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Socio-economic impact assessment of the proposed Cod Grounds Marine Protected Area

Report prepared for Department of Environment and Heritage

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Executive summary

Box 1: Key findings on potential impacts of the proposed Cod Grounds MPA

- Estimated **average annual $GVP** of commercial fishing catch from the Cod Grounds, at beach landed prices, has been **between $162,600 and $229,200** over the past seven years, and is more likely to lie at the upper end of this estimate. See main report and Appendix 1 for detailed description of methods used to reach this figure and assessment of limitations of data.
- **Six owner operators** have fished the Cod Grounds regularly over the past seven years, with another **3.5 employees** working in the six fishing businesses. Up to another eight fishing businesses may irregularly fish the Cod Grounds, with the level of irregular fishing effort not able to be determined with certainty.
- Different fishing businesses will be impacted to different extents if the proposed MPA is declared, losing **between 5% and 70% of their gross commercial fishing income.**
- In the **absence of mitigation strategies**, fishers are likely to seek to replace lost catch by targeting other fishing areas within the Ocean Trap and Line fishery, and in other NSW fisheries. This **displaced fishing effort will result in flow-on impacts** to fishers already operating in these alternative areas;
- The **running and capital costs of fishing businesses are unlikely to be reduced if fishers do not target the Cod Grounds**, as fishers often fish the area on their way to and from other fishing grounds that lie further from port than the Cod Grounds;
- **Four fish co-operatives** would be impacted by the proposed MPA, and would lose commissions from between $10,000 and $124,080 of catch at beach landed prices if the MPA is declared. Total impact would differ between co-operatives, with between 3% to 5.5% of currently landed catch being lost for three of them and potentially a much greater proportion for other co-operative ;
- **Retail outlets of fish co-operatives** would be impacted by the proposed MPA through loss of locally caught fish supplies. Sourcing alternative supplies of species such as snapper is likely to raise costs for these businesses, and may also result in lower sales to consumers who prefer to purchase locally caught fish. The likely dollar impact of this could not be assessed due to lack of data.
- There is a **low ability of local regions to provide alternative employment opportunities for fishers,** or to **absorb changes in spending** resulting from any direct impacts of the proposed MPA.
- Development of mitigation strategies should take into consideration:
  - the regulations preventing separate sale of entitlements to operate in the Ocean Trap and Line fishery from sale of a fishing business (including capital attached to that fishing business);
  - the fully fished status of fisheries into which effort may be displaced in absence of mitigation strategies;
  - the potential psychological impacts of the change on fishing families;
  - the variations in impact on different fishing businesses and fish co-operatives.

This report provides an assessment of the potential social and economic impacts of the proposed Cod Grounds Marine Protected Area (MPA). The Cod Grounds is located in Commonwealth waters, approximately four nautical miles off the coast of Laurieton, New South Wales. The proposed Cod Grounds MPA covers an area one kilometre in radius from three underwater pinnacles. The area of the pinnacles has been assessed as habitat critical for Grey Nurse Shark. All commercial and recreational fishing would be prohibited under the proposed MPA.

This assessment examined potential social and economic impacts of the proposed Cod Grounds MPA on commercial fishers and their families, and on fish co-operatives whose members currently land catch from the Cod Grounds. Data was collected via (a) structured qualitative survey of potentially impacted fishers and their families and fish co-operatives, (b) accessing catch and catch value data from NSW Fisheries and the Sydney Fish Market, and (c) using secondary data to profile socio-economic characteristics of the region in which impacted fishers and co-operative are located.

The SEIA used a 'no intervention' scenario, assuming no strategies were in place to mitigate negative impacts of the change. This provided data on the level and nature of likely impacts and possible responses. Likely responses to the proposed MPA need to be viewed in the context of overall changes to the industry over the past decade which have seen commercial fishing become a more competitive business, with narrower margins, reduced options available to fishers and increasing uncertainty about the future of fishing in the region.

The Cod Grounds is a highly productive and reliable fishing ground. Fish caught by in the Ocean Trap and Line Fishery, the only fishery operating on the Cod Grounds, often attracts premium prices due to the high quality of the fish caught by trap and line methods. The assessment identifies total annual gross value of production ($GVP) of the Cod Grounds catch of fishers regularly operating in the Cod Grounds as approximately $162,600 to $229,220 at beach landed prices, with the upper level of the range likely to be the more accurate estimate.

The Ocean Trap and Line Fishery is currently assessed by NSW Fisheries as fully exploited, as are the other fisheries in which fishers currently operating on the Cod Grounds hold licences/endorsements. There is therefore little to no potential for other areas of the Ocean Trap and Line Fishery, or for other fisheries, to absorb displaced efforts from the Cod Grounds.

The SEIA identified the following key groups potentially most affected by changes to commercial fishing under the proposed MPA:

- Fishers currently fishing the Cod Grounds, and their families. Six owner operators of fishing businesses were identified as fishing the Cod Grounds regularly over the last seven years, with in total of 9.5 people currently employed in these fishing businesses (including the owner operators). In addition, there may be up to another eight owner-operators irregularly fishing the Cod Grounds for a small proportion (less than 10%) of their income;

- Fishers operating in NSW Fisheries data collection Zone 4 who may be affected by displaced fishing effort from the Cod Grounds, and their families. It is not possible to identify specific fishers who may be affected, but the estimate of catch value affected can be used to estimate the amount of fishing effort potentially displaced to other areas;

- Managers and employees of fish co-operatives currently landing catch from the Cod Grounds; and

- To a lesser extent, local businesses who currently purchase catch landed from the Cod Grounds.

Key potential impacts of the proposed MPA in the absence of impact mitigation strategies were identified as:

- Loss of between $162,610 to $229,220 annual average fish catch by fishers regularly targeting the Cod Grounds, as well as additional catch from a small number of fishers irregularly targeting the Cod Grounds. The figure is likely to lie at the higher end of the estimated range due to the high quality of catch on the Cod Grounds;

- Increased business costs for these fishers incurred from having to source catch from elsewhere, and reduced resale value of fishing businesses with an entitlement to operate in the NSW Ocean Trap and Line fishery

- For fishing families, increased stress resulting from factors including uncertainty about fishing business viability, reduced family income, reduced self-esteem if fishing occupation was lost and the difficulty of finding alternative employment in the region

- Displaced fishing effort from the Cod Grounds. The displaced effort would be at least equal to the amount of catch lost at the Cod Grounds, and and likely to be higher to offset higher business costs incurred when fishing alternative areas;

- Reduced commissions from sale of landed catch by four co-operatives, with one considerably more impacted than the other three;

- Increased costs for local purchasers of key species caught on the Cod Grounds (particularly snapper, mulloway (jewfish), teraglin and kingfish), incurred through having to source fish supply from alternative sources, and reduction in sales;

These types of impacts are consistent with those identified in adjustments to similar changes occurring in other areas.

Loss of fish catch was not evenly distributed between potentially impacted fishing businesses. The primary species affected would be snapper and bonito, with several other species also affected including sweep, trevally, teraglin, jewfish and leatherjacket. Loss of catch would affect fishers through:

- Substantial loss (over 40% and up to 70%) of current or recent income for four full-time and two part-time fishers. Loss of 20-40% of current income for a further two to three fishing businesses; and

- Loss of irregular income, or regular income making up less than 10% of current fishing income for two to eight other fishing businesses (based on estimates provided by fish co-operatives).

The SEIA also examined key factors relating to impacts of declaring the proposed MPA, which have relevance in identifying possible mitigation strategies:

- The lack of alternative fishing areas of similar reliability and productivity to the Cod Grounds within a similar distance from port, and fully exploited status of fisheries operating in the region;

- The impacts of the proposed MPA on both owners of fishing businesses and their employees and families;

- The reluctance of most potentially impacted fishers to leave commercial fishing, and difficulty of retraining in another field of employment given fisher's education levels and current skill sets;

- The lack of alternative employment options in the region.

A mix of adjustment strategies would appear the most likely to successfully mitigate negative impacts of the proposed Cod Grounds MPA. Three main types of potential assistance were examined:

- Licence buy-outs - which would assist owner-operators, but not their employees and were more likely to be considered by those over the age of 60.;

- Assistance to keep fishing businesses viable - which would address the preference of the majority of fishers interviewed to remain in the fishing industry, however concerns were expressed at the capacity of surrounding fisheries to cope with expanded activity; and

- Retraining – which was generally rejected as an option.

Data limitations have meant that some costs are identified as estimates only, and some have not been able to be quantified in this study[1]. Key data analysis issues related to the catch volume and value data used are outlined in Box 2 below.

While it was not possible to place a dollar value on the potential of different mitigation strategies, the report has identified the types of mitigation strategies most likely to successfully mitigate negative impacts of the proposed MPA.

[1] See Appendix 1 for a detailed discussion of the sources and limitations of data used.

Box 2: Sources and limitations of catch volume and value data used in this report

Appendix 1 details the methods used to analyse data, and data sources used, and should be referred to for specific information about how sources of data used in this assessment.

Data on catch volume and value was collected through (a) accessing NSW Fisheries catch and effort data, (b) using valuations of catch based on Sydney Fish Market data with some adjustments for likely value of certain species, (c) interviews with potentially impacted fishers and managers of fish co-operatives. (The interviews were also used to collect a range of other data on potential impacts, including data on fishing business structures, and likely impacts of the proposed MPA).

NSW Fisheries catch volume and effort data is provided for a zone much larger than the proposed MPA. Estimation of the proportion of fish catch occurring on the Cod Grounds relied on estimates supplied by fishers, fish co-operatives and NSW Fisheries, all of which broadly agreed on the volume and of catch from the Cod Grounds. This means that there is a broad level of confidence in catch volume data, to approximately +/- 10%, the accuracy to which fishers believed they could broadly estimate the proportion of their catch sourced from the Cod Grounds. The volume estimates are provided as a single figure in the report, rather than giving a +/- 10% range of the estimate, as:

- Some fishers believed their estimates to be very accurate for some species/methods and less so for others, making applying a '+/-10%' range in appropriate for some estimates; and

- Confidence in estimates was higher for more recent years and lower for less recent years, and applying a +/-10% variation across all years would not be appropriate where confidence levels change over time.

Data on catch value was supplied by (a) NSW Fisheries, who supplied values based on average Sydney Fish Market data, (b) analysing Sydney Fish Market average monthly prices directly, and (c) asking co-operatives to provide data on local prices for key species.

From the volume and value data, a range value of average annual GVP at beach landed prices of catch from the Cod Grounds was produced. There is a high level of confidence that the $GVP would fall within the range of values provided, and a high level of confidence that it is more likely to fall at the upper end of the estimate range provided, given the data supplied from NSW Fisheries, fishers and fish co-operatives all suggested that high quality fish which receive high-end market prices are landed from the Cod Grounds, and estimates of fish values from various NSW Fisheries have all found SFM average data is likely to underestimate true GVP of fish at beach landed prices (SMEC 2001a,b,c).

When estimates are provided in the report based on catch volume and value data, they are always presented as a range rather than an absolute figure. The range provided represents the possible range of the impact based on the level of certainty of value data.

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Introduction

This report provides an assessment of potential social and economic impacts of the proposed Cod Grounds Marine Protected Area (MPA). This assessment provides information to help support subsequent decision-making about the proposed MPA.

This report provides a brief background to the proposed Cod Grounds MPA, and the scope of the SEIA undertaken, including the methods used for the SEIA. The report then provides:

- A history of fishing in the region, including key changes affecting fishers in the region;
- Profile of current and historical fishing on the Cod Grounds;
- Potential impacts of the proposed MPA on fishing businesses that (a) currently fish the Cod Grounds, (b) have a history of fishing on the Cod Grounds, and/or (c) would be affected by fishing displaced from the Cod Grounds;
- Potential impact of the proposed MPA on fishers and fishing families;
- Potential mitigation strategies for fishing businesses and fishing families;
- Potential impacts of the proposed MPA on fishing co-operatives; and
- A profile of the socio-economic characteristics of the area in which fishers and fish co-operatives are located and how this affects potential impacts of the proposed MPA on them.

Key factors that should be considered when developing any subsequent policies aimed at mitigating impacts if the proposed MPA is declared are then discussed.

Background

The Cod Grounds is located approximately four nautical miles off the coast of Laurieton, New South Wales, in Commonwealth waters. It is made up of three underwater pinnacles, rising to 18 metres water depth from a seabed approximately 40 metres deep. The Cod Grounds has been identified as a prime habitat for grey nurse sharks, which have been observed aggregating above the seabed, and near the gutters between the three pinnacles (Department of Environment and Heritage (DEH) 2003a). Figure 1 shows the location of the proposed MPA.

The east coast population of grey nurse sharks is listed as critically endangered under the *Environment Protection and Biodiversity Conservation Act* 1999. The Commonwealth Recovery Plan for Grey Nurse Sharks in Australia lists nineteen known aggregation sites for grey nurse sharks along Australia’s east coast. One of these is the Cod Grounds. Currently at the Cod Grounds, human activities include commercial fishing (using trap and line methods), recreational fishing and SCUBA diving (DEH 2003a).

Recognising this, the DEH released a discussion paper in 2003 providing background on grey nurse sharks and the Cod Grounds, and options for protecting grey nurse sharks at the Cod Grounds. In response to this discussion paper a total of 185 submissions were received, and were considered in developing a proposal for a marine reserve at the Cod Grounds. A proposal was then released in late 2003 for a Marine Protected Area (MPA) to be declared at the Cod Grounds (DEH 2003b).

The proposed MPA would be declared over the area within a 1000 metre radius of the three pinnacles of the Cod Grounds, a total area of 3.1 square kilometres. Within this area, all commercial and recreational fishing would be prohibited, and SCUBA diving at a minimum controlled by a permit system (DEH 2003b).

After the proposal was developed, BRS was contracted to undertake an assessment of the potential social and economic impacts of the proposed MPA on commercial fishers and fish co-operatives. Due to the lack of existing social and economic data at the appropriate scale, and the need to obtain details about their fishing activities to allow better use of NSW Fisheries data (such as fish species, fishing methods, and proportion of fishing effort occurring on the Cod Grounds), it was decided to combine data collected through interviews with potentially impacted fishers, with information accessed from NSW Fisheries catch records.

