

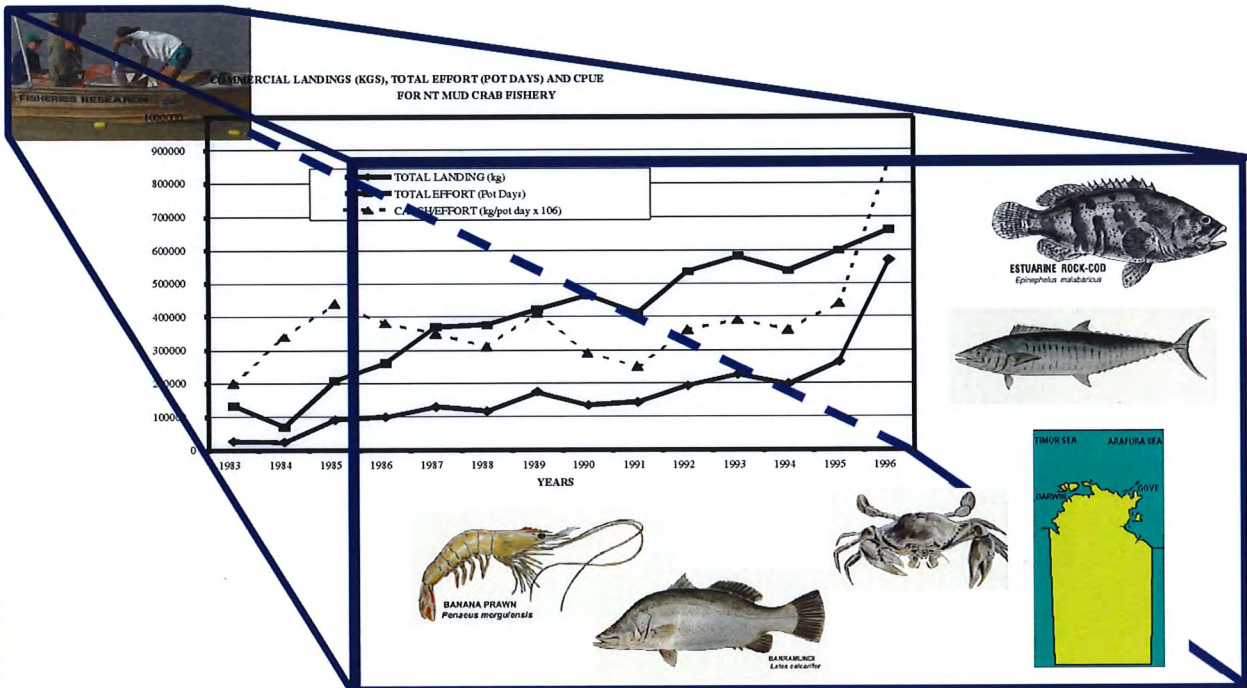


FISHERIES  
RESEARCH &  
DEVELOPMENT  
CORPORATION



# NORTHERN TERRITORY STRATEGIC PLAN

FOR



# FISHERIES

## RESEARCH & DEVELOPMENT

### 1999-2003

PREPARED BY

THE NORTHERN TERRITORY FISHERIES RESEARCH ADVISORY BOARD

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**NORTHERN TERRITORY**  
**STRATEGIC PLAN FOR FISHERIES**  
**RESEARCH AND DEVELOPMENT**

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# **STRATEGIC PLAN FOR NORTHERN TERRITORY FISHERIES**

## **RESEARCH AND DEVELOPMENT**

### **1. OVERVIEW OF NT FISHERIES AND FISHING INDUSTRIES**

The Territory's fisheries comprise commercial (wildcatch and aquaculture) and recreational and Indigenous sectors. All have played a significant role in the development of the Territory and they continue to contribute to diversified regional economic growth. The fish resources in waters adjacent to the Northern Territory are characterised by a large variety of species of relatively low abundance. Many of these species have a high growth rate and are short lived (8 - 15 yrs). Conversely, recent research has shown that growth rates in some of the NT commercial species, mainly demersal snappers, are unexpectedly low and reach a considerable age (> 25 yrs).

In spite of major advances in stock assessment methodology during the last decade, significant fisheries collapses have occurred in other parts of the world. In response, the NT Government and its fishery stakeholders have adopted conservative approaches to fisheries utilisation. This approach has sought to minimise the possibility of fishery collapse whilst maximising the optimal utilisation of the stocks.

Prawns and pearl culture make up the majority of the GVP of Northern Territory fisheries. However, a number of other species are very important to the local economy, some of which may be under-utilised (Table 1). In order of value, the major commercial fisheries and aquaculture industries are:

- Prawns (managed by the Commonwealth)
- Pearl culture
- mud crabs
- barramundi and threadfin salmon
- sharks
- demersal snappers
- Spanish mackerel
- inshore species, mainly reef fish and tropical snappers.

In addition, there are a number of small fisheries for trepang, bait fish, etc. The annual value of the commercial fisheries sector is between \$15M and \$20M for the wildcatch sector and \$50M to \$55M for aquaculture.

The overall annual expenditure on recreational fishing in the NT is conservatively estimated to be at least \$30M per year (Coleman, 1998)<sup>1</sup>. The value of recreational fishing to the Territory is difficult to estimate as it contains qualitative social and cultural elements as well as quantitative commercial outcomes through Fishing Tour Operators (FTOs). Improved ways of measuring the value of recreational fishing are currently being sought, for example, through the FRDC project by Hudloe *et al* (1998)<sup>2</sup>.

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<sup>1</sup> Please note that because of the differences in calculation methodology, no comparisons or inferences should be drawn regarding the relative values of the recreational and other sectors to the NT.

<sup>2</sup> Project 1998/165 "Framework for valuing fisheries resource use".

Due to the diversity of stakeholders and interest groups, there are different and often conflicting, policies and directions that the Government needs to consider when deciding its strategic directions for managing the conservation and utilisation of aquatic resources. For example, the values of recreational fishing need to be balanced against the use for commercial fishing; the differing requirements of Aboriginal communities for aquatic resources in their ceremonial, recreational and commercial needs; and the potential conflicts between stakeholders in the same fishery. 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.

Thus, fisheries management, research and development priorities must be set in close consultation with the stakeholders in the various fisheries and aquatic resources involved. Apart from the Fishery Advisory Committees (FAC's), this consultation also occurs through a number of formal and informal channels. The prime formal consultative mechanisms include:

- The Ministerial Advisory Committee on Recreational Fishing (MACRF),
- the Professional Seafood Producers Consultative Committee (PSPCC),
- the Territory Aquaculture Development Advisory Committee (TADAC)
- The Pearl Industry Advisory Committee (PIAC), and
- the network of Aboriginal Consultative Committees (eg the Anindilyakwa Consultative Committee and the Tiwi Coastal Waters Committee).

Before R&D strategic priorities could be set, the objectives for the management and/or development of utilisation and conservation of the aquatic resources involved needed to be clear.

The function of this Plan is to ensure that, within the resources available in the NT for fisheries research and development, the utility of the biological and technical advice needed for managing its fisheries is optimised.

## 2. DESCRIPTION OF STAKEHOLDERS

The fisheries stakeholders in the NT include the following major groups:

- Aquaculture
- Seafood Harvesters
- Seafood Processors and Marketers
- Seafood consumers
- Fishing Tour Operators
- Recreational Fishers and Divers
- Indigenous Users
- The Territory and Australian communities.

Each of these eight client groups have differing issues and needs.

There are twenty-two licences issued in the **aquaculture sector**, six of which are for pearl production. The non-pearl sector is currently worth about one million dollars per annum; most of which is from prawn production. It has strong potential for significant growth, particularly for

prawns and other high value species. The **pearl production** sector is a major established industry in the Northern Territory worth around fifty to fifty-five million dollars per annum.

**TABLE 1. LANDED VALUES OF THE NT COMMERCIAL FISHERIES WITH COMMENTS ON MANAGEMENT AND POTENTIAL FOR GROWTH IN INDUSTRY**  
(Sources: Fisheries Division 1994 to 1998 and Walters 1996)

Financial Year →	1994/95		1995/96		1996/97		Growth Potential and/or Management required
Fishery ↓	Landed Weight (t)	Value (\$x10 <sup>6</sup> )	Landed Weight (t)	Value (\$x10 <sup>6</sup> )	Landed Weight (t)	Value (\$x10 <sup>6</sup> )	
Barramundi #	735 (474)	3.08 (2.49)	750 (514)	3.49 (2.96)	777 (537)	3.31 (2.84)	Potential for increased Recreational & commercial catch - catch & effort must be monitored
Mud Crab	219	2.85	422	5.38	574	7.47	Nearly fully utilised - catch monitoring necessary - possible potential for increased recreational & commercial catch
Shark	406	1.17	840	2.22	834	2.28	Stocks in long term decline - more data needed through collaborative research
Timor Reef ♦	99 (84)	0.52 (0.45)	357 (292)	1.92 (1.61)	389 (293)	2.04 (1.46)	Probably fully utilised - needs research & international management
Finfish Trawl	+	+	+	+	+	+	One licence only - confidentiality conditions apply
Demersal	456	2.18	290	1.79	242	1.46	Good prospects for further comm. development
Spanish Mackerel *	183 (182)	0.63 (0.63)	212 (210)	0.75 (0.74)	205 (200)	0.53 (0.51)	Stocks appear to be fully utilised - stock discrimination & monitoring needed
Coastal Line	97	0.30	129	0.50	84	0.24	Potential to increase landings - more research needed
Coastal Net & Bait	51	0.17	59	0.23	39	0.13	Some potential for increasing coastal net landings
Other Fisheries	203	2.57	150	0.70	108	0.59	Potential for expansion
Non-pearl Aquaculture		1.0		1.0		1.0	Significant potential for expansion
Pearl Culture φ		50.0		50.0		50.0	
<b>SUB-TOTAL (NT MANAGED)</b>	<b>2,043</b>	<b>64.47</b>	<b>3,209</b>	<b>68.06</b>	<b>3,219</b>	<b>69.78</b>	
Northern Prawn Fishery φ		50.0		50.0		50.0	
<b>SUB-TOTAL (NOT NT MANAGED)</b>		50.0		50.0		50.0	
<b>TOTAL φ</b>		<b>114.5</b>		<b>117.0</b>		<b>119.8</b>	

# ( ) Barramundi landing only; \* ( ) Spanish Mackerel landing only;

♦ ( ) Goldband Snapper landing only; φ Estimated values only.

