

Review of Australian Fisheries Economic Statistics

Perry Smith

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perrysmith@netspace.net.au

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Summary

The efficient development of a sustainable fishing industry requires an appropriate combination of environmental, social and economic information to operate. The general purpose in this study was to review the available economic statistics in relation to the demand for information on the fishing industry and to identify possible directions for their future development.

The most used source of economic information is *Australian Fisheries Statistics*, a collaborative output between State and Commonwealth fisheries organisations and ABARE. The annual publication provides current data on commercial fisheries and aquaculture production, the ex vessel or farm gate value of that production, and details on fisheries trade for the previous year. While there is a range of other national information covering various aspects of the industry, most is prepared under different industry structures and is rarely used. ABARE Fisheries Surveys are used in relation to policy development and review of Commonwealth fisheries.

There have been major improvements in the availability of fisheries catch data made by State and Commonwealth fisheries agencies, and a very large level of biological detail prepared to address the reporting requirements of the EPBC Act. However, there have been few changes in the availability of economic information on the industry since the initial publication of *Australian Fisheries Statistics*. There is very little coverage of other sectors of the industry, particularly in relation to the post harvest sector and information on other aspects, such as the structure of the industry, recreational fishing and seafood consumption.

The demands for economic information have changed over the period. The most important of these is the use of Australian Fisheries Statistics as the basis for establishing the level of national research funding. This imposes greater responsibility for the accuracy of data used and shorter windows for the development of estimates of gross value of production. There are costs from underestimation of the value of production but difficulties in verifying the values used.

A key to providing better verification of catch values on the production sector is through improved engagement with the post harvest sector which buys the product. It is suggested that this engagement would be facilitated by development of information that helps meet the post harvest sector's needs. In particular, there could be major improvements in the availability and delivery of trade information.

The scope of the fishing industry is now significantly wider than the commercial sector. The availability of economic information on other sectors of the industry was examined to determine whether other activities could be incorporated within a common framework with the commercial sector. Some important sectors, such as recreational and customary fishing are not considered industries because of the absence of any payment for their output. However, the catches from the fishery could be valued at commercial levels if the information on catch and retention levels were consistently available. The outputs of other sectors, such as charter fishing, measured and the information required for their inclusion is becoming available.

1. Introduction

The publication *Australian Fisheries Statistics* has now covered fifteen years of seafood industry production and trade. When first developed in 1990 by the Bureau of Agricultural Economics (now ABARE) one justification for its development was the absence of any comprehensive data on the industry. This remains the case, although there have been large improvements in the quality and availability of fisheries data and information in Australia over the intervening period.

The purpose of the publication was to develop statistics that were comparable to those published for Australian agriculture, where the point of valuation was the farm gate. Catch statistics were collected by Commonwealth and State fisheries bodies from logbook data, not necessarily consistently, there was little value information available and all trade statistics were difficult to access. The Australian Bureau of Statistics had ceased publishing their national fisheries statistics collection from 1986 onwards because of funding cutbacks and difficulties in data collection.

Much of the rationale for the compilation of seafood industry statistics has changed since the collection was started. There have been major changes in fisheries management with greater emphasis on control of fishing activities and sustainability of resources. There is now a stronger emphasis on the collection and analysis of catch information by the authorities responsible for management. The adoption of objective management tools has resulted in re-examination of the data required to use such systems.

The seafood industry is now more complex. The industry has witnessed the development of aquaculture and changes in use of a range of species. The industry now employs more sophisticated marketing as the emphasis has turned from maximising catches to maximising the value of those catches. A significant proportion of Australian seafood is exported live through airfreight, targeting specialised market requirements. Products sold domestically now have greater competition from imported products and retailing of seafood has changed significantly with the engagement of the major supermarket chains.

There is now explicit recognition of a wider range of stakeholders. In addition to the commercial catching sector and the aquaculture industry, the use of resources by the recreational and indigenous fishing sectors is being more directly addressed, as are issues important to marketers and consumers. Environmental issues have become increasingly important considerations.

The management of seafood industry research and its funding has become commensurately more challenging. The level of research funding is now directly linked with the contribution of the seafood industry to the economy and research priorities have to be more objectively based and outcomes more closely scrutinised, all of which have implications for the generation, collection and analysis of data needed to achieve these ends.

