



**Evaluation of Northern Territory  
Fishing Grounds  
South of 11°S and West of 130°E**

**Fishery Report No. 40**

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## NON-TECHNICAL SUMMARY

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Project Title

EVALUATION OF NORTHERN TERRITORY FISHING  
GROUNDS SOUTH OF 11°S AND WEST OF 130°E

Objectives

Evaluate the commercial viability of demersal fishing grounds bounded by 130°E and 11°S and the Australian Fishing Zone / NT and WA border;  
Evaluate the efficiency of contemporary passive fishing methods against slightly modified gear;  
Collect and analyse data for future use in managing NT fish stocks.

Summary

Stocks of red snapper (*Lutjanus malabaricus* and *Lutjanus erythropterus*) are largely under exploited in Northern Australian waters. This is primarily due to inadequate fish handling facilities in remote areas and the relatively low market value of the fish. To assist in the development of the fishery it would help if red snapper stocks could be found close to Darwin. Reduced fuel consumption coupled with a slight increase in price and the utilisation of Darwin's cheap "back loading" freight rates could be the catalyst needed to start the fishery.

The Northern Territory Fishing Industry Council (NTFIC) believes red snappers could be the basis of a major industry. At the request of NTFIC, a project proposal was written and submitted to the Fisheries Research and Development Corporation (FRDC) by the Northern Territory (NT) Fisheries Division. Funding was granted in July 96. The project focussed on discovering commercial quantities of red snapper close to Darwin.

Even though no offshore commercial fishery (trap or line fishery outside 15 nautical miles) exists to the west of Darwin, the geographical similarity between the area and other Northern Territory fishing grounds indicated that it could contain commercial quantities of red snappers.

Prior to the project, documented exploration of the area had been limited to a few trawl surveys. However, five or six years ago small commercial quantities of red snapper were randomly taken by finfish trawlers in the southern section (south of 12 degrees 30 minutes south) of the proposed survey area.

On the advice of the FRDC Board, a Steering Committee comprising industry and government representatives was set up to oversee the project. The Committee's main recommendation was that drop lines (20 to 40 hook vertical long lines), similar to those used in the Timor Reef Fishery, be the main gear used during the field trials. It was agreed that traps and trammel nets should be used as complementary sampling methods to the drop lines. This was on the proviso that they didn't interfere with the drop lines. It should also be noted that trammel nets are illegal in Northern Territory waters except when used for research, under a permit.

Prior to the field work commencing, a desk top study took place which identified potential fishing grounds within the project area. This was done by transposing seabed sediment charts over bathymetric charts for both the project area and proven grounds in other areas. Areas within the survey region which appeared to have promising features were chosen for exploration.

In October '96, two local drop line vessels (Ace of Spades and Deep Tempest) were chartered to undertake two cruises each (a total of 32 boat days). One vessel deployed drop line gear while the other deployed traps, drop lines and sampling nets. During the first cruise the vessels explored the northern and central section of the survey area. On the second cruise, they explored the central and southern area.

The prime objective, *to find and evaluate potential commercial fishing grounds*, was achieved by discovering commercial concentrations of red snapper in the central sector of the surveyed area. Subsequent



economic analysis indicates that there is the potential for a new commercial red snapper fishery to develop from Darwin.

The secondary objectives, *to evaluate the efficiency of contemporary passive fishing methods against slightly modified gears*; and *to collect and analyse data for future use in managing NT fish stocks* were also achieved. This was done through the successful use of a shark proof drop line, an improvement in the red snapper catch rate by the use of smaller hooks and through the collection of biological data on 1,554 fish.

The drop lines caught significantly more red snapper than the other gears (ie: the traps and sample nets). Catch rates of between 100 to 200 kilograms per hour (ie: up to 100 fish) from the drop lines were not uncommon in the central region of the surveyed area. The traps caught mainly red emperor (*Lutjanus sebae*) and other small emperors (*Lethrinus* spp.), while the sample nets (trammel nets) caught everything from tiny sea snakes and prawns to large sharks and snapper.

At the completion of cruise one the Steering Committee met and made a decision to leave the trammel nets ashore. Although these nets were extremely effective, they were new and operational difficulties were being encountered. It was not possible to sort out these problems and simultaneously use the other gears.

The number of unexpected set backs were overcome during the project. On the first cruise one of the deckhands knocked his leg and ended up in hospital for two weeks with blood poisoning. The skipper of the Deep Tempest fell ill and could not come on the second cruise. While in port the skipper of the Ace of Spades injured himself and was unable to take the boat out on the second cruise. Then on the last day at sea the Ace of Spades broke the drive shaft coupling and was towed back to Darwin by the Deep Tempest.

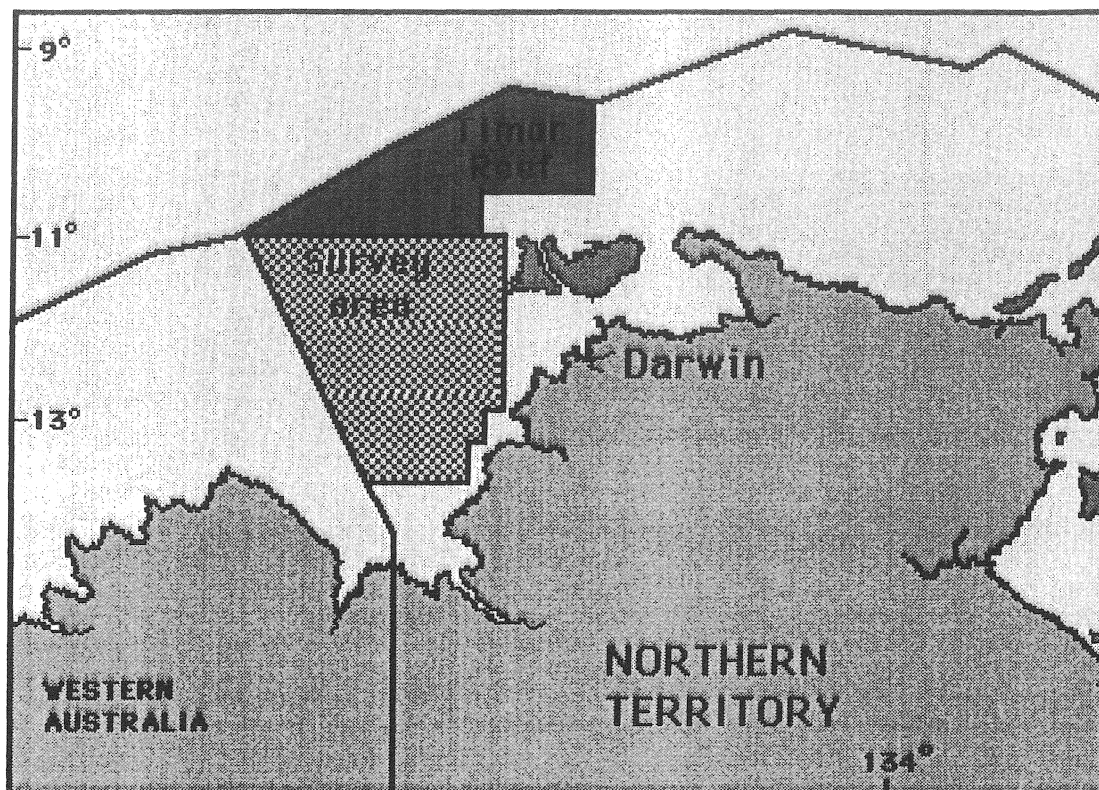
Despite the set backs, tropical storms and more than two thirds of the time at sea spent searching barren grounds the vessels still managed to land 3,525 commercial fish weighing approximately five tonnes. In one area 2,800 kilograms of good fish were landed in what was equivalent to about four days fishing, with an average catch rate of 6.7 fish per drop line.

The market prices in Brisbane for the red snapper averaged \$3.50 per kilogram while in Sydney they were slightly higher at around \$4.50 per kilogram. Other species which attained good prices were large trevally *Caranx* spp. (up to \$4.80 per kg), tricky snapper *Lethrinus fraenatus* (up to \$6.20 per kg) and goldband snapper *Pristipomoides* spp. (up to \$9.40 per kg).

Two articles on the project have been written and accepted for publication. One to the Northern Territory Fishing Industry Council's, Fishing Industry News magazine, entitled, "Red Snapper West of Darwin" and the second to the United Nation's INFOFISH International magazine, entitled, "RED SNAPPER: Australia's Under Utilised Resource".

## BACKGROUND

The Northern Territory Fishing Industry Council (NTFIC) has proposed a four phase approach to the development of the Northern Territory (NT) demersal fishery. Phase one was completed in 1995 and involved gear trials in the eastern Arafura Sea and northern Gulf of Carpentaria (FRDC project number 94/154). Phase two was to identify commercial fishing areas utilising passive demersal gear in the area west of Darwin, bounded by longitude 130°E, latitude 11°S, the AFZ and the NT/WA border (map 1). Phase three and four are intended to cover the western Arafura and southern Gulf of Carpentaria.



**Map 1. Survey Area in Relation to Darwin and the Timor Reef Fishery**

In early 1996 NTFIC was keen to begin Phase two. The evaluation of the commercial viability of demersal fishing grounds bounded by 130°E and 11°S and the Australian Fishing Zone / NT and WA border was considered extremely important because researchers had conservatively estimated sustainable yields of red snapper stocks in the NT portion of the Timor Sea at 700 tonnes per year (personal comments D Ramm and C Walters 1996). Presently, total catches of red snapper from the Timor Sea are nowhere near this sustainable yield and little, if any, are consistently taken from the survey area.

An examination of bathymetric and sediment charts indicated that the proposed area had similar topographical and geomorphological features to other known fishing grounds in NT waters. Given the similarity of these features it stood to reason that stocks of red snapper *Lutjanus* spp. and other commercial species would inhabit these waters. It is also possible that commercial stocks of other valuable demersal species existed in the area. An added advantage is that the project area is close to Darwin and reliable fish handling infrastructure.

In the Northern Territory both *Lutjanus malabaricus* and *Lutjanus erythropterus* are often referred to as red snapper. However, the common name used by commercial fishers for *L. malabaricus* is ruby emperor or saddletail snapper. This report uses the name ruby emperor for *L. malabaricus* while *L. erythropterus* are referred to as red snapper.

## NEED

Commercial exploitation of the NT demersal fishery using passive harvesting methods is currently in its infancy. The existing goldband snapper fishery in the Timor Reef Fishery operates from Darwin because it is the only NT port that has the infrastructure required to economically handle and export reasonable quantities of fresh fish. While a small amount of frozen fish is currently shipped out of Gove, it is hoped a fresh fish fishery may develop there over the next few years providing better fresh fish handling infrastructure is set in place.

The NTFIC, in consultation with the NT Fisheries Division, identified commercial development of the demersal fishery west of Darwin as its highest research and development (R&D) priority for 1996 (NT Fisheries Research Advisory Board (FRAB) meeting - March 1996). Survey studies in this area have been limited to *ad hoc* trips made by local fishers and some trawl stock assessment survey work conducted in the early 1990s as part of the FRDC project 90/15. These surveys, although only covering a relatively small proportion of the area, assisted in identifying a few possible commercial fishing grounds but not enough to base a new fishery on. A more focussed survey needed to be undertaken to ascertain the area's true potential as a viable trap or drop line fishery.

Approximately 16 licensed demersal fishers in the NT have Timor Reef licences and are reaping the rewards from the limited entry Timor Reef Fishing zone north of Darwin which was once part of the Demersal Fishery. Generally these fishers are content in harvesting high value goldband snapper and have no reason to undertake exploratory voyages outside their zone. (Note: management arrangements for the Timor Reef fishery require fishers to also hold a Demersal Fishery licence)

On the other hand, there are 44 Demersal licence holders with no Timor Reef licences. Few, if any, of these licences are being operated efficiently (ie: the fishers are unable to catch commercial quantities of fish, or the known fishing grounds are located too far away from adequate transport and marketing infrastructure or the licensees own inappropriate catching vessels).

This group of operators need to harvest fish relatively close to Darwin but lack the resources to undertake proper exploratory studies of suitable areas.

The proposal needed to address three main areas:

(1) **The need to verify the existence of commercial quantities of demersal fish in the offshore demersal fishing grounds west of Darwin.**

This was to be achieved using traps and/or drop lines as well as trammel nets. The NT Fisheries Division Fishing Gear Technology Section had been developing a trammel net for use as a research sampling method in deep water. This gear is less selective than other gears in use and is proving to be an effective sampling tool in the Timor Reef Fishery. The trammel net was to provide a complementary method for sampling in deep water (Lloyd and Mounsey in prep; Kitagawa, 1990). Its biggest advantage is that it's capable of catching most fish that make contact with it, thus giving an insight into species size ranges and fish school compositions. The trammel net was to be used to assist in determining whether commercial species exist and whether fishing operations should persevere in a particular area or move on, especially if no target species were caught by trap or drop line.

(2) **The need to use and adopt the most appropriate environmentally friendly capture methods suitable for the average Darwin based licensed demersal fishing vessel.**

Licensed demersal fishers are presently allowed to use an unrestricted number of vertical line and hook combinations (limit of 40 hooks per line) along with any number and type of portable fish trap. Demersal licence holders are as yet unsure as to what type of gear is best for catching particular species.

(3) **The need to activate presently non active demersal licences for the benefit of the Northern Territory.**

Inactive licences generate no income but monthly returns still have to be lodged, licence renewals processed and licence fees paid. This is all carried out at a cost to the NT Government and the licence holder with no social or economic return to either party.

## OBJECTIVES

The main objectives of the project were to:

- evaluate the commercial viability of demersal fishing grounds bounded by 130° E and 11 °S and the Australian Fishing Zone / NT and the WA border;
- evaluate the efficiency of contemporary passive fishing methods against slightly modified gear; and
- collect and analyse data for future use in managing NT fish stocks.

Objective one was achieved in so far as we were able to find commercial quantities of red snapper relatively close to Darwin. The catch rates per line were encouraging and have generated interest among demersal license holders. The commercial viability is still dependant on market prices. If prices of around \$4.00 to \$5.00 per kilogram can be maintained then it is highly likely a demersal fishery will start in this area. The extent of the known fishing grounds will no doubt expand once commercial operations begin in the area.

Objective two was achieved. Smaller hook sizes proved to be far more effective at catching red snapper (*Lutjanus erythropterus*) than the 12/0 to 13/0 hooks normally used in the Timor Reef Fishery. The chain drop line rigs were effective at reducing the damage caused by sharks while still maintaining viable catch rates.

Objective three was achieved. Over 1,500 fish were identified and measured. Catch and effort data was recorded throughout the field study. This data will be useful in the future management of the fishery.

## METHODS

The experimental design focussed on obtaining quantitative data from the area. This was done by exploring new grounds and comparing conventional drop line gear, as used in the Timor Reef Fishery against modified gear. Traps and trammel nets were also used to obtain catch data. All fish species caught were identified and nearly half the total catch was measured to the nearest millimetre.

The project Steering Committee refined the project plans and undertook a desk top study to identify likely fishing grounds. Bathymetric and sediment charts, combined with local knowledge and trawl survey data were used to identify likely fishing grounds. On each cruise these grounds were the first to be surveyed (for details see Appendix 1).

The NT Fisheries Division chartered two local drop line vessels for 16 days each. This amounted to 32 boat days (charter details, Tender Board requirements, Tender Documents and Contracts are available from the Department of Primary Industry and Fisheries in Darwin). One vessel deployed drop line gear while the other deployed traps, drop lines and trammel nets. Each vessel undertook two cruises.

During the first cruise the two vessels concentrated on surveying as much ground as possible in the north and central sections of the survey area. The vessels kept on the move searching during the day and night. A time limit of one hour at each fishing site had already been removed by the Steering Committee prior to commencement of the charters.

The Steering Committee agreed that during the second cruise the central and southern sections of the survey area should be investigated with more time spent in the central region. It was agreed that the skippers should have at least two days towards the end of the charters to undertake commercial fishing in an area of their choice but still within the project area. This procedure was only partially carried out. One skipper decided to keep exploring while the other was limited to where he could fish because the vessel was low on fuel.

Most trevally and fish weighing less than 700 grams were released alive and not included in the study results. A few juveniles of each species were kept for biological studies. The larger commercially viable species were quickly removed from the gear, Ike-Jimed (spiked), bleed, washed, chilled in refrigerated sea water then "soldier" packed in ice.

The fish were repacked in ice and road freighted to the Brisbane and Sydney fishmarkets. A small number of marketable fish were retained for biological studies.