**Seafood harvesters** include approximately three hundred and thirty-five commercial licence holders who target mud crabs, barramundi, offshore and inshore marine scalefish, sharks and mackerel, etc using a variety of fishing methods. The value of commercial landings is worth around

\$20 million per annum to the Northern Territory and has a moderate opportunity for growth. The Commonwealth manages the Northern Prawn Fishery that is valued at around \$120 million per annum. On average, around \$50 million per annum of prawn are taken from waters adjacent to the Northern Territory.

The **seafood processing and marketing** sector is inextricably linked to the seafood harvesting sector. This segment, although not quantifiable in dollar terms, provides the vehicle for enhancing the industry's position as a price maker rather than a price taker.

**Seafood consumers**, both in Australia and overseas, are demanding a broader variety of products and want to be assured of the quality and safety of what they eat.

**Fishing tour operators** are based in the tourism industry and promote recreational fishing as a major attraction. These businesses provide tourist anglers with facilities to catch barramundi in rivers and estuaries as well as for catching billfish, mackerel, snapper, etc in blue water fishing.

**Recreational fishers and divers** make up a substantial and increasing industry in the Northern Territory, both in terms of economic value (an annual expenditure of about \$30 million) and resource impact (an annual harvest of over 1,000,000 fish, crustaceans and molluscs). Recreational fishing related tourism is a major industry and for some species (snappers on inshore reefs, trevallies, jewfish, etc) recreational fishers take as much if not more than the commercial fishery.

**Indigenous people** own around 84% of the coastal land in the Northern Territory. They have subsistence, social, cultural and economic development needs associated with the aquatic environment. They are an integral part of NT fisheries and their needs are considered equally with other users when management arrangements are developed.

### 3 NT STRATEGIC R&D PRIORITIES

#### 3.1 Basis for a Strategic R&D Plan

The legislative basis for the management and conservation of fisheries and fish resources resides in the NT *Fisheries Act* 1988 which is an Act "to provide for the regulation, conservation and management of fisheries and fishery resources so as to maintain their sustainable utilisation, to regulate the sale and processing of fish and aquatic life, and for related purposes". Subordinate to the Act are Fisheries Regulations that provide for declaration of the various fisheries and how these are administered. The Act also makes provision for the declaration of Management Plans which provide specific management for major fisheries and waters.

To achieve the objectives of the Act relevant information needs to be gathered on the Territory's aquatic resources. The role of this Strategic R&D Plan is to ensure that the gathering of this information has been planned with priorities agreed by both stakeholders and Government.

#### 3.2 Research Reviews in NT Fisheries

In 1974 a detailed assessment of the state of the NT fisheries was made and directions for their future development and management recommended (Copes, 1974). When the NT attained self-government in 1978, the future direction of the NT fishing industry was again reviewed. The NT

Cabinet provided increased human and financial resources for the newly created Fisheries Division to implement these new directions.

Since that time, the overall functions and staffing of the Fisheries Division have been reviewed several times. The most recent reviews were carried out as part of the Economic Review Committee Report (ERC) in February 1991 and as part of the 1993 to 1995 restructuring of the Division. During 1998, a further review was carried out to assess the alignment of current Fisheries Division programs, strategies and operations with the current Government priorities and expectations. Although this review was not specifically aimed at research and development, it has provided an up-to-date view of the current directions of fisheries management and development in the NT.

In 1987, a barramundi stock assessment and management workshop was conducted by Dr Bill Fox, with funding from Industry. Dr Fox mediated between the Industry and Division, and reviewed research and management, convincingly demonstrating that the fishery was in danger of over fishing. Based on these findings the Management Plan for that fishery was amended to provide greater protection for the stocks.

In 1995 the NT Government carried out a joint Government/stakeholder strategic review of the fishing industries and published its "Future Directions" document for the Territory fishing industry. This document stated that the future of the fishing industries lies in addressing and resolving the following 8 issues:

- Sustainability of fish resources and their supporting ecosystems,
- Resource allocation and management,
- Aboriginal issues,
- Business enterprise and commercial development,
- Recreational fishing,
- Aquaculture development,
- Jurisdictional arrangements and cooperation with other fisheries agencies, and
- Administration and government services.

The Fisheries Division research programs as a whole were reviewed in 1995 to ensure that their priorities and directions were consistent with these issues and that resources were appropriately distributed. Priorities for research on the major NT fisheries were assigned for the coming three years. These priorities were based on the information available at that time on the catch, number of licences, the current levels of exploitation, the management requirements and the needs for further development. Highest priorities were given to:

1. Coastal fisheries;
2. Timor Reef;
3. Demersal/Northern Trawl;
4. Barramundi;
5. Fishery monitoring and routine assessment; and
6. Fishery development.

Because of the difficulties in making reliable assessments of fish stocks, the Northern Territory believes that a number of methodologies need to be employed to reduce the risk of management failure. To this end leading fisheries scientists such as Dr Carl Walters of the University of British Columbia, Vancouver, were engaged by the Territory to review its approaches to stock assessment and natural resource management, and seek new methodologies. In 1996 Dr Walters was contracted to re-assess major fisheries in the Northern Territory (goldband snapper, red snapper, coastal reef

fish, mud crab and barramundi) and to advise the Northern Territory Government on the biological status of these fisheries, on any changes required in their management and on any necessary changes to future research programs. A follow-up consultancy was carried out in 1997 to assess the shark and Spanish mackerel fisheries.

The recommendations of the 1995 review and those conducted subsequently by Prof. Walters were incorporated into the 1996/1997 to 1999/2000 Fisheries Division Business Plans.

### **3.3 Administration of Fisheries R&D**

The Fisheries Research and Development Corporation (FRDC) has requested that the Fisheries Research Advisory Board (FRAB) in each State and Territory produce a strategic research and development plan setting out in detail their R&D policies. In evaluating funding applications, the Board will use the policies and priorities from this Plan as part of its assessment of R&D proposals.

The Northern Territory Fisheries Research & Development Advisory Committee (NTFRDAC) takes the role of the Territory FRAB. The NTFRDAC was set up in 1994 with terms of reference to advise the Minister and the Department on:

- I. Methods of improving the management of Territory based fisheries by providing better biological, technological and economic information relevant to the fishing industry;
- II. Establishing research and development needs and priorities in both the catching, post-harvest and aquaculture sectors of the fishing industry that are required for the rational and long-term use of the Territory's fish and fisheries resources;
- III. The coordination and direction of future fisheries research and development programs and projects so that they provide information on which to base measures to manage the resources and to provide an equitable allocation of the available resources between competing user groups; and,
- IV. The applicability of research and development projects submitted on NT fisheries and the priorities to be adopted for their funding from both FRDC and other sources.

The membership of 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.

### **3.4 R&D Objectives for NT Fisheries**

Based on the fisheries legislation and the 1995 Future Directions document, the following principal outcomes have been identified for NT fisheries:

- SUSTAINABLE HARVESTING OF FISH AND OTHER AQUATIC RESOURCES
- CONSERVATION OF AQUATIC BIODIVERSITY AND IMPLEMENTATION OF ECOSYSTEM MANAGEMENT OF AQUATIC RESOURCES
- OPTIMUM UTILISATION OF FISH AND AQUATIC RESOURCES
- GROWTH OF THE AQUACULTURE INDUSTRY



Fisheries research and development priorities to achieve these outcomes have been set in close consultation with the stakeholders in the various fisheries and aquatic resources. It is essential that this consultation and collaboration continue for the successful implementation of this Strategic Plan.

## **4 SUSTAINABLE HARVESTING OF FISH AND OTHER AQUATIC RESOURCES**

### **Description**

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 ensure adherence to this truism is complex, 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 base management decisions. To be effective, the objectives of any investigations must be very clear and focussed. In the current climate of diminishing research and development resources, a strict prioritisation and triage process is being applied to ensure that the most pressing potential, actual and solvable problems relating to the utilisation of aquatic resources are addressed. The fisheries and activities listed on pages 14 and 15 have had this process applied.

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; comprehensive information from other sectors such as recreational fishers (FISHCOUNT 95) and Aboriginal communities; population abundance/harvest rate surveys; and, relevant data on basic biology, such as growth, reproduction rates, behaviour, and biomass. The models applied must provide reliable quantitative information on stock productivity; mortality rates, exploitation rates; and analysis and an understanding of fishery operations. Advice on managing the target aquatic resources flows from these analyses.

Advice on sustainable utilisation is also provided to the public and commercial, recreational and Indigenous fisheries sectors through extension and information services.

### **Planned Outputs**

The key outcomes for research and development on sustainable harvesting of fish and other aquatic resources is to provide the best available advice to fishery managers on current levels of utilisation and on future levels that will not result in over-fishing to occur. Other outcomes include:

- production of stock assessment reports accepted by major client groups for the target fisheries which focus on sustainability indicators, particularly estimates of utilisation rates and/or sustainable catch levels;
- regular reporting of research outputs to stakeholders; and
- consistency of research outputs with the stated research and development priorities.

The risks of not addressing these R&D objectives on sustainable harvesting include:

- sub-optimal outcomes, possibly with substantial negative economic and social impacts through over-fishing of stocks; and
- inadequate information available for the Division to evaluate proposals and inquiries from clients, lobby groups, etc.

