Factors Affecting the Profitability of the Northern Territory Demersal fishery

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Australian Government

Fisheries Research and Development Corporation

Project No. 1999/371

Disclaimer

This document provides a summary of discussions and agreed actions arising from a Workshop convened to consider the factors affecting the profitability of the offshore fishery for tropical snappers.

The views and comments expressed in this document do not represent the views of the Northern Territory Government or the Northern Territory Seafood Council, unless expressly indicated. Views and opinions contrary to current policy may be included in the interest of promoting critical debate. This document does not represent government policy and is made available for information only.

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Northern Territory Government
Department of Business, Industry & Resource Development

NORTHERN TERRITORY Seafood Council

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1999/371 Factors affecting the profitability of the Northern Territory Demersal fishery.

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OBJECTIVES:

1. To examine the factors affecting the profitability of the demersal fishery, including fishery economics, marketing requirements, fishery and environment interactions and alternative fishing techniques;
2. Increase industry awareness of the factors influencing economic viability; and,
3. Determine and prioritise the principal areas for further research.

NON-TECHNICAL SUMMARY:

AS OUTCOMES OF THE WORKSHOP, IT WAS GENERALLY AGREED:

- That the line and trap fishery for offshore snappers is likely to develop close to Darwin;
- Exploratory fishing trials using traps and longlines/trot lines may encourage further investment in the fishery;
- International markets offer considerable potential in the short to medium term;
- With an improved understanding of the influences of environmental conditions we may be better able to plan for those times of variable catches; and
- Trialing of alternative fishing gears in more remote areas of the fishery is necessary to improve catch rates and offset the lower prices paid for frozen snappers.
- Small Finfish trawlers can be profitably used in the more remote regions.

Despite a predicted annual sustainable yield of several thousand tonnes of red snappers from the Arafura Sea, extensive exploration by foreign fishing vessels, exploratory fishing trials and international marketing initiatives, overall landings in the offshore demersal line and trap fishery for tropical snappers remain low.

It is against this backdrop that the Northern Territory Department of Primary Industry and Fisheries and the Northern Territory Seafood Council jointly hosted a Workshop to examine the factors affecting the profitability of the NT demersal fishery.

At this time, it is important to involve all with an interest in the fishery in reaching an agreement on a strategic research and development plan to increase landings from the fishery. Such a plan seeks to identify ways to overcome the constraints identified throughout the workshop and lay the foundations for the future development of our offshore snapper fishery resources. The suggested research and development plan will certainly attract considerable interest and encourage debate about the future directions of the fishery, as some of the recommendations challenging many firmly held views about future directions for the fishery. However, one issue in which there is little debate is the low level of development of the offshore line and trap fishery for tropical snappers.

The research and development plan draws on the key issues raised for discussion at the workshop on *Factors Affecting the Profitability of the Offshore Fishery for Northern Territory's Tropical Snappers*. Future management directions are canvassed, including continuation of the existing development approach, the trialing of multiple hook technology, such as longlines and trotlines and permitting small or larger trawlers to operate in the more remote regions of the fishery.

The Workshop on Factors Affecting the Profitability of the Offshore Fishery for Northern Territory's Tropical Snappers Consultative Draft is presented for public comment and provides an opportunity for you to be involved in charting the future development of our offshore tropical snapper fisheries. All with an interest in the future development of the fishery are invited to comment on the draft Research and Development Plan and future management directions. Comments received will be considered in finalising the research and development plan for the demersal fishery and in considering future directions for the fishery.

Care has been taken in the production of this report, however it is provided as general information only and seeks to canvass a range of issues raised for discussion at the "Workshop on Factors Affecting the Profitability of the Offshore Fishery for Northern Territory's Tropical Snappers" and future management options. Views and opinions contrary to current policies and legislation may be included in the interest of promoting critical debate.

Summary of Workshop:

Discussion Point 1

Maintain the current management arrangements for the offshore line and trap fishery for tropical snappers.

Expansion of the line and trap fishery is confronted with considerable hurdles. Unlike vessels operating close to Darwin which consign their catch to premium fresh fish markets, more remote operations must process and freeze their catch at sea. While there are exceptions, frozen fish generally commands lower prices on national and international markets. Existing operators consider that that catch rates would have to be improved

considerably when fishing with lines and traps in more remote regions of the fishery to offset the higher operating cost and lower prices paid for frozen fish.

Discussion Point 2

(a) Undertake further exploratory fishing trials in the Timor Sea using passive fishing gear such as lines, traps, longlines and trotlines.

(b) Government and industry to examine potential sources of funding to underwrite exploratory fishing trials in the Timor Sea.

Investment in exploratory fishing trials may provide the necessary stimulus to encourage operators to develop the demersal fishery. Potential funding sources are to be examined. The outcomes of discussion point 2 are dependent upon the outcomes of discussion point 5.

Discussion Point 3

Develop a research plan to gather details to determine any relationship between water temperature, schooling and migration.

Details on environmental measures, including water temperature and catch rates, are to be gathered in seeking to improve our understanding of the fishery and its variability. Such an understanding will allow operators to plan their fishing activity with improved certainty. Proposed timings for the development of the research plan are outlined in the research and development schedule.

Discussion Point 4

(a) Identify existing international seafood markets for tropical snappers as a precursor to an international market campaign

(b) Develop the concept of an international marketing strategy for red snappers

(c) Establish a fishery-wide brand name linked to an approved Quality Assurance Program.

Red snappers are well-received on international markets, particularly in Asia and the US. Any marketing strategy should examine existing markets and their relative price structures. Operators seek to promote the premier status enjoyed by Northern Territory seafood on both national and international markets.

Discussion Point 5

(a) Encourage the development of the line and trap fishery within 300 nautical miles of Darwin.

(b) Examine the expansion of the trawl fishery in more remote regions of the fishery.

With resurgence in the trap fishery for offshore snappers, operators indicate that catch rates may be improved for red snappers. However, catch rates must be improved markedly to offset the expected lower returns of consigning frozen fish to domestic and international markets. It has since been shown that catch rates cannot be raised sufficiently to offset lower prices for frozen products.

Desktop analysis suggests that small scale trawling show some promise. This analysis also suggests that a large trawler has considerable potential, however, such conclusions have been drawn from limited economic and financial data.

Operational and financial considerations mean that the overall catch rate must be improved significantly in the more remote areas of the fishery. The lower prices received for frozen fish mean that a small trawler's profitability would be highly sensitive to its frozen storage capacity.

The Northern Territory Seafood Council now seeks that the expansion of the trawl fishery be considered to utilize the more remote offshore snapper resources.

Section 1

Introduction

The need for a workshop on *Factors Affecting the Profitability of the Offshore Fishery for Northern Territory's Tropical Snappers* has arisen from concerns about the low level of development of our offshore line and trap fishery for tropical snappers. Industry and government recognise that despite considerable commitments to develop the fishery, a predicted annual sustainable yield of 1500 to 2000 tonnes from the Arafura Sea, a history of trawling and droplining by foreign fishing vessels, and exploratory fishing trials, overall landings remain low.

The workshop provided an opportunity for all with an interest in the fishery to come together to contribute to a research and development plan to overcome constraints to industry's development. A complete overview of the Workshop Sessions is provided in Section 2.

Due to the diversity of stakeholders and interest groups, there are often conflicting and competing policies and directions to be considered when deciding the strategic directions for managing the conservation and utilisation of aquatic resources. Fisheries research and development must provide the managing agency with information on which to ensure that the natural resources involved are not over-fished, that conflict between stakeholders is minimised and that the resources are optimally utilised. Fisheries research and development priorities to achieve these outcomes have been developed in close consultation with stakeholders. A Research and Development Plan, incorporating the key recommendations arising from the workshop, is provided in Section 3.

Future management options to encourage the development of the offshore tropical snapper fishery are canvassed in Section 4. The key options are:

- maintain the current arrangements, that is to "wait and see" if any development of the fishery occurs,
- offer incentives to existing licensees, or
- consider alternative fishing techniques for use in remote fishing areas, in which the "fresh on ice" fishery is unlikely to develop ie; additional Finfish Trawlers
- With government assistance, continue to explore viable alternative harvest methods to line and trap for the more remote regions.

This Consultation Paper seeks to provide a comprehensive overview of the issues canvassed in the workshop on Factors Affecting the Profitability of the Offshore Fishery for Northern Territory's Tropical Snappers and will encourage discussion about the future research and development directions for the fishery.

Have your say

This Consultation Draft together with public submissions received will form the basis for a Research and Development Plan for the offshore fishery for tropical snapper and assist in determining whether the current management arrangements for the demersal fishery are appropriate. This approach provides an opportunity for those individuals unable to attend the Workshop to contribute to the development of the demersal fishery.

Written submissions should be forwarded to:

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Attention: Ray Clarke

or

Fax to: (08) 8999 2065

or

Hand deliver to:
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so that they are received by 4pm, 30 May 2002.

Section 2

Key outcomes

The workshop on Factors Affecting the Profitability of the Offshore Fishery for Northern Territory's Tropical Snappers was convened to provide a forum for the exchange of ideas, share experiences, and to reach agreement on how to best improve profitability and identify future research and development needs. The workshop consisted of a number of informal sessions in which the best outcomes flowed from the exchange of ideas and views on fishing gear, marketing, research, and environmental factors and how they affect the success of the fishery. A range of invited guests lead each of the individual sessions, with all participants encouraged to canvass the ideas raised and discuss the key factors holding back development of the fishery.

