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*Consulting in fisheries management, economics and training.*

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

A report to NSW Fisheries

by Dominion Consulting Pty Ltd

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The normal disclaimer applies.

## **(G)ECONOMIC ISSUES**

### **Introduction**

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

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

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

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

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

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

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

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

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

### **Available information**

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

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

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

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

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

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

licensing information to determine catches in each administered fishery.

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

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

- b) A specially devised social survey was executed by telephone by Roy Morgan Research in May 2001 (Roy Morgan, 2001a). A total of 870 fisher responses were recorded from a total of 1,751 fishers contacted state-wide. The survey results have been analysed for the Estuary Prawn Trawl fishery and will be referred to as "**Source: RM-SS**";
- c) An economic survey was designed and executed by mail in May/June 2001 by Roy Morgan Research (Roy Morgan, 2001b). A total of 250 fisher responses were recorded from a total of 1640 fishers and businesses contacted state-wide. The survey results have been provisionally analysed in the current study for the fishing businesses in the Estuary Prawn Trawl and will be referred to "**Source: RM-ES**";

Other information from existing literature will be referenced.

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

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

(1) **Review of the existing situation**

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

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

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

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

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

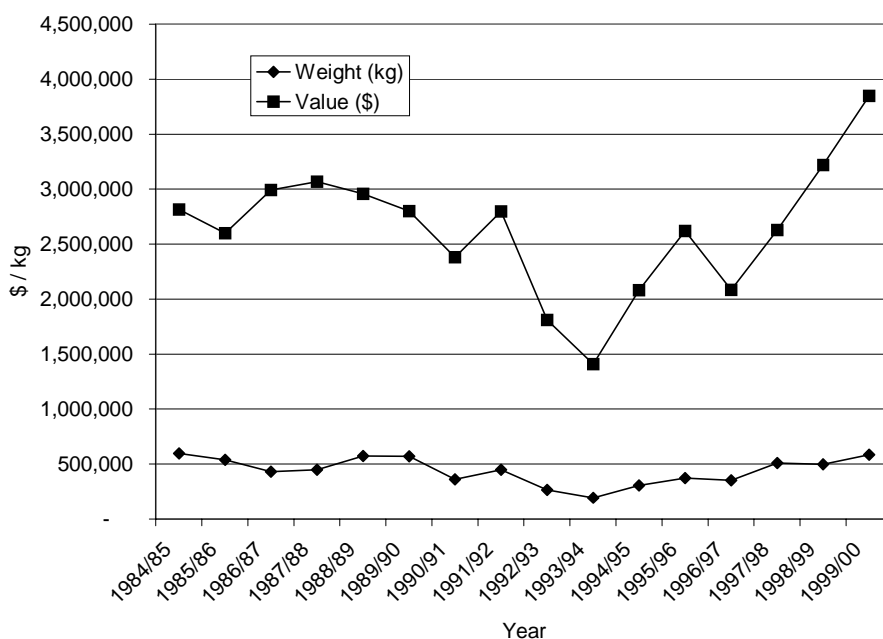
Estuary	Number of EPT entitlements issued	% of statewide EPT entitlements
Clarence River	123	41%
Hunter River	32	11%
Hawkesbury River	68	23%
Port Jackson	31	10%
Botany Bay	48	16%
<b>Total</b>	<b>302</b>	<b>100%</b>