## **5 CONSERVATION OF AQUATIC BIODIVERSITY AND IMPLEMENTATION OF ECOSYSTEM MANAGEMENT OF AQUATIC RESOURCES**

### **Description**

All Australian State, Federal and Territory Governments now recognise biodiversity conservation as part of the wider issue of ecosystem management. The Fisheries Division contributes to the protection of the Territory's aquatic ecosystems and biodiversity by providing research and development advice on aquatic populations and environments. This advice is often in collaboration with other NT Government instrumentalities such as the Territory Parks and Wildlife Commission, the NT Museums and Art Gallery, the Power and Water Authority, the Department of Lands, Planning and Environment, etc. The Division contributes through:

- assessment of proposals for developments and modifications to the aquatic environment;
- contribution to proposals for Marine Protected Areas (MPAs), marine parks, refugia, etc and assessment of their potential impacts on fisheries stakeholders; and
- identification of threats to biodiversity from over-utilisation of aquatic resources and implementation of management measures to alleviate them.

Research advice on potential threats to ecosystems and biodiversity must be formulated in collaboration with industry, planning and development agencies, and environmental protection agencies. The Division will remain in the forefront of providing biological advice on the environmental and habitat impacts of fisheries development proposals.

### **Planned Outputs**

The principal outputs for fishery related research and development on the protection of ecosystems and biodiversity include:

- risk based assessments of the probable impacts and/or benefits of proposed fisheries protected areas; and
- major client groups awareness and acceptance of environmental and biodiversity issues.

If fisheries advice on threats to biodiversity by development proposals is not provided, or if this advice is not heeded, there is a strong possibility that there will be losses of biodiversity, reduced environmental quality and damaged fish habitat. The consequences will be loss of fish production, possibly with substantial economic and social impacts.

## 6 OPTIMUM UTILISATION OF FISH AND AQUATIC RESOURCES

### Description

Within the limits of the sustainability of each fishery, this outcome seeks to optimise allocation of fisheries resources between stakeholders; provide economic analyses of existing fisheries and fishery activities, including advice on improving economic performance; develop new fisheries and new or improved fishing methods; and, fisheries extension and training for the NT. Major activities required to address this outcome include identification and documentation of potential areas of economic development of commercial fishing, fish processing, marketing and aquaculture, including facilitation of a Quality Assurance (QA) scheme. Outcomes that increase profitability by increasing unit price of product and/or decreasing production costs are also included. In the area of recreational fishing, optimum utilisation activities include advice on ways to improve the social and cultural experience of recreational fishing as well as documentation of the potential for further development of the Fishing Tour Operator business. Advice on acceptable allocation of fish and aquatic life resources between competing stakeholders and provision of appropriate extension, training and education to non-Aboriginal and Aboriginal stakeholders are also important in achieving this outcome.

### Planned Outputs

The outputs of research and development advice on optimal utilisation of NT fisheries include:

- identification and prioritisation of commercial, aquaculture and recreational fishery opportunities;
- effective Quality Assurance (QA) for the commercial fisheries and aquaculture industries;
- effective extension services developed for commercial fisheries and Aboriginal communities; and
- client acceptance of resource allocations made after consideration of relevant matters raised during stakeholder consultation.

Poor or inadequate research and development advice in critical fisheries areas may result in successful appeals or challenges to management arrangements and inefficient or inappropriate use of aquatic resources.

## 7 GROWTH OF THE AQUACULTURE INDUSTRY

### Description

In 1997/98 the value of NT aquaculture production was between \$50M and \$55M from Pearl Oyster culture with the value of production from seafood farming industry about 1 million dollars, most of which is prawn farming. The seafood farming industry is considered to have a strong potential to grow to a \$40M industry over the next 10 years, with prawns alone reaching \$20M. To achieve this production the issue of access to suitable aquaculture lands must be resolved and utilisation of sites on Aboriginal land clarified.

The research and development component in the NT Aquaculture Development Plan entitled "*Into the Blue*", states that

*"New species to be developed for aquaculture will be dependent upon markets, technical feasibility, development potential (eg land and water available) and economic viability. Research and development to address impediments to growth of existing industry sectors will also be required.*

*"Areas on which R&D efforts will be focused over the next five years (1999-2004) include:*

- Research and development on issues of generic interest to the pearling industry, such as disease control and biofouling.*
- Support as required for the prawn farming sector. One key area is to ensure supply of broodstock for larval production.*
- Continuation of work on mud crab aquaculture. Emphasis will move [from larval rearing] to juvenile and adult production systems.*
- The same government research team will pilot and proceed with feasibility work on tropical lobsters [and other species with commercial aquaculture potential].*
- Development of tropical fin fish aquaculture systems using golden snapper as the model species, adapting these (such as copepod technology) for other high value species such as barramundi cod, coral trout and grouper;*
- Support as required for the barramundi farming sector."*

The Territory research and development aquaculture Plan is built upon the *National Strategy on Aquaculture in Australia* (1994, 1997), including the elements to:

- ensure industry participation in priority setting;
- encourage collaborative research projects, both within Australia and internationally;
- encourage industry participation in research projects; and
- encourage commercialisation of research and development outcomes.

The Fisheries Division currently supports aquaculture by:

- conducting research and development on tropical aquatic species with aquaculture potential (some of which are already commercialised while others are being assessed for their economic potential);
- providing extension/technology transfer services to enhance the profitability and competitiveness of existing local commercial farming operations, including assistance in product and market development; and
- making both existing and potential aquaculture investors aware of local environmental and fisheries legislation and licensing condition that pertain to their operations.

The principal outcomes for growth of the NT aquaculture industry will be:

- **Sustainable growth of existing industries; and**
- **Development of new sustainable industries.**

The sub-programs to attain these outcomes are divided into four major categories, ie,:

- Mollusc aquaculture;
- Fish aquaculture;
- Crustacean aquaculture; and
- Industry support.

The details of these major categories are set out in Figures 11 to 14.

## **Planned Outputs**

The principal output of research and development advice on the NT aquaculture is to contribute to growth of the industry. Other outcomes include:

- production of scientific reports on aquaculture;
- industry acceptance and uptake of the results of scientific projects;
- annual reviews by the Territory Aquaculture Development Advisory Committee (TADAC);
- reviews by the Pearl Industry Advisory Committee (PIAC);
- reviews carried out under the National Aquaculture Strategy.

The risk from inadequately focused investigations and poor quality advice is that the potential growth of the aquaculture industry will not be realised and that investment funds are directed towards sub-optimal species and methods. This risk is also managed through the control of staff performance and regular program reviews.

## **8 NT FISHERIES R&D FUNDING ARRANGEMENTS**

Fisheries research and development is currently funded from several local and external sources. These include:

- Northern Territory Government funding
  - Regular allocation from the NT Government Consolidated Revenue;
  - Special purpose allocations from NT Consolidated Revenue;
  - Funding from other NT Government departments for joint projects; and
  - Allocations from the NT Fisheries Research and Development Trust Account (NTFRDTA);
- Funding for approved projects from the Fisheries Research and Development Corporation (FRDC);
- Funding from the Natural Heritage Trust for projects under:
  - Coasts and Clean Seas Program
  - Endangered Species Program
  - Fisheries Action Program
  - National Landcare Program
  - National Wetlands Program
- Funding from Agriculture, Fisheries and Forestry - Australia (AFFA) for joint NT/Commonwealth projects under the Fisheries Resources Research Fund (FRRF); and
- Funding for participation in overseas projects of interest to the NT through the Australian Centre for International Agricultural Research (ACIAR).

In addition, there are contributions of funds and assistance in kind from the NT fishing industry for special projects of joint interest.

See Appendix A for further details of funding arrangements.

## 9 DETAILED STRATEGIC PROGRAM FOR THE NEXT 5 YEARS

The 1999 to 2003 research and development program for each major fishery or fisheries activity needs to take into account the four strategic outcomes outlined in Section 3.4 above. The program to address these outcomes for each fishery and activity is represented diagrammatically in Figures 1a, 1b and 2 to 16. The information shown in each column of these diagrams is:

1. COLUMN 1 - this column identifies the general category of the fishery or activity involved (eg, wild harvest, aquaculture, technology, etc); where appropriate, the principal species involved; and the degree of stakeholder utilisation.
2. PRINCIPAL OUTCOMES - these are the principal outcomes identified above, ie, *Sustainable Harvesting of Fish and other Aquatic Resources*; *Conservation of Aquatic Biodiversity and implementation of aquatic ecosystem management*; and *Optimum Utilisation of Fish and other Aquatic Resources*. The outcomes for *Growth of the Aquaculture Industry* relate to the actual and potential industries and have been represented under each.
3. SPECIFIC R&D OUTPUTS - these are identified under each principal outcome and, where possible, have been standardised across the fisheries or activities considered. For example, a specific outcome under principal outcomes for all fisheries is economic viability; by-catch is considered under *conservation of biodiversity*, etc.
4. PROJECTS - the research and development programs and projects identified are listed in priority order for each Principal Outcome.
5. FUNDING SOURCE - three categories of funding sources are used:
  - NT Government Funded;
  - Externally funded (ie. Funded from sources external to the NT Government); and
  - Not yet funded.
6. TIMETABLE - this is a graphical representation of the timetable for each program and project from 1999 to 2003.

Figure 1a is a general diagrammatic representation of the various R&D factors that were considered during the preparation of this Plan. Not all of these factors apply to all fisheries or fisheries activities but they provide a basis for checking the relevant factors.

Development of the Aquaculture Industry (Figure 1b) has been considered differently with the principal outcomes that were identified in "*Into the Blue*" (the Aquaculture Industry Development Plan), being used. As in the other outcomes, these have been represented diagrammatically to allow easy identification of the factors to be considered under each.