### Data Collection

Fisheries officers on board the vessels recorded the following information for every piece of gear set ;

- |                           |                         |
|---------------------------|-------------------------|
| 1 Date                    | 6 Depth fished          |
| 2 Time of day             | 7 Shot duration         |
| 3 Latitude and Longitudet | 8 Species caught        |
| 4 Type of gear used       | 9 Number of fish caught |
| 5 Type of bait used       | 10 Length of fish       |

**Table 1.** List of vessels, skippers and staff involved in field trips conducted during the project.

Vessel	LOA (m)	Port	Cruise 1996	Skipper	Project Staff
Deep Tempest	16.2	Darwin	7-14 Oct'	M Reid	R Mounsey
Ace of Spades	13.5	Darwin	7-14 Oct'	W Bishop	N Gill
Deep Tempest	16.2	Darwin	16-25 Oct'	W Mounsey	J MacCartie R Mounsey
Ace of Spades	13.5	Darwin	16-25 Oct'	M Angwin	N Gill

**Table 2.** Summary of harvest methods used during the project.

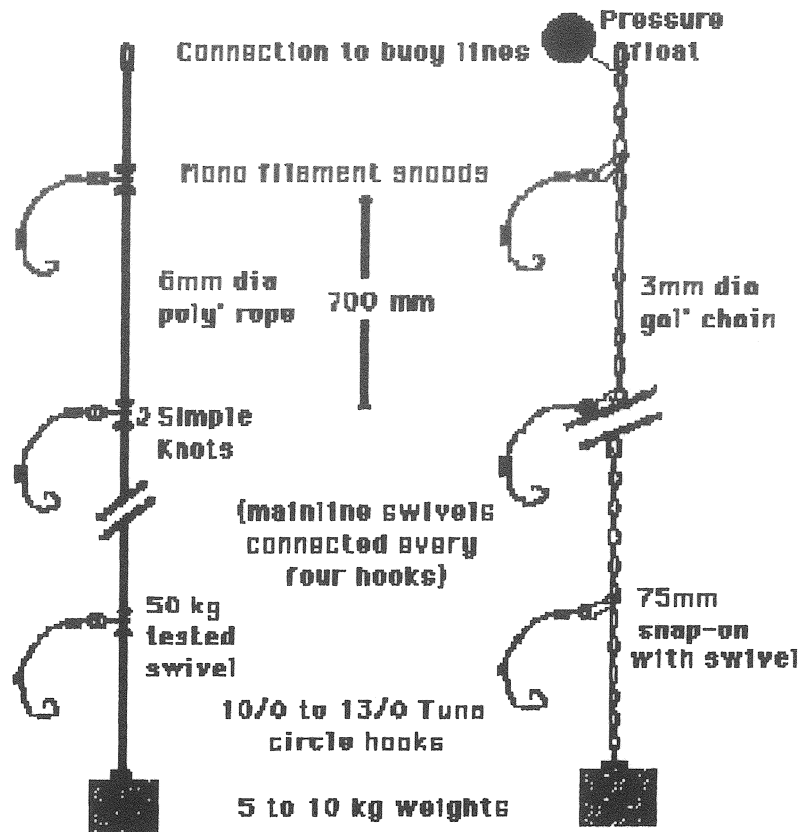
Vessel	Cruise	Depth Fished (m)	Gear	Bait	Total Set	Number Hooks
Ace of Spades	7-14 Oct'	20-124	Drop lines	Squid	133	3,225
Deep Tempest	7-14 Oct'	36-109 36-96	Drop lines Traps Trammel nets	Squid Pilchards/Tuna Nil	129 40 8	3,870
Ace of Spades	16-25 Oct'	26-99	Drop lines	Squid	256	6,120
Deep Tempest	16-25 Oct'	37-95 37-94	Drop lines Traps	Squid Pilchards/Tuna	261 58	9,080

### Drop Lines (vertical longlines)

Both vessels used standard drop line rigs. The number of hooks on each rig varied from 20 to 40. The size of hooks ranged from small 10/0 tuna circles to the larger 13/0 tuna circles. Squid was used as bait. Only on one occasion was it necessary to bring out the newly designed shark proof rigs.

Basic gear comparison experiments took place. These included randomly comparing the standard 13/0 tuna circle hooks, against 10/0 and 11/0 tuna circle hooks. Six lines were each fitted with 30 to 40 of the above hooks (ie. two lines of 10/0 hooks, two lines of 11/0 hooks and two lines of 13/0 hooks). The crew of the vessel set the lines in no particular order. Sometimes a particular line was set on a good fish mark and at other times the same line may have been set on nothing. Over 22,000 hooks were set in ten different areas and the results recorded.

The modified "shark proof" drop lines which were originally constructed from plastic coated steel cable were not used (they kept tangling in the shooting rack). They were replaced by 3mm diameter galvanised steel chain with a 150 mm diameter high pressure float attached to the upper end (see Fig. 1).



**Fig 1. Drop line hook arrangements (up to 40 hks/rig)**

Both vessels were fitted with three hydraulic deep water snapper reels, along with eight free rig drop lines (locally referred to as 'throw aways', as the whole line is thrown from the boat and left in the water attached to marker floats).

The hydraulic reels were fitted with 300 metres of 2 mm diameter braided nylon twine. This twine was connected to the bottom rigs (as seen in Fig 1.) by a heavy duty snap-on connector. The free rig lines consisted of two 300 mm diameter surface marker floats, attached to 125 metres of 6 mm diameter polyethylene rope. The end of the rope was attached to the bottom rig by a heavy duty snap-on connector.

Due to the fact that the vessels were continually on the move and only dropping lines here and there on promising looking marks it was easier and quicker to operate the free rig lines. This was faster than using the hydraulic reels.

### Shooting Racks

The baited hooks were set up on stainless steel shooting racks. These were positioned next to the hydraulic reels or on the port and starboard sides and on the stern of the vessels. Up to six racks of hooks were used in rotation when operating on a good mark of fish.

### Drop Line Fishing Procedure

Small Californian squid were thawed and cut into small pieces in the early hours of the morning. Two or three racks of hooks were baited at dawn while the vessel's anchor was being retrieved. The day began with each skipper agreeing to search a particular area. The echo sounder was the vital instrument in locating fish, although the bathymetric charts did assist in finding hard ground.

Discovering a steep two metre rise or fall in the seabed in the 50 to 100 metre depth range which turned out to be rock or coral and had sponges or soft weeds growing on it was what the skippers were looking for. If found, commercial fish were expected to be near by. Observations indicated that larger rises or falls associated with shoals or canyons generally didn't hold concentrations of commercial fish in the

south eastern Timor Sea. The red snapper targeted were usually three to five metres off the bottom (note: occasionally they were hard on the bottom). The schools varied in size from several thousand fish down to a couple of hundred (estimations made by the skippers from echo sounder readings).

Throughout most of the survey the strong tidal flow made it difficult to position the vessels on top of the fish schools. This inturn made it difficult to operate the hydraulic reels, as these machines work best when the vessel is stationary or slowly drifting over a school.

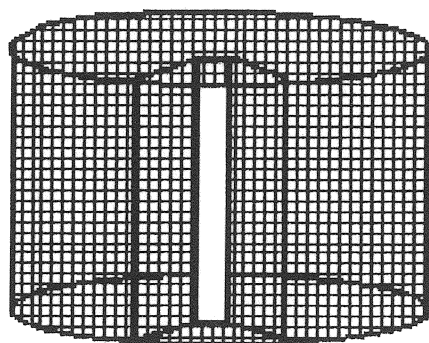
The free rig drop lines were set while the vessel was travelling into the current. A close check was kept on the direction of the current as it continually changed throughout the day. The distance the lines were released past the school of fish depended on the current strength. It ranged from directly on top of them up to 100 metres in front of the school in the deeper waters.

The lines were generally set for five to ten minutes. When more than four lines were set it was not uncommon for some of them to remain in the water for up to 25 minutes because of the time it took to remove the fish and rebait the hooks.

To retrieve the lines the vessel approached the marker floats from down current. A small grapnel anchor was used to bring the floats aboard. The mainline (buoy line) was run over a side roller and hauled with a hydraulic rope hauler. The rope was coiled into a bin until the first hook came over the roller. The bottom rig was then unclipped and manually hauled aboard. The fish were removed and the line was dragged to the rear of the vessel where it was rebaited and placed on the shooting rack.

### **Fish Traps**

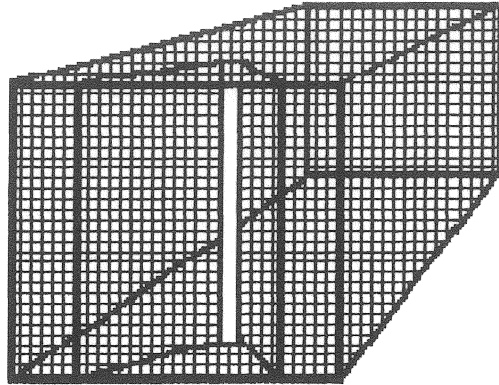
Four different fish traps were used during the survey. They were all set in the same fashion. They were normally used at night so as not to interfere with the drop lining operations. However one day was devoted to trap fishing. (Note: large traps can be difficult to handle, particularly in rough seas)



**Fig 2. Small Round**

#### ***Small "O" Trap (3 used)***

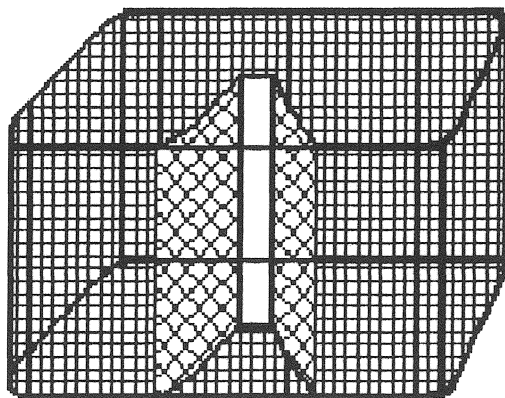
These traps had a diameter of 1175 mm and vertical height of 600 mm. The frames were constructed from 12 mm diameter steel bar which was covered in 50 mm x 50 mm x 3 mm steel mesh. A hinged door was fitted opposite the funnel.



**Fig 3. Bass Strait**

*Bass Strait Trap (2 used)*

These traps were built in Darwin by a Tasmanian lobster fisherman who was aboard one of the chartered vessels as an observer. The traps had a length of 1600 mm, a width of 750 mm and a height of 700 mm. There were no internal or external frames. They were simply bent from a sheet of 50 mm x 50 mm x 3 mm steel mesh. At the opposite end to the funnel there was a hinged door.

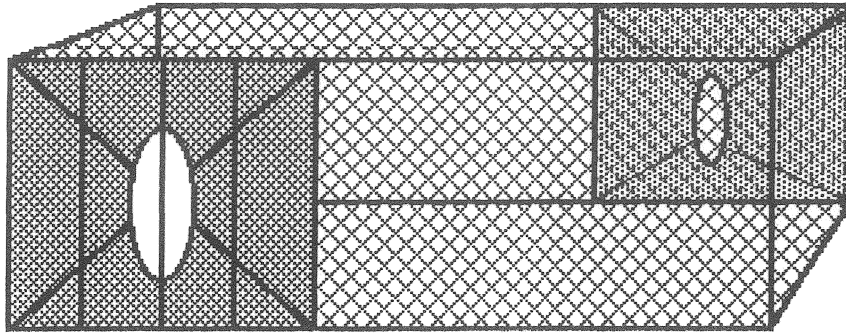


**Fig 4. Western Australian**

*Western Australian Trap (3 used)*

These standard North West Shelf traps were rounded on the corners. They had a length of 1600 mm, a width of 1600 mm and a height of 900 mm. The frames were constructed from 12 mm diameter steel bar and they were covered in 50 mm x 50 mm x 3 mm steel mesh. At the opposite end to the funnel there was a hinged door.





**Fig 5. Collapsable**

***Northern Territory Collapsible Trap (4 used)***

These locally designed traps had two entrance, were rectangular shaped and could be folded flat on the deck. The traps had a length of 1610 mm, a width of 1240 mm and a height of 620 mm. The frames were constructed from 9 mm diameter steel bar and were covered in galvanised wire chain mesh (65 mm x 65 mm x 1.5 mm). The funnels were constructed from 9 mm diameter steel bar and covered in 50 mm mesh 60 ply prawn codend material. A hinged door was built into each of the smaller side panels

**Trap Attachments**

***Buoy lines***

All the traps were fitted with 125 metre buoy lines and two 300 mm diameter, round, polystyrene marker floats. The large WA traps had 16 mm diameter bouy line while the remainder of the traps had 12 mm diameter buoy lines which were clipped to a standard bridle on each trap.

***Bait Containers***

Galvanised steel wire boxes along with prawn netting bags were used to hold the bait in the traps. Approximately half a kilogram of pilchards (*Amblygaster* sp.) and one kilogram of tuna (*Thunnus tonggol*) were used in each trap.

**Operational Procedures**

On most occasions the traps were simply thrown over the side on or near hard bottom. Very rarely were they set properly on live patches of ground. This was mainly due to the fact that drop lining was the principle fishing method used on the project and it is impractical to seriously attempt two fishing methods at the same time.

The traps were retrieved with the the hydraulic rope hauler. They were brought aboard the vessel by the use of a pot tipper, similar to those used by Australian rock lobster fishers. The fish and old baits were removed through a hinged door on the side or end of each trap.

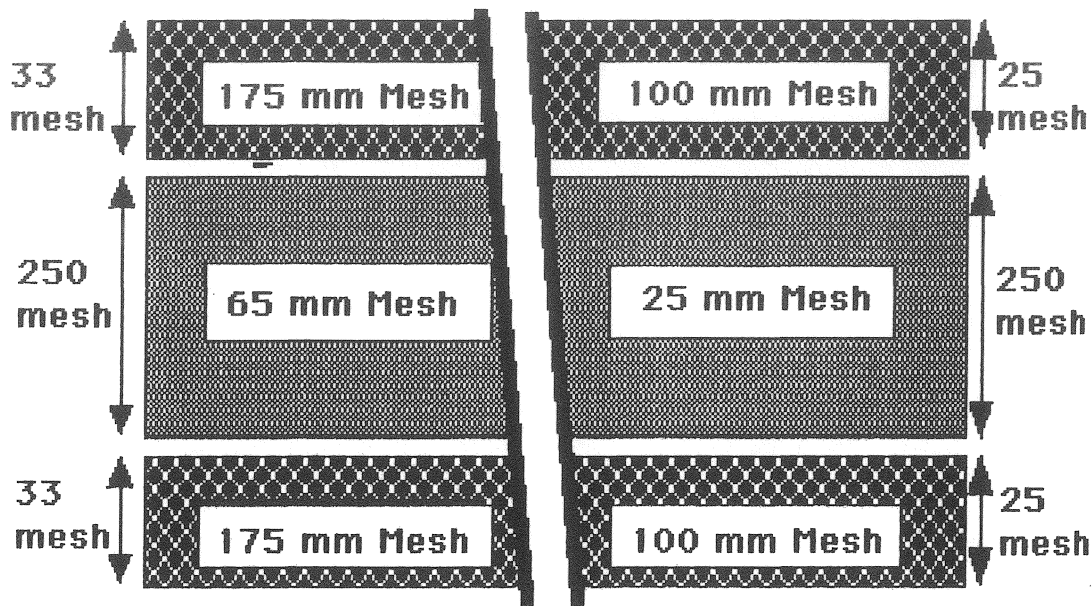
**Trammel Nets**

Although trammel nets are illegal for any normal fishing practises in the NT, they are now being used by NT researchers as biological sampling tools.

The word trammel is of French origin- derived from 'trois mailles', which means 'three meshes'. In general a trammel net is constructed of three panels of netting (ie. attached to single float and lead lines) instead of a single panel as in a gill net (see Fig. 6). Between the two larger mesh outer panels lies a loose small mesh panel. This small mesh panel has plenty of slack because it is normally two to three times as deep as the two outer panels. When a fish swims through the large outer meshes and pushes against the loose interior net a pocket is formed around the fish which traps it (as shown in Fig. 7).

The two trammel nets (Fig. 6) used on the first cruise were each 50 metres in length. The smaller net had a vertical drop of two metres, while the larger net had a drop of four metres. They were deployed when there was doubt as to the species composition of fish schools found on the echo sounder.

The webbing material used in all panels was mono filament. The mono filament sizes in the small net (Fig. 6) were line #0.8(25 mm mesh) and line #35(100 mm mesh). In the large net (Fig. 6) they were line #10(65 mm mesh) and line #50(175 mm mesh).



**Fig 6. Construction Plan Of Two Trammel Nets**

The trammel net hauling lines were made from 16 mm diameter polyethylene rope. The anchors used were five kilogram grapnels. Two 300 mm diameter styrene floats were used as marker buoys.

These nets were only used on the Deep Tempest during the first cruise. They were used to catch a large variety of fish species but took a considerable amount of time to clear. This meant that they were taking up time which could have been spent searching and drop lining. (Note: it was nearly impossible to operate the drop lines around these nets).

#### Trammel Net Fishing Procedures

The echo sounder in conjunction with the bathymetric charts were the instruments used to locate fish and likely fishing grounds. Normally the nets were set in an area where fish had been caught on the drop lines or in an area where fish life near the bottom was observed but little if anything was caught on the lines or in the traps.

The two different trammel nets were joined together and set while the vessel was travelling with the current (Fig. 8). The distance the nets were released before the school of fish depended on the current strength and ranged from directly on top of them up to 500 metres in front in the deeper waters.

The nets were generally set for about 12 hours. During this time the vessel fished in the general area. When hauling, the vessel approached the marker floats from down current. A small grapnel anchor was used to bring the floats aboard. The mainline (buoy line) was put over a side roller and hauled with the hydraulic rope hauler. The rope was coiled into a bin until the nets came to the roller. The crew then began unclipping the nets from the hauling line and manually hauled them aboard. The fish were removed and the nets were dragged to the rear of the vessel where they were stacked and readied for shooting.

