FINAL

An Assessment of Economic and Social Issues in the New South Wales Abalone Fishery Management Strategy

A Report to NSW Fisheries

By

Dominion Consulting Pty Ltd

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Disclaimer

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The normal disclaimer applies.

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SECTION B: REVIEW OF THE EXISTING OPERATIONS

Background

The Department of Infrastructure, Planning and Natural Resources (DIPNR) (formerly Planning NSW) guidelines require that the impacts of a Fisheries Management Strategy are assessed as part of an Environmental Impact Statement (EIS) (PNSW 2003). These guidelines have included relevant matters to meet the Commonwealth "Benchmarks and Terms of Reference for Environmental Assessment of Fisheries" and to satisfy the Commonwealth Government "Guidelines for the Ecologically Sustainable Management of Fisheries" for the purposes of *Environmental Protection and Biodiversity Conservation Act 1999* (PNSW 2002).

The environmental assessment is an examination of the environmental impacts of the fishing activities and considers biological, biophysical, economic and social issues (PNSW 2003). Under the principles of Ecologically Sustainable Development (ESD), the DIPNR guidelines include assessment of the economic and social impacts of any proposed fishery management strategies according to prescribed economic and social considerations. This is to make the economic and social aspects of sustainable resource use and management more transparent in the decision-making process. It also enables potential policy impacts to be mitigated in the policy development process, rather than after the event.

The economic and social assessment sections of the DIPNR guidelines require a review of existing fisheries information in section 3 (B) and an evaluation of the likely implications of the Fishery Management Strategy in section 3 (E).

The abalone fishery in New South Wales has previously included some economic performance indices in the existing share management plan developed in 2000. In undertaking the assessment, there is a lack of current economic and social information on fishing operations and the processing industry. There has been some social information on fishers, but little on the social composition of fishing communities in NSW. The current study gathers and analyses economic and social information in order to appraise the fisheries management strategies proposed for the abalone fishery in NSW.

Available Information

The current study presents the existing economic and social information as a background to the assessment of specific fishery management strategies envisaged in the future management of the abalone fishery. It should not be treated as a “valuation” of the abalone industry. The secondary information available on the seafood industry in NSW is limited, coming from licensing details of registered premises. There is no publicly available descriptive information or an economic profile of the processing, wholesaling and retail sections of the NSW seafood industry.

To gain up to date economic and social information for the assessment process across all fishery primary producers in NSW who directly interface with the fish resource, two surveys were commissioned by NSW Fisheries in May 2001. A survey of the secondary level of the seafood industry is recommended for future work. Ideally annual financial surveys of the primary and secondary sectors would give a time series and an improved understanding of inter annual variability. The economic and social surveys were to gain information on the fishers and their fishing operations, to enable the impacts of implementing fishery management strategies to be

appraised. Given this is part of a new fishery assessment process, subsequent research and information gathering is recommended for future appraisals as per the guidelines (Section E3.3)

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

This economic and social fishery management strategy assessment is a part of a process of more accountable and transparent fisheries management and improved ecological sustainability.

Initial analysis of available data revealed a deficit of economic and social information, with the available data coming from existing NSW Fisheries records. The main sources of information and data for the economic and social assessment are described below:

a) Existing NSW Fisheries licensing records have some fisher details such as postcode, endorsements holdings and fisher file and business number. Catch and effort information from the NSW Fisheries database can be added to existing licensing information. A share register is maintained by NSWF and contains data about shares holders and shareholdings.

b) Reports of Total Allowable Catch Committee and Abalone Management Advisory Committee;

c) Separate social and economic surveys were undertaken across all commercial fisheries in NSW in the May-June period of 2001. The surveys were executed by Roy Morgan Research. The number of completed economic surveys from abalone fishers in the Roy Morgan survey was an inadequate sample size. Dominion re-circulated the survey instrument to abalone fishers in June 2003 to collect information about the current status of the fishery in financial year 2001-02. A specially devised social survey was executed by telephone in May 2001 (Roy Morgan, 2001b). An overview of the state-wide social survey is reported in *Appendix 2*. A total of 28 abalone fisher responses were recorded from a total of 42 fishers contacted state-wide. The survey results have been analysed for the abalone fishery and will be referred to as "Source: RM-SS".

d) A number of publications were referred to in this assessment and the details are provided in the reference list;

(e) Australian Bureau of Statistics (ABS) data were obtained from the Bureau of Rural Science (BRS) social science unit, to examine the secondary level information available on the communities and fishers in the NSW fishing industry. The results of this fisher community profiling are presented in *Appendix* 3;

Other sources of information have been cited, including general literature, available government, industry statistics and personal or committee communications as acknowledged.

4. Economic Issues

4.1 Description of economic issues in fishery

The DIPNR guidelines for assessment of economic issues require the following:

- the investment in the fishing fleet and any significant processing facilities;
- employment including direct and indirect employment by regions or sub-regions including the proportion of fishers with income from other commercial fisheries and/or other non-fishing employment, the seasonality of employment and the demographic profile of those direct and indirect employed in the fishery;
- the economic return from the fishery including its contribution to individual, regional, and state income, the value of shares in the fishery and trends in the market value of shares held by fishers and the economic multiplier effects, economic rents and community contributions; and
- the overall risks to the economic viability of the fishery from the current operational regime, taking into consideration the likelihood/frequency of impacts and the consequence of the impacts occurring.

The DIPNR guidelines are presented to guide the reader, with a response stated below each guideline.

Guideline (a): **Outline the investment in the fishing fleet and any significant processing facilities**

Investment in the fishing fleet and equipment

The Abalone fishery is a single species, high value fishery fished by divers exploiting the target species, *Haliotis rubra*, which lives on the seabed among seaweed adjacent to shore, generally in water depths of less than 20 metres.

Abalone are taken by licence holders mostly diving with compresses air supplied from a hookah unit. The boats used in the Abalone fishery vary in style and length as many fishers commenced with displacement hulled vessels. Today most boats are trailed behind 4 wheel drive vehicles in order to access remote site along the coast. The boats vary in length, but not generally in excess of 8m (Roy Morgan, 2001a).

The economic survey of the abalone fishery conducted by Dominion Consulting for the financial year 2001-02 indicated that the current capital value of a typical fishing abalone fishing vessel and other equipment is $106,554, with typical annual economic depreciation of $13,593. Excluding the value of shares, the total capital value in the fishery with 37 divers is estimated at $3,942,498 current value and $7,147,090 replacement value (2001-02). This includes fishing vessels, engines and other fishing equipment (.

Investment in the abalone processing facilities

Abalone fishers deliver fresh/live abalone to processors, and the processors will then transfer the catch to their processing facilities. NSW Fisheries records indicate that during 2003, five processors received abalone with the three largest processors receiving 84% by weight of abalone (NSW Fisheries, 2004).

The current study prepared a questionnaire for each of these processors to collect information about the actual and replacement values of their processing facilities, operational costs, total weight of abalone processed, exports and number of people employed. Out of nine processors contacted, two of the large-scale processors in NSW responded to the survey. The results of this survey are presented in aggregate to protect business confidentiality.

The results from the survey indicate that the current capital value of a typical large scale abalone processor is approximately $409,500 and the estimated replacement cost is $1,270,500. The capital value of abalone processing businesses includes processing equipment, transportation facilities, administration and marketing facilities. Based on the economic survey results, the total capital value of the abalone processing sector in NSW, not including land values, is conservatively estimated as a minimum of approximately $1.3m.

In 2001-2002, the two abalone processors sampled received 62% of the TAC in NSW (205t) from 33 NSW abalone divers. The processors also received 197 tonnes of abalone from 21 divers in other states indicating inter-state trade linkages in the processing industry. The structure of processing companies buying abalone from shareholders and divers has not lead to significant vertical integration. Processors tend to contract divers in order to secure supply, rather than processing companies buying into the diving sector.

Approximately 90% of abalone catch was exported to overseas markets, particularly Japan (58%), Hong Kong (31%), Taiwan (8%) and Singapore (3%). Most processors directly export either live or processed product.

NSW abalone fishers currently provide their customers with a variety of products such as live abalone, canned abalone, par-boiled and frozen on shell abalone, fresh frozen on shell abalone, choice individually quick frozen (I.Q.F.) abalone meat, and fresh chilled abalone meat. Suppliers can also prepare their products according to customers' specifications. For example, vacuum packing. Some of these abalone processing companies also supply other products such as fresh, live sea urchin, sea urchin roe and turban snail.

Guideline 4(b): **Outline employment including direct and indirect employment by regions or sub-regions including the proportion of fishers with income from other commercial fisheries and/or other non-fishing employment, the seasonality of employment and the demographic profile of those direct and indirect employed in the fishery**

Employment

The Abalone Fishery is one of only two category 1 share managed fisheries in NSW (the other being the Lobster Fishery). Share management provides a basis for investors in the fishery to harvest abalone themselves or employ people to carry out the actual harvesting operations. Hence, there are three different groups of people employed in businesses in the fishery: shareholders in the fishery (investment only); shareholder/divers; and nominated divers (i.e. divers who work for a shareholder). Divers usually also employ deckhands. The NSW abalone fishing industry has direct employment in fishing operations and indirect employment through the processors and traders.

In late 2003 there were 47 shareholders, 33 divers and 37 deckhands operating in the abalone fishery from several number ports along the NSW coastal region (NSW Fisheries, 2004). This is a total of 117 persons directly employed in the catching side of industry.

The abalone processing industry in NSW has an estimated total of 106 direct employees, attributable to the processing of NSW sourced abalone. Processing abalone from other states, as well as NSW, would increase this to approximately 150 persons (ABMAC pers. comm.).

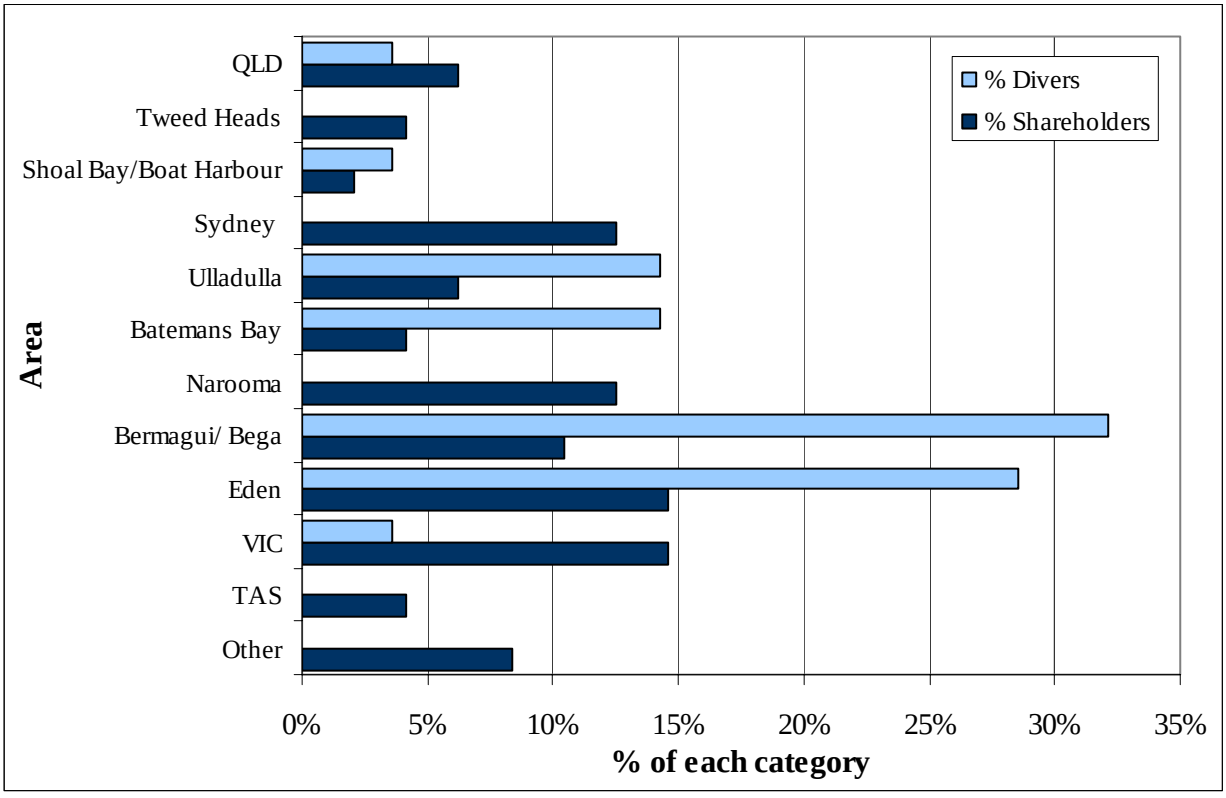
There are approximately 111 people indirectly employed on the abalone fishery and processing industry in NSW through providing inputs such as boats, diving equipment and gear supplies and inputs to the processing sector. Later in this study we select an employment multiplier for the abalone industry of 1.5. On this basis the total direct and indirect jobs attributable to NSW abalone would be 334 jobs (117 diving +106 processing NSW abalone +111 indirect).

The NIEIR (2004) study of the Abalone industry in Victoria also indicated that the flow on impact in the national economy was an additional 12.5% of the regional estimates. In the NSW case the total national abalone employment from the NSW industry would be an additional 42 jobs nationally, a total of 376 jobs.

Figure 1 presents the direct employment by regional location of abalone fishers and shareholders along the NSW coast. DPI Fisheries data indicated that approximately 67% of shareholders are from NSW and the remaining 33% from other states such as Victoria (15%), Queensland (6%), Tasmania (4%) and other (8%). Of the 67% of shareholders from NSW, 60% are based south of Sydney, in Narooma, Bermagui, Bega and Eden areas.

Most (93%) divers are based in NSW and live on the south coast of NSW. Bermagui/Bega and Eden towns have highest diver numbers, followed by Ulladulla and Batemans Bay. The details about the home ports of abalone fishers are provided in the Social Issues section.

Figure 1: Distribution of shareholders and divers (i.e. shareholder divers and nominated divers) in the NSW abalone fishery in 2000-01.



[Note: Some of the shareholders are also divers]

Some of the abalone fishers have endorsements in other commercial fisheries. For example, the sea urchin and turban shell (SUTS) is closely linked to the abalone fishery as abalone

shareholders were also endorsed in the SUTS restricted fishery. There are currently 37 SUTS fishery endorsement holders. Of these, 5 are not abalone shareholders. There is no information about the number of people directly employed in the SUTS fishery.

The Roy Morgan social survey investigated employment in the abalone fishery in the year preceding June 2001. Shareholders were asked: How many people have you employed in the last 12 months? The results are presented in Table 1.

Table 1: Estimated number of employees in the abalone fishery sample 2000-01 (Source: RM-SS).

No. of employees	Abalone fishers	Employees
0	0	0
1	12	12
2	5	10
3	1	3
4	2	8
Total	**20**	**33**

In the abalone fishery all of the 20 respondents surveyed had employees. Of these, 12 shareholders have at least one employee in their business and the remaining 8 have more than 2 employees. The social survey employment estimates indicated that 12 out of 28 fishers had their marital partners in the business.
Apart from shareholders, divers, nominated fishers and family members, there are several other sectors also involved in the NSW abalone fishing industry. For example, abalone processing, transportation, marketing, fishing gear supply and boat building sectors.

The survey results indicated that two processing companies had employed approximately 17 people on a full-time and 2 on a part-time basis in 2001-2002. An additional 42 people were employed on a casual basis working approximately 20 hours per week.

Source of income of abalone fishers
In the 2001 Roy Morgan survey abalone fishers were asked about the percentage of their income from fishing, as compared to non-fishing and other income sources, reported in Table 2.

Table 2: The percentage of income from fishing and non-fishing sources in which abalone fishers participated in the last 12 months (Source: RM-SS).

	Source of income			
% Income	**Fishing**	**Fishing related**	**Regional investment**	**Non-fishing**
< 20%	2	25	27	27
21 - 40%	0	0	0	0
41 - 60%	0	0	0	0
61 - 80%	3	0	0	0
81 - 100%	23	2	0	0
Can't Say	0	1	1	1
Total	**28**	**28**	**28**	**28**

In the abalone fishery, 23 (12 shareholders and 11 nominated divers) of 28 fishers who responded to this question have 80-100% income from fishing and another 3 shareholders with over 60- 80% income from fishing. Part-time fishing involvement is limited; with only 2 shareholders of 28 persons having less than 20% of their income from fishing related and general investments.

Table 3 shows an average income of abalone fishers. An individual average income ranges from approximately $29,250 (deckhand) to $60,000 (shareholder). Abalone fishers contribute between 54% and 69% of their household incomes.

Table 3: Average individual and household income of abalone fishers. (Source: RM-SS; Dominion 2003).

Average income	Shareholder/ diver ($)	%	Shareholder ($)	%	Diver ($)	%	Deckhand ($)	%
Individual	55,000	54%	60,000	55%	50,000	67%	29,250	69%
Household	101,000	100%	108,333	100%	75,000	100%	42,458	100%

Employment opportunities in non-fishing industries or businesses

Shareholders/Divers and Nominated Divers: Employment opportunities for fishers in other industries have been investigated through the social survey (Table 4). Out of 28 fishers who responded, 16 fishers (40%) thought that they could get full-time, or part-time employment in another trade or industry, if they wanted to**.**

Table 4: Alternative employment opportunities for abalone fishers in 2000-01 (Source: RM-SS).

Employment opportunity in another trade or industry	Shareholder	Shareholder/ Diver	Nominated Diver	Total	Total (%)
Could get full-time employment	2	6	4	12	43%
Could get part-time employment	0	1	3	4	14%
Probably could not get employed	1	6	4	11	39%
Can't say	1	0	0	1	4%
Total	4	13	11	28	100%

Deckhands: Of a total of 12 deckhands, 9 thought they could obtain full-time (5) or part time (4) employment in other trade or industry. Of the 12 deckhands, 5 are already working in other industries or businesses such as building and farming

Abalone shareholders are often closely linked by family ties or through companies which have common directors. The financial relationship between shareholders and nominated fishers is variable. Generally, nominated fishers are paid approximately $12 to $14 per Kg (pers. comm.

John Smythe, June, 2003) and are then required to pay their operating expenses from this amount.

The seasonality of employment

Time and area closures can dictate when fishers are employed. Catching an abalone quota in a given 12 month period, is subject to a number of conditions such as area closures (e.g. parts of Region 1) and time closures. For example, spawning season closures between November and March occurred in the past for some sub-zones. Until recently, the commercial fishery was also closed for part of the summer. Otherwise, divers generally work year-round to catch their quota.

Social surveys conducted by Roy Morgan and Dominion have asked abalone fishers including deckhands about number of hours they worked in the high, normal and low seasons. (See 'Social Issues' section for details).

Demographic profile

Demographic details of abalone fishers are provided in the Social Issues section.

