | 2 | 10.0 | 1.67 | TROLLING |
| 1 | 23 | 90 | 44 | 000-000 | 10.0 | 2 | 4 | 8.0 | 0.80 | TROLLING |
| 1 | 25 | 90 | 44 | 000-000 | 16.0 | 9 | 4 | 21.5 | 1.34 | TROLLING |
| 0 | 2 | 90 | 61 | 000-000 | 18.0 | 7 | 3 | 63.0 | 3.50 | TROLLING |
| 2 | 8 | 90 | 60 | 000-000 | 6.0 | 3 | 2 | 20.8 | 3.47 | TROLLING |
| 2 | 13 | 90 | 60 | 000-000 | 7.5 | 2 | 3 | 12.7 | 1.69 | TROLLING |
| 2 | 22 | 90 | 44 | 000-000 | 13.5 | 26 | 3 | 83.6 | 6.19 | TROLLING |
| 4 | 24 | 90 | 52 | 000-000 | 9.0 | 7 | 3 | 30.6 | 3.40 | TROLLING |
| 4 | 25 | 90 | 52 | 000-000 | 20.0 | 16 | 4 | 69.5 | 3.48 | TROLLING |
| 5 | 24 | 90 | 1 | 000-000 | 4.0 | 10 | 4 | 43.6 | 10.90 | TROLLING |
| 5 | 25 | 90 | 1 | 000-000 | 16.0 | 14 | 4 | 54.6 | 3.41 | TROLLING |
| 5 | 27 | 90 | 1 | 000-000 | 12.0 | 13 | 3 | 38.5 | 3.21 | TROLLING |
| 5 | 28 | 90 | 1 | 000-000 | 4.0 | 1 | 4 | 9.5 | 2.38 | TROLLING |
| 5 | 30 | 90 | 1 | 000-000 | 4.0 | 3 | 4 | 19.5 | 4.88 | TROLLING |
| 5 | 31 | 90 | 1 | 000-000 | 8.0 | 8 | 4 | 57.0 | 7.13 | TROLLING |
| 6 | 1 | 90 | 1 | 000-000 | 16.0 | 9 | 4 | 54.3 | 3.39 | TROLLING |
| 6 | 27 | 90 | 60 | 000-000 | 4.0 | 10 | 2 | 13.8 | 3.45 | TROLLING |
| 6 | 28 | 90 | 61 | 000-000 | 2.0 | 1 | 2 | 2.0 | 1.00 | TROLLING |
| 7 | 27 | 90 | 61 | 000-000 | 2.0 | 2 | 2 | 1.8 | 0.90 | TROLLING |
| 10 | 20 | 88 | 45 | 000-000 | 7.0 | 6 | 2 | 21.0 | 3.00 | TROLLING |
| 11 | 8 | 88 | 44 | 000-000 | 20.0 | 31 | 4 | 14.5 | 0.73 | TROLLING |
| 11 | 15 | 88 | 45 | 000-000 | 12.0 | 1 | 4 | 0.5 | 0.04 | TROLLING |
| 11 | 23 | 88 | 43 | 000-000 | 22.0 | 13 | 4 | 24.6 | 1.12 | TROLLING |
| 11 | 29 | 88 | 38 | 000-000 | 18.0 | 1 | 5 | 0.5 | 0.03 | TROLLING |
| 12 | 1 | 88 | 38 | 000-000 | 27.5 | 13 | 5 | 25.1 | 0.91 | TROLLING |
| | | | | | 391.5 | 263 | | 880.1 | | |

**APPENDIX 5**

## Summary of catch and activities by fishing location

| MONTH | DAY | YEAR | LOCATION | DEPTH | LINE HOURS | NUMBER FISH | NUMBER HOOK/LINE | WEIGHT | CPUE | METHOD |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 22 | 90 | 1 | 160-360 | 13.0 | 47 | 3 | 77.3 | 5.95 | BOTTOM REELS |