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

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

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

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



*Inter relationships between EPT and other endorsed fisheries*

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

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

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

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

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

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

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

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

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

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

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

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

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

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

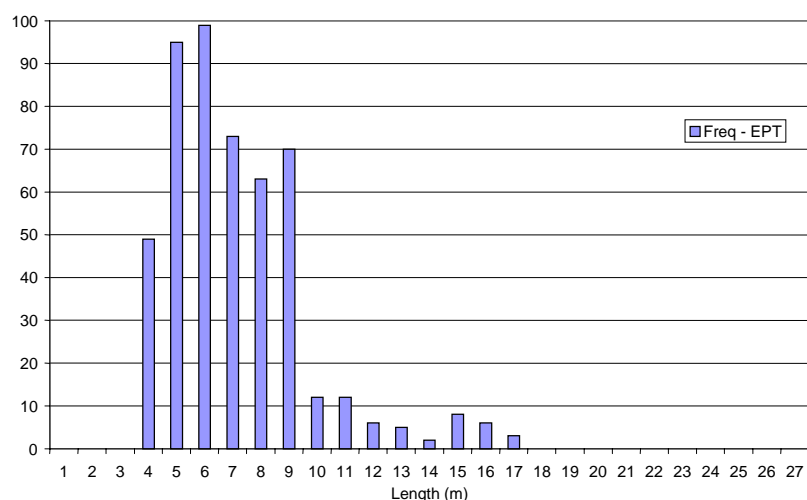
Table G4 also reports that in June 2001 there were 302 entitlements in 5 estuaries and 310 endorsed fishers. In the 1999-2000 year, 171 entitlement holders were actively fishing and 131 entitlements were inactive. The final column of Table G4 illustrates the regional dependence on the EPT fishery in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

#### *Vessel data from licence records*

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

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

**Figure G2:** The distribution of vessel lengths in the EPT fishery (NSWF, licensing data).**Table G5:** Revenue associated with different fishing methods in all NSW estuaries 1998-99 (in \$, Source: NSWF; Sydney Index).

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

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

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

### **Capital investment in the EPT fishery**

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

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

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

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

#### *EPT Ports in NSW with berthing facilities*

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

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

*Distribution – licensed processing facilities/ cooperatives*

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

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

- (1) Registered Fish Receivers (RFR), for large seafood receivers of which there are 92 state-wide, and
- (2) the Restricted Registered Fish Receivers RFR, generally smaller holders of consent forms to sell catch locally and which number 84 state-wide.

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

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

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

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

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

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

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

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

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

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

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

#### *Road transport and cold stores.*

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

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

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

*Direct employment*

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

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

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

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

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

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

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

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

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

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

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

<sup>4</sup> The ratio of 166/310 was used for sample expansion and may overestimate employment. In Table G8, 11 businesses had 45 employees and may relate to EPT vessels with OPT operations, or to processing activities, and over estimate total employment when expanded.

<sup>5</sup> 179 active EPT fishers + between 78 and 155 employees = 257 or 334.

<sup>6</sup> 310 endorsed EPT fishers + between 78 and 164 employees = 388 or 474.