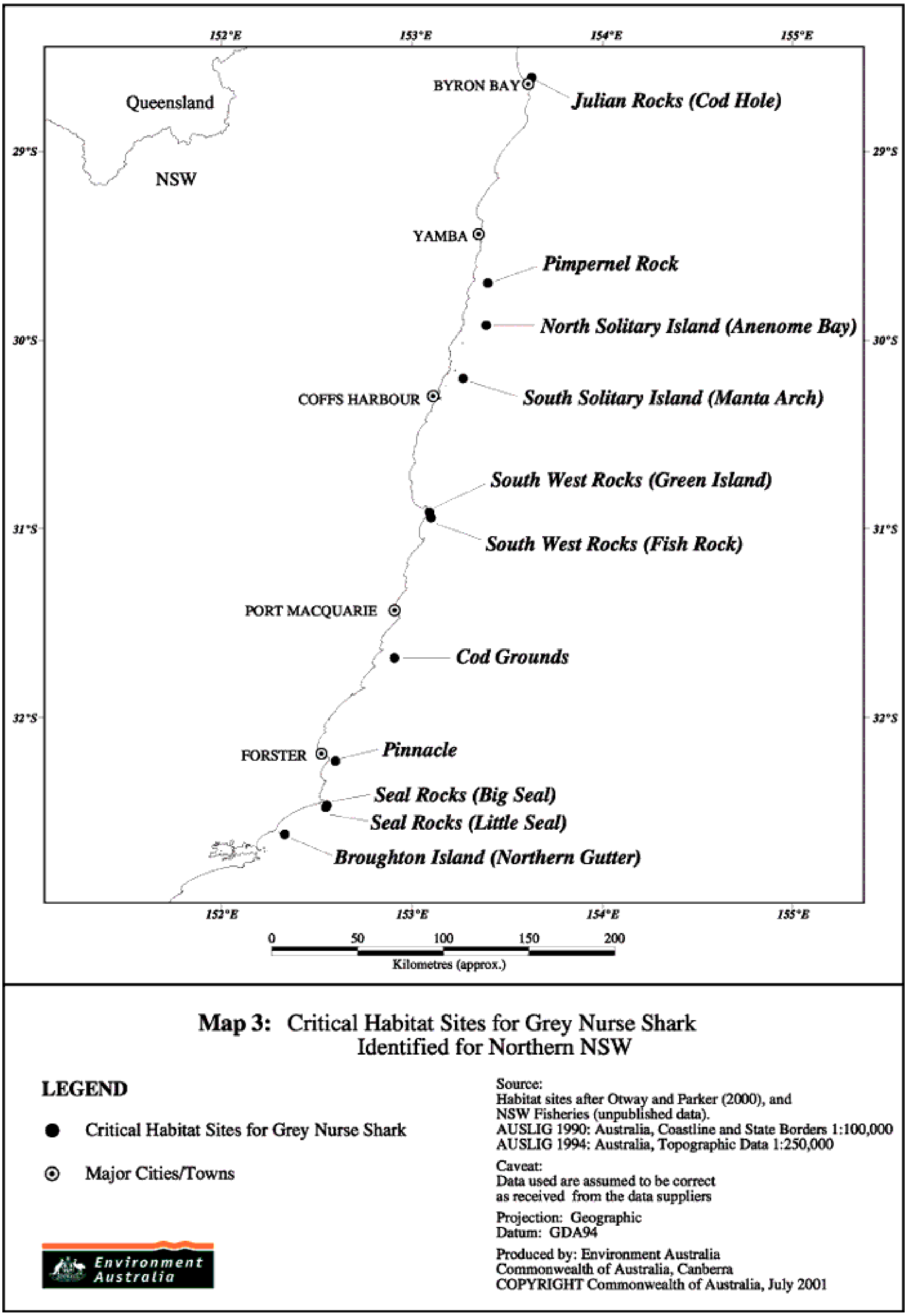

Figure 1: Location of the Cod Grounds in Northern NSW.

Source: Environment Australia (2002)

Scope and nature of the SEIA

Socio-economic impact assessment

In recent years, social and economic impact assessment (SEIA) has been increasingly used by decision makers, including both government and private sector organisations, to predict potential consequences of proposed changes in access to natural resources. SEIA is a useful tool to help understand the potential range of impacts of a proposed change, and the likely responses of those impacted if the change occurs. This understanding can be used to help design impact mitigation strategies that can minimise negative, and maximise positive, impacts of any change.

Scope of this assessment

This impact assessment examined the potential impacts of the proposed MPA on the following groups:

- Commercial fishers – including both licence holders and their employees – who have a history of fishing the Cod Grounds, and their families;
- Commercial fishers – including both licence holders and their employees – who fish in the ocean trap and line fishery in NSW Fisheries data collection Zone 4, and their families; and
- Fishing co-operatives that receive catch landed from the Cod Grounds.

This represents an analysis of the direct impacts of the proposed MPA. Likely indirect social impacts of the proposed MPA were examined by analysing key social characteristics of the region likely to be impacted. Indirect economic impacts were not examined.

Summary of methods used to assess impacts

Methods used to assess impacts were (a) accessing available data on current fishing activity, and (b) collecting data via interviews of potentially impacted fishers and fish co-operatives.

Existing data on economic and social impacts of current fishing activity in and around the Cod Grounds is limited. NSW Fisheries will be undertaking a social and economic impact assessment starting in late 2004[2]. A survey of commercial NSW fishers asking for details of fishing business activities was undertaken by Roy Morgan in 2001, but the data collected was not specific enough to be useful for estimating impacts of the proposed Cod Grounds MPA.

NSW Fisheries collects catch and effort data from commercial fishers in the region[3]. The data is collected by zone, with the Cod Grounds falling into NSW Fisheries data collection Zone 4. Zone 4 covers the area from 31 to 32 degrees South, and incorporates all waters falling into NSW jurisdiction within that range. The proposed Cod Grounds MPA boundaries would

[2] This assessment will support development of a management strategy for the Ocean Trap and Line Fishery by NSW Fisheries; assessments are being progressively carried out on different NSW fisheries (Philip Gibbs, NSW Fisheries, pers. comm.).

[3] See Appendix 1 for detailed description of the data collected by NSW Fisheries.

cover 3.1 km^2 within this Zone. The location of the Cod Grounds, and its location within data collection Zone 4, can be seen in Figure 1.

Due to the lack of existing social and economic data at the appropriate scale, and the need to obtain details about their fishing activities to allow better use of NSW Fisheries data (such as fish species, fishing methods, and proportion of fishing effort occurring on the Cod Grounds), it was decided to combine data collected through interviews with potentially impacted fishers, with information accessed from NSW Fisheries catch records for data collection Zone 4. Box 2 (page 7) details key sources and limitations of catch volume and value data used in this report. Appendix 1 provides more detail on the methods used to improve validity of data estimates, and the process used to arrive at the estimates provided in this report. This includes discussion of the number and type of interviews conducted, and of limitations of the catch volume effort and value data. A copy of the interview schedules used for fishers is at Appendix 2 and for fish co-operatives at Appendix 3.

A social profile of the region in which potentially impacted fishers lived was undertaken using data from the Australian Bureau of Statistic's *Census of Population and Housing*.

Fishing in the region of the Cod Grounds

Understanding the potential impacts of the proposed MPA requires knowledge of the types of fishing occurring in the region, and changes, for example in fisheries management, that have affected how fishers can operate in the region. This provides the context necessary to analyse how fishers are likely to respond to changes such as the proposed MPA.

Regulation of fishing on the Cod Grounds and in the region

All fishing on the area covered by the proposed Cod Grounds MPA falls within the NSW Ocean Trap and Line Fishery (OT&L) [4].

The OT&L became a category 1 share managed fishery in February 2004, where fishing businesses must have an entitlement to operate in the OT&L fishery, and fishers must hold commercial fishing licences with endorsements to operate in the OT&L. Shares will soon replace endorsements in the fishery.

Commercial fisheries in NSW (excluding Abalone and Lobster) have recently moved from restricted to share managed fisheries. Table 1 details key differences between restricted and share managed fisheries.

Table 1: Comparison of the restricted fishery and share management fishery framework for commercial fisheries in New South Wales, provided for under the *Fisheries Management Act 1994*

Source: NSW Fisheries (2002)

	Restricted fishery	**Share managed fishery**
Right issued	Validated catch history which gives rise to an "entitlement"	Shares
Access	Endorsement	Endorsement
Transferability	Subject to transfer policy	Subject to the management plan
Statutory compensation payable (under NSW law)?	No	Yes, if shares are cancelled
Statutory management plan required (under NSW law)?	No	Yes, 5 year plan

The OT&L fishery operated as a restricted entry fishery from 1 March 1997. Under the restricted entry, fishing businesses (termed 'recognised fishing operations', or RFOs) were allocated 'entitlements' to operate in the OT&L fishery based on whether their fishing effort in the OT&L met threshold criteria during the years 1987 to 1993. Fisheries catch data was

[4] A general description of the Ocean Trap and Line Fishery is given in Appendix 4.

validated for those years, with fishers given an opportunity to review the records for their RFO and challenge them if they believed they were inaccurate.

An entitlement in a restricted fishery in NSW is attached to an RFO, not to individual fishers. This means it is attached to the boat that forms the basis of the RFO, not to individuals working on that boat. More than one fisher may work in an RFO. Individual fishers must hold a commercial fishing licence, and endorsements are placed on that licence allowing fishers to operate in particular areas of the fishery using specified gear.

Within OT&L, fishers may hold multiple endorsements. This may include one or more of:

- A Line Fishing Western Zone endorsement, allowing them to fish to 100 fathoms depth (183 metres);
- A Line Fishing Eastern Zone endorsement allowing them to fish at over 100 fathoms depth; and/or
- A demersal fish trap endorsement.

In addition, vessels operating outside of 3 nautical miles are required to have an offshore fishing entitlement or an OG1 condition on their vessel licence[5].

Two types of boasts may operate as commercial fishing boats in NSW. The first are 'boat history vessels'. These are boats attached to an RFO which received fishing entitlements based on their validated catch history over 1986 to 1993. The entitlements attached to the RFO and the 'boat history vessel' must be transferred as a single package, and are not allowed to be transferred separately to each other (NSW Fisheries 2002). The second type are 'general purpose vessels', which 'can be transferred separately to the other entitlements of the fishing business' (NSW Fisheries 2002). Fishers currently regulatory fishing the Cod Grounds have boat history vessels.

Fishing boats are also licensed. Any transfers of fishing boat licences require prior approval by the Director-General of NSW Fisheries.

Obtaining a commercial fishing licence and endorsements to operate in a fishery can only occur in a restricted entry fishery through purchase of a fishing business (RFO) with validated catch history.

Many fishers with OT&L endorsements also hold endorsements and/or shares in other fisheries, and own/work in RFOs with entitlements in fisheries other than the OT&L. The other fisheries include the Ocean Hauling Fishery (including Beach Ocean Haul), Lobster Fishery, Estuary Prawn Trawl, Ocean Prawn Trawl Fishery, Estuary General Fishery, Ocean Fish Trawl Fishery, Abalone Fishery and Estuary General Fishery[6].

All these fisheries, with the exception of the Rock Lobster Fishery are in the process of transitioning to a share managed fishery. The Rock Lobster Fishery is already a share

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[5] Prior to 1991, the Commonwealth Government controlled fishing in waters over 3 nautical miles from shore. When the Offshore Constitutional Settlement was signed between the NSW and Commonwealth Governments in 1991, jurisdiction of ocean trap and line fishing activities within the 4,000 metre isobath was given to NSW. At this time, fishers who had previously held Commonwealth licenses to operate outside 3 nautical miles were automatically issued an authority called an 'OG1' on their NSW boat licence permitting them to work in offshore waters (NSW Fisheries n.d.).

[6] General information about these fisheries can be found by accessing the NSW Fisheries commercial fishing homepage, at http://www.fisheries.nsw.gov.au/com/home_management_plans.htm

managed fishery, in which shareholders are allocated a proportion of the total allowable catch set annually for the fishery according to the proportion of shares they hold in the fishery. Entry to the Rock Lobster Fishery only requires purchasing shares in the Fishery, rather than purchasing a fishing business as is the requirement in the restricted entry fisheries.

The OT&L Fishery is in the process of shifting from a restricted to a share-based fishery. At the time of report writing, eligible persons had been invited to apply for shares by 2 July 2004. In October 2004, provisional shares will be allocated to operators in the fishery. An appeals process will be taking place, allowing fishers to challenge their allocation if they believe it is inappropriate. A Share Management Plan will be drawn up for the fishery, specifying rules for share management, trading, and minimum share requirements to be allowed to operate in the fishery, amongst others. The conditions and transferability placed on shares in the OT&L fishery will not be publicly available until the Share Management Plan has been released. It is expected that the final transition to a share-based fishery will be complete by mid- to late-2005.

Nature of fishing undertaken in the region

Commercial fishers operating in the region on and around the Cod Grounds and data collection Zone 4 in general are multi-method, multi-species fishers. They fish on different fishing grounds in the region at different times, as well as using multiple fishing methods.

Multi-species, multi-method fishing has been undertaken in this area for at least several decades, with some fishers interviewed having up to four generations of this type of fishing. This approach to fishing is believed by the fishers to be highly sustainable, as targeting different areas and species at appropriate times of year allows fish stocks recovery time:

> *'… like a farmer we want to spell [an] area for a certain time of the year and go back … when we know it's more productive … It's more beneficial for us to let it stay fallow rather than be there 12 months of the year.'* –Fisher # 1
>
> *'I grew up in a multi-purpose fishery where everything was done seasonal, you pulled something until it started to get less in the catch rate and then you'd stop that and you'd go and catch something else … I was taught not to hit the one thing too hard for too long otherwise you'd wear it out.'* – Fisher # 3

Within this fishing tradition availability of multiple fishing grounds to target at different times of the year and in different conditions is important to maintaining business viability.

Changes affecting fishers in the region

Key changes affecting how fishers undertaking multi-purpose, multi-species fishing in the Cod Grounds region and surrounding areas have been able to fish in recent decades include:

- Changes in regulations, with a shift to restricted fisheries and share fisheries;
- Closures of fishing grounds;
- Changes to size limits for particular species of fish and fishing method restrictions;
- Increasing interaction with recreational fishers in some areas;
- Increasing capital and operating costs and fees charged to fishing businesses; and

- Increased market competition, from interstate or overseas fish imports.

The shift to restricted fisheries and share fisheries

Access to many fisheries, including the trap and line fishery, was historically open to any NSW licensed commercial fisher (NSW Fisheries n.d.). From March 1 1997, NSW fisheries converted to restricted fisheries, with the restrictions as described earlier.

The shift to restricted fisheries affected many of the fishers interviewed. Several undertook historical fishing for a short period of the year, or only irregularly, in a fishery and did not meet the criteria to receive an entitlement to operate in that fishery. Once the restricted fishery was declared, that fishery was no longer available for them to shift to as part of the rotational fishing methods.

Fishers responded to this change through (a) searching for new areas to fish in the fisheries for which they had entitlements, and (b) increasing fishing effort in the fisheries for which they received entitlements compared to their effort prior to the shift to restricted fisheries.

Closures of fishing grounds

The primary closure affecting fishers in the Cod Grounds region was the 2002 closure of the lower third of the Camden Haven estuary to commercial estuary fishers to create a recreational fishing haven. This affected only those with estuary general or estuary prawn trawl entitlements, and represented a considerable loss of fishing for some. Some affected fishers also hold OT&L entitlements.

The closure was part of a State-wide program of creating Recreational Fishing Havens (RFHs), in which a number estuary closures occurred. Fees from recreational fishing licences were used to fund a buy-out of commercial fishing licences operating in the RFHs and surrounding areas, in which fishers sold licences back to the NSW government. This effectively funded a reallocation of fisheries resources from commercial to recreational fishers in the RFHs (DEH 2003). NSW Fisheries purchased the estuary entitlements of fishers who chose to take part in the buy-out, paying compensation of:

- Twice the average of the three best catch years of the fishing business between 1986 and 1999, plus

- $10,000 for depreciation of equipment; and

- $10,000 retraining allowance.

Fishers kept their equipment, with the buy-out being of the entitlement only.

In the NSW Government Budget Report for 2002-2003, the NSW Minister for Agriculture and Fisheries reported that $20 million had been used to buy out 251 fishing businesses as a result of establishing 29 RFHs in NSW estuaries (NSW Government 2003).

Responses to closures of estuary areas to commercial fishing by those fishers who did not take up the option of a licence buy-out were similar to those identified above - intensified fishing in remaining areas and search for new areas to fish.

Potential future closures were also mentioned by fishers, including the proposed Cod Grounds MPA and other potential closures, not formally proposed but which fishers believe may occur in the future. These proposals have created considerable uncertainty for fishers and their families.

Changes to size limits for particular species of fish and fishing method restrictions

Changes to size limits and fishing methods in recent years have affected some fishing businesses. The biggest impact for OT&L fishers interviewed was an increase in the snapper size limit from 28 centimetres to 30 centimetres, implemented approximately two years ago. This change affected several of the fishers interviewed, and four reported their catches of snapper had reduced significantly since the size limit change.

Responses to the snapper size change varied. Some moved to target other species more intensively. One reported having effectively stopped fishing at that time, partly because of the snapper size change. Others shifted effort to areas where snapper caught was more likely to be of legal size, for example, three fishers (two owner operators and one employee) reported shifting effort from inshore reef areas, such as Mermaid Rock, to reefs further from shore such as the Cod Grounds where snapper size tended to be higher.