| 5 | 23 | 90 | 1 | 160-360 | 8.6 | 71 | 2 | 158.6 | 18.44 | BOTTOM REELS |
| 5 | 24 | 90 | 1 | 160-320 | 16.4 | 36 | 4 | 60.3 | 3.68 | BOTTOM REELS |
| 5 | 24 | 90 | 1 | 000-000 | 4.0 | 10 | 4 | 43.6 | 10.90 | TROLLING |
| 5 | 25 | 90 | 1 | 000-000 | 16.0 | 14 | 4 | 54.6 | 3.41 | TROLLING |
| 5 | 25 | 90 | 1 | 100-300 | 12.0 | 110 | 4 | 77.6 | 6.47 | BOTTOM REELS |
| 5 | 27 | 90 | 1 | 040-300 | 18.0 | 92 | 3 | 62.4 | 3.47 | BOTTOM REELS |
| 5 | 27 | 90 | 1 | 000-000 | 12.0 | 13 | 3 | 38.5 | 3.21 | TROLLING |
| 5 | 28 | 90 | 1 | 000-000 | 4.0 | 1 | 4 | 9.5 | 2.38 | TROLLING |
| 5 | 28 | 90 | 1 | 160-300 | 12.0 | 14 | 3 | 19.9 | 1.66 | BOTTOM REELS |
| 5 | 29 | 90 | 1 | 160-300 | 15.0 | 62 | 3 | 194.0 | 12.93 | BOTTOM REELS |
| 5 | 30 | 90 | 1 | 160-300 | 5.0 | 7 | 3 | 10.4 | 2.08 | BOTTOM REELS |
| 5 | 30 | 90 | 1 | 000-000 | 4.0 | 3 | 4 | 19.5 | 4.88 | TROLLING |
| 5 | 31 | 90 | 1 | 160-300 | 16.0 | 93 | 3 | 93.4 | 5.84 | BOTTOM REELS |
| 5 | 31 | 90 | 1 | 000-000 | 8.0 | 8 | 4 | 57.0 | 7.13 | TROLLING |
| 6 | 1 | 90 | 1 | 000-000 | 16.0 | 9 | 4 | 54.3 | 3.39 | TROLLING |
| | | | | | 180.0 | 590 | | 1030.9 | | |
| 1 | 2 | 90 | 38 | 000-000 | 12.0 | 10 | 4 | 16.9 | 1.41 | TROLLING |
| 10 | 2 | 89 | 38 | 160-300 | 5.0 | 13 | 2 | 17.6 | 3.52 | BOTTOM REELS |
| 10 | 2 | 89 | 38 | 000-000 | 4.0 | 2 | 2 | 4.7 | 1.18 | TROLLING |
| 9 | 24 | 89 | 38 | 140-140 | 9.0 | 4 | 9 | 1.6 | 0.18 | BOTTOM LONGLINE |
| 11 | 29 | 88 | 38 | 140-350 | 12.0 | 53 | 2 | 69.2 | 5.77 | BOTTOM REELS |
| 11 | 29 | 88 | 38 | 000-000 | 18.0 | 1 | 5 | 0.5 | 0.03 | TROLLING |
| 12 | 1 | 88 | 38 | 140-320 | 8.0 | 19 | 2 | 24.0 | 3.00 | BOTTOM REELS |
| 12 | 1 | 88 | 38 | 000-000 | 27.5 | 13 | 5 | 25.1 | 0.91 | TROLLING |
| | | | | | 95.5 | 115 | | 159.6 | | |
| 11 | 23 | 88 | 43 | 140-400 | 19.5 | 37 | 3 | 81.3 | 4.17 | BOTTOM REELS |
| 11 | 23 | 88 | 43 | 000-000 | 22.0 | 13 | 4 | 24.6 | 1.12 | TROLLING |
| | | | | | 41.5 | 50 | | 105.9 | | |
| 1 | 5 | 90 | 44 | 280- | 3.0 | 7 | 6 | 10.0 | 3.33 | BOTTOM LONGLINE |
| 1 | 4 | 90 | 44 | 000-000 | 12.0 | 5 | 4 | 9.3 | 0.78 | TROLLING |