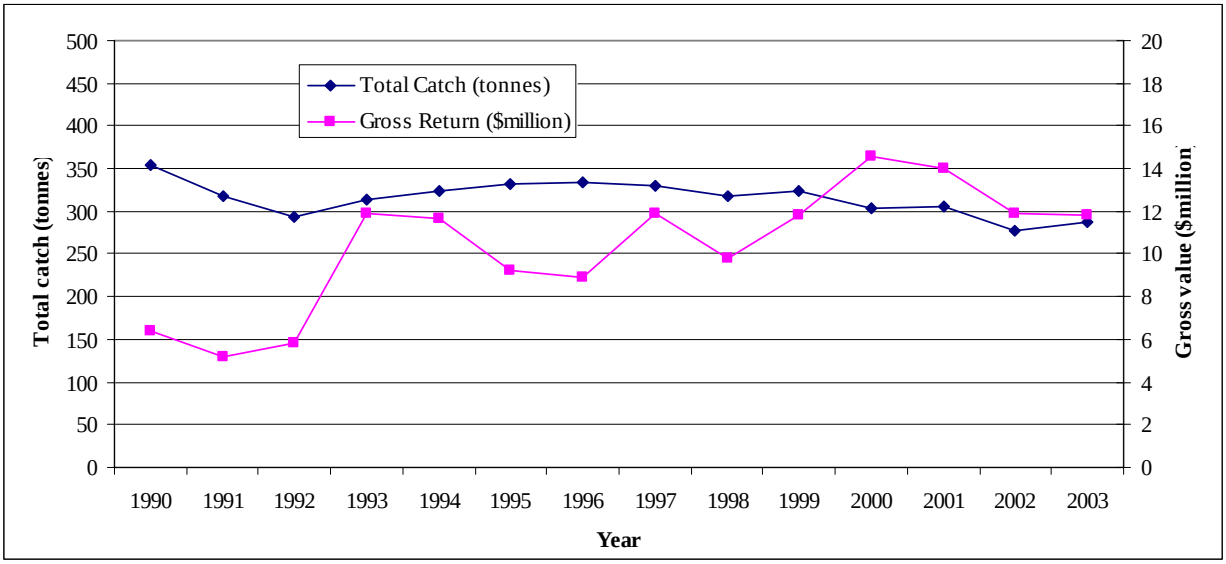
4.2 The economic return from the fishery

Guideline 4(c): **Outline the economic return from the fishery including its contribution to individual, regional, and state income, the value of shares in the fishery and trends in the market value of shares held by fishers and the economic multiplier effects, economic rents and community contributions**

Background

The abalone fishery in 2002 had an estimated annual total revenue of $12.5m and was approximately 15% of the total annual fishery production in NSW of $81.5m. The catch has been in the vicinity of 300t per annum in the late 1990s (Figure 2).

Figure 2: Historical total catch and total value of catch (nominal) associated with abalone fishery in the 1990-2003* period (Source: NSWF-Sydney Index).



* 2003 data are provisional

Total abalone catch taken in 2003 was approximately 238.2 tonnes (82%) of the total allowable commercial catch of 290.5 tonnes (Table 5).

Table 5: Total Allowable Commercial Catch, TACC taken in years 1996 to 2003 from NSW abalone fishery (Source: NSW Fisheries 2004 and DPI 2005).

Year	TACC (tonnes)	Total catch (tonnes)	% of TACC
1996	333	331	99%
1997	333	327	98%
1998	333	321	96%
1999	333	322	97%
2000	305	305	100%
2001	305	304	100%
2002	300	277	92%
2003*	290.5	238	82%
2004	283	234	83%

* 2003 TAC = Jan-June 2003 – 150 tonnes + July-Dec 2003 – 140.5 tonnes

Many abalone fishers hold endorsements in the sea urchin and turban shell fishery (SUTS). Currently there are no data available to estimate the value of the SUTS fishery and the proportion of sea urchin catch taken by abalone fishers.

This section examines the economic return from the commercial abalone fishery. The primary measure of economic profitability comes from the surveys of abalone business data. The survey contacted shareholders and divers. Processors were also surveyed, but had few surveys returned.

Appendix 1 reports the results of the economic survey of the NSW Abalone fishery in detail. The current section reviews the other economic information available from share prices, share leasing, abalone prices and exchange rates.

The economics of the processing industry

Nine abalone processors were contacted with a brief financial survey. Replies were received from the two largest processors and may not be representative. In the 2001-2002 financial year, the processing industry obtained a return to capital which apparently did not cover an assumed 7% opportunity cost of capital. Results in 2002-2003 were similar and in 2003-04 were significantly lower due to the market impact of low abalone beach prices on business (pers. comm., ABMAC). These results should be treated with caution, but are the only available information.

Several factors influence profitability in the abalone processing industry. The type of product exported depends on the preferences of the importing country. Industry responds to countries where live abalone is in demand and consumers pay premium prices. There has traditionally been a strong demand for Australian abalone in Asia, but overseas markets also receive abalone product from other producers such as South Africa, and some Asian customers prefer lower priced substitute products. The NSW abalone processing industry is not vertically integrated with production, the processors preferring to buy from contracted fishers and to look for markets which return the highest profit margins for different product forms.

Shares in the abalone fishery

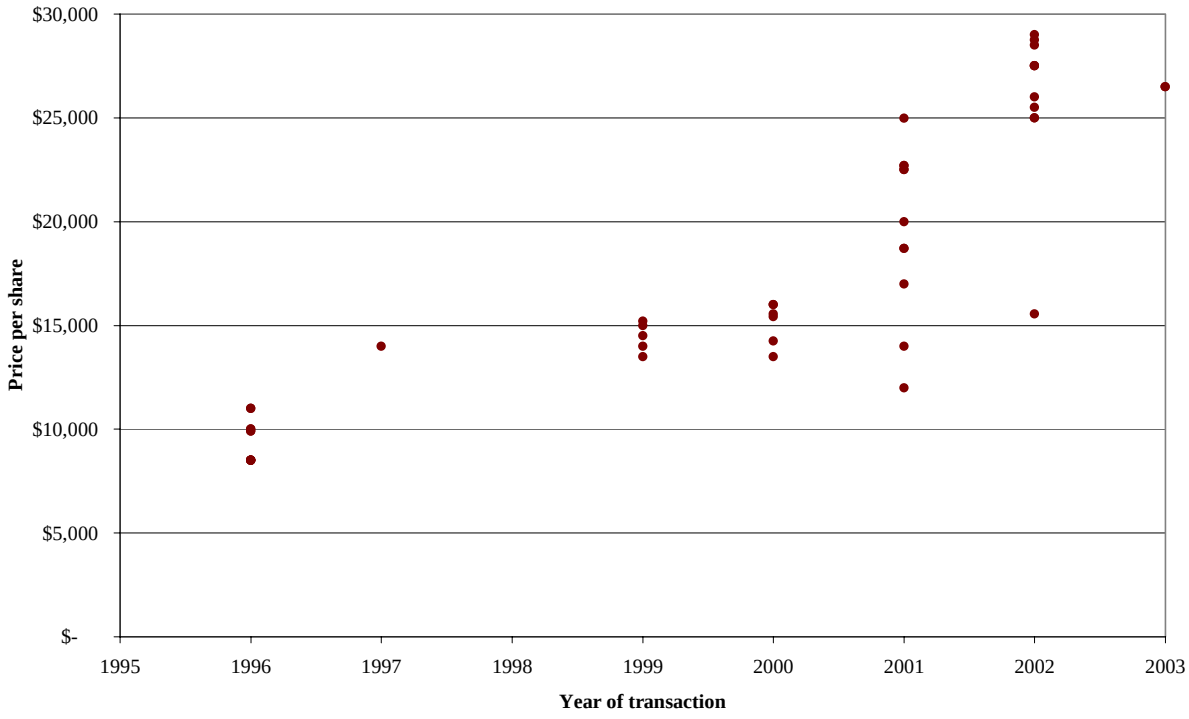
The Fisheries Management Act 1994 enables abalone fishers to hold shares in the abalone fishery. These have an associated amount of catch set annually through the TAC process. Under share management commercial abalone fishers own shares in the fishery which can be transferred or traded with some minor qualifications. A market exists for the shares which can be exchanged in lots of 10, the original allocation being 100 shares. The shares can also be leased.

As of December 31, 2003, there were 47 shareholders holding a total of 3,654 shares in the NSW abalone fishery (NSW Fisheries, 2004). Since the commencement of the Management Plan in 2000, new investors acquired shares in the fishery, with the minimum shareholding required to be eligible for an endorsement decreasing to 70 shares, and a provision for use of nominated divers.

The value of shares

The market value of an abalone share has increased from $9,400 in 1996 to $22,400 in 2003 as presented in Figure 3. In 2003 and 2004 the share price has reduced substantially and industry indicate that there are few buyers for share packages. Price per share in March 2004, may be as low as $15,000, though there have been no sales to evidence this (pers. comm., ABMAC).

Figure 3: The market of price (nominal) of abalone share transfers in the 1996-2003 (Feb.) period. (Source: NSWF and Abalone industry records).



As of December 2002, a package of 100 shares based on a TAC of 300 tonnes, was selling for approximately $2.65 million. The total estimated share capitalisation of the NSW abalone fishery would be approximately $98 million as of December 2002. Industry sources suggest that

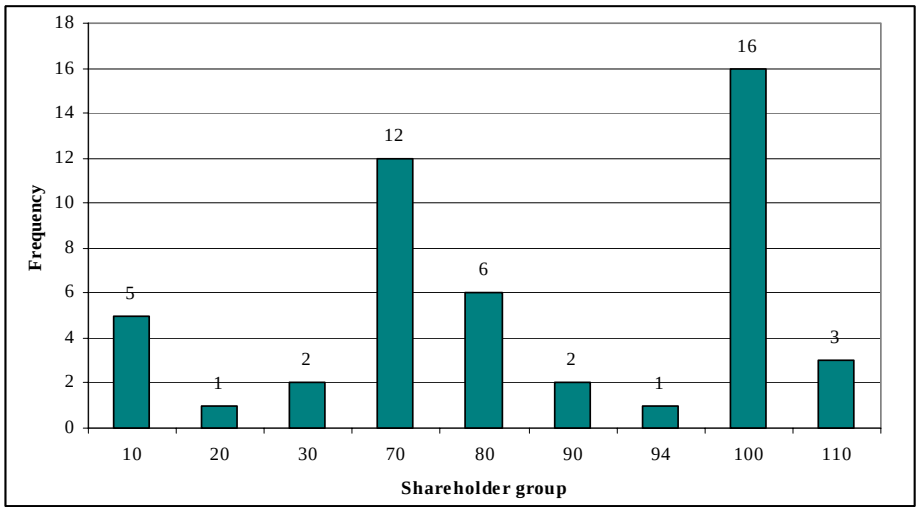
as of March 2004 when beach price were low, if 100 shares were valued at $1.5m, then total share capitalisation would be $55.5m. In 2005, with a TAC of 206t the capitalised value would be approximately $50m.

The value of shares is related to the available catch and is strongly related to the beach price of abalone (McIlgorm and Goulstone, 2001), which in turn relates to the prevailing exchange rates, trade policies and foreign demand, over which fishers have little control. The beach price of abalone has risen consistently since the early 1970s until 2003. As reported in Figure 5 the beach price has fallen from $45/kg to $31/kg in early 2003 attributable to the SARS disease outbreak and poor performance of Asian economies. The exchange rate between the Australian and the US dollar is reported in Figure 6. The US dollar is the primary currency used to trade abalone internationally. In 2004 and 2005 abalone beach prices have recovered.

The share market trends and values can also indicate investor expectations of economic returns. A lease market also exists between operators, but insufficient lease price information is available to use this as a measure of profitability. Long run business viability will be an issue for some producers.

Share trading activity
NSW Fisheries hold a share register which records information on the ownership of share which range in number from packages of 10 to 110 shares. Details of frequency of shareholdings in the fishery in 2003 are reported in Figure 4.

Figure 4: Distribution of shareholdings in the NSW abalone fishery in June 2003.



There are two major shareholding groups i.e. shareholders with 70 and 100 shares account for 58% of the total number of shares in the fishery.

Share transfer values
This section examines the value of shares and trends in the market value of shares. At the commencement of the share management plan in 2002, 37 shareholders had 100 shares each. Subsequent sales of packages of 10 shares are reported in Table 6, and the trading has given greater diversity in ownership as seen in Figure 4.

Table 6: Sales of shares in packages of 10 in the NSW abalone fishery (2000-2003).

	Number of share packages sold					
No. of shares	**2000**	**2001**	**2002**	**2003***	**Average shares sold 2000-2003**	**Total**
10-19	3	3	8	-	4	14
20-29	1	3	2	-	2	6
30-39	-	2	-	-	1	2
40-49	-	-	-	1	0	1
50-59	-	1	-	1	1	2
60-69	-	-	-	-	-	-
70-79	-	1	1	-	1	2
80-89	-	-	-	-	-	-
90-99	-	-	-	-	-	-
100-109	2	1	-	1	1	4
Total share packages	**6**	**11**	**11**	**3**	**8**	**31**
Total shares	**250**	**370**	**190**	**190**	**250**	**1,000**

Key: * Interim for 2003

Figure 5: Average yearly beach prices (nominal and real) in the abalone fishery 1998 – 2004. (Source: NSW F and NSW Abalone industry).

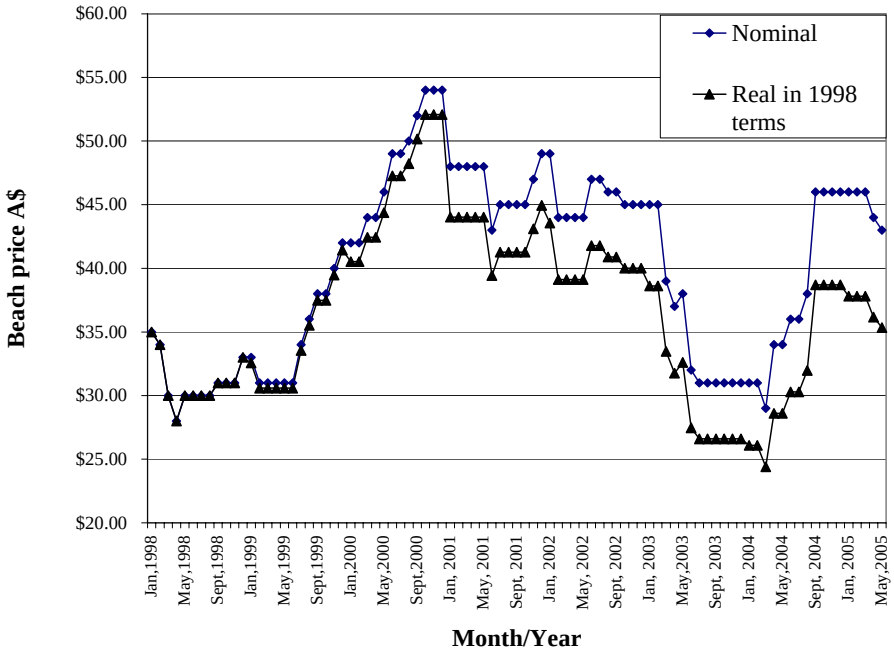
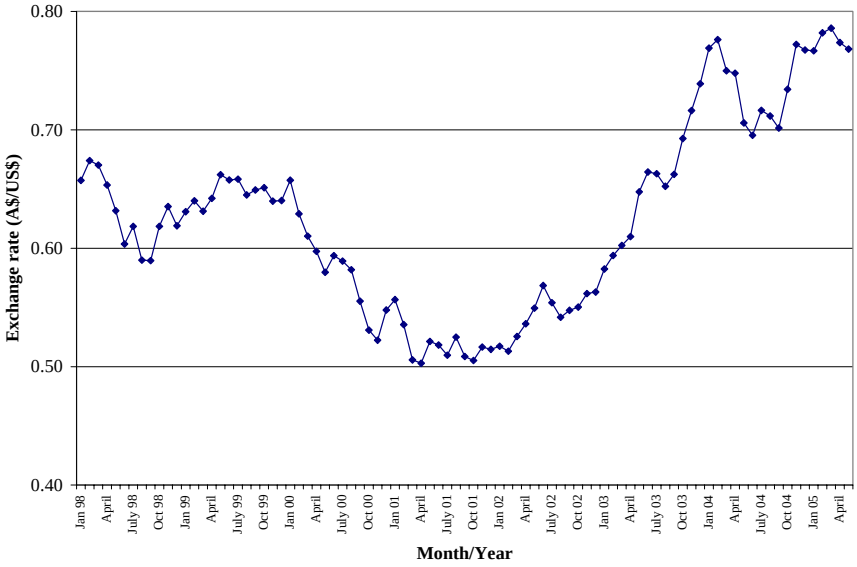


Figure 6: The A$ to US $ exchange rate in the 1998-2005 May period. (Source: OANDA, 2005).



In summary, the reduction in share values in the post 2003 period breaks with the trends of previous years as reported in Figure 3. In 2003, the abalone beach price slump reduced share values (pers. comm. ABMAC). In 2004-05 substantial quota reductions from 283t to 206t, a 26% reduction, will lead to a reduction in share value. Like any share market, it is a case of past performance not necessarily being a guide to future performance.

Quota leasing

In the abalone share management fishery, quota may be leased and transferred between shareholders provided that a shareholder does not acquire more than double their initial allocation for the fishing period. The abalone quota became almost fully transferable in the late 1990s, with several restrictions. The recent historical pattern of quota leasing is shown in Table 7.

Table 7: Quota leasing in NSW abalone fishery 1996 - 2003 (Source: NSW Fisheries 2004)

Year	Quota leased (kg)	% of TACC leased	No. of Shareholders leasing quota
1996	39,695	12	-
1997	14,440	4	-
1998	18,800	5	7
1999	31,000	9	13
2000	33,158	11	23
2001	21,016	7	19
2002	35,631	11	15
2003	37,219	13	21

During 2002, 37,219kg of abalone quota (13% of total allowable catch) was leased to other shareholders indicating that there is a viable market for trade in quota. The transfer of TACC has increase from 11% in 2002 to 13% in 2003. DPI Fisheries does not record the leasing arrangements made between quota holders. Estimates of the price paid for leased quota are not available.

Economic profit from abalone fishing

The economic profitability can be measured in several ways involving surveying of accounting and business records and by other measures, such as share price, to estimate economic rent.

Economic survey

An economic survey was developed to obtain data on the capital value, costs of fishing, and the economic rate of return for the different abalone businesses. There were two separate questionnaires developed and distributed to shareholders and divers. The results of the economic survey are presented in detail in Appendix 1.

There are three distinct groups in the fishery: Shareholders, shareholder/divers and nominated divers who work in the fishery. Some shareholders are investors who hire divers, whereas other shareholders formerly were shareholder/divers and do not currently dive. Table 8 reports the economic results from the survey of abalone fishing businesses for shareholders, shareholder/divers and divers.

Table 8: The economic return obtained from survey data for the NSW abalone fishery in 2001-02 (Source: Summarised from Appendix Table 1).

	Shareholder & Diver	Shareholder	Diver
Gross Revenue (2001-2002)	**350,258**	339,562	**107,770**
Revenue net of diver payment		**231,792**	
Total direct costs	141,337	45,348	91,335
Total indirect costs	119,713	103,665	22,759
Total economic costs	261,050	149,012	114,094
Boat cash income	**112,600**	**82,780**	**361**
Business profit	**89,208**	**82,780**	**- 6,324**
add back leasing, interest and rent	19,299	38,545	1,857
Profit at full equity	**108,507**	**121,325**	**- 4,467**
Capital excluding share value	204,204	110,022	56,248
Rate of return to boat capital* %	**53.1%**	**110.3%**	**-7.9%**
Less opportunity cost (7%)	**46.1%**	**103.3%**	**-14.9%**
* Excluding share value			
Capital including share value	2,454,204	2,360,022	N/A
Rate of return at full equity%**	**4.4%**	**5.1%**	**N/A**
Less opportunity cost (7%)	**-2.6%**	**-1.9%**	**N/A**
** Including share value			

In Table 8 the shareholder/diver operations (left hand column) are compared with the returns of a shareholder who employed a nominated diver (centre and right hand column) for the financial year 2001-02. The results are presented as a return to boat capital which excludes share value (ABARE, 2003) and return to full equity which includes a $2.25m share value.

Boat cash income, simply total income less total cash costs (ABARE, 2003), indicated the low level of diver net cash income. Shareholder/divers and Shareholders had cash income of $112,600 and $ 82,700 respectively.

Shareholder/divers and shareholders in 2001-02 both returned similar levels of profit at full equity of between $108,000 and $121,300. This return can be viewed against two measures of capital.

In government examining the innate profitability of the industry, the profit at full equity would be compared with the cost of capital excluding share value, in which case Shareholder/divers have a return to boat capital of 46.1%. The most appropriate comparison is with shareholders employing nominated divers. In total a return of $116,858 ($121,325- $4,467) for $166,268 of boat capital, gives a return to boat capital of 70.3% for shareholders employing divers. It appears that the return to boat capital of employing a diver is higher than for shareholder/divers.[1] The rate of return of between 45% and 70% of boat capital indicates the presence of rent in the fishery in 2001-02. The access to this rent underpins the abalone share price.