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

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

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

#### *Dependence measures*

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

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

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

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

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

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

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

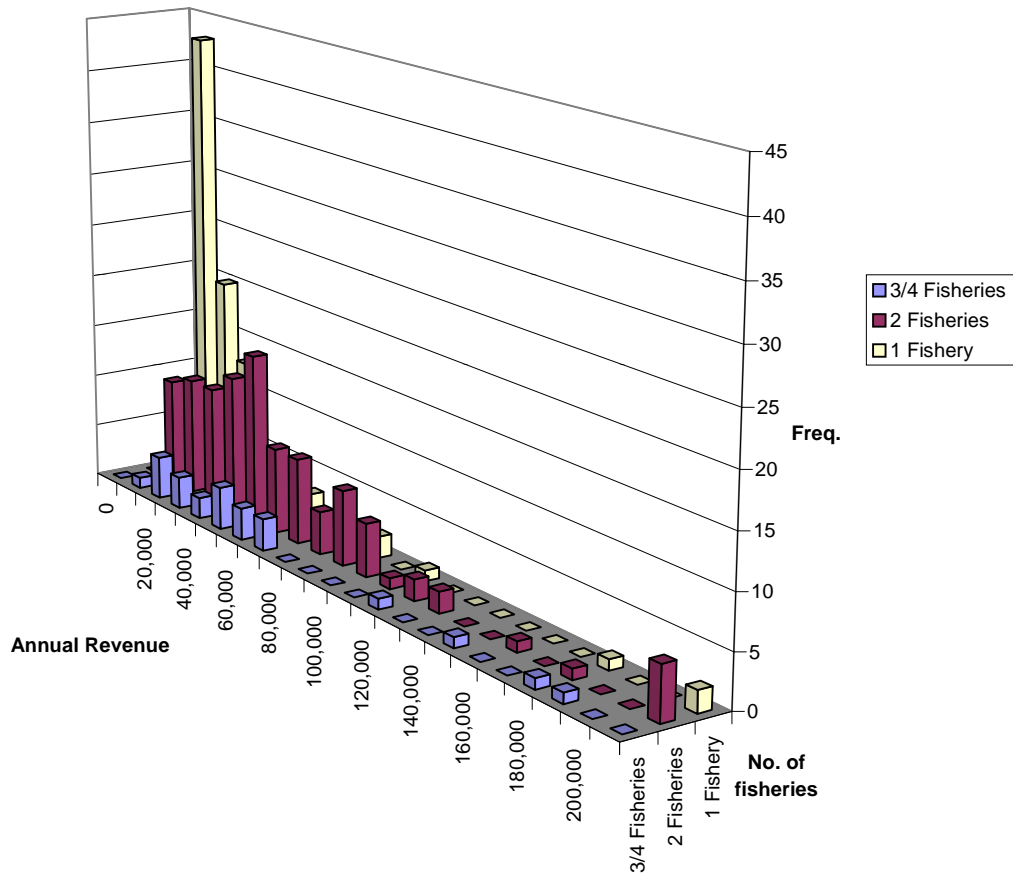
Catch Combinations	No. Fishers	Total Catch (\$)	EPT Catch (\$)	Average EPT Revenue (\$)	SD
EPT Only	62	713,988	713,988	11,516	10,649
EPT & EG	78	3,865,329	2,493,383	31,966	29,988
EPT & OPT	10	573,434	91,103	9,110	17,633
EPT, EG, OPT	7	221,251	122,296	17,471	15,025
EPT, EG, RL	4	176,533	79,193	19,798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

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

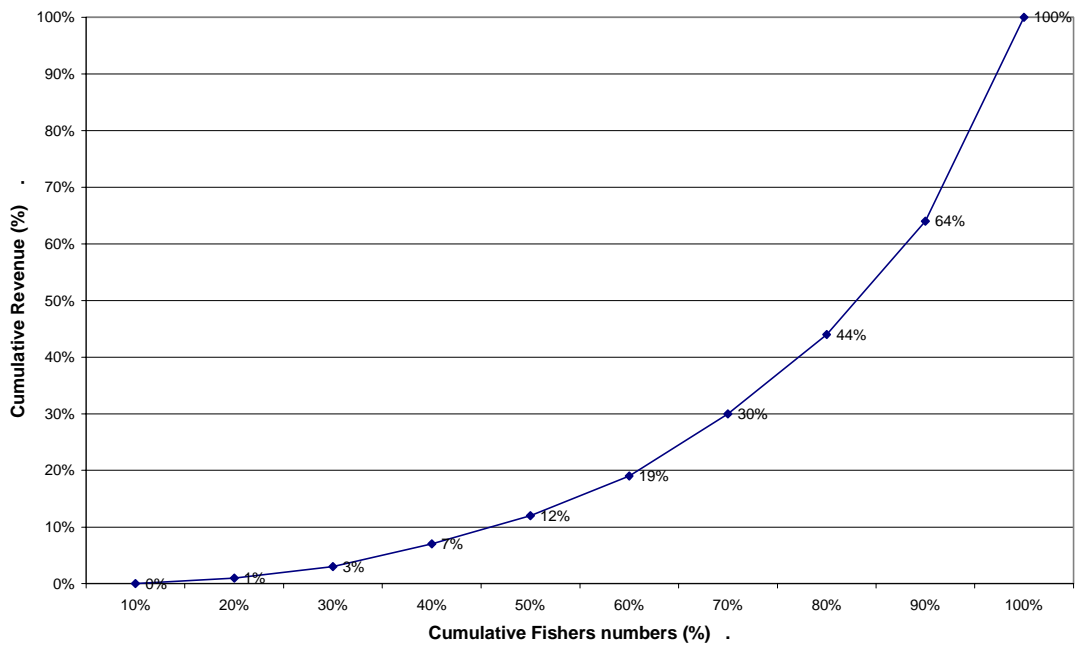
Figure G4 displays cumulative revenue from catch against the cumulative numbers of fishers in the fishery. It should be noted that:

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

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



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



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

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

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

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

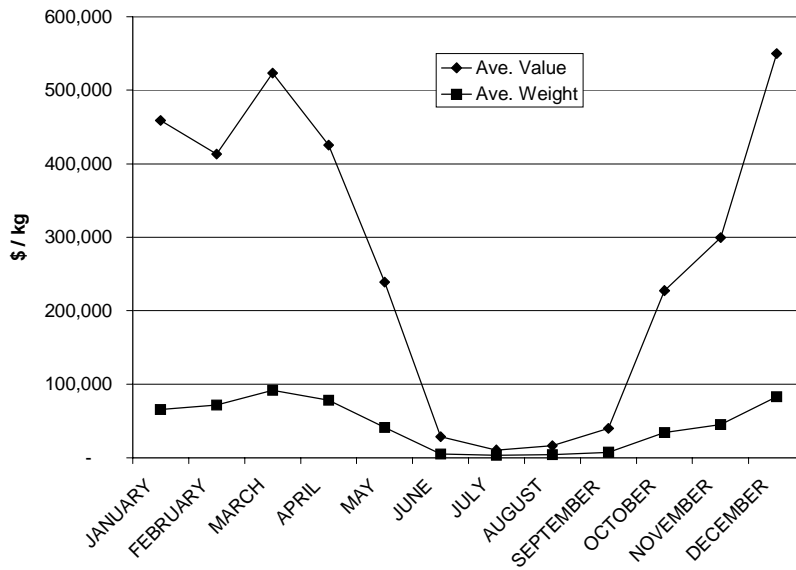
The distribution of income question revealed a mean household income of circa \$40,000, but there were 28% of fishers interviewed who did not to reply. A significant number of incomes of \$100,000 or over were recorded (7%). The accuracy of this cannot be verified, but as it represents income from all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

### **Seasonal employment**

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

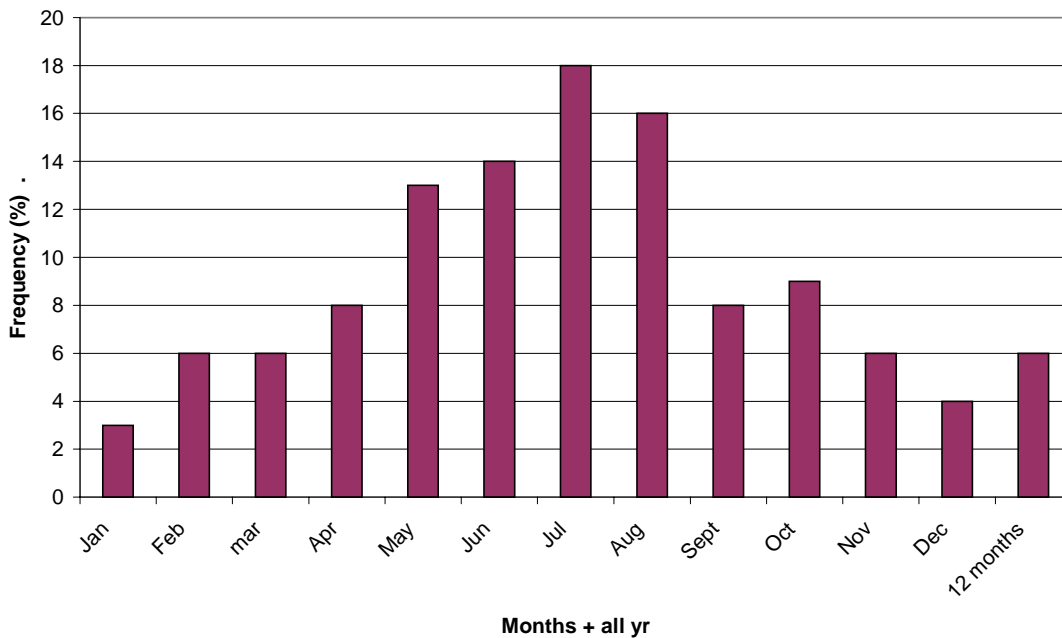
The monthly variation in EPT catches is reported in Figure G5 and indicates a reduced catch and revenue in the third quarter of the year (July-October). All else being equal, employment attributable to the EPT fishery would also be reduced in these months, as effort and labour may move to other fisheries.