Other changes to size limits or fishing methods included a ban on kingfish trapping imposed in 1995, and trip limits for gemfish (discussed by two operators). While few operators reported being directly affected by these changes, those that did reported similar impacts and responses to impacts as those resulting from the shift to restricted fisheries.

Increasing interaction with recreational fishers

Commercial fishers reported a range of interactions with recreational fishers in the region. Four reported difficulties associated with increased interaction, primarily loss of traps, resulting from recreational fishers tying up to trap buoys and inadvertently dragging the traps as their boat drifted, until the traps became snagged.

Other fishers reported a good relationship with recreational fishers and in the area of the proposed MPA, all but one reported relatively positive interactions. All who discussed the issue observed increasing use of the Cod Grounds by recreational fishers in recent years, particularly since widespread use of GPS has made the pinnacles more easily located.

Several fishers expressed concern about closures in which commercial fishing was banned but recreational fishing allowed to continue, including the recent estuary closure.

Increasing capital and operating costs for fishing businesses

All fishers reported increasing capital and operating costs for their business, in most cases reporting that these costs had risen faster than prices received for fish landed. Costs commonly mentioned as having increased significantly included:

- Licences and fees paid to NSW Fisheries, including annual licence fees, environmental survey fees, and others.
- Boat motor repair and replacement;
- Equipment such as floats and rope;
- Fuel; and
- Bait.

Most of these costs had risen due to a rise in purchase price. However, increased equipment costs resulted both from rising costs of purchasing equipment, and from increased rates of loss of equipment. The increased loss of equipment was usually a result of increased shipping traffic and/or recreational fishing effort in areas when commercial fishers are operating.

Fishers have tried to minimise the loss by fishing in areas with less shipping traffic and/or recreational fishing:

> *'We're sort of pushed into the inshore fishery more these days because of the coastal freighters … they're like trucks going up and down the highway out there now, and they run over your gear and cost you a lot of money.'* – Fisher # 1

Fishers had a range of strategies for responding to increasing business capital and operating costs, including targeting higher value species, such as snapper, which could be sold locally for a better return. Others had increased their hours of effort in order to cover capital and operating costs, or targeted areas where gear was less likely to be damaged. The Cod Grounds was identified as one area where snapper can be caught in high numbers, and where gear damage is in general lower than in other locations, due to less shipping traffic in the area.

Increasingly competitive markets

Several fishers discussed increasing competition from fish products brought in from interstate and overseas. In general, it was believed that increased competition in markets had resulted in fish prices staying relatively steady, or rising at a lower rate than business costs. Responses to this have been similar to responses to increasing business operating and capital costs.

Impacts of changes

The combined impact of the various changes discussed above has been increasing pressure on fishers to be efficient and competitive, with lower profit margins and more effort required to keep fishing businesses viable:

> *'When I first started fishing it was more of a lifestyle but now it's become more of a battle business-wise. You have to spend more hours in it, you have to stay very productive … or you will go behind … to start in the game now, I wouldn't even think about it.'* – Fisher # 1

The changes have created considerable uncertainty about the future for fishers, particularly regarding potential future changes to regulations and access to different fisheries and fishing grounds:

> *'We're basically at a point where we can't invest any more … there's no security, no-one's really game to invest a lot of money to venture into anything new. … Everyone's just jumping up and down in one spot until we get a bit of security.'* – Fisher # 2

Fishers reported the changes had altered their ability to manage their impact on fish stocks:

> *They sort of put us all into slots, what you can do, what you can't do,* [based on] *your catch history over the years, now in this area … all the little bits and pieces make up a whole and that's how we earn our income. … it impacted on us being able to earn enough income out of what we've got left … and what they've done by doing that is also put excess pressure onto the fisheries that we are allowed to be in, because to make up for the shortfalls in other fisheries we've got to go and flog the other one like hell, seven days a week, to survive.* – Fisher # 7

Overall, changes to fishing over the past decade have resulted in commercial fishing becoming a more competitive business with narrower margins; reduced fishing options available to fishers; and increased uncertainty about the future of fishing in the region. The primary response to these changes by fishers has been development of strategies to try to maintain the viability of their fishing business, in order to stay in fishing. Fishers also reported a reduction in the number of young people entering commercial fishing, and overall reduction in numbers of commercial fishers as older fishers retired.

Fishing activity on the Cod Grounds

Profile of fishing on the Cod Grounds

The Cod Grounds has a set of unique characteristics that make it an unusually productive fishing ground in the region. The Cod Grounds is comprised of three underwater pinnacles of rock, rising to an average depth of approximately 24 metres and a peak of 18 metres. The pinnacles together cover an area described by fishers as about the size of a football field. The structure of this reef, together with relatively good current conditions and its location four nautical miles from the coast, lead to high aggregations of fish on the reef structure.

Fishing methods used on the Cod Grounds include various forms of line fishing, and fish trapping. The fishing methods used are detailed in Appendix 5.

The Cod Grounds was reported by fishers to be a more reliable fishing ground than other areas of reef in the region, because of its larger size, position further from the coast and relatively shallow water compared to other reef areas in the region. In addition, the Cod Grounds is accessible in a wide range of weather conditions whereas fishing areas further from the coast had significantly higher likelihood of bad weather or current conditions preventing fishing.

> *[The Cod Ground] is only four miles from the shelf … if it's windy you can still get out and get in …* – Fisher # 6
>
> *The reason why we look at the Cod Ground is, different times of the year, it would be one of the only grounds that had the kingfish and bonitos at different times of the year. You can go up and down the coast and you don't get them, but it gets them.'* – Fisher # 12
>
> *'Fishermen have relied on the aggregation of fish on this reef's structure, as a major component of their income … similarly to the way a shop keeper would rely on a business placed in the main street of a CBD' – Fisher # 17*

The Cod Grounds is the largest area of reef rock relatively close to shore. Other reef areas are smaller, with Mermaid Reef, the next largest area of reef, considerably smaller than the Cod Grounds and closer to shore. Other small areas of broken reef exist in the area, considerably smaller than the Cod Grounds or Mermaid Reef. Other than these reef areas, there is predominantly muddy ocean floor out to the shelf.

Eleven owner operators and 6 employees of owner operators interviewed indicated a history of fishing the Cod Grounds or current fishing on the Cod Grounds. All indicated that only trap and line fishing was undertaken on the Cod Grounds, consistent with the information provided by NSW Fisheries and DEH at the beginning of the SEIA.

Key characteristics of these owner operators are summarised in Table 2[7].

[7] Note that the information provided provides a picture of differences between businesses without allowing individual identification of businesses. Descriptions of individual fishing businesses are not provided as the level of variation between businesses would allow easy identification of individuals from this type of information.

Table 2: Characteristics of current owner operators with a history of fishing the Cod Grounds

Fishing business characteristic	Number of owner operators* of fishing businesses with a history of Cod Grounds fishing (out of 11) with this characteristic
Cod Grounds fishing history	
Fishing the Cod Grounds on a regular basis within the past 4 years	6
History of fishing the Cod Grounds within past decade	11+ Eleven owner operators interviewed had a history of fishing the Cod Grounds. Other fishers in the region also reported to have a history of fishing Cod Grounds had either retired, or were not interviewed as they did not indicate a potential impact from the proposed MPA.
Over 50% of OT&L catch since 1996/97 from proposed MPA. Note that two of these also fished in other fisheries, meaning that the proportion of their overall catch from different fisheries affected by the proposed MPA may be less than 50%.	3
20-50% of OT&L catch since 1996/97 from proposed MPA. All of these fishers only fished in the OT&L fishery.	2 (plus possibly one other who declined to be interviewed, although it is not known whether this fisher would fall into this category).
Do not currently regularly fish the Cod Grounds, but current irregular catch and/or potential future catch likely to be affected by proposed MPA	7-13. Five owner operators interviewed fell into this category. Based on co-operative figures, another 2 - 8 owner operators may also fall in this category.
Employees/business structure	
Owner operator with no employees	2
Owner operator with one casual employee (paid)	3
Owner operator with one unpaid employee/s	3+
Owner operator with one full-time or more than one casual employee	2
Business is a partnership, operating with another fishing business or as a partnership between family member/s (eg owners of two fishing businesses work together, or more than one family member works in a fishing business that is held in the name of one of the family members)	5
Entitlements/endorsements/shares held	
Western Line endorsement (OT&L)	11
Eastern Line endorsement (OT&L)	7
Demersal fish trap endorsement (OT&L)	8
Ocean Prawn Trawl entitlement – inshore endorsement	2
Ocean Prawn Trawl entitlement – offshore endorsement	2
Ocean Hauling entitlement	2
Estuary General or Estuary Prawn Trawl entitlement	2
Rock Lobster shares	3
Current methods of fishing on Cod Grounds	
Demersal fish trap	7
Troll line/Lead line/ hand line	1l
Drop line	6

* The definition of 'owner/operator' used here is not traditional, and refers to 'any one of (a) a single person, (b) a husband/wife or (c) another type of partnership, in which the person, couple or partners own one or more fishing businesses with an interest in the Cod Grounds but operate as a single entity.'

Fishing history, current fishing and plans for future fishing on the Cod Grounds

Of the fishers who indicated an interest in the Cod Grounds:

- Six owner operators, operating a total of seven fishing businesses, indicated they currently regularly fish the Cod Grounds.

- All others interviewed indicated a history of fishing the Cod Grounds, with some indicating they currently irregularly fish the Cod Grounds. Two of these discussed plans to return to fishing the Cod Grounds more regularly in the future, while others indicated that the Cod Grounds represented a useful 'emergency' fishing spot when other regular fishing areas were not successful.

In general, the Cod Grounds was considered a good potential area for future fishing as part of the multi species, multi purpose rotational fishing undertaken by fishers in the OT&L fishery.

It is estimated an additional one to four fishers currently fish the Cod Grounds on an irregular basis for a small proportion (less than 10%) of their total catch and effort. This estimate is based on estimates provided by co-operative managers of numbers of co-operative members currently landing catch from the Cod Grounds (and one fisher identified as potentially impacted who did not participate in an interview). It was not possible to obtain firm identification of numbers currently irregularly fishing the Cod Grounds for a small proportion of their total catch, except that it is likely to be between two and eight fishers, based on varying reports from fishers and co-operatives.

Fishers reported that in the past 10 to 20 years considerably more boats fished the Cod Grounds, with reports of 10 to 12 boats fishing the Cod Grounds on a daily basis.

> *'There used to be 14 boats working out of here, and out early every morning, be out on the Cod Ground by daylight, little troll around, we'd come back with five or half a dozen boxes of kingfish … and bonito, that sort of thing …'* – Fisher # 7
>
> *You'd have no worries to see 10 or 11 boats on it when it was good, of a night … there's a lot of boats that have gone out of the industry and there's nowhere near that amount now.* – Fisher # 14

The reduction in boats operating on the Cod Grounds appears to have resulted from two primary influences - retirement of fishers who used to fish the Cod Grounds, and changes in catch. Two fishers had ceased fishing on the Cod Grounds due to the drop in kingfish stocks that occurred during and after the period in which kingfish traps were used[8]. However, they had planned to return when kingfish stocks recovered, which they indicated was showing signs of occurring in recent years.

Fishing methods used by Cod Grounds fishers

Methods reported in use on the Cod Grounds were demersal fish trapping, troll lines, lead lines, drop lines and hand lines. No rock lobster pots were reported used in the area covered by the proposed MPA, and the area covered by the proposed MPA is not suitable for net fishing. In the past, floating fish traps were used to trap kingfish until this ceased in 1995.

[8] Use of these traps was banned in 1995.

Business capital and running costs for Cod Grounds fishers

Owner operators interviewed owned a range of boats. Boat sizes ranged from 23 foot to 53 foot length, with a range of boat types. Most had diesel motors, with varying capacities. Boats were fitted with a range of gear types, depending on the fisheries in which entitlements/shares were held, and the fishing methods used by different fishers.

In general, all fishing businesses currently operating on the Cod Grounds were equipped with:

- Vehicle used for business purposes;
- Boat, ranging from 23 to 53 foot length, usually including diesel motor although some with outboard motor, fitted with;
  - Line and/or trapping gear, depending on methods used. This may include winches for pulling up traps and various types of line gear;
  - GPS;
  - Radar;
  - Plotter;
  - Echo Sounder;
  - Bait tanks
  - EPIRB; and
  - VHF radio/transceiver/tuner.

The age and types of capital items owned varied, and so would have a range of values. In general, boats are sold with items such as GPS etc included, and second hand Quality of life is measured in one of two ways: by measuring a person's own perceptions of their well-being; or by measuring indicators thought to indicate well-being, such as average life span, or income. GPS etc are not sold separately to boats. It is possible to value each capital items separately using an initial purchase price and depreciation approach, however as there is not a significant market for second-hand capital items attached to boats, these items were not valued separately to the boat. Given that boats are generally sold second hand with these capital items included, it is more appropriate to obtain sale values for boats including capital items.

There is a lack of available data on resale values of NSW 'catch history vessels', which are generally sold as part of a 'fishing business' package including both the boat (including capital items listed above) and attached entitlements to operate in a particular fishery.

The range of boat types and entitlements attached to the fishing business mean there is a wide variety in sale prices of boats. Table 3 provides a range of examples of advertised prices in the 'Trade-a-Boat' magazine for boats licensed to operated as commercial fishing boats in NSW waters. The figures provided are indicative only, reflecting sale asking prices rather than final sale prices, but giving some idea of variation in prices and indicative values attached to entitlements to operate in different NSW commercial fisheries, and the range of values attached to boats.

Table 3: Advertised sales prices for NSW commercial fishing businesses over 2003-2004

Source: Trade-a-Boat, Issues 314 to Issue 325, July 2003 to July 2004

Boat length & type	Entitlements/ endorsements	Boat asking price (exc GST)	Entitlement/ endorsement asking price	Total asking price for fishing business including both boat and entitlement/s (exc GST)
17 metre, timber	None	55,000		
8 metre, aluminium	None	50,000		
30 foot, glass over fly	None	52,000		
5.6 metre (18 foot), fibreglass shark cat, 2 x outboard motor, line and pot equipment	OT&L Line West; Spanner Crab North Queensland			87,500
13.49 metre (44 foot), steel	Ocean trawl, Fish trawl north, inshore/deep water/off shore P-1 prawn trawl (no OT&L)			178,000
12.82 metre (42 foot)	Prawn trawl inshore/offshore (no OT&L)	120,000 (reduced from 155,000)	80,000	200,000 (reduced from earlier 235,000)
7.6 metre, plate alloy	OT&L Line East, Line West; AFMA gummy shark			165,000
8 metre (26 foot), aluminium	OT&L Line west, AFMA gummy shark			149,000
9.19 metre (30 foot), timber	OT&L Line west	59,000	79,000	138,000
7 metre (23 foot), aluminium	OT&L Line west, Spanner crab north			130,000
6.10 metre (20 foot) aluminium, outboard	OT&L Line west			110,000
40 foot, timber, live bait tank, purse seine	OT&L Line east, Line west, tuna			250,000
14.94 metre (49 foot), timber	OT&L Line west, Ocean fish trawl north, prawn trawl inshore/offshore			155,000
41 foot	OT&L Line west			275,000

* Note that the values listed here reflect the advertised sale price, and do not necessarily match actual sale prices achieved. Not all details of boats are included in the Table. All boats were advertised complete with capital items such as GPS, etc, and had a range of engine power, fuel tank and water tank sizes.

