ESTUARY PRAWN TRAWL

EIA REPORT

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PREPARATION, REVIEW AND AUTHORISATION

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0 introduction

Background

NSW Fisheries is currently preparing fishery management strategies for the State's commercial marine fisheries. Concurrently, environmental assessments are being prepared under Division 5, Part 5 of the *Environmental Planning and Assessment Act 1979.* The assessments will estimate the level of pressure on the environment from the fishing activities and predict the likely impacts of implementing the draft fishery management strategies. The guidelines for the preparation of the environmental assessments issued by the Department of Urban Affairs and Planning (DUAP) requires that among other issues NSW Fisheries address noise, light, air quality, and energy and greenhouse issues.

SMEC Environment was commissioned by NSW Fisheries to prepare assessments addressing noise, light, air quality, energy and greenhouse issues for three commercial fisheries, Estuary General, Ocean Haul and Estuary Prawn Trawl. This report presents the assessment of the Estuary Prawn Trawl Fishery.

methodology

Estuary Prawn Trawl fishing:

- involves only otter haul net fishing;
- is undertaken by 294 fishing businesses;
- occurs in five major estuaries in NSW(Clarence River, Hunter River, Hawkesbury River, Port Jackson and Botany Bay); and
- involves four primary target species.

The methodology adopted involved:

- consultation with NSW Fisheries, members of the fishing industry and local councils;
- broadly describing the method of fishing and identifying the activities that may generate noise, light or air emissions;
- identifying the types of land use that occurs within the estuaries;
- combining the above two factors to identify whether there was any potential for significant adverse effects; and
- identifying mitigation measures to minimise or reduce identified areas of impact.

Greenhouse and energy issues were considered by examination of the fishing fleet and methods of fishing.

To present the findings of the investigations this report contains four sections:

1. this brief introduction;
2. a description of the fishing activity and estuarine environments;
3. an impact assessment for noise, light and air quality issues; and
4. a consideration of greenhouse and energy issues.

Consultation

To facilitate an understanding of the Estuary Prawn Trawl Fishery and relevant environmental issues consultation was undertaken with members of the Estuary Prawn Trawl Management Advisory Committee (EPTMAC), local Councils and the staff of NSW Fisheries.

Consultation With EPTMAC Members

Three members of EPTMAC, Mr. William Baker, Mr. Dennis Hyde and Mr. Graeme Hillyard, were contacted regarding issues in the Estuary Prawn Trawl Fishery. The members of EPTMAC serve as industry representatives for commercial fishing operators in the Estuary Prawn Trawl Fishery and have first-hand experience of the fishery's issues.

As with all commercial fisheries, the Estuary Prawn Trawl Fishery is subject to a large number of restrictions, the majority of which are imposed by NSW Fisheries. The National Parks and Wildlife Service (NPWS) also imposes some restrictions in estuaries that are bounded by National Parks, while the Maritime Services Board (MSB) maintains controls on vessel standards. The commercial fishermen themselves are also responsible for placing restrictions on their own activities, which receives strong support within the industry because it is in the overall interest of the fishery.

In relation to noise, light, air quality and energy/greenhouse issues, the general feeling was that the Estuary Prawn Trawl Fishery has very limited impact. However, some issues were raised.

- Noise Issues

  Noise issues associated with the fishery, while being acknowledged as having a greater impact in comparison to light, air quality, energy and greenhouse issues, were generally considered to be minor. For the most part, commercial fishermen are aware of noise issues associated with their operations, and make efforts to reduce its' impact. Noise was not regarded as a consideration when operations occur in areas removed from residential areas. The main issue in residential areas is early morning noise, in particular, noise associated with starting boat engines. Boats with steel or aluminium decks have rubber matting fitted in working areas to reduce noise.

- Light Issues

  The impact of lights was thought to be very minor and irrelevant for the Hunter and Clarence fisheries, as Estuary Prawn Trawling only occurs during the day. Night activity only occurs in the Hawkesbury, Port Jackson and Botany Bay. Fishing in these areas is done sufficiently far from residential areas to ensure there is no impact from the lights being used.

- Air Quality/Energy and Greenhouse Issues

  Diesel fuel is generally used on boats undertaking Estuary Prawn Trawling. The use of wet exhausts helps to limit the level of air pollution caused by boat engines. Prawn cookers fuelled by bottled LPG are a further source of emissions. Overall, it was felt that Estuary Prawn Trawl activities were well dispersed, and thus there is no concentration of boats leading to a high level of air emissions within a small area.

Consultation With Local Councils

Six local councils, Leichhardt City Council, Maclean Shire Council, Newcastle City Council, Rockdale City Council, and Sutherland Shire were contacted. A copy of the questionnaire is included as Appendix A. These Councils were selected because they contain some of the major prawn trawling estuaries within New South Wales, and because they offer a diversity of estuary types within their local government areas.

Responses were received from Leichhardt, Newcastle, Rockdale and Sutherland Councils but no response was received from the Maclean Shire Council. The responses were, on the whole, very similar, with all indicating that these Councils had very little to do with commercial fishing management, largely because the Councils do not have the staff expertise to effectively deal with fishery issues. As a result, management of commercial fishing is left to NSW Fisheries.

No public complaints have been recorded with regard to estuarine fishing and prawn trawling activities at Leichhardt, Rockdale and Sutherland Councils. To date, a very low level of complaints related to early morning noise and slipways noise has been received by Newcastle City Council. Newcastle City Council's Environmental Services Coordinator, however, did express the opinion that rising levels of complaints about noise from commercial fishing trawlers may occur in the future from people now taking up residence in Newcastle's new developments around the harbour.

Consultation With Regional Offices of NSW Fisheries

Regional offices of NSW Fisheries were contacted to determine the number and type of complaints received concerning commercial fishing activity.

Max Withnell, Regional Manager North, indicated that in northern New South Wales very few complaints are received concerning commercial fishing operations. For the most part, the complaints that are received relate to noise issues. In particular, the complaints have identified banging the sides of boats with oars or other objects to scare fish into meshing nets, use of outboard motors in residential areas at night, noise from winches and noise from prawn cookers (gas burners) when used near residential areas.

Roy Mills, Regional Manager South, indicated that no complaints had been received about commercial fishing operations during the current fishing season.

1 Estuary Prawn Trawl Fishery description

estuaries[1]

Description

Estuaries are partially enclosed bodies of waters that are connected to the ocean. The *Fisheries Management Act 1994* defines estuarine waters as "waters other than ocean waters that are ordinarily subject to tidal influence". Estuaries are characterised by brackish water caused by the mixing of ocean and fresh waters. They generally comprise complex ecosystems and sustain high levels of biodiversity, supporting a wide variety of fish and invertebrates and providing a diverse range of habitats, including mangroves, seagrasses, mud flats and sheltered rocky reef. Estuaries and their associated habitats also provide a significant contribution to terrestrial biodiversity, supporting insects, reptiles, mammals and, especially, birds.

Estuaries are found along the entire New South Wales coastline, with a total of 950 water bodies being identified, many of which are small and unnamed. Of these water bodies, 135 are considered to be major estuaries. Prawn trawling is only permitted in five major estuaries: the Clarence River, the Hunter River, the Hawkesbury River, Port Jackson and Botany Bay[2]. Trawling also occurs in the harbour at Coffs Harbour and in Jervis Bay but these are designated as part of the Ocean Prawn Trawl Fishery.

Land Uses Surrounding Estuaries

Many of the estuaries throughout NSW have become a focus for anthropogenic activities and land use. In particular, urban development has become more concentrated around estuaries due to the attractive environments they offer. This has placed increasing pressures on the estuaries and their surrounding environment. Brief descriptions of the estuaries where prawn trawl fishing occurs and their associated land use follow.

- Clarence River

  There is a range of diverse land uses found close to the Clarence River. Significant areas of State Forest (Fortis Creek State Forest) exist in the region, while there are also areas used for agriculture. Large urban areas, most notably, Grafton, are found on the shores of the river, while a number of smaller urban villages, such as Copmanhurst, Moleville and Eatonsville can also be found along the river.

[1] Much of the information presented in this section has been sourced from the *Draft Estuary Prawn Trawl Fishery Management Strategy* (NSW Fisheries 2001).
[2] Botany Bay will become a recreational fishing area in May 2002 and all commercial fishing in the bay will subsequently cease (NSW Fisheries pers. com. November 2001).

- Hunter River

  The Hunter River joins the Pacific Ocean at Newcastle on the lower north coast of NSW. The river has a busy maritime port in the harbour area located near its confluence with the Pacific Ocean. The Hunter River reaches in a north-westerly direction toward Singleton and into fresh water areas in the upper catchment.

- Hawkesbury River

  The Hawkesbury River is located to the north of Sydney with the overall water body encompassing Pittwater in the northern suburbs of Sydney and Brisbane Water near Gosford on the lower central coast of NSW. The river is a drowned river valley that is incised into a rock foundation and has relatively deep sections in the lower reaches. The river reaches in a westerly direction and into brackish waters toward the north west outskirts of Sydney. Parts of the lower reaches of the river meander through National Park areas with numerous inlets and bays. As such the river is popular as a recreational boating destination.

- Port Jackson

  Port Jackson includes Sydney Harbour, Middle Harbour, Manly Cove and the Parramatta River, which are located in the centre of the urban Sydney environs. The port is a drowned river valley, which is incised into a sandstone rock foundation and has many deep sections. The river reaches in a westerly direction through suburban areas and access is restricted by a weir near Parramatta. Sydney Harbour is a busy commercial port with large amounts of commercial and recreational boating occurring throughout both the harbour and river.

- Botany Bay

  Botany Bay is located in the southern residential and commercial areas of Sydney with the estuary reaching in a westerly and south-westerly direction into the Georges and Woronora rivers. The Towra Point Aquatic Reserve and Nature Reserve are located on the southern shore of the bay. These reserves protect internationally recognised wetlands listed under the RAMSAR convention. The shoreline of the estuary is adjacent to a combination of commercial, residential and undeveloped crown land. There is a commercial shipping port in Botany Bay and both the bay and rivers are popular as recreational boating destinations.

Fishery description[3]

Overview

The Estuary Prawn Trawl Fishery involves the taking of prawns from within estuarine waters. The main species targeted by the fishery are the school prawn, which comprise approximately 90% of the total catch, and, secondarily, the eastern king prawn. Other prawn species caught in small quantities include the inshore greasyback and the brown tiger prawn. Squid is a target species in the case of the Hawkesbury estuary and a secondary species (marketable non-target catch) in the

[3] Much of the information presented in this section has been sourced from the *Draft Estuary Prawn Trawl Fishery Management Strategy* (NSW Fisheries 2001).

others. A variety of species of fish, crab and octopus make up other secondary catch for Estuary Prawn Trawl Fishery.

The Clarence River has by far the largest prawn catch of the five estuaries open to prawn trawling. Its total catch is more than double the next largest estuary catch, being the Hawkesbury River. The Hunter River is third, followed by Botany Bay and Port Jackson.

Methods

The Estuary Prawn Trawl Fishery uses the method of trawling by otter prawn trawl nets. No other methods are used to take the catch. The otter prawn trawl net is a funnel of net towed along close to the seabed at speeds of between 2.5 and 3 knots. The net is held open by otter boards. These are small flat boards set at an angle to the direction of the towed net and act as hydrovanes. As the boards move through the water, the forces exerted on these boards spread the net open. Between the otter boards and nets are sweeps (ropes) which attach the net to the otter board. The mesh size of the net must be between 40-60mm, while the codend must be between 40-50mm. The codend or bag is the last section of net where the prawns are collected and held. In order to reduce the number of non-target fish (bycatch) that are caught, these nets must incorporate some form of bycatch reducing device. These devices are designed to allow bycatch (unwanted species) to escape from the net without significantly reducing the prawn catch.

Two trawling nets are used by vessels in some estuaries. In the Clarence River all trawlers use two nets. Elsewhere almost all vessels use one net although two nets may be used in Broken Bay (Hawkesbury River), Botany Bay and Port Jackson. Echo-sounders may be used to trace the sea floor. Mechanical winches allow the boats to trawl in deeper waters and allow greater efficiency of trawling activities.

Prawn trawling is allowed in certain areas of the estuaries and at certain times of the year. The warmer months between September and May are the 'peak' season. The majority of catches occur during the 'dark' of the moon (between the last and first quarter) on either run out or 'slack' tides. In rivers, prawn trawling is entirely a daytime operation, while in bays the operations tend to be more night based. Brief descriptions of the areas where trawling is permitted and times of operation in each of the estuaries are given below.

- Clarence River

  Trawling for prawns is permitted between the mouth of the estuary and the wires of the vehicular ferry at Ulmarra and is also permitted in Lake Wooloweyah, which lies to the south of the river entrance. Times when trawling is permitted are equivalent to 16% of the total time in a year.

- Hunter River

  Trawling for prawns is permitted between the mouth of the estuary and the junction of the Williams and Hunter Rivers. Times when trawling is permitted are equivalent to 17% of the total time in a year.

- Hawkesbury River

Trawling is permitted between a line drawn from the southern extremity of Box Head to the northern extremity of Barrenjoey Head, upstream to the vehicular ferry crossing at Lower Portland. Within this area many tributaries are closed to trawling. Trawling is permitted in the Hawkesbury River all year round.

- Port Jackson

  Trawling for prawns is permitted throughout Port Jackson but Manly Cove and the Lane Cove River are closed to trawling together with parts of Middle Harbour. Times when trawling is permitted are equivalent to about 21% of the total time in a year not including possible extensions of the season as determined by the local District Fisheries Officer.

- Botany Bay

  Trawling for prawns is permitted in Botany Bay from a line drawn between Endeavour Light to the Northern Extremity of Sutherland Point upstream (westerly) to a line from Doll's Point to Towra Point. The Cooks River is closed to trawling, as are parts of the Port Development and Airport. Times when trawling is permitted are equivalent to 16% of the total time in a year not including possible extensions of the season as determined by the local District Fisheries Officer.

Controls

The Estuary Prawn Trawl Fishery is managed entirely via input controls. These are controls that limit the resources that can be used by commercial fishermen, thus indirectly controlling the catch size. There are no direct restrictions on catch size or quotas. Input controls include restrictions on the number of licences available, the size and engine capacity of boats, the length and mesh size of nets and the locations and times that can be worked. NSW Fisheries is responsible for the majority of controls imposed on the Estuary Prawn Trawl Fishery, although the National Parks and Wildlife Services also imposes some controls, as do various local councils.

An overview of the controls is provided below.

Limited Entry

Access to the Estuary Prawn Trawl Fishery is restricted by a licence endorsement system. A licensing system provides a mechanism for controlling the number of commercial operators undertaking Estuary Prawn Trawling.

Log Books

Commercial fishermen are required to complete a monthly log book outlining the main method of fishing undertaken and the species and quantity landed. These logs must be submitted on a monthly basis.

Equipment Controls

Controls on equipment make up the greatest number of controls imposed within the Estuary Prawn Trawl Fishery. These controls include:

- Boat replacement policy – designed to prevent increases in the size of vessels and engine capacity within the Estuary Prawn Trawl fishing fleet, the policy essentially prevents fishermen from replacing their existing boats with larger more powerful boats.
- Boat size – boats must not exceed a specified length.

- Vessel licences – all vessels must be a Licensed Fishing Boat and be endorsed in the Estuary Prawn Trawl Fishery.
- Net size – all nets must comply with length and design guidelines, and must meet requirement for mesh size.
- Bycatch Reduction Devices – on 2 December 2000, Bycatch Reduction Devices were made mandatory in the Estuary Prawn Trawl Fishery.

Closures

Table 2.1 describes the daily and seasonal closures that apply to the Estuary Prawn Trawl Fishery.

Table 1.1 Summary of the time closures in the Estuary Prawn Trawl Fishery (as at August 2001)

Closure Type	Clarence River	Hunter River	Hawkesbury River	Port Jackson	Botany Bay
Weekend	Closed, but only from 8am Saturday	Closed	Closed, except for downstream from Juno Point (but only to 6pm Sunday)	Closed, except to 8am Sat.	Closed
Public Holiday	Open	Closed	Open	Open	Open
Night	Closed	Closed	Open, except Marra Marra Creek, (Berowra)	Open	Open
Day	Open	Open	Open	Closed	Closed
Winter	Closed	Closed	Open	Closed	Closed

Open: Estuary Prawn Trawling permitted
Closed: Estuary Prawn Trawling not permitted
Source: NSW Fisheries (2001)

Environmental Interactions

Estuary Prawn Trawl fishing activities may interact with the environment in relation to noise, light, air emissions, and energy and greenhouse. Table 2.2 outlines the environmental implications of Estuary Prawn Trawl fishing on each of these areas.

Table 1.2 Estuary Prawn Trawl fishing and environmental interactions

Method	Catch	Noise	Light	Air Emissions	Energy/ Greenhouse
Otter haul net	School prawn, Eastern king prawn, Broad squid, Bottle squid	Boat engines, Winches, Trawling equipment, Prawn	Operations and boat movements at night	Boat engines, Prawn cookers	Boat engines, Prawn cookers

Method	Catch	Noise	Light	Air Emissions	Energy/ Greenhouse
		cookers, Crew members' instructions			

Source: NSW Fisheries (2001)

Other Features

This assessment of the Estuary Prawn Trawl Fishery is limited to activities directly associated with its management. It does not extend to shore-based activities such as processing plants, cooperatives and boat ramps.

Other general characteristics of the Estuary Prawn Trawl Fishery include:

- There are 294 fishing businesses with prawn trawl entitlements in NSW.
- Boats generally used are between 4.5 to 11.6 metres long and usually are made from wood and/or fibreglass with diesel engines. These constitute approximately 17 % of the fishing fleet in NSW. However, some of the vessels are used to fish in other fisheries such as the Ocean Prawn Trawl, Estuary General and Trap and Line fisheries. Table 2.3 summarises the characteristics of the estuarine prawn trawling vessels in each zone.

Table 1.3 Summary of the characteristics of vessels used in the Estuary Prawn Trawl Fishery in each Zone.

Characteristic	Parameter	Zone				
		Clarence River	Hunter River	Hawkes-bury River	Port Jackson	Botany Bay
Hull Design	Displacement or Planing	Both	Both	Both	Displacement	Displacemen
Length	Range (m)	17.2 - 4.3	13.1 - 6.2	15.7 - 4.7	9.2 - 5.6	9.6 - 4.5
	Average (m)	9.9	8.6	8.0	8.0	8.1
Engine Power	Range (kW)	269 - 6.3	134 - 30	165.5 - 20.1	156.6 - 22.4	250 - 41
	Average (kW)	97.12	71.73	81.12	77.78	91.36

Source: Information supplied by NSW Fisheries

2 Impact assessment

NOISE

Impact Assessment

Potential sources of noise impact were identified in Table 2.2. They were noise from:

- boat engines - engine size reflects the power needed by fishing vessels for estuarine prawn trawling with the median engine size 67 kilowatts and 90% of the fishing fleet has motors sized 110 kilowatts or less;
- prawn cookers (on boats and on wharfs);
- fishing activities such as water release, hauling equipment and general noise; and
- crew members talking/instructions.

These activities can occur at any time of the day or night depending on the opening times of the fishery.

For noise to have an effect there must be a receptor who or which would be disturbed by the noise. For Estuary Prawn Trawl fishing these receptors are either people who live adjoining the estuary or wildlife.

Residents Adjoining Estuaries

Noise from Estuary Prawn Trawl fishing may cause adverse effects to residents where houses are close enough to the estuary for the prawn trawling activity to cause disturbance. Given the type of activity and likely low sound power level of the potential noise sources it is probable that there is only a potential for disturbance during night-time and early morning operations. The potential for disturbance would be determined by the following factors:

- size of boat engine;
- duration of prawn trawling and prawn cooking (on the vessel) activity;
- number of other trawlers operating in the same area;
- position of the house, both its distance from the activity and intervening topography; and
- land-based activity such as prawn cooking on a wharf in the vicinity of the house. A house in a coastal town or close to a wharf could be expected to have a higher background noise level to an isolated farm house.

A brief description of land use surrounding several estuaries was given in Section 2. Given the variety of estuaries there will be areas where Estuary Prawn Trawling causes disturbance at nearby houses whether these are houses in villages or towns or isolated farm or holiday houses.

Wildlife

Noise from Estuary Prawn Trawling activities would only affect wildlife when:

- trawling is undertaken in areas where wildlife that is sensitive to noise is present; and/or
- noise from trawling activities disturbs wildlife either due to the volume or type of noise generated.

Noise impacts could result from fisherman's voices, the sound of equipment contacting boats, engines, winches operating, prawn cooking and the splashing of water. Wildlife that could be affected may include birds, terrestrial mammals, aquatic mammals and non-target fish. Any such wildlife that is disturbed may:

- remain in the area but become inactive (ie hide);
- temporarily move away from the area to return when the disturbance has ceased; or
- may permanently move away from the area (this is more likely if the disturbance is prolonged or occurs frequently).

Birds and terrestrial mammals could be impacted where prawn trawling is undertaken sufficiently close to shore to impact upon these species. Aquatic mammals and non-target fish could be impacted anywhere within the estuary.

During the daytime, fauna that is sensitive to noise is more likely to occur at secluded estuary locations. These areas are likely to be fringed by native plant communities such as saltmarsh, mangrove, coastal scrub, sclerophyll forest and woodland or rainforest. Such locations are likely to be relatively free of human activity and are more likely to harbour noise sensitive species. Noise sensitive wildlife may also occur in developed areas if these are relatively quiet and support suitable habitat.

During the night-time, background noise levels are reduced. The area affected by noise and the severity of the noise impacts would be greater. A greater range of species is likely to be affected during the night-time. This would include diurnal species disturbed from their sleep and nocturnal species whose behaviour is altered as a result of noise from fishing activities.

Impacts on sleeping diurnal species would only occur where fishing is sufficiently close to their habitat to disturb such species. Prawn trawling would impact upon sleeping diurnal birds and terrestrial mammals where trawling is undertaken close to the shore or near aquatic vegetation.

Nocturnal wildlife would utilise the secluded areas referred to above. They may also move into developed areas that are noisy during the day but quiet at night. Therefore, noise sensitive species may be encountered at night-time over a greater area than during the daytime.

The significance of the disturbance to wildlife would vary depending on the species and on the timing of the disturbance. The greatest impacts could be expected during the nesting or breeding season. At these times, any disturbance could impact upon the reproduction of a species and may endanger the viability of local populations. This would be particularly be the case if the disturbance were a frequent, regular or on-going activity.

Species most likely to be impacted by prawn trawling during the nesting or breeding season would include birds that nest in aquatic or riparian vegetation or in vegetation near the water's edge. Non-target fish could similarly be impacted if trawling is undertaken near nurseries or breeding habitat such as mangroves and areas of seagrass.

Mitigation Measures

A potential for adverse effects caused by noise from Estuary Prawn Trawl fishing on people and wildlife has been identified. This is not a new potential as Estuary Prawn Trawl fishing has been a continuing industry for 75 years. There are existing controls relating to area and time of operation

on the Estuary Prawn Trawl Fishery that are summarised in Section 2.2.3. These controls were instigated for a number of reasons including conservation and to prevent disturbance to people living close to the estuaries.

The levels of complaint received concerning noise levels from the Estuary Prawn Trawl Fishery are monitored. Two authorities currently receive complaints, local councils (who tend to refer these to NSW Fisheries) and regional offices of NSW Fisheries. The number and type of complaints should be used as an input into reviewing the existing controls.

LIGHT

Impact Identification

Residents

The only potential for adverse effects from lights used in the fishery would be from spotlights used as part of the prawn trawling activity. Navigation lights or deck lighting would not have a potential for significant adverse effect. Spotlights would only cause an adverse effect where these were shone into houses adjoining the estuary. The activities of the Estuary Prawn Trawl Fishery generally do not require intensive use of spotlights nor high strength lights. It is not anticipated that this type of lighting would have a potential for significant adverse impacts.

Wildlife

Impacts from light upon wildlife are unlikely to be significant unless light beams repeatedly or continuously affect the same individuals. The severity of this impact would increase with the intensity of the light.

Wildlife most susceptible to impacts from light would be those occurring in the water, on aquatic vegetation or near the water edge. Species would include aquatic mammals, non-target fish, terrestrial mammals and birds. Nocturnal species would be most likely to be impacted. However, diurnal species disturbed from their sleep could also be impacted.

Mitigation Measures

Mitigation measures outlined for noise impacts are generally applicable for reducing the potential for adverse effects from lighting. In summary these were:

- existing controls to limit the location and hours of Estuary Prawn Trawling; and
- monitoring of levels of complaint.

Air quality

The identified source of air emissions from the Estuary Prawn Trawl Fishery are emissions from boat engines and prawn cookers. These emissions do not have a potential to significantly affect air quality, as they:

- do not represent a concentrated source of inputs as they occur in estuaries along the NSW coast;
- vary according to both season and time of day; and
- are from engines and cookers.

Mitigation measures to reduce air quality emissions are the same as those proposed to reduce energy and greenhouse inputs. These are discussed in Section 4.

Energy and Greenhouse Issues

description of Fishing fleet

Boats used in the Estuary Prawn Trawl Fishery are medium sized vessels generally of wood and/or fibreglass construction using diesel marine engines.

Table 4.1 contains a summary of the characteristics of the Estuary Prawn Trawl fishing fleet. The median figure represents the size above or below which 50% of the fleet lies. The 80% range indicates the size range within which 80% of the fleet lies, while the range indicates the smallest and largest size in the fleet. Most engines are powered by diesel (97%) with smaller numbers using petrol (2%).

Prawns are generally cooked on the vessels. Bottled LPG is used as fuel to boil the water in the prawn cookers.

No data were available for the typical use of boats in terms of hours used. This would vary according to the prawn trawling business, the estuary operated in, and the time of year.

Table 4.1 *Fishing Fleet Characteristics*

Characteristic	Number Registered	Median	80% Range	Range
Engine (kilowatt)	176	67.0	53.7 to 94.8	6.3 to 263.8
Boat Length (metres)	176	7.6	7.0 to 8.8	4.5 to 11.6

Source: Data supplied to SMEC by NSW Fisheries

Maintenance is the responsibility of the fishing vessel owner. Manufacturers' maintenance instructions should be followed to ensure engine efficiency and emission control systems work properly. Lack of compliance by vessel owners with instructions can result in lower levels of energy efficiency (ie fuel wasting) and higher greenhouse emission rates. There is no specific information on 'typical' marine engine maintenance practices but given the size and type of the industry there is likely to be a varied response to maintenance.

Diesel and petrol fuels have similar CO_2 emission factors as shown in Table 4.2. On that basis the fuels are not dissimilar in their potential greenhouse impact although this would depend on other factors such as comparative efficiency between diesel and petrol motors and motor size availability.

Consumption of LPG for prawn cooking results in CO_2 emissions as indicated in Table 4.2. LPG is a relatively efficient fuel and there are currently no viable opportunities for fuel substitution.

Table 4.2 CO_2 Emission Factors

Fuel	CO_2 Emission Factor (kg CO_2/GJ)
Diesel	69.0
Petrol	65.3
LPG	58.8

Source: *Factors and Methodologies, The Greenhouse Challenge* (Australian Greenhouse Office 2001)

Energy and greenhouse assessment

Energy and greenhouse effects are considered together as the only potential for greenhouse gas inputs is from the energy consumed in the boat engines and the LPG used for the prawn cookers. Overall, the numerical size of the fleet and the size of the boats, engines and gas cookers used, means that the overall consumption of energy resources and subsequent greenhouse gas emissions is not significant. The Estuary Prawn Trawl Fishery consists of many small businesses operating in a low technology environment. Potential measures to reduce energy and greenhouse emissions may not be practicable for many of these ventures due to initial cost.

Renewable energy sources for fishing vessel operation could include solar and wind energy. However utilisation of these energy alternatives is not currently considered economically viable for estuarine prawn trawl fishing vessels.

Potential measures to maximise energy efficiency and hence minimise the emission of greenhouse gases for commercial fishing vessels involved in estuarine prawn trawl fishing have not been investigated in detail in Australia. These measures fall into two main areas, material and technology selection, and operational practice. Specific measures applicable to each of these aspects of commercial fisheries are outlined below.

Material and Technology Selection

Material and technology selection options may significantly affect energy usage and greenhouse gas emissions. Opportunities for the reduction of greenhouse impacts and improvement of energy efficiency include:

- Improved performance marine engines.

  The US EPA and the State of California EPA's Air Resources Board (ARB) (http://www.arb.ca.gov) and the US EPA (http://www.epa.gov/oms/marine.htm) introduced parallel regulations commencing in 2001 requiring manufacturers to market improved performance marine engines. According to the ARB the regulations were introduced due to concerns that many conventional two-stroke marine engines burn fuel inefficiently and 'discharge up to 30 percent unburnt fuel into the environment'; the ARB recommend switching from a two-stroke to a more efficient four-stroke marine engine. ARB analysis shows that advanced technology marine engines burn up to 30 percent less fuel and oil.

- High strength lightweight polyethylene trawler nets.

Fuel savings of 10 to 20 percent per vessel, 40 percent drag reduction and very short term paybacks in fuel cost savings can be achieved with the use of strong high performance polyethylene smaller diameter fibre in trawl nets.

- Improvements in Bycatch Reduction Devices.

  NSW Fisheries leads research into the improved performance of these devices. Reduction in bycatch size should result in fuel savings.

- Selection of equipment with low embodied energy content.
- Energy use minimisation control equipment, including timer controls, thermostats, and sensors and controls to optimise: flow rates, temperatures, pressures and other energy relevant variables.
- Matching equipment size and machinery to catch and journey requirements to minimise energy utilisation.
- Use of energy efficient lighting systems and controls.
- Potential application of the Australian appliance energy rating system (http://www.energyrating.gov.au) to assist consumers in selecting energy efficient marine engines and vessels. California's ARB has also introduced a marine engine and watercraft labelling system to indicate to purchasers which vessels 'meet', 'exceed' or 'greatly exceed' their new regulatory requirements.

Operational Practice

A number of decisions made during operational practice can have significant impacts on energy efficiency and greenhouse gas emissions. Relevant facets of operational practice include:

- Development of systematic and cyclic maintenance programs.
- Implementation of energy and greenhouse management processes, such as:

  - ongoing education for the Estuary Prawn Trawl fishing industry owners and employees in energy and greenhouse mitigation strategies through the distribution of information through industry associations and the boat and fishing licence registration system; and
  - energy and greenhouse audits.

- Ongoing consideration of new technologies as they become available and economically viable.

3 References

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Appendix A

Questionnaire to Councils

SMEC

Commercial Fishing Questionnaire

This questionnaire is concerned with any Council involvement in the regulation of <u>commercial</u> fishing, specifically commercial fishing activity in estuaries and from ocean beaches.

Estuary fishing is fishing that occurs in tidal estuary waters, such as lagoons and rivers. It includes the removal of finfish, shellfish and prawns from estuary waters using a variety of methods, such as trapping and netting. Ocean haul fishing is fishing using nets from open ocean beaches.

1. Are you aware of any commercial fishing in estuaries and/or from beaches within your area?

☐ Yes ☐ No

2. Does Council have any formal controls on commercial fishing in estuaries and/or from beaches within your area?

☐ Yes ☐ No (skip to Q.3)

↓

2a. What do these controls deal with? *(Tick all that apply)*

☐ Location of commercial fishing

☐ Operating hours of commercial fishing

☐ Other – please specify: _____

2b. Can you please provide an overview of the nature of any of these controls

_____

3. Are there any joint arrangements between Council and NSW Fisheries for the management of commercial fishing in estuaries and/or from beaches in your area?

☐ Yes ☐ No (Skip to Q.4)

↓

(Answer Q.3a overleaf)

3a. Please outline these arrangements:

_____

4. Does your Council have any records of complaints about commercial fishing in estuaries and/or from beaches?

☐ Yes ☐ No (Skip to Q.5)

↓

4a. Approximately how many complaints have been received?

- ☐ Less then 5
- ☐ 5-10
- ☐ 10-50
- ☐ More than 50

4b. What do these complaints specifically relate to? *(Tick all that apply)*

- ☐ Noise pollution
- ☐ Air pollution/air quality
- ☐ Water pollution
- ☐ Other – please specify: _____

4c. Can you provide some brief comments on the nature of these complaints:

_____

5. Any other relevant comments you would like to add:

_____

Name:_____

Thank you for your time, it is most appreciated.

Dominion Consulting Pty. Ltd. A.C.N. 079 198 780.

Consulting in fisheries management, economics and training.

An Assessment of Economic and Social Issues in the NSW Estuary Prawn Trawl Fisheries Management Strategy

A report to NSW Fisheries

by Dominion Consulting Pty Ltd

November, 2001

Disclaimer

This report has been compiled on the basis of existing literature, information, and targeted surveys some of which was supplied by the client, New South Wales (Fisheries) and compiled under limited time and financial resources. Neither Dominion Consulting Pty. Ltd, its employees or sub-contracting parties undertake responsibility arising in any way to any persons in respect of the data, errors, or omissions arising, through mis-interpretation of information, negligence or otherwise, however caused. This report should not be used as the basis for commercial decisions; those so doing, do so at their own risk.

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The normal disclaimer applies.

(G) ECONOMIC ISSUES

Introduction

The environmental assessment guidelines issued by Planning NSW require that the impacts of a Fisheries Management Strategy are assessed as part of an Environmental Impact Statement (EIS). Under the principles of Ecologically Sustainable Development, the environmental assessment guidelines issued by Planning NSW include assessment of the economic and social impacts of any proposed fishery management strategies according to sixteen economic and nineteen social considerations, respectively. This is to make the economic and social aspects of sustainable resource use and management more transparent in the decision-making process. It also enables potential policy impacts to be mitigated in the policy development process, rather than after the event.

The economic and social assessment sections of the environmental assessment guidelines issued by Planning NSW require a review of existing fisheries information in section (1) and an evaluation of the likely implications of the plan (fishery management strategies) in section (2). Section 3 requires information shortfalls to be identified. The Planning NSW guidelines for commercial fisheries are new and it is envisaged that they may be further developed after their application to a fisheries management strategy.

The management of fisheries in NSW has not previously integrated economic and social information into the planning process in a formal manner. The current initiative to incorporate available economic and social information is an important step towards more comprehensive planning. In undertaking the assessment, there is a lack of information on basic economic characteristics of fishing operations and the secondary seafood industries. There have been no previous state-wide economic surveys or economic appraisals of the sustainability of fishing operations. There has been some social information on fishers, but little on the social composition of fishing communities in NSW. The lack of previous information, available time and resources means the current study is a first attempt to gather and analyse economic and social information in order to appraise the fisheries management plan of a specific fishery. The study is potentially short of a state-wide all fisheries perspective of economic and social information. The Planning NSW process enables such information needs to be identified.

Much of the available economic and social information comes from regulatory sources, such as NSW Fisheries licence records and fishers' catch returns. Catch records can be combined with price information available from the Sydney Fish Markets Pty Ltd to impute revenues to fishers and fisheries to estimate a value at point of first sale. This may give a minimum estimated value and probably underestimates the industry catch value.

Concurrent to the fisheries management strategy assessment process, is the recreational fishing area (RFA) process which has involved debate on value of commercial and recreational fishing sectors. The current study is not intended as a "valuation" of the fishing industry and existing economic and social information is presented as a background to the assessment of specific fishery management strategies envisaged in the future management of the Estuary Prawn Trawl fishery. The secondary information available on the seafood industry is limited, coming from licensing details of registered premises. There is no publicly available descriptive information or an economic profile of the processing, wholesaling and retail side of the NSW seafood industry. This leaves an information void in which secondary value estimates of the seafood industry in NSW are not available.

To gain economic and social information for the assessment process, two surveys were commissioned by NSW Fisheries in May 2001 to gain up to date economic and social information across all fishery primary producers in NSW who directly interface with the fish resource. There was insufficient time to survey the secondary level of the seafood industry and this is recommended for future work. The economic and social surveys were to gain information on the fishers and their fishing operations to enable the impacts of implementing fishery management strategies to be appraised. Given this is the first fishery assessment process, subsequent research and information gathering is recommended for future appraisals as per section 3 of the guidelines.

The social assessment of the fisheries management strategies also uses existing administrative information from licence records and has been augmented by a telephone survey of fishers in NSW (Roy Morgan, 2001a). This information was gathered to fill the most immediate information shortfalls for assessment purposes and to give a social profile of the state's fishers in relation to the impending need created by the FMS. This approach will need to be augmented with further fishing community surveys in the future. There is a lack of independent surveyed community opinion on fishing issues.

This economic and social fishery management strategy assessment is the first of a series in NSW and has been compiled in a short time period in which source data has been collected and analysed.

It should be regarded as a first step towards more accountable and transparent fisheries management strategy assessment in order to improve ecological sustainability.

Available information

Initial analysis of available data revealed a deficit of economic and social information, with the available data coming from the licensing and catch record information held by NSW Fisheries. Available data from the Australian Bureau of Statistics (ABS) was accessed via the Bureau of Rural Science, Social Science unit for the social assessment. Aggregate ABS data is of limited use to a specific EPT fishery study being across fishery administrations, thus including Commonwealth and interstate fishing activity. The NSW environmental impacts assessment process and ABS data access is an area for future development. Separate social and economic surveys were undertaken across all commercial fisheries in NSW in the May-June period of 2001, in order that all subsequent environmental impacts assessments could benefit from improved information.

Given the time available, the survey was able to address shortages in information on the fishing industry at the primary level of fishing enterprises and fishers. Time precluded surveying of the secondary level of the processing industry and the industrial activity associated with the seafood industry. The limitations on data are discussed as part 3 of the guidelines. As part of the assessment process, recommendations are made on how to improve the data available for future assessments.

There are four main sources of information and data for the economic and social assessment:

a) existing NSW Fisheries records from licensing and catch records;
b) results of the Social survey (Roy Morgan, 2001a);
c) results of the Economic survey (Roy Morgan, 2001b);
d) other publications with relevant material where available.

Other sources of information have been cited, including general literature and available government and industry statistics. Some background on each of the data sources used in the assessment is given below:

a) Existing NSW Fisheries licensing records show endorsements holdings and fisher file and business numbers. They also have some fisher details such as date of birth and home postcode. Catch and effort information from the NSW Fisheries database can be added to existing

licensing information to determine catches in each administered fishery.

An imputed Sydney value at time of first sale can be obtained by combining fishers' catch return data and the Sydney Fish Market (SFM) monthly average species prices. The "Sydney index" value infers that the price for all seafood landed in NSW is the monthly average price at first sale in Sydney. This may under or over report the revenue associated with individual fishers. The revenue estimate at point of first sale does not include market deductions, and it does not account for export sales outside the Sydney Fish Market, which "exceeds Sydney prices" (pers. comm., EPT MAC). Premium seafood is often sold by fishers near point of landing to obtain higher prices, with minimal freight or marketing costs. Data sourced from Department's records will be referred to as **"Source: NSWF"** or when combined with SFM data the **"Sydney index"**.

Comparisons of the Sydney Index revenue estimates and revenues, as stated by the respondents to the economic survey, indicate that the Sydney index probably understates fisher revenue at point of first sale by 10% across the EPT fishery[1]*;*

b) A specially devised social survey was executed by telephone by Roy Morgan Research in May 2001 (Roy Morgan, 2001a). A total of 870 fisher responses were recorded from a total of 1,751 fishers contacted state-wide. The survey results have been analysed for the Estuary Prawn Trawl fishery and will be referred to as **"Source: RM-SS"**;

c) An economic survey was designed and executed by mail in May/June 2001 by Roy Morgan Research (Roy Morgan, 2001b). A total of 250 fisher responses were recorded from a total of 1640 fishers and businesses contacted state-wide. The survey results have been provisionally analysed in the current study for the fishing businesses in the Estuary Prawn Trawl and will be referred to **"Source: RM-ES"**;

Other information from existing literature will be referenced.

[1] The Sydney Price Index (SPI) exceeds reported revenue in comparisons of economic survey and SPI results for 21 businesses in regions 2 and 3 (Clarence). In regions 4 and 5, a comparison of 11 business results imply that the revenue from the economic survey is 29% higher than the SPI (and is up to 54% higher in region 5, though for a small sample size of 6 businesses). A weighted average correction factor of 10% (weighted by business numbers) applies for SPI revenue estimates across the whole fishery.

The environmental assessment guidelines issued by Planning NSW for economic issues will be followed below. The guidelines are presented as numbered headings to guide the reader with a response stated below each guideline. The Planning NSW guidelines require that we "Assess the likely economic impacts of implementing the management plan having regard to the following":

(1) Review of the existing situation

(a) location, structure (including interrelationships), age and investment in the fishing fleet (if relevant); consider the regional or sub-regional implications

Location and number of fishers and vessels in fishery and sub regions.

While NSW has commercially licensed fishers operating in 80 estuaries in coastal NSW, the Estuary Prawn Trawl is limited to five designated estuaries: The Clarence River (with access to Lake Wooloweyah); the Hunter River; the Hawkesbury River; Port Jackson and Botany Bay[2]. Details of each fishery are reported in the Estuary Prawn Trawl, Fisheries Management Strategy (EPT-FMS, 2001).

In June 2001 there were 289 EPT businesses, however a number have entitlements to fish in more than one estuary resulting in 302 estuary entitlements. These are reported in Table G1.

Table G1: The number of EPT entitlements in estuaries of the EPT fishery for 1999-2000 (Source: NSWF).

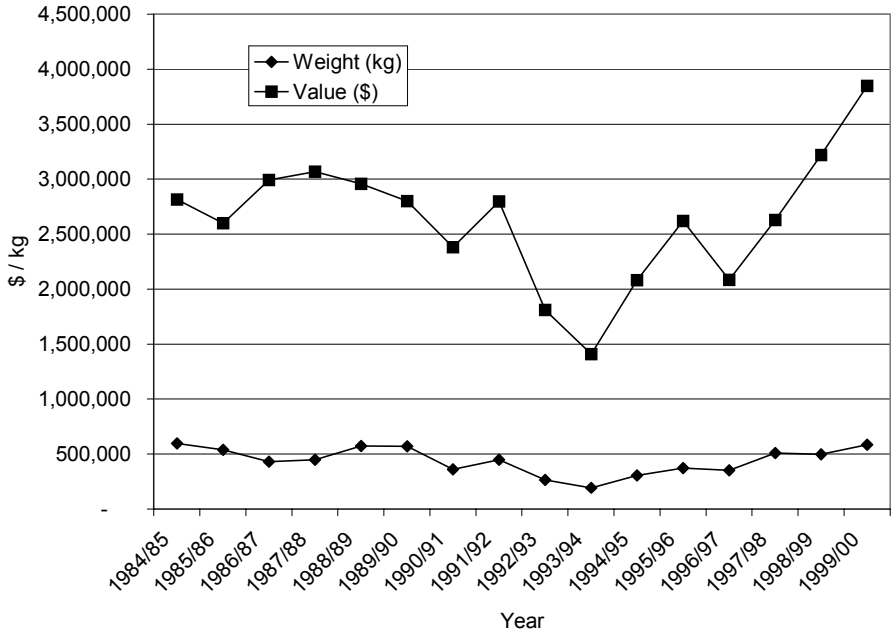
Estuary	Number of EPT entitlements issued	% of statewide EPT entitlements
Clarence River	123	41%
Hunter River	32	11%
Hawkesbury River	68	23%
Port Jackson	31	10%
Botany Bay	48	16%
Total	**302**	100%

[2] At the time of compilation of the report commercial fishing in Botany Bay is proposed to cease in mid 2002. The assessment of the FMS in the 2002-2007 will not include Botany Bay, but the current fishery description will.

Of the different estuaries the Clarence has 41% of all EPT entitlements state-wide, followed by the Hawkesbury, 23%. The total catch and value of the EPT fishery in the 1984-2000 period is reported in Figure G1.

The total production in the 1997-2000 period, when Estuary Prawn Trawl (EPT) was a distinct fishery, was approximately 500 tonnes of seafood and had an estimated value at first sale of $3.8m in 1999-2000 as reported in Table G2a.

Figure G1: Total catch (Kg) and total value ($) of catch in the EPT in the 1984-00 period (Source: NSWF; Sydney Index).



Inter relationships between EPT and other endorsed fisheries

The EPT fishery had an annual revenue of $3.8m in 1999-2000 and is approximately 5% by revenue of the total annual fishery production in NSW as reported in Table G2. An adjusted revenue for EPT is reported in Table G2, adding 10% to revenue to account for fishers receiving higher prices than the Sydney index (see Table G4).

Table G2: The total revenue of fisheries production in different fisheries in NSW (excluding Abalone) in the years 1997-2000 (millions $, Source: NSWF- Sydney index).

Year	EG	EPT	[EPT$_{adj}$]	OH	OPT	OFT	OTL	RL	Total
1997/98	19.4	2.6	*2.9*	7.2	20.9	5.2	11.2	4.2	70.7
1998/99	17.6	3.2	*3.5*	4.1	23.4	4.1	9.6	3.8	65.8
1999/00	17.3	3.8	*4.2*	4.4	22.4	3.9	9.8	4.5	66.1
Ave.	**18.1**	**3.2**	***3.5***	**5.2**	**22.2**	**4.4**	**10.2**	**4.2**	**67.5**
%	**27%**	**5%**		**8%**	**33%**	**7%**	**15%**	**6%**	**100%**

* 1999/2000 data as of May 2001 (Key: EG Estuary General; EPT Estuary Prawn Trawl; EPTadj, EPT adjusted (by 10%); OH Ocean Haul; OPT Ocean Prawn Trawl; OFT Ocean Fish Trawl; OTL Ocean Trap and Line and RL Rock Lobster)

The NSW fishery revenue for different districts along the NSW coast is reported in Table G3. The EPT fishers operate regionally within this State-wide picture of fishery interaction.

Table G3: State wide fishery revenue in different fishery zones and districts of NSW in 1999-2000 ($'000, Source: NSWF- Sydney Index).