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



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

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



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

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

*Fishing Effort and latent effort in the EPT fishery*

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

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

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

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

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

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

*Fishing Effort in the EPT fishery*

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

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

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

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

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

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

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

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

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

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

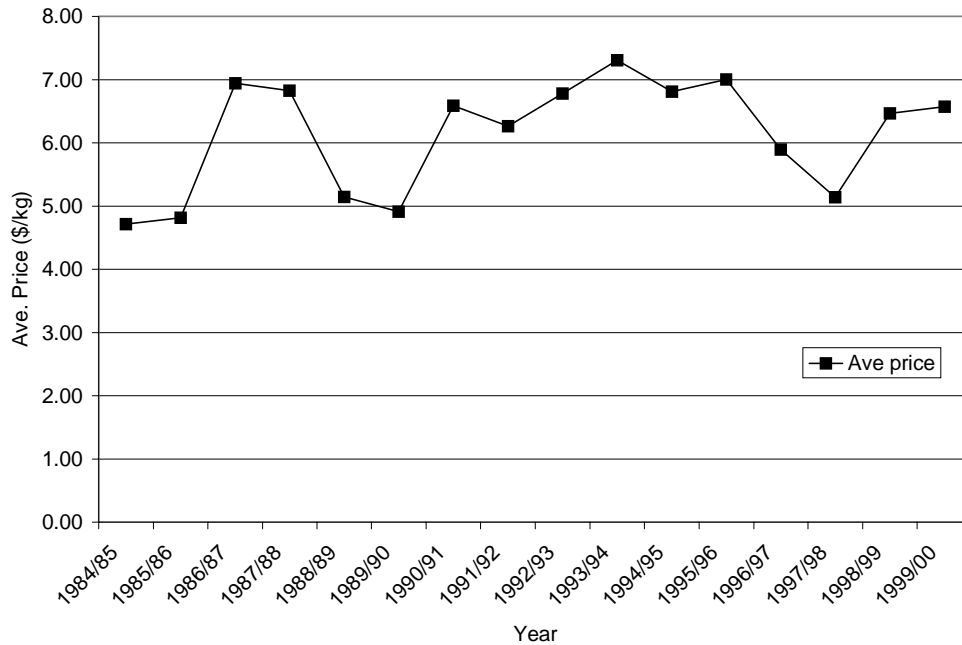
	<b>EPT</b>	<b>%</b>	
Coops	31	46%	
Sydney Fish Market	9	13%	
Shops	13	19%	
Restaurants	1	1%	
Agents NSW	7	10%	
Agents Qld	2	3%	
Agents Vic	1	1%	
<u>Bait</u>	<u>3</u>	<u>4%</u>	
Total	67	100%	n= 48