The second measure of profitability is that used by an investor who includes the cost of the shares to the cost of production. In Table 9 the results are presented for the representative shareholder/diver business, with 100 abalone shares obtaining a 4.4% to 5% rate of return to full equity in the year 2001-02. The businesses surveyed are not covering the 7% opportunity cost of capital in the financial year 2001-02. The return to shareholder only operations is higher than for shareholder/divers. The inclusion of share capital requires that an accurate share value is evident in the market place. The estimate of $2.25m was used.[2]

The divers sampled in 2001-02 work on contract and have a negative 7.9% return to their full equity i.e. boat capital, and -14.9% when opportunity costs are considered. They are forgoing returns to capital and taking wage payment below their opportunity cost of labour, presumably in return for lifestyle. However the diver survey had only five replies and may not be sufficiently representative.

Debt levels

Debt levels in respect of capital assets and fishery access (shares) vary among shareholders. Debt levels are higher for shareholders employing divers than for shareholder/divers, many of whom are original divers. In 2001-02 interest payments for the representative shareholder were $34,000, being approximately 10% of annual gross revenue. The most highly geared shareholders have 2 to 2.3 times the average level of interest payments.

Debt levels among the divers surveyed were low at an average of 2% of revenue and a top of 4% of revenue. This result should be treated with caution, due to the low numbers of divers responding to the survey.

2 There are several reasons for this. The amount paid by an owner to the diver to catch the quota is minimised by shareholders, as it is a business input paid to someone external to the business. As time progresses many original shareholder/divers move to hire a diver, but if there is a business down turn, they may return to diving. Thus shareholder/divers have substantially more capital equipment than an investor with no past in the abalone industry, who hires a diver with boat, paying on catch taken. There is more likelihood that costs are minimised by the investor /diver model Many shareholder/divers may not be minimising the cost of inputs, employing family members as deckhands etc (see Hassall and Assoc., 1999).

[2] In the years following 2001-02 the value of share has fallen. The impact of rates of return can be envisaged by comparing net returns in Table 8 over new lower levels of share and boat capital.

As in any industry, highly geared firms are often more vulnerable to the impacts of an economic downturn. The history of the abalone fishery over the last 20 years would indicate that market prices can vary impacting economic viability. Catch reductions are of greater concern. In July 2004 significant TAC reductions brought a longer term uncertainty to industry.

Rents, community contribution and management charges

Resource rent is part of the economic surplus that can accrue from a managed fishery and is attributable to access to the resource. Resource rent is made up of different elements and is the surplus attributable to the marginal fisher's last unit of effort, times the units of effort applied to the fishery (Reid and Campbell, 1998). This reflects the value of access to the resource. The balance of total rent and resource rent are intra-marginal rents, attributable to the skills of fishers and reflect innovation and skills in a healthy industry. Estimation of resource rent requires incorporation of effort and species considerations. Any profitability estimates in fisheries need to be related to the resource through bio-economic modelling to see if they are economically sustainable. This is not possible with information and data currently available.

In the NSW abalone fishery the resource rents have been capitalised into share values. This means that any attempt to retrieve resource rent by government will impact on shareholders who bought into the fishery taking account of charges that were indicated at that time. In this case the rent exits the fishery as a windfall gain to the exiting fisher and the new shareholder is often holding debt in respect of their share purchase.

The previous survey of year 2001-02 indicated that there is resource rent in the abalone fishery in that shareholders are covering most of the opportunity cost of their shareholding value which was $2.25m in 2001-02. By 2004-05 the reduction in the TAC will have reduced rent with a fall in share value.

A community contribution is payable by abalone shareholders. The NSW Fisheries Act does not specify the form of the "community contribution", but makes an in principle requirement to make a return to the community in respect of privileged access. In the NSW non-renewable natural resources sector, *ad valorem* royalty payments are made for resource extraction, usually being set as a percentage of gross revenue at the time of extraction. The renewable nature of fishery resources has led to the community contribution being a broader concept, a royalty not being specified under the Act. The community contribution has to be aware of the objectives of the Fisheries Act considering the economic viability of fishers and the sustainability of the resource, as there would be circumstances of poor industry viability in which the payment would not be a division of profit, but may be potentially harmful to industry viability and long term resource sustainability. It is this economic surplus that contributes to Gross Domestic Product and hence economic growth, and from which the community contribution payment is made. If a negative surplus exists, the fishery contribution to the State economy is negative in GDP terms. In the case of a negative surplus, the community contribution acts as a tax impost on producers, which may be undesirable. It suggests that industry either take the ups and downs of a specified payment rate, or examine with government a more risk and reward sharing system. This would have no community contribution when economic performance is unviable and higher rates of contribution in more prosperous times.

The previous arrangements for community contribution based on a percentage of revenue generated by the fishery did not take into account profitability. The contribution was set at 6% of the gross value of the fishery for year 2003/04 which is estimated at approximately $210 per share (Table 11). Since then arrangements have changed and are now take more closely linked

to profitability. Based on the recommendations of an Industry/Government Working Group, the community contribution (to come on line with the 2006/7 fishing period) will be calculated as percentage of gross revenue per share that varies on a sliding scale in accordance with a CPI adjusted average annual beach price (AABP). For example:

- if the AABP is below $43/kg the percentage rate will be 0% (i.e. no charge will be payable);
- for an AABP between $43 and $52/kg the rate will increase by 0.5% per dollar to 5% of the revenue at $52;
- for beach prices from $52 to $62 the rate will increase by 1% per dollar to 15% of revenue at $62; and
- above $62/kg the rate will remain at 15%.

To take into account the impact of any significant changes in the Total Allowable Catch (TAC) on industry profitability, threshold points relating to the sliding scale will be adjusted as follows:

- if the TAC decreases by less than 10%, the thresholds remain unchanged;
- If the TAC decreases by 10% or more, all thresholds for calculating the charge in the year affected increase by $1 for each 10% decrease in TAC. Note that a TAC decrease will be rounded to the nearest 10% to calculate the increase in the threshold; and

- If TAC reductions in any one year increase the thresholds by $2 or more, the thresholds for each subsequent year will increase by half the amount of the immediately preceding year's adjustment for that TAC change, rounded to the nearest whole dollar.

The proposed new arrangements have the advantages of a lower but more sustainable revenue flow to the Government, and offer significant benefits to industry, including:

- moratorium extended to 30 June 2005;
- no charge payable when beach price below long-term average of $43;
- long-term average dollar amount of charge reduced by approximately 60%;
- charge will respond to variations in profit resulting from beach price changes;
- charge will respond to variations in profit resulting from TAC changes; and
- thresholds will be CPI adjusted annually and charge reviewed every 5 years.

Management charges including research and compliance are calculated based on the broad pricing principles recommended by the Independent Pricing and Regulatory Tribunal (IPART, 1998). In addition to community contribution, shareholders must also meet full management costs. For the 2003-04 period fees are: management charge $242 per share; $66.76 one-off environmental assessment levy; $332 application fee, for a nomination with respect to a share holding, $221 per share transfer; $388 with respect to share mortgages; $166 transaction fee payable for quota transfers; and a $111 application fee for crew member registration (NSW Fisheries 2004).

The economics of fisheries management enables an appraisal to be made of the economic contribution of the fishery to the economy and to analyse the impact of the changes advocated in the FMS. The ESD principles dictate that resources should be valued at their market values and those subsidies should be taken into account. The current abalone charges paid by Abalone fishers in the fishery are reported in Table 9 as part of an overview of profitability of the whole fishery in 2003-04.

Table 9: An estimate of an economic account for the whole NSW abalone fishery in financial year 2003-04.

	Year 2003-04
For the abalone fishery per annum:	($ millions)
Gross revenue from catch (284t*$30/kg)	8.520
Economic cost of Effort (i)	6.908
Total economic surplus	1.622
Less Management charges to industry	0.962
Less Community contribution (ii)	0.516
Cost of FMS (iii)	0.247
Operational economic surplus (iv)	-0.103
less cost subsidies	0
Plus rise or fall in abalone stocks (v)	Reduction
Less opportunity costs (Share value) (vi)	5.18
Total economic contribution	-5.283

Key:

i $6.39m operational costs from survey and $0.518m opportunity costs of boat capital

ii Community contribution at 6%; i.e. 4% above the economic cost of effort which included 2% community contribution. (3,700*$139.60)

iii Second payment of 3,700*$66.76.

iv Surplus is $0.405m if OCC is deducted

v The trend in TACCs has been reducing

vi (opportunity cost of share investment of $2.0m share value @ 7% $5.18).

Table 9 indicates that lower prices in 2003-04 means that the catch value less catching costs (including a return to boat capital) leaves a positive surplus of $1.622m. The charges for the costs of management, the FMS and community contribution are deductions and exceed the available surplus. The available economic surplus of $-0.103m indicates there is unlikely to be economic rent in the fishery at these prevailing price levels. Subtracting the opportunity costs of shares leaves an economic contribution of -$5.283m across the fishery. Investors are not receiving a positive return to investment in this period of low prices.

Conclusions on the economic profitability of the fishery and the profit from abalone fishing.

The value of shares is at the centre of the share management system. Share value is influenced by several factors including the annual TAC and long term catch prospects, the beach price of abalone. There are also other factors such as expectations of management, levels of charges and threats to the resource. Shareholders have incentive to manage to maintain and increase share value.

In the financial year 2001-02 the surveyed results show the fishery returns were between 50% to 70% to boat capital indicating rent from the fishery at the TAC level of 283t and prevailing prices and costs. Investors were receiving -2% as a return to their investment at a share value of $2.25m. Divers were returning -14.9% to capital, not covering their opportunity costs of capital. In 2001-02 their long term viability is questioned. It is likely they forgo some of the imputed returns to labour in return for lifestyle, a form of non monetary rent. In summary the returns

from the fishery in 2001-02 are sound, while returns from abalone diving are less than required for long term viability.

Subsequent to the years in the economic survey (2001-02) the TAC has been reduced from 283t in year 2003 to 206t in 2004-05. This 26% reduction in TAC is made to protect the fish stock. Share values would be expected to reduce to reflect reductions in the TAC. It has not been possible to survey or to model returns in 2004-05, but using the economic survey for 2001-02 as a viability benchmark, we would conclude the following.

If in 2001-02 prices between $40-$50 per kg and a TAC of 290t give a normal rate of return, it is expected that the TAC reduction to 206t will reduce share price and owners will have to adjust their costs. It is likely that the TAC reduction will have maintained economic viability of the fishery, with rent being at a reduced level. This would be seen in a reduced share price, which reflects the now reduced capital value of the fishing rights. However the reduction of TAC by 26% in 2004-05 would have substantially reduced the economic viability of fishers, divers experiencing a 26% reduction in income (all else being equal). We would expect to see economic adjustment in the fishery with diver numbers reducing, due to exiting the fishery to alternative occupation, permanently, or until prospects in the fishery improve.

The NSW share managed abalone fishery is facing a number of economic risks as will be outlined later in this section.

4.3 Economic contribution to local and regional economies

The economic survey indicated that 50% of shareholder/divers and all shareholder businesses have positive net returns and are thus viable in the long-run covering economic depreciation by setting aside enough now, to renew capital at a future date. Only 20% of divers sampled appeared to meet the long term viability criteria.

Operators in profit are contributing to the local, state and national economy in terms of contributing to Gross Domestic Product (GDP). Some operators are under the long term viability measure, not contributing profit to GDP, but will contribute to economic activity through their purchases of inputs and factors of production (e.g. labour and capital) and thus to Gross Domestic Product through the profits and labour payments of firms from whom they purchase inputs. While workers in profitable and unprofitable fishing firms also contribute to economic activity through their consumer purchases it is less desirable than the creation of profit and may contribute less than expenditure on inputs in alternative industries.

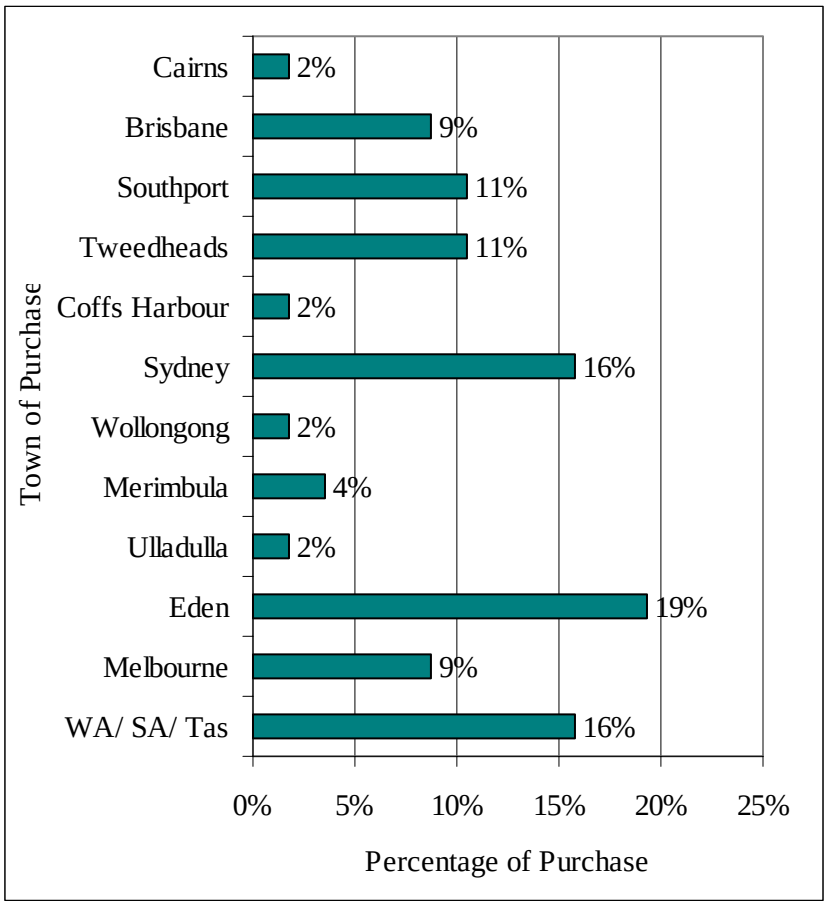
The contribution to the state and regional income in 2001-02 comes from wages being spent in the south coast of NSW by divers, deckhands and shareholders and also business input expenditure in regional economies and in the state economy also. Several shareholders live out of the south coast region and out of NSW and would reduce state and south coast regional expenditure to an unknown extent. The contribution to the state income from the industry in 2001-02 also comes from foreign exchange gained by the industry which predominantly exports the abalone.

Regional expenditure of abalone fishers

Fisher expenditures can be divided into expenditure on employment, inputs for the fishing process and capital items for fishing. Capital and input expenditures are investigated below.

The regional nature of expenditures can be seen by examining the larger scale purchases of the abalone endorsed businesses. In the social survey 28 fishers were asked about the amount and location of their major purchase over $1,000 and the expenditure locations are reported in Figure 7. Eden and Sydney are major purchase areas in NSW, accounting for approximately 31% of purchases. About 56% of these purchases occur in other states. This may indicate a significant outflow from the NSW economy and has been noted in other regional abalone industry studies (NIEIR, 2004).

Figure 7: Towns outside local area in which abalone fishers made a major expenditure over $1,000 in last 12 months (Source: RM-SS).



In the abalone fishery approximately $652,500 of purchases were made outside the fishers' local area by the 28 fishers interviewed. Wetsuits, diving gear, protective clothing, boat, car/Ute and freezers are the major expenditure constituting approximately 53% of abalone expenditure outside of the local area (Table 10).

Table 10: Purchase of items outside local area in which abalone fishers made expenditure over $1,000 in last 12 months (Source: RM-SS)

Items purchased	Fishers	%
Wetsuits/ Diving Gear/ Protective Clothing	6	21%
Boat/ New Boat	5	18%
Car/ Ute	4	14%
Freezers	2	7%
Outboard Boat Engines	1	4%
Nets	1	4%
Trailers	1	4%
Wire	1	4%
Repairs/ Refitting Of Vessel/ Engine Rebuild/ Parts	1	4%
Other	10	36%
Total	**28**	**100%**

Economic multiplier effects

This section examines the results of detailed regional expenditure studies in the NSW fishing industry, which give multipliers showing employment and production induced expenditure effects. Economic multipliers come from input-output modelling of economies and relate to the flow-on impacts of expenditure within a closed local economy. Employment multipliers estimate the impacts on employment of expenditures in the locality. Several studies appraising the multipliers and flow-on impacts in the NSW fishing industry are now dated, and risk that given their age, changes in the structure and operations of the industry since the studies were undertaken would alter estimates (Dr R. Powell, pers. comm.).

The economic significance of an industry, such as commercial fishing, can be measured in terms of direct and indirect effects. The direct effects are a measure of the value of output of the industry itself, the number of people employed and the income they receive. The indirect effects can be divided into production induced and consumption induced effects. Production induced effects are the industry's purchase of goods and services from other industries. Consumption induced effects arise from the spending of household income received as payment for labour.

The multipliers indicate the size of those impacts relative to the level of sales to final demand. The Type II ratios reflect the relationship between the total impact (direct and indirect) to the direct effect. In Table 11, a Type II value of 1.56 infers that for every dollar of direct output, there is a total impact of $1.56 due to both direct ($1) and indirect ($0.56) effects. The production and consumption induced components of the $0.56, are $0.23 and $0.32 respectively (Top line, Table 11).

Of the available literature on NSW fishing communities, studies on Eden and Ulladulla in the late 1980s are potentially most relevant to the abalone fishery and are presented in Table 11.

Table 11: Estimates from the regional economic studies of fisheries on the south coast of NSW (Powell et al., 1989).

OUTPUT (a)	Initial	Production induced	Consumption induced	Total	Type II ratio
Ulladulla (1)					
Trawl	1	0.2368	0.3269	1.5637	1.5637
Non trawl	1	0.2233	0.3409	1.5642	1.5642
Eden (1)					
Trawl	1	0.218	0.2206	1.4387	1.4387
Non trawl	1	0.2203	0.1977	1.4179	1.417
Process+	1	0.4256	0.1051	1.5307	1.5307
INCOME (b)	**Initial**	**Production induced**	**Consumption induced**	**Total**	**Type II ratio**
Ulladulla (1)					
Trawl	0.2999	0.069	0.1266	0.4955	1.6524
Non trawl	0.3156	0.0692	0.1321	0.5168	1.6378
Eden (1)					
Trawl	0.2999	0.0498	0.0802	0.4299	1.4337
Non trawl	0.2489	0.0644	0.0719	0.3852	1.5475
Process+	0.0621	0.1044	0.0382	0.2047	3.2982
EMPLOYMENT (b)	**Initial**	**Production induced**	**Consumption induced**	**Total**	**Type II ratio**
Ulladulla (1)					
Trawl	0.0184	0.0036	0.0062	0.0282	1.5363
Non trawl	0.0268	0.0032	0.0065	0.0365	1.3592
Eden (1)					
Trawl	0.0184	0.0023	0.0033	0.0239	1.3009
Non trawl	0.0147	0.0024	0.0029	0.02	1.3669
Process+	0.0034	0.0055	0.0016	0.0106	3.06

(a) per dollar of output Sources: (1) Powell et al. 1989
(b) employment / $'000 of output

Discussions

From the initial output of one dollar there are total flow-on output effects of 41.7 cents (non–trawl, Eden). Those levels of flow-on effect are relatively modest within the small local area. In most cases, this reflects the limited capacity of the local economy to supply inputs to the fishing activities as well as the relatively low level of purchased inputs used.

There have not been any specific studies of the multipliers associated with the NSW Abalone industry. The Southern NSW study indicates the ratio of all effects, are likely to be relatively small at around 1.5-2.0 for most fishing activities (Tamblyn and Powell, 1988). Powell et al. (1989) study the NSW fishing industry commenting that:

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

In 2003, a regional economic study of the abalone industry in Victoria indicated that total to initial effects were 1.4. The size of the effects was limited due to low capital involvement in harvesting, and revenues received by owners not based in Victoria leaving Victoria (NIEIR, 2004).

The available information suggests that total to initial effects are unlikely to exceed 1.5, which is low in the general economy (Tamblyn and Powell, 1988, Powell 1989 and NIEIR, 2004). Employment multipliers would also likely be of this magnitude with an additional 0.5 indirect jobs being created for every one direct job in the abalone industry. However the level of

multiplier may give the abalone industry less economic contribution than the same resources applied in alternative industries in the economy.