Aboriginal Fisheries Development - Commercial and Subsistence (Figure 16) was also considered differently with only one principal outcome, Development of Sustainable Aboriginal Commercial and Subsistence Fishing Enterprises.

In terms of fishery resource utilisation or for considering the R&D future priorities, there are three distinct utilisation categories, ie,

- Commercial industry,
- Recreational fishing, and
- Indigenous usage.

In the examination of specific R&D outcomes, it is valuable to assign the levels of usage by these usage categories for each sub-program. The levels are shown in a table contained in the FISHERY/ACTIVITY column in the analytical tables 2 to 14.

When assessing research and development priorities FRDC identifies both 'attractiveness' and 'feasibility' for projects. In this context, **Attractiveness** includes factors such as: status of the fishery; potential benefits to stakeholders; conformity with Government policy; costs of implementing the results; and, the incremental contribution to the overall of knowledge of the fishery. Basically, **feasibility** is whether the project will succeed and whether it's results will be adopted.

Research and development directions for each fishery and fisheries activity were based on the relevant recommendations from the recent review of the Fishery Division (Fisheries Division, 1998). This review assessed the Northern Territory Government priorities and expected outcomes for all sectors of fisheries and the fishing industry, including conservation of aquatic organisms and marine reserves.

The projects to address each specific R&D outcome were formulated following discussion between stakeholders and the Fisheries Division. The fisheries and fishery activities considered are:

FIGURE NO.	DESCRIPTION	PRINCIPAL SPECIES
<b>FISHERY</b>		
2	Barramundi Fishery	Barramundi and Threadfin Salmon
3	Mud Crab Fishery	Mud Crab
4	Shark Fishery	Black Tip and Spot tail Sharks
5	Timor Reef Fishery	Goldband Snapper
6	Demersal Fishery/Finfish Trawl Fishery	Red Snapper
7	Spanish Mackerel Fishery	Spanish Mackerel
8	Coastal Line/ Coastal Net Fishery	Jewfish, Snappers, etc. Blue Salmon, Mullet, Sharks, etc
<b>FISHERIES ACTIVITY</b>		
9	Recreational Fishing R&D	
10	Seafood Industry Development	
<b>AQUACULTURE</b>		
11	Mollusc Aquaculture	Pearl Oysters, edible oysters, abalone
12	Fish Aquaculture	Barramundi, tropical snappers, groupers
13	Crustacean Aquaculture	Prawns, mud crab, rock lobster, other tropical crustaceans
14	Aquaculture Industry Support	

FIGURE NO.	DESCRIPTION	PRINCIPAL SPECIES
	<b>OTHER ACTIVITIES</b>	
15	Habitat and Environment	
16	Aboriginal Fisheries Development - Commercial and Subsistence	

Attainment of the specific R&D outputs set out in these figures will ensure rational and sustainable growth of the Territory's fishing and aquaculture industries for the benefit of all stakeholders.



## **APPENDIX A.**

### **DETAILS OF NT FISHERIES R&D FUNDING ARRANGEMENTS**

#### **1 NORTHERN TERRITORY GOVERNMENT FUNDING**

##### **Regular Allocation from the NT Government Consolidated Revenue**

In 1989/99 the regular allocation to the Fisheries Division was \$3.268M; of this total \$1.6 million was used for fisheries research and development. This is the core funding for these activities.

##### **Special Purpose Allocations from NT Consolidated Revenue**

From time to time, the NT Government provides special purpose funding for priority R&D projects such as FISHCOUNT 95, the FISHDAT database and licensing system, etc.

##### **Funding from Other NT Government Departments for Joint Projects**

Occasionally the Fisheries Division carries out joint development projects with NT Departments such as the Department of Asian Relations, Trade and Industry. In some cases funding is usually in the form of paid travel expenses or reimbursement for travel, but in special cases operational funding is also supplied (eg the Mary River Wetlands Project).

##### **Allocations from the NT Fisheries Research and Development Trust Account (NTFRDTA)**

Section 51. of the Northern Territory *Fisheries Act* provides for the establishment of the Fishing Industry Research and Development Fund "for the purpose of ensuring the development of the fishing industry or research into fish, aquatic life, fishing, fisheries, the fishing environment and other related matters". This Fund is credited with the fees prescribed in the subordinate legislation and any revenues from other sources provided for the purposes of the Fund. Section 52. sets out the conditions under which the Fishing Industry Research and Development Fund Advisory Committee is established by the Minister for Primary Industry and Fisheries. This Committee consists of four members representing the Division and stakeholders and is chaired by the Director of Fisheries.

Currently the Fund receives license fees and levies for specific purposes such as buy-backs and funding the NT Fishing Industry Council (NTFIC). The Fund currently receives approximately \$180,000 pa of which \$165,000 is provided to NTFIC to fund it's operations, leaving about \$15,000 annually that can be allocated to fisheries research and development.

#### **2 FISHERIES RESEARCH AND DEVELOPMENT CORPORATION (FRDC)**

FRDC is a national organisation responsible to its stakeholders for:

- planning, funding and managing fisheries research and development (R&D) programs, and

- facilitating the dissemination, adoption and commercialisation of the results of research and development.

The FRDC was formed as a statutory corporation on 2 July 1991 under the provisions of the *Primary Industries and Energy Research and Development Act 1989* (the "PIERD Act"). Its functions had previously been exercised by the Fishing Industry Research and Development Council of the Department of Primary Industries and Energy.

FRDC (including FIRDC) has provided the Northern Territory with more than \$1.0M for individual and jointly sponsored research and development projects during the last decade. Consequently is the major source of fisheries research funding outside the NT consolidated revenue funding. These projects have covered: offshore snapper resources, mud crab data collection, pearl oyster biology, barramundi distribution and migration, etc.

### 3. NATURAL HERITAGE TRUST PROJECTS

The Natural Heritage Trust was established by the Commonwealth Government to play a major role in developing sustainable agriculture and natural resource management, as well as protecting biodiversity. The Trust focuses on five key areas:

- Land
- Vegetation
- Rivers
- Coasts and marine
- Biodiversity.

Funding for fisheries research and development projects is available under a number of the Natural Heritage Trust Programs, including:

- Coasts and Clean Seas Program
- Endangered Species Program
- Fisheries Action Program
- National Landcare Program
- National Wetlands Program

Briefly, the objectives of these various program are:

The **Coasts and Clean Seas Program** has been set up with the objectives of:

- Protecting the marine environment from the negative impacts of human activities;
- Tackling pollution problems;
- Addressing threats to marine plants and animals and habitat degradations; and
- Ensuring the sustainable use of coastal and marine areas.

The Fisheries division has obtained funding from the Coasts and Clean Seas Program for a joint study of the Mary River wetlands.

The **Fisheries Action Program** to rebuild Australia's fisheries to more productive and sustainable levels through:

- fish habitat restoration and protection,
- encouraging community participation in activities to improve fisheries ecosystems,
- aquatic pest control,
- ensuring that fishing by commercial and recreational fishers is sustainable and responsible,
- raising community awareness,
- promoting related research encouraging integrated approaches to fisheries resources management and habitat conservation.

The **National Landcare Program** works with all levels of government, industry and the community to:

- assist in enhancing the long-term productivity of natural resources in Australia;
- promote community, industry and governmental partnership in the management of natural resources in Australia;
- assist in establishing institutional arrangements to develop and implement policies, programs and practices that will encourage the sustainable use of natural resources in Australia;
- assist in developing approaches to help resolve conflicts over access to natural resources in Australia; and
- assist in raising the natural resource and business management skills of landholders.

The **National Wetlands Program** was formally established in 1992 by the Commonwealth Government and is administered by the Environment Australia Biodiversity Group (formally the Australian Nature Conservation Agency). The Program was funded in response to growing concerns over the accelerating loss of wetlands, and in recognition of the need for the Commonwealth Government to provide leadership in the implementation of the Ramsar Convention on Wetlands.

The principal aim of the National Wetlands Program is to promote the conservation of Australia's wetlands through a variety of actions such as surveys, management-oriented research, training programs and awareness raising.

The **Endangered Species Program** works with all levels of government, industry and the community to:

- prevent the extinction, due to human causes, of threatened native flora and fauna;
- prevent further species and ecological communities from becoming threatened; and
- return threatened species and ecological communities to a secure status in the wild.

#### **4. FISHERIES RESOURCES RESEARCH FUND (FRRF)**

This Fund is administered by the Fish and Aquaculture Policy Branch of the Department of Agriculture, Fisheries and Forestry. To make an application to this fund it is necessary to have a partner from the Commonwealth Government. In the case of the Fisheries Division, the Bureau of Resources Sciences (BRS) is a current project partner in a project on Ecopath.

## **5. AUSTRALIAN CENTRE FOR INTERNATIONAL AGRICULTURAL RESEARCH (ACIAR).**

The aim of the Australian Centre for International Agricultural Research (ACIAR) is to improve the wellbeing of people in developing countries and Australia through international collaboration in research and related activities that develop sustainable agricultural [and fisheries] systems and appropriate strategies for natural resource management. Most ACIAR projects are located in South East Asia and the South Pacific. The ACIAR Fisheries Program aims to develop and coordinate research to solve key problems constraining the productive use and sustainability of fisheries and aquatic resource systems in developing countries.

ACIAR projects result from indepth consultation between the participating country, the Australian proponent and the appropriate ACIAR Research Project Manager. Project proposals are evaluated by ACIAR staff and independent experts against a variety of criteria that deal with the developing countries interest and commitment, the scientific merit of the proposal and the proposed arrangements to ensure collaboration.

The NT has received funding for fisheries research projects on barramundi, trochus, demersal snappers and mud crab.