A summary of the key outcomes arising from each of the individual Workshop Sessions is provided below. Further details on a range of issues canvassed throughout the Workshop are provided in Section 5.

Workshop Session One - Marketing of Offshore Tropical Snappers

In this session, participants discussed domestic and international marketing opportunities for tropical snappers and emperors.

Market research has shown that red snappers are readily acceptable and achieved low to medium prices on domestic and international markets. It is suggested that whilst domestic markets for Goldband snappers were strong, local and interstate markets for whole "on ice" red snappers (red and saddle-tail snappers) are limited in terms of volume. Red snappers sourced from the adjacent Timor Reef line and trap fishery often satisfy interstate domestic markets.

Interest in developing international markets for fresh tropical snappers has seen the consignment of samples to both North America and Europe under a NT Government sponsored international marketing campaign. Despite considerable efforts by local fishers and a NT based marketing agent, a sudden fall in catch rates meant that there was insufficient landings of red snappers to satisfy initial export orders.

The international arena appears to offer the greater potential in the short to medium term. An international marketing focus will build on earlier export trials and ongoing export oriented initiatives, including the Hooking Into Asia II. In undertaking an international marketing focus, commercial operators seek to establish a fishery-wide brand name linked to an approved Quality Assurance Program.

Workshop participants, in drawing on their experience in catching and marketing tropical snappers sourced from similar fisheries, suggest the success of the fishery is highly sensitive to both price and supply.

Workshop Session Two - Economics of the Offshore Snapper Fishery

In this session, participants considered what is important in making a profit from the fishery. Economists explained using spreadsheet models how using various boats, prices and catch rates influence overall profitability.

The line and trap fishery supplying premium quality "fresh on ice" tropical snappers generally lies within a 300 nautical mile of a serviceable port with all season access. Attempts to land "fresh on ice" fish from more remote regions are hampered by increased operational costs and reduced fishing opportunities, due to extended travelling time and ensuring an adequate shelf-life of the catch.

Assuming a target rate of return to capital of 20% (before licence capital) and boat specifications similar to those of the current Timor Reef fishery fleet, catch rates of 600 – 700 kg/day are required. Catch rates from droplines and traps are unlikely to offset the lower prices received for frozen red tropical snappers should fishers seek to operate extended fishing trips to the more remote regions of the fishery. On the basis of economic analysis, frozen fish is unlikely to be considered as a serious long-term option for development of the demersal line and trap, fishery in more remote fishing grounds.

Highly variable catch rates experienced in the offshore line fishery were identified as the major hurdle to industry's development. Alternative passive fishing methods are likely to require similar catch rates to be profitable. Small-scale trawling shows some promise and requires further consideration. The large trawler has considerable profit potential, however, it should be noted that such a conclusion has been drawn from just 5 years of economic and financial details with only one trawl operator in the fishery.

Workshop Session Three – Offshore Tropical Snapper Research and Environmental Considerations

Both natural environment variations and human activity directly influence the productivity of our offshore fisheries. The influence of environmental considerations on catch rates, particularly sudden changes in catch rates in concert with lower water temperatures over a very short time, were discussed.

With an improved understanding of the influences of these conditions we may be better able to plan for those times of variable catches. While details on the harvests of our offshore tropical snappers are well documented, there is a need to improve our understanding of the impact of environmental fluctuations that directly affect our fisheries. It is for this reason that details on environmental measures, including water temperature and catch rates, are to be gathered.

Workshop Session Four - Fishing Gear for Offshore Snappers

Licensees currently use baited lines and traps to supply premium quality tropical snappers as fresh fish to a range of domestic markets. In this session, alternative types of passive fishing gear such as different configurations of lines and traps were discussed.

Fishers highlight that the inconsistency and highly variable catch rates experienced with baited droplines is a key constraint to the further development of the fishery. Exploratory fishing trials are to be undertaken by licensees to assess comparative catch rates of baited traps and longlines for red snappers. These fishing trials are to examine whether alternative fishing gear can overcome the highly variable catch rates.

The expansion of the line and trap fishery into the Arafura Sea is confronted with considerable hurdles. The lack of infrastructure together with its remoteness is a major obstacle to development and it is unlikely that fishing vessels will be able to consign their catch to premium fresh fish markets. While processing and freezing the catch may offset operating in a remote region, it generally commands a lower return as this catch competes directly with imports on domestic markets and competing product sourced from regions in which the costs of production are lower. Overall catch rates must be sufficient to offset the lower prices received for frozen tropical snapper and the inherent costs of operating in such a remote region with little infrastructure. It is the opinion of existing operators that it is unlikely that adequate catch rates can be achieved with lines and traps.

Government and industry are to encourage the further development of the line and trap fishery close to Darwin whilst alternative gear, such as trawlers, to be trialed in the more remote regions.

Section 3

Research and Development Plan

The future development of our offshore snapper fisheries must be sustainable. This means that if catches exceed the replenishment rate we place the future of our fisheries, and the aquatic resources on which they rely, at risk. The essential information required for ensuring sustainability is the capacity of the fishery to maintain long term replenishment rates. Within the limits of the sustainability for the fishery, there is a need to provide for the conservation of bio diversity and ensure the optimal utilisation of our fisheries resources.

A research and development plan for the offshore snapper fishery was prepared in 1999 by the Northern Territory Fisheries Research and Development Advisory Committee (NTFRDAC) in consultation with all stakeholders and clients. The NTFRDAC was established in 1994 to:

- establish research and development needs and priorities in both the catching, and post-harvest sectors of the fishing industry, thereby ensuring the rational and long-term use of the Territory's fish and fisheries resources;
- provide coordination and direction of future fisheries research and development programs and projects so that they provide information on which to base decisions; and
- provide priorities to be adopted for their funding from both FRDC and other sources.

Membership to this Advisory Committee is drawn from a wide range of fisheries stakeholders. It provides an important source of assessment and evaluation for Territory research and development programs and projects.

The key issues raised throughout the workshop sessions and their expected completion date have been incorporated in the revised research and development plan for the Demersal/Finfish Trawl fishery. Complete details with proposed timelines are provided in Table 1.

TABLE 1

WILD HARVEST FISHERIES	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE				
				NT	EXT	NYF	99	00	01	02	03
DEMERSAL & FINFISH TRAWL FISHERIES ***(Red snappers)***	**SUSTAINABLE HARVESTING**	Fishery assessment reports on the status of NT stocks of red snappers. These reports will include sustainability indicators.	- Analysis of existing data/samples in DPIF; - Stock discrimination study; - Obtain data on catches in adjacent national & international waters; and - Barotrauma experiments.	X X	X	X X					
STAKEHOLDER UTILISATION	**PROTECTION OF BIODIVERSITY**	Other than protection of the stocks from over-exploitation, there does not appear to be a need for projects aimed at protecting biodiversity. Apart the single demersal trawl license issued (which uses the environmentally friendly "Julie-Anne" trawl), Any additional trawler will be required to have the same gear.	To be developed if the fishery becomes significant - initial studies of species diversity to be carried out on log book data.								
COMMERCIAL INDUSTRY **L** RECREATIONAL FISHING **L** TRADITIONAL USAGE **NIL**	**OPTIMUM UTILISATION**	A sustainable economic viable fishery developed. Commercial Fishing Trials. There is minimal interaction between commercial and recreational stakeholders. .	- Desk top modeling to determine the likely success of alternative fishing method(s), including long lines, trot lines, traps and the use of automatic baiting machines and trawling; - Commercial fishing and marketing trials in locations identified by fishers; - Biological studies to determine any relationship between water temperature, schooling and migration.			X					

KEY:
H = HIGHLY IMPORTANT
M = MEDIUM IMPORTANCE
NIL = NO UTILISATION
L = LOW IMPORTANCE

NT = Northern Territory Funded EXT. = Externally funded NYF = Not yet funded

WILD HARVEST FISHERIES	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE				
				NT	EXT.	NYF	99	00	01	02	03
DEMERSAL & FINFISH TRAWL FISHERIES ***(Red snappers)***	**OPTIMUM UTILISATION (Continued)**	A sustainable economic viable fishery developed. (Marketing) .	- Development of an effective marketing strategy to facilitate adequate returns from the fishery; - Develop the concept of an "industry-wide" brand name linked to a Quality Assurance Program with agreed industry standards; - Identify existing international markets for tropical snappers as a precursor to an international marketing initiative.								

STAKEHOLDER UTILISATION	
COMMERCIAL INDUSTRY	L
RECREATIONAL FISHING	L
TRADITIONAL USAGE	NIL

KEY:
H = HIGHLY IMPORTANT
M = MEDIUM IMPORTANCE
NIL = NO UTILISATION
L = LOW IMPORTANCE

NT = Northern Territory Funded EXT. = Externally funded NYF = Not yet funded

Section 4

Future Directions

The need for a Workshop on Factors Affecting the Profitability of the Offshore Fishery for Northern Territory's Tropical Snappers arose from industry's and Governments concerns about the low level of development of the fishery.

Despite issuing 60 demersal fishery licences to catch tropical snappers and emperors using any number of lines and traps, landings from the fishery remain low. Workshop participants suggest that the future success of the fishery relies on overcoming the highly variable catch rates and price fluctuations for the fresh fish market and considering alternative catching technology to develop the more remote regions of the fishery.