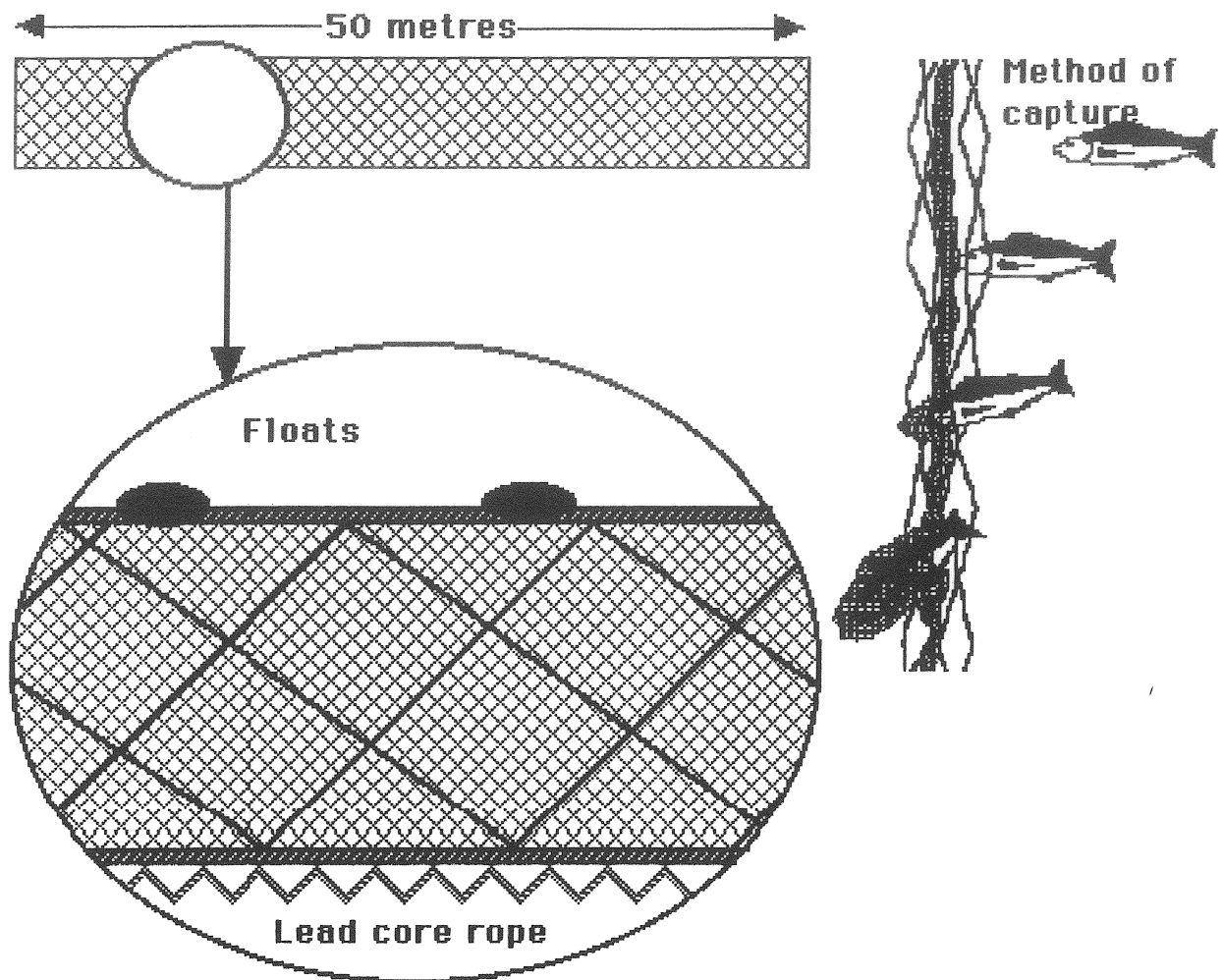


Fig 7. Trammel Net Form & Method Of Capture

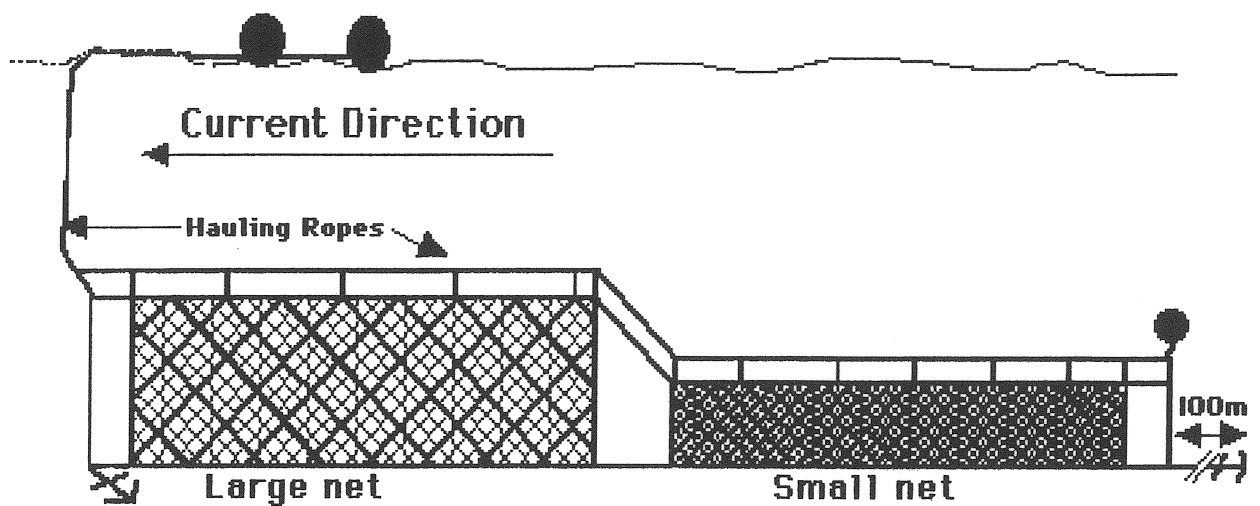


Fig 8. Trammel Nets in Fishing Mode

### Economic Analysis

The analysis was based on a spread sheet financial model developed and applied in the Northern Territory to investigate the profitability of new fisheries and new technology (eg. Buckworth and Camm, 1992 - Could trapping be a feasible additional method of fishing in Australia's Northern Prawn Fishery? ). For this project, a representative drop line vessel similar to the Deep Tempest was used to examine the effects of variations of key variables on profitability. The key variables being, fish prices and catch rates. The assumptions used in this analysis are flexible. In fact the capital value (Table 3) of the operation could be as much as a third lower and the number of crew could be increased or decreased by at least one person. The assumptions used in the analysis are summarised in Table 3.

**Table 3.** 'Base case' assumptions used in the economic analysis

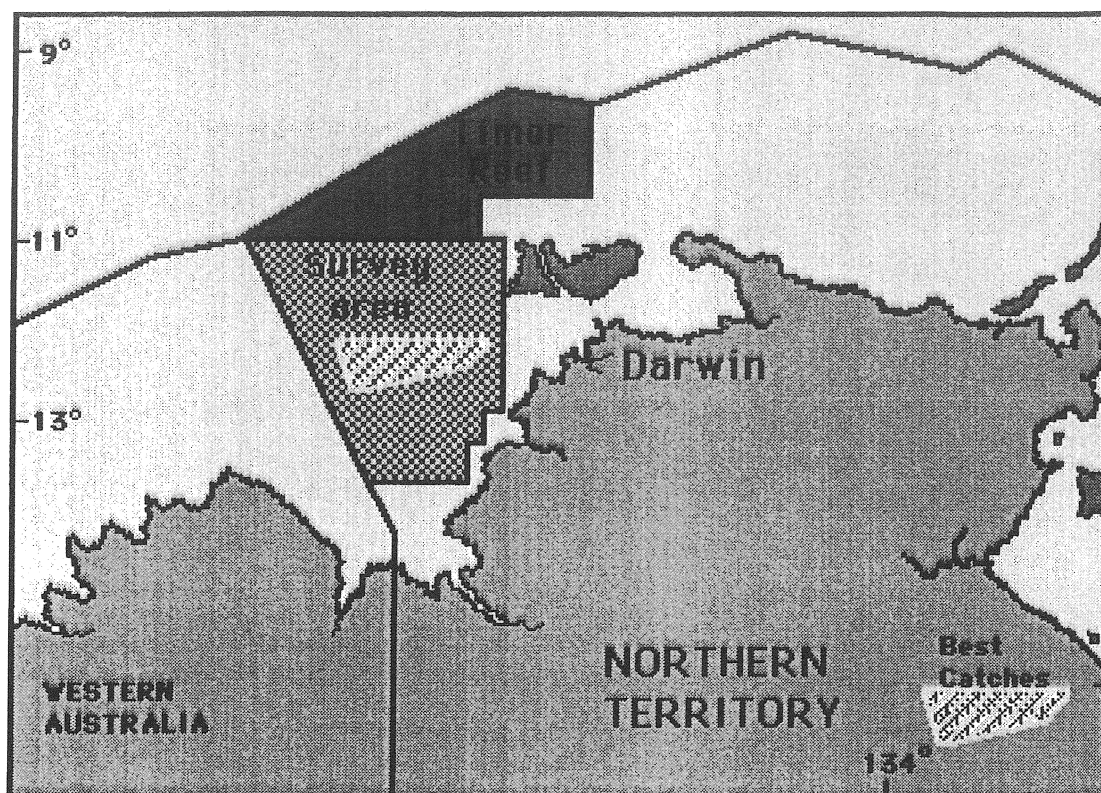
Description	Assumptions
Home Port	Darwin
Area of Operation	South East Timor Sea
Capital Value (Vessel and Equipment)	\$300,000
Annual Replacement Value of Fishing Gear	\$10,000
Number of Days at Sea per Year	240 days
Trip Turn Around	7 days
Average Travelling Time to Fishing Grounds	12 hours
Number of Crew	4
Marketing & Road Freight Costs (approx')	\$1.38 / kg of Fish Sold
Bait & Ice Costs (approx')	\$0.33 / kg of Fish Sold

The results of the analysis are reported in terms of 'annual return to capital' or profit. Annual profit is defined as revenue minus cash costs minus depreciation for a period of one year. Operator and family labour are treated as if a wage is actually paid. Annual return to capital is defined as the annual profit or loss, divided by capital value at the beginning of the year. It is the percentage return on capital invested and is roughly comparable to the rate of return the fisher might get on other investments. For example, if for a particular year revenue is \$250,000, cash costs total \$200,000 and depreciation is \$20,000, then annual profit is \$30,000 (ie; \$250,000 - \$200,000 - \$20,000). If the value of the boat and other capital invested is \$200,000 at the start of the year then the return to capital is 15% ( $30,000 \div 200,000 \times 100$ ).

## DETAILED RESULTS

The survey area took in approximately 15,000 square nautical miles. In reality the two vessels only covered a very small portion of it. It was hoped that the desk top study undertaken prior to the cruises would have homed the vessels in on fish. This was not the case. The best patches of ground holding concentrations of commercial fish were more often than not, found at random. Appendices 2 and 3 contain the detailed cruise reports for both the chartered vessels covering the period from 7 to 25 October 1996.

The striped area as seen in Map 2 shows where the majority of good ground and where commercial fish were found / caught.



**Map 2. The Surveyed Area Showing the most Productive Section**

The closest productive area to Darwin is about 90 nautical miles west of Darwin harbour. The most productive catching session was when the Deep Tempest landed around 700 kgs in five hours. The catch rates per hour during the survey varied greatly. The best rates were around 100 fish per hour. However it should be noted that survey time was limited and finding grounds was a higher priority than staying all day on a single mark and landing fish.

A total of 782 individual drop lines were set (22,295 hooks) along with 98 traps and eight trammel nets. The combined catch from all the gears consisted of 3,525 commercial fish weighing approximately five tonnes. Most of the fish caught in the trammel nets were of poor quality and were only used for biological studies. The following details only deal with prime quality fish taken from the traps and drop lines. Details referring to species caught in the trammel nets are included at the end of this section under the heading base line data.

The total number of commercial fish caught by the traps and drop lines was 3,415. Red snapper (*L. erythropterus*) accounted for 51% of the fish caught. Goldband snapper (*Pristipomoides* spp.) were the next most abundant fish making up 13%. Ruby emperor (*L. malabaricus*) made up 7.8%, red emperor (*L. sebae*) made up 7.6%, tricky snapper (*Lethrinus fraenatus*) 4.9%, trevallies (*Caranx* spp.) 4.7%, rock cods (*Epinephelus* spp.) 4.1% and husa (*Lutjanus vittus*) 2.9%. The remaining 4% of the catch comprised of 20 species. Table 4 details the number and species of fish caught.

**Table 4. Identification and number of fish caught from the traps and drop lines.**

Scientific Name	Common Name	Number Caught
<i>Lutjanus erythropterus</i>	Red snapper	1,745
<i>Pristipomoid</i> spp.	Goldband snappers	444
<i>Lutjanus malabaricus</i>	Ruby emperor	266
<i>Lutjanus sebae</i>	Red emperor	260
<i>Letrinus</i> spp.	Tricky snappers	167
<i>Carangoides</i> & <i>Caranx</i> spp.	Trevallies	159
<i>Epinephelus</i> spp.	Rock cods	140
<i>Lutjanus vittus</i>	Husa	99
<i>Melichthys</i> spp.	Trigger fish	28
<i>Carcharhinus</i> spp.	Black tip shark	24
<i>Lutjanus russelli</i>	Russell's snapper	19
<i>Lutjanus bitaeniatus</i>	White-tipped red snapper	16
<i>Decapterus macarellus</i>	Scad mackerel	10
<i>Lutjanus timorensis</i>	Timor snapper	7
<i>Seriolina nigrofasciata</i>	Black-banded kingfish	6
<i>Lutjanus bohar</i>	Two spot red snapper	4
<i>Diagramma pictum</i>	Painted sweetlip	3
<i>Scolopsis monogramma</i>	Monocle bream	3
<i>Plectropomus leopards</i>	Coral trout	2
<i>Arius thalassinus</i>	Giant salmon catfish	2
<i>Gymnocranius</i> spp.	Swallow tail sea breams	2
<i>Choerodon schoenleinii</i>	Blue bone	1
<i>Sphyrnaena barracuda</i>	Barracuda	1
<i>Nemipterus hexadon</i>	Ornate threadfin bream	1
<i>Lutjanus johni</i>	Golden snapper	1
Unknown	Being identified	5

### Species Composition and Gear

The time to set and haul a single hydraulic reel type drop line (normally about 8.5 minutes) was generally greater than that taken to set and haul a single free rig line (normally about 7 minutes). The time to set and haul three lines on a single fish mark was quicker with the hydraulic machines (7 to 10 minutes). However the fish marks were generally small making it easier to pin point the targets with the free rig lines. Over 85% of the individual sets were made with the free rig lines. The average trap took three hours thirty minutes to set, fish and haul while the trammel nets took around 12 hours.

Although occasionally the drop lines were left in the water for up to 25 minutes very few fish took the baits after the first five minutes. This was confirmed by holding the lines and noting when the fish stopped biting. There was no evidence to indicate that a line left in the water for greater than five minutes caught more fish.

**Table 5. Overall percentage make up of the catch for the major species caught by drop lines and traps.**

<u>Fish</u>		<u>Catch (percentage of catch)</u>	
<u>Scientific Name</u>	<u>Common Name</u>	<u>Drop line</u>	<u>Trap</u>
<i>Lutjanus erythropterus</i>	Red snapper	49.6%	1.5%
<i>Pristipomoid</i> spp.	Goldband snappers	12.6%	0.4%
<i>Lutjanus malabaricus</i>	Ruby emperor	7.0%	0.8%
<i>Lutjanus sebae</i>	Red emperor	4.6%	3.0%
<i>Letrinus</i> spp.	Tricky snappers	3.3%	1.6%
Others	-	12.0%	3.6%

(Note: The drop lines averaged about four fish per shot compared to each trap's average of about three fish per shot. The average soak time for each drop line was less than ten minutes. The average soak time for each trap was greater than 150 minutes.)

### Hook Sizes:- Effect on Catch

**Table 6. Comparison of catch rates of all species for tuna circle hooks (10/0, 11/0 and 13/0). Experiment carried out aboard the Deep Tempest from the 17th of November to the 25th of November.**

<u>Hook Size</u>	<u>Number of Fish</u>	<u>Number of Hooks</u>	<u>Fish Caught per Hook</u>
10/0	613	2,450	0.25
11/0	684	3,210	0.21
13/0	326	2,410	0.14
Total	1,623	8,070	0.20 average

### Hooks per Line:- Effect on Catch

**Table 7. Comparison of catch rates of all species for drop lines containing 30 and 40 hooks. Experiment carried out aboard the Deep Tempest from the 17th of November to the 25th of November.**

Hooks/line	Lines Set	Hooks Set	Fish Caught	Fish per Line	Fish per Hook
30	136	4,080	844	6.20	0.21
40	125	5,000	887	7.10	0.18
Total	261	9,080	1,731	6.6( av )	0.19(av)

### Species Hook Preferences

**Table 8. Hook size comparison by species caught aboard the Deep Tempest from the 17th of November to the 25th of November.**

Hook Size	Species	Number of Fish	Percentage of Catch For Hook Size
10/0	Red snapper	412	67.2%
	Goldband snappers	79	12.9%
	Ruby emperor	35	5.7%
	Red emperor	31	5.1%
	Tricky snappers	20	3.3%
	Husa	10	1.6%
	Mixed	26	4.2%
11/0	Red snapper	495	72.3%
	Goldband snappers	58	8.5%
	Ruby emperor	27	4.0%
	Red emperor	47	6.9%
	Tricky snappers	26	3.8%
	Husa	5	0.7%
	Mixed	26	3.8%
13/0	Red snapper	208	63.8%
	Goldband snappers	48	14.7%
	Ruby emperor	39	12.0%
	Red emperor	11	3.4%
	Tricky snappers	5	1.5%
	Husa	-	-
	Mixed	15	4.6%



### Species Preferred Depth

**Table 9. Catch of five major species caught by trap & drop line in relation to seabed depths.**

Species	No. of Fish	Depth Range (m)									
		31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120	121-130
Red snapper	1,745	0.9%	3.0%	5.9%	1.7%	2.5%	40.1%	<b>45.6%</b>	0.3%	-	-
Goldband	444	-	-	-	1.1%	1.6%	<b>55.6%</b>	39.0%	2.0%	0.2%	0.5%
Ruby emperor	266	0.8%	0.4%	1.5%	10.5%	4.1%	<b>45.1%</b>	37.4%	-	-	-
Red emperor	260	6.9%	0.4%	14.2%	10.0%	3.1%	<b>39.2%</b>	26.2%	-	-	-
Tricky snappers	167	<b>32.9%</b>	6.6%	28.7%	16.8%	3.6%	6.6%	4.8%	-	-	-

### Red Snapper Positions

The best catches of snapper (greater than five fish per drop line) were recorded at the following sites (positions):-

11°10.75 / 128°04.74	11°46.96 / 129°14.73	11°10.01 / 128°06.60
12°30.09 / 128°52.39	12°30.07 / 128°55.76	12°30.10 / 128°52.56
12°30.09 / 128°53.39	12°30.30 / 128°52.50	12°31.85 / 128°53.10
12°29.90 / 128°52.16	12°29.50 / 128°41.15	12°36.27 / 128°36.14
12°39.94 / 128°42.14	12°40.20 / 128°41.12	12°40.42 / 128°41.41
12°41.21 / 128°49.94	12°41.33 / 128°41.08	12°41.30 / 128°49.90
12°30.03 / 128°52.26	12°41.30 / 128°49.79	12°28.79 / 129°16.70
12°26.86 / 129°19.35	13°03.00 / 129°03.10	

### Shark Proof Drop Lines

During the survey very few large sharks were encountered. However on Friday October 19 while working a good patch of fish, three lines were destroyed by a tiger shark. This gave reason to test the new chain bottom rigs.