Running costs for businesses currently operating on the Cod Grounds include:

- Fuel costs, reported to range from $40 to $120 per fishing day depending on the range of the boat, engine type, and areas fished;

- Bait costs, again ranging widely between businesses depending on whether (a) bait fish were caught by the fisher or purchased; (b) type of bait used, and (c) amount of bait used, which depended on factors such as number of traps and how often they were set and pulled;

- Ice costs, varying depending on amount of ice used and price charged for ice by co-operative;

- Gear replacement costs, including replacement of lost buoys and traps. Trap costs were estimated at $100-200 for materials, not including labour of approximately 1 to 1.5 days to build a new trap;

- Motor and boat repairs, varying widely between operators and over time;

- Mooring fees

- Licence fees

- Freight costs

- Commission costs to fish receivers, usually of approximately 10%-22% depending on the fish receiver sold to;

- Phone/fax/internet

A key factor that must be considered in regard to running costs is that the highest cost items – reported by most fishers to be fuel and licence fees – are incurred regardless of whether the Cod Grounds is fished or not for most fishers currently operating on the Cod Grounds. This is because the Cod Grounds is located close to shore, and is usually fished on the way to and/or from other fishing grounds. In other words, if the Cod Grounds were not fished but other current fishing grounds were still targeted, fishers would still incur similar fuel costs and pay the same licence fees to NSW Fisheries, and so business running costs would not decrease significantly, if at all, as a result of not targeting the Cod Grounds but continuing to target other existing fishing grounds. Similarly, mooring fees will remain the same, and phone/fax and internet costs are unlikely to change.

If catch levels are reduced, commissions paid to fish receiver would fall, as would freight costs. Costs of bait and ice may or may not fall with a fall in overall catch, depending on a range of factors.

It is not meaningful, therefore, to assign a proportion of running (variable) costs of the business to fishing targeted at the Cod Grounds, as these costs are not variable in the way the term is usually defined – they will not be reduced in correspondence with a reduction in production of fish catch from the business.

As a result, when impacts of reduced catch from the Cod Grounds are discussed, a gross value added figure of the Cod Grounds catch is not provided. Instead, the beach landed $GVP of the catch is discussed, as this is more meaningful a figure in a situation where business running costs do not necessarily vary as a result of variation in the catch landed from a particular fishing ground.

Fish catch from the Cod Grounds

Fish species commonly caught on the Cod Grounds

Table 4 summarises fish species commonly caught on the Cod Grounds, and the catch methods used, based on interview information and NSW Fisheries catch data.

Table 4: Fish species commonly caught on the Cod Grounds and catch methods

Fish species (common name)	Typical methods by which species is caught**

Bonito	Handlining, drifting, trolling, leadline
Dolphinfish (mahi mahi)	Handlining, trolling
Drummer	Trap
Goatfish (red mullet)	Trap
Kingfish	Handline, drifting, trolling, setline, leadline, dropline
Leatherjacket (black reef)	Trap
Morwong (Red, Rubberlip)	Trap
Mulloway	Handline, setline
Pearl Perch	Handline
Pigfish	Trap
Samsonfish	Handline, leadline, dropline
Shark, Carpet	Handline, Setline, Dropline, Trap (carpet shark in traps)
Snapper	Handline, setline, dropline, trap
Surgeonfish	Trap
Sweep	Handline, trap
Tarwhine	Trap
Teraglin	Handline
Trevally	Handline, drifting, dropline, trap

In addition to the species listed in Table 4, several other species of fish may be caught at the Cod Grounds, on an irregular basis or as a small part of total catch[9]. However, these species form only a minor part of catch sold to market, with some used as bait fish.

Fishing effort on the Cod Grounds

The amount of fishing effort on the Cod Grounds varied considerably amongst those fishers who have regularly fished the Cod Grounds since 1996/97.

Fishers targeted the Cod Grounds for between 10% and 80% of their overall fishing effort (including both OT&L and effort in other fisheries). In general, those with higher catch value on the Cod Grounds had a higher proportion of their fishing effort targeting the Cod Grounds.

Volume and value of catch on the Cod Grounds

Estimates of the volume of catch on the Cod Grounds from 1996/97 - 2002/03 were based on[10]:

- Estimates from fishers of their effort on the Cod Grounds by fish species and fishing method. Some provided estimates of proportion of method, others proportion of particular species. In general, only major species could be estimated as a percentage, while estimates of catch of other species were based on fishing method used

- NSW Fisheries catch data for data collection Zone 4 for the licensed fishers interviewed;

- Estimates of managers of fish co-operatives of effort on the Cod Grounds; and

- Combining the three to estimate what proportion of data collection Zone 4 fishing had occurred on the Cod Grounds.

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[9] Minor species were Amberjack, Australian salmon, Bass groper, Blue eye, Cobia, Bar Cod, Maori Cod, Red Rock Cod, Cuttlefish, Eels, Flathead, Ling, Luderick, Blue Mackerel, Spanish Mackerel, Moki, Morwong – Jackass, Octopus, Parrotfish (Wrasse), Orange Perch, Ocean Perch, Pike, Sharks other than Carpet Shark, Squid, Trumpeter, Tuna sp, and Wirrah.

[10] More detailed descriptions of the methods used to estimate volume and value of catch are given in Appendix 1.

Table 5 details volume and GVP at beach landed prices of common fish species caught at the Cod Grounds from 1996/97 to 2002/03 and sold to market. Minor species are not listed separately, but their value estimated in the final row of the table. Two values for average annual GVP are provided: one based on average monthly Sydney Fish Market (SFM) prices, and the other based on maximum monthly SFM prices.

The actual GVP of catch from the Cod Grounds is likely to be within this value range, and most likely to fall at the upper end. This is supported by reports from fishers, co-operatives, and NSW Fisheries personnel which indicated that catch landed from OT&L fishers in the region of the Cod Grounds usually attracts a premium price due to the high quality of the product. In addition, local sales of fish species are likely to return higher prices to fishers and co-operatives than sales to SFM, again indicating prices received are likely to be towards or at the higher estimate. It is considered highly unlikely that the GVP would fall below the lower estimate given, given the consensus of fishers, fish receivers and NSW Fisheries personnel that catch from the Cod Grounds commonly attracts the higher-end market prices for key species caught there due to the high quality of the catch.

Volume estimates provided by fishers and fish co-operatives were highly consistent. The overall number of fishers who reported that they regularly fished the Cod Grounds was consistent with the estimates of NSW Fisheries provided at the start of the project. The correlation of estimates from different sources means it is likely that the estimates provided here are accurate to the level of identifying the numbers of fishers currently regularly fishing the Cod Grounds, and the proportion of their effort likely to be affected. However, Table 5 may understate total volume of catch from the Cod Grounds, as it does not include catch from fishers who have irregularly fished the Cod Grounds.

The volumes given in the table are based on estimates provided by fishers. Fishers gave a range of estimates, and the mid-point of these estimates were used to calculate the figures in the table. Most fishers felt confident to within +/- 10% of the proportion of their catch occurring on the Cod Grounds, so the volume estimates are likely to have a +/-10% range of potential error. See Box 2 for discussion of volume estimates used.

Table 5 identifies total average annual value of catch from the proposed MPA area over the past seven years by fishers regularly operating on the Cod Grounds of approximately $162,613 to $229,216. As stated above, the value is considered more likely to be at the upper end. Including catch of fishers who irregularly target the Cod Grounds for a small part (<10%) of their catch would increase this figure.

The most valuable species caught is snapper ($62,005 and $86,381 per annum), almost triple the value of the next most valuable species landed, bonito ($21,019-$33,156 average annual catch). Over $5,000 of catch is landed annually of carpet shark, leatherjacket, rubberlip morwong, sweep, teraglin and trevally. The species above were identified by fishers as the most important landed from the proposed Cod Grounds MPA, which is confirmed by the analysis of catch history records.

Some fishers, however, identified morwong as less commonly caught on the Cod Grounds than sweep, teraglin and trevally, indicating there may be an overestimate of the volume and value of morwong caught in Table 5. The overall contribution of this species to total catch value is relatively low compared to the key species of snapper and bonito, so that an overestimate of morwong catch has little effect on the overall estimate of GVP of catch landed from the Cod Grounds. Others debated the amount of leatherjacket caught within the boundaries of the proposed MPA, as leatherjacket is primarily caught on the mud areas away from the reef. However, the proposed MPA covers some of this area as the 1km radius of the proposed MPA would extend further than the reef area into the muddy areas, so it is considered the estimate is likely to be accurate.

Table 5: Average annual weight and GVP at beach landed prices of common species caught by regular fishers of the Cod Grounds from 1996/97 to 2002/03

Species*	Weight caught on Cod Grounds	GVP based on average SFM prices 1996/97 to 2002/03		GVP based on maximum SFM monthly prices 1996/97 to 2002/03	
	Avg annual wt 1996/97 to 2002/03 (kg)	**Avg price per kg ($)**	**Avg annual value ($)**	**Avg max price per kg ($)**	**Avg annual value ($)**
Bonito	5516.864	3.81	21019.07	6.01	33156.352
Dolphin fish	71.09	4.61	327.70	5.22	371.09
Drummer	63.71	2.42	154.26	2.56	163.10
Kingfish	330.013	8.15	2689.43	10.75	3547.64
Leatherjacket (black reef or unspecified)**	1979.031	3.07	6067.97	3.38	6689.13
Morwong (red)	197.386	8.562	1689.93	9.84	1942.28
Morwong (rubberlip)	1729.002	3.44	5943.32	4.97	8593.14
Mullet, Red (Goatfish)	135.19	6.097	824.19	11.27	1523.59
Mulloway (Jewfish)	958.0414	7.45	7135.79	9.24	8852.30
Pearl Perch	141.4943	7.19	1017.05	8.23	1164.50
Pigfish	163.7671	18.28	2994.196	22.30	3652.01
Samsonfish***	51.03	3.47	177.13	9.60	489.89
Shark, Carpet	1949.519	3.63	7071.631	5.14	10020.53
Snapper	7198.493	8.61	62005.18	12.00	86381.92
Surgeonfish	68.8	6.76	465.22	7.71	530.45
Sweep	3339.261	1.97	6587.574	2.90	9683.86
Tarwhine	142.2986	4.04	574.482	6.09	866.60
Teraglin	1210.401	5.71	6912.758	6.59	7976.54
Trevally, Silver	2392.869	2.51	6004.872	4.66	11150.77
Tuna, Mackerel	184.2571	2.48	457.2959	4.09	753.61
Total catch of common CG species	27822.5175		**140,120**		**197,510**
Total catch of common and minor CG	31686,59		**162,610**		**229,220******

* Only species commonly caught on the Cod Grounds are listed in the table. Minor species are not included.
** The 'Jackets Mixed' category of SFM prices was used to calculate the maximum value, based on fish ers reports of catching leatherjackets on the reef areas of the Cod Grounds and on mud areas which will be covered by the proposed MPA.
*** The amount of Samsonfish caught on the Cod Grounds is likely to be significantly understated as it has often been recorded in 'other/unidentified fish species' categories in NSW Fisheries data.
**** Figure is based on assumption that difference between average and maximum prices for commonly caught species on Cod Grounds is the same at the difference for minor species caught on the Cod Grounds

Figure 2 shows variation in value of the Cod Grounds catch over 1996/97 to 2002/03, for both the average and upper SFM prices. There is no particular pattern visible, with catch value varying between years but showing no steady increase or decline overall. A range of factors may affect variation between years, including fishing effort, weather, variation in prices for different species, and availability of particular species.

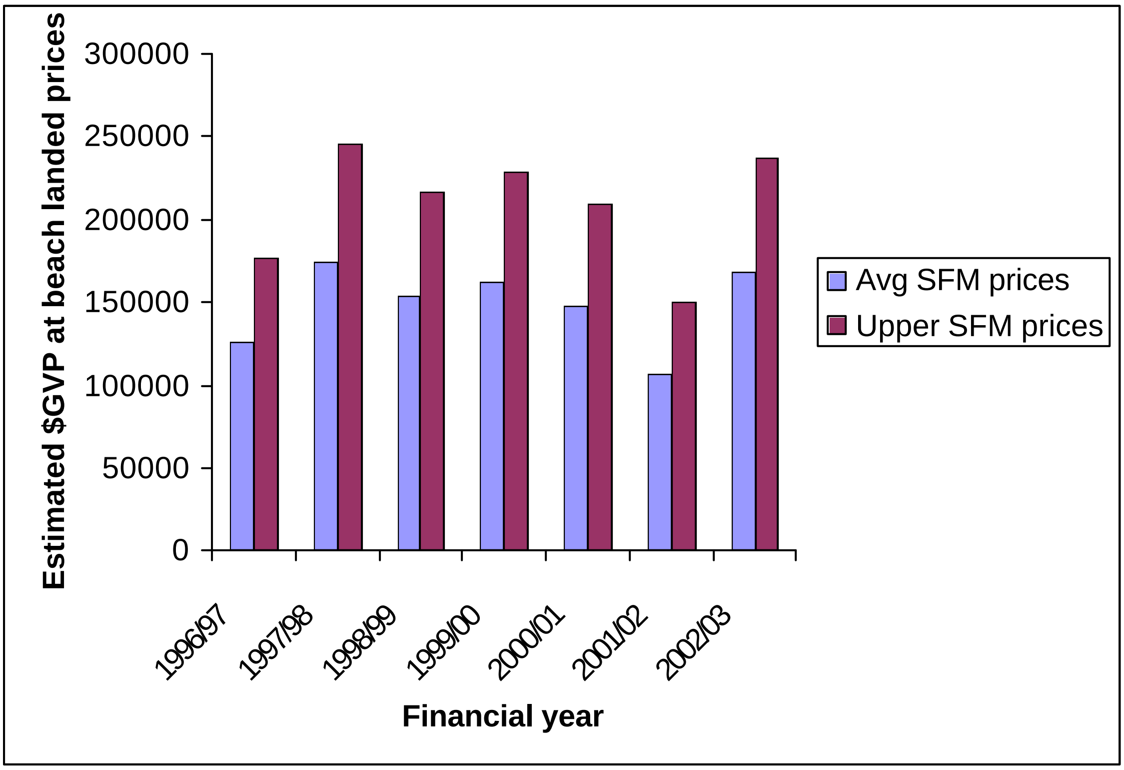

Figure 2: Annual estimated $GVP of catch from the Cod Grounds from 1996/97 to 2002/03 at average and upper Sydney Fish Market prices

Cod Grounds catch as a proportion of fisher's overall catch

The proportion of catch from the Cod Grounds also varies amongst the six owner-operators interviewed who had fished the Cod Grounds regularly over the last seven years. Table 6 provides a summary of the owner operators and the likely proportion of their catch caught on the Cod Grounds in recent years. There is a considerable difference in the GVP attributable to individual owner operators from a low of $5,500-$8,800, up to $65,000-$82,000. The ranges for the lower and higher estimate are wide due to the difficulty of estimating accurately.

Table 6: Summary of proportion of catch of different owner-operators caught on the Cod Grounds

Owner operator	Total number working (full time or part time) in fishing business	Total number of dependents supported by fishing business (figure does not include owner operator/ employees)	Likely proportion of total income made up by Cod Grounds catch (range determined by different potential values for Cod Grounds catch)*

1	2	6	40-50%
2	1	1	60-70%
3	1	1	20-30%
4	1.5	5	50-70%
5	2	3	5-8%
6	2	0	30-40%
Estimated 1-4 further owner-operators in this category	Unknown	Unknown	Small proportion of income (likely below 10%)

* Note that different owner-operators earned considerably different total income from fishing, so that a high percentage of one owner-operator's income may represent a lower total catch value than a low percentage of another owner-operator's income.

Fish receivers for catch from the Cod Grounds

Almost all catch from the Cod Grounds (close to 100%) is sold to fish co-operatives, with four co-operatives identified as receiving catch. This is discussed further below. Occasionally catch may be sold direct to fish receivers other than co-operatives, but this was not reported as occurring often or on a regular basis.

Potential direct impacts of the proposed Cod Grounds MPA on commercial fishers

Likely impacts of proposed MPA on fishing businesses currently fishing the Cod Grounds

In interviews, fishers were asked what the likely impact the proposed MPA would have on their businesses, and how they would attempt to adjust to the change, assuming no assistance was provided.