Demands for information on different aspects of the industry have increased significantly. The supply of that information has been influenced by a range of factors, including changes in the management of the resources and the information generated by the management systems used. The supply of information is also

influenced by exogenous factors, such as the representation of different aspects of the industry in the national statistics, and by endogenous factors, such as the level and types of research commissioned. Moreover, the supply of information is substantially influenced by improvements in communication enabled by the internet. It is now more feasible to collect, process and distribute information on the seafood industry quickly to a wide group or a specific sector.

With these developments in mind, it was decided to review the issues associated with the availability of economic information on the Australian seafood industry. The terms of reference provided by the FRDC Board were as follows:

Terms of Reference

- Examine the current use made of economic statistics on the Australian seafood industry with a view to ascertaining whether the statistics could be improved to meet user needs more closely.
- Examine the constraints to the preparation of statistics and identify means by which these can be overcome.
- Assess what data would be required to be collected to provide market signals to guide FRDC's investment.
- Recommend on the future development of economic statistics in relation to the Australian seafood industry.

Approach

In this report the availability of economic information on the fishing industry from public sources is examined. In the third section some of the main needs for such information are explored in relation to the available information. The issues associated with the accuracy of gross value of production estimates are examined in the fourth section.

In the fifth section the potential for developing cross-sectional economic data that may better represent the wider perspectives of the fishing industry is examined in relation to existing data sources. In the final section the potential future directions for the collection and presentation of economic data are explored in relation to likely pressures for change.

2. Economic data on the fishing industry

The definition of the fishing industry has progressively expanded from one largely based on the capture of fish in the wild and some limited farming of fish species, to one incorporating other users of the resources, and other industries that depend on the catching sectors. The Fisheries Research and Development Corporation (FRDC) defines the fishing industry as including any industry or activity conducted in or from Australia concerned with taking, culturing, processing, preserving, storing, transporting, marketing or selling fish or fish products (FRDC 2004, p24).

The FRDC definition of the fishing industry encompasses three sectors. These are

- Commercial production sector, incorporating
 - Wild catch industries;
 - Aquaculture sector; and
 - Post harvest sector, including importers of seafood products.
- Recreational sector
 - Including charter boat operators
- Customary sector
 - Covering indigenous fishing activities

Similar coverage of fishing activities is used elsewhere with variations. All State Fisheries departments, the Commonwealth Department of Agriculture, Fisheries and Forestry and the Department of Environment and Heritage have adopted similar definitions of catching sectors to encompass the major users of fisheries resources. However, responsibilities in relation to the post harvest sector usually reside with other government departments or with other areas of the same department.

Economic statistics generally are organised on an activity base, with the result that it is difficult to obtain information on a cross-section of the activities of the entire industry at any particular point in time. As statistics are on an industry base, most of the available information relates to commercial operations and very little exists on either recreational or customary fishing.

Supply of economic statistics

There are several organisations directly involved in the provision of public economic data and analysis. The most important of these are:

2.1 Australian Bureau of Agricultural and Resource Economics (ABARE)

ABARE is the economic research agency of the Australian Government Department of Agriculture, Fisheries and Forestry and has been undertaking research into fisheries issues since these functions were transferred to it in the mid 1980's. It has undertaken a wide range of research since that time and has also developed a number of ongoing information products and services, including the inclusion of fisheries industries in the national OUTLOOK conference. Most of ABARE's products are available for free download from their website www.abareconomics.gov.au

ABARE's main ongoing products that provide economic data and analysis on the fishing industry are:

(a) *Australian Fisheries Statistics*

Australian Fisheries Statistics was developed in 1990 to provide a range of economic data on the industry and has continued relatively unchanged to the present. It attempts to provide a summary of many of the key aspects of industry, including:

Fishery profiles – the fishing and management method used in each of the main fisheries together with the number of units licensed to operate in the fishery.

Gross value of production estimates, which are a compilation of fisheries catch data, aquaculture production estimates and value information. Three years data is provided, with the most current year estimated on the basis of incomplete returns while the two earlier years may be revised as the data collections are more completely analysed by the state fisheries authorities.

Catch data from fisheries is derived from logbook information provided by commercial fishers to state and Commonwealth fisheries management authorities as part of their access requirements. Aquaculture production information is generated from a variety of sources but usually from formal and informal surveys undertaken by staff of the state bodies responsible for aquaculture development in the State.