The new rigs worked well. There were no problems setting the gear or catching snapper. The catch rates appeared similar to the normal rigs (ie. averaging six fish per line), although this could not be statistically proven as only four chain equipped lines were set. One of the chain rigs was missing the 150 mm diameter float attached to the upper section (Fig. 1). This rig managed to foul itself on the bottom and resulted in the loss of a few hooks.

The third line set caught a tiger shark. During hauling the shark was attempting to bite through the chain. It was eventually killed, brought aboard and dissected. Inside its stomach were six large snapper, one red emperor and two cods. All the fish had hooks in their mouths. Swivels, rope, swages and mono lines were also found in the shark's stomach.

### Trap Comparison

Four different types of trap were used. Not enough traps were set (98) to gain meaningful comparisons. The traps were mostly fished during the night. In the daylight hours they were normally used as sampling tools or marker buoys. The reason the traps weren't set more often was due to the lack of suitable hard bottom in the area and the instruction from the Steering Committee to concentrate on drop lining.

The traps varied in volume. The Western Australian (WA) trap was twice as big as the Small Round and the Bass Strait traps. Although the WA trap caught more fish it was difficult to handle and three to four times more expensive to build than the other traps.

**Table 10. Trap catch rate comparison.**

Trap	Number of Fish	Number of Traps Set	Fish per Trap
Western Australian	202	24	8.4
Collapsible	77	47	1.6
Small Round	57	17	3.4
Bass Strait	36	10	3.6

**Table 11. Details of the four traps in relation to the number of species caught and the percentage make-up for each trap.**

Trap	Species	Number of Fish	Percentage of Catch For Particular Trap
Western Australian	Red snapper	30	14.8%
	Goldband snappers	5	2.5%
	Ruby emperor	14	6.9%
	Red emperor	60	29.7%
	Tricky snappers	17	8.4%
	Husa	30	14.9%
	Mixed	46	22.8%
Collapsible	Red snapper	13	16.8%
	Goldband snappers	6	7.8%
	Ruby emperor	9	11.7%
	Red emperor	10	13.0%
	Tricky snappers	11	14.3%
	Husa	-	-
	Mixed	28	36.4%
Small Round	Red snapper	4	7.0%
	Goldband snappers	3	5.3%
	Ruby emperor	2	3.5%
	Red emperor	24	42.1%
	Tricky snappers	13	22.8%
	Husa	1	1.8%
	Mixed	10	17.5%
Bass Strait	Red snapper	4	11.1%
	Goldband snappers	-	-
	Ruby emperor	-	-
	Red emperor	10	27.8%
	Tricky snappers	14	38.8%
	Husa	2	5.6%
	Mixed	6	16.7%

### **Brisbane and Sydney Market Prices**

All fish arrived at the Sydney and Brisbane fish markets in good condition. Most fish sold at, or close to, the maximum price paid on the day. The Sydney market generally paid higher prices for the red snapper. The Brisbane market on average paid higher prices for the remainder of the catch. It should be noted that market prices vary from day to day. A week later Sydney offered higher prices than Brisbane for the same species of fish. Table 12 has combined Sydney and Brisbane prices so as not to favour one market over the other.

**Table 12. List of the main species sold indicating the highest, lowest and average prices received**

Common Name (NT)	Low Price / kg	High Price / kg	Average Price /kg
Red snapper	\$2.50	\$5.80	\$4.15
Ruby emperor	\$2.90	\$6.10	\$4.50
Red emperor	\$7.92	\$12.00	\$9.96
Goldband snapper	\$5.00	\$9.40	\$7.20
Cod	\$5.04	\$6.00	\$5.52
Husa	\$2.70	\$3.10	\$2.90
Tricky Snapper	\$3.50	\$6.20	\$4.45
Trevally	\$0.80	\$4.80	\$2.80
Mixed fish	\$3.10	\$10.59	\$6.85

### **Economic Analysis of Drop Lining in the Timor Sea**

Evaluating, over two weeks, the commercial viability of a large unexplored area of sea has proven to be the most difficult objective. Commercial fish species were found in reasonable quantities and markets exist for the fish. This should indicate that at least a small viable commercial fishery will develop. However prices are known to fluctuate and catch rates at other times of the year may vary greatly from those achieved during the survey. Probably the best indication that the fishery has potential came from the industry. Within weeks of the survey finishing many demersal fishers and potential demersal fishers contacted the Fisheries Division. They generally expressed their approval of the project findings. They also indicated that there will be increased effort in the Demersal Fishery especially in the area west of Darwin.

There are inherent problems with using short exploratory surveys to predict the long term economic viability of a fishery. During this survey the prime focus was to discover if commercial quantities of fish could be found and caught. Normally commercial fishers target schools of fish which tend to be found on (marks/spots/grounds) which can be revisited trip after trip. One or two short trips will not substantiate long term fishing viability. It is up to individual fishers to build a databank of locations which can be visited regularly.

#### ***The Representative Boat***

The representative boat used in Table 3 is a hypothetical drop liner which would be in the mid range of boats working the Timor Reef Fishery, as far as value, size and fishing power are concerned. On the other hand, this boat might be regarded as being at the upper end of the scale for boats working other offshore reef areas.

#### ***Indicative Results***

Although a full day commercially fishing on a productive fish mark was never undertaken during the survey, 700 kgs was landed by the Deep Tempest at one site. Fish prices achieved at the Brisbane and Sydney fish markets ranged between \$0.80 and \$12.00 per kilogram but averaged around \$4.50 per kilogram. Using the above figures and taking into account the assumptions made in Table 3 it appears that the project could have been commercially viable at least on one day (see Table 13). (Note: print outs of the detailed economic model which includes additional information such as fuel price and consumption, is available on request from the NT Department of Primary Industry and Fisheries.)

The following table details the possible annual return to capital for a drop line vessel, operating in the south east Timor sea, for a range of catch rates and prices. For example, a fisherman catching 600 kg per day and receiving an average price of \$4.00/kg could earn a 16 per cent annual return on capital.

**Table 13. Annual percentage return on capital for a range of catch rates and prices.**  
(the highlighted numbers represent the catch, price and annual percentage return on capital if the best five hours fishing during the charter are indicative of an average fishing day)

Catch Rate (kg/day)	Whole Fish Prices (\$/kg)			
	4.00	4.50	5.00	5.50
400	(1)	4	10	15
500	8	14	20	27
600	16	24	31	39
<b>700</b>	25	<b>33</b>	42	51
800	33	43	53	63
900	41	53	64	76
1000	50	63	75	88

It would appear there is potential to increase prices by developing a regular supply to the market and creating a reputation for consistent high quality fish. NTFIC is presently initiating and supporting projects which focus on market development. There is less certainty about the potential to maintain or increase catch rates, although new fisheries generally have a history of increasing productivity in the early years.

The fish are assumed to be marketed in Sydney or Brisbane and road freighted in bulk containers. Road freighting involves a considerable saving of about \$0.90/kg compared to airfreight. There is some indication that prices in the order of \$5.00 - \$5.50/kg may be obtained abroad (INFOFISH). The cost of airfreighting to near Asian cities is estimated to be about \$1.25/kg more than road freighting to Sydney. Although the Sydney prices would still be more attractive at the assumed levels, the overseas markets may be more attractive during the southern winter when prices usually fall.

There is considerable potential for variation in the capital value of boats which might work in the Timor sea red snapper fishery. The values used in the example could be considered an average for a boat aged 10 years or more. Newer, larger and more expensive boats would generally yield lower annual return to capital. Such declines might be offset by increased fishing power (eg. more droplines and crew, or better fish finding technology). As an indication of the effect of boat value on profitability, the effect of doubling the boat value (starting and salvage value) but keeping all other costs constant, reduced the annual return to capital from 33% to 15%. Trebling boat value could decrease annual return to capital to 8.7%. However this is all speculative and is very dependent on the type of boats / fishing equipment, the skills of the fishers and marketing strategies.

### **Publications**

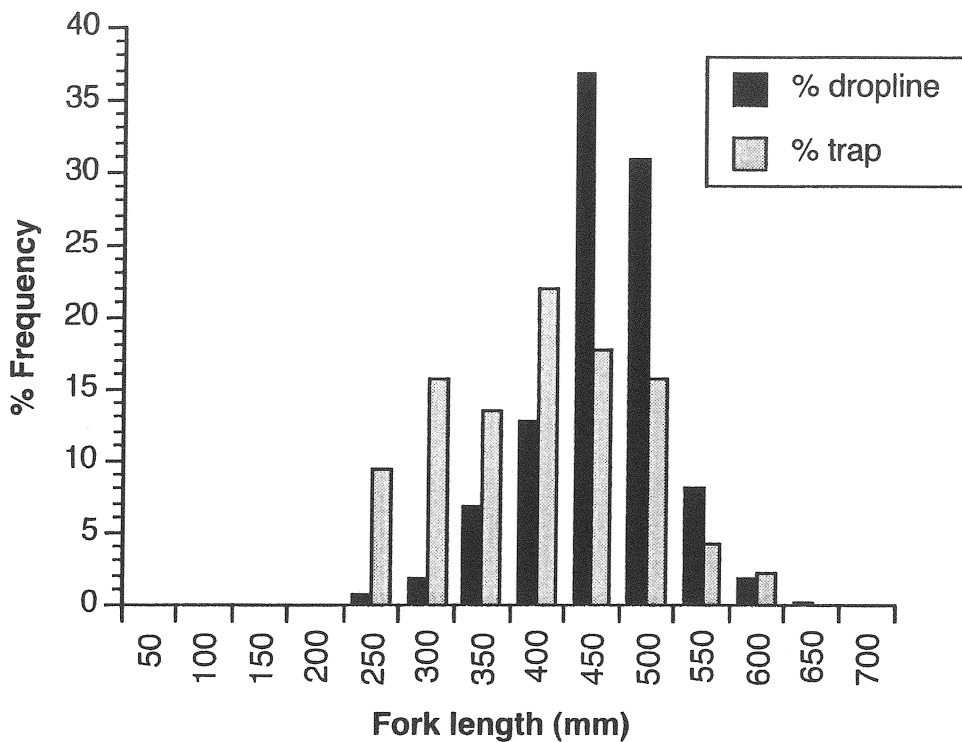
Two magazine articles have been accepted for publication. One to the Northern Territory Fishing Industry Council for it's Fishing Industry New magazine and the other to the Technology Section at INFOFISH in Malaysia for their INFOFISH International magazine (see Appendix 4 for details).

### Base line Data

A total of 1,444 fish were identified and measured from the drop line and trap catches. This represented 42% of the total catch. In addition all fish caught in the trammel nets (110 fish) were identified and measured. This information together with catch and effort data previously described gives essential baseline data which will be of value if this fishery develops.

### Length Frequency:- Trap and Drop line

The size range of fish caught by traps and drop lines as shown in Fig. 9 appears the same. However 68% of the fish caught on the drop lines were found in the 400 mm to 500 mm size range while the size range of the trap caught fish was more evenly distributed.



**Fig 9. Length Frequency For Trap & Drop lines**

Most red snapper caught were within a narrow size range (83% between 450 and 550 mm FL), whereas red emperor, goldband snapper and ruby emperor were within a broader range (250 and 700 mm FL) (Fig.10).

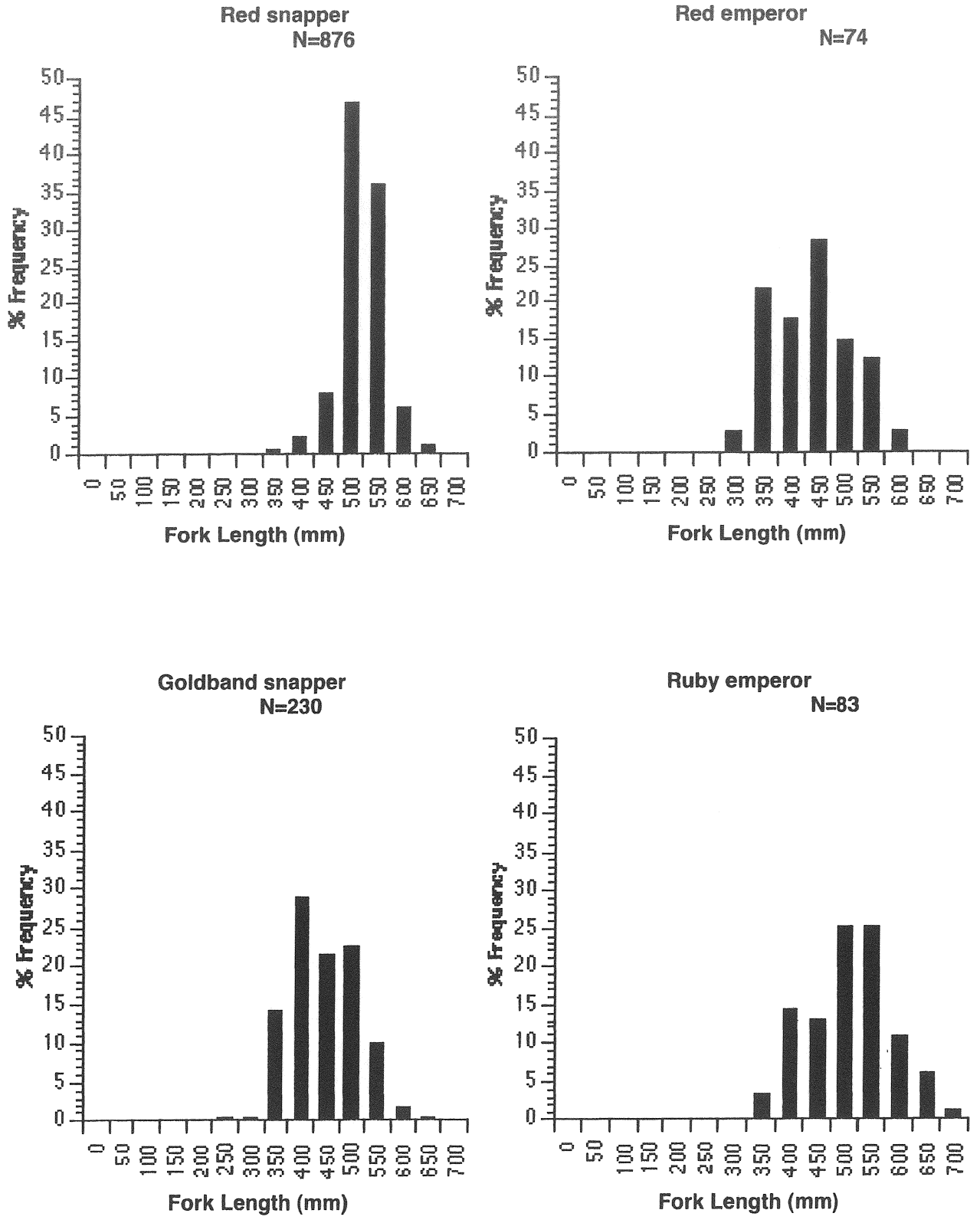
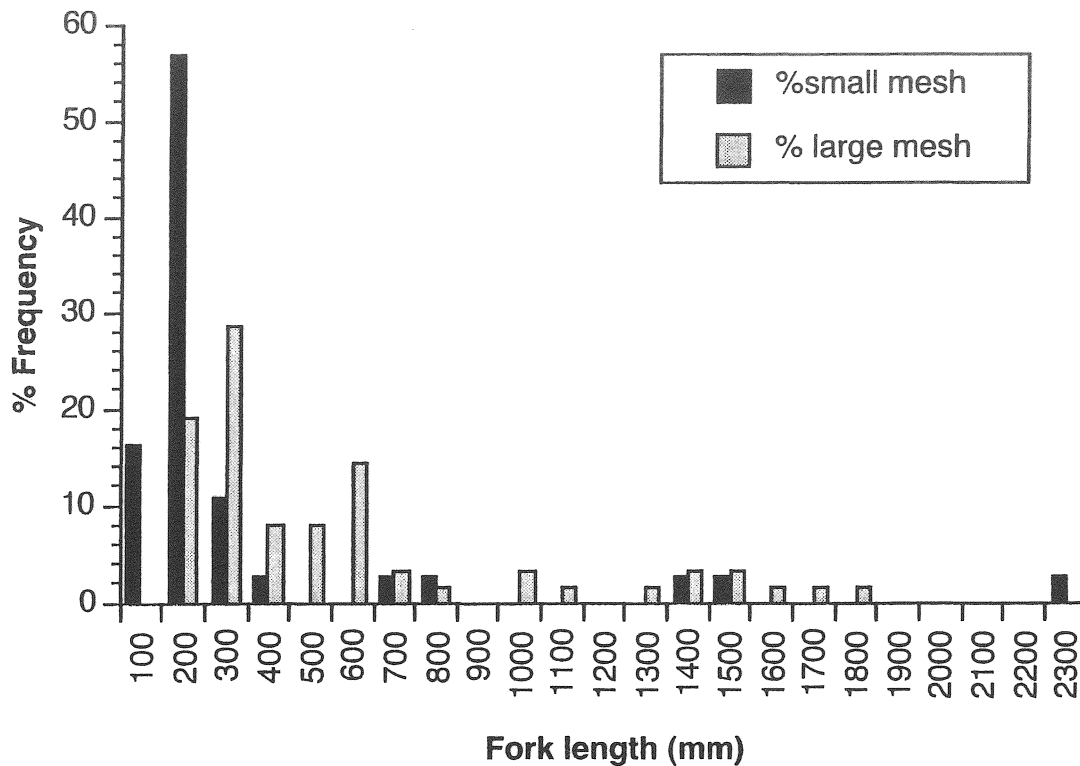


Fig 10. Drop line Length Frequencies For Four Major Species

### Trammel nets

A total of 110 fish were caught from eight trammel net sets. The size of the fish caught in the combined nets ranged from 74 mm to 2,250 mm. Eighty-four percent of the fish from the smaller mesh trammel net were in the 0 to 300 mm size range, while 78% of the fish from the larger net were in the 200 mm to 600 mm size range. However both nets managed to catch fish through out the range (Fig. 11).