| 1 | 3 | 90 | 44 | 140-280 | 9.0 | 15 | 9 | 10.6 | 1.18 | BOTTOM LONGLINE |
| 12 | 21 | 89 | 44 | 000-000 | 6.0 | 6 | 2 | 12.6 | 2.10 | TROLLING |
| 12 | 16 | 89 | 44 | 160-300 | 12.0 | 45 | 2 | 27.3 | 2.28 | BOTTOM REELS |
| 12 | 15 | 89 | 44 | 000-000 | 12.0 | 7 | 4 | 10.5 | 0.88 | TROLLING |
| 12 | 14 | 89 | 44 | 160-300 | 7.0 | 32 | 2 | 90.7 | 12.96 | BOTTOM REELS |
| 12 | 14 | 89 | 44 | 000-000 | 2.0 | 5 | 2 | 10.4 | 5.20 | TROLLING |
| 12 | 12 | 89 | 44 | 160-300 | 10.0 | 41 | 2 | 27.5 | 2.75 | BOTTOM REELS |
| 12 | 12 | 89 | 44 | 000-000 | 2.0 | 4 | 2 | 9.9 | 4.95 | TROLLING |
| 12 | 7 | 89 | 44 | 160-300 | 10.0 | 19 | 2 | 34.9 | 3.49 | BOTTOM REELS |
| 12 | 6 | 89 | 44 | 000-000 | 12.0 | 19 | 2 | 33.2 | 2.77 | BOTTOM REELS |
| 9 | 18 | 89 | 44 | 050-120 | 12.0 | 2 | 12 | 1.1 | 0.09 | BOTTOM LONGLINE |
| 1 | 22 | 90 | 44 | 000-000 | 6.0 | 1 | 2 | 10.0 | 1.67 | TROLLING |
| 1 | 23 | 90 | 44 | 220-240 | 5.5 | 6 | 2 | 1.9 | 0.35 | BOTTOM REELS |
| 1 | 23 | 90 | 44 | 000-000 | 10.0 | 2 | 4 | 8.0 | 0.80 | TROLLING |
| 1 | 25 | 90 | 44 | 000-000 | 16.0 | 9 | 4 | 21.5 | 1.34 | TROLLING |
| 2 | 16 | 90 | 44 | 170-300 | 11.0 | 19 | 2 | 16.5 | 1.50 | BOTTOM REELS |
| 2 | 17 | 90 | 44 | 160-280 | 8.0 | 22 | 2 | 11.2 | 1.40 | BOTTOM REELS |
| 2 | 22 | 90 | 44 | 000-000 | 13.5 | 26 | 3 | 83.6 | 6.19 | TROLLING |
| 11 | 8 | 88 | 44 | 000-000 | 20.0 | 31 | 4 | 14.5 | 0.73 | TROLLING |
| 12 | 5 | 88 | 44 | 180-300 | 10.0 | 24 | 2 | 28.0 | 2.80 | BOTTOM REELS |
| | | | | | 209.0 | 347 | | 483.2 | | |

| MONTH | DAY | YEAR | LOCATION | DEPTH | LINE HOURS | NUMBER FISH | NUMBER HOOK/LINE | WEIGHT | CPUE | METHOD |
|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 31 | 90 | 45 | 260-280 | 11.0 | 51 | 2 | 73.2 | 6.65 | BOTTOM REELS |
| 8 | 3 | 90 | 45 | 280-310 | 12.0 | 35 | 2 | 161.1 | 13.43 | BOTTOM REELS |
| 8 | 6 | 90 | 45 | 260-280 | 12.0 | 29 | 2 | 174.8 | 14.57 | BOTTOM REELS |
| 8 | 9 | 90 | 45 | 270-280 | 10.0 | 33 | 2 | 27.0 | 2.70 | BOTTOM REELS |
| 10 | 20 | 88 | 45 | 170-340 | 14.5 | 35 | 3 | 73.1 | 5.04 | BOTTOM REELS |