Zones	District	EG	EPT	OFT	OH	OPT	OTL	RL	TOTAL	%
1	TWEED	655	-	-	342	1,703	775	-	3,475	5.2%
1	RICHMOND	1,856	14	21	-	3,067	1,172	53	6,183	9.3%
2	CLARENCE	2,740	2,607	-	157	9,081	341	217	15,142	22.8%
3	COFFS HARBOUR	245	-	3	212	2,538	1,585	431	5,013	7.6%
3	HASTINGS	912	20	26	504	1,634	468	234	3,798	5.7%
4	MANNING	1,193	8	38	258	420	445	288	2,651	4.0%
4	WALLIS LAKE	2,272	48	40	266	614	495	600	4,336	6.5%
4	PORT STEPHENS	860	-	925	200	1,430	312	829	4,556	6.9%
4	HUNTER	1,555	287	1,003	57	1,187	282	133	4,505	6.8%
4	CENTRAL COAST	1,061	182	50	106	1	645	154	2,200	3.3%
5	HAWKESBURY	251	312	-	-	4	1	-	568	0.9%
5	SYDNEY NORTH	290	185	686	69	257	181	58	1,726	2.6%
5	SYDNEY SOUTH	467	170	13	22	151	417	430	1,670	2.5%
6	ILLAWARRA	876	-	1	1,206	62	861	565	3,572	5.4%
6	SHOALHAVEN	1,042	10	292	73	134	606	132	2,289	3.5%
7	BATEMANS BAY	442	1	715	258	88	271	395	2,171	3.3%
7	MONTAGUE	451	4	8	60	30	742	17	1,312	2.0%
7	FAR SOUTH COAST	128	-	60	645	37	228	20	1,118	1.7%
	Total	**17,299**	**3,848**	**3,880**	**4,434**	**22,439**	**9,826**	**4,558**	**66,283**	**100%**

Note: Summed by district and may vary from entitlement data in Table G4.

The state wide fishery relationships reported in Table G3 reveal that the Clarence district has 23% of state wide fishing revenue, reflecting the OPT, EPT and EG fisheries in that region. The Clarence EPT revenue is significant. Due to the mixed endorsement holdings of EPT businesses across several fisheries, the revenue associated with catches across several fisheries made by fishers and fishing businesses holding EPT endorsements is greater than $3.8m and is reported in Table G4.

Table G4: Fisher revenue for EPT fishers in the EPT and other fisheries in different estuary fisheries of NSW in 1999-2000 ($ '000, Source: NSWF- Sydney Index).

Area	Entitlements	Inactive bus. 2000	EG	EPT	OH	OPT	OFT	OTL	RL	TOTAL	EPT as % of total
Clarence River	123	46	1,758	2,653	83	4,440	26	144	45	9,193	29%
Hunter River	32	10	205	375	7	337	-	-	44	967	39%
Hawkesbury River	68	32	200	542	-	3	153	50	34	983	55%
Port Jackson	31	19	7	95	-	-	-	2	-	104	92%
Botany Bay	48	31	53	183	-	-	9	15	-	260	70%
Grand Total	**302**	**131**	**2,222**	**3,848**	**90**	**4,780**	**188**	**211**	**122**	**11,599**	**33%**

Key – Inactive business - did not submit one or more catch returns in 1999-2000.

Table G4 reports that EPT endorsed fishers had a catch value of $3.8 m from the EPT fishery in 1999-2000 period, but an additional $7.8m from these businesses' activities in other NSW

commercial fisheries. Estuary Prawn Trawl fishers catch revenue is 33% of their total fishing revenue across all fisheries. Significant operator links exist between the EPT fishery, the Ocean Prawn Trawl fishery and the Estuary General fishery. EPT revenue by estuary is reported in Table G4 and has been calculated by the Sydney index. Discussions with the EPT MAC indicate shortcomings in the price data recorded for the Hawkesbury area and its catch value is substantially higher[3].

Table G4 also reports that in June 2001 there were 302 entitlements in 5 estuaries and 310 endorsed fishers. In the 1999-2000 year, 171 entitlement holders were actively fishing and 131 entitlements were inactive. The final column of Table G4 illustrates the regional dependence on the EPT fishery in the different fishery areas, with Port Jackson and Botany Bay being most dependent on the revenue from the EPT fishery. The estimated value of catch by different methods is reported for all estuary fishing in 1998-99 in Table G5 below. Estuary Prawn Trawl is the second highest grossing estuarine fishing method and takes 16% of the annual estuary product value.

Vessel data from licence records

Vessels in the EPT fishery are diverse as businesses and fishers can have several licenced vessels. These are wheel housed, decked vessels, ranging in length between 5m and 17m with average power of 100hp (NMB, 2000). Vessels have commercial fishing equipment as allowed, mostly ice only, using utility vehicles and some direct unloading at Cooperatives (NMB, 2000). The NSWF licence data confirms the length of the vessels used only in the EPT fishery, as displayed in Figure G2. EPT fishers hold 503 boats from 2,950 state-wide, with a mean length of 7.1m and s.d. 2.55m.

[3] Comparisons of revenues declared in the economic survey indicated the Sydney index underestimated fishery revenues in zone 4 and 5. Investigation of price and sales information supplied by the Hawkesbury River fishers indicated calamari being substantially undervalued as squid in the Sydney index and school prawns being sold for bait at prices in excess of $10 per kilo. The $542,000 revenue estimate for the Hawkesbury catch in Table G4 is estimated by fishers as being up to $1.1m. The economic survey results would impute a 54% increase to make the estimate $834,600. This illustrates the need for a more accurate price monitoring system. Sydney fishers indicated a similar prawn price issue due to sales outside the Sydney Fish Market, while fishers in the Clarence region were content with the Sydney index. The economic survey results suggest a weighted adjustment factor of 10% could be applied to the whole fishery revenue to account for sales above the Sydney index method.

Figure G2: The distribution of vessel lengths in the EPT fishery (NSWF, licensing data).

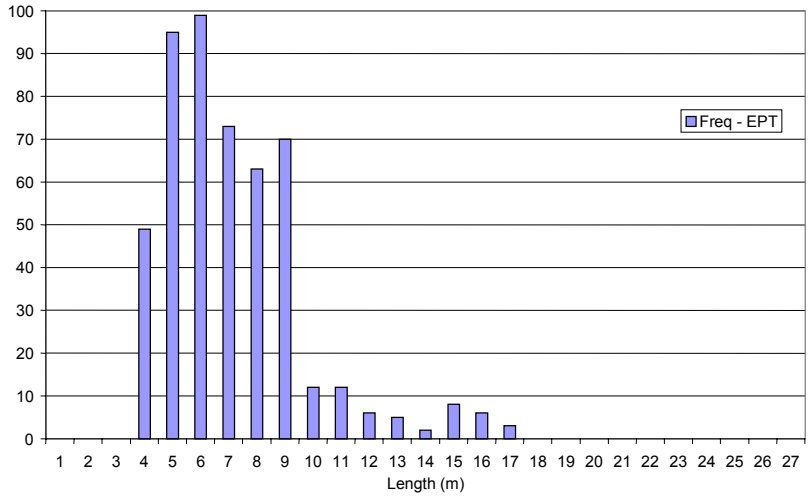


Table G5: Revenue associated with different fishing methods in all NSW estuaries 1998-99 (in $, Source: NSWF; Sydney Index).

	Method	**1998-99**	**%**
1	Mesh net, top set bottom set or splashing	5,435,908	28%
2	Estuarine prawn trawl	3,166,949	16%
3	Hauling net, beach haul	2,957,741	15%
4	Crab pot (Trap)	1,497,123	8%
5	Prawn haul net	1,087,431	6%
6	Prawn set pocket net	964,424	5%
7	Prawn running net	953,032	5%
8	Bait net	923,204	5%
9	Prawn seine (Snigger)	565,849	3%
10	Eel trap	361,786	2%
11	Mesh net, flathead	335,662	2%
12	Other or ambiguous	297,599	2%
13	Hand gathering	289,880	1%
14	Fish trap,bottom/demersal	275,253	1%
15	Handline	169,414	1%
16	General purpose, trumpeter whiting or garfish net	98,920	1%
17	Pound net	56,881	0.3%
18	Hoop or lift netting	39,112	0.2%
19	Pilchard,anchovy,bait net	35,177	0.2%
20	Garfish net (hauling)	14,278	0.1%
21	Setlining	9,715	0.0%
22	Lobster/Crayfish pot	7,472	0.0%
23	Skindiving	4,596	0.0%
24	Jigging	2,439	0.0%
25	Trolling	1,429	0.0%
26	Mesh net, bottom set	19	0.0%
	Grand Total	**19,551,290**	**100%**

(nb. This is for all NSW estuary fishing and includes the EPT fishery. Pound net now illegal).

Method endorsements in the EPT fishery are for named Estuaries only- Botany Bay, Port Jackson, Hawkesbury River, Hunter River and Clarence River.

Capital investment in the EPT fishery

Capital investment ranges from $30,000 to $150,000 for an extensive fishing business (NMB, 2000). Some small Botany Bay and Port Jackson endorsements would be less than $30,000. The appraisal of a capital value is complicated by restrictions on transferability and the additional items included within business deals, such as boats, nets, sheds and equipment. There have been no published appraisals of licence values.

The average capital investment is approximately $80,000, though these would differ with the diversity of businesses activities and assets (NMB, 2000). The range of business values would be large. More accurate information is needed on fishery licence values and investments. This need will increase, as share values will have to be monitored as an indicator of viability when the new FMS is implemented.

(b) location and condition of existing infrastructure – such as transport (water and road), berthing facilities, maintenance and repairs, cold stores if relevant, distribution and/or processing facilities; consider the regional or sub-regional implications

Information on port infrastructure comes from records held by Department of Land and Water Conservation (DLWC) and licensing records for fish receivers held by NSW Fisheries.

EPT Ports in NSW with berthing facilities

The operators in the EPT use a variety of sites and facilities for boat storage and operation. Some of these are in conjunction with established wharf and fishing cooperatives. A list of all public port assets for NSW was obtained from the Department of Land and Water Conservation. This was then compared with areas of operation of the EPT fishers, Fishing Co-operatives and towns in coastal NSW. The locations of port infrastructure are reported in Table G6.

Table G6 reports the major port facilities available to fishers in the EPT, but is unable to quantify the extent to which are used by EPT fishers making comments gathered from several sources. Interview comments are attached to the right hand side of Table G6 and indicate that coastal port facilities are not central to the operations of EPT fishers, especially when compared to some of the ocean fisheries which involve larger vessels that need harbour facilities.

Distribution – licensed processing facilities/ cooperatives

In the period prior to deregulation of fish marketing, NSW had a system of fish marketing cooperatives, certificates of exemption and consents given to fishers to sell outside the regulated system. Deregulation of fish marketing has brought a new system in which Cooperatives have a less central place than before.

NSW Fisheries has a system of two categories of fish receivers to monitor the seafood industry. The categories are:

(1) Registered Fish Receivers (RFR), for large seafood receivers of which there are 92 state-wide, and

(2) the Restricted Registered Fish Receivers RRFR, generally smaller holders of consent forms to sell catch locally and which number 84 state-wide.

Table G6: The EPT fishery and public port assets in NSW. Comments on EPT use (Source: DLWC).

Town	Port Assets	HBR	JET	WHV	ACC	EPT y/n	Comment - EPT
Tweed Heads	Tweed Heads	1	2		1	N	
Brunswick Head	Brunswick Heads	1	3	2	1	N	
Ballina	Ballina	1	1	2	1	N	
Evans Head	Evans Head	1	1	1	1	N	
Iluka	Iluka	1	2	2	1	Y	Clarence area - Vessels moor at ports of Iluka and Yamba, along river on small jetties or timber ramps to bank
Yamba	Yamba	1	2	1	1	Y	
Maclean	Maclean					Y	
Wolli	Wooli	1		1	1	N	
Coffs Harbour	Coffs Harbour	1		5	1	N	
	South West Rocks	1	2	1	1	N	
Port Macquarie	Port Macquarie	1		2	1	N	
Laurieton	Camden Haven	1	1	2	1	N	
Crowdy Head	Crowdy Head	1	2	1	1	N	
Taree						N	
Tuncurry	Tuncurry	1	1	3		N	
Nelson Bay	Nelson Bay	1	1	5	1	N	
Tea Gardens	Tea Gardens	1		1		N	
Wickham	Raymond Terrace	1	1		1	Y	Mooring along river & at Honeysuckle Port Development at Wickham
Newcastle	Swansea	1	1			N	
Mannering Park						N	
Tacoma						N	
Brooklyn	Brooklyn	1	1			Y	Mooring along river & at Brooklyn, Patonga & Brisbane Water, some on swing moorings
Pyrmont						Y	Most moor on swing moorings in Leichhardt bay or at SFM wharves
Mascot	Cooks River					Y	Most moor on swing moorings in Cooks River & use ramp for dinghy
Wollongong	Wollongong	2	1	1	1	N	
	Bellambi	1	1			N	
Berkley	Berkeley	1	1	2	1	N	
	Port Kembla	1	1			N	
	Shellharbour	1		1	1	N	
	Kiama	1	1	1	1	N	
Nowra	Greenwell Point	1	1			N	
Huskisson						N	
Ulladulla	Ulladulla	1	1	2	1	N	
	Batemans Bay	1	2	2	1	N	
	Narooma	1	1	3	2	N	
Bermagui South	Bermagui	1	3		1	N	
Eden	Eden	1	2	3	1	N	
	Throsby Creek	1	2	2	1	N	

(nb: HBR- harbour; JET – jetty; WHF – wharf; Acc – Access ramp)

Tables G7a&b were compiled from these regulatory forms and can give some indication as to the number of licensed processing facilities associated with EPT and their location. Table G7 reports an estimation of the RFR and RRFR holders and the EPT fishery – (there is insufficient data in this area and it should be treated with caution).

Table G7a: The RFRs associated with the EPT fishery in NSW (Source: NSWF Fish receiver records).

		No. RFR's	With Cold Store	No. Cold Vehicles	EPT	EPT - Cold Store	No. Cold Veh. - EPT
North	Tweed-Manning	38	34	39	14	14	16
Central	Wallis-Sydney	29	21	30	15	11	21
South	Illawarra - Far South Coast	25	22	33	10	9	12
Total		92	77	102	39	**34**	**49**

Table G7b: The RRFRs associated with the EPT fishery in NSW (Source: NSWF Fish receiver records).

		No. RRFR's	EPT	EPT - Cold Store	No. Ice Boxes - EPT
North	Tweed-Manning	22	7	7	7
Central	Wallis-Sydney	26	23	23	23
South	Illawarra - Far South Coast	35	21	21	21
Total		83	51	**51**	**51**

The estimates come from the data submitted to NSW Fisheries in registering fish receivers and the forms have limited information on the NSW seafood processing sector and are shown in aggregate to preserve confidentiality (see data requirements section 3).

Table G7a indicates the location of RFRs and RRFRs associated with the EPT fishery. It is estimated that 39 of the 92 RFRs establishments in the state (42% by number) may work with EPT species, but the proportion and volume of business is unknown. Approximately 74% of processing firms (by number) are north of Sydney and those significantly to the south of Sydney are likely involved with EPT species from other fishery sources.

The RRFR data in Table G7b indicates that of 83 RRFRs state-wide, 51 (61%) may have involvement with EPT species. All 51 have access to a cold store below 5 degrees C and have ice box arrangements in place to maintain quality. Due to historical reasons there are more RRFRs, formerly consent holders, in the southern area of the state with cold storage capacity.

Road transport and cold stores.

Road transport in the EPT fishery may be required to take the catch from the landing point to market via processors or cooperatives. From state-wide records in Table G7a, there are 49 fish transport vehicles capable of holding fish below 5 degrees C, associated with establishments which handle EPT species amongst other seafood. Only an unknown proportion of this capacity would be directly attributable to the EPT fishery. Approximately 34 of 39 EPT RFRs, have a cold store colder than 5 degrees.

(c) employment by regions and sub-regions for fishers including direct employment eg boat owners, skippers and crew and indirect employment (cold stores, traders, suppliers); identify the distribution of income including seasonality factors; identify proportion of fishers with employment in other sectors as well as fishing (where possible estimate % of income non-fisheries related for boat owners, skippers and crew) or could be considered to be semi-retired;

The NSW Fishing industry has direct employment in fishing operations and indirect employment through the cold stores, processors and traders. Current information is available for direct employment only with the social survey giving new employment estimates. Table G4 has presented the regional employment of fishers along the NSW coastal zones.

Direct employment

Fishers are employed in their businesses and each business may have several fishers. Fishers can be either owner operators, nominated fishers, employees or crew depending on the fishery. However the analysis is complicated by the ability of fishers to form several businesses, or be part of partnerships and companies. All this also takes place within the broader state wide activity patterns of fishers fishing in different fisheries where one person can be endorsed in up to six fisheries. The following facts from the database are provided at State-wide and EPT fishery level for consideration.

The fishing industry state-wide has the following figures obtained from available data sets in May 2001(NSWF database):

- In NSW there are 1,603 fishing businesses associated with 1,921 fisher file numbers;
- There are 1,590 Owner operators, 295 nominated fishers, 119 Skippers and 95 registered crew associated with the marine fisheries in NSW;
- A further breakdown of "entities" state wide reports 84 companies, 149 joint partnerships and 1,674 male and 14 female fishers;
- There were 1,407 active file numbers fishing in 1999-2000.

The following facts for Estuary Prawn Trawl were obtained from available data sets (NSWF database, May 2001):

- In EPT the 289 businesses are associated with 310 fisher file numbers;
- A further breakdown of "entities" reports 9 companies, 24 partnerships and 3 (1%) female fishers.

The social survey investigated employment in the EPT fishery. There were 171 respondents holding EPT endorsements. Each was asked: How many people have you employed in the last 12 months? (Full-time, F-T or Part-time, P-T). The results are presented in Table G8.

Table G8: Estimation of number of employees in the EPT fishery (Source: RM-SS).

No of employees	Frequency	Total employees	Full-Time	Part –Time
0	128	0	0	0
1	21	21	8	13
2	6	12	3	9
3	4	12	1	11
4	5	20	9	11
5	1	5	0	5
6	0	0	0	0
7	0	0	0	0
8	1	8	8	0
Total	**165**	**78**	**29**	**49**

Of the 166 responses to this question, 128 had no employees and 38 had a total of 78 employees, of whom 29 were full-time and 49 part-time. Assuming the sample is representative, given there were 166 responses from 310 fishers, it is proposed to multiply the survey estimate by this ratio[4]. The fishers are also to be included in employment estimates and represent 310 fisher endorsement holders, both full-time and part-time. Only 179 fishers (part-time and full-time) chose to fish in the EPT in 1999-2000.

There are between 257[5] and 474[6] persons employed full-time and part-time in fishing businesses which hold an EPT endorsement. From Table G8, 62% (49/78) of all employees are part-time in this seasonal fishery. The estimates of employment need to be seen in the context of all fishing activity state-wide, rather than for each administered fishery and requires further investigation to exclude double counting. Some indirect employment is included. Several multiplier studies, reported in Table G15, have employment Type II multiplier estimates of 1.3-1.58 (mean 1.48). From 179 fishers and 310 endorsement holders indirect employment is estimated as 86 and 148 additional persons respectively, giving a total employment estimate of between 265 and 458 persons. This is close to the results from the survey estimates.

All fishers were asked about the percentage of their income from fishing as compared to non-fishing. Income from directorships and general investments was identified as reported in Table G9.

[4] The ratio of 166/310 was used for sample expansion and may overestimate employment. In Table G8, 11 businesses had 45 employees and may relate to EPT vessels with OPT operations, or to processing activities, and over estimate total employment when expanded.
[5] 179 active EPT fishers + between 78 and 155 employees = 257 or 334.
[6] 310 endorsed EPT fishers + between 78 and 164 employees = 388 or 474.

Table G9: The percentage of income from fishing and non-fishing source in which EPT fishers participated in the last 12 months (Source: RM-SS).

Frequency	% EPT Fishing	% Fisheries Representative Work	%General Investments	% Other industries
3	<10	30	-	20
3	20.0	40	-	40
3	30.0	6	25	41
1	40.0	30	-	30
8	50.0	13	-	37
0	60.0	-	-	-
4	70.0	-	-	33
7	80.0	2	9	10
8	90.0	1	1	6
103	**100.0**	-	1	2

Table G9 reports 103 of 140 EPT (74%) endorsed fishers who responded to this question have 100% income from their EPT fishing business and another 15 (11%), had over 80% of their income from fishing. Part-time fishing involvement is limited, with 9 from 140 persons (6%) having less than 30% of income from fishing and up to 41% of their income from other industries. Fishers working in other industries are described in the social issues section. The social survey employment estimates also includes the employment of fisher's partners. In the survey sample, 56 of 136 (41%) fishers who responded to this question, had their marital partners "in the business", of which 32% were full-time and 68% were part-time.

Dependence measures

The revenue from the EPT fishery as a share of total fishing catch revenue is reported in Table G3 and area dependence on EPT is reported in Table G4 for the different pestuaries of the Estuary Prawn Trawl Fishery. Table G10 reports the level of dependence of multiple endorsement holders on the EPT fishery revenue. Dependence on EPT fishery revenue generally reduces with increasing numbers of fishery endorsements and may reflect the seasonal nature of the fishery.

Table G10: The catch combinations in the EPT fishery by EPT endorsed fishers with other fishery endorsements 1999-2000 and the inferred dependence (Source: NSWF; Sydney Index).

Nb. Endorsed no catch are latent endorsements and Endorsed –other catch are fishers endorsed in EPT who chose to fish in other fisheries

Catch Combinations	No. Fishers	%	Total Catch ($)	%	EPT Catch ($)	%	% EPT
EPT Only	62	20%	713,988	6%	713,988	19%	100%
EPT & EG	78	25%	3,865,329	34%	2,493,383	66%	65%
EPT & OPT	10	3%	573,434	5%	91,103	2%	16%
EPT, EG, OPT	7	2%	221,251	2%	122,296	3%	55%
EPT, EG, RL	4	1%	176,533	2%	79,193	2%	45%
other combinations	14	5%	980,677	9%	-	-	-
Endorsed - Other Catch	48	15%	4,837,231	42%	-	-	-
Endorsed - No Catch	87	28%	-	-	-	-	-
Grand Total	**310**	**100%**	**11,407,570**	**100%**	**3,794,516**	**100%**	**33%**

Distribution of income among fishers – categories of annual income etc.

The distribution of income is available through several measures. Firstly, revenues associated with each EPT endorsed catch combination are reported in Table G11 from the Sydney index. In the category for EPT only fishers, there was low average revenue in compared to other fishing combinations. The exception to this was fishers fishing both EPT and OPT. The distribution of annual revenue varies by fishing category. The variation in annual fisher's return is large and frequencies are plotted for the single and multiple fishing by EPT endorsed fishers in Figure G3 and confirms the diversity in revenue among EPT fishers.

Table G11: The distribution of average annual revenue for all EPT fishers fishing within the EPT fishery in 1999-2000 (Source: NSWF; Sydney Index).

Catch Combinations	No. Fishers	Total Catch ($)	EPT Catch ($)	Average EPT Revenue ($)	SD
EPT Only	62	713,988	713,988	11,516	10,649
EPT & EG	78	3,865,329	2,493,383	31,966	29,988
EPT & OPT	10	573,434	91,103	9,110	17,633
EPT, EG, OPT	7	221,251	122,296	17,471	15,025
EPT, EG, RL	4	176,533	79,193	19,798	20,226
other combinations	14	980,677	-	-	-
Endorsed - Other Catch	48	4,837,231	-	-	-
Endorsed - No Catch	87	-	-	-	-
Grand Total	**310**	**11,407,570**	**3,794,516**	**21,683**	**24,537**

Figure G3 confirms the diversity in revenue among endorsed fishers where a total of 45 EPT only fishers have revenue below $10,000 per annum, probably being part-time fishers. Both Table G11 and Figure G3 indicate the variation in fisher income with implications for policies which aim to create single fishery based fleets.

Figure G4 displays cumulative revenue from catch against the cumulative numbers of fishers in the fishery. It should be noted that:

- 50% of fishers take 88% of the fishery revenue;
- the top 10% take 36% of fishery revenue;
- the top 20% take 56% of fishery revenue;
- the top 30% take 70% of fishery revenue;
- the bottom 50% take 12% of fishery revenue indicating many part-time fishers.

Figure G3: Frequency distribution of annual fishing revenue for EPT fishers in 1999-2000, fishing EPT Only, 2, 3 or 4 fisheries (Source: NSWF; Sydney index).

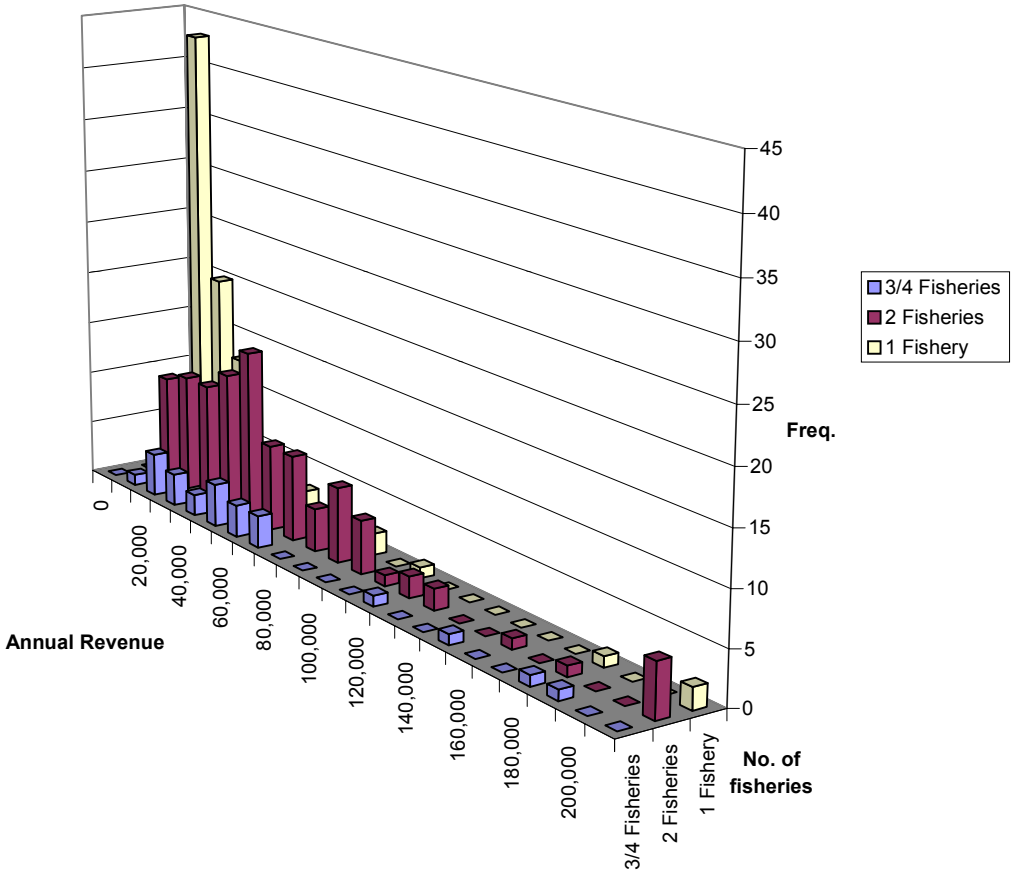
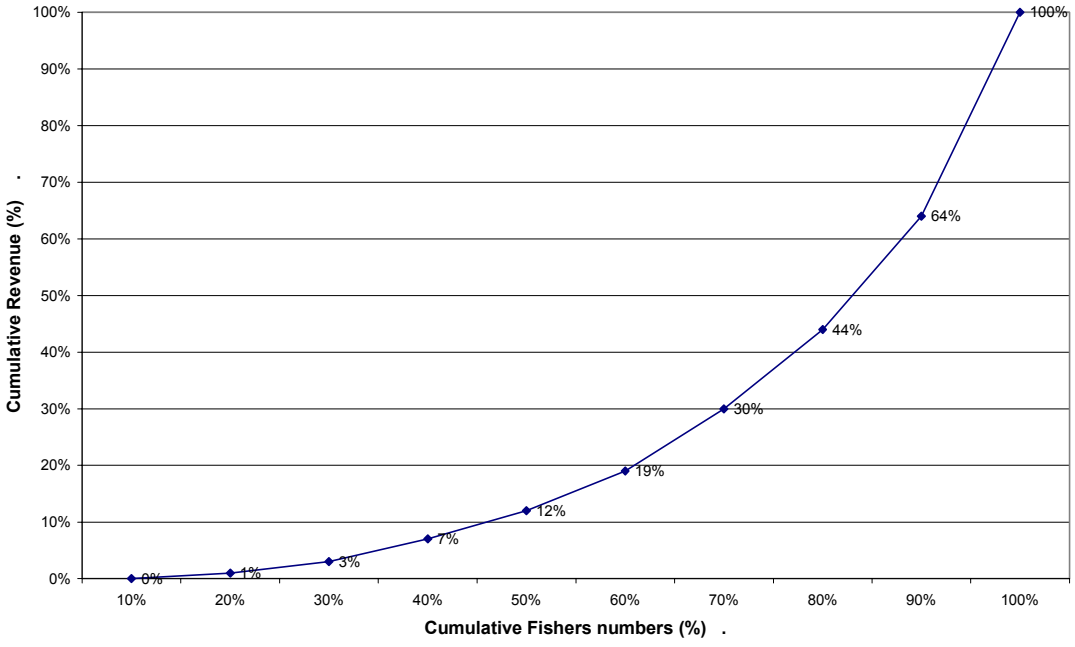


Figure G4: The cumulative revenue and cumulative number of endorsed fishers in the EPT fishery 1999-2000 (Source: NSWF; Sydney Index).



The regional dependence on estuarine and other fishing by district, is reported in Table G3. Table G4 reports that endorsed fishers in Port Jackson and Botany Bay are relatively most dependent on the EPT fishery.

Other fisher income data is available from the social survey. Table G12 reports the frequency of gross income from all sources for 171 EPT fishers interviewed.

Table G12: The frequency of gross incomes (all industries) of EPT fishers from the social survey (Source: RM-SS).

Gross individual income (all industries)			
Dollars per annum	**%**		
< 6,000	3%	60,000-69,999	4%
6,000-9,999	0%	70,000-79,999	5%
10,000-19,999	5%	80,000-89,999	4%
20,000-29,999	9%	90,000-99,999	0%
30,000-39,999	15%	100,000+	7%
40,000-49,999	9%	Can't say	20%
50,000-59,999	11%	refused	8%

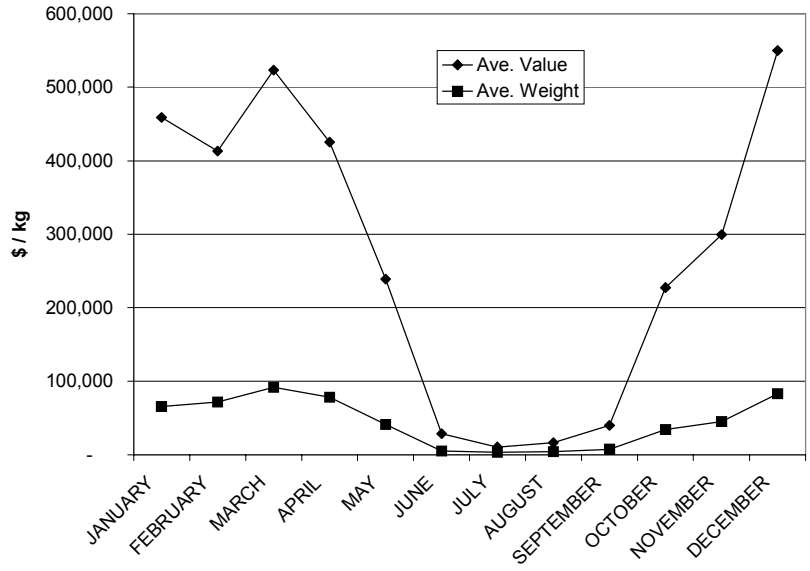
The distribution of income question revealed a mean household income of circa $40,000, but there were 28% of fishers interviewed who did not to reply. A significant number of incomes of $100,000 or over were recorded (7%). The accuracy of this cannot be verified, but as it represents income from all industries, it may indicate financial diversification and business interests outside the EPT fishery.

Seasonal employment

There was no previous data on seasonal employment prior to this study. The seasonal occurrence of the fish catch is reported below, and gives some background to seasonality in the fishery and the need for labour. Employment opportunities for fishers in other industries have been investigated through the social survey.

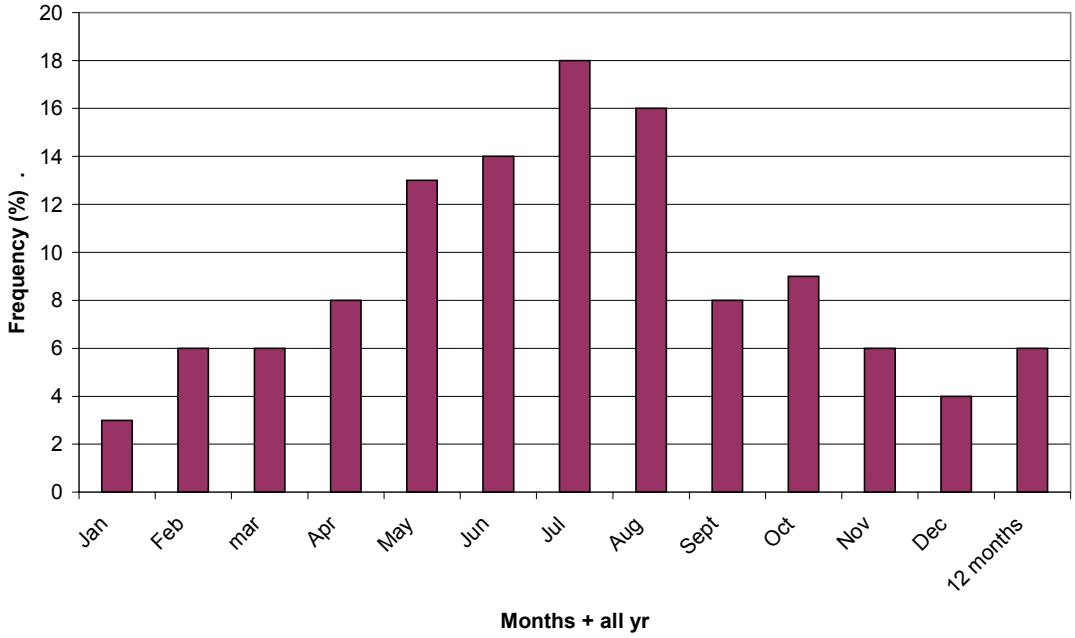
The monthly variation in EPT catches is reported in Figure G5 and indicates a reduced catch and revenue in the third quarter of the year (July-October). All else being equal, employment attributable to the EPT fishery would also be reduced in these months, as effort and labour may move to other fisheries.

Figure G5: Monthly variation in catch and revenue in the EPT fishery for years 1997/98 and 98/99 averaged (Source: NSWF -Sydney Index).



The seasonality of part-time work in other industries was investigated in the social survey. Figure G6 reports the timing of this non-fishing employment by asking "in what months did you undertake paid employment outside the fishing industry"? Figure G6 reports monthly frequencies and annual frequencies for those who worked all year.

Figure G6: Monthly frequency of employment outside fishing, (including all year round) in the EPT fishery (Source: RM-SS).



The correlation between the survey responses (Figure G6) and the NSWF EPT catch and effort catch data (Figure G5) indicates fishers work in other industries in the EPT low season (June to October) and all year round as well (see social section for further non-fishery employment analysis).

(d) examine current effort levels including latent effort and the link between effort and economic performance and the viability of the commercial operations

Fishing Effort and latent effort in the EPT fishery

Effort in a fishery can be appraised at different levels of aggregation. In the Estuary Prawn Trawl fishery each fisher produces effort in the EPT fishery and in other fisheries for which a business holds endorsements. Endorsements can be inactive, or if active, used lightly or to a fuller extent, with the fishing activity being measured in days fished.

There were 289 businesses holding 302 entitlements to fish in EPT in October 2001. For the 310 licence holders holding EPT endorsements, 223 were actively fishing in a range of commercial fisheries in 1999-2000 and 87 were not. Of the 223 active fishers, 48 could have fished in EPT, but chose to catch fish in other fisheries for which they were endorsed. This left 175 with a catch record in EPT in 1999-2000. Of these, 62 fished EPT only and 113 fished EPT and other fisheries.

In the discussion below, the term latent effort is used. It is defined as an endorsed fisher who has not submitted a catch return in a given period as they have not fished. Active effort can be thought of as having three layers in relation to effort in the EPT.

Firstly, some businesses may not be fishing any of their endorsements in EPT or other fisheries. There are 126 endorsed fishers with no fishing activity in 1999-2000. These are considered latent and are unfished for a variety of reasons (for example, multiple endorsement holdings, in another industry for a period, ill health and old age. The social section of this report provides further details). These business operators could activate their endorsements by fishing or transferring them to other operators, hence raising active effort in the fishery. Holding the licence as a fishing right for its option value is also permissible and owners incur management and licence fees.

Secondly, EPT endorsement holders that fished in other fisheries can be considered latent when considering the EPT, but not to the degree of the previous case. They have chosen to fish other fisheries for a variety of reasons, but to hold the EPT endorsement for its option value. They may choose to use it again next season. This behaviour may reflect both economic and social reasons and also perceived resource catch rates among alternative fisheries.

Thirdly, there are fishers in the EPT fishery who could increase their effort by increasing the days fished to a higher level. The management issues with latent effort are discussed in Appendix G1a.

Fishing Effort in the EPT fishery

Fishing effort records are available through the NSWF logbook system and effort measured in days fished in the EPT fishery are recorded. Past effort by days fished are reported Table G13.

Table G13: Average effort levels in the Estuary Prawn Trawl fishery, 1997-2000 (Source: NSWF catch-effort records) when EPT fishing.

	Effort (days)				
Estuary	**1997/98**	**1998/99**	**1999/00**	**Ave**	**% Total**
Clarence River	5,269	6,054	7,310	6,211	44%
Hunter River	1,765	1,302	1,276	1,448	10%
Hawkesbury River	5,622	4,535	2,417	4,191	30%
Port Jackson	609	608	702	640	5%
Botany Bay	1,857	1,809	1,210	1,625	12%
Total	**15,122**	**14,308**	**12,915**	**14,115**	**100%**

Under the FMS, effort is measured in endorsement numbers, but the prime control for management. will be the effort measured in days. The days effort in each estuary will be monitored and limited under the FMS.

(e) markets for fish harvested under the plan, eg. as domestic/export market for human food, pet/aquaculture food or other uses.

Available marketing information comes from Sydney Fish Markets and gives base line minimum values of species prices in the EPT fishery. The Sydney index prices do not incorporate the prices of exported product and refer to unweighted monthly average prices. The Sydney index price may not adequately reflect a significant portion of the EPT catch marketed outside Sydney, and the product price includes product from many fisheries outside the EPT Fishery. Market price information is a major data shortfall (see section 3).

For example, the price obtained for prawns and squid produced in the different estuaries exceeds the Sydney market price in areas such as the Hawkesbury, but may be similar for the Clarence River (pers. comm. EPT- MAC). This was confirmed by revenues obtained from the economic survey (Roy Morgan, 2001b). Living closer to high population areas enables many prawn fishers to sell directly to consumers at higher prices than received in the Sydney fish marketing system. The use of an average price for prawns in the Sydney index, may under represent quality, grades and the high prices received for top quality product.

The prawns and calamari produced in the EPT fishery have a significant export from NSW. The economic survey revealed EPT fishers exported 8.1% of their product (by value) to destinations outside Australia. This was on average $5,500 per fisher, totalling $264,000 for the 48 EPT endorsed fishers who responded (Roy Morgan, 2001b).

Marketing expenses as a percentage of gross revenue, were approximately 8.7% across all EPT businesses interviewed (Roy Morgan, 2001b). Table G14 reports the fish receivers by number and does not necessarily reflect product volume or value. EPT fishers supply the Co-operatives and Sydney markets (59%) and directly to shops and restaurants (20%).

Table G14: The frequency of marketing alternatives for 48 sampled EPT fishers (Source: RM- ES). (Note: by number of fishers in survey, not volume of product. Also there is a rounding error of around 3%.).

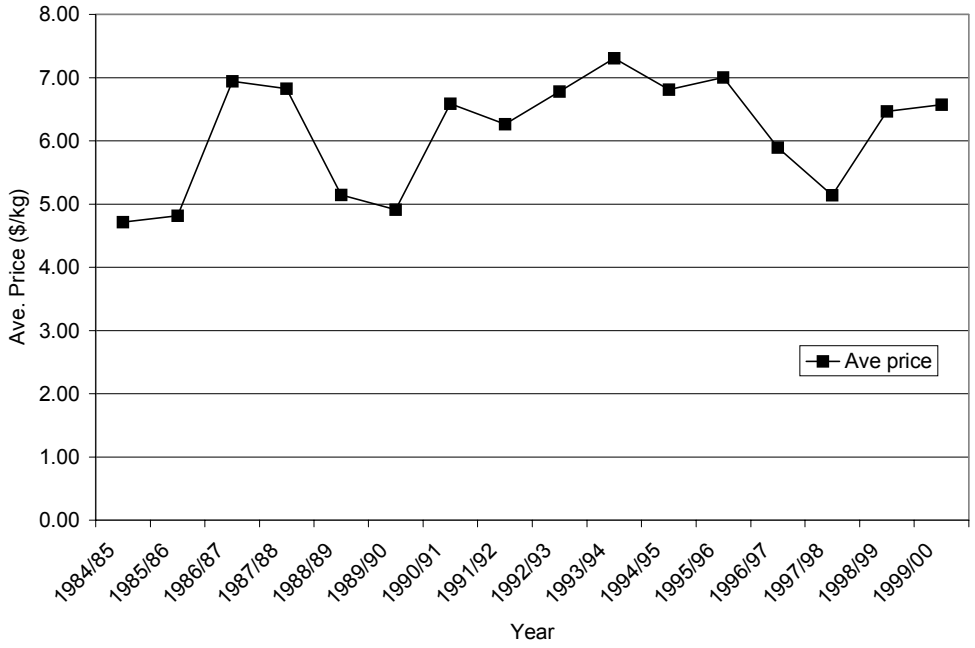
	EPT	**%**	
Coops	31	46%	
Sydney Fish Market	9	13%	
Shops	13	19%	
Restaurants	1	1%	
Agents NSW	7	10%	
Agents Qld	2	3%	
Agents Vic	1	1%	
Bait	3	4%	
Total	67	100%	n= 48

Some recent information on trends in national seafood marketing is presented in FRDC (2001), but has little estuarine fishery content. Ruello and Associates (2000), review retail and consumption of seafood in Sydney and emerging trends since a similar study of retail outlets in 1991.

Price history

The price across all species of the EPT product in nominal terms has increased from $4.70/kg towards $6.50/kg in the 1984-2000 period as reported in Figure G7 (Source: NSWF Sydney Index)(derived from Figure G1). This nominal price rise was less than inflation for the period.

Figure G7: Average price ($/kg) of EPT fish across all species in the 1984-2000 period (Source: NSWF; Sydney Index).



Prices are also related to the use of the product and fisher receipts for the Hawkesbury indicate a considerable amount of prawns being purchased by companies for sale as bait at prices in excess of $10.00 per kilo. Similarly calamari prices are considerably above the squid price assumed in the Sydney index. The different grade of product and potentially high prices for different grades suggests that a more accurate price monitoring system is needed for EPT product. This will be essential as management moves towards more optimal harvesting regimes.

(f) the economic return from the fishery including its contribution to individual, regional, state and national income; estimate the value of the share/licence held by individual fishers within the fishery

There is no previous information on economic performance of fishers in the EPT fishery. The only previous economic survey work covering some EPT fishers was by IPART (1998). The IPART study did a brief review of a cross section of fishing businesses in NSW, in order to establish their capacity to pay management charges.

Fishing operator survey

A fishing industry economic survey was developed and distributed to industry to appraise fishing industry profitability and economic viability (Roy Morgan, 2001b).

Fishing businesses and owner operators act as firms fishing among the portfolio of fishery choices available to them. An economic survey can measure the performance of the firm across all its fishing activities and give a profile of firms in the fishing industry. When we come to assess the economic performance of firms in a given fishery, we need to examine the scope of production of the firms - i.e. which combinations of fisheries does it access? We can use *pro rata* methods to attribute an economic performance to firms in each fishery. This could potentially give a rate of return for the firms in a particular fishery, but the estimate would be somewhat arbitrary, depending on the allocation of capital costs between fisheries.

Many active EPT endorsement holders (78 fishers, see Table 10b) are also holders of the Estuary General endorsement, in this seasonal fishery. The attraction of EPT fishing, relative to fishing the EG was estimated through the economic survey.

Fishers were asked to apportion effort in each endorsed fishery expressing it as a percentage of total annual effort. Similarly revenue was expressed as a percentage of total revenue in each fishery. The ratio of percentages (ie.R (EPT) = % revenue in EPT / % effort in EPT) is an index of the revenue of effort from that fishery. Then we can compare R(EPT) / R(EG) as a new relative ratio which is a measure of the relative average revenue of effort between fisheries.

For 20 fishers fishing EPT and one other fishery, the index was 1.25 for EPT, meaning that relative to their EG fishing, the revenue from a day's effort in EPT was 25% higher for these sampled fishers. For 6 fishers who fished in 2 or more fisheries, their EPT effort yielded an index of 1.21,

21% higher revenue per unit of effort than in the EG component of their fishing. However some other fishers, 6 from 34, had higher returns from their EG fishing, illustrating diversity in fisher behaviour between fisheries.