4.4. Key economic risks to the viability of the fishery under current operational regime

Guideline 4(d): **Summarise the overall risks to the economic viability of the fishery from the current operational regime taking into consideration the likelihood/frequency of impacts and the consequence of the impacts occurring.**

Economic viability is at the core of the share management system under which the fishery is managed. The system envisages that share owners have incentives to build the resource and increase the share price as the size of the stock increases (Young, 1999). The share system uses an output control, the TAC with an individual transferable quota for each fisher. This catch regulated regime is more efficient than input controls and the inefficiency that comes from trying to control by fishing effort and fishing capacity.

The examination of both economic risks and impacts of the FMS should recognise the core economics of letting the shareholders adjust in response to the TAC set. Adding a range of input based restrictions will only dilute this mechanism and reduce efficiency in the fishery.

It is important that the main risks to economic viability are identified so as they can be addressed by management and industry. The major risks to the economic viability of the NSW abalone fishery can be divided into external and internal risks. External risks are outside the control of the manager or fisher, whereas internal risks can potentially be controlled.

External risks

The following external risks to economic viability have been identified:

Beach price fluctuations, illegal fishing, disease and water quality problems, the increasing cost of inputs to the fishery and reductions in stock caused by other users.

Beach prices, illegal fishing, the cost of inputs, disease and water quality issues and reductions in stock caused by other user groups.

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Beach prices

There was a significant reduction in the market price of abalone in 2003 which illustrated that beach price was beyond the control of fishers. The reasons for reduction in the market price were:

- unpredictable changes/circumstances in overseas markets such as recent disease outbreaks in some Asian countries;
- surplus production of abalone by other countries; and
- exchange rate changes.

Prices are outside the control of abalone producers who are price takers in this global market. The industry is aware of this and attempts to add value and sell to different niches in the global market.

Illegal fishing activity

Abalone poaching and black marketing is a serious problem in the abalone fishery. Estimates of the illegal and unreported catch in NSW are in the order of 40-120 tonnes (NSW Fisheries, 2004). Illegal fishing is ranked by industry as the greatest threat to a sustainably managed abalone fishery in NSW (pers. comm. ABMAC). In a national review of the needs of the abalone sector by Macarthur Agribusiness (1998), abalone theft was ranked as the greatest threat by all abalone producing states as it adversely impacts industry viability. Shareholders also have to spend more money on managing this compliance issue and on the monitoring of illegal activities. Illegal harvesting of abalone also causes problems for scientists in compiling accurate stock assessments, increasing the risk of inaccurate information for management. Taking undersized abalone contributes to growth- and recruitment-overfishing and hence depletes the total abalone stock. Apparently there has been increased compliance in recent years among both licensed and unlicensed fishers (NSW Fisheries, 2004).

Disease and water quality

Abalone require good water quality to minimize the risk of disease. Recent *Perkinsus* outbreaks in the fishery have serious impacted region 1 which is seriously depleted and "compromised in terms of its abundance, productivity and ability to recover" (TACC, 2003).The *Perkinsus* impact on abalone grounds adjacent to Sydney has spread to areas south of Sydney. Should this trend continue there are management implications for the fishery, such as excess effort moving from the areas in the north, which have been impacted by *Perkinsus*. Currently there is no known way of controlling *Perkinsus*.

Other user groups

Abalone are taken by other user groups in the community, such as recreational fishers, aboriginal fishers. Removal of abalone by other sectors is considered in the setting of the TAC, but the current management framework does not enable commercial fishers to influence the catch of other sectors.

The costs of input

Cost increases in factors of production, such as fuel, are outside the control of the fisher and may rise through time reducing profitability.

Internal risks

Internal risks to economic viability, come in several forms. The fishery economic literature discusses several categories of problems that can impact profitability in a fishery. These are information, congestion and stock impacts, referred to as externalities in the literature (Clark 1990). The following internal risks to economic viability have been identified:

increasing costs of management, inaccurate information for TAC setting, lack of information sharing and unity among fishers, potential regional stock depletion; excessive diver numbers, inappropriate harvesting practices and the reduction of the TAC and closures.

Increasing costs of management

The industry may face increased costs for service prescribed by the government through regulation. In the abalone fishery the costs of management are high relative to the Gross Value of Production (GVP) of the fishery and reflect the fixed nature of administrative costs, compliance and research service provision. Increases in management costs will raise management costs as a percentage of GVP.

The fishery has to support a fixed level of management services such as compliance, research and administration to ensure resource sustainability and profitability. The risk to economic performance is that economic profit comes after having met these costs. Unless the fishery has both high yields and prices, the economic surplus risks getting taken up in management overhead. The fishery needs to contain costs and look at reducing them through self management where possible. The fishery also needs to grow its GVP through enhancement of the resource. This risk is exacerbated in the current trend of reduced TACCs. The risk is linked to the risk of limited involvement of shareholders in management decisions.

The quality of information used to set the TAC

The fishery management regime requires good information from fishers on many issues. Long run economic viability of the fishery requires that the information provided to the TAC committee in deciding on TACCs for the fishery, is as accurate as possible. Having errors in this information (i.e. estimates of illegal and recreational catch) can have deleterious impacts to the stock. In the fishery economic literature such impacts are the long run cost of taking a fish now, and hence removing it and its potential reproductive contribution from the stock (Clark, 1985).

Lack of information sharing and unity among fishers

Active shareholder and diver involvement in policy-making can reduce conflicts within the industry and with other stakeholders in the fishery. This requires sharing of information between fishers to enable cooperation, though the competitive fishing culture tends to constrain this.

Industry believes that in order to develop opportunities for improving sustainability (e.g. re-seeding and enhancement) there needs to be fuller industry involvement in hands on management through more devolved management arrangements. These are currently being investigated. The risk is that division in industry, inhibits collective action by industry and leads to government involvement in areas that industry could self manage.

A risk to the fishery is that lack of cooperation between fishers in collective management arrangements. These could use social relationships, processing co-operatives or similar mechanisms. Lack of information sharing and collective action by fishers leads to costly government intervention, which would affect economic viability.

Congestion and inappropriate distribution of effort within the fishery

In an open-access fishery, fishers are known to move to areas where catch rate is highest (Gordon, 1954). Having a TAC in place does not, in itself, alter this behaviour, especially in the abalone fishery where animals occur in discrete areas, such as reefs and in different densities. Where catch rates are greatest there may be an inappropriate distribution of effort within the fishery. For example, too many divers may fish in one area of the fishery, a form of congestion which may erode overall stock through serial depletion of areas. Minimum size limits are used to limit the catch and the risk of serial depletion in conjunction with the overall TAC. Regional catch targets, however, attempt to solve this problem, at least on a regional scale. The NSW abalone fishery is divided into 6 regions for management purposes. Part of Region 1 is currently closed for commercial and recreational fishing. As a result, displaced fishing effort has been partly the cause of a trend to move towards the southern regions where catch rates are generally higher. Managers are concerned about changes in the pattern of effort causing depletion of stocks in the south. The fishery is controlled by total catch limits and minimum size restrictions. Management must be careful not to erode the effectiveness of these existing control mechanisms.

The number of divers in the fishery

Under the Share Management Plan (2000) diver numbers are set at a maximum of 42 divers. Given the TAC is now significantly lower than in the year 2000, an economic threat to the fishery is having too many divers in the fishery, each one locked into taking small sub-economic amounts of ITQ. This is a capacity issue (McIlgorm and Goulstone, 2001) in which too many divers would represent a form of congestion (see above) with economic costs. Rules that a diver may only dive ITQ for one shareholder do not lead to the effective use of diving labour and is unlikely to bring least cost harvesting.

Management fears that diver numbers could potentially increase. This has raised the issue of whether the fishery needs to alter the rights in the share system to enable the diving entitlement to be separated from the shareholding. The current requirement that one diver work for a given shareholder, limits the mobility of a diver being able to catch for several shareholders, meaning that more divers are required, contributing to congestion in the fishery. This is also an impediment to economic viability.

Inappropriate harvesting practices

The commercial harvesting practices of abalone fishers may have some impact on the abalone stock if inappropriate. For example, there is potential for abalone, disturbed by fishers to be subject to increased mortality and hence cause a reduction to the size of stock. A diminishing TAC and available fishing area, when combined with reduced catch rates, may cause excessive searching and turning of abalone with detrimental impacts. This problem is also related to the risk of potentially increased numbers of divers in the fishery.

Reduction in the TAC

Given the extent of the decline in the TAC from 333t per annum in the late 1990s, to 206t in 2004-05, a major risk to the economic viability of the fishery is the availability of catch. The TAC system is indicating that the stock has reduced significantly and given that current income and the capital value of shares depends on the size of the catch, this should be a major concern. With a reduction in the TAC of 26% (283t to 206t) we should see shareholders taking steps to rebuild the fishery biomass and divers exiting the fishery as presumably 26% fewer divers are required to take the new TAC.

Closing areas

These can be formed for a variety of reasons and are created under the Fisheries Management Act 1994. The reasons for closures can be both external to the fishery (e.g. marine parks) and also an internal measure used to manage the stock. Closing certain areas (e.g. parts of Region 1) to commercial fishing is associated with reductions to the TAC and hence economic viability, despite potentially long term benefits in rebuilding the stock.

Conclusion

The review of existing operations in an economic context indicates that the fishery currently is economically underperforming and that there are a number of risks to its economic viability. Unless addressed, these risks will affect the long-term viability of businesses employed in the abalone fishery.

Some risks to economic viability were identified as being external and, as such, not generally under the control of fishery managers. For example, maximising beach price and efficient

marketing are the role of industry and not through management. The costs of fishing inputs are generally set in other sectors of the economy. Other user groups can be made aware of the needs of the commercial sector, but may not accept these.

There are also many risks to economic viability that were considered internal and these have potential to be acted upon. One of the major risks to the long-term economic viability of fishing businesses is from a declining access to abalone stocks. Recent reductions to the TAC have required a series of repeated adjustments by shareholders and divers to meet new smaller catch totals. This also tests the existing rules in the fishery and the structure of management and there are signs that some of these now need to be revised as discussed above.

5. Social Issues

The background to the social the review of social issues is given at the commencement of the Economic section. The available information is used to address the social issues surrounding the introduction of the FMS. Given the lack of previous studies, the review cannot fully complete the Department of Infrastructure, Planning and Natural Resources (DIPNR) guidelines and gaps have been identified. The need for future research is presented in this section.

The environmental assessment guidelines issued by DIPNR require examination of social information on fishers and their communities associated with the abalone fishery, including:

(a) community values and views associated with the fishery;

(b) health risks to fishers;

(c) health risks to consumers;

(d) Indigenous peoples;

(e) historic heritage; and

(f) overall risks from the current operational regime to any social issues.

The DIPNR guidelines for social issues will be followed below. The guidelines are presented as headings to guide the reader, with a response stated below each guideline.

5.1 Describing social issues in the fishery

Guideline 5(a): **Outline the community values and views associated with the fishery (including social capital issues, skill base and transferability of skills) with a brief analysis of the basis of these views and perceptions.**

A specially devised social survey was conducted in May 2001 by Roy Morgan to collect information on shareholders and divers. In June 2003, Dominion Consulting has conducted a separate survey to collect information on deckhands associated with the NSW abalone fishery. The results of these surveys are presented in the following sections.

The social survey of shareholders and divers had achieved a total of 28 replies from abalone fishers - 4 non-fishing owners, 13 owner-operators and 11 nominated divers. Out of 37 deckhands contacted, 10 responded to the survey. The following analysis is largely based on these survey responses.

Approximately 67% of NSW abalone fishery business owners line in NSW and the remaining 33% in other states (Victoria, Queensland and Tasmania). The commercial fishery for abalone is concentrated on the south coast of NSW with the major ports being Ulladulla, Batemans Bay, Bermagui, Tathra and Eden. The social survey identified that the 28 abalone endorsement holders who responded to the survey used 14 home ports in NSW. Eden, Merimbula, Tathra, and Bermagui are the major home ports for NSW abalone fishers (Table 1).

Table 1: Major home ports for the NSW abalone fishers (RM-SS)

Home Port	%
Ulladulla	5%
Batemans Bay	5%
Narooma	7%
Bermagui	12%
Tathra	12%
Merimbula	17%
Eden	29%
Other (Brisbane Water, Port Hacking,Kiama and Jervis Bay)	12%
Total	100%

NSW Fisheries data indicates that, in NSW abalone fishery, the number of abalone divers declined from 290 in 1971, to 37 in 2003 (Figure 1). Out of 37 divers, 28 were nominated divers engaged in the abalone fishery. Every abalone diver would have a crew member called a 'deckhand' assisting, though there are strict rules over who is entitled to dive in the fishery.

Figure 1: Number of divers in the abalone fishery in the period 1971-2003. (Source: NSWF).

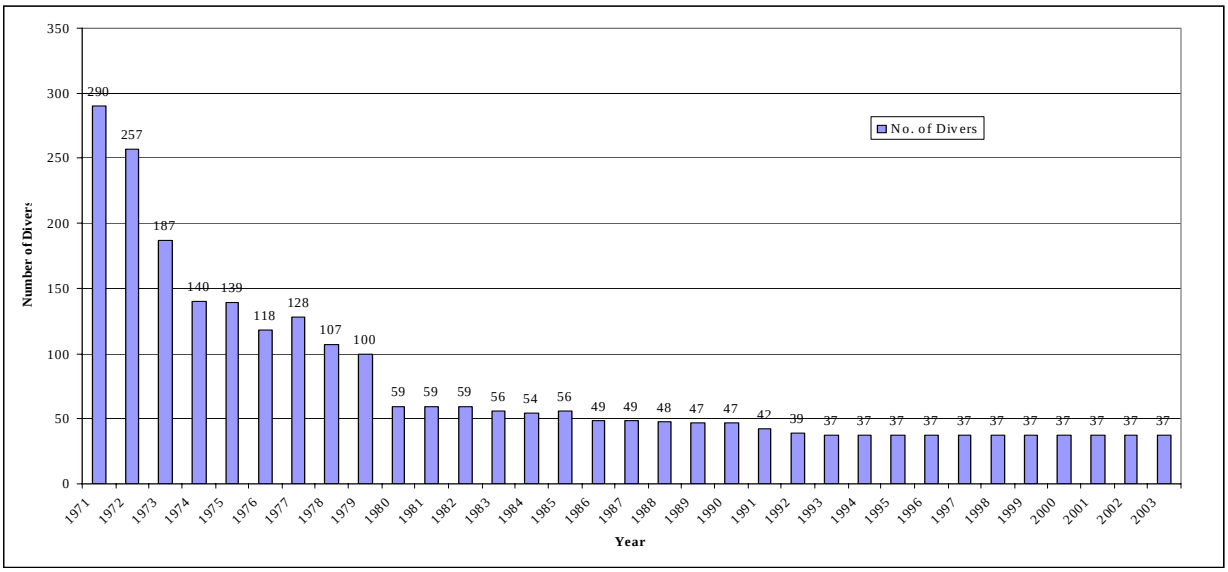


Table 2 reports the demographic profile of the shareholders, divers and deckhands in the NSW abalone fishery.

Although a majority of Abalone fishers had low rates of formal education, with 58% achieving year 10 educations or below, 11% had a university degree or tertiary education. Only 7% had a trade or business training.

Fishers also have high levels of home ownership, with 82% owning or paying off a home. Participation of females in direct fishing is 4% according to the survey and approximately 43% of Abalone fishers' partners are employed in Abalone fishing businesses.

Table 2: The demographics of fishers in the abalone fishery (Source: RM -SS and NSWF licence data).

State-wide Profile	All NSW	Abalone	State-wide Profile	All NSW	Abalone
Percent males	97%	96%	**Mean number of Children <16 years**	0.92	1.32
Mean years resident in town	20.3	19.5	**(Other) Dependants**		
Mean years in Fishing Industry	22.1	12.5	None	63%	57%
Generations in Fishing Industry	1.5	1.6	Spouse	23%	21%
Mean Hours /week in fishing industry	70.2	9.9	Children Over 16 yrs and Others	14%	21%
Percent currently employed in other industries	19%	11%	**Employed Status**		
Housing Tenure			An Owner/ Operator	87%	46%
Own	49%	50%	A Non-Fishing Owner	3%	14%
Paying off	32%	32%	An Employee Skipper	4%	0%
Renting	16%	14%	A Nominated Fisher	4%	32%
Other	3%	4%	Other	1%	7%
Education			**Employees (%)**		
Year 7/ 1st Form	4%	4%	0	65%	21%
Year 8/ 2nd Form	10%	4%	1 or more	35%	79%
Year 9/ 3rd Form	17%	11%	**Mean Individual net taxable income**	$58,710	$80,750
Year 10/ 4th Form	32%	39%	**Mean Household net taxable income**	$50,713	$102,411
Year 11/ 5th Form	4%	11%	$30,000 - $39,999	12%	7%
Year 12/ 6th Form	11%	14%	$40,000 - $49,999	7%	4%
Trade Or Tafe Certificate(s)	10%	7%	$50,000 - $59,000	5%	0%
University Degree/ Tertiary Education	3%	11%	$60,000 - $69,999	5%	4%
			$70,000 - $79,999	3%	4%
Marital Status			$80,000 - $89,999	3%	4%
Married or relationship	80%	75%	$90,000 - $99,999	1%	4%
Single	11%	25%	$100,000 +	5%	26%
Other (Divorced, separated, widowed)	8%	0%	Can't say	31%	18%
Partner employed in Fishing Business	32%	43%	Refused	9%	29%

Abalone fishers were asked how many years they have lived in their current postcode. The results indicate that 56% of fishers have lived in the same postcode area for more than 10 years and 36% more than 20 years, indicating strong association with local communities (Table 3).

Table 3: Number of years lived in the same postcode

	<10 years	**11-20 years**	**>20 years**	**Total**	**%**
Shareholder/diver	8	0	5	13	33%
Shareholder	2	2	0	4	10%
Nominated diver	3	2	6	11	28%
Deckhands	4	4	3	11	28%
Total	17	8	14	39	100%
%	44%	21%	36%	100%	

In examining dependants in abalone fishery, it was found that out of 38 fishers, 22 fishers had no dependent children below 16 years of age (Table 4). The remaining 16 fishers had 20 dependent children under 16, representing families with an average of 1.3 children per family.

Table 4: Dependent children below 16 years of age (Source: RM-SS).

No. of Children	Shareholder/ diver	Shareholder	Nominated diver	Deckhands	Total	%
None	10	3	4	5	22	58%
1	2	1	4	4	11	29%
2	1	0	3	0	4	11%
>2	0	0	0	1	1	3%
Total	**3**	**1**	**7**	**5**	38	100%

About 50% of abalone fishers had no financial dependents, 28% had dependent spouses particularly nominated divers and deckhands, and the remaining 22% had dependent parents, stepchildren or children over 16 years (Table 5).

Table 5: Percentage of financial dependents on abalone fishers (Source: RM-SS).

Dependents	Shareholder/ diver	Shareholder	Nominated diver	Deckhand	Total	%
Parents	1	0	0	1	2	6%
Children (Unspec)/ Step children	1	0	0	0	1	3%
Spouse	1	0	5	4	10	28%
Children over 16 years old	1	1	0	0	2	6%
Other	1	0	1	1	3	8%
None	8	3	5	2	18	50%
Total	**13**	**4**	**11**	**8**	**36**	**100%**

The social survey asked fishers how many people are employed in their businesses? Approximately 71% of fishers employed 1 or more licensed or unlicensed fishers in the past 12 months in their businesses (Table 6). Each nominated diver was assisted with a deckhand.

Table 6: Number of employees in the abalone fishery (Source: RM-SS).