**Fig 11. Length Frequency for Trammel nets (all Fish)**

The trammel nets produced a greater size range and species make-up (see Table 14) than either the traps or drop lines and with further development will no doubt be an excellent research sampling tool.

**Table 14. Identification and number of fish caught from the traps and drop lines.**

Scientific Name	Common Name	Number Caught
<i>Ateomycterus fasciatis</i>	Long-lipped spotted catshark	1
<i>Rhizoprionodon acutus</i>	Milkshark	4
<i>Carcharhinus plumbeus</i>	Sandbar shark	4
<i>Carcharhinus dussumieri</i>	Whitecheek shark	1
<i>Carcharhinus tilstoni</i>	Black-tip shark	10
<i>Carcharhinus brevipinna</i>	Spinner shark	1
<i>Carcharhinus macloti</i>	Hardnose shark	1
<i>Carcharhinus amblyrhynchos</i>	Graceful shark	1
<i>Carcharhinus limbatus</i>	Blacktip shark	2

**Table 14. Continued**

Scientific Name	Common Name	Number Caught
<i>Sacrida undesquamis</i>	Checkered lizardfish	1
<i>Aridae</i> spp.	Catfish	1
<i>Arius thalassinus</i>	Giant salmon catfish	4
<i>Platycephalidae</i>	Flathead	3
<i>Suggrundus</i> spp.	Brown margined flathead	1
<i>Rachycentron canadum</i>	Black kingfish	1
<i>Echeneis nalcrates</i>	Slender sucker fish	1
<i>Pristipomoides multidens</i>	Goldband snapper	10
<i>Lutjanus vittus</i>	Husa	19
<i>Lujanus sebae</i>	Red emperor	4
<i>Lujanus malabaricus</i>	Ruby Emperor	3
<i>Lujanus russelli</i>	Russell's snapper	3
<i>Lujanus argentimaculatus</i>	Mangrove jack	2
<i>Nemipterus peronii</i>	Notched threadfin bream	6
<i>Nemipterus celebicus</i>	Five-lined threadfin bream	5
<i>Pentapodus porosus</i>	North-west whiptail	9
<i>Scolopsis taeniopterus</i>	Red-spot monocle bream	1
<i>Nemipterus hexodon</i>	Ornate threadfin bream	3
<i>Diagrama pictum</i>	Painted sweetlip	1
<i>Lethrinus laticaudis</i>	No common name	1
<i>Choerodon manostigma</i>	Dark-spot tuskfish	1
<i>Psettodes eromei</i>	Tropical halibut	1
<i>Pseudorhombus dupliciocellatus</i>	Three twin-spot flounder	1
<i>Cynoglossidae</i> spp.	Tongue soles	1
<i>Abalistes stellaris</i>	Starry triggerfish	1
<i>Paramonacanthus filicauda</i>	Threadfin leatherjacket	1

## BENEFITS

The project results are expected to stimulate an increase in the value of the demersal reef fish industry in Northern Australia through the extra supply of fish to southern markets and/or to new export markets in Asia. All tropical demersal fishers will benefit directly from improvements made to the drop line fishing gear for the catching of red snapper. This report will assist new demersal fishers targeting red snapper through the supply of GPS coordinates, depths and methods. By opening up new areas, under utilised demersal licences may realise their full potential. The collection of data from a near virgin fishery will benefit scientists and managers of northern Australian and southern Indonesian offshore fish stocks.



Queensland and NT deepwater reef fisheries slow down during the south easterly windy season (June to August). Generally fishing grounds close to Darwin are not as badly affected by these conditions. East coast markets will benefit from more regular fish supplies. Service industries in Darwin which supply fuel and other vessel requirements will benefit, as will fish handling / freight companies.

Western Australian fishers will benefit if they develop their grounds adjoining the new NT grounds and tap into the infrastructure already in place in Darwin.

If the market for red snapper develops and prices increase a fishery could open up across northern Australia. With at least another 5,000 tonnes (NT Fisheries Report No. 39) of red snapper available for annual exploitation in the Arafura Sea and Gulf of Carpentaria, the fishery has the potential to make a significant contribution into the NT economy.

Large Trevally (*Caranx spp.*) and Tricky snapper (*Lethrinus fraenatus*) sold for better than expected prices on southern markets and have generated interest from Asian buyers. The potential exploitation rates for these fish are as yet unknown but both species are common around the NT coast.

The INFOFISH article will inform potential Asian buyers on the quality of demersal fish available in northern Australia. This should lead to an increase in demand and directly assist NT demersal fishers who are looking for alternative markets.

## INTELLECTUAL PROPERTY

Valuable information gathered during this project is freely available to the industry and the public.

## FURTHER DEVELOPMENTS

The project has proven that it is possible to catch reasonable quantities of red snapper relatively close to Darwin. Only time will tell if commercial fishers will be able to economically harvest the resource.

The development of markets for red snapper is probably the single most important thing to ensure the long term viability of the fishery. The fish have a prime fresh fish shelf life of three weeks. They can be caught within 12 hours travelling time from Darwin's international airport. They are popular on international markets and the price over the last few years has steadily increased. These facts should indicate that the troubles encountered selling the fish at present would be reduced if a marketing program was put into place.

Alternatively if the world market for fresh red snapper drops or doesn't increase to around \$5 / kg then the possibility of supplying frozen product should be seriously investigated.

NTFIC should continue with their four phase development plan of the offshore demersal stocks, complemented with a marketing drive for red snapper. The phase one and two have been successful in finding reasonable concentrations of red snapper. However given the size of NT waters and the small amount of exploration work carried out to date, more exploratory work is needed. Red snapper can be caught by non-trawl harvest methods provided they can be located regularly and reliably. Ground fish fisheries across northern Australia may develop rapidly if the relationship between snapper aggregations and bottom type, season and area, can be established. To this end, continued industry-government collaboration is required to detail seabed features and fish aggregations across northern Australia.

## STAFF

Name	Mr Richard Mounsey	
Position/Time	Senior Fishing Gear Technologist	20%
Qualification	Master 5	
Skills	Gear technology, fishing methods, industry extension Project management	

Name	Mr John MacCartie	
Position/Time	Technical Officer	20%
Qualification	6 years experience in fisheries R&D	
Skills	Gear technology, industry extension, data collection	

Name	Brian Cann	
Position/Time	Economist	5%
Qualification	BAGec	
Skills	Economic analysis, computer modelling	

Name	Ms Julie Lloyd	
Position/Time	Research Officer	10%
Qualification	BSc	
Skills	Biology and ecology of fish, research methods, project management	

Name	Mr Neville Gill	
Position/Time	Technical Officer	15%
Qualification	15 years Fisheries R&D	
Skills	Gear Technology, Industry Extension, data collection, processing	

Name	Mr Bruce Young-Smith	
Position/Time	Executive Officer	2.5%
Qualification	Experience in Administrative Support/Finance	
Skills	Clerical/Financial Support	

#### **FINAL COST**

The total cost of the project was estimated at \$153,477 including a FRDC pro-active grant of \$70,367. The project was completed slightly under budget. (financial statement forwarded separately to FRDC)

#### **DISTRIBUTION**

This report will be forwarded to:-

1. The NSW Fresh Fish Market
2. The Raptis Fish Market in Queensland
3. The Western Australian Fisheries Department
4. The Queensland Fisheries Management Authority.
5. The International Food Institute of Queensland
6. The Northern Territory Fishing Industry Council
7. The Members of the Project Steering Committee, and
8. NT Licensed Demersal Fishers.

#### **ACKNOWLEDGMENTS**

The Northern Territory Fisheries Division gratefully acknowledges the guidance and assistance from industry members of the Steering Committee, Graham McMahon, Clive Perry, Wayne Bishop and Iain Smith. The Division also wishes to thank the skippers involved on the project, Murray Angwin, Wayne Bishop, Mal Reid and Bill Mounsey for their collaboration, expertise and enthusiasm. A special thanks is extended to the crew of both vessels.

APPENDIX 1.

NON TRAWL HARVEST METHODS STEERING COMMITTEE  
MEETING HELD ON WEDNESDAY  
31 JULY 1996

MINUTES

	<i>Fisheries</i>	<i>Industry</i>
<b>Present:</b>	Rex Pyne (Chairman) Richard Mounsey John MacCartie Chris Calogeras Julie Lloyd	Graham McMahon Iain Smith Wayne Bishop
<b>Apology:</b>	Clive Perry ( <i>Industry</i> )	

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**Introduction**

- i Richard Mounsey opened the meeting by advising that FRDC had agreed to the project to the amount of \$70,300. The contract has been signed by Peter Blake (Secretary, DPIF) and is in the process of being sent back to Canberra. Any major changes to the project will need to be approved in writing. The provisional date for the charter is 7 October 1996.
- i Graham McMahon raised some issues with regard to the contract which he suggested required amendment:
  - the stipulation that the charter must spend one hour at each mark should be deleted;
  - a guaranteed price per kilo of fish caught is a better payment method than a straight amount per day charter fee; and
  - the marketing aspect should go hand in hand with proving the existence of the resource.
- i Rex Pyne commented that the objective of the project is to measure the size and composition of the resource and the ability to catch it with non trawl gear. The marketing aspect is important but not an integral part of the project approved by FRDC.
- i The Committee agreed that proving the extent of the resource in this fishery should take priority over the Gulf of Carpentaria project, and that a market project should be developed for 1997/98.
- i It was agreed that changes in the project were not necessary but the stipulation of one hour at each mark would be given a flexible interpretation in order to maintain a balance between commercial and research interests.

**1. Composition of the Steering Committee**

It was agreed that the present composition of the Steering Committee should remain unchanged.

**2. The Desk Top Study**

- i It was explained that the Desk Top Study is an exercise to bring together all the factors relevant to identifying the best fishing areas before the charter commences.
- i It was agreed that preparatory work should continue up to the time a successful tenderer was selected. This was expected to be towards the end of September. The intensive desk top study would then be undertaken with the successful skipper.

**Action:** *Preparatory work for desk top study to be carried out by the Division's Technology Section.*

### 3. Tender Documents for Vessel Charter

- ï It was noted that 14 instead of 16 days was used in the tender documents because it is easier to extend the duration of the charter by negotiation than to reduce it.
- ï In essence, two vessels would be chartered each for an eight day trip.
- ï It was agreed that the tender document should be amended to stipulate:
  - one vessel suitable for traps and/or trammel nets and dropline; and
  - one vessel suitable for dropline and trammel nets.
- ï It was agreed that the reference in the draft advertisement to “24 months experience in deep water dropline fisheries” be amended to 12 months experience.
- ï It was agreed that members of the Committee will be provided with the finalised copies of the tender document, the contract and the project proposal.

*Action: Provide members with final copies of tender document, contract and project proposal.*

### 4. Selection Process

- ï It was agreed that the Fisheries Division should control the selection process but if required consultation could take place with their Industry counterparts before any selection is finalised.
- ï It was agreed that the lowest tender will not necessarily win.
- ï Reference to a \$1,300 a day charter fee will be deleted from the tender document.

### 5. Agreement on the Vessel Charter Contracts

Already covered by discussion under previous items.

### 6. Developing Project Phases Three and Four

- ï A discussion took place on whether the marketing program should be a separate project or form part of Phase 2. It was noted that a marketing program could relate to all three projects (Timor Sea, Gulf of Carpentaria and Western Arafura) in so far as the same species are common to all three fisheries.
- ï Rex Pyne commented that the results of the first trial, together with the results of the forthcoming trial, should provide sufficient material for a proposal to FRDC on a marketing project.
- ï It was agreed that in order to have something ready by the deadline of early December a draft project document should be prepared now, making assumptions that commercial resources are proven to exist. The draft document should be available by 6 September 1996 so that it can be discussed at the 9 September NTFIC meeting.
- ï The draft document can be reviewed in the light of material which subsequently becomes available.
- ï Some discontent was expressed by Industry representatives that the evaluation report on the first trial had not yet been produced. Rex undertook to report back quickly on the status of this report.
- ï Julie Lloyd will analyse and report on data from the October charters.
- ï Richard Mounsey will write up the evaluation report.

*Action: Rex Pyne to report on the status of the first trial report as soon as possible.  
Richard Mounsey to write the evaluation report on the October charters.  
Draft project document to be prepared by 6 September 1996.*

### Next Meeting

- ï The date of the next meeting will be advised later, after the tenders had been processed.
- ï Consideration will be given to changing the name of the Steering Committee to the Timor Sea Evaluation Committee.

Meeting closed at 1055 hrs.

**NON TRAWL HARVEST METHODS  
STEERING COMMITTEE MEETING**

**CRUISE PLAN MEETING**

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<b>Present:</b>	<i><b>Fisheries</b></i>	<i><b>Industry</b></i>
	<b>Richard Mounsey</b> <b>John MacCartie</b> <b>Neville Gill</b> <b>Julie Lloyd</b>	<b>Graham McMahon</b> <b>Wayne Bishop</b> <b>Clive Perry</b> <b>Malcolm Reid</b>

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### **Introduction**

- Richard Mounsey opened the meeting by advising that the initial part of the desk top study to plot rises and falls in the sea bed in the proposed fishing area had been completed.
- Graham McMahon raised the points that; 1. The group should consider the coastal line fishermen in this project and 2. The exploratory fishing operations should not focus on gold band snapper.
- The group felt that operating in near shore waters may create a conflict with amateur fishers plus their vessels are not rigged for shallow water. They agreed that red snappers in general would be the target species. However the majority agreed that if gold band snapper or any other fish are taken in commercial quantities the information gained would benefit both fishers and researchers.

### **The Search Pattern**

- It was agreed that the two vessels would stay relatively close to one another. Searching would commence at approximately 128 degrees 10 minutes east and 11 degrees 20 minutes south. The vessels would then make their way in a south, south, easterly direction . The deeper waters of the region would be covered during this first cruise. The vessels would commence the second cruise at approximately 128 degrees 40 minutes east and 13 degrees 25 minutes south and make their way back towards Darwin in roughly a north easterly direction.

### **Fishing Strategies**

- They agreed that droplines will be the major gear used. If good quantities of commercial fish are found an attempt will be made to land as many fish as practical in the area before moving on in the planned direction.
- The traps and trammel nets will be used in a manner which has minimal impact on the dropline fishing.

### **Data Collection**

- Julie Lloyd spoke about the way she would like to see the data collected. The skippers agreed to fill in the same daily log sheets as they presently use in the Timor Reef Fishery. Richard Mounsey agreed to take responsibility for the data collected from the traps and trammel nets

### **Timing**

- Both vessels will begin the first charter at midday on October 7. This cruise should last 7 days. The second cruise will commence at midday on October 16 and last up to 9 days. The timing coincides with fish transport out of Darwin.

Meeting closed at approximately 1045hrs.

## APPENDIX 2.

### FRDC PROJECT PROPOSAL

#### EVALUATION OF NT DEMERSAL FISHING GROUNDS WEST OF DARWIN.

##### *FIRST FIELD TRIP CRUISE REPORT (DEEP TEMPEST)*

*Compiled by R. Mounsey*

The Northern Territory Fishing Industry Council requested the NT Fisheries Division to develop a FRDC application to fund the above project.