Value estimates are derived from a number of sources, depending on the main market chains for the product concerned. The objective is to value production ex vessel or at the farm gate, to provide an estimate that is consistent with those of other primary production used elsewhere in the National Accounts, such as for agriculture.

The main sources of value information are prices on the major wholesale markets, such as Sydney or Melbourne Fish Markets, or the prices paid by major processors to fishermen. While usually a range of values are obtained from different sources, for some industries this is not possible because of the structure of the industries involved. An examination of the accuracy of the estimates used is presented in section 5.

State value information is collected by the relevant authority through reference to the primary market in that state, and/or buyer surveys (usually fish processors). ABARE estimates the value of catches from Commonwealth fisheries, using a range of industry sources and the main Sydney and Melbourne markets. All values are reported in nominal terms.

Trade data

Information on trade in fisheries products is sourced from ABS data (cat. no. 5464.0). The data is provided monthly on tape classified according to Harmonised System (HS) product codes and is then grouped into like product categories, developed by ABARE, for publication. The information provided includes state of origin or destination, country of origin (imports) or destination (exports), volume, FOB value, some information on processed form and packaging, source and type of shipping used.

Fisheries trade data in *Australian Fisheries Statistics* is also grouped by country to provide information on bilateral trade in fisheries products to improve its use in identifying the importance of different trade links.

Australian Fisheries Statistics is published annually, usually in February. ABARE makes the publication available on the web (www.abareconomics.com) while FRDC distributes the printed version. It is estimated that around 2000 copies are distributed per year.

(b) Fisheries Economic Surveys

ABARE regularly undertakes economic surveys of operators in the main Commonwealth managed fisheries. The main purpose in undertaking the surveys is to provide fisheries managers at Australian Fisheries Management Authority (the Commonwealth fisheries management agency) and the Fisheries Branch within the Department of Agriculture, Fisheries and Forestry (the organisation with overall responsibility for AFMA fisheries management performance) with information on the economic status of fisheries under their management.

The surveys are undertaken through face to face interviews of a sample of industry co-operators, access to accounting records and landings information. Surveys of Commonwealth fisheries are generally undertaken on a two-year rotation and the results are published (Table 1 outlines the surveys published by ABARE since 2000, available electronically). The surveys provide information on changes in the main parameters affecting fisheries operations (changes in catches, catch composition, prices and costs), including the key management changes in the fisheries surveyed and other issues influencing the economic performance of operators in the fishery.

Table 2.1: ABARE Australian Fisheries Reports since 2000

Report	Fisheries	Years
Fisheries Survey Report 2004	East Coast Tuna - longline	2001-02, 2002-03
	Gillnet, hook and trap	2001-02, 2002-03
Fisheries Survey Report 2003	Northern Prawn	2000-01, 2001-02
	Torres Strait Prawn	2000-01, 2001-02
	South East Trawl	2000-01, 2001-02
Fisheries Survey Report 2002	Southern and Western tuna	2000-01, 2001-02
	Southern Shark	1999-00, 2000-01
	Southern squid jig	2000-01
Fisheries Survey Report 2001	East Coast Tuna	1999-00, 2000-01
	South east non-trawl	2000-01
	South East Trawl	1998-99, 1999-00
	Northern Prawn Fishery	1998-99, 1999-00
Fisheries Survey Report 2000	Torres St Prawn	1998-99, 1999-00
	East Coast Tuna	1997-98, 1998-99
	South east non-trawl	1997-98, 1998-99
	Southern Shark	1997-98, 1998-99
	Bass Strait Scallop Fishery	1997-98, 1998-99

As the methodology has been consistently applied for a significant period, ABARE fisheries surveys provide a time series of changes in the economic performance of the fisheries covered and information on the cost structure of those fisheries. The surveys provide a particularly useful means of examining the impact of management changes on fleet performance and identifying constraints to further gains.

(c) Australian Commodity Statistics

This is an annual compendium of statistics combining a range of data on macroeconomic and overview statistics with commodity data on agriculture, fisheries, forestry minerals and energy. The fisheries data includes some longer term (over 22 years) production and value of production statistics, sourced from *Australian Fisheries Statistics* and the earlier *ABS Fisheries* series (cat. no. 7603.0). All other statistics are sourced from *Australian Fisheries Statistics*.