There is a clear need to review the current management framework and the ways in which we encourage the development of the offshore fishery for tropical snappers. To do otherwise is likely to delay the development of our offshore fishery. Alternative options for the development of the offshore fishery are canvassed to encourage discussion about how we might best encourage the future development of the fishery without compromising the sustainability of our fisheries resources and the environment on which they rely. Some of these options are likely to be viewed by some as controversial, with any departure from the existing policies likely to be considered with trepidation. The challenge is to develop a framework that will overcome the constraints to the development of our offshore fishery for tropical snappers.

Future management options include:

Discussion Point 1

Maintain the current management arrangements for the offshore line and trap fishery for tropical snappers.

4.1 Wait and See

Industry and government have invested considerable resources in encouraging the development of our offshore tropical snapper resources, including exploratory fishing trials in the Arafura and Timor Seas, gear loans, and marketing assistance including freight subsidies for export trial shipments. Overall landings from the fishery remain low, with the majority of the fishing activity evident in areas immediately adjacent to the Timor Reef fishery or close to Darwin.

Droplining in the Timor and the Arafura Seas by Japanese vessels from 1975 to 1979, and again in November 1979 under a feasibility agreement with an Australian company, saw substantial landings of tropical snappers. More recently, exploratory fishing trials were conducted in the Timor and Arafura Sea to locate and evaluate potential fishing grounds. These trials were not commercially viable in that catch rates were unviable,

however, landings of red snappers reached 700 kg per day at one site. Exploratory fishing trials by their nature seek to determine the presence of fish on potential fishing grounds rather than proving the commercial viability of a particular site or area. Economic analysis undertaken in conjunction with the exploratory fishing trials suggests that with a price of $4.50, a catch of 500 kg per day could earn a 14 % return on capital. With sixty transferable demersal fishery licences issued, there is considerable opportunity for operators to undertake line and trap fishing in waters beyond 15 nm out to the Australian Fishing Zone (AFZ) an area of 600000 km^2. An increase in profitability due to improved prices or catch rates may encourage licensees to explore the development of the fishery in areas in which higher valued snappers, particularly Goldband, can be caught.

Continuation of the current policy is unlikely to see the further development of the line and trap fishery for tropical snappers, other than the landing of Goldband snappers and red emperors in areas immediately adjacent to the Timor Reef fishery.

Discussion Point 2

(a) Undertake further exploratory fishing trials in the Timor Sea using passive fishing gear such as lines, traps, longlines and trotlines.

(b) Government and industry to examine potential sources of funding to underwrite exploratory fishing trials in the Timor Sea.

4.2 Provide Incentives for Current Licence Holders

Development of the offshore snapper fishery may be encouraged by further investment in gear and exploratory fishing trials, an industry-wide quality assurance program and development of markets both within Australia and overseas.

If fishers are to participate in the offshore tropical snapper fishery, then a key objective is to ensure an appropriate level of profitability. This means that without an adequate level of return, fishers are unlikely to invest in terms of vessels, gear and exploratory fishing trials. Desktop analysis of alternative fishing gears, being droplining, trapping and long-lining for fresh fish, indicates overall profitability is highly sensitive to both catch rates and prices received for tropical snappers.

Previous exploratory fishing trials undertaken in the Arafura and Timor Sea using lines, traps and trotlines (short lengths of line to which many baited hooks are attached) sought to demonstrate if commercial concentrations of tropical snappers could be located and to assist in providing real time data for economic analyses. The general approach was to underwrite fishing trials thereby alleviating individual operators of the commercial risk inherent in proving new grounds. Information gathered throughout such trials are freely available to all licensees. Such an approach has proven successful in encouraging the development of other commercial fisheries, most notably the Timor Reef fishery for tropical snappers and may provide an opportunity to test market-significant quantities of

red snappers. Clearly, additional funding must be identified if further exploratory fishing trials are to be undertaken.

Discussion Point 3

Develop a research plan to gather details to determine any relationship between water temperature, schooling and migration.

4.3 Analyse environmental considerations

The influence of environmental considerations on catch rates, particularly sudden changes in catch rates in concert with lower water temperatures over a very short time, requires further research. Operators in offshore fisheries have observed sudden changes in catch rates in concert with varying water temperatures, however, the reason for these fluctuations are unknown. It is now thought to be associated with the 'el nino' weather phenomenon. This issue is of interest to fishers in ensuring overall profitability and research scientists when evaluating the health of the fishery.

Discussion Point 4

(a) Identify existing international seafood markets for tropical snappers as a precursor to an international market campaign

(b) Develop the concept of an international marketing strategy for red snappers

(c) Establish a fishery-wide brand name linked to an approved Quality Assurance Program.

4.4 Marketing Strategy for Offshore Snappers

Red snappers are readily accepted on domestic markets and achieve around $4.00 to $4.50/kg, with interest expressed by some overseas buyers at similar prices. It is suggested that whilst domestic markets for Goldband snappers was strong, local and interstate markets for whole "on ice" red snappers (red and saddle-tail snappers) are limited and highly sensitive to over-supply. The low volumes of sales on the Sydney Fish Market support such a view, where details of supply and prices paid are readily available.

Interest in developing international markets for fresh tropical snappers has seen the consignment of samples to both North America and Europe under an NT Government sponsored international marketing campaign. The initial step in undertaking an international marketing program should be a desktop review of existing international markets for red snappers. Existing operators consider that it is unlikely that adequate quantities of frozen red snappers can be maintained with lines and traps to firmly establish an ongoing market share.

An international marketing focus will build on earlier export trials and ongoing export oriented initiatives, including the Hooking Into Asia II. In undertaking an international marketing focus, commercial operators seek to establish a fishery-wide brand name linked to an approved Quality Assurance Program.

Discussion Point 5

(a) Encourage the development of the line and trap fishery within 300 nautical miles of Darwin.

(b) Examine the expansion of the trawl fishery in more remote regions of the fishery.

4.5 Evaluate alternative fishing techniques for more remote fishing areas

The requirements of fresh fish markets mean that fishing operations must land their catch on a regular basis to ensure both a continuous supply and quality control to achieve the maximum price. For these reasons, line and trap vessels will generally operate within 200 to 300 nautical miles of Darwin. Operators choose to market fresh "on ice" fish as they believe it attracts a premium over frozen product and requires minimal processing while maximising overall profitability.

Beyond this range, operators are unlikely to be able to supply the high value fresh fish markets as quality can not be guaranteed. Alternative options include onboard processing to extend the shelf life of the catch, including frozen storage. The catch rates to offset the lower returns of the frozen catch may be partially offset through value adding such as onboard processing. It is unlikely that onboard processing would see overall returns reach those enjoyed for the fresh fish market unless catch rates were significantly increased or voyage costs were reduced.

Since this workshop, many vessels explored the possibility of certification under the Commonwealth Hazard Analysis Critical Control Point (HACCP) system and GMP (Good Manufacturing Practice) to identify and control potential hazards. This certification may assist operators in achieving the highest possible price for their product. Most vessels in the trap and line fishery are presently operating under a voluntary seafood-processing standard developed by the Australian Seafood Industry Council (ASIC) in 2003.

To ensure financial viability of the fishing operation in the more remote regions of the fishery, the lower returns for frozen product must be offset through improved catch rates. It is unlikely that catch rates of 600 to 700 kg of red snapper each day can be achieved using baited droplines and traps and, on the basis of long term profitability, is unlikely to be considered as a serious long term option for development of the more remote demersal fishery. This is thought to be the case due to the mainly flat and featureless nature of the bottom throughout the Arafura Sea thus not conducive to aggregating fish.

Alternative passive fishing methods are likely to require a similar level of catch rate to provide the target level of profitability. With the resurgence in the trap fishery for offshore snappers, operators indicate that catch rates may be improved over that of baited droplines.

Small scale trawling shows some promise and also requires further consideration. The large trawler has considerable profit potential, however, it should be noted that such a conclusion has been drawn from just 5 years of economic and financial details with only one trawl operator in the fishery.

The general consensus is that trap and line fishing supplying the premium fresh fish market will operate within a 200 to 300 nautical mile radius of Darwin. Operational and financial considerations mean that the overall catch rate must be improved significantly in the more remote areas of the fishery to expand the line and trap fishery.

Section 5

5.1 Economics of the Fishery

Overall landings from the offshore line and trap fishery for tropical snappers, other than the Timor Reef fishery, remains low. Economic details have been drawn from the Timor Reef fishery to assist in making decisions about development opportunities for the demersal fishery.

In recent times six to eight boats have consistently fished in the Timor Reef Fishery. In 1998 detailed economic information was collected from two fishers operating three vessels in the fishery and was based on the dropline fishing technique. Two of the boats were broadly representative of the fishing fleet. Catch, effort and financial data for the boats were utilised for a boat profitability spreadsheet model. This model has previously been discussed with the industry and regarded as reasonable in terms of ascertaining the profitability of the fleet.

Economic Model Parameters

The most important determinants of profitability in the Timor Reef Fishery are catch rate and price. The major cost in the Fishery is labour which represents 34% of the cash costs. Other major cash cost groups are fuel (10%), repairs and maintenance (11%), freight (13%), commission (15%), bait (8%) and other costs (9%). Non-cash (depreciation and opportunity cost of capital) costs of a boat are equivalent to less than 10% of cash costs for a boat valued at $350,000.