Given the geographical similarity between proven Northern Territory fishing grounds and areas west of Darwin there was no reason why these grounds should not contain commercial quantities of fish. Prior to this project, the exploration of the area had been limited. Virtually no productive demersal fin fish fishing presently takes place outside 15 nautical miles from the coast in this region. However five or six years ago commercial quantities of red snapper and ruby emperor were taken by trawlers in the southern section of the proposed area (south of 12 degrees 30 minutes south).

A desk top study took place at the start of the project which identified potential fishing grounds within the project area. This was done by transposing seabed sediment charts over bathometric charts for both the project area and proven grounds in other areas. Initial fishing effort would then be focussed on areas which were similar to known productive grounds.

Two vessels were chartered to undertake two trips (a total of 32 boat days). One vessel deployed dropline gear and under water video cameras while the other deployed traps, trammel nets and droplines. During the first charter period both vessels had difficulty finding productive fishing grounds. However on the 5th and 6th day a few promising areas were found in the 80 to 90 metre depth range and nearer shore in about 50 metres.

#### **CRUISE REPORT**

The vessels departed Darwin mid afternoon on Monday Oct 7 and headed for the NW section of the proposed project region. Searching for fish and grounds commenced about mid night (once we had cleared known areas) but little was observed (see travelling notes for details).

#### **Tuesday 8 October**

At daylight small marks of fish were observed on the echo sounder at 11 46.491 degrees south and 128 53.542 degrees east. Deep Tempest spent 1.5 hours searching but couldn't find enough fish to shoot it's lines at.

The vessel kept heading west. Ace of Spades was about 15 miles to the north of the Deep Tempest and also seeing small marks of fish but not enough to shoot a line at.

At 0900b hrs three lines were set from Deep Tempest on rugged reef ground at 11 47.203 and 128 40.044. No fish were caught. One dropline weight was lost and five hooks straightened. We left the area and continued heading west.

At 1200 hrs we reached the 100 metre depth contour at 128 21 8 and 11 54 7. Lots of bait or plankton was showing on the echo sounder. We began a search pattern zig-zagging between 110 and 90 metres and heading NNW.

By 1400 hrs no reasonable size fish schools had been found. We headed north back up into shallower water (65-75 metres). At 1515 hrs we spotted a fish mark but were unable to line the vessel up to shoot it. The mark was relatively small and after missing it a couples times because of a fresh southerly breeze it was finally lost.

Continued heading in a NW direction until dark. No fish were found. We decided to bait six traps and began searching for trap ground. By 2000 hrs no productive looking grounds had been found (looked at a few shoals but all were barren). We continued heading up to the NNW towards the possible gravel grounds.

At 2200 hrs the six traps were set on a very small lump at 11 20 and 128 15 30 in 70 metres and left over night. Deep Tempest dropped anchor near the traps at 2230 hrs.

Two droplines were fished from the vessel for 20 minutes but nothing was caught. The Ace of Spades was about 20 miles to the NW of us in deeper water and reported that they had only caught a few fish for the day.

### **Wednesday 9 October.**

We set the trammel net at 0600 hrs close to the traps but on fairly flat un-interesting ground.

At 0640 hrs to 0715 hrs we hauled the fish traps. Only nine reasonable (2 kgs) commercial size fish were landed. The WA traps fished worse than the collapsible traps.

The trammel net was retrieved at 0730 hrs. Only half a dozen black tip sharks and a hand full of non commercial species were taken (see data sheets for details).

The plan of attack for the day was for the Deep Tempest to continue searching in the northern most section of the ground and for the Ace of Spades to explore the deeper waters near the WA border. Note; the weather had improved from rough seas and about 25 knot winds to slight seas and no wind.

Deep Tempest came across numerous bait marks in 65 to 105 metres but no commercial fish were caught on the droplines before noon. One dropline was set on top of a shallow shoal at position 11 02 and 128 07. Only one large red bass and two small husa (*L. vittus*) were caught. Lots of fish marks were showing on the sounder but the ground was too rough to set the trammel net. Four traps were set, but they only caught a few red bass, trigger fish and one large trepang. As the sea calmed algae blooms were starting to appear on the surface.

The Ace of Spades was catching a few good fish about 10 miles to the south west. Deep Tempest moved towards the Ace of Spades and made two drops with the three hydraulic machines, six fish traps were also set. The droplines caught four sharp tooth and the traps caught 1 red emperor, 1 coral trout, 1 ruby emperor and 3 cods.

Ace of Spades reported that sharks had moved in and the fish had stopped biting. After searching shoal after shoal a decision was made to move out of the area and head south.

At 2230 hrs Ace of Spades and Deep Tempest dropped anchor near position 11 38 and 128 04. The ground in this area looked promising.

### **Thursday 10 October.**

0630 hrs. Deep Tempest set six traps on hard ground in the 85 to 95 metre depth range. Then both vessels began searching in the general area. The wind was fresher and from the NW. The trammel net was not set.

The Skipper (Mal) was not well. His face was numb and he had tingling feeling in his right arm and hand. We had eaten a coral trout on Wednesday evening. Mal ate most of it and I had a small piece. I also had a tingling feeling in my arms back and hands but no where near as bad as Mal. Mal spent most of the day in bed.

Both vessels began using throw away (free rig) droplines in an attempt to home in on fish.

The six traps that were set had missed their marks because of a misjudgment of the current. 3 red emperor, 2 goldband, 3 cods and few mixed fish were caught. The traps were reset but caught hardly anything. Nothing was taken from the few shots made with the droplines.

A decision to press on south wards was mutually agreed upon. Deep Tempest was to continue southwards about 10 miles east of the WA / NT border and search both on mud and hard grounds, while Ace of Spades took a similar path about 20 miles further to the east.

At 1200 hrs our three hydraulic droplines were set at position 11 46.07 and 128 07.667 on a small mark but again nothing was caught.

At 1400 hrs eight throw aways were set over a three hour period at position 11 58.0 and 128 14.05 on small patches of fish. Only 5 goldband, 2 sharp tooth, 4 red emperor, 9 red snapper, and 10 mixed reef fish were caught. Some of the marks looked promising but small fish keep stealing the baits.

Ace of Spades reported that she was also having difficulty finding fish down to the SE.

Deep Tempest set the traps at 2130 hrs at position 12 19 and 128 30 in around 85 metres of water. The Ace of Spades reported that she had 1400 litres of fuel left. We agreed that she should start looking at grounds back towards Darwin ie; north west of Flat Top Bank.

Deep Tempest dropped anchor near the traps at 2200 hrs.

#### **Friday 11 October.**

At 0550 hrs Deep Tempest set the trammel net near the fish traps but only caught two small fish, note; the fish marks which were showing the night before had vanished. The traps caught 2 red emperor, 10 white tipped sea perch (like small red snapper), 1 ruby emperor and few small mixed fish. The ground didn't look good enough to dropline on so we moved further south. Ace of Spades report that she had just had a run in with sharks and had lost a few dropline rigs. The sea was now covered in a filthy looking slime and getting worse. In places it smelt terrible. Both the traps and net were getting covered in the slime which appeared to be rising from the sea bed.

Mal was still not well so we decided to started heading in the general direction of Darwin. This meant that we would not get to the southern grounds as planned but we were all starting to become seriously concerned about Mal's health. Even Mal thought we should start heading towards home.

1000 hrs Deep Tempest set two throw away droplines on a small fish mark in 92 metres at approximately 12 24 and 128 39 but caught nothing. At 1100 hrs we spotted a good size mark on what appeared to be harder ground at 12 25.8 and 128 41.4. Ten throw away droplines were set over a one hour period. The catch consisted of 28 red snapper, 9 goldband, 5 sharp tooth, 4 ruby emperor, 3 red emperor and a few cods, trevally etc. Ace of Spades reported catching a few ruby emperor and was about to move further to the NE.

1200 hrs. Mal was up driving the boat again and looking some what better. We decided to spend a bit of time surveying the area to see how strong the ground was. We dropped a few lines on what must have been bait schools. The hydraulic rope hauler was leaking oil through a seal so we decided against setting the trammel net.

From 1420 hrs until 1700 hrs we spotted at least ten schools of fish containing red snapper and goldband. The schools were between 5 and 10 metres high but won't bite properly. Ten throw away droplines produced only 8 goldband, 1 sharp tooth, 1 red emperor, 15 red snapper and a few small mixed species. The slime rising from the bottom was getting worse.

We kept moving on to position 12 27.75 and 128 44.98. Mal, who had been sent back to bed got up feeling better and made two drops with the three hydraulic droplines. The catch was 8 goldband and 1 ruby emperor. We decided to leave the area and continue heading SE. The report from the Ace of Spades was that they were not catching much or finding any large fish schools.

Deep Tempest keep heading eastwards marking grounds to fish the next day. No more fish were caught. The trammel net was set on hard bottom with what appeared to bait type marks, at position 12 27.3 and 129 13.6. The anchor was finally dropped at 2300 hrs on a small shoal at position 12 27.23 and 129 14.08 (just south of Flat Top Bank). Handline fishing from the vessel produced only a few tricky snapper and Spanish flag.

#### **Saturday 12 October.**

Deep Tempest hauled the anchor at 0645 hrs. The fish traps were baited and set in a line on bumpy ground near the trammel net. The net was hauled at 0745 hrs. A couple of large sharks caused minor problems getting the net aboard. It took about 20 minutes to haul the net and about 30 minutes to clear the fish and restack it. About 40 fish were caught. These ranged from large sharks to tiny aquarium species, only a few commercial species were caught, these included ruby emperor and tricky snapper (see trammel data sheets for details).

0830 hrs Deep Tempest began surveying grounds to the south of Flat Top Bank. The Ace of Spades was still searching north of Flat Top Bank but reported that they were yet to find anything promising. Little pieces of hard ground holding small schools of fish started showing up in 65 metres around position 12 35 and 129 15. Five throw away droplines were set. The baits were stripped by small fish and only one large ruby emperor was caught. The area looked suited to trapping but the traps had been left behind near where we had anchored. We decided to push on and look at the grounds in the 70-80 metre depth range down to the SW.



All morning and most of the afternoon searching continued. However, the further south we went the flatter and more lifeless the grounds became. At 1500 hrs we decided to head west to see if we could find anything in the area about 20 miles south of where we were the day before. At position approximately 12 30 and 128 50, schools of bait began showing regularly on the sounder and lots of birds and tuna were observed on the surface. The Ace of Spades reported that she was still not catching and was making a sweep towards the Perron Islands.

At 1600 hrs we found good high (10 metres plus) fish marks at position 12 39,35 and 128 47.73. The three throw away lines along with the three hydraulic lines were set but they all missed the schools because of a strong westerly tide flow. After calculating the tide three lines were set. One line caught six large goldband and four large red snapper the other two missed the schools and only caught two goldband.

1730 hrs we decided to push on in a NW direction. A few small marks produced a couple of fish but nothing terribly exciting. A few unusual fish marks were observed after dark at position 12 30 and 128 53. The trammel net was set to investigate. We dropped anchor near the net at 2100 hrs.

### **Sunday 13 October.**

0630 hrs up anchor. Began searching for fish near the trammel net at position 12 29.0 and 128 52.3. Six droplines only produced 2 goldband and 3 or 4 little fish. The tide was running too hard to haul the net so we began searching a mile or so to the north of it. Big schools of fish were observed in a general area (ie; around 12 30.18 and 128 52.50).

From 31 drops of the throw away lines (note; 30 hooks per line) 242 fish were landed. These included 165 red snapper, 56 goldband, 3 ruby emperor, 3 red emperor, and 15 small mixed species. There were at least five good schools of fish in the area and the bottom was hard with some growth on it.

Slack water was about lunch time (note, the tide cycle in the area is the same as Darwin). We hauled the net at 1300 hrs and caught basically what we expected (ie. about 60 fish including a few large goldband snapper, sharks, crabs, and small reef fish). It took a little over an hour to haul and restack the net. Ace of Spades reported that they were starting to come on to a few better looking fish marks in the 50 metre depth, down to the SE of us.

1330 hrs. Mal starting feeling ill again so we began heading for home. On the way back we saw good fish marks at 12 30.36/128 58.28, **12 28.33/128 05.53** and 12 28.182/129 06.246. Only two lines were dropped on the way back. A couple of cod and one goldband were caught.

The traps were picked up from the south of Flat Top Bank at 1900 hrs. The catch consisted of 18 large red emperor, 2 ruby snapper and 6 very large tricky snapper. The collapsible traps don't seem to hold fish over long periods as well as the WA traps. But in general the traps seemed to be catching better than the droplines when only small marks were shot at.

At 1920 hrs we headed for Darwin.

### **Monday 14 October**

Arrived Darwin harbour at 0730 hrs but had to wait in line for an hour before entering the lock. The catch was unloaded. Deep Tempest had around 600 kgs and Ace of Spades about 200 kgs (note; exact weights will be available after the fish are sold).

## FRDC PROJECT PROPOSAL

### EVALUATION OF NT DEMERSAL FISHING GROUNDS WEST OF DARWIN.

#### *2nd FIELD TRIP CRUISE REPORT (DEEP TEMPEST)*

*Compiled by R. Mounsey*

#### **WEDNESDAY 16 OCTOBER 96**

Both Deep Tempest and the Ace of Spades departed Darwin harbour late in the afternoon. The plan was for the Ace of Spades to head directly to the area where the Deep Tempest finished drop lining on the last trip. By fishing this area again it should have given us an indication as to how well the ground held fish. The Deep Tempest, which was now carrying 12 traps, of various design, was to spend at least one or two days trapping the area south of Flat Top Bank (relatively close to Darwin). This was to be accomplished either on the way out or on the way in.

#### **THURSDAY 17 OCTOBER 96**

Deep Tempest arrived at position 12°26.73 S and 129°13.50 E at daylight. Six traps were set on light reef. The Ace of Spades reported that they were setting droplines about 20 miles to the west of us.

At 0715 hrs Deep Tempest left the six traps set and headed for a spot about an hour to the west. This area had been identified on the first cruise. Only one trap was set at position 12°28.38 and 129°04.64. It was left in the water for only 15 minutes (the mark was very small and we were only wasting time). One small goldband snapper was caught. We travelled back to the six traps and began hauling at 1000 hrs. They caught 10 red emperor, 4 ruby emperor, 12 large tricky snapper, 1 large cod and 1 coral trout. Four of these traps were reset.

The Ace of Spades reported that they were catching a few ruby emperor and goldband on new ground in the general area where the Deep Tempest finished drop lining last trip.

The Deep Tempest headed to the south east (3 miles) and set another four traps and one dropline on some what better looking reef in about 60 metres of water. The dropline (10/0 hooks) caught 4 red snapper and 2 small cods. We left the traps and headed NW to see what the fishing was like 5 or 6 miles away.

The remaining four traps were set at position 12°26.6 and 129°19.4 in 57 metres of water. We then hauled the first 4 traps that were set below Flat Top Bank. Only 1 tricky, 1 ruby emperor and 1 Russell snapper was caught. Two droplines were set in this area but caught nothing.

At 1500 hrs we hauled the four southern traps. The catch consisted of 4 large red emperor, 8 cod, 1 tricky and 1 ruby emperor. The Ace of Spades reported that they were catching about five good size commercial fish per dropline.

The eight traps, we had just hauled, remained on board as we retrieved the four set to the NW. The catch consisted of 10 red emperor, 5 large tricky's, 2 cod, 1 ruby emperor, 2 red snapper and 10 small mixed reef species. This piece of ground was reasonably large with low fish marks and benthos growth all over it. We could have stayed and undoubtable caught a few more fish but decided to keep exploring in a SW direction. The Ace of Spades reported that they were catching well. They were to the west of us in about 90 metres of water.

Searching continued down to the SW to position 12°44 and 129°09. At 2000 hrs we decided to sweep back up to the NW and cut through grounds which we had been skirting around on both trips. We intended to set the traps in deeper water over night and meet up with the Ace of Spades the next day.

The Ace of Spades reported dropping it's anchor around 1900 hrs and had caught between 250 and 300 kgs for the day. We had caught approximately 120 kgs (mainly emperor).

We started observing patches of hard ground at 12°35 and 129°00 but the tide and poor weather conditions made it unwise to set the traps in the dark. At 2300 hrs we finally dropped anchor at 12° 29.5 and 128° 55.

## FRIDAY 19 OCTOBER 96

Deep Tempest lifted the anchor at 0600 hrs. The throw away (free rig) droplines were prepared. 10/0, 11/0 and 13/0 tuna circle hooks were baited separately with squid and set up on the shooting racks.

A large school of fish was found at position 12°30.1 and 128°55.8. Two lines were set. The catch was 7 large red snapper and 9 good size goldband. We were only 7 miles to the east of the Ace of Spades and felt it would be a good opportunity to get some video footage from the other boat. The school of fish was left behind and we never got back to it.

The Ace of Spades was catching a few fish when we arrived. The 'Ace' moved off the fish and allowed us to set a couple of lines along with two fish traps. The fisheries officer on board the 'Ace' filmed the Deep Tempest setting and retrieving gear.

This area was where the Deep Tempest found good concentrations of fish on the previous trip. The Ace of Spades had fished this area the day before. We decided to also put in at least half a day fishing to see how strong this ground was (ie; could this ground sustain moderate fishing pressure). We also wanted to compare various hook sizes and maybe the chain dropline rigs (if sharks became a problem) and we needed consistent catches per line to do so. The Ace of Spades had already taken over one hundred and fifty fish from the mark before we arrived.

The 'Ace' moved off and began searching to the north. They reported finding a few small marks not far away. They continued searching for an hour or two, finishing well up to the NW of us. They reported finding a large fish mark at about 1200 hrs but lost it after only catching a few good fish.