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

#### *Price history*

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

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



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

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

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

### **Fishing operator survey**

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

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

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

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

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

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

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

### ***Economic return***

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

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

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

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

### Gross costs and benefits and fishery management

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

#### *A cost-benefit schedule of the EPT fishery*

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

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

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

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

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

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

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

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

### **Licences**

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

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

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

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

**(g) Existing economic multiplier effects – costs and benefits**

*Review information on multipliers in the fishing industry of NSW.*

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

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

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

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

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

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

### Output flow-on effects

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

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

## **Discussion**

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

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

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

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

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

## **Conclusion**

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

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

#### *The Regional expenditure of fishers*

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

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

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

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

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

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

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

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

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

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

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

## (2) Likely economic implications of implementing the plan

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

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

### **Economic assessment**

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

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

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

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

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

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

### **The assessment framework**

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

- i) Describe the fisheries management objectives and the responses with economic impact under the management strategy and present in a Table form. Identify the impacts of each strategic response on the fishers and community, and rank impacts into three levels – High, Medium and Low. The ranking will reflect an opinion of the predicted scale of economic impact from available information or on a qualitative basis. The most high and medium impacting issues will be appraised, and low impact economic issues will be discussed generically;
- ii) For each of the high impact economic issues, changes and measurable impacts on sectors will be presented for each issue following the Planning NSW criteria. These include:
  - market trends that effect the fishery (DUAP, 2001: section G2a)- there is no EPT specific information;
  - implications of the strategy on access rights and economic viability (DUAP, 2001: section G2b), and
  - changes in resource allocations within the fishery sector (DUAP, 2001: section G2c) including multiplier effects, mitigation and also between fishery sectors (Commercial Fishers, Recreational fishers and Non-fishing sectors), including multiplier effects and mitigation (DUAP, 2001: section G2d). For each highly impacting management response an overall economic benefit will be presented where information is available.
- iii) Discuss the likely economic implication of maintaining the present resource allocation rules for all issues identified (DUAP, 2001: section G2e).
- iv) Justify the preferred approach under the FMS in terms of the Ecologically Sustainable Development principles, concluding the assessment (DUAP, 2001: section G2f).

## **The assessment**

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

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

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

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

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

**Table G17:** Responses ranked by potential economic impact.

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

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

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

## ii) Economic impacts

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

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

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

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

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

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

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

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

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

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

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

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

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

***Assessment scenario 1 – estimate only for envisaging potential impacts***

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

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

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

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

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

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

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

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

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

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

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

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

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

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

***Assessment scenario 2 – estimate only for envisaging potential impacts***

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

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

Medium ranked impacts are reported below.

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

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

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

#### **4) Safefood (Response 5.4a)**

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

#### **5) Other low impacting measures**

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

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

#### **6) Costs and benefits of the FMS**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

### *Multipliers*

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

fishing operations. Fishers representing latent effort, low catching businesses and perhaps elderly fishers who do not see a future in the industry, are more likely to sell shares and exit the fishery.

The assessment of the impact of minimum shareholdings on business numbers estimated a reduction of 241 to 205 businesses in the 2001-2006 period, with approximately 36 businesses leaving the industry. The regional impact will depend on fisher's responses to keeping or selling shareholdings.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The data used in the assessment is from several sources.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- a) Investigation of available prawn species price data and establishment of price data monitoring system to enable valuation and modelling of resource management scenarios, such as maximising prawn bio-value through alternative harvesting regimes.
- b) Examination of the viability of businesses, business values, endorsement and share values and the basis of share allocation prior to trading. Subsequently, monitoring of share values to ensure industry viability and the achievement of the FMS.
- c) Surveying of the economic performance of businesses after the implementation of the plan (annual or biannual).
- d) Develop a state-wide fishing industry economic restructuring model for predicting and appraising fishing business adjustments across fishery administrative divides.
- e) Revising the collection of effort data to enable more sensible modelling of catch per unit effort and productivity data. This would involve changing the fishery data logbook system and needs to happen within five years in preparation for long term sustainability issues, including economic modelling and monitoring.
- f) Developing an economic profile of the regional fishing and seafood processing industry in NSW. This could include marketing, economic infrastructure and regional benefits. This needs to be progressed by area and in conjunction with social community profiling as a basis for longer term planning.