| 10 | 20 | 88 | 45 | 000-000 | 7.0 | 6 | 2 | 21.0 | 3.00 | TROLLING |
| 11 | 15 | 88 | 45 | 220-300 | 6.0 | 2 | 2 | 2.0 | 0.33 | BOTTOM REELS |
| 11 | 15 | 88 | 45 | 000-000 | 12.0 | 1 | 4 | 0.5 | 0.04 | TROLLING |
| | | | | | 84.5 | 192 | | 532.7 | | |
| 1 | 24 | 90 | 52 | 240-260 | 3.0 | 11 | 1 | 6.5 | 2.17 | BOTTOM REELS |
| 4 | 24 | 90 | 52 | 000-000 | 9.0 | 7 | 3 | 30.6 | 3.40 | TROLLING |
| 4 | 25 | 90 | 52 | 000-000 | 20.0 | 16 | 4 | 69.5 | 3.48 | TROLLING |
| 9 | 27 | 88 | 52 | 200-220 | 7.0 | 34 | 2 | 18.5 | 2.64 | BOTTOM REELS |
| 10 | 12 | 88 | 52 | 190-210 | 9.0 | 22 | 2 | 21.6 | 2.40 | BOTTOM REELS |
| | | | | | 48.0 | 90 | | 146.7 | | |
| 9 | 19 | 89 | 53 | 120-130 | 12.0 | 1 | 12 | 1.5 | 0.13 | BOTTOM LONGLINE |
| 9 | 19 | 89 | 53 | 000-000 | 4.0 | 3 | 2 | 8.5 | 2.13 | TROLLING |
| 4 | 27 | 90 | 53 | 280-280 | 9.0 | 28 | 2 | 162.8 | 18.09 | BOTTOM REELS |
| 7 | 2 | 90 | 53 | 280-280 | 12.0 | 54 | 2 | 144.1 | 12.01 | BOTTOM REELS |
| 8 | 1 | 90 | 53 | 280-310 | 13.0 | 48 | 2 | 41.8 | 3.22 | BOTTOM REELS |
| 8 | 7 | 90 | 53 | 280-300 | 12.0 | 41 | 2 | 63.3 | 5.28 | BOTTOM REELS |
| | | | | | 62.0 | 175 | | 422.0 | | |
| 6 | 12 | 90 | 58 | 160-300 | 7.0 | 51 | 3 | 54.4 | 7.77 | BOTTOM REELS |
| 6 | 13 | 90 | 58 | 160-300 | 12.0 | 80 | 3 | 179.0 | 14.92 | BOTTOM REELS |
| 6 | 14 | 90 | 58 | 160-280 | 7.5 | 9 | 3 | 5.5 | 0.73 | BOTTOM REELS |
| 6 | 15 | 90 | 58 | 160-160 | 6.0 | 7 | 3 | 6.8 | 1.13 | BOTTOM REELS |
| | | | | | 32.5 | 147 | | 245.7 | | |
| 10 | 12 | 89 | 60 | 120-140 | 12.0 | 3 | 12 | 1.7 | 0.14 | BOTTOM LONGLINE |
| 10 | 12 | 89 | 60 | 200-310 | 12.0 | 14 | 2 | 24.2 | 2.02 | BOTTOM REELS |
| 2 | 7 | 90 | 60 | 260-280 | 3.0 | 2 | 6 | 0.5 | 0.17 | BOTTOM LONGLINE |
| 2 | 7 | 90 | 60 | 260-260 | 6.0 | 5 | 2 | 2.5 | 0.42 | BOTTOM REELS |
| 2 | 8 | 90 | 60 | 110-220 | 4.0 | 8 | 2 | 2.4 | 0.60 | BOTTOM REELS |
| 2 | 8 | 90 | 60 | 000-000 | 6.0 | 3 | 2 | 20.8 | 3.47 | TROLLING |
| 2 | 13 | 90 | 60 | 240-280 | 6.0 | 10 | 2 | 12.3 | 2.05 | BOTTOM REELS |
| 2 | 13 | 90 | 60 | 000-000 | 7.5 | 2 | 3 | 12.7 | 1.69 | TROLLING |