The catch rates for the Deep Tempest varied during the day, with the best being around 100 fish per hour. By far the most dominate specie was the red snapper, with goldband a distant second. The smaller hook sizes appeared to work better but this data still needs to be analysed. No sharks were encountered so the chain rigs were not used during the morning.

After lunch we moved a mile or two to the south and encountered sharks. Three out of four lines set were destroyed. We were left with two options; either move on or try the new chain bottom rigs.

The new rigs worked well (no problems setting hauling or catching fish). On the third shot we caught a large tiger shark with a very fat belly. It had the chain in it's mouth and was crunching on it. After giving it two barrels from a shot gun it came aboard quietly. Inside it's stomach were six large snapper, one red emperor and two cods. All the fish had hooks in their mouths (our hooks). Swivels, rope, swages and mono line were also found in the shark.

After the shark was disposed of, our gear loss problems abated, even though smaller sharks were still pinching the odd fish. We ended up fouling one of the chain droplines around a coral head and lost 10 hooks (note; these rigs will need to incorporate weak links or extra flotation to reduce gear losses on hard grounds).

We stopped fishing at 1745 hrs and prepared the traps for setting (note; two traps that were set early in the day caught 4 red emperor, 2 gold band and 2 red snapper). The total catch from the droplines for the day was 434 reasonable size commercial fish. These included 51 gold band, 6 ruby emperor, 19 red emperor, 7 cod and 359 red snapper.

The Ace of Spades reported finding large schools of fish about 12 miles to the west of us and was catching well.

At 1830 hrs all 12 traps were set. Strong currents made it difficult to set the traps on the reef (they kept missing their targets). Deep Tempest dropped anchor at 2000 hrs. Our total catch for the day was in excess of 500 kgs.

## SATURDAY 19 OCTOBER 96

The anchor was hauled at 0600 hrs. We started retrieving the traps at around 0630 hrs. A total of 83 fish were caught. They consisted of 22 red emperor, 43 red snapper, 2 goldband, 3 cod and 13 small mixed species. The traps were folded and stacked away. We then commenced searching with the droplines to the SE of where we fished the day before. At 0815 hrs a few small schools of fish were found at position 12°39.09 and 128°53.0. The early morning report from the Ace of Spades was that they had landed

around 40 red snapper while still on the anchor and they intended to further survey/fish the area during the morning.

We dropped seven lines in around 90 metres of water. The fish were patchy. A total of 25 fish were caught and consisted of 18 red snapper, 3 red emperor, 2 goldband, 2 cod and 1 trevally. The area had fish but we decided to make a big move to the SW (a storm front had hit us which was making it difficult to set and retrieve lines). The 0930 hrs report from the Ace of Spades informed us that they had landed over 90 fish for the morning and intended to stay in the area at least for a few hours.

At 1030 hrs we came onto some good bottom at position 12°33.5 and 128°49.7. Three lines were dropped. Only five commercial fish were caught. The sea conditions were getting worse. This combined with the strong current was making it increasingly difficult to hit the fish marks with the droplines. We decided to keep moving in search of greener pastures. At 1230 hrs we came onto hard ground (position 12°39.31 and 128°47.7) with very good snapper marks. We fished for 1.5 hrs but the fish wouldn't bite. We caught a couple of goldband along with a few large red snapper. We pushed on to position 12°40.4 and 128°41.1. Scattered marks were observed over a wide area. Ten lines were set and caught 93 good big commercial fish ie; 23 goldband, 13 ruby emperor, 7 red emperor and 52 red snapper. A large tiger shark took off with one of our lines. After chasing it for sometime and finally getting the line back undamaged we lost the school of fish. (We actually saw the shark; it was a 12 to 14 foot tiger) Sharks could also have had something to do with the fish disappearing.

We went searching for 3/4 of an hour and found three schools about half a mile away. We dropped a dozen lines before dark and hauled aboard 75 good sized fish. The Ace of Spades reported that they were six miles to the NW of us and had caught approximately 140 fish for the day. We ended up with around 290 fish (approx' 500 kgs).

## **SUNDAY 20 OCTOBER 96**

Deep Tempest hauled its anchor at 0630 hrs and began searching in a similar area to where the fish were caught the day before. There was plenty of bait near the bottom in the area and a few small good looking fish schools. We spent the whole morning fishing and searching the area. The Ace of Spades was surveying the area about 6 to 10 miles to the NW of us. They reported spotting some good hard looking bottom holding fish but had no luck catching any commercial species (they suggested that traps maybe OK in the area).

We set 34 lines and one fish trap. The lines caught 165 good size fish (around 2 kgs each). The single trap caught 11 fish, including 5 red emperor, 2 red snapper and 4 goldband. The fish from the lines included 23 goldband, 12 ruby emperor, 9 red emperor, 3 cod and the remainder were large red snappers.

A storm front hit us just after lunch so we decided to pack the fish in the ice room and push on. The Ace of Spades had met up with us. She stayed in the area but had to idle into the seas. The wind was blowing at 35 to 40 knots. We headed into the SW and looked at grounds along the NT/WA border. The Ace of Spades began searching again. About an hour from where we were catching fish they found good fish marks at 12°41.2 and 128°49.9. and reported landing approximately 350 kgs. Mainly goldband and ruby emperor.

The Ace of Spades then proceeded south during the evening. We began to look for hard ground south of 13°00 S and west of 129°00 E. We spotted some promising fish schools at 13°00.74 and 128°35.57. There were at least 5 or 6 schools but it was getting dark and the bottom didn't look like it would hold fish so we decided to keep searching for hard ground before dropping the anchor.

The anchor was dropped on the edge of a trench at position 13°10 and 128°52. Our catch for the day was approximately 300 kgs.

## **MONDAY 21 OCTOBER**

At 0600 hrs we began searching along a trench which ran down to the SE. Lots of bait fish marks were observed but nothing else. We then headed SW looking at lumps and bumps. Most of these features were mud rises or holes and had no decent fish on them. While we were heading south the Ace of Spades was searching around position 128°50 and 12°55. The plan was for us to investigate the more distant grounds and the 'Ace' to explore relatively close (within 25 miles) to where good fish had been caught, then look at the near shore grounds, in a day or so, on their return to Darwin.

We zig-zagged as far south as 13°30 S, then east to 129°15 E. The eastern area looked better than the muddy southern area.

At 1330 hrs the 'Ace' reported finding a new patch of commercial fish a little east of where they were fishing the evening before.

It wasn't until 1630 hrs that we found a mark good enough to shot a line at. It was a very small hard lump at position 13°03.00 and 129°03.1 in 70 metres of water. Nine lines were set. A total of 69 fish were caught. This consisted of 14 large ruby emperor, 3 red emperor, 3 cod, 2 spangled emperor and the remainder were large red snapper. It was a promising spot but it was getting late and we still had a fair number of areas to investigate.

At 2300 hrs we set the fish traps at position 12°41.5 and 128°41.5. They were simply shot over the stern with little or no time being taken to make sure they landed on good ground. (note; the skipper and crew were all tied and the traps had been baited earlier in the day and nobody felt like unbaiting smelly traps at 2300 hrs). Our catch for the day was only 140 kgs.

## **TUESDAY 22 OCTOBER 96**

The anchor was hauled at 0620 hrs. The fresh SW wind from the night before had changed to a stiff easterly breeze. The sea was quite bumpy as we hauled the fish traps. Sea lice had picked all the baits clean and only two dozen fish were caught; mainly red emperor and ruby emperor.

The Ace of Spades reported in at 0800 hrs. She was at position 12°40.112 and 129°00 and had just set a couple of lines. The skipper on the 'Ace' was uncertain about how he would spend the last three days at sea. As far as the survey was concerned the 'Ace' only needed to investigate grounds to the SE which should not have taken more than a day. The remaining two days could be spent fishing where ever the skipper wished (note; the 'Ace' was running low on fuel and was limited to where it could go).

We dropped eight lines 1.5 miles to the east of where we had the traps. The catch consisted of 40 good size fish and included 16 goldband, 5 red emperor, 13 ruby emperor and the remainder were tricky/red snapper. We could have stayed on this mark but it was difficult to land the lines on the targets due to cross currents and a sloppy sea.

We headed north for 1.5 hours to an area we had fished earlier. There were numerous schools of fish in the area and we spent the afternoon fishing there.

From the 44 lines set we landed 415 fish. They were mainly red snapper (about 1.6 kgs each) along with a scattering of goldband and ruby emperor.

The Ace of Spades reported in a number of times during the day. They were searching down to the SE of us but weren't finding much in the way of commercial species. The skipper of the Ace of Spades elected to spend the last couple of days fishing in the shallower sector of the survey area (ie; near to Darwin). We decided to stay in the 80 to 95 metre depth range for another day and then to look at possible trapping south east of Flat Top Bank on the last fishing day.

We dropped anchor at 1845 hrs and packed the fish in ice. The total catch for the day was about 700 kgs.

## **WEDNESDAY 23 OCTOBER 96**

During the early hours of the morning we were hit by a violent tropical thunder storm. The anchor dragged and we were taking waves across the deck. After a couple of hours straightening up the mess we finally hauled the anchor at 0714 hrs and began to search for fish.

The Ace of Spades reported finding a large school of squid during the night but nothing in the way of fish. We found good fish near where we finished the day before. We dropped 11 lines for 84 fish (95% red snapper). The fish, although small, were still biting strong but we decided to do a bit more searching to see if we could find more grounds and bigger fish.

At 1015 hrs we found a new hard lump two miles to the south, at position 12°31.853 and 128°53.102. We only dropped three lines. Two hit their marks, one missed (note; the seas were rough making it difficult to

read the echo sounder). The catch consisted of 16 goldband, 1 ruby emperor, 1 red emperor and one cod. We most likely could have caught more fish but decided to see what else was around.

About 1.5 miles farther south, at position 12°33.25 and 128°53.92, we spotted a small mark and dropped one line. A goldband along with one Russell snapper was caught. The fish were congregating over a hard patch of ground and after working out the tide from the first drop we were sure we could have taken a good few fish off this mark. This however would have taken up valuable time so instead we decided to keep moving simply to find out how many hard patches one would likely find simply cruising around the area.(note: at this stage our objective was not to land lots of fish. It was to get an insight on how strong these grounds are)

The Ace of Spades reported that they were drop lining small reef fish along the 30 metre contour SE of us.

We spotted fish marks at 12°41.21 and 128°49.94. This was an area the Ace of Spades had caught good large fish on a few days earlier. A couple of lines were set to see if these large fish were still there. We caught 7 very large goldband, 3 large red snapper, a large cod and some type of kingfish. We kept moving as we were running out of charter time and we wanted to find out if other marks which we had previously done well on were still holding fish.

At 1430 hrs we tested another mark at position 12°39.38 and 128°47.70. Three lines were set. The catch consisted of 6 gold band, 1 ruby emperor, 2 cod, 3 large red snapper and 1 unknown (looked like a three or four kilogram kingfish). There were fish in the area but we pushed on.

At 1530 hrs the Ace of Spades reported that they were still catching small fish in shallow. We dropped a couple of lines into fish marks (could have been bait fish) but caught nothing. We went to an area we had fished the morning before. There were a couple of good looking fish marks. Only one line was set. We landed one large sharp tooth snapper, a big red snapper and one cod. The fish were still there but there was another area close by which we had fished three days before, so we didn't hang about. It was getting late in the day and the next spot was the last place we would likely check before heading back towards Darwin.

The fish at the last spot we had planned on covering were gone. The sun was setting so we rapidly went back to the second last spot and put on board about 70 kgs before dark. This gave us about 250 kgs for the day.

At 1900 hrs we set course for ten miles south of Flat Top Bank arriving in the area at 2300 hrs. The anchor was dropped at 2330 hrs. Radio calls were made to the Ace of Spades during the evening but there was no response.

#### **THURSDAY 24 OCTOBER 96**

The anchor had dragged about six miles during the night. This was probably caused by the three tropical storms that hit us.

We searched around and found some good looking trap ground at position 12°26.41 and 129°21.20 in 63 metres of water. A dropline was set and caught two large tricky snapper. Six traps were set in the area. Another four were set at position 12°26.60 and 129°19.41 in 59 metres of water. The two remaining traps were set in 37 metres at position 12°27.55 and 129°16.24 (on top of a shoal).

The Ace of Spades reported in at 0730 hrs. Their catch for the previous day was about 100 kgs; mostly tricky snapper.

After setting the last couple of traps we went for a quick look around. Not far away at position 12°28.79 and 129°16.70 we came across patches of fish. We ended up setting 20 droplines and catching 150 good size fish (about 1.7 kgs each). Most of these fish were red snapper.

At 1200 hrs we pulled the two traps which had been set on top of a shoal (note; these were both very small traps not like the big WA traps). Ten red emperor and one tricky snapper were caught. We started heading towards the second group of traps, then decided it would be a good idea to see how a dropline performed in the same place as the traps. We turned around and travelled back the two miles we had put between us and the spot.

A single dropline was set for ten minutes. Three large tricky snapper and three trevally were caught. The trickys were placed in a tank of water on the deck and didn't seem overly stressed.

The Ace of Spades reported that they were catching a reasonable amount of fish at position 12°46.20 and 129°27.63.

While pulling the remainder of the traps at least ten good schools of snapper were sighted. However before we finished, we received a call from the Ace of Spades. It had broken down and was a drift. There was about 40 miles between us. We quickly hauled the traps and headed for the 'Ace". Our catch for the morning was at least 300 kgs and included some very large red emperor. The area looked very promising and it was unfortunate that we were unable to spend the remainder of the day fishing (of course helping our colleagues on the Ace of Spades was our number one concern at the time). At 2015 hrs we began towing the Ace of Spades back to Darwin. We arrived in Darwin the next day at 0515 hrs. The catch was unloaded in the mooring basin at 0900 hrs.

The fish were weighed during the unloading. The Deep Tempest unloaded 2.8 tonnes and the Ace of Spades a little under one tonne.

APPENDIX 3.

TIMOR SEA CHARTER CRUISE

CRUISE REPORT

VESSEL: "ACE OF SPADES"  
SKIPPER: WAYNE BISHOP  
CREW: (2) DANIEL & GLEN  
OBSERVER: NEVILLE GILL  
PERIOD: 7/10 to 14/10/96  
AREA: TIMOR SEA WEST OF 130° & SOUTH OF 11°  
FISHING GEAR: 3 HYDRAULIC DROP LINE MACHINES & 4 SET LINES  
WITH 25 to 40 HOOKS PER LINE  
OBJECTIVE: TO ESTABLISH NEW FISHING GROUNDS IN THE  
TIMOR SEA SOUTH OF THE TIMOR BOX  
FISHERY & WEST OF THE 130° LINE.

SUMMARY

7/10/96  
1330hrs. Departed Darwin, course set for Timor sea WNW approx 170nm.  
Conditions good, light NW breeze with 1/2m swell.

8/10/96  
0630hrs. Position 11°30'S 128°56'E, searching as we head WNW, bottom contour has looked  
good, however fish life has been very small and isolated.  
1330hrs. Crossed the contour at 12°09' 128°14' heading North crossing the contour in an east  
west direction to the northern tip, at approx 11°08' The sea bottom in this area  
appeared lifeless & the contours smooth.  
1900hrs. After searching all afternoon, we are now anchored at  
11°10.79'S 128°04.77'E  
10 Shots today, 17 Lines went into the water, 680 Hooks.

**CATCH:** 3 GOLD BAND: 1 SHARP TOOTH:  
3 TREVALLY: 4 YELLOW SPOT COD:

9/10/96  
0630hrs. Fish on the sounder at anchor, 4 shots, all baits gone, only small cod. Worked lump at  
11°11.8'S 128°03'E, a few red emperor & red snapper. Fish life appears only on the  
edges of the lump, (90-110m) once you leave the immediate area, all signs of life is  
gone. We are using the set line method combined with the hydraulic lines. The set line  
is a more accurate method when the marks are small.  
1125hrs. Position 11°12.15'S 128°02.9'E (75m) Fish life.  
1415hrs. Camera shot, no result, trouble with battery.  
1610hrs. Steaming west to 11°11.5'S 127°53.4'E. some good marks were found. First sign of  
saddle tail (ie; ruby emperor *Lutjanus malabaricus* ), and larger gold band. Mud  
showing on the weights.  
1900hrs. Finished for the day, 19 shots today, 44 Lines went into the water, 1760 hooks.

**CATCH:** 9 GOLD BAND: 3 SHARP TOOTH: 7 SADDLE TAIL: 8 TREVALLY: 3  
COD: 12 SEA PERCH: 3 RED BASS: 1 BREAM: 18 RED SNAPPER: 7 RED  
EMPEROR: 1 TIMOR SNAPPER: 2 CAT FISH:

10/10/96  
0630hrs. Start searching, "Deep Tempest" is in the same area, conditions are great, calm seas  
with a 5kn variable wind. Pos 11°42'S 128°04'E, searching around the 100m contour  
across the 'fingers'.



1005hrs. First shot 11°52.62'S 128°03.11'E top of lump in 63m, coral growth around the lump was evident from the sounder. 74m of water around the edge is where most of the fish life appeared.

1455hrs. Shot the best mark for the day, however only 3 very small shark were landed. We sighted many small & large sharks in this area.  
Today has been very slow, catch related, with 8 shots, 25 lines.  
**CATCH:** 1 GOLD BAND: 1 RED EMPEROR: 9 SHARK:  
8 MIXED.