In summary, this confirms that many fishers switch between the EPT and EG fisheries. The EPT fishery provides an economic opportunity for some fishers to receive 21-25% more revenue per day of effort, than in alternative EG fishing opportunities.

Economic return

A fishing industry economic survey was developed and distributed to industry (Roy Morgan, 2001b). The survey methods and results are reported in Appendix G2. The survey respondent sample was 15.6% of EPT businesses and extrapolations are based on these responses.

The economic survey indicates that 10% of EPT business respondents are earning an economic surplus under the levels of opportunity costs and economic depreciation assumed for long term viability. These operators are contributing to the local, state and national economy in terms of economic profit contributing to Gross Domestic Product (GDP). Approximately 90% of operators are under the long term viability measure, not contributing profit to GDP, but will contribute to economic activity through their purchases of inputs and factors of production (eg. labour and capital) and thus to Gross Domestic Product through the profits and labour payments of firms from whom they purchase inputs. Workers employed by unprofitable fishing firms also contribute to economic activity through their consumer purchases.

The mean economic rate of return across businesses with EPT fishing endorsements was -13% to capital and the median rate of return was -25%, indicating 50% of operators falling below this when examined in a single operational year. Businesses which obtained more than 20% of revenue from EPT, had a return to capital of -30%, indicating an economic loss. Other businesses with less than 20% of revenue from EPT, had an economic rate of return to capital of -13%. The results indicate significant long run economic viability issues for the bottom half of operators, particularly for those involved with EPT fishing. However, the apparently low return from prawn fishing conflicts with the revenue of effort information presented earlier which indicated a higher rate of return to effort in prawn fishing than in estuary general fishing. This may be attributable to poor catch recording practices in the prawn fishery. This is an issue for further investigation.

Economic rates of return within the social and socio-economic context of rural NSW requires further study, incorporating the contribution to household income from work in other sectors and family income, including welfare and social security payments. This should be part of future research work.

Gross costs and benefits and fishery management

The fishery has not been subject to a gross cost-benefit analysis. Environmental accounting under the principles of Ecologically Sustainable Development (ESD), requires that all inputs are priced at their true cost. In the fisheries case, this would include the operational costs, costs of management and ancillary services and the costs incurred in any depletion of the fish stock (ABARE, 2000; p16).

A cost-benefit schedule of the EPT fishery

The economics of fisheries management enables an appraisal to be made of the economic contribution of the fishery to the economy and to analyse the impact of the changes advocated in the FMS. ESD principles dictate that resources should be valued at their market values and that subsidies should be taken into account in the form of an environmental accounting statement. The NSWF costs of management, research and compliance, (less any of these cost recovered from industry), should be added to the costs of fishing operations to give a full economic cost. The rise or fall in the value of the fish stocks should also be included in an environmental management cost account as illustrated in Box G1 below:

Box G1: An environmental management cost account of the Estuary Prawn Trawl fishery (1999-2000).

Gross revenue from catch* per annum	$ 4.18m
Less economic cost of operations**	$ 5.88m
Operational Economic surplus	$ -1.70m
less cost subsidies***	$ 0.4m
Total economic contribution	$ -2.1m
Plus rise or fall in fish stocks****	$ 0m
Total of environmental account	$ -2.1m

* This is the revenue from catch from all EPT businesses in the EPT fishery only, adjusted by the economic survey results (see Table G3 ie. $3.8m + 10% adjustment = $4.18m) to take account of higher prices than the Sydney index.

** This is the estimated economic cost of fishing inferred from the EPT economic survey results for all EPT fishing businesses (i.e. Appendix Table GA3 reports the average business as having $112,221 of economic costs, for $79,602 of revenue ie. economic costs are 1.41 times revenue). The total economic costs, include opportunity costs, costs of licences and some costs of management.

*** To the operational surplus (TR-TC) costs of management not attributed to fishers under current cost policy are added (ie. management, research, compliance, etc). IPART estimates of total management costs are $0.546 m, less fishers payments already in economic costs, $0.151m = $0.395 m. This does not include Commonwealth fuel or other primary producer subsidies.

**** The change in the value of the stocks is unknown and is assumed to be zero, but may not be.

The management account for the fishery is in deficit, due to the high economic cost of effort in the year sampled and the additional costs of management. The account schedule illustrates how the operational performance of the fishery, management charges and stock health can be related. The intention of the FMS is to promote long term economic viability, though the fishery needs to be in a position to be able to fully fund the attributable costs of management by 2008-09.

Licences

If licences are tradeable, then licence values can provide some information about the health of the industry. However, licence prices can reflect short-run effects which are not necessarily associated with a healthy fishery, reflecting over-capacity or over-fishing (ABARE, 2000). Nonetheless, interpreted correctly, licence prices can be a useful indicator of the performance of the industry in generating net value or rent.

In a fishery which has been under management and restructuring, there is an expectation of an increase in endorsement values through time. Available observations of endorsement/ business value data from Newcastle Marine Brokers suggests there has been no significant increase in EPT business values in the last eight years. This may reflect profitability and reflect the attitude of the market and confidence in management.

In 1986 when the licence freeze came into being, licence values went to the $20,000-$150,000 business values of the mid 1990s and current period. The average capital investment is approximately $80,000, though these would differ with the diversity of businesses activities and assets (NMB, 2000). Detailed inference as to price structure of licence trades, is not possible due to a lack of available licence purchase information.

Other evidence of perceived economic surplus may include the entry of new fishers, which has happened in recent years (see fishers and licence duration in social section). This may be as much a social phenomenon, due to children and relatives of fishers entering the fishery, rather than an indicator of fishing prosperity.

(g) Existing economic multiplier effects – costs and benefits

Review information on multipliers in the fishing industry of NSW.

Economic multipliers come from input-output modelling of economies and relate to the flow-on impacts of expenditure within a closed local economy and the revolving benefits of this. Similarly employment multipliers estimate the impacts on employment of expenditures in the locality. There are several historical fishing community studies appraising the multipliers and flow-on impacts in the NSW fishing industry. These studies can be used as a guide to likely economic impacts of policies and with some careful interpretation are likely to be preferred to interpolations from non-fishing industry material. In particular note should be taken of changes in the structure and operations of the industry since the studies were undertaken (Dr R. Powell, pers. comm.).

The available literature enables discussion of multipliers in four fishing communities in NSW, Eden and Ulladulla (Powell et al., 1989), the Northern NSW region (Tamblyn and Powell, 1988) and the Clarence region (McVerry, 1996).

The economic significance of an industry, such as commercial fishing, can be measured in terms of direct and indirect effects. The direct effects are a measure of the value of output of the industry itself, the number of people employed and the income they receive. The indirect effects can be divided into production induced and consumption induced effects. Production induced effects are the industry's purchase of goods and services from other industries. Consumption induced effects arise from the spending of household income received as payment for labour. The multipliers indicate the size of those impacts relative to the level of sales to final demand. The Type II ratios reflect the relationship between the total impact (direct and indirect) to the direct effect. In Table G15 a Type II value of 1.91 infers that for every dollar of direct output, there is a total impact of $1.91 due to both direct ($1) and indirect ($0.91) effects. The consumption and production induced components of the $0.91, are $0.72 and $0.19 respectively (Top line, Table G15).

A significant issue is whether the multipliers and/or estimated flow-on impacts include the downstream effects of transport, marketing and packing? The calculation of multipliers from fishing, will only include the linkages effects that occur back through the supply of inputs to fishermen and not any effects downstream toward the consumer.

Table G15: Output, income and employment multiplier estimates from fishing community studies in NSW (Tamblyn and Powell, 1988; McVerry,1996; and Powell et al., 1989).

OUTPUT (a)	Initial	First	Industry	Production induced	Consumption induced	Total	Type II ratio
Northern NSW (1)							
Fishing	1	0.1521	0.0412	0.1933	0.7166	1.91	1.91
Clarence (2)							
Fishing	1	0.063	0.028	0.091	0.787	1.877	1.877
Ulladulla (3)							
Trawl	1	0.1705	0.0663	0.2368	0.3269	1.5637	1.5637
Non trawl	1	0.1645	0.0588	0.2233	0.3409	1.5642	1.5642
Eden (3)							
Trawl	1	0.1702	0.0478	0.218	0.2206	1.4387	1.4387
Non trawl	1	0.1813	0.039	0.2203	0.1977	1.4179	1.417
Process+	1	0.3363	0.0893	0.4256	0.1051	1.5307	1.5307
INCOME (b)	**Initial**	**First**	**Industry**	**Production induced**	**Consumption induced**	**Total**	**Type II ratio**
Northern NSW (1)							
Fishing	0.4999	0.0409	0.0147	0.0556	0.2691	0.8329	1.662
Clarence (2)							
Fishing	0.59	0.017	0.009	0.026	0.308	0.924	1.566
Ulladulla (3)							
Trawl	0.2999	0.0472	0.0218	0.069	0.1266	0.4955	1.6524
Non trawl	0.3156	0.0497	0.0195	0.0692	0.1321	0.5168	1.6378
Eden (3)							
Trawl	0.2999	0.037	0.0128	0.0498	0.0802	0.4299	1.4337
Non trawl	0.2489	0.0535	0.0109	0.0644	0.0719	0.3852	1.5475
Process+	0.0621	0.0824	0.022	0.1044	0.0382	0.2047	3.2982
EMPLOYMENT (b)	**Initial**	**First**	**Industry**	**Production induced**	**Consumption induced**	**Total**	**Type II ratio**
Northern NSW (1)							
Fishing	0.0376	0.0031	0.0009	0.0416	0.0181	0.0596	1.5868
Clarence (2)							
Fishing	0.029	0.001	0	0.03	0.014	0.044	1.499
Ulladulla (3)							
Trawl	0.0184	0.0026	0.001	0.0036	0.0062	0.0282	1.5363
Non trawl	0.0268	0.0023	0.0009	0.03	0.0065	0.0365	1.3592
Eden (3)							
Trawl	0.0184	0.0018	0.0005	0.0207	0.0033	0.0239	1.3009
Non trawl	0.0147	0.002	0.0004	0.0024	0.0029	0.02	1.3669
Process+	0.0034	0.0045	0.001	0.0055	0.0016	0.0106	3.06
(a) per dollar of output				Sources:	(1) Tamblyn & Powell, 1988		
(b) employment per thousand dollars of output					(2) McVerry, 1996.		
					(3) Powell et al. 1989		

Output flow-on effects

From the initial output of one dollar there are total flow-on output effects ranging between 41.7 cents (non trawl Eden) and 91.0 cents (Northern NSW). Those levels of flow-on effect are

relatively modest. They refer to the level of the flow-on effects within the small local area. In most cases, this reflects the limited capacity of the local economy to supply inputs to the fishing activities as well as the relatively low level of purchased inputs used. Comments from each study are reported in Appendix G3 and discussed below.

Discussion

From a state-wide perspective the comparison of Eden and Ulladulla in 1978-88 with the Northern NSW 1984-85 and the Clarence in 1992-93 shows a contrast in the nature of the fisheries, time periods, regions and what is included in the analysis ie. fishing only, or processing, handling, transport and less usually wholesale and retail.

The Eden and Ulladulla trawl fishing flow-ons reflect the structure of the trawl industry and the influence of the orange roughy catch at that time. The non-trawl data from the same period is reported and is not significantly different from the trawl data in Eden and Ulladulla when output and income multipliers are compared.

In the Northern NSW study based on 1984-85 data and covering the Tweed Heads to Tuncurry area, the activity in a range of fisheries, especially the prawn industry sector, is captured. The Clarence region study in 1992-93 focuses on the fishing activity and processing in the Clarence at that time.

Given our interest is in the flow-on effects associated with the Estuary Prawn Trawl fishery in the current year 2001 period, the use of historical information is limited.

It is unlikely that either the Clarence or the Eden and Ulladulla results will be a representative source of “typical” multiplier values for impact appraisal in the EPT fishery. The Northern NSW regional study covers the region in which the EPT fishery is a major contributor, though the study may reflect the Ocean Prawn Trawl Fishery influence. The two potential differences to take note of are the type of fishery included and what of the downstream activities are included – processing etc. (Dr R. Powell, pers. comm.).

Conclusion

The Northern NSW study indicates fishing as 82% of the total flow-on effect, which reflects many single person businesses in estuary fishing and a limited amount of processing. Both the southern and northern study indicate the ratio of all effects, to direct fishing effects, is between 1.5 and 2.0,

with one result of 2.4 (Tamblyn and Powell, 1988; Powell et al., 1988). Local multiplier effects are likely to be relatively small at around 1.5 for most fishing activities. Even in that case, the larger part of the flow-ons will be consumption-induced effects. That reflects a relatively low level of use of purchased operating inputs apart from labour, while many of the specialist inputs used are not likely to be produced locally. The multiplier will be higher where there is a significant amount of on-shore activities associated with handling, marketing and transporting the catch. The more value adding undertaken within the local area, the higher the multiplier. That could result in multipliers nearer to 2.0 (Dr. R. Powell, pers. comm.).

The Regional expenditure of fishers

Fisher expenditures can be divided into expenditure on employment, inputs for the fishing process and capital items for fishing. The previous section examined results of detailed regional expenditure studies, which give multipliers showing employment and production induced expenditure effects. Capital and input expenditures are investigated below. Little information exists on regional expenditure interactions. For the Clarence region, McVerry (1996) estimated that 27% of fishing business expenditures move outside the region, leaving approximately 70% of the first sale value of catch in the local fishing community.

The regional nature of expenditures can also be seen by examining the larger scale purchases of the EPT endorsed businesses. In the social survey, of 171 fishers asked about the amount and location of their major purchase over $1,000, 109 had no major expenditures and other expenditure locations are reported in Table G16a. Brisbane, Sydney, Grafton and Newcastle were the most frequented towns, connected with 55% of the major purchases of EPT fishers.

Table G16a: Towns outside local area in which EPT fishers made a major expenditure over $1,000 in last 12 months (Source: RM-SS).

ALL	TOTAL	%	TOTAL LESS THAN $50,000	$50,000 - $99,999	$100,000 or more	Can't Say	MOST EXPENSIVE ITEM	HAVE NOT MADE BUSINESS EXP.> $1,000
Towns \ n	**171**		**50**	**3**	**1**	**1**	**55**	**109**
Brisbane	15	27%	14	1	0	0	15	0
Sydney	9	16%	8	1	0	0	9	0
Grafton	4	7%	3	0	1	0	4	0
Newcastle	3	5%	3	0	0	0	3	0
Iluka	2	4%	1	1	0	0	2	0
Tweedheads	2	4%	1	1	0	0	2	0
Ballina	1	2%	1	0	0	0	1	0
Gosford	1	2%	1	0	0	0	1	0
Lismore	1	2%	1	0	0	0	1	0
Maclean	1	2%	1	0	0	0	1	0
Melbourne	1	2%	1	0	0	0	1	0
Nowra	1	2%	1	0	0	0	1	0
Port Macquarie	1	2%	1	0	0	0	1	0
Wyong	1	2%	1	0	0	0	1	0
Yamba	1	2%	1	0	0	0	1	0
Kempsey	1	2%	1	0	0	0	1	0
WA/ SA/ Tas	1	2%	1	0	0	0	1	0
Other	8	15%	7	0	0	1	8	0
Can't Say	2	4%	2	0	0	0	2	0
None	0	0%	0	0	0	0	0	0
Total	**55**	**100%**	**50**	**2**	**1**	**1**	**55**	**0**

Table G16b: Purchase of items outside local area in which EPT fishers made an expenditure over $1,000 in last 12 months (Source: RM-SS).

Expense	Sum of EPT	%	Expense	Sum of EPT	%
Nets	189,300	24%	Car/Ute	27,800	3%
Electronics	128,000	16%	Fishing gear	25,000	3%
Fuel/Oil	103,300	13%	Punts/ Dories	20,000	2%
Outboard engines	84,900	11%	No. of other items	15,900	2%
Inboard Engines	56,300	7%	Other	14,500	2%
Wire	47,400	6%	Pump/ gen sets.	7,900	1%
Propellors	43,200	5%	Paint	4,300	1%
Gear Box	34,800	4%	**Total**	**802,600**	100%

Table G16b reports approximately $0.8m of items expended outside the EPT fisher's local area by the 171 fishers interviewed. Nets, electronics and fuel/oil are the major expenditures, constituting 53% of EPT business expenditure outside of the local area.

Table 16c reports the pattern of expenditure on major purchases for 69 fishers. Generally fishers in the north purchase some major items in their regional areas, with Sydney having trade with a range of areas. There is a major purchase link between the Clarence and Brisbane, Lismore, Coffs

Harbour and Grafton. Fishers from the Hunter to Hawkesbury River, select Newcastle and Sydney for major expenditures.

Table G16c: Purchase location outside fisher's residence area in which EPT fishers made an expenditure of over $1,000 in last 12 months (Source: RM-SS).

	Town with major purchase over $1,000									
	Brisbane	Lismore	Yamba	Coffs Harbour	Grafton	Newcastle	Sydney	Batemans Bay/Nowra	Melbourne	Total
Evans Head	-	1	-	-	-	-	-	-	-	1
Clarence River	14	3	1	4	6	-	2	-	1	31
Iluka	1	-	1	-	1	-	1	-	-	4
Yamba	-	1	-	-	1	-	-	-	-	2
Coffs Harbour	1	-	-	-	1	1	-	-	-	3
Crowdy Head	1	-	-	-	1	-	-	-	-	2
South West Rocks	1	-	-	-	-	-	-	-	-	1
Port Macquarie		-	1	-	-	-	1	1	-	3
Hunter River	-	-	-	-	-	2	2	-	-	4
Newcastle	-	-	-	-	-	3	1	-	-	4
Lake Macquarie	-	-	-	-	-	1	1	-	-	2
Hawkesbury River	-	-	-	-	-	3	4	-	-	7
Botany Bay	-	-	-	-	-	-	-	1	-	1
Jervis Bay	-	-	-	-	-	-	2	1	-	3
Ulladulla	-	-	-	-	-	-	1	-	-	1
	18	5	3	4	10	10	15	3	1	69

(2) Likely economic implications of implementing the plan

Under the Planning NSW guidelines the likely economic implications of implementing the Fisheries Management Strategy (FMS) must be evaluated against six criteria (a)-(f). Economic impacts of the FMS are presented in section G and social impacts in section H.

The available descriptive economic information has been described in the previous section. There is insufficient economic data available to appraise many of the issues proposed in the fisheries management strategy. This limit should be recognised by the reader and where insufficient data is available this will be indicated.

Economic assessment

The economic issues section will follow the Planning NSW guidelines and notes that the economic impact assessment process in NSW has also been addressed in several other documents (NSW Government, 1997c and DUAP, 1997). The purpose of economic appraisal in an environmental context is "to achieve a socially efficient allocation of scarce resources ie. one which maximises the return, including the environmental capital stock, in order to maximise economic welfare of all citizens over time" (NSW Government 1997c; annex 5). This requires that benefits and costs are measured through market values. Total social costs and benefits also include running down, or building up of the environment (NSW Government 1997c; annex 5). This would include the fish stock in the current analysis.

The major economic assessment technique is cost-benefit analysis (CBA), which quantifies in money terms all major costs and benefits, providing a consistent basis for evaluating costs and benefit, though it does not necessarily show the distribution of benefits or costs (NSW Government 1997c). CBA requires transparent information.

There are different types of impacts to be considered in an Environmental Economic Assessment process. According to Thomas (1998) these are:

- Direct impacts of proposal;
- Indirect impacts, being one step removed;
- Cumulative impacts coming from the interaction of proposal elements;
- Predicted residual impacts, impacts not avoided or mitigated;

- Predicted probability, magnitude, distribution and timing of expected impacts;
- Forecasting of what will happen to affected components of the environment if the proposal goes ahead.

The various types of impact will be considered in the analysis of economic impacts.

The assessment framework

Given the Planning NSW guidelines and other available material examined it is proposed that the following approach will be taken to analysis of economic impacts of the fisheries management strategy. There is no objective economic data that can be ranked and the following process is used:

i) Describe the fisheries management objectives and the responses with economic impact under the management strategy and present in a Table form. Identify the impacts of each strategic response on the fishers and community, and rank impacts into three levels – High, Medium and Low. The ranking will reflect an opinion of the predicted scale of economic impact from available information or on a qualitative basis. The most high and medium impacting issues will be appraised, and low impact economic issues will be discussed generically;

ii) For each of the high impact economic issues, changes and measurable impacts on sectors will be presented for each issue following the Planning NSW criteria. These include:
   - market trends that effect the fishery (DUAP, 2001: section G2a)- there is no EPT specific information;
   - implications of the strategy on access rights and economic viability (DUAP, 2001: section G2b), and
   - changes in resource allocations within the fishery sector (DUAP, 2001: section G2c) including multiplier effects, mitigation and also between fishery sectors (Commercial Fishers, Recreational fishers and Non-fishing sectors), including multiplier effects and mitigation (DUAP, 2001: section G2d). For each highly impacting management response an overall economic benefit will be presented where information is available.

iii) Discuss the likely economic implication of maintaining the present resource allocation rules for all issues identified (DUAP, 2001: section G2e).

iv) Justify the preferred approach under the FMS in terms of the Ecologically Sustainable Development principles, concluding the assessment (DUAP, 2001: section G2f).

The assessment

(i) Describe the fisheries management objectives and the responses with economic impact under the management strategy and present them in Table form. Identify the impacts of each strategic response on the community and fishers and rank it into three levels of impacts – High, Medium and Low. The management goals from the FMS document (FMS, 2001) and responses with economic impact are described in Table G17.

The basis of the ranking in Table G17 is by highest potential economic impact. The ranking prioritises the most significant resource allocative issues affecting the whole fishery, rather than a sector or individuals. The extent of economic impact is estimated as a function of the number of businesses/persons affected and the degree of economic change to each business, potential impact on other sectors and the effect on the fish stock.

For example, the potential use of access arrangements, such as category 2 share management to reduce fisher effort by adjusting business numbers and hence capacity, has a high economic impact ranking. This is due to every business being affected and impacted financially with potential community costs and benefits. A low ranked issue is of more limited impact, some being smaller scale issues for sections of industry, such as altering specifications of a type of fishing gear regulation. This would impact only those using that gear and if the change per fisher is small, the total impact is estimated to be low. Ranking also considers the potential impacts of policies on the fish stocks.

From Table G17 several responses are ranked as highly impacting, while others have moderate economic impact and some low. The high economic impacts would come from objectives, such as providing economic viability and more secure fishing entitlements, through minimum business shareholdings to limit vessel numbers. Containment of effort through a total allowable effort (TAE) limit on major species and limits on maximum shareholdings, are also proposed during the life of the plan.

Moderately impacting economic responses involve prawn counts, size limits, optimum capture and regional prawn management measures through the Prawn Resource Forum. Food safety initiatives may also impact fishers. Impacts are discussed more fully below.

Table G17: Responses ranked by potential economic impact.

RESPONSE	DESCRIPTION OF RESPONSE	GOALS	ISSUES	RANKING
2.2(a)	Encourage the appropriate level of fishing effort to minimise overfishing	4,5,8	EFFORT	HIGH
2.3(a)	Implement separate management rules for each zone	4,5,8	EFFORT	HIGH
2.3(b)	TAC Committee to determine the Total Allowable Effort on primary species	4,5,7,8	EFFORT	HIGH
2.3(c) - pt 1	Minimum shareholdings to limit the number of vessels and operators in each zone.	1,4,5,7	EFFORT	HIGH
2.3(c) - pt 2	Limit the number of fishing days for each zone	1,4,5,7	EFFORT	HIGH
2.3(c) - pt 3	Limit the number of fishing days for businesses upon past participation	1,4,5,7	EFFORT	HIGH
2.4(b)	Establish minimum shareholdings at the fishing business level to contain effort	3,4,5,6,7	EFFORT	HIGH
5.2	Promote the economic viability of EPT fishing	3,4	VIAB	HIGH
5.3	Provide secure fishing entitlement for EPT fishers	2,3,4,8	VIAB	HIGH
5.4(a)	Co-operate with Safefood Production in the development of food safety programs		MARKET	MEDIUM
5.1	Optimise the biological yield of prawns so that economic return is maximised	3	SE	MEDIUM
2.1(g)	Review maximum counts for eastern king and school prawns	4,5,7	SE	MEDIUM
2.2(e)	Implement maximum counts on prawns in each zone	4,5	SE	MEDIUM
4.2(a)	Monitor the catch of prawn and squid species taken in other commercial fisheries	2,3,5,6,7	SE	MEDIUM
4.2(b)	Use the Prawn Resource Forum to discuss maximum counts and minimum lengths	2,3,5,6,7,8	SE	MEDIUM
4.2(c)	Determine a count and size at first capture for prawns and squid	2,3,5,6,7,8	SE	MEDIUM
5.3(b)	Prohibit shareholders in the fishery from owning maximum fisher shareholding	4	SE	MEDIUM
1.1(d) pt 1	Fishing closures to control area and time fished - conserve species	2,4,5	CLOSE	LOW
4.1(b)	Investigate closing all zones to trawling on weekends and public holidays	1,2,5,8	CLOSE	LOW
2.1 (i)	Monitor commercial landings of prawn and squid species	4,5,7	COMP	LOW
2.1(b)	Monitor commercial landings by zone	1,3,4,5,6,7,8	COMP	LOW
4.1 (a)	Assess the size of the non-commercial and illegal catch	2,3,5,6,7,8	COMP	LOW
7.2(a)	Periodic review of catch & effort forms - sufficient for environmental assessment?	3,4,5	COMP	LOW
2.1(f)	Ascertain the need for legal minimum length for squid	4,5	EFFORT	LOW
2.4(a)	Implement an owner operator rule for estuary prawn trawl fishing businesses	3,4,5	EFFORT	LOW
2.6(c)	Under a recovery plan for a species, implement precautionary actions	1,3,5	EFFORT	LOW
4.3(a)	Participate in development of the Indigenous Fishing Strategy	2,3,8	EQ	LOW
1.4(a)	Implement measures under Marine Pest or Disease Management Plans	3	SE	LOW
2.6(a)	Minor harvester of overfished species - Develop and implement a recovery plan	1,3,5	SE	LOW
2.6(b)	Major harvester of overfished species - Develop and implement a recovery plan	1,3,6	SE	LOW

Issues: SE Socio-Economic, EQ Equity, VIAB Viability, COMP Compliance, CLOSE Closure.

Low impacts may arise from fishing closures, the development of an indigenous fishing strategy, and a range of compliance, effort and socio-economic issues. There may be impacts from a variety of recovery plans. The Table groups each level of impact into different categories of issues.

ii) Economic impacts

The high, medium and low economic impacts, including an overall cost benefit appraisal of the FMS, are presented in this section.

Business shareholdings and minimum shareholdings (Responses 2.4, 5.2, 5.3)

Objective 2.4 of the EPT FMS is to prevent the activation of latent (unused) fishing effort. This will be achieved through alteration of fishing business numbers via minimum shareholdings under a secure category 2 fishing right (objective 5.2).

Under category 2 share management, shares in access are allocated (on a basis as yet undecided, NSWF, 2001), replacing the restricted fishery endorsement scheme and can be traded. The rights

characteristics of the endorsement have been augmented by the increased divisibility of the shares and increasing the transferability which enables parts of endorsements to be traded. The category 2 share proposed in the FMS is a share of access to each endorsement type and is different to a share of catch as in the existing category 1 share management fisheries (eg. Abalone, Rock Lobster). The category 2 shares are also potentially a direct control on effort levels under the FMS. However, the share defines general access, rather than an amount of individual effort. The category 2 share will enable effort at the endorsement number level to be addressed, while a suite of existing regulations such as gear, area and time restrictions, seasonality of fish availability, and economic viability, all contain effort.

Since 1994 entrants to the NSW fishing industry have needed to buy a Recognised Fishing Operation (RFO) which is a business which qualified through the 1986-90 and 1991-93 catch history qualifying period. The qualification level was $10,000 of fish or 5 tonnes in any 2 of the former qualifying years, and any 1 of the latter qualifying years.

Entrants to the EPT fishery have automatic RFO status, but across the NSW fishing industry there has been consolidation of businesses through the RFO policy (Murphy, 1999). Murphy (1999) illustrates that the adjustment has been impacting small businesses grossing below $30,000 per annum with little impact of larger businesses.

In 1990 there were approximately 2,400 licences and this had reduced to 1,650 businesses in 2001. This represents a rate of decline of 68 licences/businesses per year over the 1990-2001 period, or a total decline of 31% in 11 years, approximately 3% per year. The intention of the minimum shareholding scheme is to implement this rate of reduction of business numbers in the next 5 years, making a decline of 15% to 1400 businesses state-wide. This rate of change will form the basis for assessing economic impacts.

In Estuary Prawn Trawl a 15% reduction in the number of businesses would be from 289 businesses in 2001, to 246 by 2006. If the reduction in business numbers were uniform across the EPT, the impact in each region is reported in Table G18. Several businesses have two entitlements and this is accounted for in Table G18. There would be an adjustment of approximately 36 businesses from EPT in the 2002-2007 period after the closure of Botany Bay.

Table G18: Envisaged impact of continued adjustment of business numbers in the EPT fishery 2001-2006 at rates continued from 1990-2001.

Estuary	Number of EPT entitlements issued	15% adjustment	Number of EPT entitlements remaining
Clarence River	123	18	105
Hunter River	32	5	27
Hawkesbury River	68	10	58
Port Jackson	31	5	26
Botany Bay	48	7	41
Total (a)	**302**	**45**	**257**
Total (b)	**289**	**43**	**246**

Note: (a) sum of entitlements in each estuary versus (b) sum of all entitlements. Note: Botany Bay is not included in the assessment.

The economic impact under a share trading scheme depends on the method of share allocation. If shares were allocated at 100 per endorsement then fishers face having to gain 15% more shares in the 2002-2007 period to stay in the fishery at a cost of 15% of the market value of 100 EPT business shares. This is estimated in Assessment scenario 1 below.

Assessment scenario 1 – estimate only for envisaging potential impacts

A reduction of 15% of businesses in 5 years may equate to 15% of the value of an EPT fishing business. The value of EPT businesses is generally between $30,000 to $150,000 (NMB, 2000). On average capital investment is $80,000 (NMB, 2000), but exiting businesses are assumed to be at the lower end, $30,000-$40,000 (and below in some areas).

Remaining businesses would have to buy 15% of shares in 5 years. This equates to $4,500 to $6,000 per fishing business left in the fishery, about $900-$1,200 per year to remain in the fishery in addition to new management fees.

The economic survey suggests that this sum, plus new management charges would increase the fixed costs of operation in the fishery and adversely impact many small operators. Given the degree of latent effort holdings and fishers grossing less than $10,000 per year, the cost to remain in the fishery may lead to more than 15% of fishers being willing to surrender shares. The cost of share

purchase could be borne by more viable businesses, but for the 90% of other businesses there may be an incentive to increase effort to cover the new costs. It is essential to monitor latent effort activation and rises in historic effort levels as recommended by the strategy.

2) Limiting the number of operators and effort in each zone (Responses 2.2a, 2.3b, 2.3c, i&ii)

In the FMS response 2.3, separate management rules for each estuary, a Total Allowable Effort limit, minimum shareholdings to limit operator numbers in each estuary and limits to days fished in each estuary, based on past participation, are proposed. These policies may have economic impacts in addition to the adjustment at the business level.

The FMS proposes a total allowable effort limit for each area. The FMS proposes basing current effort allowed on past participation in the fishery. Operator numbers in each estuary, can be adjusted under the category 2 share management framework with a minimum shareholding being set in each estuary. To examine the implications of this, a Table of days effort, and fisher numbers and days effort by fishers below 40 days per year, was developed as reported in Table G19.

Table G19: Fisher numbers and effort (in days fished) in each EPT estuary with numbers and effort of fishers below 40 days per year.

Estuary	No. of Fishers	1999-00 Effort (days)	Effort/ Fisher (days)	No. Fishers < 40 days/yr	%	Effort of Fishers < 40 days/yr	%
Clarence River	82	7,310	89.1	24	29%	380	5%
Hunter River	25	1,276	51.0	12	48%	189	15%
Hawkesbury River	33	2,417	73.2	13	39%	273	11%
Port Jackson	16	702	43.9	6	38%	117	17%
Botany Bay	22	1,210	55.0	7	32%	175	14%
Total	**177**	**12,915**	**73.0**	**62**	**35%**	**1,134**	**9%**

The numbers of fishers and annual effort in days fished is evident for each estuary. With proposals to contain effort, those fishers contributing below 40 days of EPT effort per year have been identified. This shows that 35% of fishers deliver less than 40 days of effort per year and only contribute 9% of total fishery effort. Each estuary area can also be compared.

Estimating the impact of an effort limit is difficult, as adjustment at the business level will presumably remove 36 businesses from latent and less active businesses (see Table G10). Then a

reduction in days effort would lead to some fishers selling their shares and exiting EPT fishing. This may mean they fish in other fisheries, or exit the industry.

It is proposed that a 10% reduction in days effort would lead to up to 35% of EPT fishers being impacted to some extent (Table G19). It is estimated that this may translate into a maximum of 48 fishers exiting the EPT fishery, or the equivalent of 4-6 full-time fishers.

In summary, the highest impacting policies are the adjustments through business shareholdings removing 36 businesses (15%) in five years and the area based limitation of effort which will further reduce fisher numbers by another 5%. A cumulative 20% is assumed for assessment purposes.

Assessment scenario 2 – estimate only for envisaging potential impacts

A reduction of 5% of endorsements holders in 5 years through minimum shareholdings equates to 5% of the value of an EPT fishing business, exiting businesses are assumed to be at the lower end, $30,000-$40,000 (and below in some areas).

Remaining businesses would have to buy 5% of shares in 5 years. This equates to $1,500 to $2,000 per fishing business left in the fishery, about $300-$400 per year to remain in the fishery in addition to new management fees. These are preliminary estimates and would vary between estuaries and with the degree of effort adjustment to be applied, which is not stated in the FMS.

Medium ranked impacts are reported below.

3) Alternative Prawn harvesting regimes (Responses 5.1, 2.1g, 2.2e, 4.2a,b,c)

Many of the responses in the EPT address the issues surrounding managing the harvesting of prawns and squid stocks as they move from estuary to ocean. A Prawn Resource Forum (PRF) is proposed and may have both costs and benefits to fishers. The intention is to improve management of species in each estuary by incorporating prawn and species capture outside the estuary, the optimum sizes and times of harvest and have a regime of minimum size limits to improve price of product. This will have benefits and costs to different fishers through changing the distribution of catch, but is intended to lead to efficiency gains from more optimal resource use. It is likely that practices such as riddling of juvenile prawns would be reduced to let prawns mature for the

estuarine and ocean fisheries (NSWF, 2000). The economic impacts of optimal prawn and squid harvesting arrangements would require a specific bioeconomic modeling exercise beyond the scope of the current study.

4) Safefood (Response 5.4a)

The FMS recommends cooperation with Safe Food in the production of food safety programs. Marketing, processing and icing practices could also be reviewed to gain improvements in price (Ruello and Associates, 2000; SFM, 2000). The adoption of safe food practices seeks to address such issues by having minimum standards in fish handling and icing (Safe Food, 2001). Meeting new food handling health requirements is a cost for fishers, as payments for audits and annual certification are required (Safe Food, 2001). This may be a cost to fishers with limited immediate return from market (Ruello and Associates, pers. comm.). The cost implications of food safety may impact small businesses and part-time fishers to a greater extent than full-time businesses, given proposed fees and the fixed costs of additional hygiene equipment. However, many of these food changes are not directly attributable to the FMS, being driven by hygiene laws and standards for the safe production of food.

5) Other low impacting measures

There are a series of less significant low economic impacts from area closures due to species protection and weekend closures on weekends and public holidays. Recovery plans may also reduce harvesting as precautionary plans are implemented in response to species concerns. Under the FMS owner operators are to be preferred to nominated fishers in order to contain effort.

There may also be a concern of a reduced prawn and fish supply to the community from the FMS. Adjustment through the share system should keep the level of prawn and fish supply within historical levels. The extent and impact of area closures under the recreational fishing area process is unknown and is not part of the FMS assessment.

6) Costs and benefits of the FMS

The economics of fisheries management enables an appraisal to be made of the economic contribution of the fishery to the economy and to analyse the impact of the changes advocated in the FMS. ESD principles dictate that resources should be valued at their market values and that subsidies should be taken into account in the form of an environmental accounting statement as illustrated below in Box G2 for the EPT FMS (NSW Government, 1997).

Box G2a: A Management Cost Account for the EPT FMS.

For the EPT fishery per annum:	Year 2001-02	Year 2006-07	Year 2008-09
Gross revenue from catch (i)	4.18m	4.8m	5.1m
Less:			
Economic cost (of effort)(ii)	5.73m	4.87m	4.57m
Costs of share purchase (iii)	0	0.353m	0.353m
Management charges to industry (iv)	0.15m	0.15m	0.56m
Additional Cost of FMS (v)	0	0.44m	0.44m
Operational Economic surplus	-1.7m	-1.01m	-0.82m
less cost subsidies (vi)	0.4m	0.4m	0.0m
Plus rise or fall in fish stocks (vii)	0m	0m	0m
Total economic contribution	-2.1m	-1.41m	-0.82m

(i) This revenue from catch in the EPT (see Box G1) and rises at 3% per annum.

(ii) Total economic costs of fishing less management charges ($5.88m less $0.15m = $5.73m). Total cost of effort to rise by 3% pa, but business number reduce by 3% per annum and productivity of effort increases by 3% due to businesses exiting.

(iii) Share purchase costs in 2002-03 are 294 businesses * $1,200 p.a. ($900 p.a. business share purchase + $300 p.a. endorsement) = $0.353m per annum in share purchase costs to industry. (Note these costs are minimal and could be = $0.470m or higher). Business numbers fall to 250 by 2006-07 with share expenditure per operator rising.

(iv) Existing charges paid by industry $0.151m. Costs of FMS and management costs not attributed to fishers under current cost policy are added in 2006-07 and 2008-09.

(v) Additional costs of FMS is 254 entitlements * $1,700 = $0.44m and in year 2006-07, 205 businesses * $2,106.

(vi) Subsidised costs of management (ie. management, research, compliance, consulting studies etc). The current commitment of government is to maintain this at $0.4m plus c.p.i. increases until 2005. Full cost recovery is envisaged by 2008-09. Generic subsidies to industry from fuel rebates are not included.

(vii) The change in the value of fish stocks are unknown.

Under the FMS the costs of management will be increased with new costs to commercial fishers as reported in Box G2b.

Box G2b: Costs per fisher – 2001 to 2006 under the new FMS.

For the EPT fishery per annum:	Year 2001-02	Year 2002-03	Year 2006-07
Management charges (i)	513	513	604
FRCAC/EIS (ii)	230	230	0
FRDC (iii)	115	115	115
New FMS charges (iii) &(iv)	0	1,700	2,106

Share rental (iii)	0	100	100
Share purchase (v)	0	1,200	1,411
Total costs per fisher	$858	$3,858	$4,336

(i) Costs per fisher are $0.151m/294 =$513. By 2006-07 $0.151m/250=$604. (ii) FRCAC expenses are $150 and EIS $80 per fisher in first 3 year only. (iii) c.p.i. is not included. (iv) New FMS charges are based on 254 business *$1,700 each becoming 205 businesses by 2006-7 and $2,106 each. (v) These costs are minimum estimates.

The cost per fisher rises to $3,858 per fisher in year 2 and is $4,336 by 2006-07. In the post 2006-07 period the intention is to change the basis of charges, relating management charges to business shareholdings. It is not possible to accurately model this at this point in time.

In summary, intention of the FMS is to move towards making the EPT fishery become more economically viable by end of the 5 years (2006-07). The FMS response 5.2 seeks to *"promote the economic viability of estuary prawn trawl fishing"*. Full management cost recovery will be implemented by 2008-09, potentially returning the entire fishery to an economic surplus. On this basis the plan would have net economic benefits, in comparison to the current situation.

The analysis here assumes the plan can deliver the envisaged economic outcomes in the time available. This remains to be seen, as category 2 share management is new and is based on access shares, which are neither binding on effort or catch levels. The share management scheme needs further investigation as to its effectiveness on implementation. Mitigation may involve moving to a limit on effort, if effort levels are not sufficiently contained by the FMS. The EPT FMS allows for this eventuality.

The current data on costs and benefits are approximations and elements such as the increase or decrease in the value of stocks, require further research and is a gap identified by this study.

Multipliers

Commercial fishers will be most impacted by the FMS, particularly through the implementation of minimum shareholdings at the business and endorsement level. In share trading to meet minimum shareholding requirements, some fishers may exit due to being latent effort or having low catch in the EPT. Other fishers with high opportunity costs, may take the opportunity to exit the industry and to work somewhere else. The increased fixed costs of management fees and costs to buy shares are likely to impact part-time operations and latent effort endorsement holders more than larger

fishing operations. Fishers representing latent effort, low catching businesses and perhaps elderly fishers who do not see a future in the industry, are more likely to sell shares and exit the fishery.
The assessment of the impact of minimum shareholdings on business numbers estimated a reduction of 241 to 205 businesses in the 2001-2006 period, with approximately 36 businesses leaving the industry. The regional impact will depend on fisher's responses to keeping or selling shareholdings.

Multiplier effects from the adjustment will be low for two reasons. Fishers who are latent effort and fishers who catch little, have least industry output and thus generate a small proportion of any expenditure multipliers.

Secondly, where consideration is given to a decrease in commercial fishing, it is unlikely that the multipliers as described in section (g) of this Chapter will apply (Dr Roy Powell, pers. comm.). Those multipliers apply where the previously employed resources all leave the local area: a situation that is not likely to occur. The size of the multiplier effects will be smaller because many resources remain in the local area and continue to generate economic impacts.

For example, many of those previously employed will remain taking alternative employment, will receive payment from sale of shares, or move to social welfare programs. Thus, the consumption-induced effects will be limited to the difference between pre and post event income levels. Likewise, any production impacts will reflect the possibility of the resources switching to other activities (eg. boats switching into tourist/recreational uses, transport capacity being used in other industries etc.) Thus, these effects will reflect the capacity of the local area to enable a switch of resources to other industries (Dr Roy Powell, pers. comm.).

With the shareholding provisions, exiting fishers will sell shares and receive payment at market rates. The remaining fishers face increased debt to stay in the fishery and have a range of abilities to meet that debt. It is likely that effort levels may increase to pay the debt incurred, particularly if minimum shareholding criteria are increased rapidly, or by significant amounts.

The FMS will have few implications for multiplier effects for recreational fishers and the community given there is no explicit increase in output for recreationalists under the FMS. The current Recreational Fishing Area process will increase the area access for recreational fishers at the cost of commercial fisher access and may lead to greater recreational output with unknown some multiplier impacts. Mitigation of conflict is a significant issue under the FMS. Mitigation required

under the FMS may be to evaluate the reduction in conflict in the wake of the RFA process and be able to move forward under an FMS, with strategies in place to address recreational and commercial fisher conflict. These strategies to reduce conflict may need to be generated after the first round of RFA adjustments have taken place.

(iii) Predict the likely economic implication of maintaining present resource allocation rules, compared to likely economic implications of implementing the strategy or feasible option in resource allocation

Currently the number of fishing businesses and fishing endorsements across the NSW fishing industry are greater than desirable for long term economic viability and sustainability. Both vessel capacity and unregulated effort levels, are much greater than required to take historic catch levels as seen by the significant amount of latent effort among EPT fishing businesses. Reducing fishery effort under the FMS is achieved by controlling business numbers, endorsement numbers and hence fishing capacity at a regional level.

Under the present resource allocation rules the mechanisms to reduce endorsement numbers are limited and rights are less divisible than under the proposed category 2 access shares. This means there is currently less ability for the industry to adjust than under the proposals in the FMS. The linking of access shares to regions enables fisher numbers, access and effort to be discussed, enabling communities to be constructively involved.

The use of shares and minimum shareholdings at the business level will link fishing business capacity to fishing effort in a given region. This would likely lead to aggregation of business numbers, in a way similar to the aggregation of fishing businesses seen across the NSW fishing industry since the introduction of the general RFO policy.

Shares are a more flexible trading structure which will allow fishers to change their business structure with the least financial impact. Businesses may sell shares in endorsement types used little or not at all, and use that money to purchase shares in the fisheries, or subsets of fisheries, which are important economically to the business.

Currently there is little consideration of the optimum prawn size and bio-economic benefits from altering harvesting arrangements. The FMS includes developing optimal harvesting regimes for

finfish and prawns, which will have greater economic benefits than under current resource allocation rules.

(iv) Justify the preferred approach in terms of ESD principles

The ESD principles for economic assessment are presented in NSW Government (1997; annex 5) and are the precautionary principle, intergenerational equity, biodiversity principle and the valuation principle.

The preferred approach seeks to contain latent effort and improve viability of business operations, through adjustment of active effort by category 2 share management. The strategy uses the zoning in the EPT fishery, while realising that ultimately the total effort in the industry requires adjustment at the fishery business level. The preferred approach seeks to contain latent effort and improve viability of EPT business operations through adjustment of active effort by category 2 share management. This suite of measures holds with the objectives of ESD, potentially improving the fishery for future generations (intergenerational equity) by making adjustments now, so as the future can be improved.

The move to share management also is a development in the valuation of the resource through management initiatives and being able to price environmental resources within a management system (valuation principle). Under the strategies, fishers are also paying for goods and services and the higher charges will act as an incentive to reduce effort in the fishery, enabling environmental goals to be pursued in the most cost effective way.

The FMS assessment also includes a transparent incorporation of the economics of the management of the fishery, incorporating subsidies and a proposed pathway towards full cost recovery and environmental accounting. This development is consistent with ESD objectives.