An important determinant of profitability is the value of the boat capital. Unless increased boat value is matched by increased profit via increased annual catch rate, more

efficient operation, etc then return to capital will decrease as boat capital (cost of vessel) increases. For example, if all other things are held constant, a $300,000 boat returning 16% will translate into a $600,000 boat earning 8% or a $1.2 million boat earning 4%. In practice, costs will tend to increase with the capital value of the boat. Particularly, if the boat is debt financed, the return to owner's equity will reduce very quickly as boat capital increases. The representative boat is based on achieving 28 trips per year and a trip length of 8 days (port to port). Fishers adapt to low catch rate periods by extending the length of the fishing trip. During high catch rate periods, trip length is limited by factors such as storage capacity and ice supply.

Analysis

In considering possible development opportunities, investigations were undertaken on the comparative profitability of alternative catching methods and the effect of steaming times on profitability.

The outcome of spreadsheet modelling and analyses is provided in the following graphs. The key assumptions underlying each of the fishing methods/strategies is available. It is important to note that the models have been developed to evaluate a range of assumptions and situations, with the ability to be quickly re-calibrated for any changes that may occur or to assist in canvassing possible investment decisions.

The analysis considered the three passive fishing methods, that being droplining, trapping and longlining for fresh fish, small scale trawling both for fresh and frozen fish, and large scale trawling for frozen fish. The major uncertainty in the analysis remains the year round achievable catch rates for the passive fishing methods.

Analysis of the effect of steaming times on profitability yielded little useable information for future management of the fishery. The profitable radius for line and trap fishing from Darwin is quite dependent on catch rate, which itself is uncertain. Even for a particular steaming time, fishing strategies can be adopted which extend the area of fishing well beyond the steaming radius (ie where fishing starts and finishes).

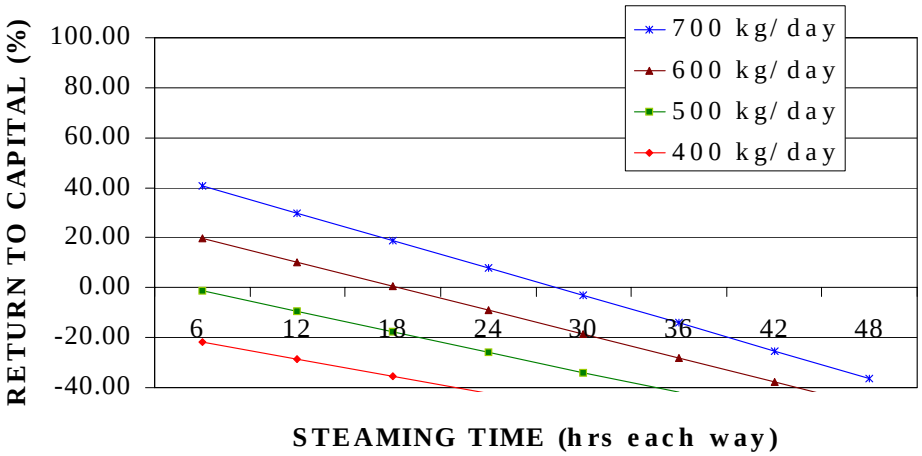
Some mention was made that two days was the maximum steaming time for one of the passive methods in view of maintaining profitability. This steaming time would provide a considerable fishing radius for vessels operating from Darwin. Such a view is probably more applicable to goldband snapper than lower priced red snappers. This is to say that the radius may indeed be smaller for lower priced fish and similar catch levels to those experienced by Timor Reef fishers.

The analysis suggests that the fishing methods chosen is much more important in determining profitability than steaming times. On the basis of the information made available together with the underlying assumptions drawn, large trawlers appear to be profitable with small trawlers showing potential for achieving attractive levels of profitability, particularly if the catch is destined to the fresh fish market. The lower

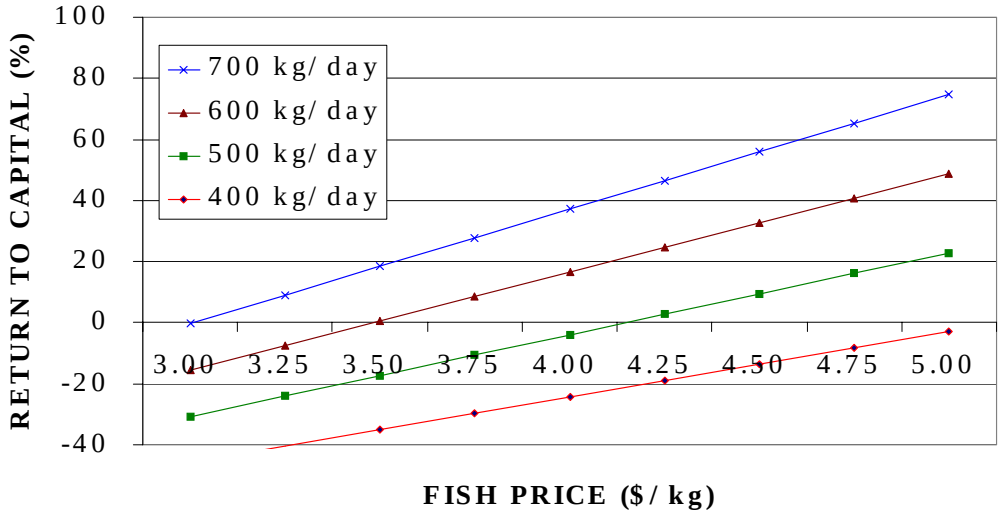
prices received for frozen fish mean that a small trawler's profitability would be sensitive to its frozen storage capacity and any changes in fuel prices or subsidy.

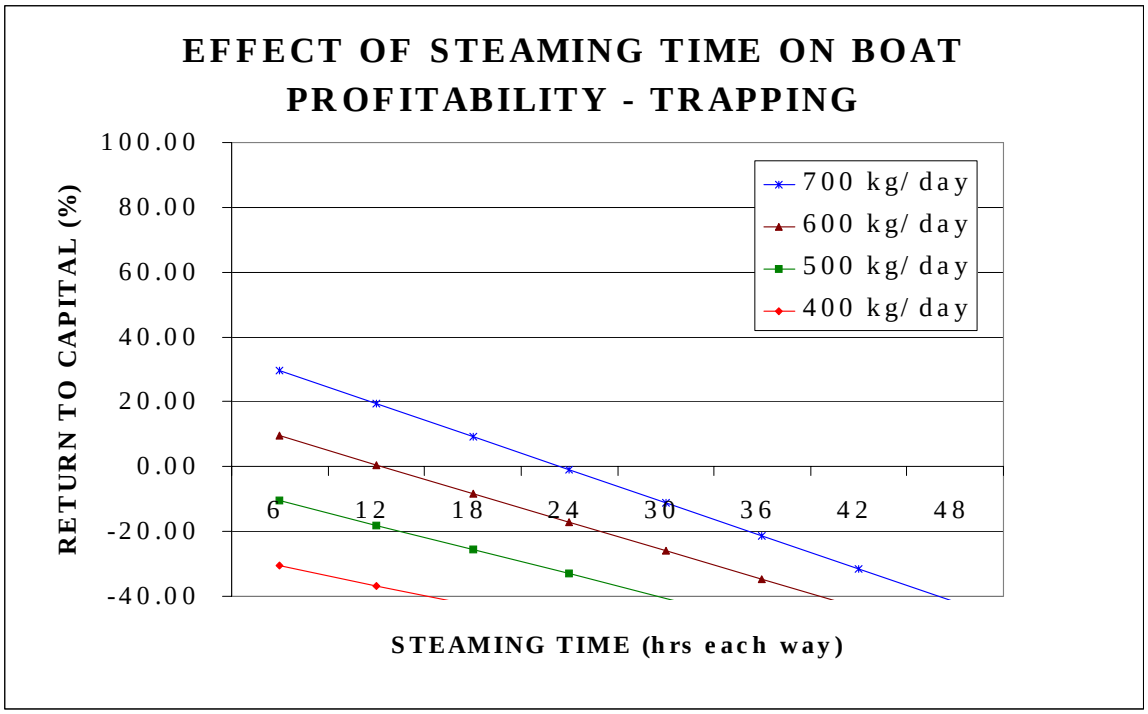
The Northern Territory Seafood Council seeks that the expansion of the trawl fishery be considered only if other passive methods prove unsuccessful. Recent discussions with the Northern Territory Seafood Council have indicated their desire to seek an additional Finfish trawler to operate in the more remote regions of the fishery. This additional licence would be subject to a range of conditions including ensuring habitat protection for the principal trap and line fishery species, Goldband snapper, and to remove a significant number of latent demersal licences from the fishery.