The following discussion of impacts represents a 'no intervention' impact scenario in which it is assumed no mitigation strategies are in place.

For fishers currently fishing the Cod Grounds, the initial change would be loss of current catch from the Cod Grounds, with the magnitude of the likely change as identified above.

All of the current fishers indicated they would respond to the change in the absence of mitigation strategies by attempting to keep their fishing businesses viable. The key strategy discussed was searching for new areas to fish in order to make up the catch lost from the Cod Grounds. Most fishers stated they would leave fishing only if their business proved unviable after attempting to find alternative fishing. Some believed there was potential their business may become unviable:

> *Because this is virtually a hand to mouth business, if I lose 30 plus percent [fishing income] it will just make it totally unviable for me. I might try and hang on for a year or so but I honestly think it will be the end of me, I think I will probably have to go on the dole or something.* – Fisher # 18

Overall, the impacts of attempting to maintain fishing business viability by replacing lost catch from the Cod Grounds were reported to be:

- Increased time spent travelling to and from alternative fishing grounds, likely to be further from homeports than the Cod Grounds;
- Increased fuel costs;
- Increased bait and equipment costs from intensifying fishing effort by putting down extra traps, discussed as a potential coping strategy by three fishers;
- Increased safety issues due to fishing in more adverse weather conditions;
- Increased wear and tear on the boat, particularly the motor;
- Lost fishing time while exploring for new viable fishing spots;
- Less reliable fishing resulting in less reliable returns from fishing, and hence more fishing hours having to be put in;
- Reduced time with family;
- Increased stress; and

- Competition with other fishers operating in areas Cod Grounds fishers may shift to.

Searching for new areas to fish, whether in trap and line or other types of fishing, would take time. The time spent searching for new areas to fish – by testing different areas and experimenting with different fishing methods until appropriate catch rates were found – would be an additional cost on top of the cost of lost catch from the Cod Grounds.

In addition, most fishers believed that fishing in alternative fishing areas in the OT&L fishery would necessarily involve considerably increased fishing costs, as there are few reef fishing areas as close to shore, and alternative fishing grounds are further offshore. No similar area of reef exists as close to shore as the Cod Grounds. Smaller areas of inshore reef are mostly currently fully exploited and/or less productive and reliable in terms of fish catch than the Cod Grounds. Attempting to source alternative catch from other reef areas within four nautical miles of the coast would result in increased costs due to higher fishing time required to achieve the same catch, with associated higher fuel, bait and other expenses.

Alternative fishing areas with potential for similar high value product tend to be a considerable distance from shore, in areas considerably more subject to adverse weather and current conditions. Extra travel time incurred in reaching these fishing grounds would incur extra fuel costs, increased wear and tear on boats with more rapid replacement of motors. In addition, longer travel times reduce the amount of hours spent fishing once good fishing grounds are reached. Fishers also believed that adverse weather and current conditions would mean that good fishing days would be considerably fewer than on the Cod Grounds.

> *There's an old saying that used to always be said by the old fishermen, 'you go wide, you go broke' and it's still as true today – you go working wide and you're at the element of the current, you're at the element of the ships, you're at the element of the tuna fishermen drifting their gear across the ocean, and basically you go wide full time and you're broke.* – Fisher # 2

> *If we have to we'll be working more marginal conditions, more rough days when the current is really strong … if you compare a day out droplining off the shelf compared to a day off the Cod Grounds, whereas you might spend fifty dollar you'd spend a hundred dollars and bait too, and three hours travelling there as opposed to an hour and fifteen each way … if someone said to me you'll just have to put more effort in droplining I'll just look at them and laugh, it's not my decision, it's nature's decision* - Fisher # 8

> *It'd be like me saying to you … 'you can still work, you have to have the same productivity, but I'm taking your computer off you and you'll never have it again. So you've still go to go to work, same wage, and produce the same amount of output, but not have a computer.* – Fisher # 17

Those with fewer current entitlements/endorsements/shares would have less options than those holding multiple entitlements/endorsements/shares. For example, fishers holding only a Line West endorsement could not fish in areas beyond 100 fathoms without obtaining a Line East endorsement. In addition, the type of boat and equipment owned may further restrict the potential to find alternative fishing areas offshore.

> *With me being a western line only, they keep taking these close reefs away, not very long [and] I can't go on. I've always specialised, I haven't diversified with lobsters or anything else … so that makes it harder for me … I've got nothing to break up my licence or sell or anything.* – Fisher # 12

Fishers also discussed expanding their current operations in fisheries other than trap and line as a way of responding to the proposed MPA in the absence of mitigation strategies. They had similar concerns that this would involve higher business costs without an accompanying increase in income.

Given that in the Ocean Trap and Line, Ocean prawn trawl, Estuary prawn trawl, Estuary general and Ocean Hauling fisheries, major fish species are predominantly assessed as fully fished, there appears little capacity for other areas of the OT&L, or other fisheries in which fishers hold entitlements, to absorb displaced effort. (NSW Fisheries 2003a,b,n.d.). Table 7 provides definitions of fishery exploitation status used by NSW Fisheries.

Table 7: Definitions of fishery exploitation status used by NSW Fisheries

Source: NSW Fisheries (2003a)

Definition	**Exploitation status**
Under fished	The appraisal of a fish stock that suggests that the stock has the potential to sustain catches significantly higher than those currently being taken
Moderately fished (sustainable)	The stock is assessed to be fished at levels which would probably allow only limited increases in catches
Fully fished (sustainable)	The appraisal of a stock which suggests that current catches are sustainable and close to optimum levels (the definition of which may vary between fisheries; e.g. catches are close to maximum sustainable yield, or fishing effort is close to a biological reference point). In a fully fished fishery, significant increases in fishing effort above current levels may lead to overfishing
Overfished /Depleted	The appraisal suggests that current fishing levels may not be sustainable, and/or yields may be higher in the long term if the fishing level is reduced in the short term. This may be due to recruitment overfishing, growth overfishing and/or as a result of habitat degradation
Uncertain	There is little or no information about the status of this stock (e.g. no catch data or only very recent catch data)
Unknown	The only information about the status of this stock is long term fishery dependent catch data

None of the fishers interviewed believed they currently had the financial ability to purchase fishing businesses with entitlements to operate in fisheries in which they did not currently operate, or to purchase shares to enable them to expand their activities in, or enter into, the rock lobster fishery.

Finally, concern was expressed that in the absence of mitigation strategies the proposed MPA will lower the resale value of licences in the OT&L Fishery. Licence values drop with closures as the licence no longer provides access to as many fishing areas, and hence is not seen to provide as reliable a guarantee of viable fishing. As boats are sold with a licence in a particular fishery or fisheries, this may reduce the overall ability to sell the business, which is a significant issue as all fishers indicated they were relying on selling their fishing business to help provide for retirement.

BRS was advised by a marine broker operating in the region that pricing of fishing businesses at the point of resale tends to be based on comparable values of fishing businesses – in other words, what other fishing businesses have recently sold for. This is because basing travel values for resale on small business principles, ie historic return made from the business, is difficult for fishing businesses where the return may be affected by the skill level and effort applied by the business operator, as well as by weather conditions and seasonal variability eg in water temperatures. However, the catch history of the business is a factor in sale value. The broker contacted advised that impacts of an MPA on trade resale values would depend on the amount of change in fishing versus change in fishing operators resulting from the MPA.

If mitigation strategies are put in place which change fishing effort (eg by reducing it through removal of fishing operators/businesses, or through other means) to equal the change in fishing area availability, then it is possible trade values for resale of fishing businesses would not change.

Likely impacts of proposed MPA on fishing businesses not currently fishing the Cod Grounds

In the absence of mitigation strategies, the key impacts of the proposed MPA on fishers not currently fishing the Cod Grounds would be:

- Increased competition in their fishing areas;
- Loss of potential future fishing on the Cod Grounds; and
- Current 'back-up' fishing, and lower resale value of their fishing business.

Fishers not currently operating on the Cod Grounds believed there was potential for increased fishing pressure in areas outside the Cod Grounds as a result of the proposed MPA, causing them difficulty in maintaining their catch. Only one of the fishers interviewed did not believe this was a potential problem.

> *It's an unspoken gentleman's agreement in fishing for years – that's more or less your country, you fish that country and I don't go near you, you know, but if you get forced off [your country] you're going to have to encroach on someone else's country … it creates friction, but you gotta do something.* – Fisher # 1
>
> *It's an honour system, sort of, fishermen – if they know you got a couple traps here they give you a bit of leeway and don't crowd you out, but you know, if everyone's fighting for a dollar…* - Fisher # 11

It was not possible for these fishers to predict the exact location and size of this displacement impact, as they did not know where fishers currently operating on the Cod Grounds were likely to shift their fishing effort if the proposed MPA is declared. Some indication of the location and scale of displacement is provided from comments of those currently fishing the Cod Grounds, which suggested: (a) all would seek to make up lost catch by fishing elsewhere, (b) switched effort would be predominantly limited to fisheries in which they already hold entitlements and endorsements, (c) they would need to at least match the income lost from the Cod Grounds through alternative catch, and (d) they may need to increase catch income due to the need to cover higher business costs. This suggests displaced fishers would be needing to replace at a minimum a collective total of $162,610 of lost GVP, and more likely over $229,220.

Those fishers with historical activity in the Cod Grounds, but who do not currently fish it, raised concerns about the potential for loss of future fishing from the Cod Ground. Some indicated existing plans to return to the Cod Grounds in the next five years, while others had no active plans but irregularly fished the Cod Grounds when other areas were not productive. Fishers were concerned that the proposed MPA would seriously limit their ability to fish for particular species which tend to congregate at the Cod Grounds and are not found at many other locations in the region, and that if prices for these species increased in future they would not be able to source fish from within the proposed MPA area.

> *Taking this Cod Ground away isn't about what we used to be able to catch, it's about what we may be able to catch in the future that we're not going to because we're not allowed to be there.* – Fisher # 7

Finally, fishers not currently fishing the Cod Grounds believed declaration of the proposed MPA would reduce the resale value of their fishing businesses, as it restricted the number of good fishing areas available to fishers with fishing businesses with an OT&L entitlement.

Likely impacts of proposed MPA on fishers and fishing families

The impacts of the proposed MPA on fishers and their families relates mainly to the flow-on effects of impacts to the fishing business on family life. Key demographic characteristics give an indication of the variety of families likely to be affected.

Demographic characteristics of fishers and their families

The majority of fishers[11] interviewed were male, over 40 years of age, had not completed high school, and had worked in commercial fishing for over 20 years. Four of the fishers had worked in jobs other than commercial fishing before turning to commercial fishing. The rest had worked almost entirely in commercial fishing for their working lives, apart from some short-term employment in jobs usually involving manual labour. (See Table 8). Fishers are not separated into those who currently fish the Cod Grounds and those who do not, to avoid individual identification of fishers.

Table 8: Demographic characteristics of fishers interviewed

Characteristic	Number of fishers (out of total of 17 who actively work on boat, of whom 15 were interviewed)
Gender of fisher operating boat	
Male	16
Female	1
Age	
20-29	1
30-39	3
40-49	4
50-59	7
60-69	2
Education level	
High school to age 14 or 15	7
Completed high school	2
University degree	1
Unknown	7
Years working in commercial fishing	
0-4	2
5-10	2
10-20	0
20-30	7
30-40	4
Unknown	2

A total of 14 fishing families were interviewed as part of this SEIA. In some cases only one member of the family - an active commercial fisher - was interviewed. In others more than one family member was interviewed. Some families had more than one family member currently actively commercially fishing; where the families did not live together as a single unit they were counted as separate even if two families were related.

[11] The term fisher here refers to those who have actively worked on a fishing boat within the last three years, and does not include partners who may do business accounts or other work in the business. The definition is limited due to difficulty accessing details for all partners of fishers who undertook paid or unpaid work in areas of the fishing business other than the fishing itself.

Table 9 summarises key characteristics of the 14 fishing families interviewed. The information is for those who currently fish the Cod Grounds and those who do not, to ensure individual identification of fishing families is not possible.

Table 9: Key characteristics of fishing families interviewed

Characteristic	**Number of fishing families (out of a total of 14 interviewed)**
Type of family unit	
Unmarried fisher, no dependents	1
Married fisher with adult children no longer financially dependent, or no children	6
Married fisher with 1-3 children financially dependent	7
Family income	
Fishing income only	8
Non-fishing income (no estimates of proportion of income from sources other than fishing were made due to low response to question in interviews).	3
Unknown	3

Potential impacts of the proposed MPA on family life

Fishers discussed the potential impacts of the proposed MPA in terms of effects on their livelihood, their lifestyle, and their physical and mental health. They discussed the impacts by drawing on their experience of previous changes that restricted their fishing to explain the increased stress associated with such changes:

> *'When these sort of things happen it puts extra stress on you and your marriage and everything else, you go home cranky and take it out on your missus and kick your dog, you know…'* – Fisher # 7

> *'I had a good lifestyle for a while but now I feel like it's a burden. You know how you feel when something's been taken out of your hand by the government? I've got no control.'* – Fisher # 17

Fishers and family members who took part in interviews discussed the impacts of the potential changes to their fishing business and on family life.

All stated that the impacts on fishing businesses would require fishers to spend more hours working in their business (either through shifting effort from the Cod Ground to new areas, or increasing effort when affected by displaced fishing from the Cod Grounds). This would result in fishers spending less time with their families. This may include having to go fishing for more than a day at a time, depending on how far offshore fishers went to seek alternative catch, and the fisheries to which they shifted effort from the Cod Grounds.

> *'The current fishing pattern that we've got now is geared around our family … I mean I could go prawn trawling all the time but I'd never see my wife and kids, I mean the way I've got things now I get to see them all the time, sit down and have tea with them.'* – Fisher # 8

> *'I wouldn't be happy and the kids wouldn't be happy* [due to less time spent with their father] *so chances are we'd have to [try to] find something else or take a cut in income, which we can't do because we've got repayments on the house, repayments on the boat…'* – Fisher's partner # 1

The second impact discussed was reduced family income resulting from lost fish catch, increased costs attempting to make up lost catch, or increased costs incurred attempting to maintain catch while impacted by displaced fishing effort from the Cod Grounds. This would have obvious impacts on families, with increased difficulty meeting loan repayments, covering household costs, and increased stress on family members.

> *My income gets restricted, my life and my family and my retirement … it impacts on my ability to have a reasonable lifestyle because my income is only so much, it's just not possible.* – Fisher # 7

The third impact discussed was that fisher's partners might need to find work, or increase their current workload, to increase family income. Concern was expressed that this would be difficult because of a lack of employment opportunities in the region, and might eventually require shifting to another region to find work. This would then incur further costs involved in relocating to a new area.

> *'If I have to go out and get a job I'm not with the kids and so that impacts the family again.'* – Fisher's partner # 1

Quantification of impacts on family life was not possible, but the type of impacts show that the initial impacts on fishing businesses would have a range of flow-on effects on fishing families in the absence of mitigation strategies.

Potential socio-economic impacts on fish co-operatives

Fish co-operatives potentially impacted are those with members actively landing catch from the Cod Grounds. These co-operatives were identified by fishers who currently fish the Cod Grounds and by directly querying co-operatives in the region. Four co-operatives were identified whose members potentially landed catch from the Cod Grounds and Managers of all four co-operatives were interviewed for the project.

Current business structure and history of the co-operatives

All four co-operatives have been in operation for some time, usually since the 1940s, and receive catch from fishers operating in a number of restricted or share managed fisheries, including the OT&L fishery. All co-operatives reported declining numbers of co-operative members landing regular catch. The current number of OT&L businesses landing catch at co-operatives varied from as many as 11 to as few as three.

All co-operatives sold catch through three primary markets:

- Retail outlet attached to the co-operative and operating from the co-operative's premises;
- Local markets such as restaurants and wholesale fish retailers; and
- Distant wholesale markets, predominantly the SFM.