Management at the estuary level in the EPT fishery is consistent with ESD, in that the link between fishers and the resource is more defined, potentially leading to improved stewardship among fishers. This should be extended in developing management regimes for prawns in their whole lifecycle, which involves other managed fisheries. Regional management through the Prawn Resource Forum should enable all prawn fishers in different administered fisheries and communities to be constructively involved in maximising prawn fishery value. It will also enable

responsible local fishery management, including biodiversity considerations in whole estuary harvesting regimes.

The adjustment of industry capacity through category 2 share management may run the risk of activating latent effort and increasing effort on the fish stock to pay new management charges. The basis of allocation of share has yet to be confirmed. The FMS is precautionary in monitoring effort levels, but may be vulnerable to rapid changes in industry behaviour at the on set of share trading.

The FMS is a first step in the assessment process and it is a move towards an improved culture in which the impacts of the FMS are identified and appraised within the principles of ESD. The achievement of the FMS goals can also be monitored under a performance appraisal framework in this new process.

(3) Data requirements in relation to the assessment of the impacts on the economic issues

(a) Provide reference to technical data and other information relied upon to assess impacts; indicated its reliability and what uncertainties (if any) are associated with the use of the data in the assessment of the FMS

The data used in the assessment is from several sources.

The EPT catch and effort data from NSW Fisheries Department can be joined with NSW Fisheries licensing data for tables which include fisher endorsements. In EPT the catch and effort data are segmented into each estuary. When licence data is used for spatial analysis and segmented by fisher district from general records there may be occasions that fishery activity in an estuary traverses two districts (eg. Table G3).

Across the NSW Fisheries'record system effort data (in days fished) is complicated by the logbook system where fishing three methods in one day, ends up being records as one day of effort against each of three methods. This limits the potential for accurate production modelling, or bio-economic analysis in the EPT and other fisheries.

A significant issue for fishers is the use of the Sydney index for price imputation on declared catches. The monthly average price for a species from Sydney Fish Market is multiplied by the declared catch for a species. This enables both fishery wide and individual fisher revenue estimation. There are several cautionary notes in doing this.

Some species, such as calamari/squid may not have a representative monthly average price. The imputed price will likely be a minimum estimate of the price of species which are in strong demand. For example seafood such as larger prawns, are unlikely to be sent to Sydney market as local demand is strong at higher prices, without commission and freight. In some cases fishers in areas outside Sydney may receive prices closer to Sydney retail levels for valuable species.

The economic survey was by mail in a short time period, being completed by fishers. Respsonses may have been less accurate than verification of declared data through accounting records. The economic survey asked fishers to declare gross revenue from catch in 1999-2000 and this was compared with the predicted Sydney index for each fisher to see the inter relationship. The Sydney index may under estimate actual prices in EPT businesses by 10% and this varies by estuary with region 4 and 5 exceeding the Sydney index by 30% to 54%.

There are also uncertainties in the value of EPT businesses and endorsement values. Diversity among business packages mean the true value of access is difficult to determine. The move to share management will require examination of the structure of business and endorsement values.

(b) Identify where there are gaps in knowledge important for the assessment of the impacts of the fishery

Several gaps are apparent. The major one is the lack of an industry wide profile and input-output analysis of the seafood industry in NSW, including processing, wholesaling and the movements and values of seafood in the marketing chain. This would enable an evaluation of the secondary stages of the fish catch including transport, wholesaling, processing, exports, imports and employment derived from the NSW fish resource. It could potentially extend to retailing also.

Multipliers could be estimated and contribute to future assessments. The regional importance of the seafood industry in each zone could be evaluated. Part of this could use the Register Fish Receiver annual renewal forms to include more information on processing activity in relation to the fisheries under management.

Price information outside Sydney needs to be collected on a regional and fishery basis. This is required, as several of the future assessment issues, such as the optimal harvesting time of prawns will require bio-value models using biological and size and price information for different prawn species during their estuary to sea migrations.

Economic viability is part of the objectives of the Fisheries Management Act (1994) and annual; surveys of economic profit are needed to account for strong annual variation. Business, endorsement and shares values is an area requiring more research. Similarly longer term planning needs to be able to monitor the cost of operations and this could use existing survey information to establish a representative "fishing cost index". This would monitor cost changes for producers and could parallel the Sydney price index for fish revenues.

Economic inter-relationships between fishing communities and within the fishing industry has been briefly addressed in the current social survey and could be augmented through time.

(c) detail a timetable for developing the data sets important for understanding longer term resource issues.

Data needs can be addressed in the next five year period through development of a strategy for improving the following data:

a) Investigation of available prawn species price data and establishment of price data monitoring system to enable valuation and modelling of resource management scenarios, such as maximising prawn bio-value through alternative harvesting regimes.

b) Examination of the viability of businesses, business values, endorsement and share values and the basis of share allocation prior to trading. Subsequently, monitoring of share values to ensure industry viability and the achievement of the FMS.

c) Surveying of the economic performance of businesses after the implementation of the plan (annual or biannual).

d) Develop a state-wide fishing industry economic restructuring model for predicting and appraising fishing business adjustments across fishery administrative divides.

e) Revising the collection of effort data to enable more sensible modelling of catch per unit effort and productivity data. This would involve changing the fishery data logbook system and needs to happen within five years in preparation for long term sustainability issues, including economic modelling and monitoring.

f)Developing an economic profile of the regional fishing and seafood processing industry in NSW. This could include marketing, economic infrastructure and regional benefits. This needs to be progressed by area and in conjunction with social community profiling as a basis for longer term planning.

Appendix G1a: What is the management issue with latent effort?

Current fishery endorsement capacity exceeds the level of effort applied to the fishery. This leaves "latent effort" which is an administrative construct as described above.

For example, a firm may hold endorsements to fisheries A, B, C, and D, and currently be fishing in fisheries A, B and C. Endorsement D is regarded as "latent effort" when appraising fishery D, but fishery D is unlikely to be fished by the firm as it is currently fishing in fishery A, B and C. Industry seeks the security of having fishery D as an option if some combination of fisheries A, B and C has a poor period. While this option of sideways movement of effort is desirable from the firm's perspective, the potential influx of effort is deemed to be a problem by managers observing effort levels in fishery D, who may be concerned about sustainable levels of effort in that fishery.

Holding multiple endorsements, including endorsements for fisheries not currently exploited, is a sensible diversification of risk on the part of the fishing firm. Although the vessel in the above example is not exploiting fishery D, its D endorsement has an option value. It provides the firm with some degree of income insurance if fisheries A, B or C experience a downturn for any reason.

Latent effort is seen as a problem by administrators because of the size of the potential shifts of effort among fisheries. Firstly, latent vessels have to have a reason to forgo their current activity and enter the fishery. However with each vessel that shifts into fishery D, for example, conditions may improve in fisheries A, B and C and deteriorate in D as a result of the effort redistribution. In other words, there is a natural brake on the process, although shifts in effort of this type are not directly managed or coordinated in any way.

Despite the above argument, if there is a very large amount of latent effort and a substantial reason for it to be activated, enough effort could shift into fishery D to cause significant effects on stock. This is the central concern of administrators with latent effort in developing sustainable fishery management plans and is generally a low risk unless there are strong economic signals, such as fish price increases, for latent effort to be activated. However latent effort should also be attributed to the excessive number of fishing businesses in the industry, not to the range of activities of each firm. An efficient policy response is to reduce the number of businesses, while allowing each firm full opportunity to diversify its activities among fisheries. It is not desirable for a group of vessels being linked to a single endorsement type in an ailing fishery, when other viable fishing opportunities exist, but may be denied by the administrative system.

In summary, it is economically undesirable to limit directly the capacity of fishing businesses to move between fisheries as this reduces the scope of the businesses and their security of operation. However, if there is excess capacity there must be mechanisms to reduce total effort across the industry, through a reduction in the number of businesses (Metzner and Rawlinson, 1999).

Appendix G1b: Latent effort and the EPT fishery.

There is a large latent effort associated with the EPT fishery. The potential for activation of latent effort by new entrants is governed by the natural economic brakes of viability, being engaged in other fishing or work activities and the cost of fishing effort. Potential activation of latent effort is also contained by a range of regulations which control effort.

Under the FMS latent effort is to be contained. The removal of latent effort is not an explicit strategy and would have serious ramifications for industry. The latent effort issue is investigated below.

The activation and removal of latent effort

We assume each fisher file number is allocated 100 shares. This is an approximation to both business and endorsement shareholding giving the dimensions of the potential impact for assessment purposes. The total number of shares stay in the fishery, with scenario A envisaging the removal of latent shareholdings over 5 years and scenario B, the removal of latent shareholdings and those shares held by fishers currently fishing elsewhere, in 5 years. There are 310 endorsed fishers, with 87 fishers associated with latent endorsements and 223 endorsed in EPT and fishing in other fisheries.

In Appendix Table GA1 the Shareholder Index (SH) illustrates how the fisher's shareholding would increase relative to the base period shareholding under each scenario. Scenario A would require a 57% increase in share holdings and scenario B, a 100% increase in shareholdings over five years.

To remove latent effort would cost each remaining shareholder 39% of 100 shares for scenario A, approximately 39% of the cost of an EPT business. Under scenario B, the removal of latent and under used effort, would be the equivalent of a remaining fisher buying 77% of a business.

Appendix Table GA1: Two scenarios estimating the reduction of latent effort in the EPT fishery in the next 5 years through shares being transferred to remaining fishers.

Scenario A	Latent effort reduced to zero in five years					
	2002	2003	2004	2005	2006	2007
EPT shares	31,000	31,000	31,000	31,000	31,000	31,000
made up of						
Latent	8,700	6,960	5,220	3,480	1,740	-
Fished other	4,800	5,175	5,549	5,924	6,298	6,673
Mixed fishing	11,300	12,182	13,063	13,945	14,827	15,709
EPT only	6,200	6,684	7,168	7,651	8,135	8,619
Average SH index	1	1.08	1.16	1.23	1.31	1.39

Scenario B	Latent effort and fished other reduced to zero in 5 years					
	2002	2003	2004	2005	2006	2007
EPT shares	31,000	31,000	31,000	31,000	31,000	31,000
made up of						
Latent	8,700	6,960	5,220	3,480	1,740	-
Fished other	4,800	3,840	2,880	1,920	960	-
Mixed fishing	11,300	13,043	14,787	16,530	18,274	20,017
EPT only	6,200	7,157	8,113	9,070	10,026	10,983
Average SH index	1	1.15	1.31	1.46	1.62	1.77

It is proposed that shares will be linked to effort (days fished) and thus contain fishing effort. Fishing effort would tend to increase, to enable remaining fishers to fund additional share purchases in order to remain in the fishery. Effort needs to be closely monitored during the execution of the FMS.

Appendix G2: The NSW fishery economic survey and the EPT fishery

This appendix summarises the methods and results of an economic survey of operators in the EPT fishery. A state-wide economic survey was distributed (Roy Morgan, 2001b) and analysed for the EPT fishery as part of the current study. The purpose of the survey was to determine the operational surplus of a range of fishing operators in the EPT fishery.

The resource rent is an economic surplus which is part of the difference between the Total Revenue of effort and the Total Cost of effort across the fishery. Resource rent is made up of different elements and is the surplus attributable to the marginal fisher's last unit of effort, times the units of effort applied to the fishery (Reid and Campbell, 1998). This reflects the value of access to the resource. The balance of total rent and resource rent are intra-marginal rents, attributable to the skills of fishers and reflect innovation and skills in a healthy industry.

Estimation of rent also requires incorporation of effort and species considerations and is made more difficult by the multiple fishery behaviour of different fishers. Any profitability estimates in fisheries need to be related to the resource through bio-economic modelling to see if they are economically sustainable. This is not possible with information and data currently available.

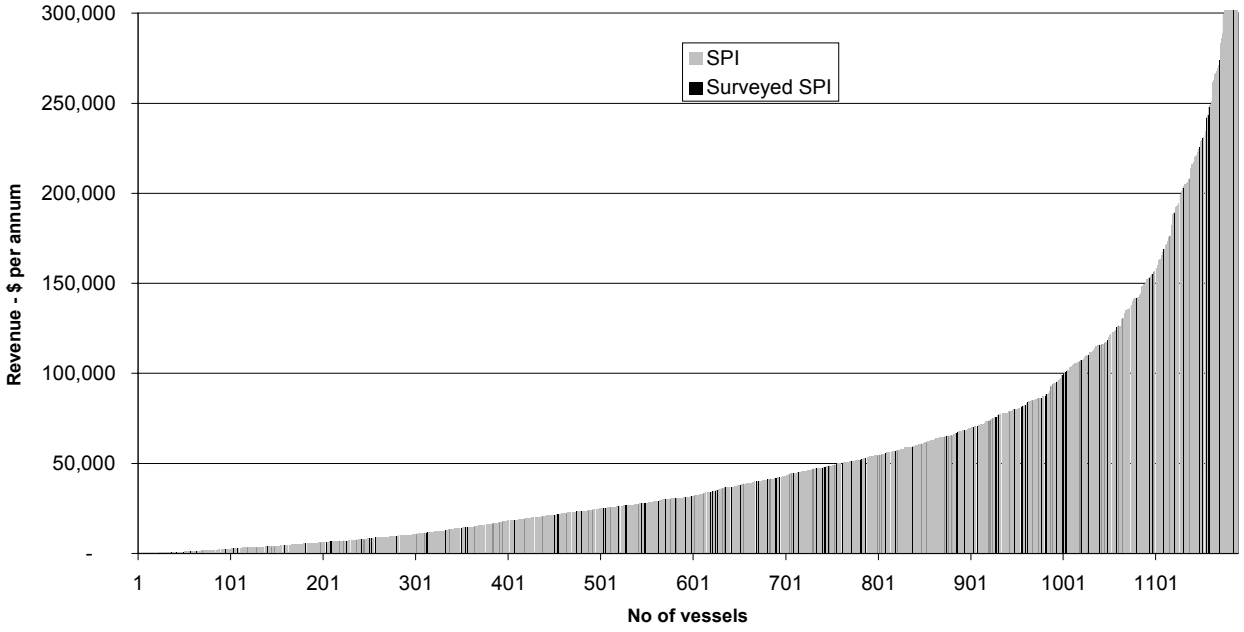
Fishing operator survey

Fishing businesses and owner operators act as firms fishing among the portfolio of administered fisheries available to them. Opportunities in other industries than fishing would also be a consideration as fishers switch between fishing and alternative economic opportunites in other industries. An economic survey can measure the performance of the firm across all its fishing activities only, but to gain an economic rate of return from a single fishery is more difficult. We need to examine the scope of production of the firms, examining the combinations of fisheries the firms access. An estimate of the returns from the EPT fishery would be somewhat arbitrary, depending on the allocation of capital costs and catch between fisheries.

The state-wide survey had 259 responses from 1,640 fishers contacted (15.7%). In the EPT fishery 46 of 294 businesses responded (15.6%). The representativeness of the state-wide survey response is reported is in Figure GA1 below. This illustrates the surveyed operators in comparison to the estimated revenue of all operators from the Sydney Price Index (SPI) and shows a potentially representative coverage of operators. The sampled fishing businesses with EPT fishing had the

same response rate as the state-wide survey and is proposed as being reasonably representative of operators in the EPT Fishery.

Appendix Figure GA1: The sample of fishers that responded to the NSW Economic survey, presented against the estimated Sydney Price Index (SPI) revenue for all NSW fishers.



Sustainability and fishing firms

In the NSW fishing industry we have fishing businesses and fishers contracted to those entities. The issues for sustainable management of the fishery resources is the overall level of effort exerted by industry on the fishery resources in NSW, and the distribution of that effort among the various fish stocks. Under current management measures, effort is contained by regulations, endorsements, limits on fishing times, areas, gears and by the economics of operations. We wish to find if it pays to go fishing. However, the ongoing containment of effort requires a downward adjustment in the number of firms in the industry due to technical advancement, and rises in costs of fishing operations (Metzner and Rawlinson, 1999).

Total effort in the industry can be reduced by direct retirement of fishing businesses where money for voluntary adjustment is available, or by other industry self funded adjustment arrangements. After adjustment, remaining businesses may have improved economic performance for the same or less effort levels, due to more catch being available in a region, and experience less congestion and competition between fishing operations. In any economically efficient change to the policy regime the winners' gains exceed the losers' losses, and a transfer payment may be possible through a levy on those fishers remaining. A central issue is the exit decision of firms from the industry. Where a

firm fishes one fishery, this exit decision may be estimated more readily than if a firm has divided its fishing between two or more administered fisheries.

Current fishery endorsement capacity exceeds the level of effort applied to the EPT fishery. This then leaves "latent effort" which is primarily an administrative construct (see Appendix G1), except where fishers are genuinely not able to fish their endorsement due to ill health as previous discussed.

What should be the measure of economic health of the fishing industry?

A healthy fishing industry is one that derives enough sustainable revenue to cover its annual operating, fixed and capital costs which are determined through survey methods. They include wages, including an imputed wage to the owner/operator, running costs, maintenance and repairs, insurance, and levies which reflect fishery management costs. Capital costs are harder to measure, but in principle they represent the annual interest and depreciation on the vessel and gear. Interest cost is the rate of return which the capital could earn in another use: it is calculated as a percentage of the capital value where the percentage is the risk adjusted cost of capital. Depreciation is an annual cost which recognises the finite life of a fishing vessel. In principle, the annual depreciation compounded forward at the market rate of interest should provide a sum large enough to replace the vessel at the end of its economic life.

There are three main measures of the value of the capital of a fishing firm. These are the value of the vessel and gear:

- at historic cost – what was originally paid for the asset;
- at indemnity value –the insured value which is taken to be an estimate of current market value; and
- at replacement cost – what a new vessel and gear would cost.

The replacement cost is the basis for measuring the long-run health of the industry. If firms are able to earn the required risk adjusted rate of return and set aside sufficient funds to purchase a new vessel when the existing vessel is fully depreciated, then it is viable in the long-run. If revenue fell short of that amount then we would expect to see the market value of vessels falling, and perhaps some highly geared firms having trouble meeting loan interest and repayment schedules.

An important proviso to the above discussion is that the calculations are based on sustainable revenue. It is a characteristic of the fishing industry that when stock conditions are bad, vessels are sometimes able to maintain their revenue to some extent by increasing effort; surviving by running down a different form of capital -the fish stock. In the EPT fishery there is significant variation between years.

Appraising economic viability

Fishing enterprise viability can be estimated through accounting data collected in a survey. This gives an accounting view of a firm's individual performance, but is not good for measuring performance across different businesses in the fishing industry, or between industries. Economists adjust accounting data to gain more useful industry economic performance measures.

The residual of Total Revenue less Operating Costs is Operating Profit. Depreciation and the opportunity cost of capital are deducted to give economic profit or loss (Campbell and Nicholl, 1994). In the study a 7% opportunity cost of capital was included in economic costs after ABARE, (2000) which is 3% less than applied in Reid and Campbell, (1998) and Hassall and Associates (1999). Fisheries management charges and licence fees are included in operational costs, even though they are not technically a factor of production being a transfer payment from industry to government in respect of access and management services.

Labour costs are imputed from questions in the survey regarding days fished and unpaid days worked by the fishers and his family in the fishing industry. Wages rates for non-managerial private sector employment (trades and unskilled labour) were used to calculate an imputed value of labour (ABS, 2001). The basis of imputation was for an annual average wage of $34,320, ($660 per week) imputed on a daily basis. Imputation was made for paid an unpaid days and at a lesser fractional rate for staff and family members.

The discounted annualised sum was calculated in respect of meeting the replacement cost of the assets at the end of their lifespan from current income flows. The great variety in size and ages of vessels and capital equipment in the EPT fishery pose interesting questions in the analysis. When capital is valued at its opportunity cost, some small scale fishing operations with fully depreciated capital equipment lead to traditional measures of profitability, such as return to capital, being less applicable than for an industrial fishing fleet. Rates of return may be apparently high or low due to minimal capital value.

Estuary Prawn Trawl profitability results (Note: this material is in draft form and is supplied under the normal caveat in respect of information supplied by fishers).

There were a total of 46 economic surveys from EPT endorsement holders, though 6 were unused in the sample due to quality concerns. The surveys were divided into three groups for analysis: all EPT fishing businesses; EPT businesses with more than 20% of gross revenues from EPT; and EPT businesses with <20% of gross revenue from EPT fishing. This division was made to recognise the different levels of revenues and dependence on active EPT fishing among businesses with EPT endorsements. Survey results reported in Appendix Table GA2.

Appendix Table GA2: Respondent numbers, mean business and range of revenues for the three fisher business groups in the NSW EPT fishery (Source: RM-ES).

Vessel category	Obs.	Mean Revenue	Minimum Revenue	Maximum Revenue
All EPT Businesses	40	79,602	6,000	506,000
EPT>20%	25	50,357	6,300	95,000
EPT<20%	15	126,394	36,000	506,000

The variety in business categories and activity levels among fishers are evident. For the sampled EPT businesses the major fishery overlap is with EG fishing, 22 of the 40 businesses accessing the EG fishery, while 9 are also endorsed in the Offshore Prawn Trawl fishery.

Accounting measures

The survey results are reported in Appendix Table GA3.

Appendix Table GA3: The accounting revenues and costs for a representative EPT fishing business (Source: RM-ES).

$	EPT>20%	EPT< 20%	Average Vessel	EPT>20%	EPT< 20%	Average Vessel
Gross revenue	50,357	126,394	79,602	100%	100%	100%
Direct costs*	19,006	80,955	42,847	38%	64%	54%
Indirect costs**	16,349	45,847	27,759	32%	36%	35%
Total costs	35,355	126,802	70,606	70%	100%	89%
Gross operating profit	**15,002**	**- 408**	**8,997**	30%	0%	11%
these costs include:						
* wages	1,877	22,411	9,775			
** Interest	4,261	2,508	3,615			

The results report that direct operating expenses, such as bait, fuel, boat repairs, fishing gear repairs, freight costs and wages to employees, are 38%-64% of revenue in the two activity groups, the 64%

being attributable to businesses with <20% of gross revenue in EPT. Indirect costs, such as boat and vehicle registrations, insurances, fishery management charges, rates, bank and business administration expenses, were 32% and 36% of revenue respectively, making total operational costs 70% and 100% of total revenue. The wages recorded were for employees as opposed to payments to owner operators, and were between 3% and 17% of revenue, meaning the survey data for wages did not record payments by the business to the owner as wages, particularly in the case of businesses with >20% of revenue from EPT. Approximately 50% of the EPT businesses sampled had no interest payments, 25% had annual interest payments up to $1,500 per annum and 25% had interest payments greater than $1,500 per annum. Operating profit in the two business categories, is apparently 30% and 0% of gross revenue. Owner/fishers draw wages from their operating profit and little accounting profit is probable. In summary, conclusions on long run viability are difficult to draw from the accounting data and requires an economic approach.

Economic results

The economic survey results include adjustments to give the economic depreciation, the imputed cost of labour and opportunity cost of capital and are reported in Appendix Table GA4.

The results for long run viability are presented in Box G1 below.

Box G1: Long run economic viability – covering economic depreciation.

In the long term the following had positive returns in excess of all costs including economic depreciation:

2 of the 25 (8%) EPT businesses with > 20% revenue in EPT;

2 of the 15 (13.3%) EPT businesses with < 20% revenue in EPT.

In total this indicates that 4 from 40 (10%) of all EPT endorsed fishing businesses were above long run economic viability, covering opportunity costs of capital, imputed labour and depreciation on the basis of being able to replace capital at the end of the lifespan of their assets.

Long run economic surplus exists for 10% of all EPT fishing businesses examined. Businesses which obtained less than 20% of total revenue from EPT had an economic rate of return to capital of -13%, while businesses with >20% of revenue from EPT had an economic rate of return to capital of -30% as reported in Appendix Table GA4. The average economic rate of return to capital across all the businesses was -18%, the median being -25%.

Appendix Table GA4: Results of the Economic survey of the EPT fishing businesses in the financial year 1999-2000 (Source: RM-ES).

$	EPT > 20%	EPT <20%	Average Business
Gross revenue	**50,357**	**126,394**	**79,602**
less costs			
Cooperative expenses	1,025	2,393	1,565
Bait	346	371	356
Boat fuel	5,358	19,843	10,929
Fishing gear	2,749	9,747	5,440
Vehicle fuel	2,064	6,162	3,640
Freight	813	247	595
Other costs	821	564	722
Imputed Labour	35,335	36,474	35,773
Total Direct costs	**48,511**	**75,801**	**59,021**
Boat registration/fees	1,347	3,357	2,120
Vehicle registration	677	925	768
Insurance	594	4,275	2,010
Fishery Man. Charges	226	173	205
Com Fish Licence	876	1,102	963
Accounts	760	1,269	956
Phone	1,128	1,087	1,112
Power	403	997	637
Rates	1,292	2,359	1,702
Bank expenses	270	1,416	722
Economic depreciation	2,591	8,142	4,726
Repairs	4,687	25,899	12,845
Repairs vehicle	1,328	4,445	2,527
Travel	60	529	241
Other costs	524	7,263	3,116
Opp. Cost of Capital	7,485	36,254	18,550
Total Indirect costs	**24,247**	**99,492**	**53,200**
Total Economic costs	**72,758**	**175,293**	**112,221**
Economic gross profit	- 22,401	- 48,899	- 32,619
Capital asset value	74,853	362,544	185,503
Ec. Rate of Ret.to Capital	-30%	-13%	-18%

Discussion of economic viability and the EPT fishery

The viability of fishing businesses in the EPT fishery is investigated by the economic survey on declared data. This was for one financial year only and should be followed by a series of annual surveys to see profitability over a longer time horizon and to see the variation due to fluctuations in prawn abundance. The declared revenue from prawn sales should also be verified, as under-reporting of catch would reduce apparent economic performance.

The accounting measure does not include any opportunity costs and indicates that for many fishers payment to the operator will come out of the business after other deductions – "fishing for wages". The economic surplus available varies between the two types of operation examined and is highest

for the EPT businesses with less than 20% of gross revenue from EPT fishing. This result may be contrasted with the relative returns to effort from prawn and EG fishing which were compared and suggested that prawn fishing had up to 25% higher returns to effort. Should the cost of effort in both fishing activities be equal, then the higher returns from non-prawn fishing in the survey may not be consistent with the relative returns to effort declared by fishers between fishing activities and suggests a possible under reporting of the prawn catch.

The economic profit enables long term viability to be appraised with 10% of businesses having economic profit and are thus viable in the long run covering economic depreciation by setting aside enough now, to renew capital at a future date. This infers that 90% of operators are performing below the long run viability benchmark. This does not mean they cannot operate on a day to day basis in this seasonal fishery, but that they forgo some element counted in economic costs as presented in Appendix Table GA4.

It is likely that fishers forgo payment for the time involved with the fishing business. The high labour commitment to fishing in the EPT is reported in Appendix Table GA5 where the average EPT fisher spends 53% of their time on "unpaid" tasks of fishing, delivery time, repairs, maintenance, management and administration. Appendix Table GA5 indicates labour is also contributed by family at a rate of 22% of fisher days and this was also included in the imputed labour cost.

Appendix Table GA5: The annual average unpaid and paid days fishing by EPT endorsed businesses (Source: RM-ES).

	>20% EPT	**<20% EPT**	**All**
Number of respondents	25	15	40
Fisher days unpaid	103	111	106
Fisher days paid	203	189	197
Fisher unpaid days as % of paid	**51%**	**59%**	**53%**
Family days unpaid	26	69	43
Family days unpaid as % of paid fisher days	**13%**	**36%**	**22%**

For example if the fisher's partner or family member works for less than the imputed pay rate, and the operators earn a satisfactory return, then the imputed wage calculation is possibly unreasonable (Stanton, 1972; ABARE, 2000). Fishers may take less wages than the imputed rate to keep the business operational, in the face of alternative earning opportunities. Opportunity costs of capital can be forgone, as can depreciation, with fishers hoping to keep current assets operational beyond their envisaged lifespan, or to locate a second hand vessel if a replacement is required.

In discussing efficiency and farmer welfare in the NSW farming sector, Standen (1972) noted that replacement cost based measures for depreciation and off-farm imputed earnings may be invalid measures of opportunity costs of these resources in the rural industry context, tending to overstate off-farm benefits. For some fishers the opportunity costs for labour outside fishing may be close to zero, or if pensionable age, social security payments of up to approximately $10,000 per annum. Commonly fishers indicate they forgo payment for lifestyle and autonomy. This may even extend to short term periods where fishers forgo wages, cease fishing or move to other industries until fishing improves. This substitution between fishing and other industries is likely an efficient strategy for fishers to remain in fishing in the long term. Many of the EPT fishers in the Clarence and Hunter Rivers operate on this basis having cane farming and other alternative business interests.

There are also impediments to fishers exiting the fishing industry. Lack of marketable fishing rights with restrictions on transferability, limit the sale of fishing licenses. Exiting the industry also involves outlays on transport, food and lodgings incurred during an industry transfer period. The prospect of false starts in new employment also restricts exiting and the "psychic costs" of changing occupation and place of living. The fishers in EPT endorsed businesses may identify with the following quote made in respect of NSW Dairy Farmers - "If higher incomes are available only with a change in employment or location, then strong attachment to present positions could mean that the individuals would not be better off in the alternative positions" (Standen, 1972).

Conclusions

Long run economic surplus only exists for 10% of all EPT fishing businesses examined, being greatest in the businesses which obtained less than 20% of total revenue from EPT. These businesses had an economic rate of return to capital of -13%, while other businesses with more than 20% of revenue from EPT had an economic rate of return to capital of -30%. The average economic rate of return to capital across all the businesses was -18%, the median being -25%.

The long term viability of the lowest half of EPT fishing businesses is questionable, but has to be interpreted within the context of seasonal and part-time nature of fishing operations in the fishery and the concept of the rural lifestyle and impediments to altering that lifestyle as previously discussed. The median rate of return is -25% to capital, indicating half the businesses were below this rate of return in the 1999-2000 financial year. Many of these fishers indicated that in the survey period, refit or breakdown had impaired their fishing performance leading to costs and limited income.

The current survey results shed light on IPART's previous finding that "70% of fishers will encounter problems in their capacity to pay higher management charges"(IPART, 1998 p 63). Many operators will have difficulty in meeting additional management or additional restructuring costs, as reported in the EPT assessment.

Appendix G3: Comments from regional fishing industry studies with economic multipliers.

Comments from each study are reported for the southern and northern NSW area.

Southern NSW

In the study by Powell et al. (1989) the flow on effects of potential policy changes are analysed in 1987-88 when 5,615t of trawl fish, including orange roughy, was landed in Eden and 1,877t of trawl fish in Ulladulla (Powell et al., 1989). The report has some appended information on non-trawling fishing activity. Both are of interest to the current study in appraising impacts on the EPT fishing community. The study included fishing, processing and fish handling.

Eden - For the trawl fishing in Eden in 1987-88 Powell et al. (1989) have two comments:

"Overall the industry has a ratio of total to initial effect of about 1.5 which is relatively low. It would seem to be accounted for by a high capital intensity in handling and processing operations with corresponding low labour use and low labour income payments. There is also a low use of locally provided inputs (these show up as low production-induced effects). The latter is due to the "smallness" of the Eden economy and its limited capacity to provide inputs to the trawl fishing industry." Powell et al. (1989; p41).

" Impacts of the trawl fishing industry on the Eden economy in 1987-88. The total initial output of the trawl fishing industry of $8.5m generated a further $4.5m, totaling $13.1m in output in the local economy. This represented 8.8% of the total output in the local economy. Trawl fishing also generated household income of $2.97m with 189 jobs, which represented 8.04% and 12% of total income and employment in Eden respectively" Powell et al. (1989; p46).

Ulladulla

The multipliers in Ulladulla were for the trawl fishing industry, trawl handling and total trawl industry, with no processing. Comments made by the authors were:

"Trawl fishing generated almost $5m of output, provided 94 jobs and $1.6m of income to households. The ratio of local industry impacts to initial activity in the trawl fishing sector in terms of income is 1.7. That means for ever $1 paid to trawl workers, all other activities generate 1.7 times this amount" Powell et al. (1989; p51).

"The total output of the trawl fishing industry of $3.2m generated a further $1.8m, totaling $5.0m in output in the local economy. This represented 3.2% of the total output in the economy. The trawl fishing industry also generated a total household income of $1.6m associated with 94 jobs, representing 3% and 3.8% of total household income and employment in Ulladulla" Powell et al. (1989; p56).

Northern NSW

The Northern NSW study was part of an agriculture and fishing community study for the area from Tweed Heads to Tuncurry using data from the 1984-85 period.

Tamblyn and Powell (1988) comment:

"Commercial fishing, local transport to cooperatives, the handling and processing operations of fish cooperatives and transport from the cooperatives to major markets were included. Excluded were local wholesale and retails sales of fish, Sydney Fish market operations and blackmarket sales, which are reported to be sizeable. All amateur and pleasure fishing is excluded." (Tamblyn and Powell, 1988; page 45).

On the economic impact they summarise:

"The industry produced products valued at $48.9m, and employed 1,476 people who received payments of $21m. In employment terms, the impacts are dominated by fishing which comprise 82 per cent of the total effect. This is high given that all fish are processed in some way. However, much of that processing adds only a small amount of value through cleaning, scaling and packing. This also means that the ratio of all effects of fishing is relatively low at about two." (Tamblyn and Powell, 1988; page 45).

In estimating output from Fish Co-operatives the authors adjusted for double counting of output due to fish coops buying fish in. The NSW Government economic appraisal guidelines warn of the potential errors and inaccuracies in Input-Output studies relating to poor data, double counting of output impacts, and inappropriate application of multipliers (NSW Treasury, 1997). After adjustment, they indicate that "the ratio of all direct and indirect effects to the fishing direct effect" is 2.404 (Tamblyn and Powell, 1998; p 47).

Clarence

In the Clarence the McVerry (1996) study indicated that:

"Estimates of the value of output from the commercial fishing industry in the Lower Clarence for 1992-93 amounted to $14.0 million, with flow-on impacts for businesses supplying goods and services to those in the direct employment of the fishing industry of $12.3 million. The total direct and indirect value of output for the commercial fishing industry in the Lower Clarence region for 1992-93 was, consequently, $26.3 million. Over half of the fisheries production of Northern NSW is derived from the Lower Clarence region, indicative of the productive capacity of the Clarence River and the adjacent offshore fishing grounds" (McVerry, 1996).

"The total number of jobs generated directly by the commercial fishing industry in the Lower Clarence region for 1992-93 was 382, with the flow-on employment impacts resulting in another 190 jobs. The fishing industry in the Lower Clarence provides direct and indirect employment for 572 people, which represents 12.6 percent of the total employment in the area. Any decline in employment from the fishing industry will impact on the employment levels and economic activity in the Lower Clarence region due to the limited number of alternative job opportunities in the area". (McVerry, 1996).

(H) SOCIAL ISSUES

The background to the social assessment of the Estuary Prawn Trawl FMS is given at the commencement of the Economic section (G).

The environmental assessment guidelines issued by Planning NSW require examination of social information on fishers and their communities. Australian Bureau of Statistics (ABS) data was obtained from the Bureau of Rural Science (BRS) social science unit, to examine the secondary level information available on the communities and fishers in the NSW fishing industry. The results of this fisher community profiling are presented in Appendix H1.

The second approach was a fisher telephone survey of all fishers in NSW to obtain more specific social information of relevance to appraising issues under the Fisheries Management Strategy process. An overview of the state-wide social survey is reported in Appendix H2.

The available information is used to address the social issues surrounding the introduction of the Estuary Prawn Trawl Fisheries Management Strategy. Given the lack of previous studies, the review cannot fully complete the Planning NSW guidelines and gaps have been identified. The need for future research is presented in section 3.

The Planning NSW guidelines for social issues will be followed below. The guidelines are presented as headings to guide the reader, with a response stated below each guideline. The environmental assessment guidelines issued by Planning NSW require that we:
"Assess the likely social impacts of the fishing activity proposed under the management plan".

1) Review of the existing situation

(a) Describe the demographic profile of those employed in the fishery (by regions/sub-regions/fleets) – including:

(i) direct employment eg boat owners, skippers and crew; identify those with multiple endorsements and those "part-time" fishers (eg with other sources of employment, or semi retired); and indirect employment (cold stores, traders, suppliers);

The Estuary Prawn Trawl fishers fish in five estuaries as reported in Table G1 and G4 of the economic section.

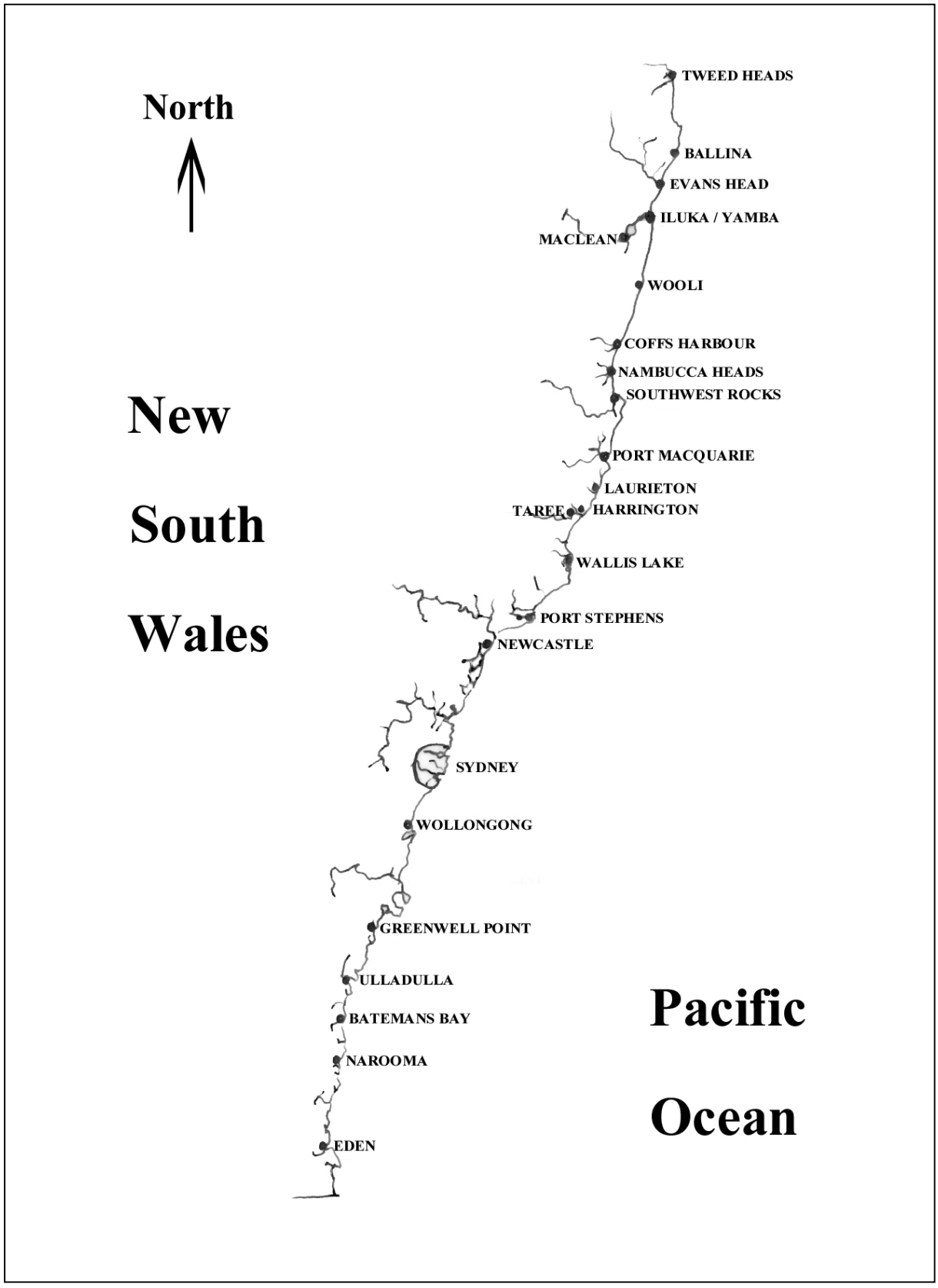
The profile of fisher communities in coastal NSW for all commercial fishers is reported in Appendix H1. The information on EPT fishers and their communities has been extracted and are summarised in Table H1, which reports social indices for EPT fishers at the zone and district level from ABS and licensing data. This can be used in appraising management impacts at district or grouped post code level. Figure H1 is a map of coastal fishing towns along the NSW coast and can be used in conjunction with district and postcode Tables.

Table H1: Summary table of social indices for EPT fishers in zones and districts of NSW (Source: ABS/BRS and NSWF licence data).

Zone	Home District	P'code Population	P'code Fishers	EPT P'code Fishers	Un employed (%)	SEIFA	Med. Ind. Income (wk)	Employed in C.F. as (%) of labour force	Employed in EPT as (%) of labour force
1	TWEED	7,976	19	1	16.2	921	250	0.41	0.02
	RICHMOND	4,374	35	6	18.1	909	215	1.02	0.17
	Zone	**12,350**	**54**	**7**	**17.1**	**915**	**233**	**0.72**	**0.10**
2	**CLARENCE**	**43,353**	**259**	**121**	**18.8**	**919**	**222**	**3.12**	**1.46**
3	COFFS HARBOUR	44,336	72	5	18.1	958	250	0.35	0.02
	HASTINGS	27,129	53	4	19.0	921	215	0.78	0.06
	Zone	**71,465**	**125**	**9**	**18.6**	**940**	**233**	**0.57**	**0.04**
4	MANNING	9,566	45	5	19.3	896	180	0.65	0.07
	WALLIS LAKE	19,457	88	2	15.1	939	250	2.78	0.06
	PORT STEPHENS	52,562	101	6	13.0	967	250	1.33	0.08
	HUNTER	30,332	45	14	14.9	915	226	0.23	0.07
	CENTRAL COAST	159,297	62	25	10.6	978	270	0.00	0.00
	Zone	**189,629**	**341**	**52**	**12.7**	**946**	**248**	**0.11**	**0.04**
5	HAWKESBURY	2,380	30	28	7.4	1004	300	0.00	0.00
	SYDNEY	3,276,207	189	84	7.3	1047	350	0.00	0.00
	Zone	**3,278,587**	**219**	**112**	**7.4**	**1026**	**325**	**0.00**	**0.00**
6	ILLAWARRA	6,653	18	1	19.0	827	180	0.10	0.01
	SHOALHAVEN	53,871	75	2	15.1	945	215	0.81	0.02
	Zone	**60,524**	**93**	**3**	**17.1**	**886**	**198**	**0.46**	**0.01**
Grand Total		**3,989,867**	**1,091**	**304**	**15.3**	**943**	**235**	**1.03**	**0.25**

Key: Postcode population as of 1996; postcode fishers-for all NSW and EPT fishers; Unemployed by postcode as of 1996 census; SEIFA -Socio-economic index for areas (ABS), Med. Ind. Inc.- median individual income per week as of 1996 census; Employed in commercial fishing (or EPT) as percentage of labour force; see Appendix 1 for a fuller explanation of variables.

Figure H1: Map of fishing towns on the NSW coast.



Inspite of operating in 5 estuaries only, EPT business owners inhabit a range of small towns and the social survey identified that there were 171 EPT endorsement holders using 26 "home ports" in NSW, 67% of which were in the 5 EPT estuaries. In Table H2 ABS postcode data enables EPT fishers to be identified as part of fishing communities in NSW[1]. The definition of fisher communities is an area for further work.

In Table H1, EPT fishers are approximately 28% of all NSW fishers in the analysis. Unemployment by region is higher in rural NSW and will be investigated later in this section. The Socio-Economic Index for Areas (SEIFA) is a measure of socio-economic disadvantage, relative to 1,000 units. In Table H1, most of rural NSW fishing zones are under 950 on the SEIFA index, while Sydney exceeds 1,000. Median weekly income data for regions in 1996 show a similar situation.

In Table H1, EPT fishers are most numerous in the Clarence River region and from the Hunter River, south to Sydney. In Table H1, the second last column reports all commercial fishers as a percentage of the local working population and the last column reports EPT fishers as a percentage of the local working population. These are ABS data from the 1996 census. Fishers in the Clarence and Hunter areas, have the highest percentage of EPT fishers in the work force indicating economic and social dependence. In areas of higher general population, the fishers as percentage of labour force method does not reflect the size of the fishing community (for example, Hawkesbury River, Sydney Harbour and Botany Bay), as the general work force is large relative to the number of commercial fishers.

Table H2 reports major home post codes for EPT fishers within districts and illustrates the diversity in community structures and in the home locations of EPT fishers. EPT fishers are most numerous in the Clarence region and in postcodes from central coast to Sydney. EPT fishers form a substantial part of the NSW fishing community in many postcodes ranging from 1.7% to 100% of local fisher numbers. A significant number of postcode areas with EPT fishers fall below 920 on the SEIFA index of disadvantage and may well be more adversely impacted by changes under the FMS (For example: Broadwater/Coraki, Evans Head, Woombah/others and Iluka in the Clarence River region; Laurieton/others, Harrington/Coopernook, Mayfield and Stockton in the Hunter River). Similarly a range of areas record median individual weekly incomes below $200 in the 1996 census. Several postcodes have a high percentage of EPT fishers in the work force (for example; Woombah/others, Yamba/others, Lawrence/others, Iluka, Maclean, Tea Gardens, and Stockton/others). Conversely some postcodes have relatively few EPT fishers as a percentage of the

[1] This is explained in Appendix H1, where the available data is for postcodes with over 10 NSW commercial fishers.

work force (eg. Hawkesbury, Sydney), though this should be interpreted with caution, given the weakness of this method in areas of high population. Table H2 indicates the numbers of EPT endorsed fishers in each post code and this should be referred to in any inference. For example the Hawkesbury River commercial fishers are a very small percentage of the total labour force, but number 10 and 18 EPT fishers.

The numbers of direct and indirect employees associated with the EPT fishery and the multiple endorsement structure are reviewed in the economic section, Chapter (G) .