**NORTHERN TERRITORY  
STRATEGIC PLAN  
FOR  
FISHERIES  
RESEARCH AND DEVELOPMENT**

**FIGURES**

## **FIGURES 1a to 16**

- 1a**        **GENERALISED LAY-OUTS FOR FISHERIES AND FISHERY ACTIVITIES R&D**
- 1b**        **GENERALISED LAY-OUTS FOR AQUACULTURE R&D**
- 2-8**        **WILD HARVEST FISHERIES**
- 9**         **RECREATIONAL FISHING**
- 10**        **SEAFOOD INDUSTRY DEVELOPMENT**
- 11-14**     **AQUACULTURE**
- 15**        **HABITAT AND ENVIRONMENT**
- 16**        **ABORIGINAL FISHERIES**

FISHERY/ ACTIVITY	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE														
				NT	EXT.	NYF	99	00	01	02	03										
<table border="1"> <tr> <td colspan="2">STAKEHOLDER UTILISATION</td> </tr> <tr> <td>COMMERCIAL INDUSTRY</td> <td></td> </tr> <tr> <td>RECREATIONAL FISHING</td> <td></td> </tr> <tr> <td>TRADITIONAL USAGE</td> <td></td> </tr> <tr> <td colspan="2">KEY: H = HIGHLY IMPORTANT M = MEDIUM IMPORTANCE L = LOW IMPORTANCE NIL = NO UTILISATION</td> </tr> </table>	STAKEHOLDER UTILISATION		COMMERCIAL INDUSTRY		RECREATIONAL FISHING		TRADITIONAL USAGE		KEY: H = HIGHLY IMPORTANT M = MEDIUM IMPORTANCE L = LOW IMPORTANCE NIL = NO UTILISATION		SUSTAINABLE HARVESTING	<ul style="list-style-type: none"> <li>Development               <ul style="list-style-type: none"> <li>Biology</li> </ul> </li> <li>Management               <ul style="list-style-type: none"> <li>Stock assessment</li> </ul> </li> </ul>									
	STAKEHOLDER UTILISATION																				
	COMMERCIAL INDUSTRY																				
RECREATIONAL FISHING																					
TRADITIONAL USAGE																					
KEY: H = HIGHLY IMPORTANT M = MEDIUM IMPORTANCE L = LOW IMPORTANCE NIL = NO UTILISATION																					
PROTECTION OF BIODIVERSITY	<ul style="list-style-type: none"> <li>Habitat surveys</li> <li>Trophic studies</li> <li>By-catch identification</li> <li>By-catch reduction devices</li> </ul>																				
OPTIMUM UTILISATION	<ul style="list-style-type: none"> <li>Stakeholder competition               <ul style="list-style-type: none"> <li>Social &amp; Economic benefits</li> </ul> </li> <li>Recreational fishing</li> <li>Economic viability               <ul style="list-style-type: none"> <li>Commercial fishing                   <ul style="list-style-type: none"> <li>Reliable resource information</li> </ul> </li> <li>Increased catch                   <ul style="list-style-type: none"> <li>Gear development</li> </ul> </li> <li>Decreased costs                   <ul style="list-style-type: none"> <li>Quality assurance</li> </ul> </li> <li>Increased value                   <ul style="list-style-type: none"> <li>Marketing</li> </ul> </li> </ul> </li> </ul>																				

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

**FIGURE 1a. GENERALISED LAY-OUT OF ANALYSIS OF OUTCOMES, PROJECTS AND TIMETABLES FOR THE VARIOUS FISHERIES AND ACTIVITIES.**

FISHERY/ ACTIVITY	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE																					
				NT	EXT.	NYF	99	00	01	02	03																	
DEVELOPMENT OF THE AQUACULTURE INDUSTRY	SUSTAINABLE GROWTH OF EXISTING INDUSTRIES																											
	<table border="1"> <thead> <tr> <th colspan="2">STAKEHOLDER UTILISATION</th> </tr> </thead> <tbody> <tr> <td>COMMERCIAL INDUSTRY</td> <td></td> </tr> <tr> <td>RECREATIONAL FISHING</td> <td></td> </tr> <tr> <td>TRADITIONAL USAGE</td> <td></td> </tr> <tr> <td colspan="2"><b>KEY:</b></td> </tr> <tr> <td colspan="2">H = HIGH YIELD/START</td> </tr> <tr> <td colspan="2">M = MEDIUM/YIELD/START</td> </tr> <tr> <td colspan="2">L = LOW YIELD/START</td> </tr> <tr> <td colspan="2">NIL = NO UTILISATION</td> </tr> </tbody> </table>	STAKEHOLDER UTILISATION		COMMERCIAL INDUSTRY		RECREATIONAL FISHING		TRADITIONAL USAGE		<b>KEY:</b>		H = HIGH YIELD/START		M = MEDIUM/YIELD/START		L = LOW YIELD/START		NIL = NO UTILISATION		DEVELOPMENT OF NEW SUSTAINABLE INDUSTRIES								
STAKEHOLDER UTILISATION																												
COMMERCIAL INDUSTRY																												
RECREATIONAL FISHING																												
TRADITIONAL USAGE																												
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FIGURE 1b. GENERALISED LAY-OUT OF ANALYSES OF OUTCOMES, PROJECTS AND TIMETABLES FOR AQUACULTURE.



WILD HARVEST FISHERIES	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE																					
				NT	EXT.	NYF	99	00	01	02	03																	
<b>BARRAMUNDI FISHERY</b>  <i>(Lates calcarifer)</i>	<b>SUSTAINABLE HARVESTING</b>	Reports on the status of NT stocks of barramundi. These reports will include sustainability indicators.	- Assessment of barramundi stocks using: analysis of catch & effort trends; depletion experiments (mainly in the Corroboree Billabong); sampling of migrating recruits; and, analysis of data from tag returns.	X																								
			- Assess the impact of saline intrusion and of saline intrusion controls on barramundi in the Mary R. wetlands. - Assess the effects of crocodile predation, cryptic mortality and movement of fish in tidal areas on resource estimates. - Assess survival of Manton Dam stocked fish. - Participation in FISHCOUNT 2000.	X	X																							
	<b>PROTECTION OF BIODIVERSITY</b>	Provision of information on the by-catch from commercial and recreational barramundi fishing.  Distribution of resource access optimised (see Tables 15 & 16).	The effects of barramundi fishing on protected biota such as dugongs, turtles, etc are considered in Table 15 (Habitat and Environment).																									
<table border="1"> <tr> <th colspan="2">STAKEHOLDER UTILISATION</th> </tr> <tr> <td>COMMERCIAL INDUSTRY</td> <td>H</td> </tr> <tr> <td>RECREATIONAL FISHING</td> <td>H</td> </tr> <tr> <td>TRADITIONAL USAGE</td> <td>H</td> </tr> <tr> <td colspan="2">KEY:</td> </tr> <tr> <td colspan="2">H = HIGHLY IMPORTANT</td> </tr> <tr> <td colspan="2">M = MEDIUM IMPORTANCE</td> </tr> <tr> <td colspan="2">L = LOW IMPORTANCE</td> </tr> <tr> <td colspan="2">NIL = NO UTILISATION</td> </tr> </table>	STAKEHOLDER UTILISATION		COMMERCIAL INDUSTRY	H	RECREATIONAL FISHING	H	TRADITIONAL USAGE	H	KEY:		H = HIGHLY IMPORTANT		M = MEDIUM IMPORTANCE		L = LOW IMPORTANCE		NIL = NO UTILISATION		<b>OPTIMUM UTILISATION</b>	- Determination of the economic benefits of impoundment stocking;	- The value of the recreational fishing experience is currently being addressed nationally by Hudloe <i>et al.</i>  - Analysis and quantification of stakeholder competition for the NT barramundi resource.			X				
STAKEHOLDER UTILISATION																												
COMMERCIAL INDUSTRY	H																											
RECREATIONAL FISHING	H																											
TRADITIONAL USAGE	H																											
KEY:																												
H = HIGHLY IMPORTANT																												
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**FIGURE 2. BARRAMUNDI FISHERY STAKEHOLDER PARTICIPATION, R&D OUTCOMES, PROJECTS AND TIMETABLE.**

WILD HARVEST FISHERIES	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE				
				NT	EXT.	NYF	99	00	01	02	03
<b>MUD CRAB FISHERY</b>  <i>(Scylla spp.)</i>	<b>SUSTAINABLE HARVESTING</b>	Fishery assessment reports on the status of NT stocks of mud crabs. These reports will include sustainability indicators.	<ul style="list-style-type: none"> <li>- Monitoring of the commercial catch, fishing effort and size composition;</li> <li>- Genetic identification of the NT stock distribution;</li> <li>- Tagging study for spawning behaviour and movement during spawning;</li> <li>- Density estimate experiments to determine stock size &amp; identification and quantification of mud crab habitats utilising satellite imagery, aerial photography, etc. (See also Figure15).</li> </ul>	X							
	<b>PROTECTION OF BIODIVERSITY</b>	There are no relevant by-catch problems with the mud crab fishery although nets for obtaining bait in some areas may have a small by-catch.									
	<b>OPTIMUM UTILISATION</b>	<ul style="list-style-type: none"> <li>- Determination of the contribution of indigenous and recreational sectors to the overall exploitation of mud crab stocks.</li> </ul>	<ul style="list-style-type: none"> <li>- The catch from the recreational and indigenous sectors will be calculated from FISHCOUNT 2000 data and information on allocation and usage between stakeholders investigated.</li> </ul>								
<b>STAKEHOLDER UTILISATION</b>											
COMMERCIAL INDUSTRY    H											
RECREATIONAL FISHING    H											
TRADITIONAL USAGE    H											
<b>KEY:</b> H = HIGHLY IMPORTANT M = MEDIUM IMPORTANCE L = LOW IMPORTANCE NIL = NO UTILISATION											