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

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

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

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

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

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

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

### **Appendix G1b: Latent effort and the EPT fishery.**

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

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

#### **The activation and removal of latent effort**

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

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

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

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

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

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

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

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

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

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

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

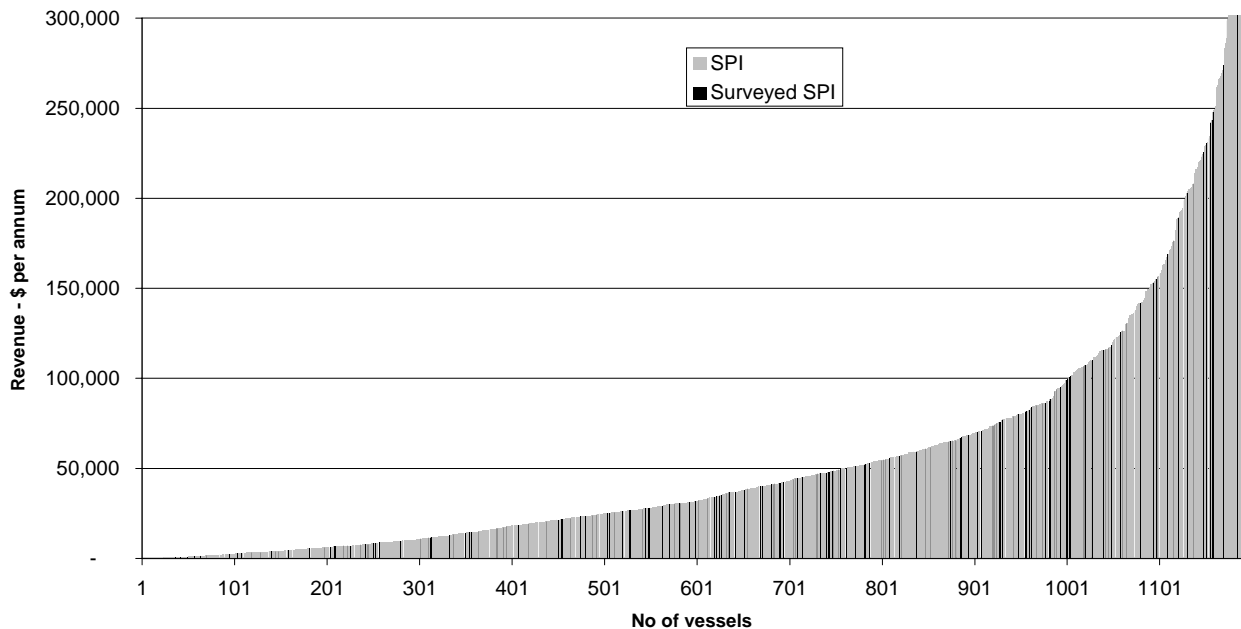
### **Fishing operator survey**

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

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

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

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



**Sustainability and fishing firms**

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

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

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

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

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

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

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

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

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

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

### **Appraising economic viability**

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

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

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

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

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

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

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

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

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

### Accounting measures

The survey results are reported in Appendix Table GA3.

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

\$	EPT>20%	EPT<20%	Average Vessel	EPT>20%	EPT<20%	Average Vessel
Gross revenue	50,357	126,394	79,602	100%	100%	100%
Direct costs*	19,006	80,955	42,847	38%	64%	54%
Indirect costs**	16,349	45,847	27,759	32%	36%	35%
Total costs	35,355	126,802	70,606	70%	100%	89%
Gross operating profit	<b>15,002</b>	<b>- 408</b>	<b>8,997</b>	30%	0%	11%

these costs include:

* wages	1,877	22,411	9,775
** Interest	4,261	2,508	3,615

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

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

### **Economic results**

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

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

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

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

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

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

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

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

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

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

### Discussion of economic viability and the EPT fishery

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

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

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

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

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

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

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

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

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

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

## **Conclusions**

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

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

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

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

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

#### **Southern NSW**

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

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

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

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

#### **Ulladulla**

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

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

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

### **Northern NSW**

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

Tamblyn and Powell (1988) comment:

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

On the economic impact they summarise:

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

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

## **Clarence**

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

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

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