Co-operatives and their retail shops employed between 3 and 6 full-time equivalent employees (FTEs). This was usually made up of 1 to 2 FTEs employed managing the co-operative, and others employed in the co-operatives' retail outlet. The retail outlet was either run directly by the co-operative, or by a lessee.

Key changes affecting co-operatives in recent years have been:

- A reduction in the total number of co-operative members;
- A reduction in catch landed by co-operative members; and
- FoodSafe and other workplace safety regulations requiring upgrade of co-operative facilities.

Due to these changes all four co-operatives had either invested in building new premises, or were in the planning stages. This represented a considerable repayments cost to co-operative members over time. Co-operatives reported that adapting to changes had required reducing co-operative employees, separating the co-operative retail outlet by leasing it to a shop manager. All co-operatives were concerned about their potential future viability if member numbers continued to decline, and if volume of landed catch declined.

Catch currently landed from the Cod Grounds at different co-operatives

Information from co-operatives supported the data received from fishers as to which species are commonly caught at the Cod Grounds, although co-operatives usually identified a smaller range of key species. Snapper was again identified as the most valuable species, followed by bonito and jewfish.

While co-operatives were not able to provide information on the percentage of their throughput currently landed from the Cod Grounds, knowledge of where different fishers landed catch, and the proportion of their catch reported as being sourced from the Cod Grounds, was used to estimate the proportion of the Cod Grounds catch landed at each co-operative (See Table 10). The impact is unevenly distributed between co-operatives, with one co-operative estimated to have a substantially larger exposure to activities in the Cod Grounds.

Table 10: Estimated average annual GVP landed from Cod Grounds to different co-operatives from 1996/97 to 2002/03

Co-operative	Average annual GVP of catch landed at co-operative from 1996/97 to 2002/03	Estimated percentage of total GVP landed at the co-operative over 2002/03*
1	$95,000 - $124,080	Not able to be calculated as Fish Receiver Records not available from NSW Fisheries. Expected to be considerably more affected by the proposed MPA than the other three co-operatives.
2	$26,950 - $33,800	3% to 4%
3	$10,080 - $21,720	4.5% to 5.5%
4	$12,300 - $18,500	3% to 4%

*Note that this estimate is based on only one year of records, as NSW Fisheries has only two full years of fish receiver's records from co-operatives. Without a longer data history it is not possible to estimate if this year is representative or not. In addition, this does not reflect whether the catch was on-sold through the co-operative's retail outlet or not, a factor which may considerably change the return to the co-operative from the fish.

Markets for fish from the Cod Grounds

Co-operative managers identified the primary markets into which they sold those species most commonly caught on the Cod Grounds. Table 11 summarises the key markets identified for different species commonly caught on the Cod Grounds. The key market for the highest value snapper catch was the local markets which includes sales through the co-operative's retail outlet, and to other local markets such as restaurants. The primary alternative market was the SFM, although some co-operatives occasionally sold to other wholesale auction markets.

Table 11: Key markets for different fish species commonly caught on the Cod Grounds as identified by fish co-operative managers

Fish species	Key markets
Snapper	Local
Trevally	SFM
Kingfish	SFM and local
Bonito	SFM, small amount sold as bait in local market
Teraglin	Local – shop and other
Mulloway (jewfish)	Local – shop and other
Other species commonly caught on Cod Grounds	Predominantly sold to SFM

Prices and costs of selling product to different markets

Costs and returns varied across the different markets. General information was provided for the three types of primary market: sales to the co-operative's retail outlet; sales to local customers such as restaurants and other co-operatives; and sales to Sydney Fish Markets or other auction markets.

Sales to the co-operative's retail outlet or local market eg restaurants

Returns received from sales by the co-operative to their retail outlet varied, depending on whether the retail outlet was run as a part of the co-operative, or by a lessee, and pricing policies of co-operative managers. In general, co-operatives made a higher commission on fish sold to their retail outlet than fish sold to SFM. This was for two reasons: not having to pay commissions at SFM or freight costs, as well as sometimes receiving a higher price for the fish than would have been paid by other markets.

Commissions received by co-operatives from sales to their own retail outlets varied from 18% to 22% with commissions received by co-operatives when selling into local markets other than retail outlets vaying more than this, from 10.5% to 18%. Sales into some local markets also incurred freight costs, whereas sales to the retail outlet did not.

Prices paid by retail outlets and by other local purchasers were usually determined with some reference to trends in markets such as the SFM. However, for key species such as snapper and jewfish, prices paid are often above SFM prices. There is high demand for these species in the local market, and locally landed product is considered to be of higher quality than product purchased from other markets such as the SFM. Therefore local purchasers are often willing to pay a premium for key species such as snapper and jewfish, and to pay a higher price to regular suppliers.

Sales to Sydney Fish Market or other auction markets

Sales to SFM were reported in general to result in a lower return to co-operatives, due to the local markets paying a premium for particular species in high demand, and to higher costs and lower commissions received.

When selling to SFM, the SFM charges 9% commission on fish sales (as at April 2004). Co-operatives generally only charge a 9-13% commission on sales to SFM, less freight costs. The effect of freight costs on overall return depends on the price per weight and volume of species received (as freight costs are based on weight/volume transported), and the distance product is freighted.

Fish co-operatives receive a considerably higher net return from sales to local markets than sales to SFM or other wholesale auction markets.

The differences in prices received, as well as the differences in markets into which key species were sold, were used to modify average SFM prices to provide a more realistic value of the Cod Grounds catch, as described above. In addition, this data was used to estimate potential impacts of the proposed MPA on the fish co-operatives and associated retail outlets and local markets.

Commission currently received for catch from the Cod Grounds

Based on the information above on markets for key Cod Grounds species, and commissions received by co-operatives for sales into different markets, the average current commission received from Cod Grounds catch by co-operatives was calculated. The estimate was calculated by taking the average commissions charged by co-operatives of 20% for sales to local markets and 10% for sales to the SFM, and the estimates of catch value provided earlier.

The total current commission across the four co-operatives would be likely to fall between $23,709 and $33,420. It is more likely to fall at the upper end of this estimate, as catch is more likely to be at SFM maximum monthly prices than SFM average prices. In addition, co-operatives would receive some income from their retail outlets (via profits or lease payments) resulting from sale of catch caught on the Cod Grounds.

Potential impacts of proposed Cod Grounds MPA on fish co-operatives

The proposed MPA would potentially impact on fish co-operatives through:

- Reduced landed catch of some species, including snapper and mulloway, which are key species sold into local markets;

- Reduced commissions received by the co-operative, of approximately $23,710 to $33,420 and likely to be at the higher end of this estimate; and

- Reduced number of co-operative members. if the overall number of fishers reduced as a result of declaration of the proposed MPA.

Co-operatives reported that these impacts may result in reduced return to the co-operative, and potentially a reduction in working hours for part-time employees, or a reduction in overall number of employees. It may also create difficulties in making repayments for upgrading of facilities, or obtaining finance to upgrade facilities in the future.

Potential impacts of proposed Cod Grounds MPA on fish co-operative sales outlets & other markets

The key potential impacts of the proposed MPA on retail outlets attached to co-operatives would be:

- Loss of some local supply of fish. This would include primarily the following species: snapper, jewfish, teraglin and kingfish. All co-operatives indicated that snapper supply, their largest local selling species, would be hardest hit. Local supply would be reduced significantly by the proposed MPA;

- Increased time and cost sourcing fish supply from alternative markets. Fish would need to be sourced by purchasing from alternative sources than the fish co-operatives, including co-operatives located some distance away (over 100 kilometres) or markets such as the SFM. In all cases, freight costs and higher prices would be paid to purchase the fish from other wholesalers instead of direct from fishers via the co-operative. Different co-operatives indicated these costs would be passed on to customers, or would reduce their sales margins, or a combination of both.

- Lower quality of fish supply. All four co-operatives indicated concern that the fish obtained from alternative sources would be of lower quality than that purchased directly from the co-operative. The lower shelf life of fish which may be several days old by the time it is purchased and delivered to the shop would create difficulty with shop turnover. High-quality product as currently delivered locally would be difficult to source elsewhere.

- Potential loss of sales. The current competitive edge of the four co-operatives is based on their supply of locally caught fish. The absence of locally caught fish, and potentially lower quality product, would lead to reduced sales.

- Potential loss of viability of business. All four co-operatives believed the cumulative effect of the impacts discussed above could result in loss of business, and consequently a need to reduce employee work hours and/or shop opening hours. However, they were not able to predict the size of the impacts, or the likelihood of successfully adapting to the change by sourcing fish supply from alternative markets. This was because the impact and success of adaptation would depend on how successful fishers were at sourcing fish from elsewhere, the price and availability of fish supplies from alternative sources to fishers, and the willingness of customers to purchase fish not sourced locally; factors not able to be estimated by co-operative and co-operative retail outlet managers.

Mitigation strategies for reducing negative impacts of the proposed MPA on fishers and their families

Three potential mitigation strategies were discussed by fishers who were interviewed: licence buy-outs, assistance to stay in fishing, and retraining. These were categories discussed by fishers without prompting in most interviews, although in some interviews the interviewer listed these three categories if fishers had difficulty identifying potential mitigation strategies.

Licence buy-out

Licence buy-outs were discussed as an option by all fishers, most of whom had observed licence buy-outs in the context of other fisheries closures. Licence buy-outs are relevant only to owner-operators and not employees of fishing businesses; the number of employees of fishing businesses currently operating on the Cod Grounds should be taken into consideration when considering whether licence buy-outs are an appropriate mitigation strategy to reduce potential negative impacts of the proposed MPA.

The majority of owner operators did not believe a buy-out was an ideal option, but despite this, five owner operators indicated it would be an option they would consider taking up if it was offered. In addition, most of those interviewed who stated they themselves were not interested in a buy-out believed that many others would take up the option of a buy-out were it offered to them.

This option appeared more attractive to owner operators who had either:

- Been working as a commercial fisher for less than ten years, having shifted to commercial fishing after working in another job for some time; or

- Were over 60 years of age and already considering 'winding down' or having reduced their fishing effort in recent years.

However, three of the five indicated they would prefer to see if they could remain viable in fishing before choosing whether to take up a licence buy-out option:

> *If I found it was just costing me more than I was making well then, there's no point in carrying on … it's not in my immediate plan to do that* [get out of fishing] *because I do enjoy it but … if you're gonna go backwards, you can't flog a dead horse, as they say.'* – Fisher # 11

These owner operators discussed a need for licence buy-outs to offer an appropriate amount of money to purchase out the licensed business as a whole.

The primary reasons given by others for rejecting license buyouts were a strong preference for staying in commercial fishing if at all possible, and concern that they would not find alternative employment and would end up on the dole.

> *When the river buy out took place … one of them who took the buy out, he wasn't capable of being retrained for anything, he just didn't have the skills to do any other job, as a result Mr Carr's got all his money via the poker machine tax and now he's on the dole … their life skills for 20 years, 30 years, is all fishing …'* – Co-operative manager # 1

> *I'm too young to retire, and too old to do anything else* – Fisher # 14 (aged in late 50s)

'I'd love to stay in [fishing], *I really would, it's a job I feel I'm being useful and … if I can't get a job which is very likely at my age and considering the conditions of the employment market around here … I'd just end up on the dole and it seems just a waste.'* - Fisher # 18

Assistance to stay in fishing

The option preferred by the majority of owner-operators and other fishers was assistance to stay in fishing.

To get other employment around here would just be impossible, the only way would be to invest in another part of fishing, like another endorsed fishery, so you could offset the lost income from fishing [the Cod Grounds] – Fisher # 1

The types of assistance to stay in commercial fishing discussed were:

- Assistance to purchase new entitlements (through purchase of fishing businesses) and/or new or extra shares in particular fisheries (depending on whether they were buying into a restricted or share-managed fishery). The most commonly suggested option was assistance to purchase rock lobster shares;

- Assistance to purchase new equipment or updated equipment to help fish new or other areas; and

- Research to identify new potential fisheries in the region.

The attraction of this option relates to the stated intention of most fishers to attempt to remain in fishing if the proposed MPA is declared, even with reduced viability and potential negative impacts including lost income and reduced quality of life (eg longer working hours and increased stress). However, many of the fishers interviewed recognised that a strategy relying solely on providing assistance to remain in fishing could result in considerably increased pressure on different fishing grounds

'If I'm supplied with another licence then you're going in and putting pressure on something else, you're taking pressure off one and putting it straight back on another one.' – Fisher # 12

Assistance to stay in fishing would only result in a net effect of no increased pressure on fishing if assistance to expand fishing for some fishers was balanced by licence buy outs that reduced effort from other fishers.

Retraining

Overall, retraining was considered an option not likely to be viable. However, if retraining in marine-related work was provided, retraining may be more successful.

Only one fisher was willing to considering retraining in general and an additional two fishers would consider retraining if their fishing business failed, and the retraining was in a field related to fishing or work on the ocean (eg, charter boat, marine research activities and aquaculture).

Reluctance in considering retraining was due to one or more of the following concerns:

- Difficulty in finding employment after retraining, given high unemployment rates in the region;

- Retraining would not lead to a job they found satisfying or returned the same level of income as fishing;
- Too old to be retrained (expressed by all but two fishers) and/or
- A strong preference to remain in fishing, with several stating shifting to a different job would cause depression and loss of dignity.

> '*That* [retraining] *is all right if you're only young, but you know, what are they gonna train me for … I might as well just stay with it and putter along.'* – Fisher # 10 (aged in late 50s)

> *It's going from a job you've always wanted to do for the rest of your life to something you don't want to do so it comes down to your mental state, sort of thing.'* – Fisher # 5 (deckhand age in his twenties)

> *For me, I mean I'm a skipper and I drive a boat and I've got a bit of dignity … and the dignity of being a fisherman … master of your own destiny, all of a sudden you're a brickies labourer or something like that … so as far as your stature or dignity, it goes right to the bottom, you've got no tickets on you for your life's labour.'* – Fisher # 3

> *It's a bit late to do anything else when you're* [in 30s/40s] *and you don't know anything else and you only done two years of high school … it'd probably take a long time to adjust, you know, I dunno how I'd go with a stop and go sign.'* – Fisher # 2

The fish co-operative managers interviewed indicated that in some areas, fishers who had taken buy-outs when estuary fishing areas were closed had returned to work as deckhands – often for little or no income – for other fishers. This indicates a very strong desire to stay fishing and reluctance to move into other types of employment.

The preference was for retraining to be available if their fishing business failed as a result of declaration of the proposed MPA, rather than having to make an immediate decision about leaving fishing and retraining.

> *'If I find five years after they close the Cod Grounds I still can't cope, I'd like retraining available to me so I've got the option of retraining instead of just going broke …'* – Fisher # 17

Other

The only other mitigation strategy discussed by fishers was a suggestion by two fishers that they would be willing to undertake work assisting fisheries research activities, whether this involved retraining or not. Both believed this would be a useful option in which their knowledge of the local region and commercial fish species could be put to use.

Socio-economic profile of potentially impacted communities

All potentially impacted fishers and their families lived within three Statistical Local Areas (SLAs)[12] – the Hastings Part A, Hastings Part B, and Greater Taree SLAs. The Hastings Part A & B SLAs cover the area shown in yellow on Figure * below, with Hastings Parts A covering Port Macquarie, and Hastings – Part B the remainder of the area. The Greater Taree SLA is located directly south and potentially impacted fishers in that area live mostly in the coastal area bordering the Hastings – Part B SLA.

Figure 3: Location of Hastings Municipality

map source: http://www.hastings.nsw.gov.au/fsMain.html . More detailed maps can be viewed at the site, as indicated on the map above

Most socio-economic activity of the potentially impacted fishing families, apart from some purchase of fishing equipment and post high-school education activities for

[12] Statistical Local Areas are geographic regions for which the Australian Bureau of Statistics provides data

fisher's children, appeared to occur within the three SLAs. The majority of fishers currently fishing the Cod Grounds live in coastal towns in the Hastings Part B and Greater Taree SLAs. Fishers who may be impacted by displaced effort live mostly in coastal towns (including Port Macquarie), although some lived in inland towns within the Hastings Part B and Greater Taree SLAs. However, their social activities are not restricted to these coastal towns, with fishers and their families purchasing goods and services through the three SLAs.