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**FIGURE 3. MUD CRAB FISHERY STAKEHOLDER PARTICIPATION, R&D OUTCOMES, PROJECTS AND TIMETABLE.**

WILD HARVEST FISHERIES	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE					
				NT	EXT.	NYF	99	00	01	02	03	
<b>SHARK FISHERY</b>  (Black Tips & Spot Tails)	<b>SUSTAINABLE HARVESTING</b>	Fishery assessment reports on the status of NT stocks of commercial sharks and grey mackerel. These reports will include sustainability indicators.	<ul style="list-style-type: none"> <li>- Collation and reporting on existing data;</li> <li>- Review of logbook program and implementation of an at sea monitoring program to improve data quality and type; and.</li> <li>- Investigate the effects of fisheries in adjacent national and international jurisdictions and by-catch in Australian waters are having on northern shark populations</li> </ul>	X			—					
	<b>PROTECTION OF BIODIVERSITY</b>	Assessment of the quantity of commercial sharks taken in other fisheries.  Assessment of species composition of target and non-target species taken by pelagic nets and longlines.	Identification of species in the commercial catch (a CSIRO project).			X	—					
	<b>OPTIMUM UTILISATION</b>	There is little interaction between commercial and recreational fishing as there is little recreational activity on the commercial species although they are regularly taken as incidental catch.  NT is endeavouring to fully utilise sharks to maximise value of the fishery including developing markets for shark and shark parts.	Development of markets for shark parts not traditionally sold.			X	—					

STAKEHOLDER UTILISATION	
COMMERCIAL INDUSTRY	H
RECREATIONAL FISHING	L
TRADITIONAL USAGE	H
<b>KEY:</b> H = HIGHLY IMPORTANT M = MEDIUM IMPORTANCE L = LOW IMPORTANCE NIL = NO UTILISATION	

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**FIGURE 4. SHARK FISHERY STAKEHOLDER PARTICIPATION, R&D OUTCOMES, PROJECTS AND TIMETABLE**

WILD HARVEST FISHERIES	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE				
				NT	EXT.	NYF	99	00	01	02	03
<b>TIMOR REEF FISHERY</b> (Goldband snapper, sharptooth snapper)  ( <i>Pristipomoides spp.</i> )	<b>SUSTAINABLE HARVESTING</b>	Fishery assessment reports on the status of NT stocks of <i>Pristipomoides spp.</i> These reports will include sustainability indicators.	<ul style="list-style-type: none"> <li>- Fishing power survey to enable standardisation of CPUE;</li> <li>- Collection &amp; analysis of length at maturity and age data;</li> <li>- Obtain data on catches from Indonesian waters in the Arafura and Timor Seas to improve stock estimates;</li> <li>- Determination of stock structure off northern Australia; and</li> <li>- Barotrauma experiments to provide data for tagging &amp; migration experiments.</li> </ul>	X	X	X					
	<b>PROTECTION OF BIODIVERSITY</b>	Other than protection of the stocks from over-exploitation, there does not appear to be any need for projects aimed at protecting biodiversity. As the fishery is targeted at using lines and traps, the by-catch and habitat damage is not regarded as significant.	Data on the level of by-catch in the snapper fishery will continue to be collected through log books								
	<b>OPTIMUM UTILISATION</b>	<p>There is no interaction between commercial and recreational stakeholders due to little or no recreational activity on these species.</p> <p>Investigation of the economic performance of the Timor Reef fishery.</p>	<ul style="list-style-type: none"> <li>- Development of a management strategy of waters between NT, QLD, WA and Indonesia;</li> <li>- Annual update of the economic performance of the industry;</li> <li>- Influence of offshore oil and gas development on catches and catch rates; and</li> <li>- Effects of environmental influences such as the El Niño and La Nina events in fishery profitability.</li> </ul>	X	X	X					
<b>STAKEHOLDER UTILISATION</b> COMMERCIAL INDUSTRY: H RECREATIONAL FISHING: Nil TRADITIONAL USAGE: Nil  <b>KEY:</b> H = HIGHLY IMPORTANT M = MEDIUM IMPORTANCE L = LOW IMPORTANCE NIL = NO UTILISATION											

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**FIGURE 5. TIMOR REEF FISHERY STAKEHOLDER PARTICIPATION, R&D OUTCOMES, PROJECTS AND TIMETABLE**

WILD HARVEST FISHERIES	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE				
				NT	EXT.	NYF	99	00	01	02	03
<b>DEMERSAL &amp; FINFISH TRAWL FISHERIES</b>  <i>(Red snappers)</i>	<b>SUSTAINABLE HARVESTING</b>	Fishery assessment reports on the status of NT stocks of red snappers. These reports will include sustainability indicators.	<ul style="list-style-type: none"> <li>- analysis of existing data/samples in DPIF;</li> <li>- Stock discrimination study;</li> <li>- Obtain data on catches in adjacent national &amp; international waters; and</li> <li>- Barotrauma experiments (see Timor Reef Fishery).</li> </ul>	X	X			—			
	<b>PROTECTION OF BIODIVERSITY</b>	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), the fishery is targeted using traps and lines where the by-catch and habitat damage is minimal.	To be developed if the fishery becomes significant - initial studies of species diversity to be carried out on log book data.								
	<b>OPTIMUM UTILISATION</b>	There is minimal interaction between commercial and recreational stakeholders.  A sustainable economic viable fishery developed.	<ul style="list-style-type: none"> <li>- Workshop to assess opportunities for red snapper fishery and the effects of environmental influences such as the El Niño and La Nina events in fishery profitability;</li> <li>- Gear trials to determine economical fishing method(s) for these species, including long lines, trot lines, traps and the use of automatic baiting machines;</li> <li>- Biological studies to determine any relationship between water temperature, schooling and migration;</li> <li>- Development of an effective marketing strategy to facilitate adequate returns from the fishery; and</li> <li>- Monitoring program to assess fishery performance.</li> </ul>			X		—			
<b>STAKEHOLDER UTILISATION</b>											
<b>COMMERCIAL INDUSTRY</b>		L									
<b>RECREATIONAL FISHING</b>		L									
<b>TRADITIONAL USAGE</b>		Nil									
<b>KEY:</b> H = HIGHLY IMPORTANT M = MEDIUM IMPORTANCE L = LOW IMPORTANCE NIL = NO UTILISATION											

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**FIGURE 6. DEMERSAL AND FINFISH TRAWL FISHERY STAKEHOLDER PARTICIPATION, R&D OUTCOMES, PROJECTS AND TIMETABLE.**

WILD HARVEST FISHERIES	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE				
				NT	EXT.	NYF	99	00	01	02	03
<b>SPANISH MACKEREL</b>  <i>(Scomberomorus commerson)</i>	<b>SUSTAINABLE HARVESTING</b>	Fishery assessment reports on the status of NT stocks of Spanish mackerel. These reports will include sustainability indicators.	<ul style="list-style-type: none"> <li>- Monitoring of the commercial catch and fishing effort;</li> <li>- Completion of stock discrimination study and determination of stock movement and exchange;</li> <li>- Determination of sustainability indicators;</li> <li>- Electrophoretic identification of Mackerel species; and.</li> <li>- Review the appropriateness of a tagging program to determine movement &amp; exploitation rates.</li> </ul>	X			—	—	—		
	<b>PROTECTION OF BIODIVERSITY</b>	Other than protection of the stocks from over-exploitation, there does not appear to be any need for projects aimed at protecting biodiversity. As the fishery only uses lines, by-catch and habitat damage is not regarded as a significant factor.									
	<b>OPTIMUM UTILISATION</b>	Determination of the contribution of recreational fishing to the overall exploitation of Spanish mackerel.	The catch from the recreational fishery will be calculated from FISHCOUNT 2000 and information on competition between stakeholders investigated.	X	X			—	—		
<b>STAKEHOLDER UTILISATION</b> COMMERCIAL INDUSTRY <b>H</b> RECREATIONAL FISHING <b>M</b> TRADITIONAL USAGE <b>M</b> <b>KEY:</b> H = HIGHLY IMPORTANT M = MEDIUM IMPORTANCE L = LOW IMPORTANCE NIL = NO UTILISATION											

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**FIGURE 7. SPANISH MACKEREL FISHERY STAKEHOLDER PARTICIPATION, R&D OUTCOMES, PROJECTS AND TIMETABLE.**

WILD HARVEST FISHERIES	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE					
				NT	EXT.	NYF	99	00	01	02	03	
<b>COASTAL LINE &amp; COASTAL NET FISHERIES</b>  <i>(Jewfish, snappers, blue salmon, mullet, shark, etc.)</i>	<b>SUSTAINABLE HARVESTING</b>	Reports on the status of NT stocks of coastal fish species. These reports will include sustainability indicators for the principal species.	<ul style="list-style-type: none"> <li>- Collection and analysis of biological data, including size at sexual maturity, reproductive stage, length-weight relationships and age;</li> <li>- Analysis of logbooks from commercial fishers and fishing tour operators;</li> <li>- Tagging program to determine movement and exploitation rates; and,</li> <li>- Analysis of FISHCOUNT 2000 data on recreational &amp; indigenous fishing; and</li> <li>- Review of the multi-species modelling options for the fishery.</li> </ul>	X								
	<b>PROTECTION OF BIODIVERSITY</b>	A large number of species are taken in these fisheries, some of which could be considered as by-catch. Report provided on the composition of catch from principal sectors	<ul style="list-style-type: none"> <li>- Monitoring program for the coastal net fishery to determine catch composition and spatial distribution of species.</li> </ul>			X						
	<b>OPTIMUM UTILISATION</b>		<ul style="list-style-type: none"> <li>- The recreational component of the coastal line fishery is about 6x the commercial catch. There is already some conflict between stakeholders for the resource. There is also a need to optimise recreational access to the resource.</li> <li>- The commercial component of these fisheries need projects in the areas of gear development, quality assurance and marketing to assist in their further development.</li> </ul>	X	X							
<b>STAKEHOLDER UTILISATION</b> COMMERCIAL INDUSTRY M RECREATIONAL FISHING H TRADITIONAL USAGE H  <b>KEY:</b> H = HIGHLY IMPORTANT M = MEDIUM IMPORTANCE L = LOW IMPORTANCE NIL = NO UTILISATION												