No. of employees	Shareholder/ diver	Shareholder	Nominated diver	Total	Total (%)
None	**2**	**0**	**6**	**8**	**29%**
1	5	2	5	12	**43%**
2	3	2	0	5	**18%**
3	1	0	0	1	**4%**
>4	2	0	0	2	**7%**
Total	**11**	**4**	**5**	**28**	**100%**

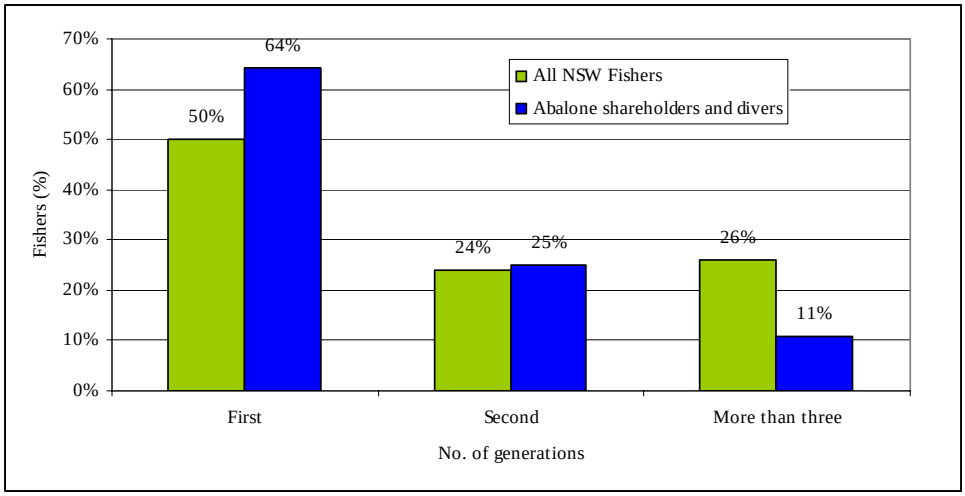
The importance of social identity

There is no accepted definition of "fishing communities" and this requires further analysis of economic and social interactions and linkages between fishers and between communities (Fenton *et al* 2000).

The NSW abalone fishers are a part of the rural coastal community along the southern NSW coastal area. Approximately 42% of responded abalone fishers consider fishing as a lifestyle, rather than merely a business or job.

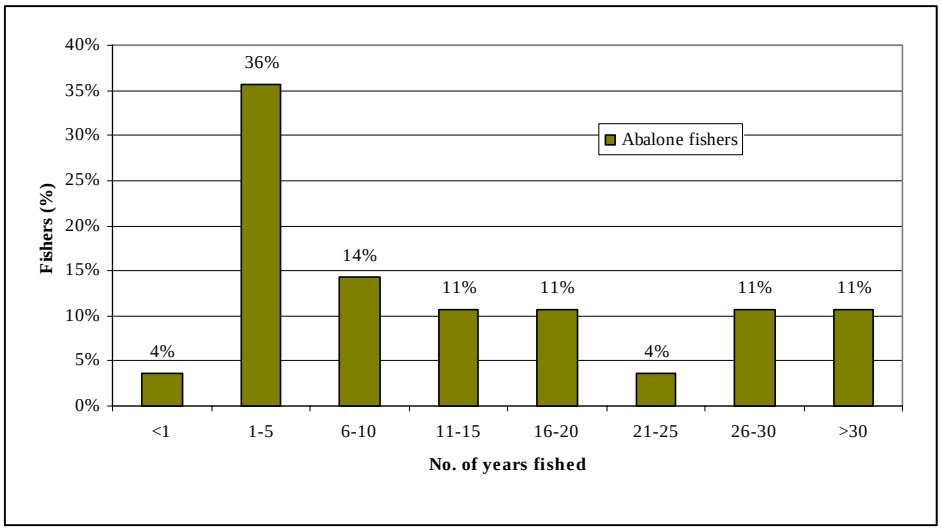
Fishers were asked how many generations their family had been in the NSW fishing industry and results are reported in Figure 5. The abalone fishery has more first generation fishers than the average of the NSW commercial fishing industry. Approximately 64% of abalone fishers are first generation fishers, and 36% have two or more generations of involvement in fishing. This may indicate the level of long-term social association and integration with communities and potential to be significant contributors to social capital.

Figure 5: Frequency plot of number of generations in the abalone Fishery (Source: RM-SS).



A measure of fishers' experience, which contributes to the sense of fishing industry involvement and community, is the years of fisher involvement with the industry. Figure 6 shows the number of years abalone fishers have been in the NSW fishing industry. Of the 28 abalone fishers responded, 13 (46%) fishers have been fishing for more than 10 years in the fishing industry. The mean years of experience of abalone fishers is 12.4.

Figure 6: Frequency plot of years fished by abalone fishers in NSW fishing industry (Source: RM-SS).



Abalone fishers were asked about their pattern of travel for their main fishing activity. Table 7 shows about 50% of fishers travel only less than 25km per day in their fishing operation, and only 25% of fishers travel more than 50km per day. This reflects fishers' preference to fish in areas adjacent to their home port.

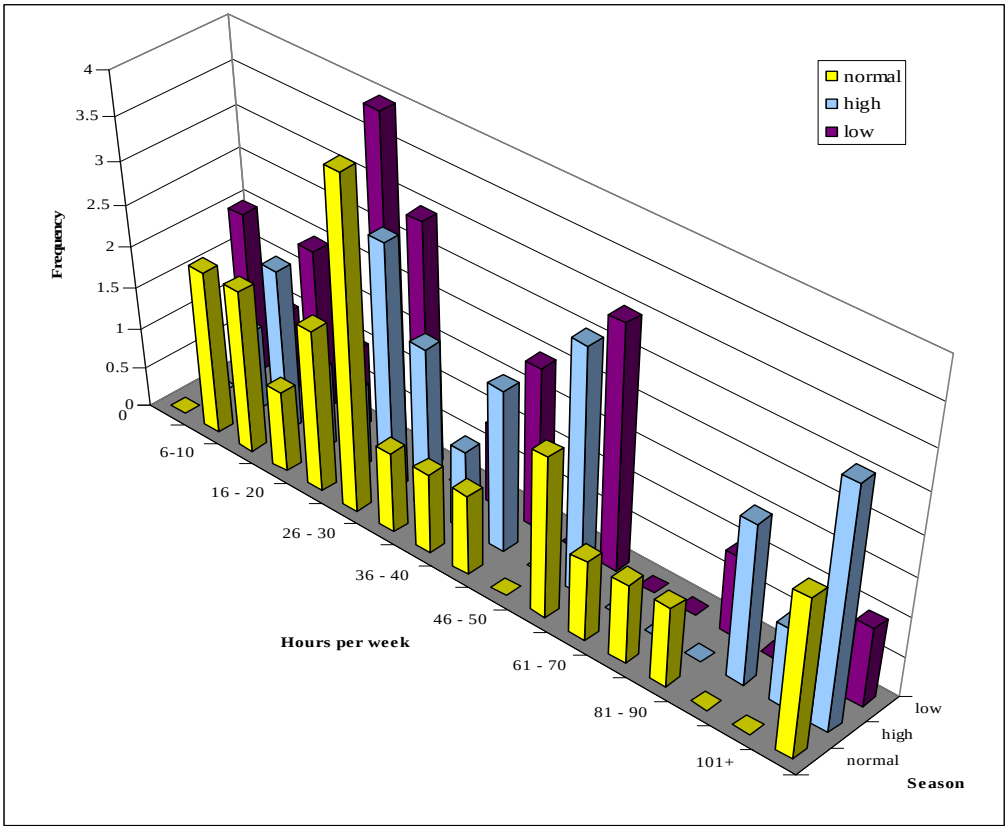
Table 7: Travel distance to main fishing site in the abalone fishery (Source: RM- SS)

Distance/Time	Freqency	%
<25km, 1 hr by boat	14	**50%**
25km-50km, 1- 2 hrs by boat	7	**25%**
50km-100km, 2-3 hrs by boat	3	**11%**
>100km , >3 hrs by boat	2	**7%**
Can't say	2	**7%**
Total	**28**	**100%**

Job satisfaction within the NSW Abalone fishery

The social survey asked questions to provide information on industry working practices. Part of the fishers' life style is that actual diving takes fewer hours than the conventional 40 hour week. Fishers were asked to estimate their average working hours per week in normal, low and high seasons. The estimates from the telephone interview are reported in Figure 7. The data suggest that normal weekly average working hours are 35.5 per week. This is significantly lower than 42 hours per week estimated by ABS for fishers nationally (ABS, 1996). High season estimates exceed 44.7 hours/week, while low season hours are 28.1 hours/week.

Figure 7: Hours worked per week in the normal, low and high seasons in the abalone fishery (Source: RM-SS).



Approximately 46% of abalone fishers are owner operators and have an average of over 12.5 years of fishing experience. 11% of abalone fishers work in other industries such as processing units. Approximately 43% of Abalone fishers' partners are employed in abalone fishing businesses.

Fishing forms a significant part of individual fisher's income, with 82% of fishers earning more than 80% of their income from fishing. Fishers' individual average income from all industries was estimated at $80,750 per annum. An estimated average household income of $102,411 indicates the overall contribution of 79% by fishers to household income.

The extent of part-time and full-time fishing is reported in the economic issues section of this report. The fisher skills base was investigated through questions in the social survey. Fishers were asked about their current work in other industries and their capacity and willingness to transfer from fishing to other industries. Approximately 11% of abalone fishers currently worked in other industries.

When asked about their capacity to consider alternative employment either, full-time or part-time, the fishers were answered:

- 43% (12) could get full-time employment outside fishing;
- 14% (4) could get part-time employment outside fishing and
- 39% (11) could not get employed outside fishing – fishing is "all I know".

The 39% who answered "I probably could not get employed outside fishing, as fishing is all I know" were asked if they would consider retraining. A total of 14% would and 25% would not

consider re-training. The fishers who would not consider retraining were asked about their reasons which are reported in Table 8. Participants generally gave more than one response.

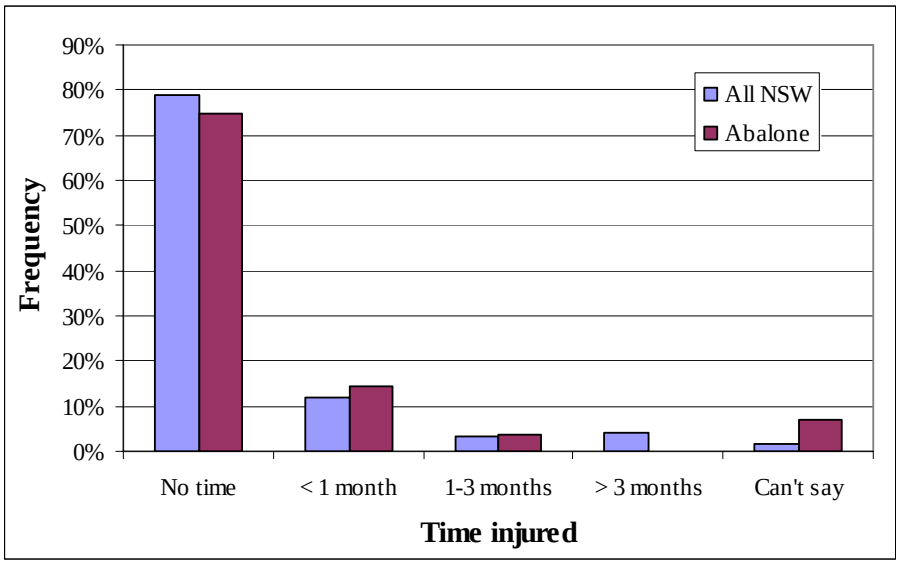
Table 8: Reasons for abalone fishers remaining in the fishing industry.

Reason	Frequency	%
Fishing is the only industry I know	3	21%
I'm too old	3	21%
I enjoy fishing	3	21%
I've invested in fishing equipment	2	14%
It's a family business	3	21%
Total	**14**	**100%**

Age, lack of experience other than fishing, family business, and fishers' lifestyle were the major reasons for not considering retraining to enter industries outside fishing. Those who indicated (4 of 11) a willingness to retrain showed interest in charter fishing, tourism/hospitality and building industries as their alternative employment/business opportunities.

Abalone diving is a risky and dangerous activity and can lead to injuries. Approximately 25% of abalone divers were out of fishing for 2 weeks or more in the previous year through industrial injury. The comparison with all fishers in NSW in Figure 8 indicates the level of industry related injuries in the abalone fishery is not significantly different from other fisheries in NSW, but that health problems in the longer term may be significantly different.

Figure 8: Duration of non-working time from industrial injury in the abalone fishery (Source: RM-SS).



Demographic profile of deckhands in the abalone fishery

The survey results indicate that 91% of deckhands work on a full-time basis in the NSW abalone fishery. All 11 deckhands responded to the survey are male and 73% of them are either married or in relationship, while 27% are either single, or separated. No partners of deckhands surveyed worked in the fishing industry. A majority of deckhands had a formal education, with

60% achieving year 10-12 education, 27% a TAFE certificate, 18% had a university degree and 36% business training. A total of 15 people depend on the 11 deckhands who responded to the survey. About 55% of deckhands have dependent children less than 16 years of age and 60% have other dependents such as a spouse or an elderly parent. Approximately 82% of deckhands either own or are paying off a home and the remaining 18% either rent or live with parents.

The mean years of experience of deckhands in the fishing industry is approximately 7.5, but they have lived in the same postcode for about 13.6 years. During normal and high seasons deckhands worked between 25-27 hours per week and in other seasons only 10 hours per week.

Out of 11 deckhands, 5 are also employed in other industries and earn about 26% of their income from building, farming and other sources. Deckhands' average individual gross income from all sources was estimated at $27,364 and an average household income of $41,773, indicating deckhand's income from fishing contribute 66% of household income. About 82% of deckhands thought that, if they wanted to, they could get either full-time or part-time employment in other industries. The remaining 18% did not think they could be employed in other industries.

Discussion

The social survey information shows the NSW abalone fishers are part of the rural community and abalone harvesting meets both economic and social needs. Only 14% of abalone fishers would consider employment outside fishing. Age, lack of experience in other businesses, family business and fishers' lifestyle are the major constraints to moving to other industries or businesses. This "psychic income" from fishing is highly regarded by divers, who do not feel they would be satisfied by other work in the same way. This reduces fisher mobility in the work force. In addition, abalone fishers have high levels of residency as 55% of fishers have been living in the same postcode area for more than 10 years and this also indicates they have strong association with the local community.

Given the close association between deckhands and abalone divers, any change in the diver's business will have a substantial economic and social impact on the deckhand. Deckhand families are largely dependent on fishing, as their income from fishing constitutes 66% of household income. For example, the reduction of TAC in 2004-05 from 283t to 206t will likely reduce both the numbers of divers and deckhands required to take the TAC at least cost.

As a result of closing some areas for commercial fishing, effort is moving to other areas, which may influence some fishers to consider relocating their residency. As abalone fishers have high levels of residency and also high levels of home ownership, moving towards the southern part of the fishery may disturb some families. It is unlikely that fishers will travel a long distance from home to catch their quotas.

Abalone diving is one of the most dangerous fishing operations and often leads to health problems and injuries. Approximately 25 % of abalone divers were out of fishing for 2 weeks or more in the previous year because of industrial injuries. Health risks to abalone divers and consumers are provided in a separate section of the EIS.

Guideline 5(b): Health Risks To Fishers:	[The Ecology Lab]
Guideline 5(c): Health Risks To Consumers:	[The Ecology Lab]
Guideline 5(d): Indigenous Peoples:	[The Ecology Lab]
Guideline 5(e): Historic Heritage:	[The Ecology Lab]

5.2 Overall social risks from the current operational regime.

Guideline 5(f): **Summarise the overall risks from the current operational regime to any social issues taking into consideration the likelihood/frequency of impacts and the consequence of the impacts occurring.**

The major social risks facing abalone fishers from the current share management regime are:

- ineffective control on illegal fishing and marketing activities;
- reduced employment opportunities;
- limited alternative employment opportunities; and
- other risks related to health and safety risks, conflicts, non-compliance, and equity.

These risks are described below.

Illegal harvesting and marketing of abalone

The recent study by the Australian Institute of Criminology reports that the illegal market in poached abalone is a lucrative one and involves a variety of players ranging from suppliers, handlers, buyers and distributors (Tailby and Gant, 2002).

In the case of NSW abalone fishery, the impact of illegal fishing activity is ranked the highest priority due to its potential impact on the sustainable management of the resource. In a national review of the needs of the abalone sector by Macarthur Agribusiness (1998), abalone theft was ranked as the number 1 threat by all abalone producing states. It has been observed that some abalone shareholders exceed their quota limits, or harvest undersized abalone. In some cases nominated divers and deckhands maybe involved in illegal activities, such as selling part of their catch to illegal buyers without the shareholders (owners) knowledge.

Despite strict regulations, controlling illegal harvesting of abalone is becoming more difficult because a small portion of catch can attracts large sums of money and the product is easy to hide. The product can be sold in the market easily because of its high value. The difficulties inherent in policing illegal activity within the industry are numerous and stem from the fact that illegal harvesting takes place offshore and can occur at any number of sites along Australia's extensive southern coastline. Illegal processing can likewise occur almost anywhere, and there are possibilities of cross-border movement of stolen product.

The Australian Institute of Criminology study recommends that continued assessment, monitoring, and regulation and policing of the licensed and unlicensed abalone sectors are key strategies that must be used to address the threat of unsustainable harvesting from Australia's abalone fishery.

Reduced of employment opportunities:

The abalone fishery has high entry costs for investors or nominated diver wishing to become shareholders. Given the substantial rise in share price since the 1990s it appears that nominated divers may not be in the position to be able to buy shares from shareholders and to become abalone shareholders. For many divers this has been an expectation. Reductions in the TAC mean that the number of divers required by shareholders to take the new reduced level of TAC is reducing. The total revenue paid to divers would also reduce as there is less TAC to catch.

Limited alternative employment

Although some fishers expressed their willingness to leave the fishery there are many reasons why fishers cannot leave the fishing industry and start another business. For example, fishing forms a significant part of individual fisher's income, with 82% of fishers earning more than 80% of their income from fishing, and approximately 39% fishers have dependents. Apart from lack of alternative employment opportunities, fishers are not adequately qualified to start other businesses. Few fishers have a trade or business training and are not inclined to leave abalone diving. Lack of adjustment in diver numbers following the significant TAC reductions of 2004 indicates a reluctance to exit the fishery to alternative employment.

Other risks

Other risks include conflicts, inequitable distribution and barriers to access to ownership and lack of collective action.

(a) Conflicts: Inappropriate distribution of fishing effort may lead to conflicts within the industry. There are also conflicts between commercial and other sectors such as recreational and Indigenous fishing. An allocation policy that addresses commercial, recreational and traditional issues is required to allocate abalone resources to all resource users in the fishery.

(b) Inequitable distribution: Policies that government may apply to address the apparent shift of effort to the southern regions may have unequal distributional impacts on fishers. For example closing region 1 impacted fishers in the north more than those in the south. Current policy does not restrict fishers to take their quotas in a given region. Segmenting the fishery may impose additional costs of fishers with both economic and social impacts.

(c) Lack of collective action: A lack of collective action among all stakeholders is a risk to the effective implementation of restructuring programs (e.g. rebuilding of abalone stocks). Fuller involvement of processing and marketing sectors in fishery management may bring existing cooperation in harvesting into the resource management area.

SECTION E: ASSESSMENT OF THE POTENTIAL ECONOMIC AND SOCIAL IMPACTS OF IMPLEMENTING THE ABALONE FISHERY MANAGEMENT STRATEGY

3.0 Economic and Social Issues

The Department of Infrastructure, Planning and Natural Resources (DIPNR) (formerly Planning NSW) Environmental Impact Statement (EIS) guidelines the DIPNR guidelines (PNSW 2003) require that the potential economic and social impacts of implementing the Abalone Fishery Management Strategy (FMS) are assessed. The assessment of the FMS is presented below in two separate sections - economic issues and social issues.

3.1. Economic Issues

Introduction
As indicated in the Draft Fishery Management Strategy, it is the NSW Government's intention to promote a viable abalone commercial fishing industry, consistent with ecological sustainability and ensure cost-effective and efficient management and compliance in the abalone fishery. A number of 'management responses' have been proposed in the FMS to achieve these goals. As required by the guidelines, this section outlines the potential change in economic viability of operators as a result of implementing the FMS with a focus on:

i. assessing the ability of fishers to pay increased management costs in this fishery;
ii. the potential market trends and developments likely to affect the fishery; and
iii. the potential impact on the value of shares in the fishery.