These three SLAs also represent the region in which fishers and their families would need to seek alternative employment if they could no longer depend on fishing income.

Table 12 compares key socio-demographic variables of the SLAs in which potentially impacted fishers live to averages for NSW and Coastal Australia[13].

In general, the profile of the regions has <u>two key implications for ability of fishers to adjust to potential impacts of the proposed Cod Grounds MPA, and for impacts on the local population</u> of changes in family and business spending levels of fishers:

- Fishers or fishing family members in the region are likely to have difficulty finding alternative employment outside fishing, given high unemployment rates, ageing population, and low spending ability of a regional population in which many households have low incomes; and
- Local communities are highly vulnerable to changes in levels of local spending, indicated by the high unemployment rate, high proportion of low-income households, and high dependency ratios.

Key differences between the area in which potentially impacted fishers live and may seek non-fishing employment, and NSW and Coastal Australia, are:

- **Higher population growth than average** in Hastings A and Hastings B, most likely reflecting the shift of retirees to the coast;
- **High dependency ratios.** This means that there is a higher proportion of children under the age of 16 and adults over the age of 64 in the three SLAs than the average for NSW or coastal Australia. In fact, total dependency ratios are very high in the three SLAs, with 67.5% to73.5% of the population of the three SLAs made up of children and elderly people, compared to an average 51.4% to 53.9% in the overall population. Most of this is due to a higher proportion of elderly people in the population of the three SLAs;
- **Older population.** The median age of the population of higher in all three SLAs than the average for either NSW or coastal Australia;
- **High proportion of low income households**. The proportion of households receiving less than $300 income per week in the three SLAs was between 18.2% and 19.4%, compared to an average 13.8% in NSW and 15.5% in coastal Australia.

[13] Coastal Australia refers to the area one SLA inland of the coast or ocean, apart from SLAs running parallel to the inside boundary of large harbours, bays and estuarine systems. This means Coastal Australia does not include populations of capital cities or other large Australian cities but reflects the demographics of coastal populations not living in large cities.

- **Low proportion of high income households**. The proportion of households receiving more than $1200 income per week in the three SLAs was between 13.3% and 16.6%, compared to an average 32.5% in NSW and 26% in coastal Australia.
- **High unemployment rate.** Unemployment rates were between 10.2% and 12.5% in the three SLAs, compared to an average 7.2% in NSW and 8.3% in coastal Australia.
- **High proportion of population receiving pensions**. Between 45.1% and 51.4% of the population in the three SLAs were receiving government pensions in 2001, compared to an average of 40% in NSW and 42.2% in coastal Australia.

Levels of economic diversity did not show a clear pattern of difference. In the three SLAs, retail and health services were the biggest employers.

Proportions of the population employed in fishing and related industries were higher in the three SLAs and in coastal Australia than for the NSW average.

Table 12: Key socio-demographic characteristics of areas in which potentially impacted fishers live, compared to averages for NSW and Coastal Australia

	Statistical Local Area			Averages	
	Greater Taree	**Hastings - Part B**	**Hastings - Part A (Port Macquarie)**	**NSW Average**	**Coastal Australia average**
Total population	42,838	26,144	38,002	-	-
Annual population growth 1996-2001	0.2	1.7	2.3	1.0	1.0
Total dependency ratio, 2001	67.5	70.1	73.5	51.4	53.9
Child dependency ratio, 2001	37.4	35.0	32.9	31.5	31.1
Elderly dependency ratio, 2001	30.1	35.1	40.1	19.9	22.8
Median population age	40	43	43	35	37
Sex ratio (number males per 100 females)	95.6	96.6	90.8	97.5	97.3
Low income households, 2001 (earning less than $300/wk)	19.4	18.2	18.3	13.8	15.5
High income households, 2001 (earning over $1200/wk)	13.7	13.3	16.6	32.5	26.0
Proportion of 16 year olds in full-time education, 2001	82.8	86.2	83.2	84.6	81.0
Unemployment rate, 2001	12.2	11.9	10.2	7.2	8.3
Change in unemployment rate 1991-2001	-4.0	-5.2	-4.1	-	-
Economic diversity (proportion of persons employed in top three employing industries), 2001	43.4	38.9	43.2	37.9	42.3
Three industries with highest employment, 2001	Retail, health, manufacturing	Retail, health, construction	Retail, health, property and business services	Retail, property & business services, manufacturing	Retail, manufacturing, property & business services
Proportion of families receiving government pensions, 2001	51.4	49.5	45.1	40.0	42.2
Proportion of those employed who work in commercial fishing, 2001	0.6	0.5	0.3	0.1	0.4
Proportion of those employed who work in commercial fishing, seafood processing and fish wholesaling, 2001	1.2	0.6	0.4	0.1	0.6

Raw data source: Australian Bureau of Statistics Census Data 1996, 2001

Conclusions

Key groups that would be affected by changes to commercial fishing under the proposed MPA are:

- Fishers operating in the NSW Ocean Trap and Line Fishery currently fishing the Cod Grounds, and their families. Six owner operators of fishing businesses were identified as fishing the Cod Grounds regularly over the last seven years, with a total of 9.5 people currently employed in these fishing businesses (including the owner operators). In addition, there may be up to another eight owner-operators irregularly fishing the Cod Grounds for a small proportion (less than 10%) of their income;

- Fishers operating in NSW Fisheries data collection Zone 4 who may be affected by displaced fishing effort from the Cod Grounds, and their families. This includes fishers operating in both the OTLF and in other fisheries. It is expected most displaced fishing effort would initially occur within data collection Zone 4, with subsequent potential for displacement of fishing effort outside this Zone. It is not possible to identify specific fishers who may be affected, but the estimate of catch value affected can be used to estimate the amount of fishing effort displaced to other areas;

- Managers and employees of fish co-operatives currently landing catch from the Cod Grounds; and

- To a lesser extent, some local businesses who currently source catch from the Cod Grounds.

These represent the groups likely to be most impacted by the proposed change.

Key impacts of the proposed MPA in the absence of impact mitigation strategies would be:

- Loss of between $162,610 to $229,220 annual average GVP at beach landed prices of fish catch by fishers regularly targeting the Cod Grounds, as well as additional catch from a small number of fishers irregularly targeting the Cod Grounds. These figures are based on NSW Fisheries catch data, estimates of fishers and fish co-operatives, and Sydney Fish Market historical price data. The figure is likely to lie at the higher end of the estimated range due to the high quality of catch on the Cod Grounds;

- Displaced fishing effort from the Cod Grounds, at least equal to the amount of catch lost and likely to be higher to offset higher business costs incurred when fishing alternative areas;

- Reduced commissions from sale of landed catch by four co-operatives, with one considerably more impacted than the other three;

- Increased costs for local purchasers of key species caught on the Cod Grounds (particularly snapper, mulloway (jewfish), teraglin and kingfish), incurred through having to source fish supply from alternative sources; and

- Potential reduction in sales of fish from fish co-operative retail outlets, due to having to raise prices of fish and obtain it from non-local sources, and consequent reduction in fish purchase by local consumers.

Key factors relating to impacts of declaring the proposed MPA, which should be taken into consideration in making decisions about adjustment strategies in the event the proposed MPA is declared, are:

- The lack of alternative fishing areas of similar reliability and productivity to the Cod Grounds within a similar distance from port;

- Higher fishing business costs likely to be incurred to find alternative fishing areas if the proposed MPA is declared;

- The impacts of the proposed MPA on both owners of fishing businesses and their employees and families;

- The reluctance of most potentially impacted fishers to leave commercial fishing, and difficulty of retraining in another field of employment given fisher's education levels and current skill set tends to be focussed on commercial fishing only;

- The potential for a small number to be interested in a licence buy-out if it were offered; and

- The lack of alternative employment options in the region.

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Appendix 1: Methods

Interviews with fishers and fish co-operatives

Identification of potentially impacted fishers and fish co-operatives

Fishers and fish co-operatives potentially impacted by the proposed MPA were identified by:

- Contacting fishers/co-operatives who had identified themselves as potentially impacted in submissions made to DEH about the proposed Cod Grounds MPA;
- NSW Fisheries identifying commercial fishers potentially impacted by the Cod Grounds[14];
- Holding an initial meeting with the fishers identified through the two processes above, and asking them to identify any other potential fishers affected, and to identify co-operatives where the fishers landed catch from the Cod Grounds; and
- When interviewing co-operative managers, asking how many members of their co-operative were known to land catch from the Cod Grounds.

The level of likely coverage of fishers who currently regularly fish the Cod Grounds by this SEIA is very high. All of those who fish the Cod Grounds for the majority of their current catch were interviewed. It is believed that all but one of those who regularly fish the Cod Grounds were interviewed.

It is likely that a small number of fishers who irregularly fish the Cod Grounds for a small part of their income at times of the year which do not coincide with the times when consultation for the proposed MPA and subsequently the SEIA, were undertaken, were not interviewed. Based on the information provided by fish co-operatives about numbers of fishers landing catch from the Cod Grounds, it is expected two to eight fishers would fall within this range.

The level of coverage of fishers who do not currently fish the Cod Grounds, but who may be impacted by the proposed MPA if it is declared, is more difficult to ascertain. Only a proportion of these fishers were interviewed for the project – those who identified they may be impacted and were identified through the processes above. From these, it was possible to identify key potential impacts, and further interviews were not considered necessary.

Number and type of interviews conducted

Table A.1 summarises the numbers and types of interviews conducted for the project. To ensure confidentiality of participants, exact ages and other details which might allow identification of individuals are not provided.

[14] Note that all commercial fishing recorded on the Cod Grounds in the last seven years has been by commercial fishers falling in the jurisdiction of NSW Fisheries. All of the reported fishing was in the NSW Ocean Trap and Line Fishery. No Commonwealth fisheries reported fish catch on the Cod Grounds in this time.

Table A.1: Interviews conducted for the Cod Grounds SEIA

Type of interviewee	Number interviewed
Owner operator of fishing business that has currently or historically operated on the Cod Grounds (note that some owner operators might operate more than one fishing business)	11
Employee of fishing business who works on the boat (paid or unpaid, may be acting as business partner of owner-operator. Note that these employees might also own businesses allowing them to operate in areas other than the Cod Grounds, but do not own a business with an entitlement for the Trap and Line Fishery)	4
Partner in fishing business who does not work on the boat	3
Family members of owner operators or employees. Note: the first number does not include family members who were business partners or employees in the fishing business. The number in brackets indicates family members of owner operators who were business partners or employees in the fishing business.	1(5)
Fish co-operative manager	4
Fish co-operative retail outlet lessee	2
Total number interviewed	**25**
Number of owner-operators identified as potentially impacted who declined to take part in an interview	1
Number of employees/partners of owner-operators not interviewed but identified as working on boat in interviews with owner-operators	2

All but one fisher identified as potentially having a significant proportion of their current fishing impacted if the proposed MPA is declared agreed to be interviewed.

Interview questions

Commercial fishers were asked questions about the following topics:

- Their history of fishing in the region, including how long they had been fishing, types of fishing, number of people working in the fishing business, entitlements/endorsements/shares held and equipment owned;
- Amount of family income dependent on fishing;
- Changes to fishing in recent years which have affected their business and the impacts of these changes;
- Their history of fishing on the Cod Grounds, including proportion of fishing method, effort and different species caught on the Cod Grounds over time;
- Potential impacts of the proposed MPA on their business and personal life;
- Potential adjustment strategies to assist with coping with the impacts discussed; and
- Basic demographic information about age, number of dependents and education level.

The full list of interview questions asked is attached at Appendix 2.

Fish co-operative managers and lessees of fish co-operative retail outlets were asked questions about the following topics:

- History and operation of the co-operative and co-operative retail outlet, including details of the different markets to which co-operatives sell fish landed by their members;

- Potential impacts of the proposed MPA on the co-operative, including number of members likely to be affected, species affected, and the markets in which catch from the Cod Grounds is currently sold; and

- Potential impacts of the proposed MPA on the co-operative retail outlet, including alternative sources for obtaining fish supply currently sourced from the Cod Grounds and costs involved in sourcing alternative supply.

The full list of interview questions asked is attached at Appendix 3.

Ethics

The purpose, potential risks, and ways information supplied would be used in this project were explained to all interviewees before asking their permission to be interviewed. Interviews were taped after consent for undertaking a taped interview had been obtained. In this report, the identities of individuals have been kept confidential. BRS is the only organisation with access to the raw data gathered for the SEIA, and guaranteed not to supply this raw data to any other organisation without express permission of the individuals who supplied that information.

Catch volume, effort and value data

Types of catch and effort data supplied

Commercial fishers interviewed were asked to consent to release of their fish catch and effort data from NSW Fisheries to BRS. All licensed fishers interviewed agreed to this request. NSW Fisheries supplied the following types of data for catch landed by licensed fishers:

- Days of effort on different fishing methods;

- Monthly reported volume of catch of individual fish species;

- Monthly reported value of catch of individual fish species.

Data was supplied from financial year 1984/85 to most recent data for all fishing businesses except those where the current owner-operator purchased the business after June 1984, in which case data supplied was from the date of purchase by the current business owner.

In addition, Sydney Fish Market (SFM) data was accessed for fish species commonly caught on the Cod Grounds. SFM data is available by month for species sold at the market, with minimum, average and maximum prices per month provided.

This data was combined with estimates provided by co-operatives and NSW Fisheries of the quality of catch from the area, to provide estimates of fishing effort, volume and value of catch on the Cod Grounds over time.

Limitations of catch volume, effort and value data

There are significant limitations to the NSW Fisheries and SFM data, related to the size of the geographic zone for which the data was provided; the accuracy of catch returns; the valuation of reported catch; and the number of fishers for whom data was obtained.

Size of geographic zone

The smallest zone for which NSW Fisheries could provide data was data collection Zone 4, shown in Figure 1. This zone is considerably larger than the area of the proposed MPA within data collection Zone 4, as can be seen from Figure 1. This meant that the proportion of data collection Zone 4 catch occurring on the Cod Grounds had to be identified from sources other than catch and effort data. It was determined through:

- Reviewing information about fishing on the Cod Grounds gathered during the process of developing the proposal for the Cod Grounds MPA;

- Asking commercial fishers and fish co-operatives who declared an interest in the Cod Grounds (a) the fishing methods used on the Cod Grounds, (b) the fish species caught on the Cod Grounds, and (c) the proportion of their fishing effort, different fishing methods, and catch over time occurring at the proposed MPA; and

- Discussions with NSW Fisheries staff familiar with the area about the fishing methods, species and effort occurring on the Cod Grounds.

A consistent picture was provided from these different sources of the fishing methods and types of species caught on the Cod Grounds. Amongst fishers who declared an interest in the Cod Grounds, the level of catch reported was consistent with reports from co-operative managers. Fishers usually also described their knowledge of fishing undertaken by other commercial fishers on the Cod Grounds; again, there was consistency in reports from different fishers.

The only aspect on which there was disagreement was the number of fishers who irregularly fish the Cod Grounds for a small proportion of their catch, with some fishers believing very few did this, while others reported that several fishers fished the Cod Grounds on an irregular and infrequent basis in addition to those identified who fished regularly. This would represent a minor part of the current catch from the Cod Grounds and a small proportion (estimated as likely to be under 10%) of catch for those fishers irregularly fishing the grounds, and therefore was not included as part of the estimates provided in this report.