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**FIGURE 8. COASTAL NET AND COASTAL LINE FISHERY STAKEHOLDER PARTICIPATION, R&D OUTCOMES, PROJECTS AND TIMETABLE**

RECREATIONAL FISHERIES	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE														
				NT	EXT.	NYF	99	00	01	02	03										
<b>RECREATIONAL FISHING RESEARCH &amp; DEVELOPMENT</b>  <table border="1"> <tr> <td colspan="2">STAKEHOLDER UTILISATION</td> </tr> <tr> <td>COMMERCIAL INDUSTRY</td> <td>N/A</td> </tr> <tr> <td>RECREATIONAL FISHING</td> <td>H</td> </tr> <tr> <td>TRADITIONAL USAGE</td> <td>M</td> </tr> <tr> <td colspan="2"> <b>KEY:</b>            H = HIGHLY IMPORTANT            M = MEDIUM IMPORTANCE            L = LOW IMPORTANCE            NIL = NO UTILISATION         </td> </tr> </table>	STAKEHOLDER UTILISATION		COMMERCIAL INDUSTRY	N/A	RECREATIONAL FISHING	H	TRADITIONAL USAGE	M	<b>KEY:</b> H = HIGHLY IMPORTANT M = MEDIUM IMPORTANCE L = LOW IMPORTANCE NIL = NO UTILISATION		<b>SUSTAINABLE HARVESTING</b>	<p>Biology and resource assessment of the species involved is largely covered by the sub-programs on other fisheries and species. The major future project for this sub-program will be its participation in FISHCOUNT 2000 as part of the core development team.</p>	<p>Specific projects include:</p> <ul style="list-style-type: none"> <li>- National survey of non-commercial fishing;</li> <li>- Spatial delineation of recreational fishing effort in Darwin Harbour and Shoal Bay; and</li> <li>- A voluntary logbook/monitoring project to better quantify catches of individual species.</li> </ul>	X	X						
	STAKEHOLDER UTILISATION																				
	COMMERCIAL INDUSTRY	N/A																			
RECREATIONAL FISHING	H																				
TRADITIONAL USAGE	M																				
<b>KEY:</b> H = HIGHLY IMPORTANT M = MEDIUM IMPORTANCE L = LOW IMPORTANCE NIL = NO UTILISATION																					
<b>PROTECTION OF BIODIVERSITY</b>	<p>Quantification of target and associated recreational species in specific areas to ensure that aquatic biodiversity of the NT is not endangered.</p>	<p>Identification of recreational fishing discarded and/or released by-catch will be made from FISHCOUNT 2000.</p>	X																		
<b>OPTIMUM UTILISATION</b>	<p>Catch of recreationally important species is distributed between the commercial, indigenous and recreational sectors so as to provide the optimum economic and social benefits to the NT community.</p> <p>Fishing Tour Operators (FTOs) ventures providing adequate service to visiting and local recreational fishers.</p>	<p>Preparation of a Recreational Fishing Industry Development Plan.</p> <p>Participation in FISHCOUNT 2000.</p> <p>To be discussed with FTOs and relevant NT Government agencies prior to project formulation.</p>	X	X																	

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**FIGURE 9. RECREATIONAL FISHING RESEARCH AND DEVELOPMENT STAKEHOLDER PARTICIPATION, OUTCOMES, PROJECTS AND TIMETABLE.**



FISHERIES TECHNOLOGY	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE					
				NT	EXT.	NYF	99	00	01	02	03	
SEAFOOD INDUSTRY DEVELOPMENT	SUSTAINABLE HARVESTING	Exploratory fishing carried out for under-utilised NT fish resources.	Projects to address the outcomes of this sub-program are contained in the appropriate individual fisheries and activities ( eg Harvesting of red snapper in the western Arafura sea using various fishing techniques).									
	PROTECTION OF BIODIVERSITY	Where significant by-catch problems have been identified, this sub-program provides research and development information for its reduction.	None current.									
	OPTIMUM UTILISATION	Development of new or modified gear technology for the fishing industry, as required.  Improved product handling and marketing.  Economic services provided to Government and the stakeholders, as required.	In most cases projects under this outcome are contained in the projects for the various individual sub-programs, but there are several generic activities that require specific attention. These include:  - Assistance in the development of a Quality Assurance (QA) program for the NT fishing industry.  - Economic analyses of the NT fishing industry and of fisheries research directions, as required.									

STAKEHOLDER UTILISATION	
COMMERCIAL INDUSTRY	H
RECREATIONAL FISHING	Nil
TRADITIONAL USAGE	M?
KEY: H = HIGHLY IMPORTANT M = MEDIUM IMPORTANCE L = LOW IMPORTANCE NIL = NO UTILISATION	

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**FIGURE 10. STAKEHOLDER PARTICIPATION, R&D OUTCOMES, PROJECTS AND TIMETABLE FOR SEAFOOD INDUSTRY DEVELOPMENT**

AQUACULTURE	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE																						
				NT	EXT.	NYF	99	00	01	02	03																		
<b>MOLLUSC AQUACULTURE</b>  <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2"><b>STAKEHOLDER UTILISATION</b></td> </tr> <tr> <td>COMMERCIAL INDUSTRY</td> <td>M-H</td> </tr> <tr> <td>RECREATIONAL FISHING</td> <td>Nil</td> </tr> <tr> <td>TRADITIONAL USAGE</td> <td>L</td> </tr> <tr> <td colspan="2"><b>KEY:</b></td> </tr> <tr> <td colspan="2">H = HIGHLY IMPORTANT</td> </tr> <tr> <td colspan="2">M = MEDIUM IMPORTANCE</td> </tr> <tr> <td colspan="2">L = LOW IMPORTANCE</td> </tr> <tr> <td colspan="2">NIL = NO UTILISATION</td> </tr> </table>	<b>STAKEHOLDER UTILISATION</b>		COMMERCIAL INDUSTRY	M-H	RECREATIONAL FISHING	Nil	TRADITIONAL USAGE	L	<b>KEY:</b>		H = HIGHLY IMPORTANT		M = MEDIUM IMPORTANCE		L = LOW IMPORTANCE		NIL = NO UTILISATION		<b>SUSTAINABLE GROWTH OF EXISTING INDUSTRIES</b>	A Pearl Oyster Industry Development Plan produced.	- Production of a Pearl Oyster Industry Development Plan.	X			—				
	<b>STAKEHOLDER UTILISATION</b>																												
COMMERCIAL INDUSTRY	M-H																												
RECREATIONAL FISHING	Nil																												
TRADITIONAL USAGE	L																												
<b>KEY:</b>																													
H = HIGHLY IMPORTANT																													
M = MEDIUM IMPORTANCE																													
L = LOW IMPORTANCE																													
NIL = NO UTILISATION																													
Health service provided for the pearl oyster culture industry.	- Monitoring of pearl oyster health. - Investigation of pearl oyster diseases.	X	X		—	—	—	—	—																				
Economic efficiency of pearl culture farming improved.	- Production of pearl oyster histology atlas. - Investigation of biofouling of cultured pearl shells		X		—																								
						X																							
						X		—	—	—	—	—																	
	<b>DEVELOPMENT OF NEW SUSTAINABLE INDUSTRIES</b>	Report on feasibility *of edible oyster farming in the NT.	- Explore the feasibility*of farming edible oysters in the NT.				X	—																					
		Report on feasibility *of tropical abalone aquaculture in the NT.	- Explore the feasibility *of farming tropical abalone in the NT				X		—																				

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**FIGURE 11. OUTCOME, OUTPUTS, TIMETABLE AND FUNDING SOURCES FOR MOLLUSC AQUACULTURE.**

AQUACULTURE	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE																								
				NT	EXT.	NYF	99	00	01	02	03																				
<b>FISH AQUACULTURE</b>  <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2">STAKEHOLDER UTILISATION</th> </tr> <tr> <td>COMMERCIAL INDUSTRY</td> <td></td> </tr> <tr> <td>RECREATIONAL FISHING</td> <td></td> </tr> <tr> <td>TRADITIONAL USAGE</td> <td></td> </tr> <tr> <td colspan="2"><b>KEY:</b></td> </tr> <tr> <td colspan="2">H = HIGHLY IMPORTANT</td> </tr> <tr> <td colspan="2">M = MEDIUM IMPORTANCE</td> </tr> <tr> <td colspan="2">L = LOW IMPORTANCE</td> </tr> <tr> <td colspan="2">NIL = NO UTILISATION</td> </tr> </table>	STAKEHOLDER UTILISATION		COMMERCIAL INDUSTRY		RECREATIONAL FISHING		TRADITIONAL USAGE		<b>KEY:</b>		H = HIGHLY IMPORTANT		M = MEDIUM IMPORTANCE		L = LOW IMPORTANCE		NIL = NO UTILISATION		<b>SUSTAINABLE GROWTH OF EXISTING INDUSTRIES</b>	A barramundi aquaculture industry plan produced.	- Production of a barramundi aquaculture Industry Development Plan.	X									
	STAKEHOLDER UTILISATION																														
COMMERCIAL INDUSTRY																															
RECREATIONAL FISHING																															
TRADITIONAL USAGE																															
<b>KEY:</b>																															
H = HIGHLY IMPORTANT																															
M = MEDIUM IMPORTANCE																															
L = LOW IMPORTANCE																															
NIL = NO UTILISATION																															
Operation of a semi-commercial barramundi hatchery to support industry development	- Production of barramundi larvae and fingerlings for stocking of enclosed water and for sale.	X																													
Stocking of enclosed waters to support recreational fishing (eg. Manton Dam)	- Stocking of Manton Dam.	X																													
<b>DEVELOPMENT OF NEW SUSTAINABLE INDUSTRIES</b>	Report on the technical feasibility * of farming new tropical aquatic species.	Investigate potential for aquaculture of the short listed tropical species, including:	- Assessment of the economic feasibility * of possible candidate species;			X																									
			- Develop & refine copepod feed technology for larval fish;	X																											
			- Develop broodstock holding techniques for tropical species;	X																											
			- Develop larval rearing techniques for tropical species;	X																											
			- Develop growout protocols for tropical species; and,	X																											
Reports on the economic feasibility * of production of the species chosen above.	- Develop growout feeds for tropical aquaculture species.	X																													