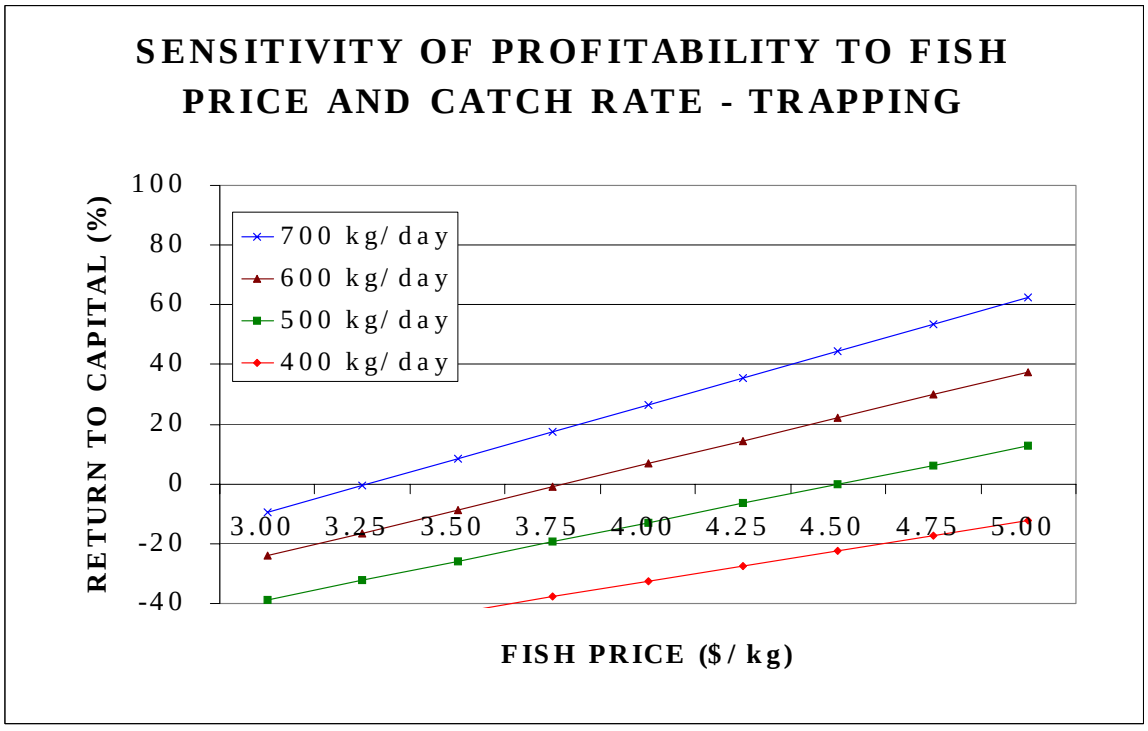
EFFECT OF STEAMING TIME ON BOAT PROFITABILITY - DROPLINING



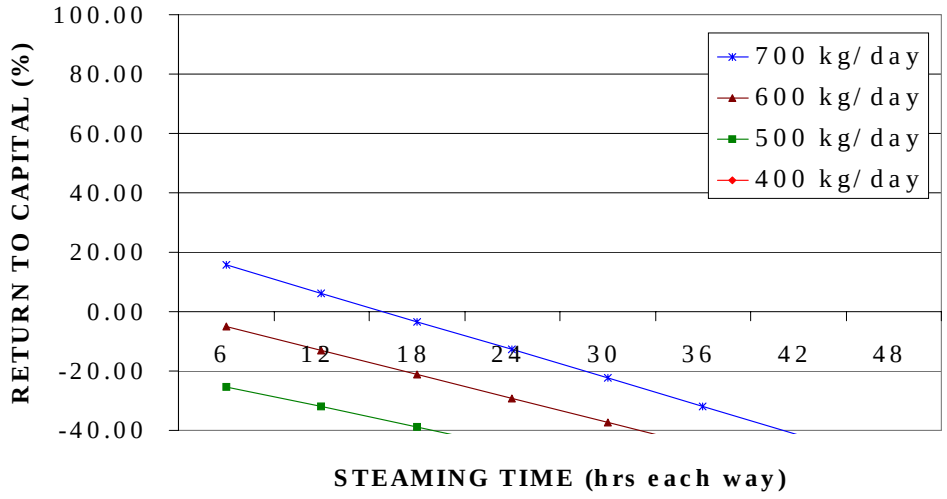
SENSITIVITY OF PROFITABILITY TO FISH PRICE AND CATCH RATE - DROPLINING



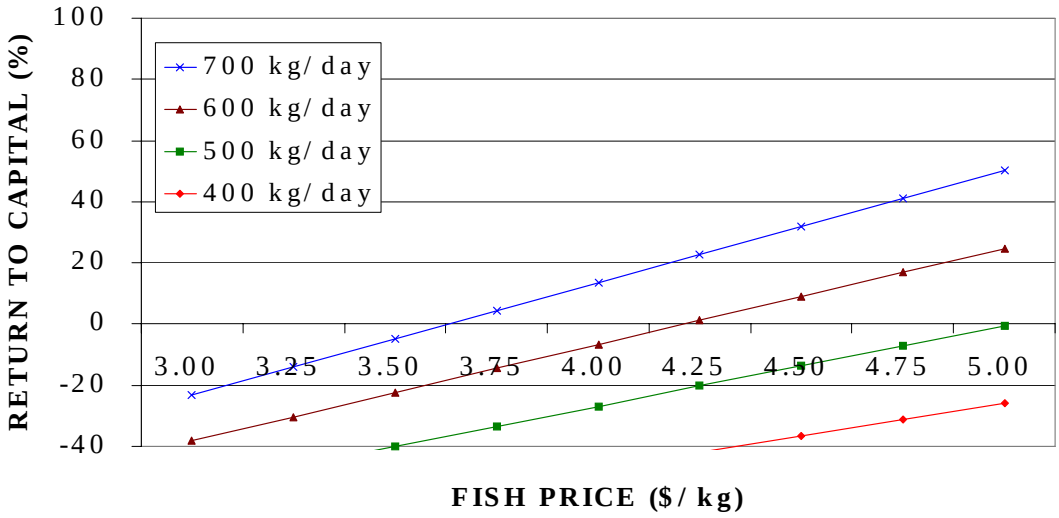

EFFECT OF STEAMING TIME ON BOAT PROFITABILITY - TRAPPING
RETURN TO CAPITAL (%)
100.00
80.00
60.00
40.00
20.00
0.00
-20.00
-40.00
6
12
18
24
30
36
42
48
700 kg/ day
600 kg/ day
500 kg/ day
400 kg/ day
STEAMING TIME (hrs each way)


SENSITIVITY OF PROFITABILITY TO FISH PRICE AND CATCH RATE - TRAPPING
RETURN TO CAPITAL (%)
100
80
60
40
20
0
-20
-40
3.00
3.25
3.50
3.75
4.00
4.25
4.50
4.75
5.00
700 kg/ day
600 kg/ day
500 kg/ day
400 kg/ day
FISH PRICE ($/ kg)