Table H2: ABS social index data on EPT fishing communities in NSW at the postcode level (Source ABS/BRS; NSWF licence data).

Zone	Home District	Post code	Town/Suburb	P'code Pop'n	P'code Fishers	P'code Fishers (EPT)	EPT fishers as % of all NSW	Un employed (%)	SEIFA	Med. Ind. Income (wk)	Employed in C.F. (%) of Labour force	Employed in EPT (%) of Labour force
1	TWEED	2487	CHINDERAH/OTHERS	7,976	19	1	5.3%	16.2	921	250	0.41	0.02
1	RICHMOND	2472	BROADWATER/CORAKI	1,761	10	2	20.0%	19.5	919	250	1.02	0.20
1	RICHMOND	2473	EVANS HEAD	2,613	25	4	16.0%	16.8	900	180	1.02	0.16
2	CLARENCE	2469	WOOMBAH/OTHERS	933	10	3	30.0%	27.2	854	180	1.02	0.31
2	CLARENCE	2464	YAMBA/OTHERS	5,340	64	14	21.9%	17.1	954	250	4.46	0.98
2	CLARENCE	2460	LAWRENCE/OTHERS	29,145	24	16	66.7%	14.8	951	250	1.21	0.81
2	CLARENCE	2466	ILUKA	1,863	65	24	36.9%	18.6	891	180	4.46	1.65
2	CLARENCE	2463	MACLEAN/OTHERS	6,072	96	64	66.7%	16.2	946	250	4.46	2.97
3	COFFS HARBOUR	2456	WOOLGOOLGA/URUNGA	11,848	20	1	5.0%	20.5	944	250	0.46	0.02
3	HASTINGS	2431	SOUTH WEST ROCKS	3,965	33	2	6.1%	18.6	926	180	0.78	0.05
3	HASTINGS	2440	CRESCENT HEADS/OTHERS	23,164	20	2	10.0%	19.3	916	250	0.78	0.08
3	COFFS HARBOUR	2450	COFFS HARBOUR	32,488	52	4	7.7%	15.8	971	250	0.24	0.02
4	PORT STEPHENS	2301	NELSON/SALAMANDER BAYS	25,046	27	1	3.7%	11.1	997	250	1.04	0.04
4	CENTRAL COAST	2261	BERKELEY VALE/OTHERS	32,623	19	1	5.3%	14.1	935	250	0.00	0.00
4	MANNING	2443	LAURIETON/OTHERS	8,093	21	1	4.8%	20.6	909	180	0.60	0.03
4	HUNTER	2281	SWANSEA/OTHERS	11,349	15	1	6.7%	14.3	935	180	0.05	0.00
4	PORT STEPHENS	2315	NELSON BAY/OTHERS	8,393	54	2	3.7%	14.3	966	250	1.04	0.04
4	WALLIS LAKE	2428	FORSTER/TUNCURRY/OTHERS	19,457	88	2	2.3%	15.1	939	250	2.78	0.06
4	CENTRAL COAST	2250	ERINA/OTHERS	57,810	10	3	30.0%	7.7	1025	350	0.00	0.00
4	PORT STEPHENS	2324	TEA GARDENS/OTHERS	19,123	20	3	15.0%	13.6	937	250	1.91	0.29
4	CENTRAL COAST	2251	AVOCA BEACH/OTHERS	29,370	11	4	36.4%	8.5	1032	250	0.00	0.00
4	MANNING	2427	HARRINGTON/COOPERNOOK	1,473	24	4	16.7%	18.0	883	180	0.71	0.12
4	CENTRAL COAST	2257	EMPIRE BAY/OTHERS	25,326	10	6	60.0%	11.6	957	250	0.00	0.00
4	HUNTER	2304	MAYFIELD/WARABROOK	13,925	18	6	33.3%	17.6	890	250	0.07	0.02
4	HUNTER	2295	STOCKTON/OTHERS	5,058	12	7	58.3%	12.8	918	250	0.56	0.32
4	CENTRAL COAST	2256	WOY WOY/OTHERS	14,168	12	11	91.7%	11.1	941	250	0.00	0.00
5	HAWKESBURY	2083	MOONEY MOONEY	1,450	12	10	83.3%	5.7	1042	350	0.00	0.00
5	HAWKESBURY	2775	SPENCER	930	18	18	100.0%	9.2	967	250	0.00	0.00
5	SYDNEY		SYDNEY NORTH & SOUTH	3,276,207	189	84	44.4%	7.3	1047	350	0.00	0.00
6	SHOALHAVEN	2541	NOWRA/OTHERS	29,663	16	1	6.3%	12.0	957	250	0.81	0.05
6	ILLAWARRA	2506	BERKELEY	6,653	18	1	5.6%	19.0	827	180	0.10	0.01
6	SHOALHAVEN	2540	GREENWELL POINT/OTHERS	24,208	59	1	1.7%	18.2	933	180	0.81	0.01
					1091	**304**						

The social survey enabled a social profile of EPT fishers to be developed as reported in Table H3.

Table H3: The demographics of fishers in the EPT fishery (Source: RM -SS and NSWF licence data).

Statewide profile		All NSW	EPT
Mean age of fisher (years)*		54.4	47.1
Age range		16-88	20-85
Percent males		99.2%	100.0%
Mean years resident in town		24.2	23.8
Mean years in Fishing Ind.		20.8	21.7
Generations in Fishing Ind.		1.9	2.0
Median Hours /week in fishing industry		54.1	52.6
Percent currently employed in other industries		19.1%	22.5%
Housing Tenure			
Own		49.9%	49.1%
Paying off		32.8%	27.8%
Renting		15.8%	18.9%
Other		1.4%	4.1%
Education			
Did not finish PS		2.0%	4.2%
Did finish PS		3.6%	4.8%
Year 7		4.1%	4.8%
Year 8		9.6%	10.1%
Year 9		17.4%	16.7%
Year 10		32.1%	31.0%
Year 11		3.8%	3.0%
Year 12		11.4%	11.3%
Trade cert.		10.1%	11.3%
Ind/ business		1.7%	1.8%
Uni		3.3%	0.6%
Other		0.9%	0.6%
Marital Status			
Married or relationship		81%	80%
Single		11%	11%
Other (Divorced, separated, widowed)		8%	9%
Partner employed in Fishing Business		40%	41%
Mean number of Children <16 years		1.2	1.6
(Other) Dependants			
None		63%	69%
Spouse		23%	22%
Children - over 16 and other		14%	9%
Employed Status			
Owner operator		88%	95%
Non fishing owner/other		4%	2%
Nominated fisher/skipper		8%	3%
Employees (%)	0	65%	73%
	1 or more	35%	27%
Mean Individual net taxable income (all industries)		$ 39,634	36,185
Mean Household net taxable income		$ 42,483	39,395
< 6,000		3%	4%
6,000-9,999		2%	1%
10,000-19,999		7%	5%
20,000-29,999		20%	23%
30,000-39,999		20%	19%
40,000-49,999		11%	9%
50,000-59,999		8%	7%
60,000-69,999		8%	7%
70,000-79,999		5%	10%
80,000-89,999		5%	8%
90,000-99,999		1%	0%
100,000+		11%	7%

Table H3 reports that the average age of NSW commercial fishers is 54.4 years and is higher than the 45.3 years recorded for all Queensland fishers (Fenton and Marshall, 2000). The average age of the EPT fishers is 47.1. Participation of females in direct fishing is zero according to the survey, though 41% of fishers' partners are employed in EPT fishing businesses. Approximately 95% of EPT fishers are owner operators, average over 21.7 years of fishing experience, work a median of 52.6 hours per week, and 22.5% of EPT fishers work in other industries. Fishers have high levels of residency, averaging 23.8 years and high levels of home ownership, with 77% owning or paying off a home.

The 171 EPT fishers interviewed had low rates of formal education, with 72.6% achieving year 10 education or below. Approximately 13.1% had a trade or business training. Fishing forms a significant part of individual fishers income, with 85% of income from fishing (see Table G9 of the economics chapter). Fisher net taxable income from all industries was $36,185 after tax, of an average household income of $39,395, indicating the overall contribution of 92% by fishers to household income.

In examining dependants, it was found that 60% of EPT fishers had no dependent children below 16 years of age as reported in Box H1.

Box H1: Dependent children below 16 years of age for EPT businesses (RM-SS).

No. of Children	Freq.	Total Children	%
0	103	-	[60% of 171]
1	21	21	15%
2	24	48	34%
3	19	57	40%
4+	4	16	11%
Total	**171**	**142**	**100%**

The balance of 68 fishers had 142 dependent children under 16, representing families with an average of 2.1 children per family. Table H3 reports about 69% of 171 EPT fishers had no financial dependents, 22% had dependent spouses and 9% had dependent grandparents, parents, stepchildren and children over 16 years.

Of 171 EPT endorsement holders contacted, 139 had been fishing in EPT in the previous 12 months. The balance of sampled endorsement holders were fishing elsewhere.

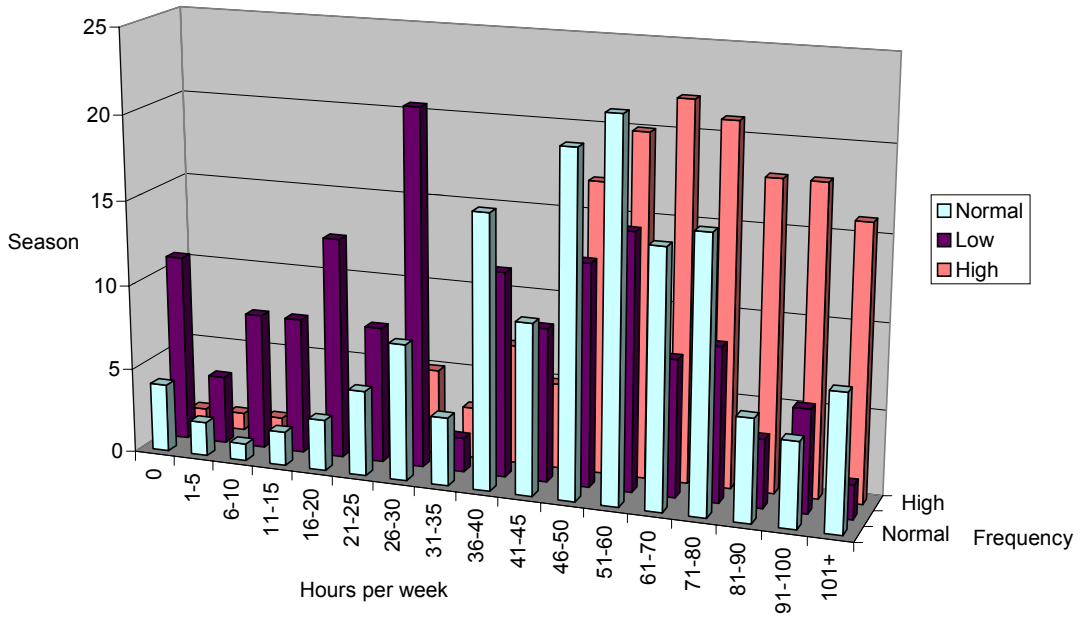
(b) Outline the community values associated with commercial fishing, in particular :

(i) fishers' ways of life; fishing communities and trends associated with changes in fishing technology, communications and estuary management practices.

Industry working practices

The social survey asked questions to provide information on industry working practices. Part of the fishers life style, is that fishing takes more hours than the conventional 40 hour week. Fishers were asked to estimate their average working week in normal, low and high seasons. The estimates from the telephone interview are reported in Figure H2. The data suggest that normal working hours are 52.6 per week. This is significantly in excess of the 42 hours per week estimated by ABS for fishers nationally (ABS, 1996). High season estimates exceed 70 hours/week while low season hours are typically 26-30 hours/week.

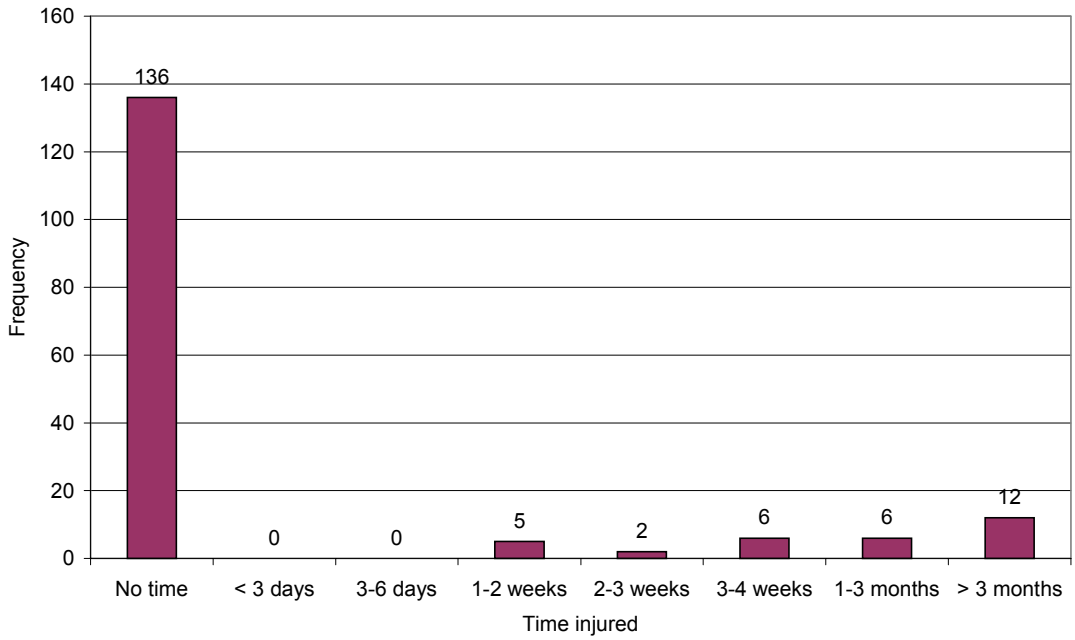
Figure H2: Hours worked per week in the Normal, Low and High seasons in the EPT fishery (Source: RM-SS).



Fishing is a diverse activity and can lead to industrial injury.

About 18% of the 171 fishers interviewed were not active in the fishing industry in 1999-2000 for a variety of reasons (Roy Morgan, 2001a). The graph indicates that 81% of fishers had no fishing injuries in the previous 12 months, but that 16% of fishers were out of fishing for 2 weeks or more in the year 1999-00 through industrial injury (26 fishers). This indicates the level of industry related injuries in the EPT fishery.

Figure H3: Duration of non-working time from industrial injury in commercial fishing in the EPT fishery (Source: RM-SS)



Investigate community/regional aspects of fishers

The regional location of fishers by district is reported in Tables H1 and H2. There is no accepted definition of "fishing communities" and this requires further analysis of economic and social interactions and linkages between fishers and between communities (Fenton et al. 2000).

The regional location of fishers by district is been reported in Tables H4a and H4b. Fishers were asked about their pattern of travel for their main fishing activity. In Table H4a about 9% of fishers show significant traveling behaviour of over 50km per day in their fishing operation. This may reflect the travel by EPT fishers arising from their other fishing activities.

Table H4a: Travel distance to main fishing site in the EPT fishery (Source: RM- SS)

	Frequency	**%**		
<25 km, 1hr by boat	117	69%		
25-50 km, 1-2hr by boat	32	19%		
50-100 km, 2-3hr by boat	13	8%		
>100 km, > 3hr by boat	2	1%		
Can't say	6	4%	n=	170

Fishers were asked how many years they have lived in their current postcode area? The results are reported in Table H4b.

Table H4b: Residency at current postcode (Source: RM-SS)

Years	Freq.	%	Years	Freq.	%
<1	3	2%	21-25	18	11%
1-5	20	12%	26-30	13	8%
6-10	21	12%	Over 30 yrs	66	39%
11-15	16	9%	Can't say	0	0%
16-20	14	8%	n=	171	100%

Table H4b shows 75% of fishers have been living in the same postcode area for 10 years or more. Less than 14% have moved their postcode residency in the last 5 years. The EPT fisher population is reasonably sessile, with limited operational travelling behaviour and has a significant number of fishers who have been resident in a local area for a long time. This is probably an indication of their community involvement in local areas.

(i) social capital issues; age distribution of fishers; skill base and transferability of skills; consider trends by region or sub –region affecting entry or exiting of fishers, employees or boat owners in the sector

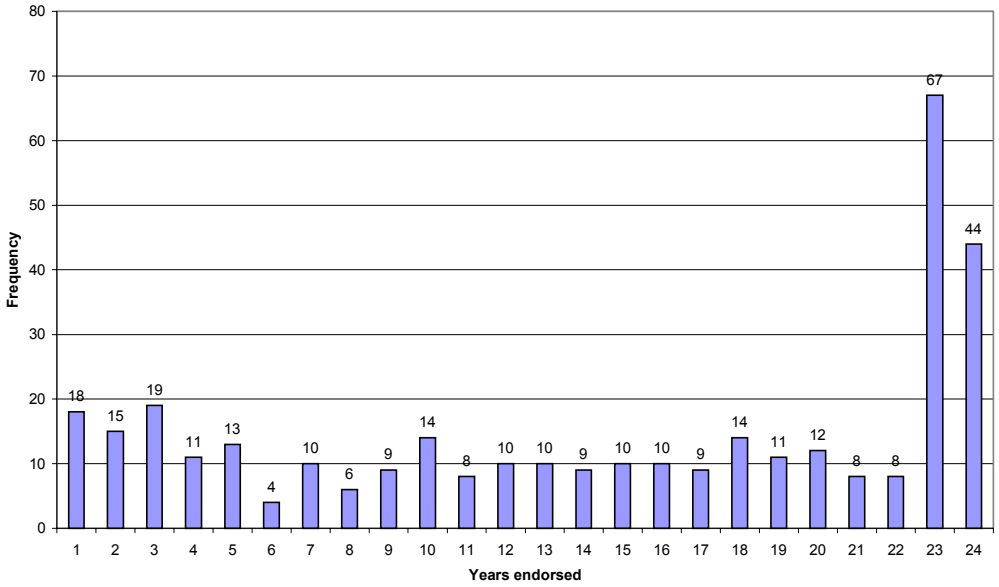
There is no one accepted measure of social capital (NSW government, 1997b). Fishers are often a significant part of the social infrastructure in small coastal communities. For example, an illustration of the potential contribution of fishers to local social capital is reported in Table H5 from McVerry (1996). Fishers and their club memberships in the Clarence community are reported. Clubs can be a place for fishers to socialise with other fishers, workers and the community. There is no other available information on fishers and social capital in NSW.

Table H5: Fishers as a percentage of club memberships in the Clarence region (McVerry, 1996).

Type of Club	Fishers as % of club membership
Bowling Club	41
Golf Club	27
RSL	18
Soccer, Football, Coastguard	4
Surf, Cricket, Lions Clubs	3
Softball, Rowing, Horse, Clarence Catchment Management	2
Bike Club, Naval Reserve	1

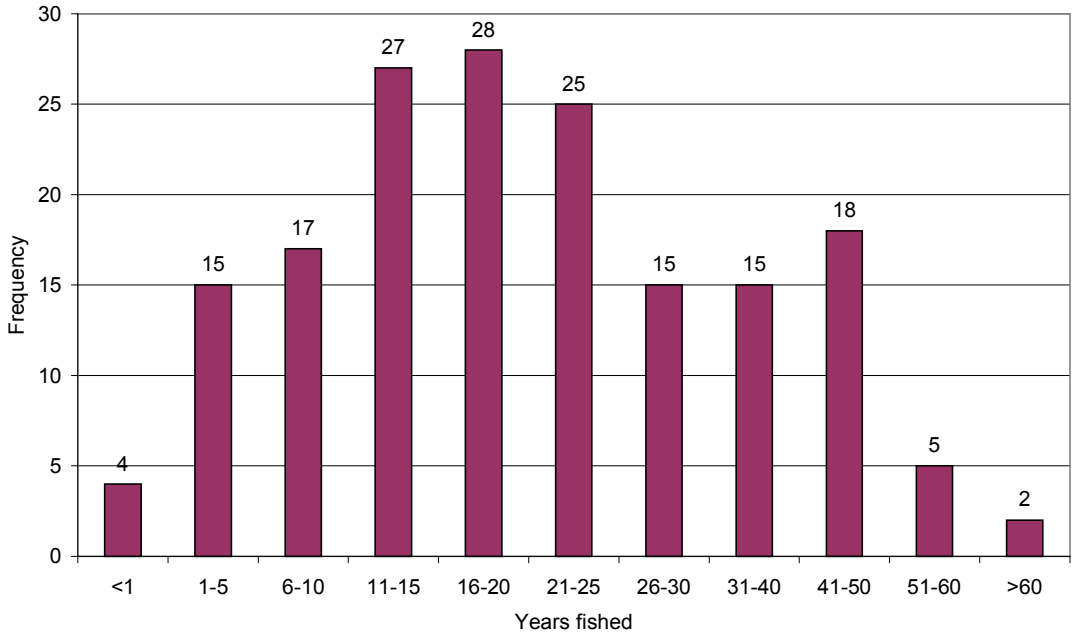
A measure of fisher's experience, which contributes to the sense of fishing industry involvement and community, is the years of fisher involvement with the industry. License record information goes back to 1977 for the EPT fishers, have been summarised in Figure H4 and shows that 31% of fishers interviewed were fishing prior to 1977 when current electronic licence records began.

Figure H4: Number of years EPT fishers have been licenced in NSW (NSWF licence data).



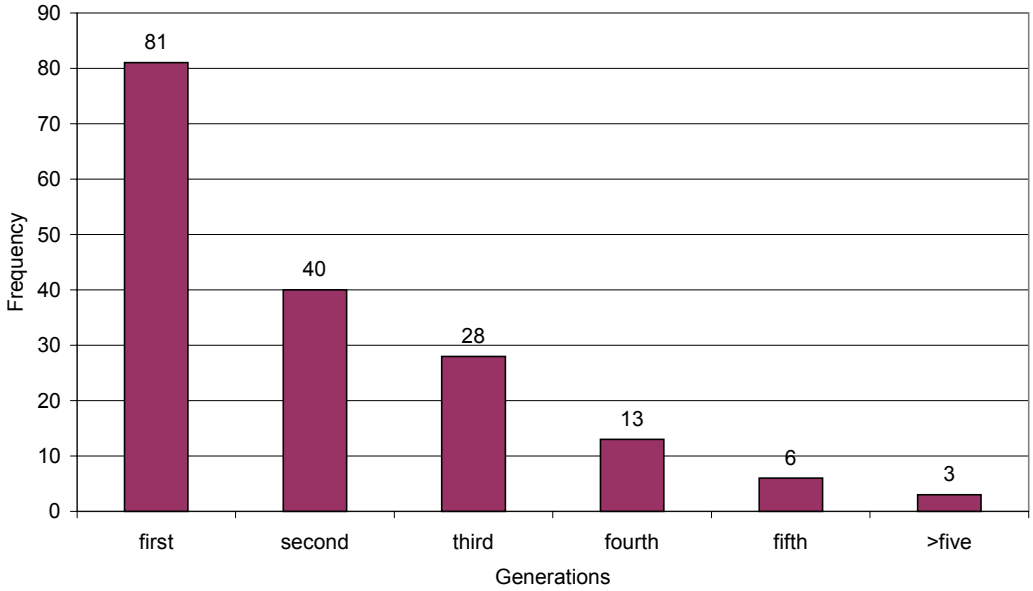
The mean licence duration is 15.0 years representing 5,241 person years fishing experience among 349 fishers. Of the 349 fishers for whom records are available, 60% have over 20 years of experience. Fishers have also been entering the EPT fishery in recent years. Figure H5 reports how many years fishers had been in the NSW fishing industry as recorded in the social survey.

Figure H5: Frequency plot of years fished by EPT fishers in NSW fishing industry (Source: RM-ES).



Both private and social capital are potentially seen in family involvement in fishing. Fishers were asked how many generations their family had been in the NSW Fishing industry and results are reported in Figure H6.

Figure H6: Frequency plot of number of generations in the EPT Fishery (Source: RM-SS).

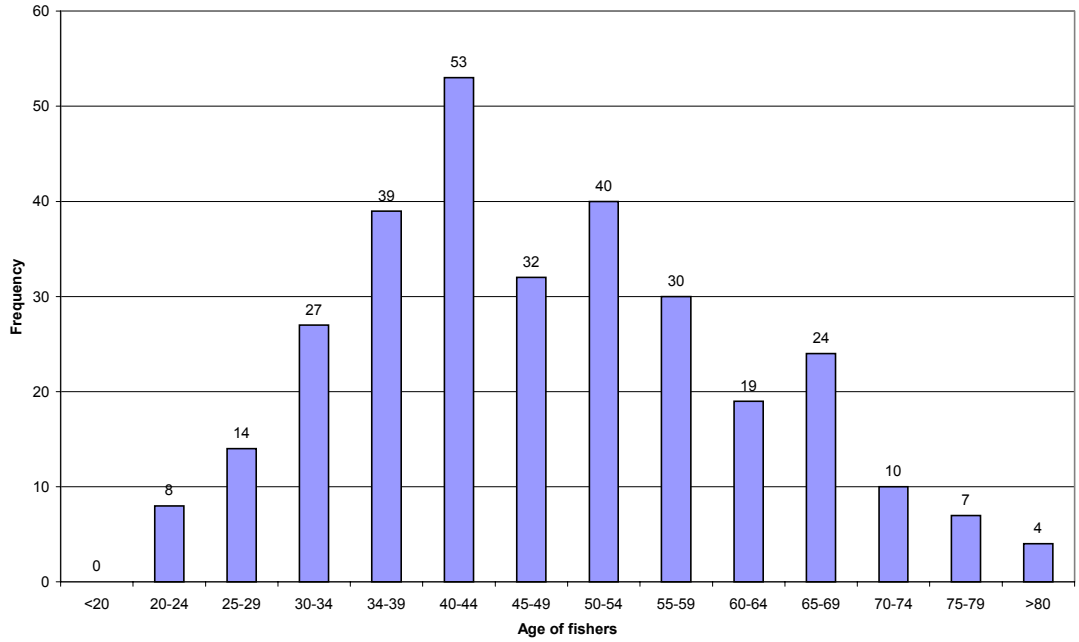


There are 47% of EPT fishers who are first generation fishers, 23% who are second generation and that 30% of EPT fishers were third or more generation. The 47% of first generation fishers, reflect entrants who may be more capable of adjustment, than fishers from multi-generational fishing families. There are 53% of fishers with a two or more generations of involvement in fishing, which may indicate longer term social association and integration with communities and potential to be significant contributors to social capital.

Age profile of licensed EPT fishers

The ages obtained from licence records of fishers operating in the 1999-2000 period are reported in Figure H7 for all EPT fishers and those active in 1999-2000. For 349 records the mean age is 47.1 years. Of these, 20 % are aged greater than 60 years and will be entitled to the age pension within the lifetime of the FMS.

Figure H7: Age distribution of EPT fishers (Source: NSWF licence records)



The extent of part-time and full-time fishing is reported in the economic issues Chapter G, Table G9. The fisher skills base was investigated through questions in the social survey. Fishers were asked about their current work in other industries and their capacity and willingness to transfer from fishing to other industries. 22% of EPT fishers worked in other industries. Of these 38 EPT fishers (from 171 interviewed) who were undertaking paid work outside the industry:

- 26% would consider earning all their income from that other industry;
- 71% would not; and
- 3% were undecided.

All 171 EPT fishers were asked about their capacity to consider alternative employment either full-time, part-time, or could not get employed outside fishing, as fishing is "all I know":

- 13% (23) could get FT employment outside fishing
- 15% (26) could get PT employment outside fishing and
- 67% (115) could not get employed outside fishing – fishing is "all I know".
- 4% (7) Don't know/ can't say.

The 115 fishers from 171 who answered "I probably could not get employed outside fishing, as fishing is all I know" were asked if they would consider retraining. A total of 17% (19) would and 83% (96) would not, consider re-training or were undecided. The 96 fishers who would not consider retraining, were asked about their reasons which are reported in Table H6. Participants generally gave more than one response.

Table H6: Reasons for not considering retraining to industries outside fishing (Source: RM-SS).

	EPT	%
I'm too old	46	29%
I enjoy fishing	38	24%
Fishing is only industry I know	36	23%
I've invested in equipment	11	7%
It's a family business	8	5%
Bad health/injuries	4	3%
Illiterate/Low education	3	2%
Risk of unemployment	2	1%
Language barrier	2	1%
Other	6	4%
Can't say	0	0%
n=	96	100%

Age was the major reason for not considering retraining for 29% of the sample, followed by only having experience in the fishing industry and enjoying fishing. All of these are inhibitors to the mobility of labour. Those who indicated a willingness to retrain were asked about their interest in retraining into other industries. The results are reported in Table H7.

Table H7: Industries which fisher would consider retraining into (Source: RM-SS).

Industry	EPT	%
Charter fishing	3	16%
Landscaping	1	5%
Tourism	1	5%
Government	1	5%
Other	8	42%
Can't say	5	26%
n=	19	100%

Discussion

The social survey information show the EPT fishers to be dependent on the fishing industry with approximately 83% of fishers indicating they have limited capacity or willingness to move from fishing to other employment. Approximately 26% would be able to consider employment outside fishing. Of those who would not, experience, age, education and a high level of fisher self identification, inhibit fishers' capacity to move to other industries. This "psychic income" from fishing is highly regarded by fishers, who do not feel they would be satisfied by other work in the same way. This reduces fisher mobility in the work force.

There has been little investigation of fisher mobility in the Australian fishing industry, but some notable social studies, such as Bell and Nalson's seminal study in 1974, focus on issues for NSW dairy farmers facing industry viability and restructuring issues. Farmers were found to have strong identification with the land, farming and had low mobility. A range of quotes about the mobility of

farmers from Bell and Nalson, (1974) is presented in Box H2 and may apply to fishers in the EPT fishery.

Box H2: Quotes on social mobility issues for dairy farmers in northern NSW (Bell and Nalson, 1974).

It is not necessarily the worst farmers who leave the industry, but those who recognise other opportunities and are prepared to take the risk of turning to some other occupation. …..those that remain could be a hard core residue of economically and socially depressed farmers.

Farmers with off farm work were less inclined to be in poverty, compared with those without dual occupations
Few respondents had alternative work. Social explanations are that farmers are farmers by tradition and it may also reflect lack of available opportunities for alternative work in different areas.

Social reasons for exiting farming may be the long hours involved in the industry, affording little leisure time, the advanced age of respondents and their wives, a potential labour shortage through sons leaving the industry, and reasons such as sickness and disputes around farming issues.

Old farmers, with no one following in the business, were not prepared to invest in new equipment.

Parents may not be encouraging children into the industry, but encourage education etc.

"Retreat farming" with the farmer holding on until eligible to receive the old age pension. Wife dissatisfaction is a major social influence in the dairy sector.

Many respondents were third generation and value farming as a way of life. With the independence it affords, are loath to leave their local social environment, friends, neighbours and relatives and the voluntary associations in which they have been active.

Away from farming they will have to compete with others for land based jobs. There may be a shortage of part-time labouring jobs.

The intergenerational nature of occupational mobility - most farmers transfer from one type of farming to another. Socially many farmers stay within 30 miles of place of birth. These ties may prevent farmers taking opportunities outside their area.

Farmers are independent and have a history of shunning government initiatives preferring voluntary adjustment.
They also tend to shun the CES (Commonwealth Employment Service) and rely on their own initiative.

A study analogous to the Bell and Nalson's work, is required across all fishers in NSW to confirm this material. There are significant social issues for fishers below retirement age seeking other employment. These will vary from area to area as indicated later in the social assessment.

Regions fished and regional unemployment statistics

The regional importance of the EPT fishery to the local community is reported in Table H1 and H2. Unemployment data is available from current ABS statistics (ABS, 2001) only at a more aggregated level than the 1996 census data, which is available for each postcode. Table H8a reports recent ABS unemployment data as of February 2001 for rural areas of coastal NSW.

Table H8a: ABS statistical regions and rural coastal area male unemployment (ABS, Feb. 2001).

	Labour force ('000)	Unemployed Feb. 2001 ('000)	% Male
Richmond-Tweed & Mid-North Coast SRs	106.1	15.8	14.9%
Gosford -Wyong SR	71.4	6.2	8.7%
Hunter SR	171.8	18.1	10.5%
Newcastle SR	149.8	17.4	10.5%
Sydney	-	-	6.0%
Illawarra SR	112.2	8.4	7.5%
South Eastern SR	152.9	12.2	8.0%
NSW Total			**7.2%**

Regional unemployment data indicates higher rates of unemployment in areas away from Sydney, being higher in the north than in the south. Male unemployment by age group also varies in NSW as reported in Table H8b.

Table H8b: Percentage male unemployment in NSW (ABS, Feb. 2001).

Age	**15-19**	**20-24**	**25-34**	**35-44**	**45-54**	**55 and over**
%	21.9	10.6	6.6	5	4.8	4.9

The fishing population in the EPT fishery is almost entirely male, with only 2 female fishers, from 349 endorsements. More detailed statistics for unemployment by regional postcode are available from ABS 1996 census statistics in Table H2. This gives a longer term view of regional unemployment in postcodes of coastal NSW.

Fisher numbers and unemployment at the postcode level are reported in Table H1 and H2. The range of unemployment is from 7% in Sydney, to 27% in Woombah/Others area in the Clarence region. The impact of the FMS and unemployment are assessed in the second part of this report.

(ii) community views and perceptions

Views of community

The EPT fishers are a part of the rural coastal NSW community, being aggregated around the five estuaries in which estuarine prawn trawling is permitted. There have been no formal studies of community values, views and perceptions and this require further research.

Views of the community on commercial prawn trawling in estuaries are varied. The Hunter, Port Jackson and Botany Bay have weekend closures and time for fishing, thus limiting the public awareness of commercial fishers. The public often note occasional dead fish, odours and wastes associated with commercial fishing as evidenced by letters received by NSW Fisheries. Similarly

landing sites and fish cleaning areas can reduce amenity. Definitive public views on fishing are difficult to obtain given the differing views on fishing issues within the community.

A public telephone survey was undertaken by Roy Morgan Research in 1999 investigating general community attitudes to a recreational fishing licence. There was a general community concern that the marine environment should be looked after. The Roy Morgan (1999) survey of 500 persons in NSW indicated that 95% of person felt it was important "that our fish stocks are well looked after". In the same survey 44% of responses prioritise "looking after the environment" as the most important aspect of managing fisheries.

Other opinions from the public, have been aired as part of the Recreational Fishing Area (RFA) process. The views reflect the context of the RFA debate and are not cited here.

The community expect EPT fishers to provide fresh seafood for the majority of the population who do not catch their own prawns and fish. This is also difficult to measure, but is evidenced by local demand for prawns.

(c) Identify current interaction of commercial fishing with the community including

(i) other recreational activities – boating, swimming, diving, whale/seal watching and other eco-tourism activities, discuss the potential for conflicts and synergies on a regional/subregional basis through interaction with recreational fishers, eco-tourism and related activities;

Regional marine leisure activity and integrated sea use between competing user groups

Coastal NSW has a great diversity in marine leisure activities. There is no definitive study on marine leisure activities in the NSW coastal region and data is lacking. Marine leisure activities tend to follow population distributions, or population movements, such as annual holidays to selected estuary regions.

Charter fishing usually goes offshore, but uses estuaries for some types of fishing, depending on the region. There is little formal whale watching activity, but general pleasure cruises occur in tourist venues close to Sydney (eg. Port Stephens etc). Recreational boating takes place along the NSW coast, but also in estuaries where many sail schools and water skiing activities prefer the shelter of

the estuary environment. Diving takes place along the coast and in estuaries, where spear fishing may also take place or be subject to restrictions.

The potential for conflict is minimised by commercial fishers not fishing openly at times of high tourist activity, or only fishing in areas not frequented by tourists. Commercial fishers in the Hawkesbury have agreed to close areas at weekends so as to reduce conflict with water skiing enthusiasts. Tourists enjoy the fish and prawns cooked at the local fish shop or Coop, as evidenced by seafood sales in tourist destinations, but are also concerned over loss of environmental amenity (Roy Morgan, 1999). Recreational fishers also use locally produced prawns as a major bait source. This local production of bait prawns is preferable to prawns being imported from other areas, or even abroad creating bio-security concerns.

(ii) the visual and amenity issues

The estuary fishers can both contribute and detract from visual amenity. Tourists expect to see small working boats pulled along side on the edge of the estuary, but may object to fish odours, nets drying and fish offal/ frames disposed of in inappropriate ways, such as on shore. Similarly, processing establishments and recreational fish cleaning areas can attract pelicans and birds to feed on scraps, which may not be seen as a visual or health amenity. This can be related to fish sorting practices which can leave small numbers of dead fish washed up on shore. Many of these issues can be addressed within industry and at the local council level.

(2) Likely social implications of implementing the plan

This section evaluates the social impacts of implementing the EPT Fisheries Management Strategy according to the environmental assessment guidelines issued by Planning NSW. Social impact assessment (SIA) of fishery management plans is a recent innovation in NSW. This is an assessment of social issues under the Planning NSW guidelines related to the implementation of the EPT FMS. The analysis is constrained by the available information, the resources available to the study and the lack of background information in this emerging area.

There is not an accepted fishery specific methodology to assessing social issues and relevant approaches are available from other natural resource industries. In the NSW Government's *Guidelines for assessing social impacts* (NSW Government 1997b) the following measure of community well being are recommended:

- Economic and financial measures - income measures, poverty lines, household expenditure, unemployment rates and indicators of business activity;
- Quality of life measures - leisure time, air and water quality, rates of illness and life expectancy, educational attainment levels, housing size and density, availability of social services;
- An assessment of intangible factors- quality of life measures, such as community spirit, levels of social cohesion, confidence in public institutions and intangible aspects of social well being including "social capital".

The NSW Government guidelines indicate there is no one measure of social well being and that while economic measures dominate many assessments, the quality of life measures and intangibles should be considered in policy assessment. Governments can use social assessments to "better anticipate the effects on policies and programs". When social impacts are made more transparent, policy trade-offs are highlighted and subsidiary policies to deal with negative impacts on particular areas and groups may be formulated" (NSW Government, 1997b). The social impact assessment in fisheries management plans in Australia is a new development.

Methods of Social Impact Assessment (SIA)

The NSW Government Guidelines suggest "it is not possible to establish a single SIA methodology to apply at a state-wide policy and program level because of the nature and impact of the policies often extend across regions and groups" (NSW Government, 1997b, p9). The guidelines set a broad perspective or framework for social assessment summarised in a "quick test summary table" (NSW Government, 1997b, p23) as shown in Box H4.

Box H4: Quick test summary table (adapted from NSW Government, 1997b, p23).

1)Describe the policy objective
2) Identify the social impacts of the proposed policy
3) Measuring change and social impacts
4) Evaluating social impacts and social justice principles
5) Responding to impacts (monitoring, management and mitigation)

Further Government guidelines extend to the *Rural Community Impacts Statements* (NSW Government 1997a). In these the economic and social characteristics of rural communities in NSW are specifically recognised and recommended to be included in government decision making as summarised in Box H5. It is likely that rural fishing communities in coastal NSW struggle with similar issues.

Box H5: Summary of Characteristics Rural Communities after NSW Government, (1997a).

Geographic isolation - business being based at a distance from suppliers or markets;
A narrow and variable economic base- being dependant on one industry, coal mining, forestry, fishing etc, also being influence by public sector employment changes;
Physical isolation and small population size – individual families may live outside community centres and a greater distance from a more substantial regional service centre. Isolation limits social interaction, cultural and employment opportunities and access to public sector services and facilities. Communities may have small populations and express feelings of vulnerability being at a distance from the central decision making process.
A strong 'self help' culture – rural and regional communities are often "typified by values of self reliance, resourcefulness and independence, often responding to opportunities or threats with a strong and cohesive communal spirit".

A strong attachment to place – strong emotional/cultural attachments to as geographical location or place.

Rural industries have a major impact in the environment - rural and regional communities are custodians of most of the land of the state and intensively use natural resources.
Economic performance is dependent on environmental conditions – primary industries depend on environmental resources used as their inputs.

Social impacts and fisheries management

The social impact assessment of Fisheries management strategies in NSW is a new development and requires some adaptation of accepted analytical frameworks for assessment to suit the fisheries issues and to fulfil the environmental assessment guidelines issued by Planning NSW. In natural resource studies a four stage procedural framework is proposed by Fenton et al. (2000) as: Assessment (including scoping and profiling); Prediction; Mitigation; and Monitoring.

These steps concur with the Planning NSW and NSW Government Social Impact guidelines (NSW Government 1997b). However, the appraisal of social impacts of management of a natural resource also needs to incorporate the linkages between the changes in the social system induced by management and the affect on the resource system, and how changes in the resource system impact the social system. Fenton et al. (2000) recommend that the direction, strength, duration and positive and negative effects of the social system/resource system interactions, also need to be recognised. This can happen at several levels, but has a high information requirement beyond the scope of the current study and is recommended work in section 3.

Assessment of the social impacts of the FMS

It is proposed that the following approach will be taken to analysis of social impacts of the fisheries management strategy against the environmental assessment guidelines issued by Planning NSW seen in section H2.2.

Social issues arising from implementing a new management plan fall into several categories.

Firstly, there are socio-economic impacts arising directly from how the fisheries management strategy impacts the resource and the social system, including the community. Secondly, a plan brings change with social issues to be addressed by fishers. The socio-economic impacts are most readily quantified. Other measures of the capacity and willingness of fishers to respond or incorporate change are more difficult to estimate, requiring substantial fisher consultation and communication.

The current study prioritises the socio-economic impacts from the FMS. Other elements may be deemed to be important to individual fishers, but there is insufficient baseline information to independently evaluate fishers' opinions. The intention in a co-management consultation process,

is that the development of the FMS has taken the fisher's viewpoint into account through the management advisory committee system and port meetings, outlining the intention of the FMS.
The following procedure was used to identify and rank social impacts. The fisheries management objective, with potential social impact and the response under the management strategy, are described and presented in Table form.

The social impacts of each management strategy response are identified on fishers and the community and responses ranked into three levels – High, Medium and Low. The ranking reflects the predicted scale of social impact. For example, social impact may be determined as a function of the number of fishers affected by a policy, times the degree of impact of the policy on each fisher, or on the community.

The assessment

The management goals and the responses in the FMS were examined and those with potential social impacts are presented in Table H9. They were then ranked in order of predicted social impact. Priority was given to the socio-economic dislocation arising from impacts identified in the previous economic assessment, given their potential impact greatest numbers of fishers and families in the fishing community.

Ranked medium after issues with socio-economic dislocation, are social impacts with implications for fisher practices, the community, or which may be socially contentious, or require social co-operation. For example, the establishment of the Prawn Resource Forum, the development of the indigenous fishing strategy, weekend closures and the scientific observer program will require considerable social co-operation and have social impacts. Similarly, changes in prawn count size rules, safefood practices, owner operator policy and maximum shareholdings will have social ramifications.

Thirdly, there are numerous responses which have social implications for industry with compliance issues and communication within the fishing community. These low ranked responses are socially impacting in that failure to keep addressing conflict, compliance and communication issues, will adversely impact the co-management process and hence management of the fishery, to the detriment of the community. These issues are central to the functioning of the new management strategy and to the reduction of conflict among stakeholders and with the community. Social impacts will be addressed in section 1.3(ii) below.

Table H9: Ranking of socially impacting responses for the EPT Fisheries Management Strategy.