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**FIGURE 12. STAKEHOLDER PARTICIPATION, OUTCOMES, OUTPUTS, TIMETABLE AND FUNDING SOURCES FOR FISH AQUACULTURE.**

AQUACULTURE	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE															
				NT	EXT.	NYF	99	00	01	02	03											
<b>CRUSTACEAN AQUACULTURE</b>  <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2">STAKEHOLDER UTILISATION</th> </tr> <tr> <td>COMMERCIAL INDUSTRY</td> <td style="text-align: center;"><b>H</b></td> </tr> <tr> <td>RECREATIONAL FISHING</td> <td style="text-align: center;">Nil</td> </tr> <tr> <td>TRADITIONAL USAGE</td> <td style="text-align: center;"><b>L</b></td> </tr> <tr> <td colspan="2"> <b>KEY:</b>            H = HIGHLY IMPORTANT            M = MEDIUM IMPORTANCE            L = LOW IMPORTANCE            NIL = NO UTILISATION         </td> </tr> </table>	STAKEHOLDER UTILISATION		COMMERCIAL INDUSTRY	<b>H</b>	RECREATIONAL FISHING	Nil	TRADITIONAL USAGE	<b>L</b>	<b>KEY:</b> H = HIGHLY IMPORTANT M = MEDIUM IMPORTANCE L = LOW IMPORTANCE NIL = NO UTILISATION		<b>SUSTAINABLE GROWTH OF EXISTING INDUSTRIES</b>	Prawn Aquaculture Development Plan produced.  Assistance provided to local industry to develop & maintain a viable & sustainable prawn aquaculture industry.	<ul style="list-style-type: none"> <li>- Production of a Prawn Aquaculture Development Plan.</li> <li>- Sustainable <i>Penaeus monodon</i> (Tiger prawn) populations for broodstock supply;</li> <li>- Ensure reliable supply of locally produced <i>Penaeus monodon</i> larvae;</li> <li>- Investigation of feasibility of local production of feeds suitable for NT prawn farming; and</li> <li>- Create and keep current a database on cultured prawn diseases and parasites.</li> </ul>	X				—				
	STAKEHOLDER UTILISATION																					
COMMERCIAL INDUSTRY	<b>H</b>																					
RECREATIONAL FISHING	Nil																					
TRADITIONAL USAGE	<b>L</b>																					
<b>KEY:</b> H = HIGHLY IMPORTANT M = MEDIUM IMPORTANCE L = LOW IMPORTANCE NIL = NO UTILISATION																						
<b>DEVELOPMENT OF NEW SUSTAINABLE INDUSTRIES</b>	A Mud Crab Aquaculture Development Plan produced.  A technology package for a mud crab production system produced for transfer to industry.  Report on the feasibility * of tropical rock lobster aquaculture in the NT produced.	<ul style="list-style-type: none"> <li>- Production of a Mud Crab Aquaculture development Plan;</li> <li>- Development of a technology package for a mud crab production system for transfer to industry;</li> <li>- Undertake national &amp; international collaborative nutrition &amp; extension work with ACIAR, FRDC, QDPI, UVP &amp; SEAFDEC;</li> <li>- Feasibility * studies on the development of viable and sustainable tropical rock lobster aquaculture.</li> </ul>	X				—															

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**FIGURE 13. STAKEHOLDER PARTICIPATION, R&D OUTCOMES, PROJECTS, TIMETABLE AND FUNDING SOURCES FOR CRUSTACEAN AQUACULTURE.**

AQUACULTURE	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE				
				NT	EXT.	NYF	99	00	01	02	03
<b>INDUSTRY SUPPORT FOR AQUACULTURE</b>	<b>SUSTAINABLE GROWTH OF EXISTING INDUSTRIES</b>	A specialist aquaculture pathology service provided to the aquaculture industry.  A general advisory service to industry is also provided.	- Work plan to be provided following the appointment of the pathologist.	X			---	---	---	---	---
		<b>DEVELOPMENT OF NEW SUSTAINABLE INDUSTRIES</b>	Production of regional aquaculture plans to ensure that adequate areas suitable for aquaculture are set aside in an integrated coastal management system for the NT.	- Development of regional aquaculture plans.	X			=====			
Facilitation of aquaculture projects that have Aboriginal involvement or interest.	- Development of an aquaculture extension service for Aboriginal communities.		X		X	=====					
Cost-benefit analyses provided for aquaculture projects.	- Development and refinement of cost-benefit models for the significant aquaculture sectors.		X		X	=====					

<b>STAKEHOLDER UTILISATION</b>	
COMMERCIAL INDUSTRY	H
RECREATIONAL FISHING	Nil
TRADITIONAL USAGE	M
<b>KEY:</b> H = HIGHLY IMPORTANT M = MEDIUM IMPORTANCE L = LOW IMPORTANCE NIL = NO UTILISATION	

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**FIGURE 14. STAKEHOLDER PARTICIPATION, R&D OUTCOMES, FUNDING SOURCES AND TIMETABLE FOR AQUACULTURE INDUSTRY SUPPORT.**

ENVIRONMENT & HABITAT	PLANNED OUTCOMES	SPECIFIC R&D OUTPUTS	PROJECTS	FUNDING SOURCES			TIMETABLE																					
				NT	EXT.	NYF	99	00	01	02	03																	
ENVIRONMENT AND HABITAT	CONSERVATION OF AQUATIC BIODIVERSITY	<ul style="list-style-type: none"> <li>- Threats to stocks of utilised fish and aquatic life assessed;</li> <li>- By-catch from commercial fishing operations minimised.</li> </ul>	<ul style="list-style-type: none"> <li>- Investigation of introduction of exotic aquatic pests in ballast water and on vessel hulls, as required.</li> </ul>	X	X	X	—————																					
			<ul style="list-style-type: none"> <li>- See projects in the individual fishery &amp; activity groups.</li> </ul>	X	X		—	—	—	—																		
<table border="1"> <tr> <th colspan="2">STAKEHOLDER UTILISATION</th> </tr> <tr> <td>COMMERCIAL INDUSTRY</td> <td></td> </tr> <tr> <td>RECREATIONAL FISHING</td> <td></td> </tr> <tr> <td>TRADITIONAL USAGE</td> <td></td> </tr> <tr> <td colspan="2">KEY:</td> </tr> <tr> <td colspan="2">H = HIGHLY IMPORTANT</td> </tr> <tr> <td colspan="2">M = MEDIUM IMPORTANCE</td> </tr> <tr> <td colspan="2">L = LOW IMPORTANCE</td> </tr> <tr> <td colspan="2">NIL = NO UTILISATION</td> </tr> </table>	STAKEHOLDER UTILISATION		COMMERCIAL INDUSTRY		RECREATIONAL FISHING		TRADITIONAL USAGE		KEY:		H = HIGHLY IMPORTANT		M = MEDIUM IMPORTANCE		L = LOW IMPORTANCE		NIL = NO UTILISATION		PROTECTION OF AQUATIC HABITATS	Status of coastal and estuarine fishery habitats assessed and any necessary protection implemented.	<ul style="list-style-type: none"> <li>- Relationship between mangroves and fish productivity.</li> </ul>	X			—————			
	STAKEHOLDER UTILISATION																											
	COMMERCIAL INDUSTRY																											
RECREATIONAL FISHING																												
TRADITIONAL USAGE																												
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<ul style="list-style-type: none"> <li>- assessment of need for aquatic reserves and MPAs.</li> </ul>	X			—————																								
<ul style="list-style-type: none"> <li>- Development of Cobourg Fishery and Cobourg Area Management Plans.</li> </ul>	X			—————																								

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**FIGURE 15. HABITAT AND ENVIRONMENT R&D OUTCOMES, PROJECTS AND TIMETABLE.**

ABORIGINAL FISHERIES	PRINCIPAL OUTCOMES	SPECIFIC R&D OUTCOMES	PROGRAMS/ PROJECTS	FUNDING SOURCES			TIMETABLE				
				NT	EXT.	NYF	99	00	01	02	03
ABORIGINAL FISHERIES DEVELOPMENT - COMMERCIAL AND SUBSISTENCE	DEVELOPMENT OF SUSTAINABLE ABORIGINAL COMMERCIAL AND SUBSISTENCE FISHING ENTERPRISES	<p>- Viable fishing ventures developed</p> <p>[NB A major approach to development of viable fisheries ventures in Aboriginal communities is through collaborative ventures with other commercial operators - this aspect have little R&amp;D involvement and is not considered in this analysis].</p>	- Quantification of indigenous harvest and its composition through FISHCOUNT 2000;	X	X		_____				
			- Development of fishing gear appropriate to local species and Aboriginal fishers;	X			_____				
			- Development of markets for products from Aboriginal ventures.			X	_____				

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**FIGURE 16. OUTCOMES, PROJECTS, FUNDING AND TIMETABLE FOR ABORIGINAL FISHERIES DEVELOPMENT - COMMERCIAL AND SUBSISTENCE.**