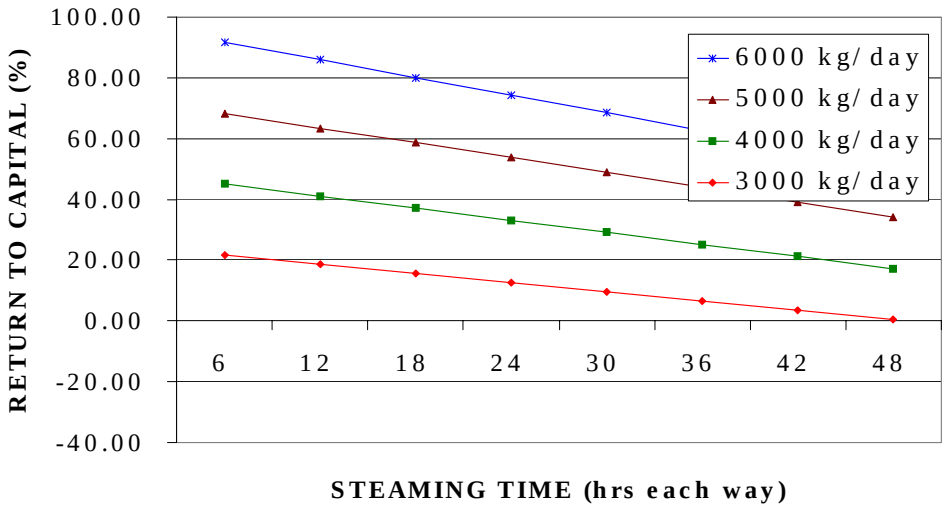
EFFECT OF STEAMING TIME ON BOAT PROFITABILITY - LONGLINING



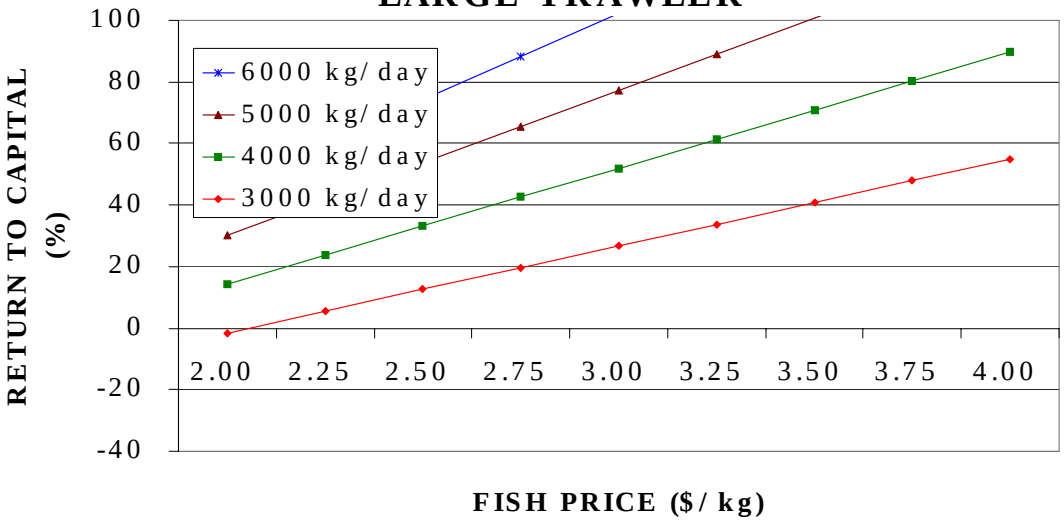
SENSITIVITY OF PROFITABILITY TO FISH PRICE AND CATCH RATE - LONGLINING

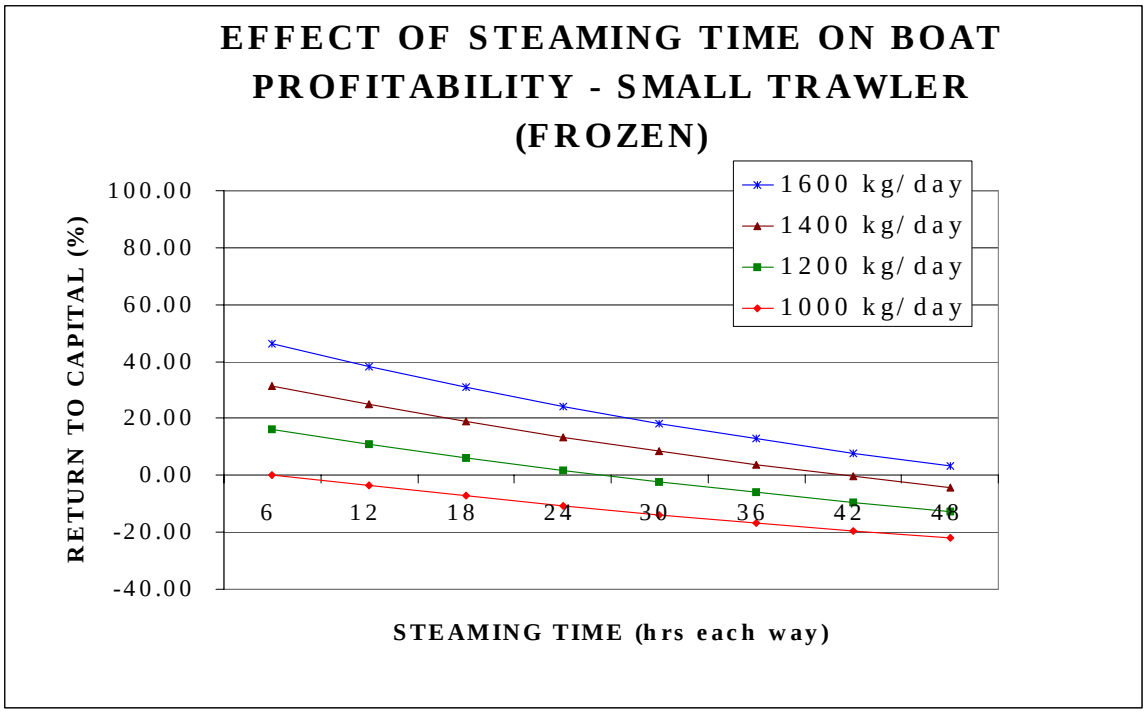


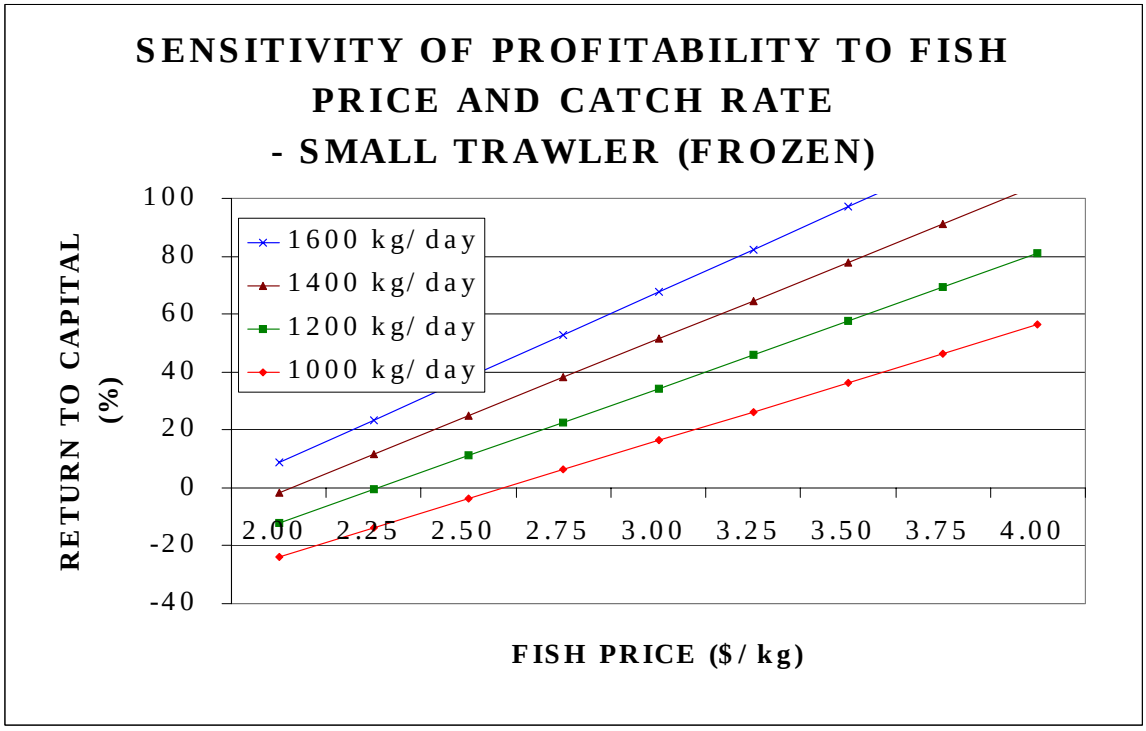
EFFECT OF STEAMING TIME ON BOAT PROFITABILITY - LARGE TRAWLER

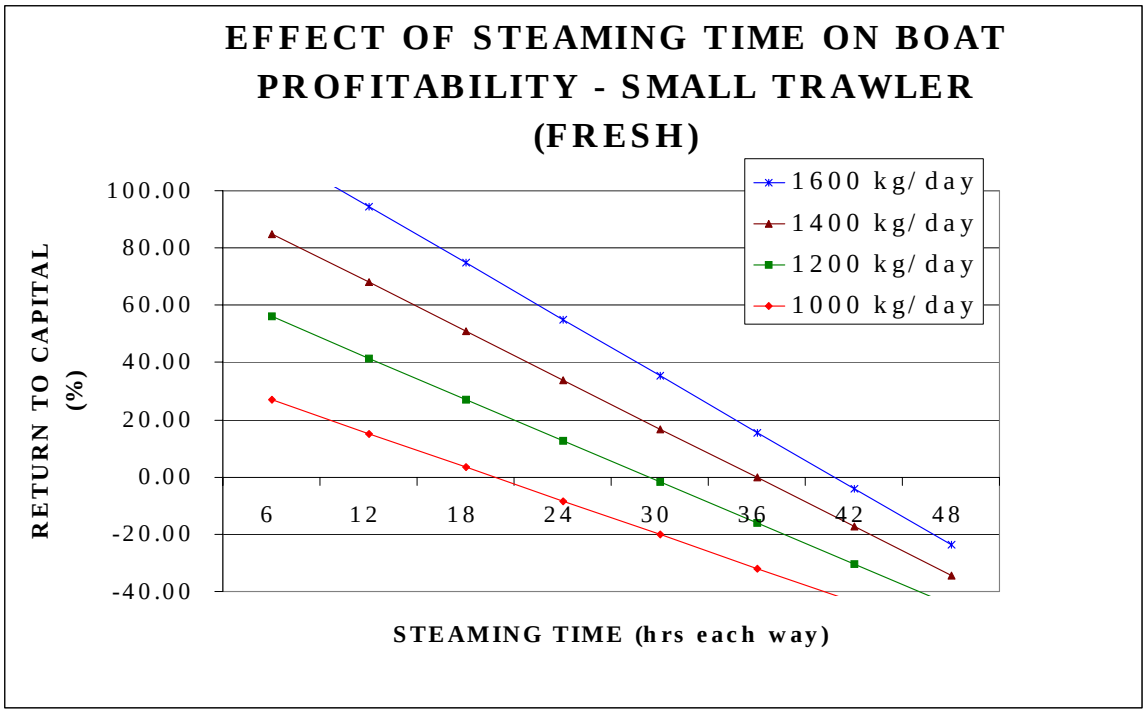


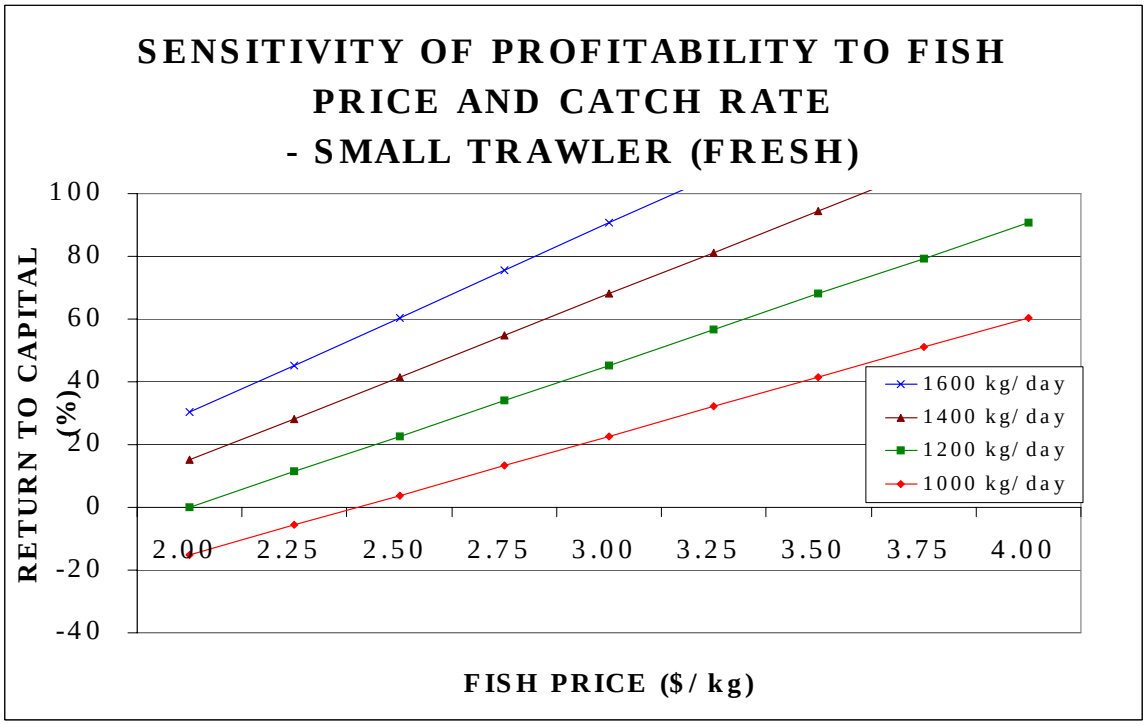
SENSITIVITY OF PROFITABILITY TO FISH PRICE AND CATCH RATE - LARGE TRAWLER




EFFECT OF STEAMING TIME ON BOAT PROFITABILITY - SMALL TRAWLER (FROZEN)
RETURN TO CAPITAL (%)
100.00
80.00
60.00
40.00
20.00
0.00
-20.00
-40.00
6
12
18
24
30
36
42
48
1600 kg/ day
1400 kg/ day
1200 kg/ day
1000 kg/ day
STEAMING TIME (hrs each way)


SENSITIVITY OF PROFITABILITY TO FISH PRICE AND CATCH RATE - SMALL TRAWLER (FROZEN)
RETURN TO CAPITAL (%)
100
80
60
40
20
0
-20
-40
2.00
2.25
2.50
2.75
3.00
3.25
3.50
3.75
4.00
1600 kg/ day
1400 kg/ day
1200 kg/ day
1000 kg/ day
FISH PRICE ($/ kg)


EFFECT OF STEAMING TIME ON BOAT PROFITABILITY - SMALL TRAWLER (FRESH)
RETURN TO CAPITAL (%)
100.00
80.00
60.00
40.00
20.00
0.00
-20.00
-40.00
6
12
18
24
30
36
42
48
STEAMING TIME (hrs each way)
1600 kg/ day
1400 kg/ day
1200 kg/ day
1000 kg/ day


SENSITIVITY OF PROFITABILITY TO FISH PRICE AND CATCH RATE - SMALL TRAWLER (FRESH)
RETURN TO CAPITAL (%)
100
80
60
40
20
0
-20
-40
2.00
2.25
2.50
2.75
3.00
3.25
3.50
3.75
4.00
FISH PRICE ($/ kg)
1600 kg/ day
1400 kg/ day
1200 kg/ day
1000 kg/ day

5.2 Stock Assessment for Red Snappers

Harvesting of fish and other aquatic resources can only be sustainable if the long-term rate of harvest does not exceed the long-term rate of replacement to the stock(s). The information required to achieve this is inherently imprecise and often expensive to collect. Research on the status of fish populations and their levels of sustainable utilisation provides fishery managers and stakeholders with information on which to make informed decisions about future management options. The essential information required for ensuring sustainability of utilised fish populations is their capacity to maintain replacement levels. To assess this capacity in the context of potential management strategies for each fishery, reliable stock assessment methods and accurate relevant data are required. These data include:

- catch and effort distribution and spatial dynamics from commercial logbooks;
- population abundance/harvest rate surveys; and,
- relevant data on basic biology, such as growth, reproduction rates, behaviour due to environmental influences amongst others, and biomass, movement and migration.

Fishery stock assessment methods generally rely on detecting fisheries induced impact of fishing through catch per unit of effort (trend index) statistics. Sequential concentrated fishing effort does not in itself imply any serious risk of biological stock depletion; there can still be very large stocks spread over the habitat at densities too low to attract fishers using existing fishing methods. However, a typical pattern of catch and effort trends in which there is sequential cropping of aggregations is for CPUE to increase rather than decrease over time, as fishers target previously under-fished areas in more remote regions. The trend of catch and effort will continue to appear healthy until fishers have discovered all fishing grounds within the operation distance of a major port and notice decreased catch rates. Such a situation may be described as “sequential depletion”.

The assessment approach for red snappers involved two steps. Firstly, estimation of optimum long term exploitation rates (the proportion of stock which can be harvested annually without placing the fishery at risk) from growth data assuming that natural mortality rate and optimum exploitation rate are generally about equal to the growth curve parameter K. Secondly, the application of this exploitation rate to estimates of unfished and current stock biomass is undertaken, based on a method known as stock reduction analysis (SRA). SRA is based on assuming knowledge of either the stock size at one moment in time (e.g., red snapper biomass in 1990 around 24000 t based on trawl survey) or on an estimation of the relative reduction in stock size that has occurred over a period of time. This knowledge or estimate is then entered into a spreadsheet along with a model that accounts for stock production/loss components over time (measured growth rates, estimated natural mortality and recruitment rates, and measured catch removals), and the model is run with different initial (unfished) stock size estimates until an estimate is found that “best fits” the known biomass or assumed relative stock size reduction. SRA has been widely used in fisheries assessment, mainly in circumstances where we cannot obtain a reliable index of relative abundance changes over time from commercial