This section also assesses whether the overall risks to the economic viability of the fishery are likely to change by implementation of the management measures proposed in the FMS.

The wider NSW Government assessment framework
The purpose of economic appraisal, in an environmental context, is "*to achieve a socially efficient allocation of scarce resources i.e. one which maximises the return, including the environmental capital stock, in order to maximise economic welfare of all citizens over time*" (NSW Government 1997c Annex 5). This requires that benefits and costs are measured through market values. Total social costs and benefits also include running down, or building up of the environment (NSW Government 1997c Annex 5). The current analysis is undertaken in the light of these aspects.

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

The approach to the Assessment
The DIPNR guidelines require the focus of the assessment to be the impacts on "*the potential change in economic viability of operators as a result of implementing the Draft FMS***"**. While most of the guidelines ask for industry impacts, guideline 4(d) indicates that "*the overall risks*

to the economic viability of the fishery" should be assessed. The guidelines have focused on impacts on the fishing industry, but we also assess fishery wide issues.

It is proposed that the following approach will be taken to analyse the economic impacts of the FMS. We will:

- Identify and appraise management responses with economic impact on viability of the operators and on the fishery as presented in an overview table (Table E1); and
- Identify and assess the most highly impacting viability issues in detail, with medium and low impact economic issues being discussed generically.

The current descriptive economic information has been described in the previous section. There is insufficient economic data available to appraise the impacts several of the responses proposed in the FMS. This limit should be recognised by the reader and where insufficient data are available, this will be indicated.

The management goals from the FMS document (FMS, 2004) and responses with economic impact are described in Table E1. Impacts are ranked as high, medium and low, but are not individually ranked within these impact categories. The high ranking category is where "*the potential change in economic viability of operators as a result of implementing the Draft FMS***"** or *"the overall risks to the economic viability of the fishery"* are clear and significant. Each of these will be assessed in the text. The medium and low categories are where potential changes to economic viability and overall risks are less than in the high category.

3.2 Identification and assessment of issues impacting viability.

The management responses were examined and those with possible economic impacts identified. These were then separated into those with high, medium and low economic impacts as presented in Table E1.

Table E1: Responses ranked by potential economic impact

Management response	Brief description of response	Impact
2.1 (a)	Continue to implement a state-wide TACC for abalone, determined by the TAC Committee, and develop a more complete harvest strategy for the fishery.	High
2.2 (b)	Manage the spatial distribution of fishing effort.	High
3.1 (a)	Undertake an independent review of the application of established cost recovery principles to the Abalone Share Management Fishery and implement the approved outcomes.	High
4.1 (b)	Control the number of divers in the fishery.	High
4.1 (c)	Develop formal strategies to plan for and adapt to the effects of environmental and economic fluctuations on the fishery	High
4.1 (d)	Revise the minimum level for trading abalone shares to one share.	High
4.2 (a)	Remove the shareholding aggregation limit.	High
7.1 (a)	Continue to implement and review, in consultation with ABMAC and key stakeholders, the compliance strategic plan and update where appropriate.	High
7.3 (b)	Examine the costs and benefits of increasing effective enforcement to reduce illegal catch and assist in maintaining the fishery biomass relative to other stock rebuilding measures.	High
2.2 (a)	Continue to investigate the feasibility of implementing different size limits on a variety of spatial and temporal scales, with provision to implement longer term actions.	Medium
2.2 (c)	Develop and implement a program for closing and re-opening areas to commercial abalone harvesting.	Medium

2.3 (b)	Continue to support initiatives to refine estimates of the total catch of abalone, including commercial, recreational, Indigenous and illegal catches.	Medium
2.3 (d)	Develop a strategic plan for the management of the current closure within Region 1 and all areas of the fishery affected by *Perkinsus*.	Medium
3.1 (b)	Continue to refine the delivery of specific management services and standards through service delivery agreements or outsourcing regarding research, administration and compliance.	Medium
3.1 (c)	On request by the Abalone Management Advisory Committee (ABMAC), undertake independent performance reviews of the services delivered by DPI under service agreements or other service providers under contract.	Medium
3.1 (f)	Communicate the Department's operational plans and policies for the management of the fishery to all fishery participants.	Medium
4.1 (a)	Refine the performance indicators for monitoring trends in the commercial viability of typical abalone fishing businesses so as to be based on net returns.	Medium
7.3 (a)	Design and implement an industry communication program to assist in preventing illegal catch.	Medium
2.2 (d – f)	Implement reseeding/translocation/habitat rehabilitation experiments.	Low
3.1 (e)	Adopt technological improvements in the catch reporting system that are cost effective and result in the earlier receipt of catch and effort data.	Low
6.1 (b)	Finalise the development of a method of estimating the rate of disturbance of undersize abalone	Low
7.1 (b)	Develop a cost-effective system for divers to report the planned location of their fishing activity.	Low
7.2 (c)	Require processors of abalone harvested from the fishery to record the number of abalone handled (in addition to weight) on the prescribed record keeping form(s)	Low
7.2 (d)	Introduce a mechanism to apply temporary bans on processors, wholesalers and retailers (including individuals and business entities) if they are caught in possession of abalone without the appropriate documentation.	Low
8.1 (a)	Continue the development of the MAC and industry networking process to improve the effectiveness of consultation, including the appointment of an independent chairperson and examination of improved communication methods.	Low
8.1 (b)	Improve the communication with nominated divers to ensure information from divers is transmitted to management and vice versa.	Low
8.1 (c)	Consult with abalone processors and marketing agencies while developing management policies.	Low
8.2 (b)	Develop a communication plan regarding human-induced environmental impacts that are likely to adversely effect or alienate abalone populations, habitat or reef	Low

The review of existing data indicated risks to the economic viability of the abalone fishery were:

- External risks of beach price fluctuations, illegal fishing, disease and water quality problems, the increasing cost of inputs to the fishery and reductions in stock caused by other users.
- Internal risks of the increasing cost of management, inaccurate information for TAC setting, excessive regulation, potential regional stock depletion; excessive diver numbers, stock impacting harvesting practices and the reduction of the TAC due to reductions in the stock.

Identification and assessment of the most highly impacting viability issues is in detail, with low impact economic issues being discussed generically.

The draft FMS proposes to:

- **2.1 (a) Continue to implement a state-wide TACC for abalone, determined by the TAC Committee, and develop a more complete harvest strategy for the fishery; and 4.1 (c) Develop formal strategies to plan for and adapt to the effects of environmental and economic fluctuations on the fishery**

The TAC mechanism is the core management tool in this fishery. It ensures the longevity of the stock that underpins the economic wellbeing of industry. The setting of the TAC gives direct signals to shareholders that enable them to quickly adjust their businesses to changes in the TAC. This mechanism appears to work well in the fishery, but the design of the current rights system rules relating shareholders and specific divers, means that reductions in the TAC leads to each diver taking less, rather than fewer divers remaining in the fishery.

Setting the TAC as part of a more complete harvest strategy would allow fishing businesses to plan for the future, thereby reducing the risk of economic viability to individual fishing businesses.

- **2.2 (b) Manage the spatial distribution of fishing effort**

The abalone fishery is for a sedentary species that occurs in different reef areas and is not distributed equally. A risk under current operations is the potential effects to the stock of concentrations of effort. Fishers will move to areas where catch per unit effort is highest (Gordon, 1954), due to being able to take their intended catch in a shorter period of time. Fishers are of different diving skills and monitoring effort does not translate consistently to catch (Dominion, 1999). Inexperienced divers will take a longer time and possibly more turning of abalone to gain their catch.

Under the draft FMS two options are proposed (although a combination of the options may also be considered) to reduce the potential for undesirable concentrations of fishing effort:

Option 1: Industry continues to adhere to TACC regional targets on a voluntary basis.

To be effective a voluntary scheme requires adherence to recommended regional targets and a flow of information from DPI to Industry, and within Industry, about the distribution of catch among fishing areas. Adherence to regional targets would be reinforced through the proposed Abalone Fishery Code of Practice. If cooperation is successful in controlling regional catch, this could have a positive impact on economic viability.

Should voluntary arrangements not work the alternatives are to:

a) have more social structure in industry harvesting arrangements through using existing processor-diver networks to make a code of conduct that actually works, primarily due to the cost of alternative arrangements;

b) apply regulation to try and make this regime work. This may have costs, but may be less costly than area based alternatives.

Failure of these may lead to considering allocating quota on an area or regional basis. In both cases the costs of regulation may increase costs and reduce profitability.

Option II: TACC regional targets are used to allocate individual quota on a pro-rata regional basis.

The move to say 3 smaller areas (i.e. 3 groups of 2 adjacent regions) for the TAC regime can lead to the TAC for each share being divided into three areas. (Alternatively the share could be divided into three areas which would be rather more irreversible than trying ITQs on an annual basis.) If a shareholder had ITQ in three areas they could choose to trade annually to achieve the mix they wanted. However three areas increase management complexity and may triple the transactions required to run the fishery with significant cost increases. In the current declining fishery the move to regional TACCs may have economic benefits expressed in the share price and in the trading prices for quota in each area. However the real long-term economic need is to address the declining TAC trend which has major long terms impacts on the value of the fishery.

As previously discussed, smaller areas also risk having less accurate data and having undesirable effects if the regional TACCs are not set correctly, with fishers being locked into catching from given areas when it is not appropriate.

In summary, observing an apparent rise in movement of effort in the fishery is likely related to closing Region 1 and requiring those fishers to take their catch from other regions in the fishery. Given the general decline in the TAC, shifting effort may be a sign of too many divers in the fishery and is linked with the apparent inability of the fishers to adjust out of the fishery. Both these issues will be discussed later.

If catch were related to sub-areas in the ITQ system, it would increase the information required to set the TAC and may have some adverse effects if the TAC is not set correctly locking fishers into taking catch from a given area. Co-operation between divers is required to reduce the risks of regional depletion. If regional erosion occurs, industry could face regional closures and reductions in the TAC.

- **3.1 (a) Undertake an independent review of the application of established cost recovery principles to the Abalone Share Management Fishery and implement the approved outcomes.**

A review of the application of established cost recovery principles to the fishery may find that current charges are inappropriate. This could be to the advantage or disadvantage of shareholders as it may determine they are being over-charged or under-charged. Such a review would reduce the risk to economic viability of individual fishing businesses.

- **4.1 (b) Control the number of divers in the fishery.**

The number of divers in the fishery has a potential risk to economic viability. The approach in the draft FMS has been to consider three options for managing the number of divers:

Option I: Issue a new diving entitlement to the shareholders who currently hold 70 or more shares, with the entitlement not transferable except upon sale of the associated shares or fully transferable separate to shares.

It is proposed to divide the shareholding and to create a diving entitlement. At the start of the Share Management Plan in 2000, there were 3700 shares in the fishery, representing 37 divers

with 100 shares each. Original shareholder divers sought the capacity to sell up to 30 shares and to require owning 70 or more shares to dive.

At the start of the Share Management Plan each abalone share had both an ownership and diving right within it. If the fishery is to examine separating the diving right from the shareholding in some form, then each current share has a "diving right". This could be developed from simple permission of the shareholder to catch on their behalf, to independent harvesting through a separate tradeable diving right, as in Tasmania. The fishery needs to consider the costs and benefits of a third party ownership regime to the NSW abalone fishery. Further development of diving entitlement based on holding 70 shares, may be deemed inequitable by shareholders who purchased shares believing them to have both ownership and diving rights.

There are several issues to examine:

a) *the number of divers that should be in the fishery*;
Given the concern about 42 divers, the fishery could move towards each of 37 divers having a pre-agreement with shareholders to dive 100 shares in a season. This would limit diver numbers to 37. Divers would need to be able to dive for more than one shareholder in order to dive small packets of 10 and 30 shares held by different owners. However recent TAC reductions would indicate that least cost harvesting may require substantially less that 37 divers. On a TAC of 206t this could be as low as 20 divers (circa 10 tonnes each).

b) the link between the number of divers and shareholdings.
Initially 37 divers would be required for the fishery. Some shareholders with 100 shares may want to dive 70 shares and have to either dive 30 shares for someone other owner, or have some other diver dive an additional 30 shares. Initially the pre-agreement approach would mean the shareholder still holds both rights, but in time the fishery could move to devolve the catching right to autonomous divers. This may be attractive to shareholders given the wind fall gain on selling the diving entitlement, but share value would also decline and a limited pool of divers may increase their price per kilogram for harvesting services.

Fully devolving the catching right encourages third party investment in shares. The trading of a single share would then be applicable. An examination of dividing the rights would also need to see if the processors in NSW could move to have a brokering role in standing between divers and shareholders to reduce commercial conflict, as in Tasmania.

Economic viability is reduced when diver numbers are too numerous (McIlgorm and Goulstone, 2001) and it is desirable that diver numbers reduce in a fishery with a falling TAC in order to maintain fishing profit. The economic viability also depends on the rules relating divers and shareholders. In some circumstances owners may fear having a restricted number of divers due to the likelihood of this leading to a rise in the price of harvesting services. However it is undesirable for economic viability that the number of fishers does not reduce autonomously in the face of price and TAC decreases.

Option II: Progressively limit the number of endorsements to dive to 37 by a) immediately raising the minimum shareholding (to dive) for new entrants into the fishery to 98, and, b) setting a 10 - year timetable to raise the minimum shareholding requirement to 98 for all existing shareholders (with provision to trade less than 10 shares).

This option assumes that the shareholding and diving right are not divided. The number of divers and number of shareholders are linked and would require a 10 year capital adjustment pathway back to 37 share owning divers, diving 98 shares each. This risks reducing the

value of the fishery as the aging shareholder /divers will only be able to sell to prospective owner divers. Those shareholders with less than 98 shares face having to go into debt to meet a ten year goal through buying additional shares.

The pain in taking such debt for capital purchases is high and rather draconian compared to a fuller examination of third party ownership. The economic impact of such forced adjustment would be contractionary and may reduce share values considerably and would be inefficient.

Option III: Continue current arrangements where there is a review of management if the number of divers exceeds 42.

Although the fishery could potentially have 52 divers under the current minimum shareholding, the numbers have not exceeded 42 since the gazettal of the share management plan in 2000. The reduction in TAC by approximately one third since year 2000, the increases in the costs of fishing, the economic performance of divers in 2001-02, all suggest that the numbers of divers should be reducing.

Impediments to numbers of divers reducing are likely administrative rules impeding trade. The rules on trading down to 70 shares were made to suit abalone shareholders who were original divers. The rule of shareholders having one diver, do not enable divers to fish ITQ for several shareholders.

The optimum number of divers in the fishery should be related to the TAC, not shares, and a diver's ability to take catch. Historically in the late 1990s divers caught around 9 tonnes each. In 2004 a shareholding has 5.5 tonnes associated with it. The current arrangements do not enable diver services to be delivered at least cost and is economically inefficient due to management rules. For example, in the theoretical case of sole ownership of the entire fishery, it is likely a TAC of 205t could be taken by less than 20 divers (10t per diver).

- **4.1 (d) Revise the minimum level for trading abalone shares to one share; and 4.2 (a) Increase the shareholding aggregation limit from 6% to 15%.**

The abalone fishery has had significant reductions in the TAC since the time of the Share Management Plan 2000, which constrained share ownership to a 6% limit by any entity. Given that the ITQ has reduced from 330t to 206t in the last 5 years, it is reasonable to suppose that shareholders may need to adjust their shareholdings. Flexibility to trade shares in packages of less than 10 shares would allow for more precise adjustments. It is also preferable to have a limit of more than 6%, to enable share holdings to aggregate transparently. The need for any upper limit to share ownership could also be examined. For example the abalone processing sector in NSW has only several entities and is not seen as being restrictive. There is no upper quota holding limit in the Victorian abalone fishery (DPIVF, 2005). Fewer restrictions on the ownership and tradability of shares would increase the viability of individual fishing businesses.

- **7.1 (a) Continue to implement and review, in consultation with ABMAC and key stakeholders, the compliance strategic plan and update where appropriate; and 7.3 (b) Examine the costs and benefits of increasing effective enforcement to reduce illegal catch and assist in maintaining the fishery biomass relative to other stock rebuilding measures.**

The nature and extent of the illegal fishing problem requires the commercial fishery to address illegal fishing and the sale of illegal product in the marketplace. Information on illegal activities is critical to effective enforcement of the TAC regime. The compliance strategic plan must adjust to changes in the way illegal fishing occurs and respond to new information as it becomes available. Increasing resources to compliance may reduce illegal activity which would in turn increase the overall economic viability of the fishery as it would reduce risk to the stock.

Management responses with moderate to low impacts on economic viability.

A number of management responses in the draft FMS that are different from current arrangements do not have direct economic consequences to the fishery, but may improve economic viability in the medium- to long-term.

Of these, there are a number of management responses that are proposed that would make harvesting more efficient (MRs 2.2a, 2.2c and 2.3d). Refining estimates of the catch from other sectors (MR 2.3b) would also make harvesting more efficient as it would allow the TAC to be determined from more precise data. More efficient harvesting would mean more profit to fishing businesses and therefore reduce the risk to economic viability.

Other management responses have potential to help rebuild or protect the stock in the medium- to long-term (MRs 2.2d-f). Successful rebuilding would increase the TAC and hence increase profit to fishing businesses. In addition, recognition of the undesirable consequences from an increased turnover of undersized abalone during harvesting would help to protect the stock. These proposals would reduce the risk to economic viability.

There are other proposed changes that have the potential to safeguard the fishery from illegal activity (MRs 7.1b, 7.1c, 7.2c, 7.2d and 7.3a). As discussed previously, proposals with potential to reduce illegal activity decrease the risk to the stock, which is the basis for the fishery. These management responses may reduce the risk to overall economic viability.

The industry's viability can be impacted by increases in management costs. The scale of the fishery, especially when either beach prices or TACCs are reduced, makes the fixed cost of management a disproportionately large portion of total cost when compared to larger abalone fisheries in other states of Australia. The cost-effectiveness of fisheries management services and management service delivery mechanisms must be critically evaluated to achieve management outcomes at the lowest cost. The draft FMS seeks to increase the effectiveness of expenditure minimising costs and improving long term viability (MRs 3.1b, 3.1c and 4.1a). ,.

There are some management responses proposed with the intent of improving communication within the fishery and with external bodies (MRs 3.1f, 8.1a-c and 8.2b). Improved communication would increase efficiencies and reduce the potential for adverse impacts to the fishery from internal or external sources. This may also reduce the risk to overall economic viability.

3.3 Impacts from the proposed draft FMS

The potential change in economic viability of operators as a result of implementing the Draft FMS *(Guideline 3.1 (a))*

Economic viability of the abalone fishery

The 2001-02 economic survey indicated that an average abalone investor with 100 abalone shares obtained a return to full equity on an investment of $2.25m just 2% short of covering

opportunity costs. The annual return to boat capital, which did not include share value, indicated profitability in the fishery already captured in share values. The reduction of the TAC was made to protect the economic health of the fishery.

The intention of the draft FMS is to promote long-term economic viability and sustainable harvests. The costs of management in the abalone fishery have been recovered from the industry under the existing share management plan since 2000.

The draft FMS has policies which can address overcapacity in the number of divers in order to improve the returns from abalone fishing. Such policies add some costs, but the economic advantages to industry viability of proposals in the draft FMS can outweigh the costs of their development if the most efficient options are chosen.

Assessment:

(i) The potential impact of the draft FMS on the ability of shareholders to pay increased management costs in the fishery

An FMS may impact the viability of industry in that it reduces catch or increases costs. Table E2 presents estimates of revenue per share and costs of effort per share and lists the deductions under the FMS.

Under the FMS, management charges per share are expected to increase from current (2003-04) $246 to $ 350 by 2008-09 (Table E2). Table E2 indicates how abalone shareholders may be able meet these increased management charges, providing catch quotas and beach prices return to 2001 levels.