RESPONSE	DESCRIPTION OF RESPONSE	GOALS	ISSUES	RANKING
2.1(f)	Review maximum counts for eastern king and school prawns	4,5	EFFORT	HIGH
2.2(a)	Encourage the appropriate level of fishing effort to minimise overfishing	4,5,8	EFFORT	HIGH
2.1(e)	Implement maximum counts on prawns in each zone	4,5	EFFORT	HIGH
2.3(a)	Implement separate management rules for each zone	4,5,8	EFFORT	HIGH
2.3(b)	TAC Committee to determine the Total Allowable Effort on primary species	4,5,7,8	EFFORT	HIGH
2.3(c) - pt 1	Minimum shareholdings to limit the number of vessels and operators in each zone.	1,4,5,7	EFFORT	HIGH
2.3(c) - pt 2	Limit the number of fishing days for each zone	1,4,5,7	EFFORT	HIGH
2.3(c) - pt 3	Limit the number of fishing days for businesses upon past participation	1,4,5,7	EFFORT	HIGH
2.4(b)	Establish minimum shareholdings at the fishing business level to contain effort	3,4,5,6,7	EFFORT	HIGH
5.1	Optimise the biological yield of prawns so that economic return is maximised	3	SE	HIGH
4.2(d)	Use the Prawn Resource Forum to discuss maximum counts and minimum lengths	2,5,6,8	SE	HIGH
5.1(a)	Determine a count and size at first capture for prawns and squid	1,2,4,5	SE	HIGH
5.3(b)	Prohibit shareholders in the fishery from owning maximum fisher shareholding	4	SE	HIGH
5.2	Promote the economic viability of EPT fishing	3,4	VIAB	HIGH
5.3	Provide secure fishing entitlement for EPT fishers	2,3,4,8	VIAB	HIGH
1.1(f) pt 1	Fishing closures to control area and time fished - conserve species	2,3,4,5	CLOSURES	MEDIUM
1.1(f) pt 5	Fishing closures to control area and time fished - promote harmony	2,3,4,5	CLOSURES	MEDIUM
2.4(a)	Implement an owner operator rule for estuary prawn trawl fishing businesses	3,4,5	EFFORT	MEDIUM
4.3(a)	Participate in development of the Indigenous Fishing Strategy	2,3,8	EQ	MEDIUM
5.4(a)	Co-operate with Safefood Production in the development of food safety programs		MARKET	MEDIUM
8.1(a)	Develop a scientific observer program for information and quality control.	1,2,3,7	SE	MEDIUM
4.4(a)	Investigate closing all zones to trawling on weekends and public holidays	1,2	SE	MEDIUM
2.1(d)	Promote research on prawn and squid populations	1,4,5,6,7,8	COMM	LOW
2.5(c)	EPT MAC contribute to NSW Fisheries reviews of the habitat management policy	1,6,8	COMM	LOW
2.5(d)	EPT MAC will contribute to policies and legislation of other Governmment agencies	1,6,8	COMM	LOW
6.3(a)	Utilise the EPT MAC as primary consultative body for issues affecting the fishery	1,3,4,7,8	COMM	LOW
6.3(b)	Utilise the services of an Independent Chair in the EPT MAC	3,5,8	COMM	LOW
8.1(c)	Issue of research permits under section 37 authorising research programs	6	COMM	LOW
7.1(a) pt 1	FMS & Environmental Assessment accessible to public via NSW Fisheries website	4,6,8	COMM	LOW
7.1(a) pt 2	FMS & Environmental Assessment accessible to public via Fisheries offices	4,6,8	COMM	LOW
7.1(a) pt 3	FMS & Environmental Assessment accessible to public via targeted mailouts	4,6,8	COMM	LOW
7.1(b)	Produce brochures, newsletters and educational programs	4,6,8	COMM	LOW
7.1(c)	Respond to inquiries by industry or the public with respect to FMS	4,6,8	COMM	LOW
7.2(a)	Publish educational information on the protection of fish habitat	4,6,8	COMM	LOW
4.1 (b)	Monitor commercial landings of prawn and squid species	2,5,	COMP	LOW
2.5(a)	NSW Fisheries continue review development applications with impacts on fishery	1,3,5	COMP	LOW
2.5(b)	EPT MAC will consider the impacts of activities external to the fishery on the resource	1,3,6,8	COMP	LOW
4.1 (a)	Assess the size of the non-commercial and illegal catch	2,3,5,6,7,8	COMP	LOW
6.1(b)	Endorsement suspension and share forfeiture scheme for serious offences	4,7,8	COMP	LOW
8.2(a)	Periodic review of catch & effort forms - sufficient for environmental assessment?	1,2,4,6	COMP	LOW
8.2(b)	Determine accuracy of current recording of species identification in catch records	1,2,4,6,7	COMP	LOW
4.2(b)	Monitor commercial landings by zone	2,5	EFFORT	LOW
4.2(c)	Limit the quantities of byproduct species	1,2	EFFORT	LOW
2.1(g)	Ascertain the need for legal minimum length for squid	5	EFFORT	LOW
2.3(d)	Maintain the boat replacement policy	1,5,6,8	EFFORT	LOW
2.6(c)	Under a recovery plan for a species, implement precautionary actions	1,3,5	EFFORT	LOW
1.4(a)	Implement measures under Marine Pest or Disease Management Plans	3	SE	LOW
6.2(a)	Continue the prohibition of taking fish for sale as authorised by fishing license	2,5	SE	LOW
2.6(b)	Minor harvester of overfished species - Develop and implement a recovery plan	1,4,5,6	SE	LOW
2.6(a)	Major harvester of overfished species - Develop and implement a recovery plan	1,4,5,6	SE	LOW
4.2(a)	Monitor the catch of prawn and squid species taken in other commercial fisheries	2,3,5,6,7	SE	LOW

Categories: SE socio-economic, EQ Equity, IND Industry practices, COMP Compliance, COMM Communication.

(1.2) **Health issues -** Not in Dominion's TOR

(1.3) Social implication for fishers of any changes in resource allocations

(a) predict the likely social implications of maintaining the present resource allocation rules.

Appraise rules and social impact

The current rules in the EPT fishery impact fishers in several ways. The high number of EPT entitlements and latent effort, may reflect diversified fishing businesses where many fishers are part-time and fish seasonally in the EPT fishery. About 33% of EPT businesses revenue is from the EPT fishery (see Table G4).

Under the current management regime there are limited mechanisms to assist re structuring. Responses proposed under the FMS will reduce the number of fishing businesses through the introduction of category 2 share management and minimum entry requirements at the fishing business level, giving fishers stronger fishing rights and a market for shares, enabling fishers to exit with a payment on sale of shares.

The predicted social impact of maintaining the present rules on fishing effort are that they may not sufficiently address economic viability and resource sustainability concerns at the regional level and risk. The FMS will enable effort and stock concerns to be addressed by a total allowable effort limit and minimum shareholding provisions at the estuary level to reduce capacity in a given estuary. This will impact and displace some fishers.

The predicted outcomes from maintaining current rules are that in five years time there will be many older, low or non catching fishers, who will not readily be able to financially realise the value of their fishing endorsement or business. The move to shareholdings will enable fishers to exit the fishery with a payment. The resource will also be more adequately safeguarded through the ability of industry to respond to fluctuations through more transparent access mechanisms and ways to adjust effort in the fishery.

Current management of the Estuary Prawn Trawl fishery is in relative isolation from the management of the general prawn catch in the estuaries, through net and trap methods and from the Ocean Prawn Trawl fishery. The Prawn Resource Forum is proposed under the FMS to address collaborative management and optimal harvesting of the prawns species which migrate from estuary to sea. Several issues in the fishery, such as prawn minimum size limits may lead to increased social conflict within industry sectors and between industry and other sectors if not addressed as proposed under the FMS (NSWF, 2000).

(b) outline any implications on fishers, their families or any local communities from any changes in the resource allocations including the likely social impacts on particular sectors (eg in certain locations, sub-regions or regions) if changes in the resource allocations were implemented; outline any possible measures which could be taken to mitigate any impacts

Implications of FMS changes

Significant social impacts are identified from Table H9 in the FMS. The implications of major impacts are examined on fishers, families and communities.

Managing businesses by minimum shareholdings

The FMS proposes to address industry viability and capacity through the implementation of category 2 share management and the use of minimum shareholdings at the business level (response 2.4b). Estimates of adjustment in the EPT fishery in the economic issues section (Chapter G) indicate that 36 of 241 businesses may be removed by share trading in the 2002-2007 period. In the next five years 15% of 254 EPT entitled fishers, approximately 38 fishers, will be displaced. These may be mostly elderly fishers, or latent effort holders and low catchers grossing less than $10,000 per year.

The use of minimum shareholdings to address effort levels in regions, together with the total allowable effort limit (response 2.3c, pt 1) will also impact EPT fishers, but the extent in terms of exiting fishing depends on their business's other endorsement holdings. It is likely that the impact of adjusting businesses and effort at the endorsement level will have a cumulative effect on top of business adjustments. A value of 5% has been assumed over 5 years, but this depends on the extent of the effort limits in each area.

Given the number of multiple endorsed businesses, particularly with Estuary General endorsements, there may be significant cumulative impacts from the EG FMS on EPT business numbers. Similarly the RFA process will reduce EPT endorsement holdings to an unknown extent through cumulative impact.

It is predicted that the removed businesses would be a mix of latent effort holders, and fishers who catch below $10,000 per year. The profile of these groups is investigated via the social survey and results reported in Appendix H3. Latent effort in the EPT is in regions 2, 4 and 5 where latent effort is 22%, 38% and 45% respectively (Appendix Table AH4). Businesses with less that $10,000 revenue from all fishing are in regions 2,4 and 5 with 8%, 11% and 26% of fishers.

In summary, latent effort is held by fishers who have fished in the past, are not necessarily old and are probably undertaking some alternative employment. They have a mix of fishing experience and family connections with the fishing industry and have a limited capacity to retrain. Fishers earning less than $10,000 are part-time prawn fishers stating a willingness to work in other industries full-time. For both latent effort and low catchers, there is a limited capacity and willingness to retrain.

Effort limits and minimum shareholdings

Other high ranking social issues are effort related measures with separate rules for each prawn estuary, limiting effort per zone through a total allowable effort limit and the implementation of minimum shareholdings. This will raise issues of displacement among fishers as about 5% of fishers may be displaced as estimated in section G.

This equates to 5% of endorsement holders being impacted on top of the 15% from the business adjustment. It is not possible to tell which estuaries will be most affected, but approximately 5% of 254 endorsed fishers would be impacted, approximately 13 fishers in all.

Optimal prawn management

Social and economic impacts will arise from the implementation of a range of measures surrounding more optimal management of the estuarine prawn resource. The establishment of the Prawn Resource Forum (PRF) and a range of measures such as minimum and maximum counts in each zone and on prawn species, will address the management of optimal economic and biological prawn yields. Alternative harvesting practices at different points of the prawn lifecycle could be implemented. Significant social cooperation will be needed in implementing the Prawn Resource Forum and in operationalising optimal management regimes, in which social implications should be addressed.

Several medium impacting polices are in introducing closed areas to protect stocks and promote species recovery. Part of the proposed closures are for the weekends and public holidays and will have social benefits through reduction of conflict and greater amenity for marine recreationalists and the community. Social cooperation will be needed in developing the indigenous fishing strategy and implementing the owner operator ruling.

Low level social issues will arise from processes requiring good communication between management, stakeholders and the community. Several compliance issues also arise which require social cooperation as do recovery plans and pest invasion responses.

Discussion

Regional impacts of any changes under the FMS can be estimated from the information reported from ABS social data in Table H1. The impacts of a 20% reduction in fisher numbers across the EPT fishing communities is assumed and is reported in Table H10.

Table H10: Summary table of social indices for EPT fishers with an estimated reduction of 20% in fisher numbers shown by district and zone (adapted from Table H1).

Zone	Home District	P'code Population	P'code Fishers	EPT P'code Fishers	20% of EPT Fisher numbers	Un employed (%)	SEIFA	Med. Ind. Income (wk)	Employed in C.F. as (%) of labour force	Employed in EPT as (%) of labour force
1	TWEED	7,976	19	1	0.2	16.2	921	250	0.41	0.02
	RICHMOND	4,374	35	6	1.2	18.1	909	215	1.02	0.17
	Zone	**12,350**	**54**	**7**	**1.4**	**17.1**	**915**	**233**	**0.72**	**0.10**
2	**CLARENCE**	**43,353**	**259**	**121**	**24.2**	**18.8**	**919**	**222**	**3.12**	**1.46**
3	COFFS HARBOUR	44,336	72	5	1.0	18.1	958	250	0.35	0.02
	HASTINGS	27,129	53	4	0.8	19.0	921	215	0.78	0.06
	Zone	**71,465**	**125**	**9**	**1.8**	**18.6**	**940**	**233**	**0.57**	**0.04**
4	MANNING	9,566	45	5	1.0	19.3	896	180	0.65	0.07
	WALLIS LAKE	19,457	88	2	0.4	15.1	939	250	2.78	0.06
	PORT STEPHENS	52,562	101	6	1.2	13.0	967	250	1.33	0.08
	HUNTER	30,332	45	14	2.8	14.9	915	226	0.23	0.07
	CENTRAL COAST	159,297	62	25	5.0	10.6	978	270	0.00	0.00
	Zone	**189,629**	**341**	**52**	**10.4**	**12.7**	**946**	**248**	**0.11**	**0.04**
5	HAWKESBURY	2,380	30	28	5.6	7.4	1004	300	0.00	0.00
	SYDNEY	3,276,207	189	84	16.8	7.3	1047	350	0.00	0.00
	Zone	**3,278,587**	**219**	**112**	**22.4**	**7.4**	**1026**	**325**	**0.00**	**0.00**
6	ILLAWARRA	6,653	18	1	0.2	19.0	827	180	0.10	0.01
	SHOALHAVEN	53,871	75	2	0.4	15.1	945	215	0.81	0.02
	Zone	**60,524**	**93**	**3**	**0.6**	**17.1**	**886**	**198**	**0.46**	**0.01**
Grand Total		**3,989,867**	**1,091**	**304**	**60.8**	**15.3**	**943**	**235**	**1.03**	**0.25**

The number of EPT fishers in zone 2, (Clarence), zone 5, (Hawkesbury) and zone 4 (Manning to Central Coast) are highest. An estimate of EPT fishing community vulnerability to social and economic impacts is reported in Table H11. This ranks EPT fishers as proportion of labour force, ranked highest to lowest to show dependence, and the SEIFA index, ranked lowest to highest to show relative disadvantage. They are combined to give a joint ranking of community vulnerability. Table H10 indicates the potential impact on fishing communities of a 20% reduction in fisher numbers. Table H11 is an index of the vulnerability of EPT fishing communities generated from ranking of community income dependence and the ranked SEIFA index giving each equal weighting.

Table H11: Joint ranking of community vulnerability for EPT fishers, (from ABS and NSWF data).

Home District	Employed in EPT as (%) of labour force	Rank Labour	SEIFA	Rank SEIFA	Joint rank score
CLARENCE	1.46	1	919	5	5
RICHMOND	0.17	2	909	3	6
MANNING	0.07	4	896	2	8
ILLAWARRA	0.01	11	827	1	11
HUNTER	0.07	4	915	4	16
HASTINGS	0.06	5	921	6	30
PORT STEPHENS	0.08	3	967	11	33
WALLIS LAKE	0.06	5	939	8	40
TWEED	0.02	7	921	6	42
SHOALHAVEN	0.02	7	945	9	63
COFFS HARBOUR	0.02	7	958	10	70
CENTRAL COAST	0.00	12	978	12	144
HAWKESBURY	0.00	12	1004	13	156
SYDNEY	0.00	12	1047	14	168

This indicates that the EPT fishing communities in the Clarence River area are most vulnerable, followed by the Hunter River postcode areas. They are most vulnerable to changes from the socio-economic impacts under the FMS given their higher dependence, lower SEIFA score, or a combination of both. For these communities, high unemployment, such as seen in the Clarence, also indicates potential difficulty in fishers finding alternative employment outside fishing.

It is apparent in Table H11, that outside of Sydney and the Central Coast, EPT fisher communities are more vulnerable to changes in their economic well being. This does not mean that fishing families in the Sydney/Central Coast area are less impacted by policies, but that these communities have more socio-economic alternatives than small rural isolated communities in coastal NSW. Table H2 presents SEIFA data at the post code level. Those postcodes within vulnerable districts with low SEIFA indices are identifiable and illustrate how small numbers of fishers in certain postcodes are vulnerable to socio-economic impacts. For example, Woombah in the Clarence region with SEIFA 864 and unemployment of 27.2% in the 1996 census (see Table H2)[2].

Under the FMS trading fishers can sell shares and receive a payment. This opportunity to exit may be taken by fishers over 60 years of age as a "superannuation package". Licence records indicate that approximately 20% of EPT fishers are likely candidates in the next five years, indicating that a 20% adjustment in the fishery, could be filled by elderly fishers alone. Part of the mitigation would

[2] As noted in Appendix H1, the Tables combining ABS and NSWF licence data are for postcodes with more than 10 NSW fishers. In the EPT analysis approximately another 20% of fishers live in postcodes with fewer than 10 fishers in the NSW fishing industry. The EPT analysis does not include these 20% of fishers and their communities could be relatively more impacted than those postcodes with more fishers.

be to investigate the position of elderly fishers and the impact of selling shares and receiving money on their age pension. Preliminary discussions with Centrelink indicate that income and asset tests apply and that a home owning fisher with partner, would be able to have $200,500 in assets in addition to their home, before the pension payment would be reduced. Few EPT businesses would exceed $100,000 and pension entitlements are unlikely to be impacted, though this depends on the financial status of the fisher.

The majority of fishers are below 60 years of age and wish to operate in EPT fishing as a business or way of life. The results of the social survey indicate that both business and lifestyle are important aspects of familial and social identity among EPT fishers. Some fishers are rural, low income part-time fishers, representing a "cottage industry", rather than the professional full-time industry proposed under the FMS (response 2.3b). This requires further study (see section 3).

The social impacts of displacement of between 15% and 20% of 310 fishers over 5 years, are estimated in Table H12, using data from the social survey results in Table H3.

Table H12: The number of dependants impacted by the removal of fishers in the 2002-2007 period (Source: RM-SS).

	Numbers		
Displaced fishers		**36**	**48**
Dependents			
Mean number of dependent children	1.6	58	77
No dependents	69%	0	0
Spouse	23%	13	18
Other dependents	14%	8	11
Total dependents		**79**	**105**

The numbers of dependants associated with 36-48 typical EPT fishers is between 79 and 105. This is an upper estimate, as if older fishers exit the fishery, then the number of dependent children below 16 reduce towards zero, making 21 to 29 dependants.

The impact of fisher displacement on the communities will also depend on the exiting fishers' catch levels (their current contribution towards output) and their alternative income source on leaving fishing. A multiplier of 1.5-2.0 (Dr R. Powell, pers. comm.) would apply to impacts where no other income, including social security was available. Displacing 20% of fishers under share management will only reduce catch by a few percent. Many of the fishers will move to other opportunities, or to the age pension and welfare. Any negative multiplier effects from any the change would be small in

the regional economy. However, there may be local distributional impacts in small townships were fishers live. Payment received from selling shares may assist the local economy, depending on the pattern of trade. Debt levels among remaining fishers would likely rise with economic and social consequences. Should an area have a large number of low income, elderly fishers, the impact of adjustment might be greater in that area. The pattern of trading under share management should be monitored.

Other social impacts

Other social impacts are ranked as Medium and Low. Most social issues identified in Table H9 require good communication among fishers and with the community. Some FMS industry developments require the cooperation of fishers in supporting scientific observer programs and food safety program development. Both of these will depend on the cooperation of fishers. Fishery closures to conserve species and promote harmony among resource users through restricting areas and times of access, including weekend and public holiday closures, is ranked medium as it will impact may commercial fishers.

In Table H9 the low ranked issues involve communication in the management process, compliance initiatives which need the social cooperation of fishers and several recovery plan and catch monitoring initiatives.

From the social survey, there were 16% of fishers interviewed state-wide who refused to complete social surveys. Such levels of resistance to FMS initiatives, could also impact the acceptance of new operating rules, or codes of conduct, to the detriment of the fishery and the community. Most of the low impact social responses in the FMS require the cooperation of fishers and management, in order to increase compliance. The policy changes have been discussed at the EPT Management Advisory Committee and through a series of port meetings about the FMS. Fishers reactions have been noted by NSW Fisheries staff as part of the FMS consultative process.

Response 2.2 (c) compares the social implications of implementing the strategy in the short, mid or longer term and identify existing or likely conflicts within or between communities, and consider the effects on conflicts of proposed changes in resource allocations

The reduction of conflict is needed in the EPT fishery. Mechanisms for better cooperation among fishers include the area and time closures to lessen conflict between fishers and other users of waterways, such as water skiers. Communication and the management advisory committee process

are central to reducing conflict in the different estuaries. The Prawn Resource Forum should also help in managing concerns over prawn use in the estuary and ocean fisheries and will be an initiative with short term and long term benefits in reducing conflict and promoting more regulated harvesting.

Many social issues are larger than can be resolved by the FMS and will only be resolved in longer time frames. For example, an FMS objective is achieving a "full-time professional industry" and hence presumably maximising the direct monetary returns from the EPT. Does a "full-time professional industry" give a more sustainable industry, than one comprised of part-time fishers? Questions need to be asked as to whether this objective is socially desirable and what social equity implications it has, given that lifestyle values, not direct financial returns, are a major motivation for many fishing activities. Valuing the activities of full-time professionals over those of part-time amateurs and possibly those of recreational and indigenous fishers as well, embodies judgements that may not be in accord with community values. The FMS may limit the number of fisheries a business can operate in and thus tend to increase part-time or seasonal fishing. In EPT, seasonal access can be either by full-time or part-time fishers, with justification for both. The social and ESD aspects of this issue needs to be examined in NSW, and even nationally, and is recommended in further work.

(d) Identify the likely change in attitudes to compliance and the likely changes in the level of compliance.

The implementation of the FMS will bring several challenges for compliance. It is envisaged that if the FMS responses are followed and communication and compliance are recognised in the co-management framework, then this will assist with the levels of compliance. Endorsement suspension and share forfeiture are being implemented for serious offences. The increases in the cost of operations and displacement of fishers may lead to an increase in illegal fishing. This would have to be monitored, particularly through information from fishers in each EPT estuary.

The economic survey revealed the importance of accurate catch and price data to the management system. The integrity and accuracy of catch data needs to be upheld to guarantee sustainability. When days effort become limited and minimum shareholdings apply, there will need to be substantial monitoring of the catch in the EPT, as incentives will exist to sell unrecorded catch for cash in order to meet new FMS charges. This would then impact the ability of management to accurately monitor catch levels and to maintain sustainable stocks. Mitigation of this in the management system may be to recognise the high variability in the inter-annual abundance of

prawn stocks and have flexible mechanisms to allow fishers to respond to fluctuations, hence reducing frustration among producers. Local management arrangements and the Prawn Resource Forum could contribute to this cooperative process with benefits to compliance levels.

(c) Justify the preferred approach in terms of ESD principles.

The ESD principles for economic assessment are presented in NSW Government (1997; annex 5) and are the precautionary principle, intergenerational equity, biodiversity principle and the valuation principle.

The EPT FMS intends to contain latent effort and adjust active effort across the fishery, through business adjustment and specific regional total allowable effort restrictions which will enable minimum shareholding provisions to reduce the number of fishers. The management process has previously had insufficient economic and social input and lacked mechanisms and incentives for fishers to adjust effort in the face of resource issues. The FMS addresses this and thus it is pursuing the inter-generational objective of ESD. Implementing the changes to business numbers through minimum shareholdings is also a positive step in developing incentive and value. As adjustment takes place, the fish resource should start to develop more value to the remaining fishers, increasing the incentive to steward the resource.

There are major social issues that may not be sufficiently addressed by the EPT FMS. Cross sectoral issues with recreational fishers are complicated by the RFA process, the impacts of which are unknown. However, much recreational prawning occurs in non commercial fishing areas.

The economic review has indicated some commercially viable fishers and many low income, part-time, life style fishers. In seeking more sustainable resource use it is unlikely that the desire of government to create a professional full-time fishing industry will suit the majority of fishers in the seasonal EPT fishery. The seasonal nature of the EPT resources and the most appropriate harvesting need further discussion and evaluation under ESD criteria. The Prawn Resource Forum, proposed in the FMS will help in this process. The EPT FMS, is a first step in management of the EPT fishery under ESD principles.

(3) Data requirements in relation to the assessment of the impacts on the social issues

(a) Provide reference to technical data and other information relied upon to assess impacts; indicated its reliability and what uncertainties (if any) are associated with the use of the data in the assessment of the FMS

As there was little social information on commercial fishers in NSW, ABS survey data (ABS, 1996) and a Rapid Social Appraisal questionnaire (Roy Morgan, 2001b) was executed by a telephone. This was a first step towards the incorporation of social information in the management of fishers in NSW. Given the complexity of the fisheries production inter relationships, multiple communities and political climate among industry members facing significant allocation issues, the survey sought to gain a rapid over view of social issues raised under the FMS.

The social survey was believed to be accurate, with minimal erroneous information. Responses to questions on income levels were lowest and the survey may have had some inaccurate responses on income levels. Mis-information was not readily detectable and a limited number of cross checks were available.

Data supplied from the Australian Bureau of Statistics (ABS) were related to the 1996 census and were dated, but the most accurate available at the postcode level for fishers. The ABS definition of fishers may be misleading including fishers in non Commonwealth fisheries, aquaculturists and also those who define themselves as “fishers”, as opposed to other industry categories in the census.

(b) Identify where there are gaps in knowledge important for the assessment of the impacts of the fishery

The social profile of EPT fishers can be augmented through time by further studies. Regional analysis of fisher communities is a priority integrating with economic information on the importance of the fishing activity to the community infrastructure of towns in NSW. Other approaches examine expenditures by businesses, employees, employee residential locations, social infrastructure services and existing social networks (Fenton and Marshall, 2001).

Future social survey work should address community structure and inter-relationships at a regional level and articulate with regional economic studies previously recommended in section G. This could be developed to monitor community impacts through all the fishery management strategies being developed in the next few years.

Investigation of lifestyle values related to fishing are required, as financial returns are marginal. Specific profiles of fisher lifestyles in different communities could be undertaken. The measurement of wider community values, views and perceptions could also be enhanced and formalised. Similarly, more time and the background from this study will allow more qualitative approaches to be taken. For example, applying anthropological or ethnographic methods, like in-depth interviews or group discussions, examining historical documents, media reports, oral histories as sources of information about fishers' and communities' values, attitudes and perceptions (Pers. comm. Dr Heather Aslin).

The economic and social merits of a full-time professional industry versus part-time fishers requires further investigation against the principles of ESD. This could also extend to study of cross sectoral studies involving recreational and indigenous fishing.

(c) Detail a timetable for developing the data sets important for understanding longer term resource issues.

Fuller social profiles and regional analysis of fishing communities in NSW should be undertaken in the next three years to assist in monitoring the impacts of adjustment and in preparation for appraisal of future management strategies. The survey information recently obtained is a start, but has a limited shelf life. A strategy for identifying social data needs and appraising social issues across all NSW fishing communities is required as soon as possible.

More complete regional industry and fishing community studies need to be undertaken in the next two years, recognising the communities can be impacted through multiple fisheries management strategies. In the longer term repeating social impact assessments for each fishery FMS risks ending up as a piece meal and duplicative process if progress is not made in more fundamental fishery community profiling and monitoring in the next 2 years. It is desirable for the fishing community profile and characteristics to be more clearly identified so as to enable impacts from different FMSs to be monitored.

With this community information it is then possible to address other information shortfalls on community attitudes, fisher profiles and to monitor the family and community impacts of specific fishery management plans in the next 1-5 years.

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Appendix H1: Fisher community profile of commercial fishers in NSW (Source: BRS/ABS data).

There has been no previous attempt to present a fishing community profile of the NSW Fishing Industry. The relevant social data of fishers in NSW was obtained from the ABS statistics via the Bureau of Rural Science Social Science unit and the numbers of commercial fishers in NSW from NSW Fisheries records. These are reported in Appendix Table H1. Maps are reported in Appendix 4.

Appendix Table HA1: Social index data for NSW Fishing communities at the postcode level (Source: ABS, 1996 /BRS and NSWF).

Zone	Home District	P. code	Town/Suburb	No. Fishers	Total Population	Unemployed (%)	SEIFA	Med. Ind. Income (wk)	Employed in C.F. (%) of labour force
1	TWEED	2485	TWEED HEADS	22	8,978	20.0	893	200-299	0.3
1	TWEED	2486	TWEED HEADS/BANORA POINT	22	24,984	14.4	953	200-299	0.41
1	TWEED	2487	CHINDERAH/OTHERS	19	7,976	16.2	921	200-299	0.41
1	RICHMOND	2472	BROADWATER/CORAKI	10	1,761	19.5	919	200-299	1.02
1	RICHMOND	2473	EVANS HEAD	25	2,613	16.8	900	160-199	1.02
1	RICHMOND	2478	BALLINA/OTHERS	52	24,184	13.7	972	200-299	0.52
2	CLARENCE	2460	LAWRENCE/OTHERS	24	29,145	14.8	951	200-299	1.212
2	CLARENCE	2463	MACLEAN/OTHERS	96	6,072	16.2	946	200-299	4.46
2	CLARENCE	2464	YAMBA/OTHERS	64	5,340	17.1	954	200-299	4.46
2	CLARENCE	2466	ILUKA	65	1,863	18.6	891	160-199	4.46
2	CLARENCE	2469	WOOMBAH/OTHERS	10	933	27.2	854	160-199	1.02
3	COFFS HARBOUR	2448	NAMBUCCA/OTHERS	18	8,690	19.1	927	160-199	0.8
3	COFFS HARBOUR	2450	COFFS HARBOUR	52	32,488	15.8	971	200-299	0.24
3	COFFS HARBOUR	2456	WOOLGOOLGA/URUNGA	20	11,848	20.5	944	200-299	0.46
3	COFFS HARBOUR	2462	WOOLI/OTHERS	20	2,599	20.0	917	160-199	1.19
3	HASTINGS	2431	SOUTH WEST ROCKS	33	3,965	18.6	926	160-199	0.78
3	HASTINGS	2440	CRESCENT HEADS/OTHERS	20	23,164	19.3	916	200-299	0.78
3	HASTINGS	2444	PORT MACQUARIE	37	34,162	15.2	966	200-299	0.48
4	MANNING	2427	HARRINGTON/COOPERNOOK	24	1,473	18.0	883	160-199	0.71
4	MANNING	2430	TAREE/OTHERS	35	28,312	14.0	950	200-299	0.71
4	MANNING	2443	LAURIETON/OTHERS	21	8,093	20.6	909	160-199	0.595
4	WALLIS LAKE	2423	BUNGWAHL/OTHERS	17	3,247	14.5	939	200-299	2.78
4	WALLIS LAKE	2428	FORSTER/TUNCURRY/OTHERS	88	19,457	15.1	939	200-299	2.78
4	PORT STEPHENS	2301	NELSON/SALAMANDER BAYS/OTHERS	27	25,046	11.1	997	200-299	1.04
4	PORT STEPHENS	2315	NELSON BAY/OTHERS	54	8,393	14.3	966	200-299	1.04
4	PORT STEPHENS	2324	TEA GARDENS/OTHERS	20	19,123	13.6	937	200-299	1.91
4	HUNTER	2280	BELMONT/OTHERS	10	22,225	10.5	989	200-299	0.05
4	HUNTER	2281	SWANSEA/OTHERS	15	11,349	14.3	935	160-199	0.05
4	HUNTER	2295	STOCKTON/OTHERS	12	5,058	12.8	918	200-299	0.555
4	HUNTER	2304	MAYFIELD/WARABROOK	18	13,925	17.6	890	200-299	0.07
4	CENTRAL COAST	2250	ERINA/OTHERS	10	57,810	7.7	1025	300-399	0
4	CENTRAL COAST	2251	AVOCA BEACH/OTHERS	11	29,370	8.5	1032	200-299	0
4	CENTRAL COAST	2256	WOY WOY/OTHERS	12	14,168	11.1	941	200-299	0
4	CENTRAL COAST	2257	EMPIRE BAY/OTHERS	10	25,326	11.6	957	200-299	0
4	CENTRAL COAST	2261	BERKELEY VALE/OTHERS	19	32,623	14.1	935	200-299	0
4	CENTRAL COAST	2259	MANNERING PARK/TACOMA/OTHERS	40	46,846	10.6	972	200-299	0
5	HAWKESBURY	2083	MOONEY MOONEY	12	1,450	5.7	1042	300-399	0
5	HAWKESBURY	2775	SPENCER	18	930	9.2	967	200-299	0
5	SYDNEY	171400	SYDNEY NORTH & SOUTH	189	3,276,207	7.3	1047	300-399	0
6	ILLAWARRA	2500	WOLLONGONG	10	32,326	12.6	998	200-299	0.1
6	ILLAWARRA	2502	PRIMBEE/OTHERS	10	13,000	18.9	847	160-199	0.1
6	ILLAWARRA	2506	BERKELEY	18	6,653	19.0	827	160-199	0.1
6	ILLAWARRA	2533	KIAMA	12	13,553	7.6	1067	200-299	0.23
6	SHOALHAVEN	2540	GREENWELL POINT/OTHERS	59	24,208	18.2	933	160-199	0.81
6	SHOALHAVEN	2541	NOWRA/OTHERS	16	29,663	12.0	957	200-299	0.81
7	BATEMANS BAY	2536	BATEMANS BAY/OTHERS	32	14,335	15.5	970	200-299	1.175
7	BATEMANS BAY	2537	MORUYA/OTHERS	10	9,002	18.2	960	200-299	1.54
7	BATEMANS BAY	2539	ULLADULLA/OTHERS	63	11,499	17.4	942	160-199	0.81
7	MONTAGUE	2546	NAROOMA/OTHERS	53	8,135	15.9	955	160-199	1.54
7	FAR SOUTH COAST	2551	EDEN	61	3,726	12.1	916	200-299	2.56
			Total	**1615**					

Explanation of Relevant Social Data for NSW Fishing Post Code Areas.

The data contained within Appendix Table H1 has been acquired from the Australian Bureau of Statistics (ABS) Housing and Population census 1996. The data on zones, districts, postcodes and fishers numbers is from NSWF.

Population -The total population is for the postcodes as in the 1996 census data (ABS, 1996).

Unemployment -Unemployment is the proportion of the labour force seeking either part-time or full-time employment, expressed as a percentage at postcode level from the 1996 census data (ABS, 1996).

SEIFA Index of Disadvantage - The Australian Bureau of Statistics (ABS) developed the Socio-Economic Index for Areas (SEIFA) of relative disadvantage from the 1996 population census. Areas with the greatest disadvantage have high proportions of low income families, unemployed people, people without educational qualifications, households renting public housing and people in low-skilled occupations. The SEIFA score for Australia as a whole is standardised at 1,000. Australia's non-metropolitan average is 972, so, a SEIFA[3] score of 941 (as is the case with Woy Woy/others), which is 31 points lower than Australia's non-metropolitan average, would indicate the town's residents are more disadvantaged than most of non-metropolitan Australia.

Weekly Median Individual Income - The ABS' 1996 housing and population census derives information about individual income from income categories. The median income is that income category that splits the population, ie. it refers to the category where 50 percent of the population from an area selected area has income categories either above or of the same category as the median. For example, in Spencer, 50 percent of the population earned between $0 and $299 per week and 50 percent earned $200 or more per week. Sydney's median individual income ($300 - $399) is one of the highest in this sample, compared to Wooli's in the Coffs Harbour district, which is one of the lowest ($160 - $199).

Employment in Fishing -Employment[4] in the fishing industry has been expressed as a percentage of the Total Labour Force (TLF). For example, 2.78 percent of Forster/Tuncurry's labour force is employed in commercial fishing. The commercial fishing category includes all of the following

[3] "The ABS does not supply SEIFA values at the post code level. Supply options are at the level of the Statistical Local Area (SLA) or census Collection District (CD). To present SEIFA values at the postcode level it was necessary to calculate a mean score from all SLAs that intersected the post code in question. While this method results in an estimated SEIFA value for postcodes, it can be regarded as a fairly accurate estimation because SEIFA scores are strongly correlated with local geography" (BRS, 2001).

[4] "The BRS do not have a NSW data set on employment in commercial fishing at the postcode level. Data is at the SLA level. For consistency, the data is again presented at the postcode level by calculating a mean score from all SLAs that intersected the post codes. Again, it is considered that this is fairly accurate estimation given the circumstances of local geography" (BRS, 2001).

possible sub-categories: Rock lobster fishing; Prawn fishing; Finfish fishing; Squid jigging; Line fishing; Marine fishing; Marine fishing undefined; Aquaculture; and Commercial fishing undefined.

The data in Appendix Table H1 is for postcodes with more than 10 NSW commercial fishers. This means that 1,615 fishers from a total of 1,920 are included in the analysis. The other 305 live in postcodes areas with less than 10 fishers are omitted. This should be borne in mind in the analysis of results.

Appendix H2: The telephone Social Survey (Roy Morgan, 2001a).

The available information in NSW was previously limited and relied entirely on the NSWF licensing system. Recognising this a social survey was undertaken by telephone in May 2001 (Roy Morgan, 2001a). The social survey had 870 replies from 1,751 businesses contacted in NSW as reported in Appendix Table HA2.

Appendix Table HA2: The response rate for the NSW social telephone survey (Source: RM-SS).

	Frequency	**%**		
Completed questionnaires	870	50%		
			50%	
No reply	115	7%		
Engaged	36	2%		
Unobtainable	136	8%		
Appointments	59	3%		
Repeated calls (6)	78	4%		
Total unable to contact	424		24%	
Refusals	278	16%		
Terminations	179	10%		
Refusals/terminations	457		26%	
Total	**1751**			**100%**

The response rate across all fishers in NSW was 50%. These figures compare favourably with the telephone survey of Queensland fishers (Fenton and Marshall, 2000), though there are 26% of refusals/ terminations and approximately 24% of fishers were unable to be contacted.

Some 10% of interviews were terminated, usually due to language problems during the interview (Roy Morgan, 2001a). The completed interview results may not adequately reflect fishers from non-English speaking backgrounds. Approximately 16% of fishers refused to participate in the survey. This was due to a variety of reasons which can only be surmised, but which may indicate significant social discord between fishers and management in relation to the FMS and the Recreational Fishing Areas process and perceptions of management among fishers.

Of the total statewide replies, 171 replies (20%) were from Estuary Prawn Trawl endorsement holders who constitute 18% of all endorsement holders statewide. Of 171 EPT endorsement holders contacted, 139 (81%) interviewed in the social survey had been fishing in the EPT in the previous 12 months. Data records show there are 349 entitlement holders in the EPT and 179 (51%) went fishing in 1999-2000. The sampled fishers are more active than the endorsed population.

Appendix H3: Social profiling of fishers likely to exit the EPT fishery under the FMS

It is predicted that many elderly fishers will likely exit the fishery in the next five years. Two other categories of fishers are examined here to see their social profiles. They are those who are currently constitute latent effort and EPT fishers grossing under $10,000 from all their fishing.

The social profile of latent effort share holders.

There are EPT endorsed fishers who are latent in all fisheries. This means they did not catch fish in any commercial fishery administered by NSW Fisheries in 1999-2000, but have previously fished in NSW. Appendix Table HA3 reports the regional dispersion of EPT fishers considered as latent effort and the proportion who responded to the social survey. Their characteristics can then be identified from the survey results.

Comparisons of latent effort holders and total endorsement numbers by zone are also presented in Appendix Table HA3. The average zone has 37% of total endorsements latent. Adjustment of endorsements by zoning will mean that a generic state-wide minimum shareholding rate would impact zones differently. If considering social impacts by numbers of latent fishers, then zone 5 has the largest number of latent effort fishers who may be potentially impacted by the FMS, whereas zone 1 and 3 have the highest percentage of latent endorsements.

Appendix Table HA3: The social survey coverage of latent EPT endorsed fishers (Yes is a SS response) (source: RM-SS).

Zones	Yes	No	Total Latent	Total Endorsed	Latent as % of Endorsed
1		4	4	7	57%
2	9	18	27	121	22%
3	3	4	7	14	50%
4	9	16	25	65	38%
5	12	44	56	125	45%
6		1	1	1	100%
7	4	2	6	6	100%
Total	**37**	**89**	**126**	**339**	**37%**

The following information is available on latent endorsement holders from the social survey:

- The median age bracket was 40-44 years old, with 30% of these fishers having lived in their current residence for over 30 years.
- 35% have dependent children.

- The median years fished was 16-20 years.
- 50% have more than one generation of fishing history.
- Gross income: 32 % of interviewees chose not to reply. Of those who did, the median income was $35,000-$39,999. 73% said that 90-100% of their income is from fishing.
- Most (74%) had no employees, while a further 18% had one or two employees.
- A minority (24%) claimed to have employment in other industries, and 22% claimed they could get full-time employment, and another 14% that they could get part-time employment in other industries. Only 18% would consider retraining, with the most common reasons for refusal being I'm too old (33%), or I enjoy fishing (22%).

In summary latent effort is held by fishers who have fished in the past, are not necessarily old and are probably undertaking some alternative employment. They have a mix of fishing experience and family connections with the fishing industry and have a limited capacity or willingness to retrain.

The social profile of EPT endorsement holders grossing less than $10,000 per year.

Social impacts are also likely to arise from low earning EPT fishers with catch revenue estimated by the Sydney index at below $10,000 across their fishing activities. It is likely that these fishers may sell shares rather than trading up to the minimum shareholding. For the EPT endorsement holders there were 54 fishers in 1999-00 who grossed less than $10,000 in all their fishing in NSW. Appendix Table HA4 reports fishers numbers (< $10,000 per annum) as percentages of total active fishers in each area. On average it is 15% state-wide with the greatest number (33) and percentage (26%) in zone 5.

Appendix Table HA4: Survey Coverage of EPT Endorsed Fishers earning less than $10,000 in the fishing industry (Yes is a SS response).

Zones	Yes	No	Total < 10K	Total end.	<10K as % of total
1				7	0%
2	5	5	10	121	8%
3				14	0%
4	5	2	7	65	11%
5	10	23	33	125	26%
6				1	0%
7				6	0%
Total	**20**	**30**	**50**	**339**	**15%**

The characteristics of the EPT fishers involved with fishing businesses grossing less than $10,000 of fish in 1999-00 are:

- The median age bracket was 50-54 years old, and the median number of years fished was 11-15 years. 45% of fishers have more than one generation of fishing history, and 50% of these fishers have lived in their current residence for over 20 years.
- Dependents: 55% of fishers had no dependent children under 16, 35% have more than 1 child under 16.
- Gross income: 25% of the interviewed fishers chose not to reply. Of those who did, the median income was $25,000 - $30,000, while 60% of those interviewed said that 90-100% of their income is from fishing.
- Most (80%) had no employees.
- Employment in other industries: About (35%) claimed to have employment in other industries. When asked if they could get full-time employment in another industry, over half (55%) chose not to reply. Of those who did reply, only 16% claimed they could get full-time employment in other industries, while another 32% claimed they could get part-time work. Only 10% would consider re-training, with the most common reasons given being too old (35%) and fishing is all I know (24%).

Fishers earning less than $10,000 a year in 1999-00 have a range of ages, and length of involvement with the fishing industry. 35% work in other industries, and 25% chose not to answer the income question. 60% indicated they were full-time fishers and 35% considered themselves too old to retrain.

These fishers earning less than $10,000 per annum are part-time fishers with 35% admitting to other employment, 60% claiming to be full-time fishers, possibly older fishers or lifestyle fishers.

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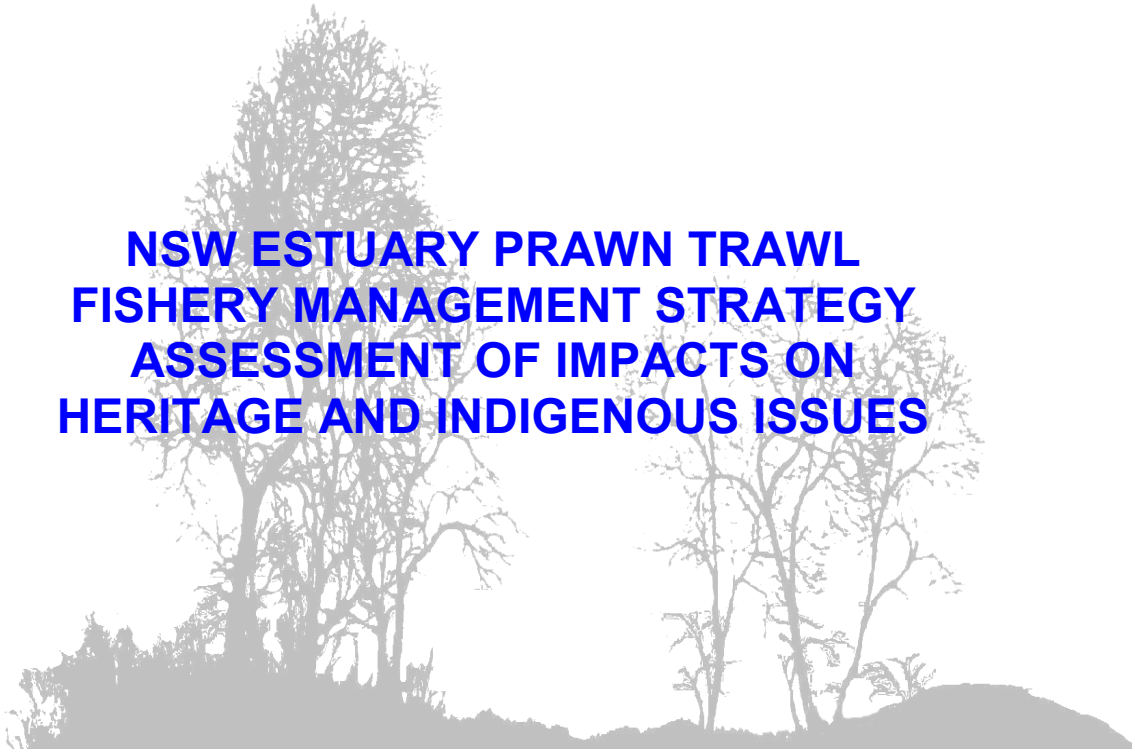

NSW ESTUARY PRAWN TRAWL FISHERY MANAGEMENT STRATEGY ASSESSMENT OF IMPACTS ON HERITAGE AND INDIGENOUS ISSUES

Prepared by:

Umwelt (Australia) Pty Limited
Environmental and Catchment Management Consultants

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NSW FISHERIES

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APPENDICES

1.0 INTRODUCTION

The draft Estuary Prawn Trawl Fishery Management Strategy (September 2001) has been prepared by NSW Fisheries to fulfil the requirements of the Fishery Management Act 1994. The strategy sets out the objectives of this sector of the NSW commercial fishery, together with a vision for the future sustainable management of the fishery. It also documents how the fishery will be managed, including rules for access and operation, performance indicators, monitoring regimes and triggers for review.

Prior to the finalisation of the Estuary Prawn Trawl Fishery Management Strategy (EPTFMS), an environmental impact assessment under the provisions of the Environmental Planning and Assessment Act 1979 (EP&A Act) is required. The Department of Urban Affairs and Planning (DUAP) has provided Director General's Requirements for the preparation of an Environmental Impact Statement and a Planning Focus Meeting has been held to clarify the issues of concern to key stakeholders, that must be addressed in the EIS.

This document addresses the issues that have been noted in the Director General's Requirements for the EIS in relation to heritage and Indigenous matters.

1.1 DIRECTOR GENERAL'S REQUIREMENTS

The issues that must be assessed in relation to heritage matters are noted in Section 2.3 of Part H (Social Issues) of the Director General's Requirements:

(a) Identify shipwreck sites or other sites of historic heritage that are likely to be affected by fishing activities and outline measures to minimise risk of harm to these sites.

(b) Identify any important Aboriginal heritage sites/places used by fishers and outline protocols/measures to be developed in consultation with representatives of the Aboriginal community to minimise risk of harm to these sites.