harvest or survey statistics. SRA does not usually provide a precise stock size estimate, but provides broad bounds on likely stock size and potential for future harvest.

Estimates of optimum annual exploitation rates range from 10-30% of the total stock, but are low for red snapper due to their slow growth, low natural mortality rates and the accumulated large natural bio masses. For these reasons, only a small percentage of the total stock of red snappers can be taken safely each year from such accumulations, so the high abundance seen in many areas should not be considered as evidence of high sustainable yields.

Simple stock reduction analysis (SRA) provides gross estimates of how much the red snapper stock was reduced by foreign fishing and hence what its long term potential might be for Australian development. In the red snapper analysis, the unfished stock size was varied to see what stock would have been present in 1970 (before major removals by foreign trawl fleets) in order that the stock have been reduced to 24000 t (NT trawl survey estimate) in the Australian zone by 1990. This method gave unfished stock size estimates in the order of 50000 t for the AFZ, which in conjunction with measured growth rates implies a sustainable annual harvest of 1500 t which equates to a harvest rate of around 3 percent.

Alternative Hypotheses about Stock Status and Sustainability

Estimates of sustainable yield for the red snappers in the Arafura Sea are in the order of 1500 t to 2500 t. A key issue is not just total abundance, but also spatial concentration patterns. Stocks could be quite large, but spread out so that commercially viable concentrations are rapidly being removed and will only slowly be restored through recruitment and movement into concentrated areas by fish that are now spread out; new and more efficient fishing technologies could make it economical to harvest fish at lower concentrations.

5.3 History of the Commercial Fisheries for Tropical Snappers

Interest in the offshore line and trap fishery for tropical snappers extends over a considerable period. Japanese droplining vessels fished northern Australian waters between 1975 and 1979, with annual landings of up to 1500 t of reef fish. With the declaration of the Australian Fishing Zone (AFZ) in 1979, a feasibility fishery agreement saw a Japanese fishing vessel undertake droplining trials in the Timor Sea over a two-year period. The aim of this study was to assess the size and extent of the offshore deep-water reef fish resources and the possibility of establishing a viable commercial fishery for domestic operators. Following this survey, the Northern Territory Government and fishing industry representatives collaborated in exploratory fishing trials, with the local Fishing Vessel “Rachel” undertaking fishing trials in 70 to 140 m of water to the north and north east of Darwin, in 1982.

Harvesting of tropical snappers by domestic fishers has generally been within the confines of the Timor Reef fishery, or in areas of a suitable depth immediately adjacent to the boundary of the fishery. Overall catch rates using droplines range from about 200kg/day to 600kg/day, with *Pristipomoides multidens*, marketed as goldband snapper accounting for about 80% of landings.

Exploratory fishing trials in the Arafura Sea were undertaken on two separate occasions throughout 1995 in evaluating non-trawl harvest methods for red snapper and saddle-tail snapper. Saddle-tail snapper and red snapper were caught by droplines, longlines and trotlines with traps landing goldband snapper and red emperor. A Red and saddle-tail snapper catches patchy and generally only on small reefs and hard ground. Further exploratory fishing trials were undertaken to the west of Darwin in 1996 by local dropline vessels to find and evaluate potential commercial fishing grounds, evaluate the efficiency of contemporary fishing methods against slightly modified gears and to collect and analyse data for future use in managing NT fish stocks.