Table E2: Estimated viability projections of a shareholding and changes in costs per share under the Fisheries Management Strategy 2001 to 2008.

	YEAR	2001	2003-04	2004-05	2008-09
1	Quota per share (kg)	82.40	76.90	63.50	75.00
2	Average annual beach price/kg	47.40	29.67	37.50	50.00
3	**Gross Revenue per share**	**3,906**	**2,281**	**2,381**	**3,750**
	Less costs				
4	Catch cost/ share @ x $per kg**	1,154	1,000	762	1,050
5	Administration costs/share	225	239	239	250
6	Imputed management cost/share	323	342	342	350
7	Economic depreciation/share	0	0	0	0
8	Opportunity cost of capital (7%)	1,575	1,400	1,400	1,750
	less govt charges				
9	Management charge/share	246	263	263	300
10	Community contribution/share	0.00	139.60	139.60	150.00
11	FMS/EIS/share	0.00	66.76	27.00	0.00
	Total Economic Cost/share	**3,522**	**3,451**	**3,173**	**3,850**
12	**Net Economic surplus /share**	**384**	**(1,169)**	**(792)**	**(100)**
13	Capital value/share	22,500	20,000	20,000	25,000
14	**N.E. Surplus as a % of capital**	**1.7%**	**-5.8%**	**-4.0%**	**-0.4%**

Key ** $14 in 2001& 2008-09, $13 in 2003-04, $12 in 2004-05

1 Catch in kg per share - recovers by 2008?
2 Beach price - increase from 2003 lows?
3 Revenue per share is catch x average annual price
4 Catch cost per kg paid to the diver to catch the abalone.Includes boat, deckhand wages but not fees.
5 A/c,phone,power,rates/rent,travel,+legal(non-lit)bank&membership fees (AB EIS survey 2001-02)
6 Imputed cost of management services provided to business (AB-EIS survey 2001-02 & ABARE, 2000)
7 Economic depreciation - none as nominated diver produces product
8 Opportunity Cost of Capital - full equity(7% AB EISs &ABARE (2000), not a risk adjusted rate)
9 Management costs divided by 3,700 shares & 3,654 post 2003 buyout includes new FMS costs
10 Community contribution/share @ 6% of gross revenue, paid in arrears 2008 estimate only
11 FMS/EIS/share - current process to finish in 2004
12 Net economic surplus is gross return less total economic costs (incl fees and opportunity costs)
13 Value per share is market price /100 from previous transactions 2004-2008 estimates only
14 Net Economic Surplus as a % of estimated capital share price

Discussion

Economic viability is strongly driven by price and catch. Intended measures through the draft FMS for maintaining and building stock and hence catch levels, are essential. The TAC must recover towards 2001-02 levels for shareholders to be able to meet the costs of management and development proposed in the FMS.

Cooperative solutions to solve concerns over regional depletion are likely to be less expensive than regulated solutions or sub-dividing the fishery into different areas. The costs and benefits of such policies should be compared prior to any policy changes.

The capacity of shareholders to pay for management is related to efficiency. The current system relating shareholders and diver numbers has not led to a reduction in diver numbers. Dividing the diving entitlement and ownership parts of all shares can reduce the costs of harvesting and hence increase the capacity to meet management charges. The draft FMS can achieve these potential efficiencies if implemented to achieve greater economic viability.

(ii)The potential impact of the FMS on the value of shares in the fishery

The draft FMS can positively impact share values by rebuilding the TAC. The FMS draft has potential to arrest the trend in declining TACCs and for maintaining or increasing the value of the fishery.

The draft FMS proposes the means for reducing diver numbers and hence the cost of production. This should work to increase profitability and share price. The draft FMS encourages shareholders to take fuller responsibility in the management process, so as to maintain and increase share value.

3.4 The draft FMS and the risks to economic viability

Whether the risks to the economic viability of the fishery are likely to change by implementing the management measures in the Draft FMS *(Guideline 3.1 (b))***.**

The review of existing information indicated the following risks to economic viability:

- External risks of beach price fluctuations, illegal fishing, disease and water quality problems, the increasing cost of inputs to the fishery and reductions in stock caused by other users.
- Internal risks of increasing costs of management, inaccurate information for TAC setting, lack of information sharing and unity among fishers, potential regional stock depletion; excessive diver numbers, inappropriate harvesting practices and the reduction of the TAC and closures.

The following section assesses whether these risks are likely to change as a result of implementing the FMS.

Beach price
Reducing this risk was not in the scope of the draft FMS. Abalone fishers have little control over unpredictable changes/circumstances in overseas markets, trade policies, surplus production of abalone in other countries and exchange rates. The industry has to interpret marketing information and identify overseas markets and their trade policies and trends. The abalone industry may also want to explore developing new marketing strategies, new markets and new products with other Abalone fisheries nationally.

Illegal fishing
The FMS proposes some specific changes to compliance strategies for dealing with illegal harvesting of abalone and intends to appraise the costs and benefits of current strategies. The proposed changes should reduce the level of illegal activity which would consequently reduce the potential risk to the stock. Any reduction in illegal activity should have direct benefits to the commercial sector and may lead to increases to the TAC. This would have positive benefits to the economic viability of the fishery. The draft FMS proposes developing a strategy for the management of marine pests and diseases affecting abalone, with initial emphasis on *Perkinsus* (2.3a). This will be a positive step in addressing disease issues and lower risk, in as much as it can be. Developing and executing a scientific program to fully investigate these issues must be a priority for both researchers and policy-makers. Given the nature of these problems, it is likely the draft FMS can reduce or contain risk in these external areas. It may also increase awareness of managing the disease issue.

Other user groups
It is not the intention of this FMS to impact on the level of catch of abalone taken by other user groups in the community, such as recreational fishers, aboriginal fishers. Removal of abalone by other sectors is considered in the setting of the TAC, but the current management framework does not enable commercial fishers to influence the catch of other sectors.

Costs of inputs
The draft FMS cannot address the costs of inputs which are outside the control of industry and government.

Internal risks and the draft FMS

Increasing costs of management
The intent of the draft FMS is to control the costs of management by making management more efficient and cost-effective. The draft FMS proposes greater involvement by shareholders in management decisions, and catering for economic fluctuations in the harvest strategy. These steps would improve economic viability.

The quality of information used to set the TAC
The accuracy of information for TAC setting is a risk identified by the FMS. The fishery management regime requires good information from fishers on many issues. Long run economic viability of the fishery requires that the information provided to the TAC committee in deciding on TACCs for the fishery, is as accurate as possible. There is intent in the draft FMS to improve the precision of the information used in the setting of the TAC. For example, improving the estimates of illegal and recreational catch. This should address the risk.

Lack of information sharing and unity among fishers
A risk to the fishery is that lack of cooperation between fishers in collective management arrangements. Cooperation could use social relationships, processing co-operatives or similar mechanisms. Lack of information sharing and collective action by fishers leads to costly government intervention, which would affect economic viability. The draft FMS proposes a number of management responses for improving communication within the fishery. These will provide efficiencies that will improve economic viability. Achieving cooperation is in the hands of industry.

Congestion and inappropriate distribution of effort within the fishery
The TAC does not stop fishers moving to areas to fish where catch rate is higher. Taking too much catch from a given area has the potential to affect the stock, thereby posing a risk to economic viability of the fishery. Under the draft FMS regional catch targets, attempt to solve this problem on a regional scale. The draft FMS proposes options for managing fishing effort in a spatial context and reducing potential risk to the stock. This issue should also be related to congestion in the fishery from having too many divers. Reduction in diver numbers through the draft FMS may resolve much of this issue.

The number of divers
Current rules linking divers to shareholders do not translate into divers exiting the fishery when significant TAC reductions are made. Linking shares and divers in a restrictive manner through rules about one shareholder and one diver inhibits economic efficiency. This points to excessive diver numbers and poor adjustment mechanisms. The draft FMS proposes three options for managing the number of divers and reducing the potential risk of increases. It is

essential that the fishery examines these options. Given experience in other abalone fisheries it is likely that separating the shareholding and diving entitlement, has most merit. Options compounding the current situation with draconian enforced capital trading of shares to minimum numbers are to be avoided. Re-examining current rules that restrict labour mobility are essential to an efficient outcome.

Inappropriate harvesting practices

Under current arrangements a diminishing TAC and available fishing area, when combined with reduced catch rates, may cause excessive searching and turning over of the abalone. The risk is that this would cause detrimental impacts to the stock and hence affect economic viability. This problem is also related to the risk of potentially increased numbers of divers in the fishery. The draft FMS proposes to estimate whether disturbance of undersized abalone is increasing to inappropriate levels.

Reduction in the TAC

A major risk to the economic viability of the fishery is the decline in TAC in recent years. The draft FMS proposes many measures for maintaining and rebuilding the stock to safeguard against further declines and reduce the risk to economic viability. However if TAC keeps declining during the lifespan of the FMS, additional measures may be required.

Closing areas

Closing certain areas (e.g. parts of Region 1) to commercial fishing is associated with reductions to the TAC and hence economic viability. The draft FMS proposes to develop criteria for opening and closing areas and a harvesting plan for Region 1. This would be part of harvesting strategies.

Summary

Overall, the draft FMS proposes to address the risks to economic viability previously identified. Several of the risks, such as the regional movement of effort and excessive diver numbers, suggest that action is needed in two stages.

Rules relating that restrict the mobility of diver labour should be relaxed to enable least cost harvesting. Subsequently research into changing the current rights regime rules to promote greater autonomous adjustment through the separation of diving and shareholder entitlements. Should be undertaken. The draft FMS enables both of these pathways to be followed.

3.5 Social Issues

Introduction

The environmental assessment guidelines issued by the Department of Infrastructure, Planning and Natural Resources (DIPNR) (formerly Planning NSW) require that we assess the potential impacts of implementing the Draft Fishery Management Strategy. These guidelines include:

a) Identify any likely changes in social impacts (on fishers, their families or any local communities) as a result of implementing the Draft FMS;
b) Assess whether the risk of social impacts are changed (and the potential magnitude of this change) by the management measures in the Draft FMS;
c) Assess the potential change in impacts on Indigenous interests and values of implementing the Draft FMS including on:
    - traditional fishing and access to fisheries resources and areas of cultural value;
    - Indigenous communities' well being, including economics, employment and community viability; and
    - the implementation of the NSW Indigenous Fisheries Strategy;
d) Identify whether the risk of impacts on Indigenous interests and values are likely to change (and the potential magnitude of this change) as a result of implementing the management responses in the Draft FMS;
e) Identify any likely changes in impacts on heritage values as a result of implementing the Draft FMS; and
f) Assess whether the risk of impacts on heritage values are changed (and the potential magnitude of this change) by the management measures in the Draft FMS.

Social issues arising from implementing a new management plan fall into several categories. Firstly, there are socio-economic impacts arising directly from how the fisheries management strategy impacts the resource and the social system involving fishers, including the community.

Secondly, a management strategy brings changes, with social issues to be addressed by fishers. The socio-economic impacts are most readily quantified. Other measures of the capacity and willingness of fishers to respond or incorporate change are more difficult to estimate, requiring substantial fisher consultation and communication.

Other elements may be deemed to be important to individual fishers, but there is insufficient baseline information to independently evaluate fishers' opinions. The analysis is constrained by the available information, the resources available to the study and the lack of adequate background information in this emerging area. The following framework was used to assess the potential social impacts of implementing the draft FMS.

Assessment framework

Social impact assessment of fishery management plans is a recent innovation in NSW. In the NSW Government's guidelines (NSW Government 1997b) for assessing social impacts, the following measures of community wellbeing are recommended:

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

The NSW Government's guidelines indicate that while economic measures dominate many assessments, the quality of life measures and intangibles should be considered in policy assessment. Governments can use social assessments to "better anticipate the effects on policies and programs". When social impacts are made more transparent, policy trade-offs are highlighted and subsidiary policies to deal with negative impacts on particular areas and groups may be formulated" (NSW Government, 1997b).

The NSW Government's guidelines suggest *"it is not possible to establish a single SIA methodology to apply at a state-wide policy and program level because of the nature and impact of the policies often extend across regions and groups"* (NSW Government, 1997b, p9). The guidelines set a broad perspective or framework for social assessment summarised in a "quick test summary table" (NSW Government, 1997b, p23) as shown in Box E4.

Box E4: Quick test summary table (adapted from NSW Government, 1997b, p23).

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

Further guidelines extend to the *Rural Community Impacts Statements* (NSW Government 1997a). In these the economic and social characteristics of rural communities in NSW are specifically recognised and recommended to be included in government decision making as summarised in Box E5. It is likely that rural fishing communities in coastal NSW struggle with similar issues.

Box E5: Summary of Characteristics of Rural Communities (after NSW Government 1997a).

Geographic isolation - business being based at a distance from suppliers or markets.

A narrow and variable economic base- being dependant on one industry, coal mining, forestry, fishing etc, also being influence by public sector employment changes.

Physical isolation and small population size – individual families may live outside community centres and a greater distance from a more substantial regional service centre. Isolation limits social interaction, cultural and employment opportunities and access to public sector services and facilities. Communities may have small populations and express feelings of vulnerability being at a distance from the central decision making process.

A strong 'self help' culture – rural and regional communities are often "typified by values of self reliance, resourcefulness and independence, often responding to opportunities or threats with a strong and cohesive communal spirit".

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

Rural industries have a major impact on the environment - rural and regional communities are custodians of most of the land of the state and intensively use natural resources.

Economic performance is dependent on environmental conditions – primary industries depend on environmental resources used as their inputs.

Social impacts and fisheries management

The social impact assessment of fisheries management strategies in NSW is required to fulfil the environmental assessment guidelines issued by DIPNR.

In natural resource studies a four stage procedural framework is proposed by Fenton *et al* (2000) as:

- assessment (including scoping and profiling);
- prediction;
- mitigation; and
- monitoring.

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

The current study prioritises the socio-economic impacts from the fisheries management strategy. There are four basic questions that need to be answered in Social Impact Analysis of any proposed fisheries management strategy: (1) who will be affected; (2) what will happen to the people affected; (3) what social changes will occur under each proposed management alternative; and (4) how will any changes affect the social fabric and stability of the fishery and fishing communities (NMFS, 2001).

3.6 Assessment of the social impacts of the draft Abalone FMS

The following procedure was used to identify and assess the potential social impacts of the FMS.

- The social impacts of each management strategy response are identified on fishers and the community and responses ranked into two levels – High and Low. The ranking reflects the predicted scale of total social impact. For example, high total social impact may be determined as a function of the number of fishers affected by a policy, times the degree of impact of the policy on each fisher, or on the community. Other policies impacting less people or impacting to a minor extent are then relatively less impacting in total and are recorded as low.
- The implications of major impacts on fishers, their families and local communities were examined.
- Priority was given to the socio-economic dislocation arising from impacts identified in the previous economic assessment. These management responses will have major social impacts on abalone divers and crew members as it leads to restructuring the entire fishery in terms of number of entitlements and categorisation of fishing areas.

The management goals and the responses in the Fishery Management Strategy were examined and those with potential social impacts are presented in Table E3.

Table E3: Responses ranked by potential social impact

Management response	Brief description of response	Impact
4.1 (a)	Refine the performance indicators for monitoring trends in the commercial viability of typical abalone fishing businesses so as to be based on net returns.	High
4.1 (b)	Manage the number of divers (details to be determined)	High
4.1 (d)	Revise the minimum level of trading abalone shares to one share.	High
4.2 (a)	Remove the shareholding aggregation limit.	High
7.1 (a)	Continue to implement and review, in consultation with ABMAC and key stakeholders, the compliance strategic plan and update where appropriate.	High
7.1 (b)	Develop a cost-effective system for divers to report the planned location of their fishing activity.	High
7.2 (c)	Require processors of abalone harvested from the fishery to record the number of abalone handled (in addition to weight) on the prescribed record keeping form(s)	High
7.2 (d)	Introduce a mechanism to apply temporary bans on processors, wholesalers and retailers (including individuals and business entities) if they are caught in possession of abalone without the appropriate documentation.	High
7.3 (a)	Design and implement an industry communication program to assist in preventing illegal catch.	High
7.3 (b)	Examine the costs and benefits of increasing effective enforcement to reduce illegal catch and assist in maintaining the fishery biomass relative to other stock rebuilding measures.	High
3.1 (f)	Communicate the Department's operational plans and policies for the management of the fishery to all fishery participants.	Low
8.1 (a)	Continue the development of the MAC and industry networking process to improve the effectiveness of consultation, including the appointment of an independent chairperson and examination of improved communication methods.	Low
8.1 (b)	Improve the communication with nominated divers to ensure information from divers is transmitted to management and vice versa.	Low
8.2 (b)	Develop a communication plan regarding human-induced environmental impacts that are likely to adversely effect or alienate abalone populations, habitat or reef	Low

(a) Identify any likely changes in social impacts (on fishers, their families or any local communities) as a result of implementing the Draft FMS (*Guideline 3.2a*)

Some management responses would have significant impacts on fishers (shareholders, divers and crew members) and their dependents, abalone processors, and local communities in terms of access, employment and incomes. Other responses aimed at increased monitoring, controlling and surveillance in the fishery will have significant impact on the level compliance and minimise illegal fishing activities. The following section identifies likely changes in these and other issues as a result of implementing the FMS.

Employment

Social impacts of the rights regime have been the creation of diving jobs (nominated divers) for young divers who wish to enter the industry. Many entrant divers are sons or sons-in-law of shareholders. The historical position of a licence with one diver and deckhand (*circa* 1987) has now been replaced with a share which is supporting an owner, one diver and a deckhand (McIlgorm and Goulstone, 2001). In 2004-05, significant reductions in the TAC, have applied downward pressure to the number of divers required in the fishery. This is prior to consideration of the FMS.

The draft FMS is not likely to create additional jobs in the catching sector. Given it is a TAC controlled fishery several options suggest the number of divers and hence deckhands will reduce. One of the options for controlling the number of divers is based around the creation of a new diving entitlement and an increase in the shareholders. This would increase third party ownership and lead to new investors in the fishery with some social benefits. Should single shares be able to be transferred, this may enable divers to purchase shares with social benefits.

The abalone processing sector may have some additional jobs as it is expected to continue to develop new added value products. Given the level of secure fishing rights in the fishery it is unlikely that there will be significant job losses, attributable to the draft FMS.

The rights system has given greater security for the families of share owners, divers and deckhands. On the death of a shareholder, or for any other reason shareholder can no longer operate, his/her family can employ a nominated diver and still receive an income from the abalone shares. If they chose to sell their shares and exit the fishery they may do so. Presently, shareholders contemplating retirement can sell down their shareholding to 70 shares and work the smaller quota by using existing divers. However, under one of the options for controlling the number of divers which involves increasing the minimum shareholding, this would not remain

Equity Issues

In the design of the NSW share fishery system there were concerns about the potential for concentration of ownership (Young, 1999). The need for these should be reviewed. The draft FMS proposes to increase the shareholding aggregation limit (say from 6% to 15%, 4.2a) and decrease the minimum tradable package to one share (4.1d). There would then be potential for concentration of share ownership and a fishery with as few as 7 business entities. Fewer larger shareholdings maintain economic viability of their businesses through rationalising the costs of diving by employing fewer divers. This would have social impacts on divers.

Many of the young divers may be able to run their diving as a viable business and can invest in shares themselves through time, but they may not become endorsement holders unless they buy

an existing shareholding of 70 or more shares with an attached endorsement. The economic survey indicates divers may not be able to gain entry to ownership. Not having an incentive of ownership even in the future, risks having a fishery where divers are short term in perspective and may be open to malpractices as a way to get ahead. The option for creating a separate diving entitlement would be beneficial in this respect, as divers may be able to afford to buy such a property right. The possible division of shares to be traded singly may also enable divers to access shares more easily.

Sharing resources between the commercial and other sectors (e.g. recreational and indigenous) is likely to be an issue which needs to be addressed. Currently the indigenous fishing strategy gives a framework for discussion with the indigenous community. There is no equivalent mechanism to communicate with other recreational sectors. Many of the issues are cross sectoral and need airing outside the limited recreational input at the MAC. In the FMS management responses that are proposed to improve communication across sectors would go some way to address this issue.