The issues that must be assessed in relation to Indigenous issues are noted in Section 3 of Part H of the Director General's Requirements:

(a) Identify the interests of Indigenous people in the resources harvested by the fishery and in habitats that may be impacted by the proposed activity.

(b) Assess the impacts of the activities proposed to be authorised by the management strategy on Indigenous interests. In particular, assess the impacts of implementing the strategy on:

1. traditional fishing, including access, participation and culture (such as places of significance - middens, totemic symbols etc);
2. Indigenous communities' well being, including economics, employment and community viability;
3. government policies on Indigenous fishery issues, including the NSW Indigenous Fishery Strategy.

(c) Mitigation and management measures.

1.2 THE NATURE OF THE ESTUARY PRAWN TRAWL FISHERY

The activity for which approval is being sought under Part 5 of the EP&A Act is the use of otter trawl nets (prawns) to take invertebrates and some fish for sale. This fishery operates in five NSW estuaries:

- Clarence River;
- Hunter River;
- Hawkesbury River;
- Port Jackson; and
- Botany Bay.

Trawling for prawns also occurs in Coffs Harbour and Jervis Bay, however, in these estuaries, the activity is managed within the ocean prawn trawl fishery.

Prawn trawling is permitted in the Hawkesbury River throughout the year. In the other estuaries, prawn trawling is permitted for seven to eight months of the year, from October to early autumn.

The target species for prawn trawling are school prawns (all five estuaries) and eastern king prawns (other than in the Clarence estuary). In the Hawkesbury River, broad squid and bottle squid are also target species.

The estuary prawn trawl fishery also results in catches of incidental species (known as by product), particularly in the Hawkesbury, Port Jackson and Botany Bay. Species include sand whiting, yellow fin bream, tarwhine, snapper, leatherjacket, flounder, flathead, tailor, mulloway, octopus and blue swimmer crab. Diverse species are also caught as bycatch in all five estuaries. Prawn trawlers use bycatch reduction devices to reduce the numbers of fish of these species that are inadvertently caught by prawn trawl nets. Bycatch species are typically part of the "estuary general" fishery.

School and eastern king prawns are also important species for the recreational fishery in NSW and continue to also be an important resource for coastal Aboriginal people.

The activity that is being assessed in this EIS is only the actual prawn trawling that occurs in estuaries. Land based activities that are peripheral to prawn trawling are not included in this environmental impact assessment. These land based activities include boat launching, storage and maintenance areas, and net storage and maintenance areas. In general, these activities are likely to be covered by a range of existing development consents under the planning regulations applying in the local government area in which they are located.

The core study area for this environmental assessment is therefore the bed and internal banks of five estuarine waterways, as shown in **Figures 1.1** to **1.5**.

1.3 SCOPE OF STUDY AND ASSESSMENT

This assessment is presented in three main parts.

Section 2 of the document deals with European heritage issues. European heritage sites, reflecting the importance of maritime activities in the past development of NSW, are located in many estuaries. This assessment considers potential impacts of estuary prawn trawl activities on those European heritage sites that are listed in inventories maintained by The NSW Heritage Commission, the National Estate, and the Australian Shipwreck register. It is considered that there is a low risk that estuary prawn trawl fishing activities will impact on these sites, although some shipwreck sites may present safety risks to estuary fishers. In this context, the assessment does not explore the historical details for European heritage sites.

The Director-General's requirements in relation to Aboriginal heritage sites relate to the identification of Aboriginal sites or places that are used by (estuary prawn trawl) fishers, and preparing protocols to minimise the risk of harm to these sites by estuary prawn trawl fishery activities.

There is abundant ethnographic and archaeological evidence for past use of estuaries and beaches by Aboriginal people, and of the importance of resources from these environments to Aboriginal economies and lifestyles. This evidence is described in **Sections 3.2.1** to **3.2.4**.

Known Aboriginal sites are recorded in the NPWS Aboriginal Sites Register, and there are thousands of known sites located on the banks of estuaries. Sites (most commonly open campsites and middens) are known from the banks of virtually every estuary in NSW. In addition to the known sites in the estuarine landscape context, there is potential for archaeological evidence to be present that is not yet recorded in the NPWS Register. Some of this evidence may be known to local Aboriginal people, and some is sub-surface evidence that has no surface expression unless disturbed by processes such as excavation and land clearing. Very few known Aboriginal sites are located within the channel of estuaries that are used for commercial fishing activity.

In assessing the existing and potential impacts of activities that would be authorised under the EPTFMS on known Aboriginal sites, a strategic approach has been taken.

The estuary prawn trawl fishery operates in five large estuaries and in each case, there is abundant ethnographic and archaeological evidence of past Aboriginal occupation. The extent of the potential impact of estuary prawn trawl fishing on the physical evidence of past Aboriginal occupation that may be located on the banks of the estuaries, does not justify the mapping and assessment of every known site along the banks of the five estuaries. A search of the NPWS Aboriginal Site Register for each of these estuaries would require consultation with multiple coastal Local Aboriginal Land Councils, to obtain permission to gain access to large amounts of culturally sensitive data. This is not practical within the scope of this EIS process. Neither is it appropriate that the locations of such a large number of coastal Aboriginal sites be made public in one publication.

Instead, **Sections 3.2.1** to **3.2.4** synthesise the information that is available about the ways that Aboriginal people used and valued estuary resources in the past, and discuss the types of risks to sites that could be associated with estuary prawn trawl fishery activity. **Section 3.3** discusses options for minimising the risk to Aboriginal sites and places.

The extent of Aboriginal cultural heritage and contemporary Indigenous issues related to the estuary prawn trawl fishery is not directly related to the size of the commercial fishery in any one of the five estuaries in which prawn trawling is practised. Indigenous issues are frequently associated with the regulatory framework for the fishery, rather than the scale of individual enterprises in each estuary. This matter is discussed further in **Section 4**.

It is important to note that there are several other concurrent policy development initiatives by NSW Fisheries that will affect the interaction of Aboriginal fishers with the estuary prawn trawl fishery. In particular, NSW Fisheries is currently working with the Aboriginal community to develop an Indigenous Fishery Strategy, that will provide a new framework for the management of interactions between Indigenous and commercial fisheries. The information presented in this assessment draws on the work in progress towards the Indigenous Fishery Strategy, and outlines a process for ongoing review of regulatory relationships, but in no way pre-empts the outcomes of that strategy.

2.0 HISTORIC HERITAGE

This section reports the results of a review of the historic heritage that is located within the precincts of the five estuaries in which prawn trawling activities occur. The review of historic heritage has defined those elements of the resource that are, or appear to be, located in such a position that either estuarine prawn trawling operations might have some impact on an element or vice versa.

For the purposes of this report, historic heritage has been differentiated between the transport and structural contexts. This differentiation is essentially dictated by the base source(s) or recording database(s) from which data has been derived. The transport context is specifically represented in the record of shipwrecks. The structural environment includes such resources as boatsheds, landing ramps, seawalls, breakwaters, wharves and boat harbours, but also includes such developments as structures for oyster culture, groynes and piles. This latter group of structures may have no physical connection to the shoreline.

2.1 TRANSPORT HERITAGE

This section addresses shipwrecks that have been recorded in estuaries. It is heavily based on data contained in the Australian National Shipwreck Database (ANSD), which is maintained by the Australian Institute for Marine Archaeology.

2.1.1 Methodology

For this component of the study, the sources of data were the ANSD with additional source material obtained from:

- *The Register of British Shipping;*
- Annual reports of government departments, particularly in the latter quarter of the 19th Century;
- The Register of the National Estate, maintained by Environment Australia;
- The (NSW) State Heritage Register, maintained by the NSW Heritage Council;
- The (NSW) State Heritage Inventory, maintained by the NSW Heritage Council;
- *Bar Dangerous: A Maritime History of Newcastle* (Callan 1986) and *Bar Safe* (Callan 1994);
- Index of shipwrecks on the NSW Coast Between the Hawkesbury and Manning Rivers, 1788-1970 (Fletcher nd);
- *Australian Shipwrecks* (Loney 1980);
- *Shipwreck Atlas of New South Wales* (NSW Heritage Office 1996);
- *Centenary: NSW Steamship Wrecks* (Parsons 1995);
- *Scuttled and Abandoned Ships in Australian Waters* (Parsons & Plunkett 1998);
- Navigational charts of the coastline and estuaries; and
- Information from state-wide and local newspapers.

The sources of data are collectively referred to as "the marine archaeological record" and are appropriately referenced in the following material and particularly in appendices.

Search of the marine archaeological record indicated that nearly 1500 shipwrecks have been recorded along the New South Wales coastline, of which 196 could be related to the entrances and bodies of the five estuaries in which prawn trawling takes place. One of the difficulties posed by the ANSD, and by the marine archaeological record generally, was that the location of many shipwrecks could not be specified with any degree of accuracy, particularly regarding shipwrecks of the 19th Century. The judgment involved in differentiating estuarine from open-water shipwrecks was guided by the following criteria:

1. Detail of the geographical location of the wreck and/or precision in description of geographical features relevant to the wreck. For example, while a wreck described as located in Sydney Harbour is relatively definitive, one that refers to the wreck location as being simply "Port Stephens" may refer to the estuary or to the stretch of coastline, but a reference to "Hannah [sic: Anna] Bay" will place the wreck in open water;

2. The nature of the vessel's voyage, eg. international, inter-colonial, coastal intra-state, or port service. Thus, a vessel in transit from Valparaiso to Newcastle will have been unlikely to enter Port Stephens;

3. For other than port services, the origin and destination of the voyage: for instance, a vessel engaged on a late 19th Century voyage from Port Macquarie to Sydney, wrecked on the Hastings bar will be deemed to be outbound and the wreck will be included in the Port Macquarie estuary;

4. For a port service, whether a vessel was in-bound or out-bound. For example, a vessel towing another vessel into open water to be scuttled, and wrecked at the port entrance as a result of the tow will be included as an estuary wreck; and

5. The circumstances of the loss, eg. navigation error, failure of equipment, condition of wind and/or weather. The examples of such causes are boundless and need to be read in conjunction with criteria 3 and 4 above.

Greater precision in describing the disposition of shipwrecks could only be achieved by research of primary sources.

2.1.2 Results

By an application of the judgment criteria to the raw results of researching the marine archaeological record, 196 shipwrecks appear to be located within the five estuaries in which prawn trawling takes place along the New South Wales coastline.

The particulars of these shipwrecks are contained in a table included **Appendix 1**. The table sets out:

- the name of the vessel;
- the best estimate of date-of-loss;
- the best estimate available of the location of the wreck, sorted by estuary from north to south;
- the primary and other sources of data about the loss;

- the reference of the shipwreck in the ANSD; and
- any comments that appear relevant.

2.2 STRUCTURAL HERITAGE

This section is concerned, essentially, with all historic heritage resources, other than shipwrecks, that have been recorded in estuary precincts and is based on data contained in National, State, regional and local heritage reviews.

2.2.1 Methodology

For this component of the study, research was directed mainly to the following base records:

- The Register of the National Estate (RNE), maintained by Environment Australia;
- The (NSW) State Heritage Register, maintained by the NSW Heritage Council; and
- The (NSW) State Heritage Inventory, maintained by the NSW Heritage Council.

Other sources considered for some specific sites were:

- Statutory studies and reports at local and regional level of historic heritage resources;
- Studies relating to coastline and estuary management strategies;
- The studies and reports by archaeologists, of specific historic heritage resources;
- Navigational charts of the coastline and estuaries; and
- Information from state-wide and local newspapers.

The sources of data are collectively described as "the archaeological record" and are appropriately referenced in the following material (see also **Appendices 1** and **2**).

Search of the archaeological record revealed that, as related to the entrances and bodies of the five estuaries in which prawn trawling occurs:

- a total of 25 sites have been entered in the Register of the National Estate (RNE), as either "Registered" or "Indicative Place". The status entry "Indicative Place" confirms that the site has been proposed for registration but that the registration process is not yet complete. Accordingly, the submission of the site may be either accepted or rejected for registration;
- a total of 17 sites have been entered on the (NSW) State Heritage Register (SHR), as either "Registered" or "Interim Heritage Order". The status entry "Interim Heritage Order" confirms that the site has been proposed for registration but that the registration process is not yet complete. Accordingly, the submission of the site may be either accepted or rejected for registration; and
- the (NSW) State Heritage Inventory (SHI) indicates that 231 sites have been recorded on Regional Environment Plans (REP) and Local Environment Plans (LEP) pursuant to the (NSW*) Environmental Planning and Assessment Act* 1979.

The level at which a site is recorded, on the RNE, the SHR, or in a REP or LEP, is a basic indication of the level of cultural significance attached to the site. An abstract of the concept of cultural significance is contained in **Section 2.3**.

Some questions regarding the relationship of individual resources to estuaries were raised by the heritage records. In general, the location of resources in the RNE and SHR were specific but those of REPs and LEPs were less so. In cases of doubt, the following criteria were applied:

1. the probable limit of tidal influence and navigability within an estuary by reference to maps and charts;

2. concurrent with 1 above, the probable capacity of tidal reaches within estuaries to support commercial fishing; and

3. more precise location of sites by the use of peripheral or explanatory data. For example, reference to a bridge on a named highway over a named river could be identified on a map of the area and its location taken into account with criteria 1 and 2 above.

2.2.2 Results

By an application of the judgement criteria to the raw results of research of the archaeological record, 273 sites appear to be located within the five estuaries in which prawn trawling takes place. Of these sites**,** 25 are entered on the RNE, 17 are entered on the SHR and 231 are recorded in the SHI as being recorded on either REPs or LEPs.

The particulars of these sites are contained in a table attached to this report as **Appendix 2**. The table deals separately with the results of research of the RNE on one hand (**Part 1**) and of the SHR and SHI jointly, on the other (**Part 2**). **Part 1** of the Table sets out:

- the name of the site, item or resource;

- the status of the site, item or resource in the RNE process;

- the estuary to which the resource relates;

- the date of construction or an indication of the age of the resource;

- the location of the resource; and

- the reference to the database entry of the resource in the RNE (the RNEDB).

Part 2 of the table sets out:

- the name of the site, item or resource;

- the location of the resource;

- the estuary to which the resource relates;

- the date of construction or age of the resource, where this is evident from the registration records;

- appropriate comments regarding the resource;

- the reference to the database entry of the resource in the SHR and/or SHI; and

- the level of heritage listing, which indicates the level of significance that has been accorded to the resource.

2.3 THE CONCEPT OF SIGNIFICANCE

The extent to which an item of historic heritage is a constraint to future development depends largely on the assessment of its significance. This section explains the concept of cultural significance and the following section notes the significance that has been attributed to various heritage resources. The protection afforded by Commonwealth and State heritage and planning legislation is also noted.

The Heritage Act, 1977 (NSW) defines items of environmental heritage to be:

> *Those buildings, works, relics or places of historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance for the state of New South Wales.*
>
> *In the context of this report, significance is the measure of the value and importance of elements of the archaeological record to cultural heritage. While the fabric of the archaeological record is the subject of the assessment of heritage significance, the assessment itself is conditioned by the environmental and historic context of the site. Furthermore, an evaluation of heritage significance is not static but evolutionary, as a function of evolving community perspectives and cultural values.*

The Australia ICOMOS Charter for the Conservation of Places of Cultural Significance (the Burra Charter) classifies the *nature* of cultural significance in terms of historical, aesthetic, scientific and social criteria. The implications of these classifications are as follows:

- Aesthetic significance addresses the scenic and architectural values of an item and/or the creative achievement that it evidences. Thus, an item achieves aesthetic significance if it has visual or sensory appeal and/or landmark qualities and/or creative or technical excellence;

- Historical significance considers the evolutionary or associative qualities of an item with aesthetics, science and society, identifying significance in the connection between an item and cultural development and change;

- Scientific significance involves the evaluation of an item in technical and/or research terms, considering the archaeological, industrial, educational and/or research potential. Within this classification, items have significance value in terms of their ability to contribute to the better understanding of cultural history or environment and their ability to communicate, particularly to a broad audience within a community; and

- Social significance is perhaps the most overtly evolutionary of all classifications in that it rests upon the contemporary community appreciation of the cultural record. Evaluation within this classification depends upon the social spiritual or cultural relationship of the item with a recognisable community. (Marquis-Kyle & Walker 1992, 21-23)

Historical study looks to the documentary record of human development and achievement, as interpreted by the authors of the documents that comprise the primary and secondary resources. In parallel, historical archaeology is concerned not only with the documentary record but also with material evidence. The archaeological record may provide information not available from historical sources. An archaeological study focuses on the identification and interpretation of material evidence to explain how and where people lived, what they did and the events that influenced their lives. Considerations material to archaeological study include:

- Whether a site, or the fabric contained within a site, contributes knowledge or has the potential to do so (perhaps, whether the archaeological record validates or contradicts the historical). If a site can contribute knowledge within the *nature* criteria above, the availability of comparative sites and the extent of the historical record should be considered in assessing the strategies that are appropriate for the management of the site; and

- The level at which material evidence contributes knowledge in terms of current research themes in historical archaeology and related disciplines.

The "level of contribution" is thus a critical determinant and is assessed according to the same protocols as is cultural significance, that is, in terms of representativeness/rarity and local/regional/state associations.

In relation to "research themes and historical archaeology and related disciplines", the direction of historical archaeology implies, and is conditioned by, consideration of historic, scientific, cultural, social, architectural, aesthetic and natural values. It is a convenient method of classifying the values of material evidence, within the Nature criteria above, in terms of the following broad model:

- *Historical* value lies at the root of many of the other values by providing a temporal context and continuity, thereby providing an integrating medium for the assessment of social, cultural and archaeological significance;

- *Scientific* value depends upon the ability of an item to provide knowledge contributing to research in a particular subject or a range of different subjects;

- *Cultural* value attaches to artefacts which embody or reflect the beliefs, customs and values of a society or a component of a society and/or have the potential to contribute to an understanding of the nature and process of change and its motivation;

- *Social* value derives from the way people work(ed) and live(d) and from an ability to understand the nature, process of change and its motivation. Social significance is closely related to cultural significance, in its concern with the practicalities of socio-cultural identification;

- *Architectural* value depends on considerations of technical design (architectural style, age, layout, interior design and detail), the personal consideration (ie. the work of a particular architect, engineer, designer or builder) and technical achievement (construction material, construction technique, finish);

- *Aesthetic* value addresses the manner in which an item comprises or represents creative achievement, epitomising or challenging accepted concepts or standards; and

- *Natural* value attaches to items that either support or manifest existing natural processes and/or systems or which provide insights into natural processes and/or systems.

Within this general framework, the assessment of significance is made in the light of two distinct measures: the degree of significance and the level of significance.

- The *degree of significance* of heritage material is evaluated as being either *representative* or *rare*. *Representative* items are those which are fine distinctive, characteristic and/or illustrative examples of an important class of significant item or a significant aspect of the environment. *Rare* items are those which singularly represent or represent an endangered, discrete, or uncommon aspect of, history or cultural environment. By derivation, items considered within

the context of broader investigation as being insignificant may be dismissed by an evaluation of *little or none;*

- The *level of significance* of heritage material is assessable in five classifications depending upon the breadth of its identifiable contemporary community or historical or geographical context. Thus -

  - a *local* classification recognises an item as being significant within a local historical/geographical context or to an identifiable contemporary local community;

  - a *regional* level of significance recognises the item as significant within a similar regional historical/geographical context or identifiable contemporary regional community; and

  - a *state* level of significance identifies that item as significant in a state-wide historical/geographical context or to an identifiable contemporary state-wide community (Heritage Office 1996, 4-7).

  and by derivation:

  - a *national* level of significance attaches to an item that is significant in a nationwide historical/geographical context or to an identifiable contemporary nationwide community; and

  - an *international* level of significance has the appropriate connection to international context or the international community.

2.4 ISSUES FOR FUTURE MANAGEMENT

This section identifies issues that are material to the management of heritage resources in the context of the use of estuaries for commercial fishing.

2.4.1 National Constraints

Appendix 1 tabulates the shipwrecks that are recorded in the marine archaeological record for the five estuaries in which prawn trawling takes place. Apart from general heritage and planning legislation at Commonwealth and State levels, these shipwrecks may be protected under the *Historic Shipwrecks Act* 1976. The Act applies within Commonwealth waters and upon the declaration by a State that the Commonwealth Act so applies, to the waters of a State. New South Wales has made such a declaration. The *Historic Shipwrecks Act*, s4A, sets out the base criteria for consideration of a shipwreck as historic as being that the shipwreck be:

> *(a) situated in Australian waters, or waters above the continental shelf of Australia, adjacent to the coast of a Territory; and*
>
> *(b) at least 75 years old.*

The Act further provides that:

- the Minister may declare historic the remains of disturbed or fragmented shipwrecks and artefacts related to shipwrecks (s4A(5), -(6), -(7));

- whether or not within the base criteria, the Minister may declare historic individual shipwrecks, the individual remains of disturbed or fragmented shipwrecks and individual artefacts related to shipwrecks (s5);

- whether or not within the base criteria, the Minister may make a provisional declaration of a shipwreck or of artefacts associated with a shipwreck pending determination (s6);

- the Minister may declare a "protected zone" not exceeding 200 hectares as the curtilage of a shipwreck (s7);

- upon publication in the Gazette of a notice declaration a shipwreck and/or site and/or article historic, a person holding an artefact related to the declaration must give it to the Minister (s9) and the minister is empowered to demand the surrender of such an article by notice (s10);

- the Minister may give directions as to the custody of material the subject of declaration (s11);

- It is an offence to destroy, damage, disturb or interfere with an historic shipwreck or artefact or to attempt to dispose of any material to which a declaration applies (s13);

- It is an offence to enter a protected zone with tools, explosives, equipment for diving and/or conducting any prohibited activities; to trawl, dive or undertake any other underwater activity; or to moor (s14);

- the Minister is empowered to issue permits to allow the exploration or recovery of a shipwreck or artefacts associated with a shipwreck (s15); and

- Any person discovering a shipwreck or artefacts from a shipwreck must report the find to the Minister (s17).

and provides penalties for offenders against its provisions.

In addition to the above, **Appendix 2 Part 1** tabulates 25 resources that have been assessed as being of National significance. For these items/places the requirements of the *Australian Heritage Commission Act* 1975 must be taken into account in management planning that affects those resources. The *Australian Heritage Commission Act* contains few constraints other than against Commonwealth agencies and against the removal of resources from Australia. However, the Commonwealth Government currently proposes to extend substantial protection to resources registered in the RNE by devolution of heritage administration to the *Environment Protection and Biodiversity Conservation Act* 1999 from the *Australian Heritage Commission Act* 1975. It is anticipated that the levels of protection afforded by this amendment will be at least as stringent as that provided by the (NSW) *Heritage Act* 1977.

2.4.2 State Constraints

Appendix 2 Part 2 tabulates 17 resources within the five estuaries in which prawn trawling takes place, that have been assessed as being of State significance. The requirements of the (NSW) *Heritage Act* 1977 must therefore be taken into account by any management planning that affects those resources. The *Heritage Act* established measures for the protection of heritage resources. Heritage sensitivity may be indicated by historical research and/or by various on-site archaeological surface surveys. The discovery of relics is highly likely once soil is disturbed in circumstances where either historical research or archaeological surface survey indicates sensitivity. The *Heritage Act* defines a relic as:

> *Any deposit, object or material evidence –*
>
> *(a) which relates to the settlement of the area that comprises NSW, not being Aboriginal settlements; and*

(b) which is 50 or more years old.

The Act further provides that:

- Sites and relics in a range of descriptions are protected from disturbance and damage (ss. 24-34, 35A-55B, 130, 136-7, 139);
- Relics may be the subject of conservation orders (ss. 26(2)(b), 35A,36,37, 44);
- Relics are protected on the ground on all sites (ss. 26(2)(a), 35A36, 37, 44);
- Approval of excavation is required if a development site is listed on the NSW Heritage Register (s. 60);
- No disturbance or excavation may proceed for the discovery of relics (not subject to a conservation instrument) except with an Excavation Permit (s. 139);
- An excavation permit is required if a site is not the subject of an order under the Heritage Act (s. 140);
- Location of sites must be reported to the Heritage Council (s. 146); and
- Recovery of relics from excavation must be reported to the Heritage Council (s. 146A).

and provides penalties for offenders against its provisions (s. 157).

2.4.3 Regional and Local Constraints

Appendix 2 Part 2 also tabulates 231 resources that have been assessed as being of Regional or Local significance. The requirements of the (NSW*) Environmental Planning and Assessment Act* 1979 must be taken into account by any management planning relating to those resources. The *Environmental Planning and Assessment Act* established measures for the protection of heritage resources, substantially the equivalent of the protection provided by the *Heritage Act*. The *Environmental Planning and Assessment Act* provides for sites to be scheduled as:

- Heritage items in terms of local, regional and State significance (ss. 24-72);
- Sites in development control plans or subject to development controls (ss. 37-9, 76); and
- Subject to planning controls or additional conservation provisions (ss. 37-9, 76);

and provides further that relics fixed to land may be scheduled, as may relics associated with heritage items in schedules (ss. 24-74). The Act also specifies penalties for offences.

2.4.4 The Interaction of Commercial Fishing with Historic Heritage Resources

The activities associated with commercial estuary prawn trawling are limited to associated boating, foreshore access and the use of a variety of netting styles.

The physical and spatial presence of heritage resources within estuaries is likely to have only a marginal effect on commercial prawn trawling operations. With regard to shipwrecks, it appears likely that commercial prawn trawling in estuaries will have no impact on residual material evidence, having regard to the likely nature, bulk and mass of any residual material and the

potential for sub-surface material to be covered by silt/sand. Nonetheless, in the reverse situation, it is possible for residual wreckage to pose a hazard, as a potential snag for nets.

Similarly, structures such as oyster racks, pile and submerged material evidence, pose a greater threat to fishers than the reverse, and land-based heritage resources have survived, usually, because they have been constructed of relatively robust materials. Some timber jetties and wharves may have deteriorated or will progressively deteriorate to the point of fragility, such that impact from a vessel would be capable of causing damage or destruction.

Otherwise, it is appropriate to observe that the greater potential for impact on historic heritage resources will arise from the construction, maintenance and repair and/or extension of shore-based infrastructure, peripheral or complementary to commercial prawn trawling activity in estuaries. Some such activity may be directly subject to external regulation, but it is pertinent to draw attention to the need for care in the management and/or repair of shore-based facilities.

2.5 RECOMMENDATIONS

These recommendations are made on the basis of:

- the limited review of historical context of the estuary precincts contained in this report;
- the review of the archaeological context of the estuary precincts contained in this report;
- the limited descriptions of the fabric and the precise locations of some of the material evidence of estuaries, particularly relating to shipwrecks;
- synthesis of the archaeological and historical contexts that is available from the reviews;
- the appreciation of the significance of the heritage resources;
- consideration of the management issues and potential impacts of the proposed use;
- discernment of the potential affects of commercial fishing styles; and
- recognition that the greater potential for impact on historic heritage resources is likely to arise from activities peripheral to commercial fishing.

It is recommended that:

1. In general in connection with the development, the attention of all authorities and agencies has been, and that of all commercial fishers, their contractors and employees will be, directed to the provisions of the NSW *Heritage Act* 1977 and in particular to:

    (i) the definition of relic under that Act;

    (ii) the provisions of sections 24-34, 35A-55B, 130, 136-7, 139 and 140 of that Act;

    (iii) if any is activity is proposed that will, or may, cause the disturbance of a resource that is registered on the SHR, the requirement for grant of an Approval under s.60 of the Act;

    (iv) if any activity is proposed that will, or may, cause the disturbance of a resource that is not registered on the SHR, the requirement for grant of an Excavation Permit under s.140 of the Act;

(v) the basic requirements that, in relation to any development, if:

- a relic (whether *transport* or *structural* within the definition of this report) is suspected, or there are reasonable grounds to suspect a relic in ground, that is likely to be disturbed damaged or destroyed by excavation;

- any relic is discovered in the course of excavation that will be disturbed, damaged or destroyed by further excavation;

the developer must notify the Heritage Office of New South Wales and suspend work that might have the effect of disturbing, damaging or destroying such relic until the requirements of Heritage Office have been satisfied (a requirement capable of being obviated by the prior issue of an Excavation Permit).

2. In relation to any proposed development of ancillary facilities associated with commercial prawn trawling activities in an estuary, potential to impact on heritage resource(s) must be considered. The developer shall commission a study and report by an appropriately qualified person of the heritage values of the area potentially to be affected by the proposed development. Presumably any such report would form part of the process of the development application to the relevant approval authority.

3.0 ABORIGINAL HERITAGE

3.1 STATUTORY CONTEXT

All evidence of past Aboriginal occupation in NSW is protected under the provisions of the National Parks and Wildlife Act 1974 (NPW Act), regardless of its significance or the tenure of the land on which it is located. Each individual item of physical evidence of past Aboriginal cultural activity in the landscape is defined by the NPW Act as a "relic". Aboriginal sites are localities that include or display one or more pieces of this evidence. For instance, a site may be identified by the observation, on or below the ground surface, of a single piece of flaked stone (isolated artefact), or by an accumulation of many (often thousands) of pieces of flaked stone (open campsite or open artefact scatter). Aboriginal sites also include middens, rock shelters with cultural deposit or art, stone arrangements and structures, scarred and carved trees, and burials. Open campsites or artefact scatters are the most common type of occupation evidence in NSW generally; however, along the coast, midden sites are very common, reflecting the importance of shellfish and fish in the coastal diet and the robustness of shell fish remains in the landscape.

Aboriginal places that have been declared by the Minister for the Environment and duly gazetted, are also protected by the NPW Act. An Aboriginal place is a place in the landscape that has spiritual significance for Aboriginal people, but where there is not necessarily any physical evidence of past Aboriginal occupation.

It is an offence under the NPW Act to knowingly deface, damage or destroy an Aboriginal "relic" (as defined by the Act) or Aboriginal place without the prior written consent of the Director-General of National Parks and Wildlife Service (NPWS). This consent is obtained through an application under Section 90 of the Act for Consent to Destroy. It is NPWS policy that applications for Consent to Destroy must be accompanied by written evidence of consultation with the representatives of the local Aboriginal community, and it is unlikely that NPWS would grant a Consent to Destroy in cases where the local Aboriginal community had not supported the application.

The NPW Act does not define "knowingly". However, NPWS does provide guidance as to what constitutes a "known" site in relation to development that is assessed as integrated development. An Aboriginal site is considered to be known if:

- It is registered in the NPWS Aboriginal sites register; and/or
- It is an Aboriginal site known to the Aboriginal community; and/or
- It is located during surveys or test excavation conducted prior to the lodgement of a development application.

This definition makes it clear that it is incumbent on a proponent to consult with the local Aboriginal community and to conduct appropriate research into records of archaeological evidence, prior to commencing a development that will disturb the land surface.

In this environmental assessment, the risks to specific individual Aboriginal sites have not been identified. Risk has been assessed at a strategic level, in terms of the types of evidence that can be expected to be located along the banks of estuaries, and the aspects of the proposed activity that have the potential to have an impact on those types of archaeological evidence.

3.2 ARCHAEOLOGICAL AND ETHNOGRAPHIC EVIDENCE FOR ABORIGINAL USE OF ESTUARY FISHERY RESOURCES IN NSW

In general, the archaeological and ethnographic evidence clearly indicates that fishing and shell fish gathering were of great importance to Aboriginal people in pre-European times, right along the NSW coast, and the evidence suggests an increasing use of the full diversity of coastal resources over time. The evidence also suggests distinct differences in the styles of accessing the estuary and coastal fishery resources on the north and south coasts (eg. in terms of seasonality and targeted species). Sullivan (1982) attributes these differences in the first instance to significant geomorphic differences between the north and south coasts. The north coast is dominated by long sandy beaches, and large river estuaries, lakes and bays. The south coast is much more a rocky coastline with numerous headlands and rock platforms, smaller estuarine waterways, and shorter beaches that have a geomorphic history of shoreline retreat.

This section reviews and synthesises the ethnohistorical and archaeological evidence for Aboriginal use of and occupation of estuarine habitats. This evidence provides the cultural context for ongoing Indigenous, recreational and commercial use of estuarine fishing resources. The archaeological evidence also provides the background to contemporary Indigenous fishing activity in estuaries. Although estuary prawn trawling occurs in only five estuaries, all from the central and north coast regions, this review of ethnographic evidence is more wide ranging. School prawns are seasonally present in most estuaries along the NSW coast and would have been a widespread potential summer resource for Aboriginal people. Ethnographic evidence tends to be spatially patchy so the review considers the evidence for the entire coastline.

3.2.1 Ethnographic evidence

3.2.1.1 Descriptions of fishing method and equipment

There are many 19th Century ethnographic references to Aboriginal people fishing in north and south coast estuaries, at estuary mouths and around headlands. Whilst these descriptions would have been affected by the cultural values of the European settlers at the time, they do provide a clear indication of the ways in which Aboriginal people accessed the resources of coast estuaries.

Examples of the observations of nineteenth century settlers are provided below:

Ainsworth (1922) - "*the seasons were known to them by the foliage and flowers. They could tell by the natural signs of flowers and fruit when the salmon and mullet were due on the beaches and in the rivers, and also when certain game was likely to be in evidence in particular localities*."

Hodgkinson (1845) - "*fish formed a never failing article of food for (*Aboriginal people*)*."

Henderson (1851) describes Aboriginal people diving for oysters, slowly working their way upstream in estuarine creeks.

Beaglehole (1955) (quoting from Captain Cook) "*on the sand and mud banks are oysters, muscles (sic) cockles etc which I believe are the chief support of the inhabitants, who go into the shoald(sic) water with the canoes and pick them out of the sand and mud with their hands and sometimes roast them and eat them in the canoe, having a fire for that purpose as I suppose*."

Hodgkinson (1845) claims "*the (*Aboriginal people*) at the Macleay and Nambucca Rivers spear in a few minutes sufficient fish for the whole tribe, on the shallow sand banks and mud flats on that part of the river which rises and falls with the tide*."

Crown Lands Commissioner (Fry 1843:653) - "*the subsistence of the natives of this portion of the colony being determined in a great manner from fishing, the localities which they inhabit are consequently the immediate banks of the rivers Clarence and Richmond*". Of the coastal Aborigines, Fry says "*their diet is composed almost entirely of fish and honey*."

Ainsworth (1922) provides detailed descriptions of the fishing methods used by Aboriginal people near Ballina:

> "*They were exceedingly expert hunters and fishermen and in these pursuits brought to their aid many ingenious weapons and contrivances. In catching fish they used what they called a 'tow-row' - that is a finely meshed net attached to a stick of bamboo bent in the shape of a bow about eight feet across between the two ends. This gave a bag effect to the net and with a tow-row in each hand the blacks could surround the fish schools in narrow and shallow waters and catch them by the hundreds. The cordage of these nets which were very strong and beautifully woven, was made from the inside fibre of the stinging tree and from the bark of the kurrajong. They used a similar net in hunting.*
>
> *The tribe usually camped in divisions at different places excepting during the oyster season, when they assembled unitedly at Chickiaba, on North Creek, where the large oyster banks on the foreshores to this day mark the old feeding ground.*" (Ainsworth 1922:28-31)

In addition, Ainsworth describes groups of people moving to the coast in September to take advantage of the huge shoals of salmon in the surf at that time of year. These fish were caught by spearing.

Macfarlane "*As the swamps reached the waterless stage an abundance of eels presented a plethora of the needful for the sustenance of the aboriginal, and there as little trouble capturing the slimy wrigglers in the shallow water. Some of these attained a large size, but the average weight was considered the best for eating. It was strange how the swamps produced so numerous a quantity of the eel species, as in drought periods they were cleared of the fish, but breeding was renewed when refilled with water from a flood."*

Macfarlane notes that the eels were cooked on a grill made of green sticks, suspended about 60 to 90 cm above the cooking fire.

Perry (1839) - May - referred to a group of Aboriginal people living in huts in a sort of temporary village at the head of a deep estuary (Clarence): "*which appears to give considerable command of fishing ground, such a position being essential to their subsistence…., The canoes of these (*Aboriginal people*) were formed with more care than those in the neighbourhood of Port Macquarie and other places that had been visited, and were moored in a line in front of their villages. The* (Aboriginal people*) appear to possess, to a certain extent, habits of industry; their fishing nets, baskets, water vessels and cooking utensils being constructed with peculiar care and neatness. These people were delighted with being presented with some fish hooks*."

Scott, quoted in Brayshaw (1966) - "*the schools used to travel from west to east close inshore on the northern side of the harbour, at high water…. The fishermen, generally about half a dozen at once, would rush into the water up to their middles…, then when the school was within striking distance, the spears would all be landed at once*."

Mackaness (1941) noted that Aboriginal people in the Twofold Bay region built lightweight bark canoes with folder ends. When fishing the Aboriginal people were noted to *"occupy a kneeling position in their Mudjerre or canoes and may be seen like floating specks off the coast spearing salmon; they are expert fishers*."

Mackaness (1941) - "*fish are abundant and the Aborigines may be termed Icthyophagist…. Their mode of taking fish is by net, spearing and line and hook, the latter ingeniously made from bone. Their canoe a sheet of bark from the straight part of a tree folded at the end*." (far south coast)

Anderson (1890) also describes canoes and wooden implements used by Aboriginal people on the south coast. The canoes were made of bark strips and were found along beaches as well as estuaries.

These descriptions provide an insight into the equipment that was used by Aboriginal people and also alludes to the community nature of fishing activity. This theme is strongly supported by Aboriginal people today.

Equipment used for obtaining resources from estuaries included:

- Spears. There are references to spear fishing from the shore, from canoes and within the shallow water. Spears had four or five prongs and were sometimes tipped with barbs "of kangaroo teeth". Spears were also used to catch fish in the surf.

- Fish traps. Traps were sometimes made of stone (such as the structures at Arrawarra, Point Plomer and on Broughton Island), but were frequently made of plant materials, such as matted fences across tidal channels (Enright 1935, Bundock 1898, Burns 1844, Rudder 1925). These authors suggest that very large quantities of fish could be easily caught in these structures, especially during major fish runs (eg. mullet).

- Nets. There is some suggestion that nets on the north coast were made by women. A variety of nets were used in estuaries, including the "tow-row" described by Ainsworth. Nets could also be used in much the same way as fence type fish traps in the shallow (or narrow) upper reaches of estuaries.

- Hook and line. Hooks and lines were in use by Aboriginal people at Sydney Harbour when Europeans first arrived there. There is some archaeological debate as to whether line fishing

was a post European adaptation in some parts of the north coast, but shell fish hooks and slightly conical, ground edge items recorded as fish hook files, are widespread in midden sites on the central and mid north coasts.

- Canoe. Aboriginal people were clearly skilled at the navigation of light weight craft in sometimes dangerous currents. There are references from the north and central coasts of people cooking fish and shellfish in their canoes.

- Look out trees. There are several references to people climbing trees (using footholds and ropes made from bark and vines) to act as a lookout for schools of fish. One of these trees existed in the Worimi Local Aboriginal Land Council area on the shore of Port Stephens until very recently.

- Hand trapping or collection. This was the principal method for gathering shellfish, although baskets or other containers may also have been used to facilitate transport. In the case of deeper water shellfish (ie. not pipi or rock platform species), there are references to people diving (examples are oyster and more recently abalone on the south coast).

- Poisoning - there are references to the use of a "smart weed" to stun fish in waterholes or estuarine backwaters.

Several of these Aboriginal fishing strategies will not be archaeologically visible.

3.2.1.2 Species targeted and seasonal preferences

The species identified in various ethnographic references as being targeted by Aboriginal people are summarised in **Table 3.1**.

Table 3.1 - Summary of Ethnographic References to Species (North Coast)

Habitat	Species
Estuary	• Fish including black bream, garfish, whiting, flathead, tailor and trevally • Prawns (noted as a potential resource, no observations of use) • Oysters, whelks. Oyster diving and collection involved the whole tribe (see also McBryde (1982) re the Wombah middens) • Birds including swan, wild geese, wild duck, redbill and pelican
Tidal creeks and swamps	• Birds - quail and brolga • Eels • Crabs and crayfish, lobster • Mussels, cockles (Anadara), oyster • Tortoise • Food plants including rush (typha), cunjevoi, orchid, blue water lily, blechnum fern • "cobra"

Table 3.1 - Summary of Ethnographic References to Species (North Coast) (cont)

Habitat	Species
Beach and coast	• Fish - sea mullet, groper, kingfish, leatherjacket, bullseye, salmon, snapper, stingray • Crabs and crayfish • Shellfish - pipi, rock platform species, anadara and mussel (brought from the estuary) • Pandanus, pigface • Terrestrial species such as macropods • Mutton birds • Whales (possible strandings)

Ethnographic references to, and archaeological evidence of, prawn fishing by Aboriginal people in pre European times, are rare to non-existent. It seems unlikely, however, that Aboriginal people were not aware of the potential of prawns to supplement their diet during the summer months, and equally unlikely that prawns were not caught, considering the range of fishing technologies used by Aboriginal people. On the north coast, for instance, aboriginal people used woven nets (tow row) to catch schools of fish. These nets could also have been used to catch prawns.

There are a number of possible reasons for the apparent invisibility of prawn fishing in ethnographic and archaeological references, including:

- Prawns may have been a minor component of the diet, and early European observers did not see Aboriginal people specifically targeting prawns in estuaries.

- Early European observations of Aboriginal fishing tended to focus on the more spectacular fishing methods (such as use of large pronged spears)., or on activities that involved large groups of people in one place (such as gathering shell fish from oyster beds). There are several references to "beautifully crafted" nets, but no to their use to catch prawns.

- If prawns were caught from canoes, they could have been consumed on the water, leaving no archaeological evidence in the main midden sites. McBryde discusses this option in relation to the relatively low proportion of fish bone in some large midden sites.

- Crustacea are very fragile in archaeological deposits, with no part of the prawn shell sufficiently robust to be preserved for any length of time. Evidence of prawn consumption would therefore be differentially lost from the archaeological record. Even in the short term, prawn shells might not have been preserved on the surface for long enough for contemporary (early nineteenth century) Europeans to report their presence.

There is a widespread view amongst the ethnographic reports, in part substantiated by excavation of midden sites, that people were generally on the coast through late spring, summer and autumn, but lived in the hinterland through the winter. However, some fish that are known to have been targeted by Aboriginal fishers were also far more common (in schools) in the winter months, and it is possible that early observers did not note short visits to the coast at these times to obtain particular resources.

For example, Ainsworth (1922) notes that in September there were the salmon (*Arripis trutta*) runs. Sea mullet were also important. Mullet can be obtained almost continuously throughout the year, except possibly for early summer. From about late April to early September, sea mullet migrate in enormous shoals northwards along the beaches and would have been easily obtained by netting and spearing.

By way of contrast, Sullivan (1982) refers to observations by Robinson (1844) of the apparently healthy appearance of Aboriginal people both on the uplands (of the Monaro) and right along the south coast between Goalan Head and Gippsland Lakes in mid winter, during June and July. These descriptions do not suggest a strongly seasonal pattern of coast and hinterland occupation. Sullivan suggests that wintering on the south coast may have been more common than on the north coast.

Sullivan 1978 notes the size of the population in the north coast valleys at contact, and the rapid demise of traditional life and customs (within 30 years of European settlement). Large groups of people met and camped at one spot for quite lengthy periods; eg. 200-300 at Ballina in 1853 for the "oyster season", 300 at Woodburn, and 600 at Tintenbar. There are also several references to village like settlements (e.g. at the mouth of the Clarence estuary), suggesting relatively permanent settlement, at least on a seasonal basis.

Villages are also described from the south coast around 1840 (eg near Pambula, Brierly 1843), but there is a strong suggestion that even by this time, Aboriginal occupation patterns on the south coast had been severely impacted by European settlement (eg whaling) and that the villages were not representative of pre European times.

3.2.2 Types and distribution of archaeological sites

Sullivan (1982) provides an overview of the archaeology of shell midden sites along the NSW coast. Although a number of middens have been further investigated since that time, most of Sullivan's conclusions remain unchallenged. Key features of the archaeological evidence from middens are noted below. These features provide abundant evidence of the importance of the estuary fishery resource to Aboriginal people, and also point to changing technological and social organisation over time to enhance the return from the fishery. The structure of the NSW coastline, amongst other reasons, underpins some variations from north to south along the coast.

Colley (1987) highlights the difficulties of interpreting Aboriginal economic activity from the remains that are preserved in midden sites, particularly in relation to catch composition and seasonality. Factors include differential preservation of various materials (both plant and fish/shellfish) and the broad seasonal spectrum of some species.

Key features of NSW coastal midden sites include:

- In excess of 1500 midden sites have been recorded along the coast, primarily as open sites. In the Sydney region, a relatively high proportion of middens are situated in rock shelters, reflecting the relative abundance of cavernous overhangs close to the shoreline.

- The largest estuarine middens in NSW are located in the Macleay Valley (Clybucca and Stuarts Point). These mounded midden sites are estimated to contain 150000 to 200000 cubic metres of material. Similarly large middens are also known from the Richmond and Clarence valleys.

  McBryde (1982) describes the results of excavations in large middens along the estuaries of the Richmond, Clarence and Macleay rivers. The shell middens of the Richmond estuary near Ballina include mounds up to 400 metres in length and standing four metres high, whilst on the Macleay, middens stretch almost continuously near Clybucca for several miles. On the Clarence, middens stretch almost continuously from near Wombah (13 kilometres inland) to the coast. These deposits are located about 100 metres from the present bank of the main channel. In some cases they are situated on two terraces.