Fishing Methods

Skippers using colour sounders, GPS, plotters, bathometric charts (particularly the depth soundings appearing on the reverse side), and experience, search for schools of tropical snappers. In particular, fishers use colour sounders to detect schools of fish, with experienced operators able to determine the type of fish from the colour and formations of the fish school. It would appear from catch information and fishers comments that the majority of fishing time is dedicated to landing the high value goldband snapper in preference to other species. In doing so, existing fishers search for goldband snapper in depths of 80 – 160 m along reef frontages and on sand flats located near pinnacles. Fishers generally maintain the vessel in position to deploy baited lines and remain on location until catch rates decline, either due to loosing contact with the school or available fish being caught.

Multiple droplines may be deployed at any one time, each with 30 to 40 tuna circle hooks (size 11/0 to 13/0) attached. Heavy cord is used as the mainline. Hooks are attached by snoods (short length of monofilament fishing line) to a short section of line that is then attached to the mainline with a “shark” (quick release) clip and has an anchor attached. The use of a quick release clip allows operators to attach baited hooks and continue fishing, whilst the hauled section with fish attached is cleared. Hooks, generally baited with squid, are set within 25 m of the seabed for 3 to 15 minutes. Longer soak times may lead to lower catch rates due to shark predation or snapper struggling free from the hooks. The fishery developed using “throw away” set lines, (lines buoyed and set free of the vessel and later retrieved and hauled aboard by a mechanised winch), however most vessels now have hydraulic or electric reels. Daily catch rates are provided in Figure 1.

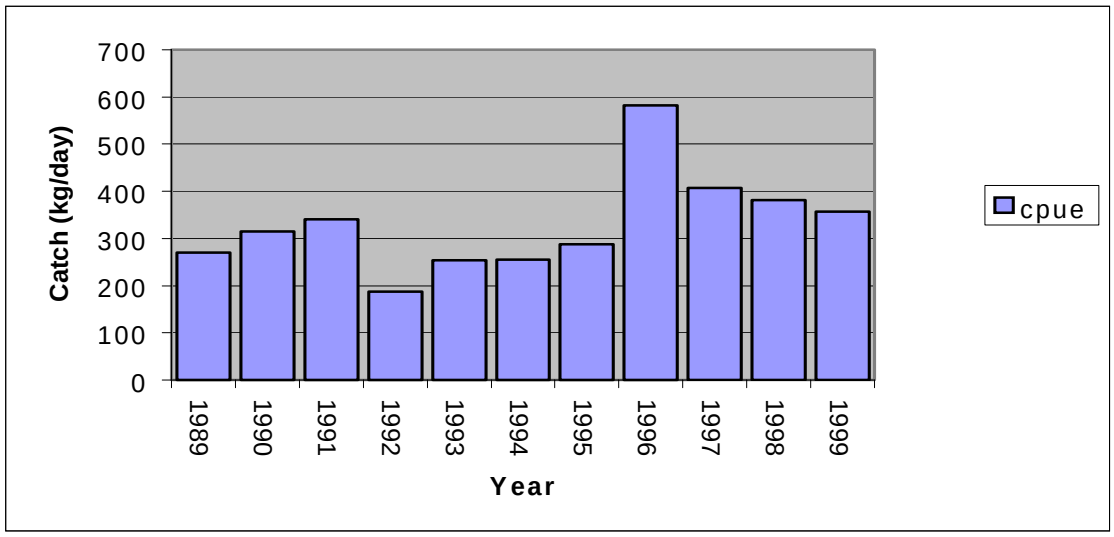


Figure 1: Average daily catch (kg) by Timor Reef fishers for the period 1989 to 1999 (Annual landings (kg) /total fishing days)

The recent success of fish trapping in the offshore snapper fishery has seen the resurgence in their use. While occasionally used in the past to target goldband snapper and other species, including red emperor, red snapper and saddle-tail snapper, the majority of offshore snapper fishers have more recently chosen to use traps in preference to baited lines.

Fishers generally set 30 to 40 baited traps in depths of 80 to 120m both along reef fronts and on open ground. Fishing with traps commences at around 4 am with fishers using an echo sounder to search for suitable bottom type and the presence of fish. Baited traps are then set for two to six hours depending on catch rates and retrieved with the aid of a mechanised hauler. The traps are then re-baited, and reset on suitable grounds. The preferred bait are pilchards (small bait fish). Fishing generally continues until 11 pm.

Tropical snappers caught by traps and baited lines are spiked (ike-jime), bled and held in ice slurry or chilled seawater for a short time. The catch is then soldier packed "on ice" and stored in insulated storage containers or a purpose built hold onboard the vessel.

Fishing trips are generally of five to ten days duration, with the length of the fishing trip determined by weather conditions, the distance to the fishing grounds, overall catch rates and the need to market a premium quality “fresh on ice” snapper. Studies undertaken reveal that tropical snappers enjoy an extended shelf life stored "on ice".

Section 6

Further Reading

Report on Dropline Fishing Operations - Observations of the fishing vessels "Takuryo Maru No. 11" during feasibility fishing operations in the Australian Fishing Zone (December 1980) (Fisheries Report No. 6)

The Japanese fishing vessel "Takuryo Maru No. 11" undertook fishing trials using multiple hook droplines to assess the viability of landing demersal reef fish in areas adjacent to Vulcan, Barracouta and Heywood Shoals.

The vessel completed nine voyages each of about six weeks duration between 1980 and 1982 with each trip yielding about 90 tonnes of whole fish. This report provides a comprehensive overview of the fishing gear and dropline machines, daily fishing routine, processing and freezing of demersal reef fish and tunas.

Development Prospects For An Off-Shore Reef Fishery In Northern Australian Waters (Fisheries Report No. 13)

Following the success of the foreign fishing vessel "Takuryo Maru No. 11" and encouraging response from test marketing of tropical snappers in Darwin, a local vessel was chartered to undertake exploratory fishing trials in the Timor Sea.

This 1982 report provides a complete overview of the early development of the Timor Reef fishery, including harvesting of high value tropical snappers by mechanised droplines and traps, processing of catch and economic analysis of the operations of a domestic vessel in the fishery.

An Assessment of the Profitability of Australian Trawlers Operating in the Northern Demersal Fishery (Fisheries Report No. 18)

The profitability of operating a trawler in the northern Australian demersal trawl fishery is examined in this 1989 report. A spreadsheet model was developed to assess the feasibility of domestic operators entering the trawl fishery previously fished by Taiwanese and Thai operated vessels.

The study found that second hand prawn trawlers departing the Northern Prawn Fishery would be marginally profitable, with a likely return to capital of about 13% proving unattractive to domestic fishers in pioneering a "new" fishery. Overall returns were highly sensitive to catch rates and prices, with a 10% increase in prices resulting in a 21% return to capital. Similarly, a 10% increase in catch rates boosted annual return to capital to around 17%.

Profitability of a Demersal Trap Fishery (Technical Bulletin No. 157)

An assessment of the profitability of a demersal trap fishery in waters adjacent to the Northern Territory was reviewed in 1990. This report suggests that a promising line and trap fishery may be developed to the north of Darwin supplying premium quality high valued snappers to local and interstate fresh fish markets.

This analysis built on fish trapping trials in the Timor Sea. Various scenarios were modelled, with annual returns on capital ranging from 22.2% to 37.8% pa with profitability highly sensitive to market prices received and catch rates. A 20% increase in landings was necessary to achieve a similar increase in overall profitability from a 10% increase in prices. The duration of fishing trips, capital cost of vessels and labor costs were important contributors to overall profitability.

The Effects of Trapping on the Storage Life of Reef Fish (Fisheries Report No. 23)

The shelf life and consumer acceptance of trap caught demersal fish were assessed. This study revealed that fresh tropical snappers have an extended shelf life and high consumer acceptance making them ideal to market interstate.

Evaluation of Non-Trawl Harvest Methods for Red Snapper in Northern Australia (Fisheries Report No. 36)

The harvesting of saddle-tail and red snappers from the Timor and Arafura Seas using non-trawl methods was the subject of this 1995 study.

With the departure of foreign fishing trawlers after 20 years of operation and the low level of development by the domestic trawl fishery, exploratory fishing trials were undertaken in the Arafura Sea.

This study showed that droplines, longlines and trotlines predominantly caught saddle-tails and red snappers with traps catching goldband snapper and red emperor. Schools of saddle-tail and red snappers were patchy and generally found over reef and other hard ground. Analysis of the economic performance showed overall return to capital ranged from –19% to 45% depending on catch rates and market prices.

Evaluation of Northern Territory Fishing Grounds South of 11^{o} S and West of 130^{o} E (Fisheries Report No. 40)

A second exploratory fishing trial to find and evaluate potential commercial fishing grounds, evaluate the efficiency of contemporary fishing methods against slightly modified gears and to collect and analyse data for future use in managing NT fish stocks were undertaken in 1996 on ground to the west of Darwin.

Commercial quantities of red snappers were discovered in some areas, overall catch rates were improved using smaller hooks and the successful trialling of a “shark proof” dropline, with 5 tonnes of demersal snappers and emperors landed. The catch was marketed on interstate markets, with prices of $3.50 to $4.50 received for red snappers.