2300hrs. After a long steam, we are now anchored at Newby Shoal 11°52.56'S 129°08.30'E

11/10/96  
0630hrs. Deck work, we rearranged the hydraulic winches & commenced searching around the shoal. Sea conditions perfect. A few fish marks have been seen in the 65m range. These marks were small although some good size saddle tail were landed.

1340hrs. After searching to the north to 11°25'S, we are now steaming NW and will then head SE across the same area. Where the fish were scattered earlier in the day.(between Newby Sh. & the North eastern shoal in approx 60m of water).

1900hrs. Anchored 12°03.7'S 129°23.3'E  
**CATCH:** 8 SADDLE TAIL: 1 RED EMPEROR: 6 MIXED:

12/10/96  
0630hrs. Searching the area to the NE of Flat Top Bank and then over the area to the east through the gravel & sand marked on the nautical chart.

1520hrs. Pos 12°31.2'S 128°54.4'E, another small mark. The area on the bottom is approx 2m by 2m high. Most of the other marks seen throughout the survey have been smaller, 1m by 1m high. These marks do not hold a lot of fish.

2200hrs. After searching to the SSE covering many lumps etc marked on the nautical chart, we are now anchored at pos 13°04.43'S 129°26.97'E

13/10/96  
0700hrs. Searching along the 50m contour line travelling to the North.  
1025hrs. 12°55' 129°34' Pelagic schools showing on the sounder. Visual sightings of schools of tiny Scad feeding on the surface.  
Sea conditions are again perfect with a 5kn variable wind.  
Throughout this survey the brown coloured algae bloom has been prolific everywhere.

1640hrs. 12°36.6'S 129°46.9'E in between the 50m & 30m contour lines, a good size mark of red snapper & trevally.  
This was the last mark fished for the survey.  
**CATCH:** 34 RED SNAPPER: 23 TREVALLY:

1900hrs. Steaming for Darwin.

14/10/96  
0400hrs. Arrived at fisherman's wharf.

CATCH COMPOSITION BY SPECIES & NUMBER

Gold Band	Sharp Tooth	Red Emperor	Red Snapper	Saddle Tail	Mixed Species
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14	4	9	52	16	69
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A TOTAL OF 52 SHOTS WITH 4 LINES (Av. 30 HOOKS EACH LINE)

Neville Gill  
Fisheries Research  
13/10/95

## TIMOR SEA CHARTER CRUISE

### CRUISE REPORT

VESSEL: "ACE OF SPADES"  
SKIPPER: MURRAY ANGWIN (MUZZER)  
CREW: (2) DANIEL & CARL  
OBSERVER: NEVILLE GILL  
PERIOD: 16/10 to 25/10/96  
AREA: TIMOR SEA WEST OF 130° & SOUTH OF 11°

FISHING GEAR: 3 HYDRAULIC DROP LINE MACHINES & 4 SET LINES  
WITH 25 to 40 HOOKS PER LINE

OBJECTIVE: TO ESTABLISH NEW FISHING GROUNDS IN THE  
TIMOR SEA SOUTH OF THE TIMOR BOX FISHERY  
& WEST OF THE 130° LINE.

### SUMMARY

16/10/96  
1400hrs. Departed Darwin on the second leg of the survey, our course is set for Pos 12°30.19'S  
128°52.50'E in the Timor sea, as agreed upon, a distance of approx 80nm. Sea  
conditions are favourable with no swell and a light variable wind.

17/10/96  
0700hrs. Arrived on fishing grounds Pos 12°30.83' 128°58.26'. With the calm conditions, we  
sighted numerous 200lt drums floating just under the surface. These drums would be  
very dangerous if they were hit by a moving vessel such as the type we are in.  
1345hrs. 4 Gold Band & 6 Red Emperor were caught from the above pos. Fish life was located in  
a couple of areas within 2nm of this position.  
Pos 12°30.1' 128°52.21' 90m, a small area of coral bottom found by the "DEEP  
TEMPEST" on the first leg of the charter.  
We spent the afternoon in this area and caught good size gold band & red snapper with  
a few saddle tail & red emperor.  
1930hrs. Now anchored in the same area.

**CATCH: 35 GOLD BAND: 6 SADDLE TAIL: 6 RED EMPEROR: 94 RED  
SNAPPER: 8 MIXED:.**

18/10/96  
0630hrs. Fish school under the boat before the anchor was lifted. Pos 12°29.50' 128°41.12'  
Fished for two hours.  
0830hrs. "Deep Tempest" arrived at the same location, and we captured some video footage of  
the traps being set and lines of fish being hauled. As earlier agreed we continued our  
searching to the NW leaving the "Deep Tempest" to fish this productive location.  
1100hrs. Pos 12°25.78' 128°40.3' Good looking bottom, no shot. Trap bottom in this area.  
1330hrs. Pos 12°24.74' 128°40.68' No sign of any life in this area.  
1415hrs. Pos 12°28' 128°15' Now steaming south, bottom looks good for traps.  
1630hrs. Pos 12°29.57 128°41.10' Good drop off 4-5m, fish life everywhere, we will search the  
area tomorrow.  
2200hrs. Finished for the day. Anchored pos. 12°29,50' 128°41.12'  
**CATCH: 7 GOLD BAND: 6 SADDLE TAIL: 8 RED EMPEROR: 38 RED  
SNAPPER: 28 TREVALLY: 3 MIXED:**

19/10/96  
0600hrs. Fish under the Boat at anchor. Pos 12°29.50' 128°41.12', 5 shots were carried out with good catches of red snapper.

1345hrs. Pos 12°30.10' 128°52.21' another small area of holding bottom. Schools of fish have been scattered throughout both the areas searched today.

1930HRS. Anchored in the same area. 12°36.01' 128°36.40'  
**CATCH: 35 GOLDBAND: 6 SADDLE TAIL: 6 RED EMPEROR:  
94 RED SNAPPER: 8 MIXED:**

20/10/96  
0600hrs. Another calm day, searched areas around 12°36' 128°36' & 12°41' 128°33', good looking bottom, no fish life.

1300hrs. Met with "Deep Tempest" at 12°40.2' 128°41.2'.  
More video shots of traps coming aboard.  
Squall passed through, 25kns of wind and 1.5m swell.

1520hrs. Pos 12°41.21' 128°49.94' Good size mark, video shot of school on sounder screen. 6 shots, good size fish.

1840hrs. We are now steaming south to the 13° line so that searching may continue further south again, in-line with the agreed program.

2000hrs. Anchored for the night.

21/10/96  
0630hrs. Pos 12°55.09' 128°37.52' Some good marks in the area, although only a couple of fish caught. We were all prepared to start searching to the south in the next grid area, when we were informed by radio from the "Deep Tempest", that the area to the south was very muddy and lifeless. (The "Deep Tempest" had spent a half day searching this area and found no fish at all) We still had 4 areas to survey (about a days work) to the ESE, and were also reminded by the "Deep Tempest" about the flexibility of the last 2 days of the charter (three days to go). The contract states that the last 2 days of the charter may be used at the skippers discretion, by either searching for new ground or fishing the known locations that are holding fish. We deliberated over this decision for some time, talking to both the "Deep Tempest" and Wayne Bishop via the ships radio. A decision was made to go back to the North (30nm) and fish the area that has been searched by both vessels and is the most productive area.  
The plan was to fish for a day in this productive area and then continue searching to the ESE for the remaining 2 days.

1330hrs. Back where we were yesterday afternoon Pos 12°41.3' 128°49.9' Good fish life in the area.

1850hrs. Anchored 12°40.18' 129°01.95'  
**CATCH: 15 GOLD BAND: 3 SHARP TOOTH: 27 SADDLE  
TAIL: 10 RED EMPEROR: 8 RED SNAPPER: 18 MIXED:**

22/10/96  
0630hrs. Searching, small marks scattered in the area, a couple of shots, no fish.

1400hrs. Searching to the ESE, fish marks found, probably bait, small Scad caught on the lines.

1445hrs. Pos 12°51.45'S 129°03.45'E Large mark, video shot of sounder, caught large gold band & saddle tail.

1600hrs. We have made the decision to search to the SE, covering areas that have not been covered by this survey and then continuing SSE between the 50 & 30m contours.

2100hrs. Anchored Pos 13°24.28' 129°34.89'

23/10/96  
0600hrs. Awoke to a 35-40knt rain squall.  
Muzza (skipper) sighted a large school of squid around the boat last night. There was no sign of the mark in the morning.

1130hrs. 31m of water, Pos 13°17' 129°38' Small marks scattered through this area, however only small reef species, Blue line emperor, Striped sea perch Small red emperor etc.

1900hrs. Anchored, Pos 13°06.21' 129°45.49' We searched all day along the contour line and found only isolated marks and holding bottom for small inshore reef fish.

24/10/96  
0630hrs. Search pattern continued to the north between the 30 & 50m contours. We kept a few small red emperor & tricky snapper in the circulating tank to asses their survival rate. These fish did not appear to be affected at all, and lived happily until the water supply was turned off.

1130hrs. Pos 12°46.20' 129°27.63 Small school of reds and trevally, 3 shots.  
 1330hrs. Pos 21°36.80 129°46.93' Another small school of reds and trevally.  
 1500hrs. During searching mode the rubber coupling between the gearbox and motor had let go causing loss of power to the shaft. This was assessed to be a "Major" and a tow to Darwin was organised with the "Deep Tempest". The "Deep Tempest" was catching fish at a position south of Flat top bank. She immediately set about to check and stow aboard the traps set in this area.  
 2000hrs. "Deep Tempest" arrived at our position and the tow line was connected. Sea conditions were favourable and we proceeded to Darwin.

25/10/96  
 0600hrs. Arrived at fisherman's wharf.  
 0730hrs. With the assistance of "Deep Tempest" the "Ace of Spades" was made secure in the basin.

**CATCH COMPOSITION BY SPECIES & NUMBER**

Gold Band	Sharp Tooth	Red Emperor	Red Snapper	Saddle Tail	Timor Snapper	Mixed Species
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104	3	30	251	109	5	184
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A TOTAL OF 84 SHOTS WITH 4 LINES (Av. 30 HOOKS EACH LINE)

Neville Gill  
 Fisheries Research  
 5/11/96

## APPENDIX 4.

### RED SNAPPER WEST OF DARWIN

#### Richard Mounsey reports:

Ten to twenty red snapper per dropline was not uncommon aboard Mal Reid's vessel "Deep Tempest" during the October FRDC funded project to Evaluate NT Fishing Grounds South of 11° South and West of 130° East.

The "Ace of Spades" and "Deep Tempest" were chartered for 16 days to survey grounds and test passive fishing gear in the Demersal Fishery west of Darwin. The gear used on the "Deep Tempest" alternated between hydraulic reel droplines, *throw-away* droplines and traps while the "Ace of Spades" concentrated on hydraulic reel and *throw-away* droplines.

The survey started approximately 90 miles north east of Darwin and swept in an arc to where the NT/WA border meets the Australian Fishing Zone boundary, then southwards to the mouth of the Victoria River and finally north west back towards Darwin.

Approximately four and half tonnes of quality fish were landed. Red snapper (*Lutjanus erythropterus*) dominated the catch. Catch rates between 50 and 100 fish per hour were common aboard the "Deep Tempest" during the last week of the survey. The prime fishing grounds generally extended from the southern tip of Flat Top Bank to 10 miles south then west to the 100 metre depth contour where it extended southwards for another 20 miles.

The more northern grounds were particularly disappointing. There were numerous rises and trenches but very little in the way of hard live bottom other than on top of the shoals. These shallow water grounds only seemed to hold small reef fish, red bass or sharks. The deeper areas were generally barren. However, it should be noted that a few years ago commercial trap vessels did land commercial quantities of fish from this area.

On the southern grounds, down towards the Victoria River, in the 65 to 85 metre depth range many schools of small fish were observed. These fish simply cleaned the baits off the hooks. The sea bed in the area was covered in lumps and bumps but unfortunately most of these were formed from sand waves or mud rises. No commercial fish were taken in this area.

In the shallow waters sweeping back up to Darwin small reef fish were taken at a number of spots. However none of these areas looked particularly promising for Demersal fishers.

The droplines out fished the traps, although the traps caught more red emperor and tricky snappers. Squid were used for bait on the droplines. Tuna and pilchards were used in the traps. The best catching session for the droplines (*throw-aways*) was around 700 kgs in five hours. The traps averaged about 10 kgs per trap per set. There was no noticeable difference in the catch rate between the four types of trap used.

The droplines were rigged with 10/0, 11/0 and 13/0 tuna circle hooks. Although the catch data is still to be properly analysed the 11/0 hooks were undoubtedly easier to bait than the 10/0 hooks and definitely caught many more red snapper than the 13/0 hooks. The only concern with these small hooks was that goldband snapper often dropped off at the roller.

As expected, sharks were a problem but our new chain lower mainline arrangements seemed to solve the problem. On one occasion three droplines were damaged by sharks. The new chain rigs were connected and within minutes an eight foot tiger shark was on the deck. It contained six snapper in it's gut along with hooks, swivels, swages, mono snoods and rope, all belonging to our damaged lines.

As on the last survey, the bathometric charts were worth their weight in gold. Not the front of the chart but all the depth soundings on the back. A change of depth, two or three metres, normally indicated hard ground and fish life. Depth changes greater than three metres normally indicated mud or sand rises and produced no fish.

The grounds south of Flat Top Bank are only an overnight steam from Darwin. Six productive reefs were found in this area in less than two days. It is highly likely other productive reefs exist and projected catch

rates of a 100 red snapper per hour could be improved on. This area also produced reasonable quantities of red emperor, large tricky snapper and ruby emperor.

Considering that fresh whole red emperor caught on the first cruise fetched over \$9 per kg, whole tricky snapper \$6 per kg and whole ruby emperor \$5 to \$6 per kg, it is highly likely that an industry will develop in the area if the market price for fresh whole red snapper can be increased from its present \$3.50 per kg to some where around \$5 per kg.

Detailed cruise reports giving positions and catch rates have been submitted to the project steering committee. Industry access to the catch data sheets can be obtained from the Department of Primary Industry and Fisheries, Fishing Gear Technology Section.

## RED SNAPPER: AUSTRALIA'S UNDER UTILISED RESOURCE

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In recent years substantial stocks of Red Snapper (*Lutjanus erythropterus*) have been discovered in the offshore seas surrounding the Northern Territory. Low market prices and the amount of fuel required to reach these off shore stocks have been the major factors restricting the development of the fishery. However, in October'96, researchers uncovered a new stronghold of Red Snapper close to Darwin. This discovery maybe the catalyst needed to kick start this potential fishery.

Richard Mounsey reports:

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For as long as records have been kept, the seas off Australia's Northern Territory (NT) have been fished by foreign fleets using a variety of fishing methods. Some of these methods, such as bottom trawling, caught large numbers of non target species and damaged demersal habitats. In the early 1990's Australian fishers and Government agencies united and put a stop to licensed foreign fishing activities in the waters surrounding the Northern Territory. In addition, a commitment was made to develop more passive fishing methods which would help ensure the long term viability of the fisheries and improve product quality.

Since the departure of the last foreign fleet from NT waters a number of surveys have taken place. These have focussed on the exploration of unknown areas, the testing of environmentally friendlier fishing gears and stock assessment studies. Red Snapper (*Lutjanus erythropterus*) and Ruby Emperor (*Lutjanus malabaricus*) have undoubtably been the two most abundant fish encountered during these surveys. Stock assessment results indicate that the present harvest of both these fish could be increased by around 500%.

Ruby Emperor are slowly but surely becoming a viable commodity. They are being taken as an incidental catch in the Timor Reef Fishery (vertical long line fishery) and although they are not as yet achieving the seven to eight Australian Dollars per kilogram paid for fresh Gold Band Snapper (*Pristipomoides multidens*), they are regularly exceeding five dollars per kilogram.

The discovery of a Red Snapper concentration close to Darwin means that fuel requirements will be lower and high quality fresh fish could be regularly landed in Darwin and flown daily to interstate or international destinations if viable markets can be found.

During the latest survey over four and half tonnes of snapper and emperor were landed. Ninety percent of these were caught on vertical long lines and the remainder, mainly Red Emperor (*Lutjanus sebae*), were caught in portable fish pots. Approximately three tonnes of Red Snapper were caught. Individual Red Snapper ranged in weight from 0.75 kgs to 2.4 kgs, with the majority being around 1.5 kgs. Each fish was quickly removed from the hook, Ike Jimed (spiked), bled and placed in an ice slurry for about two hours before being soldier packed in powder ice.

Catch data for the area close to Darwin is yet to be properly analysed but the small (16m) multi purpose vessel used on charter, at times landed and processed over 200 kgs of fish per hour. A dedicated commercial vertical long liner would likely improve on this catch rate.

The only hindrance to the vertical longline operation was caused by sharks. Mainly, Tiger Sharks (*Galeocerdo cuvier*). On one occasion four lines were set. Three were destroyed by a single Tiger Shark. A line with it's lower section made from light chain was used to over come the problem (see attached vertical longline hook arrangements diagram). Within minutes a three metre Tiger Shark was hauled aboard. An inspection of it's gut revealed six large snapper still attached to hooks, swivels, rope, etc.,

The chain rigs appeared to fish as efficiently as the normal rigs. There were no problems setting or retrieving them, however they had a tendency to lay flatter on the bottom which increases their likelihood of fouling.

Overall this latest survey has been encouraging and it is now up to NT researchers and fishers to expand the grounds and find a market for prime quality Red Snapper. The firm white flesh of Red Snapper is yet to be fully appreciated by Australian consumers and an education program on how to prepare and cook the fish is probably required. On the other hand markets may already exist in neighbouring countries and the Northern Territory could become a reliable supplier of this high quality product.

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