The level of consistency in reporting and data from different sources provided a high level of confidence in estimates of the fishing effort and catch volume on the Cod Grounds in the last seven years for those who have regularly fished the Cod Grounds, although fishers did have some variation in their estimates of percentage of different species caught and fishing methods used on the Cod Grounds. Fishers believed they could broadly estimate the proportion of their catch sourced from the Cod Grounds to an accuracy overall of approximately +/- 10%. The volume estimates are provided as a single figure in the report, rather than giving a +/- 10% range of the estimate, as:

- Some fishers believed their estimates to be very accurate for some species/methods and less so for others, making applying a '+/-10%' range in appropriate for some estimates; and

- Confidence in estimates was higher for more recent years and lower for less recent years, and applying a +/-10% variation across all years would not be appropriate where confidence levels change over time.

Accuracy of catch returns

The data provided by NSW Fisheries is only accurate to the extent that accurate monthly catch returns have been submitted by commercial fishers, and entered accurately into databases by NSW Fisheries. NSW Fisheries catch and effort data from 1994 onwards is unvalidated – fishers have not had the opportunity to check and if needed challenge the data held by NSW Fisheries. In future, NSW Fisheries will be comparing catch data reported by fishers with data received from fish receivers, to check if data matches. While observer programs have not been carried out in the Ocean Trap and Line Fishery, regular compliance checks are in place.

It is not possible to estimate the potential for inaccuracy in the catch data provided. The only way to do this would be to compare catch data from NSW Fisheries with records held by fishers, fish co-operatives and other fish receivers to check for any discrepancies. This process would also allow more accurate valuation of catch. This process would require considerable time going over records with individual fishers, co-operatives and other fish receivers and was not possible within the timeframe of this SEIA.

Valuation of reported catch

Valuation of Cod Grounds catch required likely values of catch to be imputed. This was done using SFM data. This has limitations, in that catch sold locally may receive a different price to catch sold at SFM.

NSW Fisheries provided data on Sydney Fish Market (SFM) average monthly price by species. Data on maximum average price received for species commonly caught on the Cod Grounds was also obtained from the SFM. SFM monthly averages are also an average across a species, including both low and high quality product. For example, low quality product may have been frozen and imported, not been gutted, or otherwise be of low quality. High quality product of the same species may attract a price several times higher than that of low quality product. Therefore the average price may overestimate or underestimate actual prices received for fish from the Cod Grounds, depending on the quality of catch from the Cod Grounds.

Information provided from NSW Fisheries (Makin, pers. comm.), fish co-operatives and fishers all indicated that prices received for product sold from the Cod Grounds are likely to be higher than SFM average prices. This is because:

- Catch from the Cod Grounds is usually high quality, value added product – referring to the quality and condition of the fish when it arrives at market. It is therefore likely to attract high prices;
- Catch of several species commonly caught on the Cod Grounds is often sold locally. Local sales often result in a higher return to fish co-operatives and fishers; and
- Other studies of beach landed prices of fish landed in NSW have found that SFM average monthly price data is likely to underestimate the true price received by anywhere from 12% to 21%, even for those who are not reported as consistently landing high quality catch (SMEC 2001a,b,c);

To reflect this, a range of potential catch values were calculated, in which the potential catch value was based on (a) SFM averages and (b) SFM monthly maximum prices.

The only way to estimate with more accuracy the value of catch landed would be through a thorough audit of commercial fisher, fish co-operative and other fish receiver records that record over time the market and prices received for fish. This would take considerable time, and was not possible within the timeframe and resources of this project.

Number of fishers for whom data was obtained

Fishers who are currently fishing the Cod Grounds were interviewed. However, some fishers who previously worked the Cod Grounds have retired or left the area permanently in recent years, and it was not possible to obtain estimates of how much of their catch before they left the area was sourced from the Cod Grounds. As they would not have returned to fish at the Cod Grounds in the future, these fishers would not be impacted by the proposed change.

In addition, NSW Fisheries is unable to supply data for a fishing business unless the licensed fisher who submitted the catch return – who may or may not be the business owner – gives consent. In some cases, some of the fishers who had submitted returns in the past could not be contacted to provide consent for data release. As a result, it is only for the years 1996/97 to 2002/03 that confidence can be held that complete data on likely fishing effort and catch volume of regular fishers operating on the Cod Grounds can be estimated, even though some fishing businesses provided estimates of catch prior to 1996/97, as prior to 1996/97 other fishers operated on the Cod Grounds who could not be contacted to obtain permission to access their catch and effort data. Therefore only catch data for the years 1996/97 to 2002/03 was used for this report.

Appendix 2: Interview schedule for fishers

The following list of questions were asked in interviews with fishers. The questions are phrased as topics, with the interviewer exploring answers to open-ended questions with the fishers as appropriate. The questions were not always asked in the exact format given below – for example, in some interviews fishers began discussing some areas covered in the questions before they were asked; in these cases the questions were explored when they were brought up rather than staying with the order of questions given below.

General fishing history

Personal fishing history

- Do you work full-time or part-time in the fishing industry?
- Are you an owner/operator, non-fishing owner, employee skipper, nominated fisher, business manager or other?
- What types of fishing do you do?
- What licences/entitlements/endorsements/fisheries shares do you hold, and what fees do you pay for these?
- How long have you been fishing?
- Do you have a family history of involvement in the fishing industry?
- How many people work in your fishing business (paid and unpaid), what are their roles, and what proportion of their time would they spend working in the business?
- What equipment do you own/use? Where is different equipment used, to target what species?
- Can you describe how your fishing effort changes over time, eg with different times of year, different seasons, different weather?
- Has your overall level of effort changed over time? If so, in what way?
- Could you tell me about the importance of fishing to you, not just in terms of commercial return, but also other ways it is significant to you?

Fishing in the region/fishery

- What changes have been occurring to commercial fishing in this region over recent years? (Prompt by asking if there have been any regulatory changes, changes in available catch, changes in business costs/ fish prices, as needed, after they give initial response)
- What impacts have these changes had on you? (Go through each change they have listed & discuss)

Other employment

- Do you or others employed in the fishing business (identified earlier) have employment other than fishing?

- If so, what employment & how many hours/week
- What percentage of your net income comes from your fishing activities, and what percentage from other work?

Cod Grounds fishing history/interest

Cod Grounds fishing history

Use map to identify their definition of the area covered by the Cod Grounds and how big this is compared to the proposed Cod Grounds MPA.

- Have you fished the area covered by the proposed MPA in recent years, or do you otherwise have an interest in it? (If an interest, ask them to define)
- In what ways is the area covered by the proposed Cod Grounds MPA significant to you (this may include aspects other than its commercial fishing importance)

If they do fish the proposed Cod Grounds MPA area:

- Has the amount of fishing you have done at the Cod Grounds changed over time? If so, in what way? (Prompt by asking whether the amount of time, fishing method, species caught has changed).
- What percentage of your fish catch (by species if possible) has been caught in the area that would be covered by the proposed Cod Grounds MPA over the last three years. Has this varied much from previous years? (Discuss previous years as appropriate).
- What percentage of your fishing effort has been spent in the area that would be covered by the proposed Cod Grounds MPA over the last three years. Has this varied much from previous years? (Discuss previous years as appropriate).
- What proportion of each of your different fishing methods is undertaken in the area that would be covered by the proposed Cod Grounds MPA in the last three years. Has this varied a lot from previous years? (Discuss previous years as appropriate).
- Is any of your fishing equipment used more in the area covered by the proposed MPA than in other areas you fish?
- Describe the importance of the proposed MPA area to you.

If they have an interest in the proposed Cod Grounds MPA area but do not fish there:

- What interest/s do you have in the area of the proposed MPA?

Potential impacts of the proposed MPA

Impacts of proposed MPA (fishing)

- What do you believe would be the main impacts of this particular proposed MPA (refer to map again to emphasise that discussion is about this single MPA proposal) on you, your business & your family? (No prompts on this question, explore their responses, then ask more specific questions below)

Specific questions for those who fish the area covered by the proposed Cod Grounds MPA:

- If the proposed MPA was declared, would you need to change your fishing activities? If yes:
  - In what ways?
- If the proposed MPA was declared, how would that affect your [specify that we are asking for a broad assessment of type, direction and magnitude of change rather than specific dollar figures]:
  - Fishing effort
  - Expenses such as fuel and bait (explain do not need specific costs, but indication of broad nature of changes)
  - Equipment costs
  - Catch landed
  - Employees (if any)
  - Other aspects of your fishing business
- Are there other areas you could shift your fishing to if the proposed MPA was declared? If yes:
  - Will there be any extra cost involved in fishing these areas instead of the proposed MPA area? If there are, could you describe the type of costs (after their initial response prompt as needed with travel time/distance, fuel, days of effort to get catch, reliability of the ground, safety, weather, equipment)
  - What if any differences would there be in the fish you could fish for in other areas compared to the proposed MPA area?

Specific questions for both those who fish proposed Cod Grounds MPA and those who don't:

- Will your current fishing activities in areas other than the proposed Cod Grounds MPA be affected by the proposal? If yes:
  - How will they be affected?

Other impacts of proposed MPA

So far we've talked mostly about the potential impacts the proposed MPA would have on your commercial fishing. I'd now like to ask questions about the potential impacts of the proposed MPA on aspects of your life other than your commercial fishing activities, and the flow on impacts of any impacts on your commercial fishing activities – in other words, how the impacts we have already discussed would affect your life.

- What impacts would the proposed MPA have on you and your family other than the direct impacts on commercial fishing we have already discussed? This may include impacts that might occur to you and your family's lifestyle or wellbeing as a result of the impacts we have already discussed.

- I'd now like to ask some more specific questions about the potential impacts of the proposed MPA other than the impacts on commercial fishing activities. Could you tell me what impacts the proposed MPA would have on you, your family, or other participants in your fishing business in terms of:
    - Your lifestyle – what changes might occur to you/your family's lifestyle as a result of the proposed MPA? Would there be any likely changes to the way you/your family live your life? If so, how would those changes affect you/your family?
    - Emotional impacts
    - Financial impacts, referring to how these would affect your life rather than the dollar value of the financial impact
    - Other impacts

<u>Ability to adjust to changes</u>

- If the proposed MPA goes ahead, what sort of assistance would be useful to you to help you cope with the impact it would have on you? (no prompts on this question; follow with more specific questions below as needed)
- I have noted down the range of impacts on your fishing we have discussed. I now want to go through each of these, and find out (a) how you think you will try to respond to this impact, and (b) if assistance was to be provided to try to help to adjust to that impact, what sort of assistance would be most useful to you.
    - [Impacts will be listed in turn and the two aspects above discussed]

<u>Demographic information</u>

For all involved in the fishing business, ask for details of:

- Age
- Number of years they have fished (if not covered earlier in interview)
- Number of dependents
- Education level

Appendix 3: Interview schedule for fishing co-operatives

History and operation of the co-operative and co-operative shop - general

1. Could you give me some history about the co-operative, including how long it has been operating, how the number and type of members has changed over time, and whether the co-operative and co-operative retail outlet are combined or separate entities?

2. How many fishers currently regularly bring in catch?

3. How many employees does the co-operative have, and how many are full-time/part-time?

4. How many employees does the co-operative retail outlet have, and how many are full-time/part-time?

5. Where does the co-operative sell product landed by its members?

6. What commissions and freight costs are charged when product is sold to different markets (go through commissions for sale to co-operative retail outlet, local restaurants/shops, other co-operatives in region, and major markets such as the Sydney Fish Markets, and freight costs for different sales options)?

7. What differences in returns to fishers occur when product is sold to different markets eg if the same species is sold locally or to the Sydney Fish Market?

8. What differences in return to the co-operative occur when product is sold to different markets?

9. What differences in return to the co-operative retail outlet occur when product is sourced from the co-operative versus other markets (go through other markets in detail as appropriate)?

Potential impacts of the proposed Cod Grounds MPA on co-operative

10. How many of the co-operative's fishers are likely to have their catch affected by the proposed MPA?

11. What species are likely to be particularly affected?

12. Where does the co-operative currently sell these species eg co-operative retail outlet, local restaurants, other co-operatives, Sydney Fish Market)

13. What impacts will these changes have on the co-operative (discuss each in detail as raised by interviewee)?

Potential impacts of the proposed Cod Grounds MPA on co-operative retail outlet

14. With regard to the catch affected by the proposed Cod Grounds MPA that is currently sold to the co-operative retail outlet:

    a. Where else can you source these species?

b. What differences in cost are there when sourcing these species from the markets described above (go through sources of differences in cost as they are described)?

c. Are there any difference in quality of the product when sourced elsewhere? If so, how does this affect the retail outlet?

d. How will you change the management of the retail outlet to adjust to these changes?

Appendix 4: Ocean Trap and Line Fishery

The following is a brief summary of the NSW Ocean Trap and Line Fishery (OT&L). It has been based on NSW Fisheries information on the fishery accessible at http://www.fisheries.nsw.gov.au/com/otlf/trapline.htm. For more detailed information on the fishery, see this website.

The OT&L 'is a multi-method, multi-species fishery targeting demersal and pelagic fish along the entire NSW coast, in continental shelf and slope waters.' (NSW Fisheries n.d.).

The OT&L covers the entire NSW coastline, from the Queensland to the Victorian borders, and extends seaward to the 4,000 metre isobath, which lies approximately 60 to 80 nautical miles offshore.

Fishers operating the OT&L can have a number of endorsements attached to their commercial fishing licence, which authorise uses of particular fishing methods, or take of particular species. Fishers operating on the Cod Grounds generally held one or more of:

- Line fishing (western zone) endorsement, authorising taking of fish by all line methods went of the 100 fathom depth contour;
- Line fishing (eastern zone) endorsement, authorising taking of fish by all line methods east of the 100 fathom depth contour; and/or
- Demersal fish trap endorsement, authorising taking of fish by bottom set fish traps.

Line fishing has a long history in NSW, with handlining occurring since at least the 1850s. A range of different line methods have gradually been introduced since that time. Detail on current line fishing methods used on the Cod Grounds is provided in Appendix 4.

Until 1 March 1997, access to the fishery was available to any NSW licensed commercial fishers. Restrictions to the fishery up to that point took the form of licensing arrangements and input control (such as control on trap sizes and hook numbers permitted on lines). From 1 March 1997, the fishery was declared a restricted fishery under the *Fisheries Management Act 1994*. This meant that all fishers were required to hold an endorsement on their NSW commercial fishing licence authorising them to use particular methods in particular zones covered by the fishery. Restricted entry fisheries were discussed in detail in the main report.

Species currently targeted by OT&L fishers are considered generally to be fully exploited.

Appendix 5: Fishing methods used on the Cod Grounds

Fishing methods used by Ocean Trap and Line fishers on the Cod Grounds are (based on information provided by fishers currently fishing the Cod Grounds):

- Fish trapping: The use of baited rectangular cages around a reef, moved regularly, and usually approximately 180x120x90 centimetres, baited with fish bait held by wire in the centre of the trap. The trap has a single entrance. Trap fleets used by fishers currently operating on or around the Cod Grounds ranged from fleets of 10 to 30 traps.

- Handlining with bait – at day or night, drifting, trolling or anchoring and using live bait fish, kept in a water circulating live bait tank, on lines held by hand or rod;

- Drifting – drifting over the reef with baited lines or rod, and repositioning the boat to drift over the reef again;

- Trolling – using motor propulsion to navigate over the Cod Grounds, dragging lure or bait at 3-12 knots at different depths to as low as six metres;

- Leadlines – Combination of drifting, handlining and trolling using a heavily weighted line and navigating slowly (2 knots or below), using live bait or squid to target fish up to 10 metres from the bottom of the reef. Also called downrigging;

- Setlines – Using a horizontal line with six hooks attached, laid across the ocean floor with floats and weights at each end for retrieval. Targets bottom dwelling fish;

- Droplining – Weighted vertical line dropped adjacent to peaks and drops on the pinnacles, using live or dead bait and up to six traces or hooks on each line with one float

- Jigging and casting – Use of an erratically retrieved lure with a casting or jigging action while the boat is positioned either by anchoring or drifting over a shoal of fish.