| 5 | 1 | 90 | 60 | 280-300 | 10.0 | 23 | 2 | 29.3 | 2.93 | BOTTOM REELS |
| 6 | 27 | 90 | 60 | 200-220 | 2.0 | 5 | 2 | 1.7 | 0.85 | BOTTOM REELS |
| 6 | 27 | 90 | 60 | 000-000 | 4.0 | 10 | 2 | 13.8 | 3.45 | TROLLING |
| 7 | 26 | 90 | 60 | 200-300 | 7.0 | 7 | 2 | 10.2 | 1.46 | BOTTOM REELS |
| 11 | 3 | 88 | 60 | 130-280 | 12.0 | 11 | 2 | 17.1 | 1.43 | BOTTOM REELS |
| | | | | | 91.5 | 103 | | 149.2 | | |
| 10 | 31 | 89 | 61 | 160-300 | 22.0 | 25 | 2 | 34.5 | 1.57 | BOTTOM REELS |
| 0 | 2 | 90 | 61 | 000-000 | 18.0 | 7 | 3 | 63.0 | 3.50 | TROLLING |
| 4 | 24 | 90 | 61 | 220-240 | 9.0 | 8 | 2 | 5.2 | 0.58 | BOTTOM REELS |
| 5 | 2 | 90 | 61 | 200-300 | 6.0 | 14 | 2 | 4.0 | 0.67 | BOTTOM REELS |
| 6 | 28 | 90 | 61 | 200-220 | 9.0 | 28 | 2 | 79.6 | 8.84 | BOTTOM REELS |
| 6 | 28 | 90 | 61 | 000-000 | 2.0 | 1 | 2 | 2.0 | 1.00 | TROLLING |
| 7 | 27 | 90 | 61 | 200-300 | 9.0 | 11 | 2 | 65.2 | 7.24 | BOTTOM REELS |
| 7 | 27 | 90 | 61 | 000-000 | 2.0 | 2 | 2 | 1.8 | 0.90 | TROLLING |

| MONTH | DAY | YEAR | LOCATION | DEPTH | LINE HOURS | NUMBER FISH | NUMBER HOOK/LINE | WEIGHT | CPUE | METHOD |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 77.0 | 96 | | 255.3 | | |
| 10 | 19 | 89 | 68 | 100-300 | 37.0 | 71 | 2 | 49.0 | 1.32 | BOTTOM REELS |
| 9 | 26 | 89 | 68 | 100-120 | 12.0 | 7 | 12 | 8.1 | 0.68 | BOTTOM LONGLINE |
| 9 | 26 | 89 | 68 | 090-120 | 16.0 | 45 | 2 | 16.5 | 1.03 | BOTTOM REELS |
| 9 | 26 | 89 | 68 | 000-000 | 11.0 | 2 | 2 | 4.3 | 0.39 | TROLLING |
| | | | | | 76.0 | 125 | | 77.9 | | |
| 12 | 1 | 89 | 95 | 160-300 | 2.5 | 6 | 2 | 2.8 | 1.12 | BOTTOM REELS |
| 12 | 1 | 89 | 95 | 000-000 | 2.0 | 2 | 2 | 7.7 | 3.85 | TROLLING |
| 12 | 30 | 89 | 95 | 160-300 | 10.0 | 16 | 2 | 21.5 | 2.15 | BOTTOM REELS |
| 11 | 30 | 89 | 95 | 000-000 | 4.0 | 4 | 2 | 7.2 | 1.80 | TROLLING |
| 11 | 29 | 89 | 95 | 160-300 | 10.0 | 5 | 2 | 3.6 | 0.36 | BOTTOM REELS |
| 11 | 21 | 89 | 95 | 160-300 | 7.0 | 3 | 2 | 1.6 | 0.23 | BOTTOM REELS |
| 11 | 18 | 89 | 95 | 000-000 | 36.0 | 4 | 4 | 77.6 | 2.16 | TROLLING |
| | | | | | 71.5 | 40 | | 122.0 | | |
| | | | | | 1069.0 | 2070 | | 3731.1 | 3.49 | |