  Oyster the dominant shell fish throughout the deposit at Wombah (97% in some levels). Maximum carbon dates range from around 3500 BP at the base of the deposit, up to 1500 BP in level 2A of the middens. Despite the large volume of oyster shell in these sites, McBryde (1982) estimates that the oyster component in the big middens on the north coast is considered

to have provided only 0.1% of the dietary requirements of expected groups visiting the site over the dated period of occupation. McBryde concludes:

- The diet was likely to have been a mixed one and the archaeological evidence overemphasises the shellfish component;

- The period of occupation in any one year was likely to be short, and as hunting and fishing were still practised, the nineteenth century observers could well have missed the significance of shell fish gathering;

- The evidence indicating that occupation was brief and periodic strongly suggests seasonal occupation, i.e. a segment of an economy exploiting different resources at different times of the year;

- The shell fish gathering, fishing and hunting economy documented for the site could be an important element in the total annual diet, a refreshing change in activities and food components. Shell fish could be important in this change, even though not providing a high return in terms of energy.

- Mounded middens are also found on the south coast, for instance at Pambula (these are relatively well preserved), at Wagonga Inlet, Wallaga Lake and Sussex Inlet. Smaller middens are widespread from the mouths of estuaries to the upper reaches.

- Estuarine shell fish species comprise approximately 50% of the shell in middens along the coast. On the south coast, rock platform species are more common, reflecting the higher incidence of headlands. Beach pipi middens are common on the north coast, but many of these have been destroyed.

- The mounding of midden sites may have been for cultural reasons rather than for any environmental reason. Sullivan (1982) refers to midden mounds as markers of good places to return to in the landscape, plus a concept that keeping the waste shell together would encourage more shellfish at that location.

- Middens on the south coast tend to be sheltered by headlands and also tend to face to the north and east. In the Clarence Region of the north coast, sheltered middens tend to be located on the western side of dunes. (note the relatively low frequency of headlands on the north coast, when compared with the south coast). The aspect of sites also reflects winter wind directions and possible seasonality of occupation.

- Midden sites are often located close to supplies of fresh water, such as tributary creeks, springs, fresh ponds in coastal deflation basins and wetlands. Sullivan suggests that 80 to 90% of all midden sites are within 200 metes of a water supply, although occasional very large middens, containing entirely shell, are more than 500 metes from fresh water.

- Coastal sites provide evidence that they were clearly used in summer, but the evidence for winter use is less definitive. Species that are present in midden sites could have been available all year round.

- There is a tendency towards increasing variety of fish species and sizes in the upper layers of sites. Several authors suggest that this is due to the introduction of new fishing technologies (particularly line fishing) over time. Dates for fish hooks are all less than 1000 years. On the south coast, there is a clear change towards hairy mussel and edible mussel in the last 1000 years.

- Fish species that are reported from midden sites include snapper, bream (black and silver), leatherjacket, redfish, wrasse, mullet, flathead, and mulloway.

- Many midden sites have been destroyed by European land uses, with substantial destruction in the early years of colonisation when middens were exploited as a source of lime. Pipi middens along the coast may also be relatively underrepresented in the archaeological record, because many have been destroyed by mining and by coastal erosion and dune transgression processes.

- Human burials have been reported from midden sites right along the coast. Sullivan suggests that many of these burials, which include males and females (adults) and children, are relatively recent (last 200 years). Wherever they occur, and whatever their age, the presence of a burial in a midden deposit is highly significant to the Aboriginal community.

3.2.3 Implications of other types of archaeological evidence and Aboriginal places

Gungil Jindabah Centre (1996), (in NSW NRAC 1996) describes the cultural value of the coastal and estuarine landscape to Aboriginal people on the north coast of NSW, with particular reference to the importance of "country". They note that the coastal component of the region was, and still is, a central component in the culture of many Indigenous communities. The coastal area has the highest population density in the region and the seacoast provides a rich source of fisheries resources. Coastal land, estuarine and marine resources were and still are of major economic, spiritual and cultural importance.

> "*Aboriginal people have continued their associations with their sites and still adhere to the spiritual laws associated with them. This is despite the historical conflict and inbuilt preconceptions adhered to by non aboriginals since the British invasion.*"

One example of a significant site that is well known is the Goanna Headland site at Evans Head. This area contains sacred places as well as archaeological sites that are considered significant. This site physically consists of the Evans Headland, Pelican Island, the land associated with the top end of Bundjalung National Park, and formations of the headland including fresh water sites, the vegetation, the animals and the ocean. The site follows the Evans River upstream to Woodburn and then follows the Richmond River up as far as Coraki. The Gungil Jindabah Centre notes that there are various spots along the Evans and Richmond Rivers where parts of the story are indicated by natural formations. The actual headland cannot be separated from the surrounding areas. To say that the headland alone is significant, is to separate it from all other physical features of the site and diminishes its true extent, nature and cultural integrity.

The Gungil Jindabah Centre (1996) also refers to totemic spiritual associations, observing that these relate to every plant or animal within the natural environment. Every family has a totem which connects them to their existence. These totems bind people together in a spiritual essence to their ancestors and their clan groups. Totems may also relate to the wind, water, or other climatic condition. These places are sacred and should not be interfered with. However, Aboriginal people would not generally discuss these spiritual concerns in the wider community.

3.3 INTERACTIONS BETWEEN ESTUARY PRAWN TRAWL FISHERY AND ABORIGINAL HERITAGE SITES

The EPTFMS provides a framework for commercial netting of prawn species in five estuaries.

There are many Aboriginal sites along the banks of estuaries that provide abundant evidence of the value of estuarine resources to Aboriginal people, and in fact these sites underestimate the values of estuaries because no plant materials are preserved and only a portion of the more robust animal parts remain. There is, for instance, no archaeological evidence of prawn fishing and consumption,

just as there is no archaeological evidence of the widespread use of plant materials as foods, medicines, tools and equipment by Aboriginal people.

Estuary prawn trawling techniques involve the setting, towing and retrieval of nets. The nets are operated from small boats. In the large estuaries where prawn trawling is permitted, these fishery activities are most unlikely to impact on the stability of estuary banks or beds. Most prawn trawling areas, for instance, are within open estuary reaches where wind waves and tidal or flood currents are the dominant causes of bed and bank instability. The slow passage close to the bank of small trawling vessels would have relatively minimum impacts. There is some potential for boat passage to exacerbate bank erosion in narrow channels that may provide access to other parts of the estuary (e.g. along the narrow channels leading into Wooloweyah Lagoon), although prawn trawling vessels comprise only a small portion of total boating activity in these waterways.

The nature of estuary prawn trawling means that although the banks of estuaries are lined with known Aboriginal sites, there is a low risk that sites will be impacted by estuary prawn trawling activities.

There is potential for fishery related activities to impact on Aboriginal sites at restricted locations along estuarine waterways, for instance at boat ramps, and localities that are used for storage and maintenance of equipment. The extent of the risk associated with these activities will vary from one estuary to another and definition of the risk for an individual estuary will depend heavily on the availability of local knowledge (e.g. provided by discussions with local Aboriginal people and local NPWS officers).

Where potential impacts on Aboriginal sites are known to exist, it is important that they are addressed by liaison and management actions at the local level. This will ensure compliance with the requirements of the NPW Act and will also enhance co-operation and understanding of cultural concerns.

In general, the physical evidence of past Aboriginal occupation of estuary banks is most severely threatened by land uses and activities other than estuary prawning and fishing. Large midden sites in the Hunter estuary and north coast estuaries were exploited for lime in the Nineteenth Century, and sometimes also for road base. Many sites have also been destroyed by agricultural land uses, urban and tourist development and some have been destroyed by bank erosion (that may have natural or anthropogenic causes).

In the cases of both Aboriginal sites along the banks of estuaries, the overall risk that activities authorised by the EPTFMS will detrimentally impact on cultural heritage evidence is considered to be very small.

3.4 PROTOCOLS TO REDUCE THE RISK OF HARM TO SITES

The discussion presented in **Section 3.3** suggests that overall, the risk that activities that are authorised by the EPTFMS will impact on Aboriginal sites (ie. physical evidence of past occupation), is low. Notwithstanding this, several management actions are proposed to ensure that risks to archaeologically and culturally sensitive areas are minimised. These include:

- Consultation with local Aboriginal community representatives in relation to any proposed commercial fishery facility that would be located on an estuary bank or foreshore. This would include maintenance of existing ramps, new launching ramps, wharves and regional boat storage or maintenance sites. In general, such facilities will require separate environmental assessment and development consent including assessment of potential impacts on Aboriginal cultural heritage; and

- Ongoing consultation with local Aboriginal communities about developments in the commercial sector. This will occur, for instance, through Aboriginal representation on regional management advisory committees (MACs).

4.0 INDIGENOUS ISSUES

4.1 THE ROLE OF FISHING IN COASTAL ABORIGINAL COMMUNITIES

This section describes the role of estuary fishing and prawning in Aboriginal communities today. The discussion demonstrates the continuity of fishing as an important Aboriginal cultural activity, and highlights the species and habitats that are targeted by Aboriginal people. As noted in **Section 3**, there is minimal ethnographic and archaeological evidence of pre European prawning by Aboriginal people, but also no evidence that Aboriginal people would not have taken advantage of summer prawn runs to supplement their diet.

The discussion in this section also explores, at a general level, the ways in which existing and proposed strategies to manage the estuary prawn trawl fishery interact with and impact on the interests of Aboriginal communities. As noted in **Section 4**, this interaction is being explored more fully in the development of an Indigenous Fishery Strategy.

4.1.1 Historical and contemporary fishing by coastal Aboriginal communities

Section 3 described the evidence for pre European Aboriginal use of the estuary fishery, and the ethnographic evidence from the first years of competition for the resources of NSW estuaries with commercial and recreational fishers.

The State Aboriginal Land Council has noted the strong historical dependency of coastal Aboriginal communities on fishing and marine resources. They provide an Aboriginal perspective of the locations of missions that were established to accommodate Aboriginal people in the late Nineteenth Century, observing that many missions were located on estuaries or coastal headlands. Aboriginal people who were relocated to these missions would have been expected to provide a substantial proportion of their food supply by fishing and shellfish gathering.

A few publications provide evidence of the continuity of fishing as a lifestyle for Aboriginal people, and illustrate with specific case studies, the general principle described by the State Aboriginal Land Council. An example is the description of the Wreck Bay community on the NSW south coast (Egloff 1981). Schnierer and Robinson (1996) review environmental uses and issues for Aboriginal people on the NSW north coast.

4.1.1.1 The Wreck Bay fishing community - a south coast example of historical Aboriginal estuarine fishing

Egloff (1981) refers to abundant archaeological evidence of Aboriginal fishing and shell fish gathering along the shorelines at Wreck Bay, with extensive middens containing shell fish, fish hooks (using shell) edge ground axes, bone points and flaked stone implements. Axe grinding grooves, open campsites, bora rings and burial sites are also reported from the peninsula. Egloff describes fishing by men using spears that had hard wood prongs tipped with bone points. These spears were used in the bay and in shallow waters over rock reefs. Women also fished, using hook and line. Species represented in the midden sits include snapper and bream, as well as pipi and cockle.

The Aboriginal population in this part of the south coast was decimated after European settlement. Eventually the remaining Aboriginal people were settled at reserves at Roseby Park and Jervis Bay (Beecroft Peninsula), although a few people had continued to live in these areas throughout the

nineteenth century. Egloff (1981) reports that the Office of the Protector of Aborigines provided a boat and fishing gear to Aborigines at Broughton Creek in 1882 and that a boat was also provided to the Jervis Bay people (at Currambene Creek) the following year.

When the Commonwealth took over administration of Jervis Bay in 1922, there were 25 Aboriginal people living in a fishing village at Wreck Bay and Aboriginal crews had fished this part of the coast throughout the latter part of the nineteenth century.

Egloff's (1981) description of fishing at Wreck Bay in the first half of the twentieth century highlights the following features:

- Net fishing from small boats for mullet, blackfish, jewfish, kingfish, whiting and bream. 200 to 300 cases of fish could be caught at a single shot. Aboriginal fishers operated in the bay and as much as 13 kilometres out to sea;
- Snapper caught off the reefs with hand lines;
- Spotters stationed at vantage points (including high trees on the beach);
- Fish were carted to the railway at Bomaderry for transport to markets;
- Each catch was divided into five parts - one part for each crew member and one for the boat and gear which needed constant repair;
- In the 1940s and 1950s there were seven to eight crews of Aboriginal fishermen operating at Wreck Bay, and a rotation system was used to provide equitable access. Each crew had rights for 24 hours in turn;
- Most fishing was done between Christmas and Easter, and at other times men worked at local timber mills or picking vegetables;
- Catches declined in the late 1950s and 60s and so did prices fetched for fish;
- During the depression, families camped on the southern beaches of the bays and collected pipis, mussels and oysters. People also gathered abalone at this time. It was sun-dried on wire racks and sold to traders from Sydney; and
- Interestingly, Egloff (1981) does not describe prawning by Aboriginal people at Wreck Bay, either in archaeological or historical contexts.

Egloff (1981) also notes that the Office of the Protector of Aborigines also provided fishing boats to reserves and camps along the far south coast:

> "*In the Bodalla district, Aborigines were considered by ME Mort to be destitute without a boat. These Aborigines had sold fish for a living until their boat was wrecked while going to the assistance of a sinking vessel. Another image shattered; most white Australians do not realise the extent to which coastal Aborigines quickly adopted European maritime technology and became net fishermen capable of making their own gear and surprisingly enough, also pursued large whales. Recently buried at Wreck Bay is one of the great whalers of Twofold Bay, Aden Thomas. Before him were Hadigadi and Adgeree, two coastal Aborigines famous for their whaling exploits.*" (p 23)

4.1.1.2 Contemporary Aboriginal community participation in estuary fishing

The number of Aboriginal people fishing in estuaries (for fin fish or prawns) today is not well documented. Few Aboriginal people now hold commercial licences that provide access to the estuary general sector of the industry (Hector Saunders pers comm, Karuah Local Aboriginal Land Council).

However, a project funded by the Natural Heritage Trust and undertaken by the Centre for Indigenous Environmental Research at the Southern Cross University is seeking to shed some light on Indigenous fisheries in NSW (Schnierer pers.com.).

Under current licensing arrangements, most Aboriginal fishers are included in the recreational sector of the fishery. Recreational prawn fishing is a popular activity in NSW estuaries and NSW Fisheries estimate that approximately 0.5% of the population goes prawning at least once a year.

NSW Fisheries is currently coordinating a national survey of recreational fishing activity. The project is a joint initiative of Commonwealth, State and Territory governments. A sample of 45000 Australian households was selected from Australian Bureau of Statistics subdivisions. These households were contacted by telephone and information collected about participation in fishing, household structure, demographic profile (including ethnicity) and fishing intentions in the coming year.

Fishing households were encouraged to participate in a diary program where monthly information was collected about fish catches, fishing effort and fishing expenditure. Although data processing is continuing, NSW Fisheries has provided preliminary information for the first ten months of the survey.

Preliminary results are noted below (Gary Henry pers comm):

10300 households were selected in NSW.
About 8300 households provided a full response to fishing participation questions.
These households contained about 19600 people.
1.4% of the sample were Indigenous people.

1836 fishing households in NSW agreed to participate in the diary survey.
23 (1.3%) of these households were Indigenous.
3590 fishing people in NSW took part in the survey.
63 (1.7%) of these were Indigenous people.

Clearly, the sample of 63 Indigenous fishers is only small and also includes both inland and coastal fishers. Nevertheless, the sample provides a preliminary indication of some of the characteristics of Aboriginal fishing activity, which perhaps distinguish it from fishing by other groups.

The sample of 63 Aboriginal fishers has gone fishing on 266 separate occasions in the past ten months and the number and species diversity of their catch is shown in **Table 4.1**. Estuarine and marine species are shown in italics. The fishing effort by these fishers over the period of the survey is greater than the average across the State, hinting at the broader Aboriginal community consumption of the catches of Aboriginal fishers. The currently available data does not provide an indication of other types of fishing activity, or of other estuarine resources that are of importance to Aboriginal people.

A more detailed survey and analysis of Aboriginal fishing practices would be needed to draw firm conclusions about the nature of participation of Aboriginal fishers in the estuary fishery.

Table 4.1 - Results of Recreational fishing survey, Indigenous households

Species Common name	Kept	Released	Total
Bream – unspecified	*32*	*66*	*98*
Carp	37	1	38
Catfish – freshwater	1	2	3
Catfish – unspecified		6	6
Cod - Murray/ Murray perch	4	20	24
Cod - red rock/ red scorpion/ coral perch		2	2
Cod – unspecified		1	1
Fish – other		12	12
Flathead – unspecified	43	79	122
Flounder/ sole/ flatfish – unspecified		6	6
Garfish – unspecified	30		30
Gurnard	3		3
Leatherjacket	6		6
Lobster – unspecified	12	11	23
Morwong – blue	0		0
Mullet – unspecified	4	7	11
Mulloway/ jewfish/ kingfish	3		3
Non-Fish – other	1		1
Perch - golden/ yellowbelly/ callop	42		42
Perch – pearl	1		1
Perch - redfin/ English		1	1
Pike – unspecified		1	1
Salmon - Australian east/ west/ kahawai		1	1
Shark – unspecified	1		1
Snapper - pink/ southern/ squire	2	13	15
Tailor/ chopper/ jumbo	9	7	15
Trout – brown		1	1
Trout – rainbow	10		10
Whiting -unspecified	10	39	49
Yabbies	7		7
Yabbies/ nippers/ bass yabbies	40		40
Grand Total	**298**	**276**	**574**

4.1.1.3 Fishing method on the north coast

Faulkner (2000) provides general information about Indigenous fishing in northern NSW today. He notes that target species include both freshwater and saltwater species, with fish, crayfish, freshwater mussels, marine/estuarine shellfish, aquatic woodworms and freshwater turtle being mentioned.

Fishing technology includes hand lines (82%), rods and reels (57%), nets and spears, together with specialised traditional environmental knowledge. Faulkner (2000) notes particularly the concentrated effort of Aboriginal fishing practice, where a group of fishers is fishing not only for themselves, but to provide food, medicines and other resources for others in their community. The scale of fishing effort by these Aboriginal fishers is greater than if they were occupied with recreational fishing activity as individuals, but the catch is generally not intended for sale. Notwithstanding this, the catch has significant value to the Aboriginal community, as a supply of food, to meet social obligations within the community and to provide materials for barter. More detailed analysis of north coast fishing participation, practices and cultural values is provided in Faulkner (2001, in prep) (not currently available).

4.1.2 The economic and social value of fishing and prawning in coastal Aboriginal communities

Most Aboriginal people who fish in estuaries are currently classified as recreational fishers. Many recreational fishers of all ethnic backgrounds fish for both lifestyle and dietary supplementation reasons. However, the way fishing is reported to be practised by the Aboriginal community reflects strong cultural, lifestyle and economic factors.

Aboriginal people persistently describe fishing activity as something that is done at the community scale, rather than the individual scale. Many members of the community join together to fish and collect shellfish and to share other information about the environment. Sharing and barter of fish catches is part of the way people within a community meet their social and cultural obligations to others. The fishing outing also provides opportunities for the passing of traditional ecological knowledge and cultural knowledge from one generation to the next.

The economic value of this type of fishing activity to individuals and to whole Aboriginal communities is difficult to quantify. There are a number of constraints that need to be taken into consideration when assessing the economic value of estuary fishing in Aboriginal community economies and therefore the impact that regulation of the fishery has had and will have on the economy of Aboriginal communities. These matters are noted below, on the basis of anecdotal information from the State Aboriginal Land Council and some Local Aboriginal Land Councils. Although it would be possible to document and verify these general statements, a detailed social and anthropological study would be necessary. Such a study is beyond the scope of the present EIS process. The time frame necessary to achieve the level of trust between the Aboriginal community and researchers, and for transfer of effective information about the economic value of various activities, is also outside the scope of this EIS process. Some of these matters are currently being addressed through the consultation for the preparation of an Indigenous Fishery Strategy for NSW (see **Section 4.5.3**).

Key points that have emerged from the consultation during the preparation of this EIS include:

- In general, many people who live in coastal Aboriginal communities are relatively disadvantaged in terms of education and access to the broader job market. This affects the relative economic importance of non-market food sources to individuals and to the community.

- On the south coast, employment based around a series of seasonal jobs is described. These include work in sawmills, bean and potato picking and fishing (particularly during the summer - but note that estuary prawn trawling is not practised in south coast estuaries). Fishing is

described as a community subsistence activity, with most of the catch consumed within the community, and a portion traditionally traded for other commodities, or sold locally (not through the Commercial Cooperative). This type of fishing and trading is described as being of great importance to community welfare, although the overall cash exchange may be very small, and very poorly documented.

- On the north coast, small scale marketing of fish or shellfish at the local level provides an important economic supplement to the incomes of individuals and is also considered to provide important social benefits to communities with a high level of unemployment amongst young people.

- Community based fishing and use of other estuary resources is described as having indirect economic value to Aboriginal communities; for instance, because fishing parties also collect traditional medicines from the estuary, because the fish resources provide a healthy component of the diet (reducing the risk of certain illnesses), and because the fishing activity may provide outlets for other social issues that have economic implications. None of these aspects are documented quantitatively.

- Aboriginal people state that they have a strong interest in the sustainable use and management of estuary fishery resources, so that the full range of resources of value to the community is available for future generations.

4.2 CURRENT ACCESS OF ABORIGINAL COMMUNITIES TO ESTUARY FISHERY RESOURCES

Commercial fishing has existed in NSW estuaries since the mid nineteenth century, and by historical accounts from the late nineteenth century, it existed initially as a locally based activity because of the lack of effective refrigerated transport to bring catches to the Sydney or export markets. Commercial fishing operations moved to more remote estuaries early in the twentieth century. Commercial prawn trawling commenced in Port Jackson in 1926, spreading to the other four estuaries in the 1940s. There have been substantial increases in prawn trawling fishery effort since that time. Thus, although the interaction of traditional Aboriginal fishing activity with the commercial estuary sector in estuaries spans approximately 150 years in the Sydney area, and 100 years elsewhere on the NSW coast, the interaction with prawn trawling activities is restricted to only five estuaries and a period of 60 to 80 years.

From the late nineteenth century, a number of estuaries (or parts of estuaries) were closed to commercial fishing and prawn trawling, generally to conserve or to allow the regeneration of fish stocks. Traditional Aboriginal fishers (not holding commercial licences) would have continued to have access to the aquatic resources of these waterways during periods of commercial closure.

Since the mid 1980s, a number of new regulations have been introduced by NSW Fisheries (see **Table 4.2**). The broad objective of these regulations was to enhance the efficiency of the commercial fishery, and introduce greater control over fishing effort and impact. Until this time, many nominal participants in the industry had held licences that were used only rarely in terms of the historical importance of the commercial fishing activity to the licence holder's income. However, with many "sleeper" licences issued, there was a potential for major impacts on the fishery resource, if for instance, all licence holders decided to increase their effort and use the full extent of the licence. The new provisions forced amalgamation of many smaller businesses and low-activity licences.

In many Aboriginal communities, at least some members held general commercial fishing licences up until the early 1980s, and participated in the commercial sector, as well as fishing to support family and friends (see **Section 4.1**). The number of Aboriginal people who are licensed as

commercial fishers in the estuary prawn trawl sector and the relative scale of their fishing effort, is not known.

The introduction of greater regulation in the estuary fisheries from the mid 1980s had several unintended consequences in relation to the access of Aboriginal communities to the estuary fishery. The impacts of the regulations continue to be of concern to Aboriginal fishers, and are discussed further in **Section 4.2.1**.

Table 4.2 summarises the changes to the regulations and the ways in which these changes are seen by the Aboriginal community to have disadvantaged their access to the fishery. The information presented here about the views of the Aboriginal community is based on discussions with the NSW Aboriginal Land Council, NPWS Aboriginal sites officers/liaison officers along the NSW coast and a small number of individual Aboriginal fishers.

Table 4.2 - Increasing Regulation of Estuary Fisheries

Date	Regulation	Effects on Aboriginal fishers (advice from Aboriginal community representatives)
1980	Access to the abalone fishery limited	Commercial access to abalone is available only to those holding commercial licences. Two licences are held by the Cruise family at Eden, but no other Aboriginal fishers now participate legally in commercial abalone fishing. Aboriginal communities feel that the scale of their past involvement in abalone fishing was greater than the individual recreational fisher, and was not recognised in the allocation of abalone licences, in what is now a very lucrative industry. Aboriginal people feel that they were not consulted adequately about their interests in this industry at the time. Note that abalone is not part of any estuary fishery.
1984	Freeze on the issue of new boat licences	This was the first time that access to the general fishery had been limited. Although existing boats were not affected, limits were introduced on new commercial boat licences, and additional boats had to be justified.
1986	Access limited to offshore prawn trawling	No specific information available.
1987	Freeze on the issue of new commercial fishing licences	The aim of this regulation was to ensure that new participants in the fishing industry replaced existing fishing effort rather than adding to it. Aboriginal communities note that they tend to fish in community groups, so that more than one generation would be represented in a fishing group. During fishing activities, not only fishing skills but other cultural information might be shared with younger members of the community, so that sale or transfer of the licence from one generation to another is not as straightforward as in some other parts of the general community. Coastal Aboriginal communities feel that they were disadvantaged by this change to the legislation
1993	Access to the lobster industry limited	No specific information available.

Table 4.2 - Increasing Regulation of Estuary Fisheries (cont)

Date	Regulation	Effects on Aboriginal fishers (advice from Aboriginal community representatives)
1994	Licensing policy introduced, catch validation required	The 1994 legislation was the first part of the changes that continued until 1997 when the restricted fishery concept was introduced. Although NSW Fisheries required only small commercial returns to be documented, some Aboriginal families who had held general commercial licences were not able to meet this requirement. In this period, requirements that all participating fishers hold a licence were introduced. Aboriginal fishers feel that the small scale, group fishing strategy of Indigenous people is disadvantaged by this requirement. The policy did not affect estuary prawn trawl entitlements, which could be freely traded at that time.
1997	Restricted fisheries introduced for major marine fisheries	This legislation ended the period that licensed fishers could automatically access multiple fisheries. The estuary prawn trawl fishery was declared a restricted fishery, with endorsements replacing previous authorisations. Aboriginal people feel that NSW Fisheries did not consult adequately with them about the implications of this legislation. Entry to the restricted fishery required demonstration of a minimum level of catch history. Aboriginal people feel that basing licence renewals on returns lodged with NSW Fisheries was not consistent with the "circular seasonal" fishing practised by Aboriginal communities, and the family support/barter economy of Aboriginal communities. The restricted fishery licences also meant that separate licences now needed to be held to access the estuary general, beach haul and prawn haul components of the fishery, which were all part of the seasonal round of small scale Indigenous fishers. Aboriginal fishers also report that the zoning of the coast for licensing purposes is not consistent with their seasonal activities, which would once have involved considerable movement along the coast (eg from Nowra to Lakes Entrance).
2001	The estuary prawn trawl fishery will be made a Category 2 share management fishery. Shares are proposed to be issued for 15 years, with compensation of share holders if the fishery is closed within that time and shares are cancelled.	Continues the restrictions introduced in 1997.
	Closure of certain beaches and estuaries to commercial activity during holiday periods	Several NSW estuaries are closed to commercial fishing over weekends and during holiday periods when recreational demand is greatest, or to protect habitat/resources (total of 200 closures current). Aboriginal people do not generally regard themselves as recreational fishers. These closures further restricted community scale fishing activities (eg pipi gathering).

4.3 IMPACT OF CHANGING REGULATIONS - SPECIES AND LOCATIONS

4.3.1 Fish and prawn species

Table 4.3 shows the most commonly caught commercial species in estuaries and the extent to which some of these species are currently exploited by the commercial fishery (based on NSW Fisheries, May 2001, Draft Estuary General Fishery Strategy and September 2001 Estuary Prawn Trawl Strategy). **Table 4.3** also shows the species that are commonly reported to be caught by Indigenous fishers, or have been reported as a significant component of bone from Aboriginal sites along the NSW coast.

Table 4.3 - Species valued by commercial and Indigenous fishers

Species	Commercial fishery	Indigenous fishing
Sea mullet	Important resource, likely to be fully fished	Frequent ethnographic references right along the coast; reported in recreational survey of Indigenous fishers; reported from south coast Indigenous fishers in 1950s
Luderick	Moderately fished	Widely fished, anecdotal information
Yellowfin bream	Fully fished	Black bream (not yellow fin bream) reported ethnographically and in midden sites; reported from the Wreck Bay community in 1950s
School prawns	Fully fished	Widely fished, anecdotal information. Would not be archaeologically visible
Eastern king prawn	Fully fished	No information available. Would not be archaeologically visible
Greasy back prawn	Uncertain	No information available. Would not be archaeologically visible
Tiger prawn	Uncertain	No information available. Would not be archaeologically visible.
Dusky flathead	Fully fished	Reported ethnographically and in midden sites; reported in recreational survey of Indigenous fishers
Blue swimmer crab	To be determined	Widely fished, anecdotal information
Mud crab	Uncertain	No information available
Sand whiting	Moderately fished	Reported ethnographically and in midden sites; reported in recreational survey of Indigenous fishers; reported from the Wreck Bay community in the 1950s
Longfinned eels	Moderately to fully fished	Ethnographic reports of eel trapping in upper estuaries and wetlands
Pipi	To be determined	Most common species in ocean beach middens; pipi gathering a strong contemporary Indigenous fishing activity, both recreational and small scale commercial
Squid	Uncertain	No information available
Octopus	Uncertain	No information available, would not be archaeologically visible
Whitebait	Uncertain	No information available
Catfish	Uncertain	No information available
Sole	Uncertain	No information available
Fantail mullet	Underfished	No information available
Silver trevally	Fully fished to overfished	Reported ethnographically and in midden sites

Table 4.3 - Species valued by commercial and Indigenous fishers (cont)

Species	Commercial fishery	Indigenous fishing
Mulloway	Fully fished	Reported from archaeological sites; reported from the Wreck Bay community in 1950s
Tarwhine	Moderately fished	No information available
Leatherjacket	Moderately to fully fished	Reported from archaeological sites
Garfish	Moderately fished	Reported in recreational survey of Indigenous fishers
Tailor	Moderately fished	Reported ethnographically; reported in recreational survey of Indigenous fishers
Snapper	Fully fished to overfished	Reported from archaeological sites; reported in recreational survey of Indigenous fishers
Yellowtail	Moderately fished	No information available
Trumpeter whiting	Moderately fished	No information available – probably widely fished
Australian salmon		Commonly reported in ethnographic descriptions
Rock oyster		Abundant in estuarine middens (especially north coast)
Mud/sand oyster		Common in estuarine middens along entire coast
Hairy and edible mussel		Abundant in upper levels of south coast middens (last 1000 years)
Blood cockles (Anadara cockles)		Contemporary Indigenous fishing, very common in estuarine middens right along the coast
Rock platform shellfish		Common in coastal middens, particularly on the south coast, where headlands more frequent
Mud whelk		Common in archaeological sites

This very preliminary level of analysis indicates, as might be expected, that there has been and continues to be a strong overlap between the fish species targeted by commercial fishers and those that have been targeted by Aboriginal people in past and contemporary fishing activities. There is much less overlap between commercial and Indigenous shell fish harvesting, although a number of the shell fish species preferred by Aboriginal people are also now collected by other ethnic groups in NSW. The extent of overlap between estuary prawn trawl fishers and Indigenous fishers is very poorly documented.

It is of note that both of the principal target species of the estuary prawn trawl fishery are considered to be fully fished.

4.4 NATIVE TITLE AND LAND CLAIMS

Local Aboriginal Land Councils in NSW may make claims with respect to Crown Land under the NSW Aboriginal Land Rights Act. In general, land claims to date have included parcels of land along the banks of estuaries, and on beaches. For instance, the government announced in March 2001 the granting of a Land Claim by the Worimi Local Aboriginal Land Council over substantial sections of Stockton Beach. Although part of the claim is proposed to be leased back to NPWS to become part of a new national park in the vegetated dunes of Stockton Bight, the granting of the Land Claim will provide the Land Council with opportunities to exercise a high level of control over the use and management of the beach and dunes, including the management of a large number of midden sites.

The Commonwealth Native Title legislation was introduced in 1993. Up until the end of June 2001, a total of 335 Native Title claims had been made by Aboriginal people in NSW. Very

few of these have been determined yet and only 52 have reached the acceptance or registration stage. Of the 335 claims, 147 have subsequently been withdrawn.

Where it is demonstrated to exist, Native Title provides the Aboriginal community with opportunities to negotiate in relation to allocations of the resources of the land (or water) in question, and also to negotiate compensation for loss of access to traditional sites and practices.

Of the Native Title claims that have been lodged to date in NSW (and the Jervis Bay territory), 50 relate to land around estuaries and along the coast. Two claims on the south coast (by the Walbunja people and the Djiringanj people) extend both along the coastline and out to the 200 nautical mile limit. Other examples of claims that cover estuarine and coastal waters include those by the Bherri Werri people (Jervis Bay), Eloura people (south of Wollongong), Gundungurra people (Moruya) and Banjalang people (north of Yamba and at Byron Bay).

In some cases, Native Title claims have been made and subsequently withdrawn, although this is not necessarily an indication that local Aboriginal people consider that the claim has a weak case. In all cases, the effort required to demonstrate the necessary connections to the land, and to achieve successful outcomes from Court cases, is high. It can be expected that resolution of Native Title issues will take many years.

The issue of Native Title is noted in the draft Estuary Prawn Trawl Fishery Management Strategy as a reason that Aboriginal people are stakeholders in the development and implementation of the strategy. The draft strategy also alludes to the potential for Native Title to lead to the exclusion of other groups of estuary fishers from some waterways. As no Native Title claim that would provide for exclusive use or partial curtailment of other users has yet been granted in coastal NSW, the draft strategy does not specifically address the process for dealing with future interactions between Indigenous fishers and commercial fishers in this context.

The draft Strategy does discuss contingency plans "in the case of emergencies or unpredictable events" and also has a trigger point for review that relates to significant shifts in the balance between catches taken by various sectors (commercial, Indigenous and recreational) in any estuary.

These broad strategies will allow the Estuary Prawn Trawl Management Strategy to be reviewed and amended over time, as the issues related to tenure of waterways and the seabed are further resolved.

4.5 MANAGEMENT OF INDIGENOUS FISHING AND ESTUARY PRAWN TRAWL FISHERY INTERACTIONS

4.5.1 Outstanding issues of concern to coastal Aboriginal communities

The level of Aboriginal participation in the commercial fishery sector appears to have declined substantially over the last twenty years. There are now perhaps less than fifteen active fishing licences (estuary general and estuary prawn trawl) held by Aboriginal families along the coast. However, the lack of commercial participation is not an indication of declining Indigenous participation in fishing and prawning generally. There are four main categories of outstanding issues of concern to the Aboriginal community in relation to their participation in the management of fisheries in NSW (NSW Fisheries 2000) and each of these is also relevant to the impact of estuary prawn trawl commercial fishery strategy on Aboriginal communities:

- lack of recognition and accommodation of traditional Indigenous fishing practices;
- declining participation of Aboriginal people in commercial, recreational and aquaculture fisheries;

- insufficient meaningful presence and participation of Aboriginal people in the process for managing and conserving fisheries resources; and

- need for better communication and consultation with Aboriginal people.

4.5.2 Actions to address Aboriginal concerns in the draft EPTFMS

The draft estuary prawn trawl fishery management strategy identifies Indigenous people as stakeholders in the estuary prawn trawl fishery, noting that these interests arise from:

- direct participation in the fishery as commercial fishers;

- traditional fishing practices, whereby people catch fish and prawns on behalf of themselves and their community; and

- lodgement of Native Title claims over estuarine areas that are used for commercial prawn trawling (e.g. the Banjalang claim in the Clarence estuary) (see **Section 4.4**).

NSW Fisheries legislation does not currently recognise Indigenous fishers as a separate sector of the fisher population, and this is the main reason why none of the legislative reviews to date have given extensive consideration to Aboriginal community concerns.

The draft EPTFMS does not specifically address the Aboriginal community's view that the evolution of the fisheries legislation in NSW has gradually but consistently undervalued the interests of Aboriginal people in the estuary fishery. The draft strategy does, however, foreshadow future amendments to the strategy to better accommodate Aboriginal community interests.

One of the key goals of the Fishery Management Strategy is to appropriately share the resource. One of the objectives of the estuary prawn trawl management strategy specifically addresses Indigenous concerns:

> *Objective 4.3: To implement the NSW Government's Indigenous Fishing Strategy, as relevant to the estuary prawn trawl fishery.*
>
> *(a) participate in the development and subsequent reviews of the Indigenous Fishing Strategy and make adjustments to this fisheries management strategy where needed.*

Several other objectives and strategic actions listed in the estuary prawn trawl strategy will also be of interest and potential benefit to Indigenous stakeholders. These include:

- Objective 1.1: to minimise the impact of fishing activities on non retained fish (d) use fishing closures to control the are and time fished, to
  - conserve primary and byproduct species
  - reduce bycatch in areas and at times of high abundance of bycatch species
  - avoid direct interactions with the habitats of threatened species, populations or ecological communities
  - promote harmony with other waterway activities and resource users.

- Objective 2.1: to maintain the stocks of primary and byproduct species of the estuary prawn haul fishery at or above a level that minimises the risk of overfishing.

- Objective 2.3: to conserve fish stocks by managing levels of active effort in the fishery.

- Objective 2.5: to minimise the impact of activities external to the estuary prawn trawl fishery on the resources harvested by the fishery and on fishery related habitats.

- Objective 2.6: to promote the recovery of overfished species.

- Objective 4.1: to monitor and provide an appropriate allocation of the fisheries resources between fishing groups, acknowledging the need of seafood consumers to access fresh quality fish.

- Objective 6.3: to provide effective and efficient communication and consultation mechanisms in relation to the estuary prawn trawl fishery.

- Objective 8.2: to promote community awareness as to the importance of fish habitat to fish stocks.

These objectives demonstrate a commitment by the estuary prawn trawl fishery to operate in an ecologically sustainable manner that recognises the needs of other stakeholders and the need for excellent communication and understanding of the perspectives of those stakeholders.

4.5.3 Performance indicators and trigger points

The draft estuary prawn trawl fishery management strategy includes one performance indicator that relates directly to the sharing of the fishery resource between fishing groups (including Indigenous fishers).

- Catch levels (including estimates) from the commercial, recreational and Indigenous sectors (excluding catches attributable to recreational fishing areas).

This indicator is accompanied by a trigger point that will require action if the relative catch of the identified sectors varies by more than 25% over five years.

The performance indicators and trigger points will be reviewed when the overall strategy is reviewed to ensure that they provide appropriate guidance on the interaction between the estuary prawn trawl fishery and Indigenous fishers.

4.5.4 Towards a NSW Indigenous Fishery Strategy

NSW Fisheries has recognised that coastal Aboriginal communities have long standing and legitimate interests in the fishery resources of estuaries. The NSW Government now also acknowledges that Indigenous community interests in the estuary fishery are contemporary and do not only relate to past history. The traditional access of Aboriginal communities to natural resources has been restricted by existing fisheries management policies and legislation.

A recent working paper prepared by NSW Fisheries (2000) indicates that consultation is progressing about how best to recognise and accommodate the rights and interests of Aboriginal people in the estuary fishery and other commercial fisheries. The working paper is part of the process for the development of an Indigenous Fishery Strategy for NSW.

The working paper does not provide a specific definition of Indigenous fishing activities, but several important characteristics can be deduced (see **Section 4.1**).

A number of actions have already been implemented to recognise the interests of Indigenous stakeholders. These include:

- NSW Fisheries accessed funds from the Federal Government as a result of the Coastal Zone Inquiry to employ an officer to begin the development of an Aboriginal fishery strategy (1996/7);

- A series of workshops with Indigenous communities across NSW in 1998. These workshops identified hundreds of issues of concern to Aboriginal people, falling into approximately 15 main categories of issues, that should be addressed by the Indigenous Fishery Strategy;

- In October 2000, the NSW recreational fishing fees policy was released. The policy exempts Aboriginal people fishing in saltwater from the recreational fishing fee, provided that they are party to a registered native title claim and traditional cultural fishing under the Indigenous Fishery Strategy. Until the Strategy is released an interim arrangement has been implements. Local Aboriginal Land Council members and any Aboriginal person fishing with them are exempt from the fee if fishing in the Local Aboriginal Land Council area. A practical process for issuing certificates of fee exemption is now being considered; and

- Principles for the Indigenous Fishery Strategy have been proposed.

4.5.5 Interaction of the EPTFMS and the Indigenous Fishery Strategy

The time frame for the finalisation of the Indigenous Fishery Strategy is not clear, and there are many complex issues to be resolved before a sustainable strategy is agreed to by the stakeholders. It is most probable that the Estuary Prawn Trawl Fishery Management Strategy will be assessed and will commence implementation before negotiations about the Indigenous Fishery Strategy are complete.

The preliminary indications are that the Indigenous Fishery Strategy will, subject to Government funding, address many of the issues that remain as outstanding concerns to the Aboriginal community in relation to the estuary prawn trawl fishery. It is also possible that the strategy will include a staged series of actions to gradually improve Indigenous access to the natural resources of estuaries and other fisheries, ensuring that any necessary changes to the EPTFMS will also be gradual.

Ongoing review of the Estuary Prawn Trawl Fishery Management Strategy will be essential to ensure that any changes in the policy approach to Indigenous fisheries are adopted within the EPTFMS. It is proposed that the EPTFMS will be reviewed in two years, with particular attention to ensuring consistency between any Indigenous Fishery Strategy that exists at that time, and the management protocols contained in the EPTFMS.

4.5.6 Further strategic actions to mitigate impacts on Indigenous fishers

It is anticipated that the consultation leading to the adoption of a new NSW policy for fishing by Indigenous fishers will address many of the outstanding concerns of the Aboriginal community. The key actions, in relation to estuaries, that are being considered for inclusion in an Indigenous Fishery Strategy (NSW Fisheries Working Paper, 2000) are noted below. There is as yet no indication as to which of these options may be included in the strategy that is agreed between the NSW Government and Aboriginal people, but discussions are continuing. Options being discussed include:

- Issue permits or change regulations to allow exemptions for the use of certain low impact fishing gear (for instance small nets, spears and traps).

- Establish closures or management rules on sites that are recognised as significant to protect traditional Indigenous fisheries.

- Establishing closures on particular species for harvest by Indigenous people only, such as bimbulas (blood cockles). Bimbulas are currently under utilised and are of low interest to commercial fishers. These could form the basis of a sustainable Indigenous fishery.

- Issuing permits to allow possession and bag limits to be exceeded for certain species, areas or periods, for individual and communities.

- Some under utilised species such as Australian salmon could become a useful base for boutique-style, value-added processing in a small artisan style fishery and processing venture that used local community labour and resources.

- Expansion of the fishery for gathering beach worms and pipis from north coast beaches for bait for recreational fishing could be a viable and sustainable scheme.

- Extensive aquaculture (ranching) of black bream, snapper and prawns in intermittent south coast lagoons could be a viable scheme.

- Establish a program (like a Fishcare Volunteer Program) with Indigenous communities, to use and pass on Indigenous knowledge about fish habitat and conservation.

- Cross-cultural training for fisheries officers, and employment of Aboriginal Fisheries officers to enhance the accessibility of fisheries information to Aboriginal communities.

- Establish an Indigenous fisheries committee (to advise the current advisory council on Indigenous issues).

It is of note that these options do not appear to relate specifically to access to the estuary prawn fishery, and this matter should be considered further during the consultation process.

NSW Fisheries is advancing new policies in relation to marine conservation areas, recreational fishery areas and aquaculture at the same time as strategies for various commercial sectors are being developed and assessed. Within this far reaching review of fishery management, innovative opportunities for responding to Aboriginal cultural values in relation to the estuary prawn trawl fishery (and other fisheries) may emerge. The critical action in this regard is to provide meaningful opportunities for communication and discussion of all aspects of fisheries management with Aboriginal community representatives. A secondary action is that close co-ordination is maintained between all aspects of fishery management policy as it evolves.

5.0 SUMMARY OF ACTIONS TO MINIMISE THE RISK OF IMPACT OF ESTUARY PRAWN TRAWL FISHERY ACTIVITIES ON ABORIGINAL SITES AND INDIGENOUS ISSUES

As noted above, the risk of impacts on Aboriginal sites from estuary prawn trawl fishery activities is considered to be low at the whole of industry level, although specific local issues may emerge that need careful management.

Many of the concerns of Aboriginal communities about the impact of current commercial fishery regulations on their livelihoods and lifestyles are being addressed through the partnership with NSW Fisheries to develop an Indigenous Fishery Strategy. However, this process may take some time, both to finalise to the satisfaction of all stakeholders, and to implement through changes to other strategies and legislation.

In the shorter term, several actions are recommended to minimise the risks of adverse interactions between estuary prawn trawl fishery activity, Aboriginal heritage and contemporary Indigenous community issues. These include:

- Focus on enhancing communication between NSW Fisheries and Aboriginal communities at all levels. This would include:

  - cultural awareness training for NSW Fisheries staff;

  - Aboriginal membership of local area fishery management committees;

  - Employ Aboriginal liaison officers to enhance transfer of information to Aboriginal communities, and to assist with the management of culturally sensitive information;

  - Consultation with Aboriginal community representatives about proposed new fishery infrastructure along the banks of estuaries that could impact on sites of cultural heritage value; and

  - Consultation with NPWS about potential impacts on known Aboriginal sites for any new infrastructure development.

- Prepare cultural awareness material for commercial fishers in the estuary prawn trawl sector (and other sectors) highlighting risks to Aboriginal sites and how these can be minimised;

- Ensure close co-ordination of the preparation of new fishery management strategies for commercial, conservation, recreational and Indigenous sectors, to enhance opportunities for identifying innovative cross sectoral management options;

- Explore opportunities for further Indigenous fishing or recreational fishing development in estuaries that are currently subject to a low level of commercial fishing activity; and

- The EPTFMS should be reviewed after two years, so that changes to Indigenous fishing policies can be accommodated.

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