Compliance, monitoring and enforcement

The illegal market in abalone is a lucrative one and involves suppliers, handlers, buyers and distributors and has strong social elements, illegal fishers often being related by family or social ties. There are a number of new management responses that will assist in deterring potential for illegal activity.

The option for creating a separate diving entitlement would help to encourage divers to be compliant with their harvesting and not fall into illegal harvesting and marketing practices. Under the new system illegal harvesting would lead to their diving entitlement potentially being revoked. A restricted number of divers may lead to considerable social discord between shareholders and divers over the cost of harvesting services.

Generally greater involvement of fishers in developing and implementing fishery policies will make fishers more responsible and accountable for their behaviour in conducting fishing operations and hence increase compliance in the fishery.

(b) Assess whether the risk of social impacts are changed (and the potential magnitude of this change) by the management measures in the Draft FMS (*Guideline 3.2b*)

The *Review of Existing Operations* section identified major social risks, including: illegal fishing and marketing activities; reduced employment opportunities; limited alternative employment opportunities; and other risks related to health and safety risks, conflicts, non-compliance, and equity.

The risk of illegal fishing and marketing activities is likely to reduce as the FMS proposes a number of new measures in this area. In particular, a cost-benefit assessment of the way compliance resources are allocated will be beneficial. There is intention to implement an internal industry communication program to report illegal catch. A proposed requirement of registration for abalone crew members will increase compliance in the fishery. The requirement for maintaining a register of the total number of abalone, in addition to total weight of abalone, received by each processor may reduce supply of illegal catch to processors.

The risk of increasing conflicts is likely to reduce as the FMS proposes to increase communication within industry and between industry, government and other stakeholders. In

addition, better allocation policies are likely to be introduced in NSW, as all NSW commercial fisheries are now under share management category 1.

3.7 Performance reporting, monitoring and research regime

(a) Evaluate the likely effectiveness of performance reporting and monitoring regime to provide appropriate information for monitoring the impacts on the social and economic issues *(Guideline 3.3 a)*

The likely effectiveness of performance reporting and monitoring regime to provide appropriate information to monitor social and economic issues in the NSW abalone fishery is evaluated in this section. Performance reporting and monitoring to address these issues is planned in section 4 of the FMS.

While any management initiative has costs and presumably benefits, we are reviewing the capacity of the management system to provide the information necessary to monitor the key social and economic issues in the FMS.

The economic issues we are going to examine are:
- Economic viability (Goal 4);
- diver numbers; and
- Efficiency and cost effectiveness of management arrangements (Goal 3)

The social issue is:
- Appropriately sharing abalone resources (Goal 5);

Economic issues
It is desirable to monitor economic viability (Goal 4). As proposed in the draft FMS the economic viability can be monitored through monitoring of beach prices, catch rates (a way to monitor the productivity of the fishers and fishery), management fees, and the total catch. The average return to share price is also a measure for share owners. Viability of divers requires economic analysis of their fishing operations.

Economic viability
Net returns are the preferred measure of economic viability but require a range of data. It is preferable to have a range of economic indicators based on net returns than a single indicator. For example, if beach prices are significantly down, we would expect the net return to reduce. Management can immediately note beach price reductions, which if sustained will impact net profit and finally share value. As beach prices and total catch can be monitored easily these have been proposed to give an estimate of gross returns. Changes to gross return would point to the need for further analysis of net return as it is required. Average abalone catch rates are monitored as part of the regular catch and effort data collection and can be retrieved for each producer. Currently there is little information available about the payments by shareholders to nominated divers to take catch. This payment is a significant economic indicator. Obtaining the costs of inputs for divers generally requires an economic survey, though monitoring of key input prices, such as fuel, is an indicator. Levels of management fees are available from DPI.

Diver numbers
The relationship between owners and divers contains important economic information. The price paid to divers for catch is an economic indicator, though it is difficult to collect. Monitoring the number of divers is also critical in the fishery as it is the key capacity

development measure (McIlgorm and Goulstone, 2001). Excess diver numbers can increase other observed problems, such as congestion and shifts in effort between areas.

Efficiency and cost effectiveness of management arrangements

Monitoring cost effectiveness and efficiency of management services requires the development of the existing management regime to include additional performance monitoring. The basis of efficiency and cost effectiveness of management would be the definition of services to be delivered and the standard required by industry, with industry bearing the cost. These details are presented in service delivery agreements between DPI and the abalone industry. Part of these agreements is performance appraisal. In fishery management the performance can be benchmarked against alternative management regimes in other fisheries and abalone fisheries in other states. While services for a given cost may provide an index of efficiency, the measure of effectiveness requires comparison of the total benefits from the costs incurred. It also includes monitoring of increased costs for new developments which will bring growth and economic prosperity to the fishery.

Social issues

The likely effectiveness of the performance reporting and monitoring regime to provide appropriate information to monitor social issues is evaluated below.

The abalone resource should be shared by resource users in a way that minimizes negative social and economic impacts in the fishery (Goal 5). Although the abalone resource is currently exploited by commercial, recreational and Indigenous fishers, monitoring of the shares of catch between sectors is not a mature process. This will likely change with proposals to refine estimates of catch from other sectors and the development of the Indigenous Fishing Strategy and Implementation Plan. The FMS attempts to improve this multi user regime. Performance reporting of the success between sectors and the minimization of conflict would require feedback from different sectors represented primarily on the MAC. The performance of industry in recognising culturally significant areas requires communication with the cultural groups and the involvement of DPI staff with experience in the indigenous strategy area, as a third party.

The commercial abalone code of conduct is one of the major monitoring initiatives in the FMS. The can be updated with any changes in the fishery. For example, including new information on heritage areas and critical abalone habitats. Industry is required to fulfill obligations within the code. Performance reporting is based primarily of self assessment by the industry and also by assessment by DPI as the regulatory authority under which the fishery is occurring.

(b) Evaluate the likely effectiveness of any research plan to identify and prioritise research to meet key knowledge gaps for the sustainable management of the social and economic implications of the fishery *(Guideline 3.3b)*

Socio-economic research

There are some gaps in economic research for sustainable management of the abalone fishery. Long term management needs to be able to monitor the cost of fishing operations and the economic viability of shareholders and nominated divers. Information gathering has been focused on the performance of shareholder businesses. However as fewer original diver remain the monitoring of the economic viability of those performing harvesting services will be an important measure of fishery viability.

The economic performance of the fishery can contribute to share values, but it does not determine long term optimal exploitation questions. The fishery requires a bio-economic modeling exercise to indicate optimal harvesting/effort and the long term bio-economic relationships required in promoting stock rebuilding.

Other less imperative economic research could examine the economic inter-relationships between fishing communities and within the fishing industry that have been briefly addressed in the current social survey. Determinants of shares value is also an area that may be investigated, particularly as it would be informative to many small investors who may consider ownership of single shares under the draft FMS.

Illegal fishing is one of the most serious issues in the abalone fishery. Social research is required to investigate the nature of illegal catch, major parties involved and the reasons for it. This will help develop effective measures to address the situation.

The monitoring of effectiveness of social interaction between fishers in the implementation of the Code of Conduct could also identify impediments to fishers participating in more collective management arrangements.

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Appendix 1: The economic survey of the NSW Abalone fishery

1. Introduction

This appendix summarises the methods and results of an economic survey of shareholders, nominated divers and deckhands in the NSW abalone fishery. The purpose of the survey was to determine the operational surplus of shareholders and nominated divers in the abalone fishery.

An economic survey questionnaire was developed and distributed by Dominion Consulting to all abalone shareholders and divers to collect information on economic aspects of their fishing operations. The data were analysed as part of the current study.

The survey had a total of 24 replies of which 19 were from the 41 *shareholders* or *shareholder/divers* in the fishery, approximately a 46% return. A survey was sent to *nominated divers* and only 5 divers replied, from approximately 25 nominated divers in the fishery, a 20% return. The financial information was for the financial year 2001-02.

Both survey samples come from surveys that were returned from the mail out and are treated as being representative, but the results from the divers survey may be biased for inference purposes given the smaller sample size.

The quota limit for each shareholder and similar marketing arrangements mean that there is likely less variation between shareholders or shareholder/divers than in a non-quota fishery. The break up of several 100 shares packages into smaller units has increased variation in operational data in the fishery.

During the compilation of the EIS, concerns among industry regarding deteriorating economic conditions led to provisional data being requested from industry for financial year 2002-03. These returns were judged to be too provisional for explicit inclusion, but were used as verification material for projections of economic performance in the periods following 2001-02.

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

A healthy fishing industry is one that derives enough sustainable revenue to cover its annual operating, fixed and capital costs. Economic costs include wages, including an imputed wage to the owner/operator, running costs, maintenance and repairs, insurance, and levies which reflect fishery management costs.

Capital costs are harder to measure, but in principle they represent the annual interest and depreciation on the vessel and gear. Interest cost is the rate of return which the capital could earn in another use: it is calculated as a percentage of the capital value where the percentage is the risk adjusted cost of capital. Depreciation is an annual cost which recognises the finite life of a fishing vessel. In principle, the annual depreciation compounded forward at the market rate of interest should provide a sum large enough to replace the vessel at the end of its economic life.

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

- at historic cost – what was originally paid for the asset;

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

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

An important proviso to the above discussion is that the calculations are based on sustainable revenue, which may not be the case in a cross-sectional one year financial survey of fishing operations.

In economic studies of the fishing industry the value of capital has only tended to consider capital used in the production process sometimes called boat capital. The value of a licence or permit has often not been regarded as having a social opportunity cost. Appraising returns to an enterprise in a tradable rights based fishery can also include the value of the right as an opportunity cost of capital. Purchasers of rights have invested in the fishery as opposed to alternative fisheries and other investments and are expecting a return to capital on their investment. The term return to full equity includes the costs of licence and is a measure which includes the investment, whereas the return to boat capital does not (ABARE, 2003).

3. Appraising economic viability

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

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

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

In the case of nominated divers the annual wage of $34,320 was imputed across an average of 105 days fished by each diver. Deckhands were assumed to receive $3 per kilo of abalone

caught and were included in the imputed wages. The opportunity cost of shareholders' managerial and administrative time was imputed at a rate equivalent to the cost of paying some one else to perform that service (ABARE, 2000). Imputation was by days declared in the survey assuming a salary $50,000 per year for 220 business days. Shareholder/divers had an annualized annual rate of pay based on their historical pay rates in the fishery.

The discounted annualised economic depreciation sum was calculated in respect of meeting the replacement cost of the assets at the end of their lifespan from current income flows. For the few non-fishing investors in the fishery, there is little economic depreciation, whereas fishers now employing a diver, still keep their capital in case of having to return to diving. Such an issue raises questions as to the efficient cost of all inputs (Hassalls and Associates, 1999).

4. Abalone Fishery Profitability Results

There were two types of operation namely shareholder/diver and shareholder with nominated diver. The data were also analysed to assess the viability of diver business operations. Out of 21 business responses, there were 5 shareholder/divers, 11 shareholders and 5 divers.

Economic survey results

The viability of fishing businesses in the abalone fishery is investigated by the economic survey for the year 2001-02. Boat cash income, simply total income less total cash costs (ABARE, 2003), indicated the low level of diver net cash income. Shareholder/divers and Shareholders had cash income of $112,000 and $ 82,700 respectively.

Appendix Table 1 indicates the average rates of return to full equity less 7% opportunity costs were -1.0% to -1.8% for shareholders/divers and shareholders and -11.8% for nominated divers. Under the long-term viability assumptions which included adjustments for economic depreciation, the imputed cost of labour and opportunity cost of capital, the returns to full equity in all three categories were not covering their opportunity cost of capital. Share values were estimated from share sale data at $2,250,000 during the 2001-02 period.

The rate of return to full equity reported in Appendix Table 1 is similar between shareholder/divers and shareholders and significantly lower for divers. By full equity we include the value of shares in addition to boat capital (ABARE, 2003) and this is the return considered by an investor. Return to boat equity is a measure that can be applied to shareholder/divers, who would have a 57% return on boat capital, if the share value was not included in capital. This is of interest to government as it indicates rent in the fishery. Both return to full equity and boat capital are cited (ABARE, 2003). Appendix Box 1 reports the distribution of long-run economic profitability among different business types.

Appendix Box 1: *Long-run economic viability – covering economic depreciation.*

From the 2001-02 annual results the following had positive average returns in excess of all costs including economic depreciation indicating long-run viability:

Shareholder/Diver: 2 out of 5 (40%)
Shareholder with nominated divers: 6 out of 11 (55%)
Nominated divers: 1 out of 5 (20%)

Appendix Table 1: Results of the Economic survey of the abalone fishery in the financial year 2001-2002 (Source: DC-ES)

	Shareholder & Diver	Shareholder	Diver
Gross Revenue (2001-2002)	**350,258**	339,562	**107,770**
Revenue net of diver payment		**231,792**	
Imputed labour cost	111,530	32,906	63,438
Provisions	2,759	69	496
Boat Fuel and Lubricants	5,883	3,438	9,684
Fishing gear	6,172	1,220	3,097
Vehicle fuel	5,255	2,032	5,775
Boat repairs	5,617	4,502	4,915
Protective clothing	621	280	438
Catch bags	756	85	160
Vehicle repairs and maintenance	2,743	815	3,332
Total direct costs	**141,337**	**45,348**	**91,335**
Boat Registration	303	87	94
Trailer Registration	320	166	123
Vehicle Registration	1,531	466	814
Insurances	5,133	1,424	3,587
Management charges	26,500	26,500	441
Fees	914	955	453
Legal (non-litigation)	629	1,375	200
Legal (Litigation)	9,399	10,417	-
Accounting	4,586	5,423	1,512
Phone	4,164	2,315	1,411
Power	1,974	215	217
Rates and rents	1,051	302	286
Bank charges	1,812	2,078	861
Interest on capital equity	8,432	13,320	1,687
Interest on fishery access cost	9,881	20,665	-
Economic depreciation	23,392	-	6,684
Travel/Accommodation	13,251	7,217	2,000
Membership costs	1,981	3,308	337
Repairs to building/plant	285	292	-
Quota Leasing and transfer	460	4,409	27
Boat&Vehicle Lease	3,122	-	2,025
Other indirect costs	594	2,732	-
Total indirect costs	**119,713**	**103,665**	**22,759**
Total economic costs	**261,050**	**149,012**	**114,094**
Boat cash income	**112,600**	**82,780**	**361**
Economic business profit	**89,208**	**82,780**	**- 6,324**
add back leasing, interest and rent	19,299	38,545	1,857
Profit at full equity	**108,507**	**121,325**	**- 4,467**
Capital excluding share value	204,204	110,022	56,248
Rate of return to boat capital* %	**53.1%**	**110.3%**	**-7.9%**
Less opportunity cost (7%)	**46.1%**	**103.3%**	**-14.9%**

* Excluding share value

Capital including share value	2,454,204	2,360,022	N/A
Rate of return at full equity%**	**4.4%**	**5.1%**	**N/A**
Less opportunity cost (7%)	**-2.6%**	**-1.9%**	**N/A**

** Including share value

From the 2001-02 survey, 2 shareholder/divers, 6 shareholders, and 1 diver had positive economic returns in excess of all costs including opportunity costs of capital, imputed labour and depreciation on the basis of being able to replace capital at the end of the lifespan of their assets. The economic net return for 2001-02 enables long-term viability to be appraised with 50% of shareholder/divers and all shareholder businesses having positive net returns and are thus viable in the long-run covering economic depreciation by setting aside enough now, to renew capital at a future date. Only 20% of divers sampled appeared to meet the long term viability criteria.

Diver businesses in 2001-02 have negative net returns and are not covering economic depreciation by setting aside enough now, to renew capital at a future date. This does not mean they cannot operate on a day to day basis, but that they forgo part of their true economic costs as presented in Appendix Table 1.

Often in the fishing industry fishers forgo payment for the time involved with the fishing business, as opposed to direct fishing time. The labour commitment to fishing in the abalone fishery is reported in Appendix Table 2

Appendix Table 2: The annual average unpaid and paid days of fishing by businesses in the abalone fishery (Source: DC-ES).

	Shareholder &Diver	**Shareholder**	**Diver**	**Grand Total**
No. of Respondents	5	11	5	21
Total Fisher days	327	117	220	235
Total fisher days unpaid	6	3	3	5
Fisher unpaid days as % of paid	**2%**	**3%**	**1.5%**	**2%**
Family days unpaid	32	22	18	24
Family days unpaid as % of paid fisher days	**10%**	**18%**	**8%**	**10%**

The average abalone business operator and family members spend 12% of their active fishing time on "unpaid" tasks of fishing, deliveries, repairs, maintenance, management and administration. Commonly divers in the fishery indicate they forgo payment for lifestyle and autonomy**.**

In the early 2003 period operators reported a downturn in profitability due to reduced quota and falling market price in Asia. It is noteworthy that the return in other years will be different from the industry profile reported in 2001-02.

Conclusions

The survey of 2001-02 indicates that long run economic surplus exists for 40 % of shareholder/divers, 50 % of shareholders, and 20 % of divers examined, being greatest in the fishing businesses operating as shareholders only. These positive economic returns indicators of rent in the fishery, providing conditions for sustainable stocks, capital capacity, prices of abalone and inputs, and the management structure of the fishery are all met. The average net return to equity less opportunity costs was -1%, the median being -2% with 50% of all abalone businesses likely having less than the median return

Appendix 2: The Social Survey of the NSW Fishery

The available information in NSW was previously limited and relied entirely on the NSWF licensing system. Recognising this, a social survey was undertaken by telephone in May 2001 (RM-SS). The social survey had 870 replies from 1,751 fishing businesses contacted in NSW as reported in Appendix Box 2.

Appendix Box 2: The response rate for the NSW social telephone survey (Source: RM-SS).

	Frequency	**%**
Completed questionnaires	870	50%
No reply	115	7%
Engaged	36	2%
Unobtainable	136	8%
Appointments	59	3%
Repeated calls (6)	78	4%
Total unable to contact	424	24%
Refusals	278	16%
Terminations	179	10%
Refusals/terminations	457	26%
Total	**1,751**	**100%**

The response rate across all fishers in NSW was 50%. These figures compare well with the telephone survey of Queensland fishers (Fenton and Marshall, 2001), though there are 26% of refusals/ terminations and approximately 24% of fishers were unable to be contacted.

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

Of the total statewide replies, 28 replies were from abalone shareholders who constitute 67% of the total 42 abalone shareholders in NSW. Of these 28 shareholders responded, 13 were owner operators, 4 non-fishing owners, 9 nominated fishers and 2 others. NSW Fisheries data 2001-2002 show that there are 37 divers in the abalone fishery and all of them went fishing in 2001-2002.

Appendix 3: Fishing Community Profile of Commercial Fishers in NSW

The relevant social data of fishers in NSW was obtained from the ABS statistics via the Bureau of Rural Science Social Science unit and the numbers of commercial fishers in NSW from NSW Fisheries records. These are reported in Appendix Table 3.

Appendix Table 3: Social index data for NSW fishing communities at the postcode level (Source: ABS, 1996 /BRS and NSWF).

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

Explanation of Relevant Social Data for NSW Fishing Postcode Areas.

The data contained within Appendix Table 3 has been acquired from the Australian Bureau of Statistics (ABS) Housing and Population census 1996. The data on zones, districts, postcodes and fishers numbers is from NSWF.

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

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

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

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

Employment in Fishing: Employment[4] in the fishing industry has been expressed as a percentage of the Total Labour Force (TLF). For example, 2.78 percent of Forster/Tuncurry's labour force is employed in commercial fishing. The commercial fishing category includes all of the following possible sub-categories: Rock lobster fishing; Prawn fishing; Finfish fishing; Squid jigging; Line fishing; Marine fishing; Marine fishing undefined; Aquaculture; and Commercial fishing undefined. The data in Appendix Table is for postcodes with more than 10 NSW commercial fishers. This means that 1,615 fishers from a total of 1,920 are included in the analysis. The other 305 live in postcodes areas with less than 10 fishers are omitted. This should be borne in mind in the analysis of results.

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

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