(d) Australian Commodities

This is the flagship general ABARE publication, published quarterly. It contains research articles on a range of issues, including macroeconomic and trade impacts on the rural economy as well as specific research into agriculture, minerals and energy, fisheries and forestry. Included in the March quarter edition are annual forecasts of industry GVP and exports, major macroeconomic indicators and a range of other statistics as part of wider assessments of the economic changes affecting rural industries.

The data in this publication is useful in making inter-sectoral comparisons, such as identifying the contributions of the fishing industry to the economy, seafood exports to food and total rural exports.

Table 2.2: Fisheries in the rural economy

		2001-02	2002-03	2003-04	2004-05	2005-06(e)
Fisheries GVP						
Fisheries GVP	\$'m	2 430	2 284	2 167	2 059	2 152
Total farm and fisheries prodn	\$'m	41 915	34 772	38 982	37 420	39 306
Fisheries as percent of total	%	5.8	6.6	5.6	5.5	5.5
Fisheries exports						
Total fisheries exports	\$'m	2 100	1 844	1 652	1 542	1 590
Total food exports		26 585	22 284	22 089	23 966	25 963
Fisheries as percent of total	%	7.9	8.3	7.5	6.4	6.1
Total rural exports	\$'m	33 953	29 720	28 653	29 981	30 491
Fisheries as percent of total	%	6.1	6	5.5	4.9	5.2

Sources: ABARE *Australian Commodities*, March 2006, *Australian Food Statistics* 2005

(e) ABARE estimates

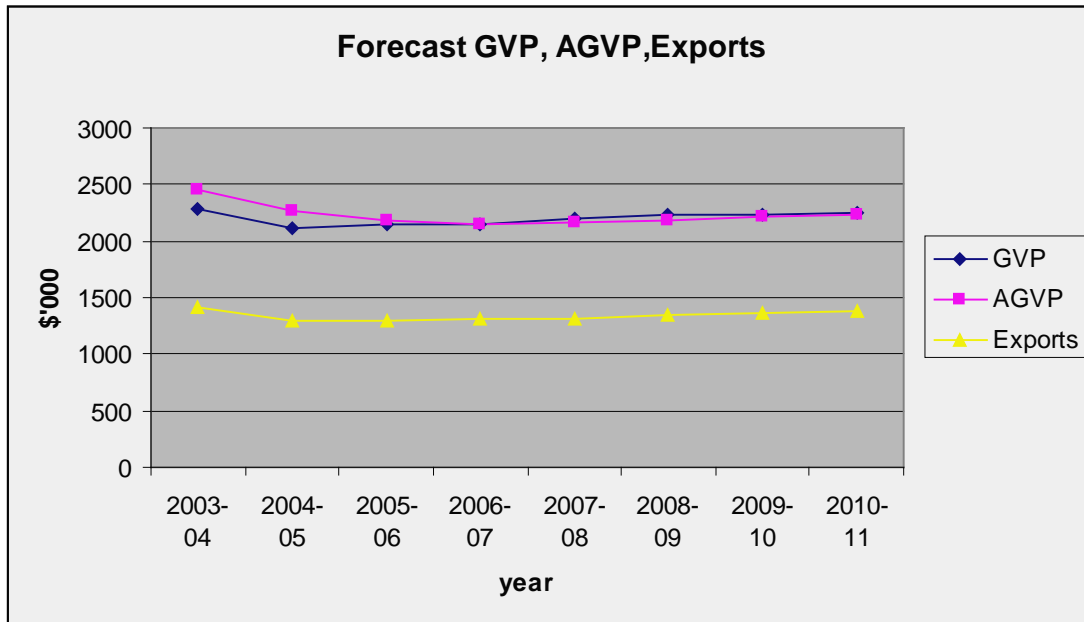
(e) Outlook Conference

In addition to coverage of macroeconomic and specific rural sector issues, ABARE's annual OUTLOOK conference incorporates specific sessions on fisheries every second year and has one session on outlook related issues.

Usually the presentations at OUTLOOK focus on longer term forecasts of fisheries GVP and the value of seafood exports, and examine the issues likely to affect the industry markets. In the OUTLOOK 2006 the forecast fisheries GVP was anticipated to slowly recover to near 2003-04 levels in real terms in 2008-09 (see Figure 1). The

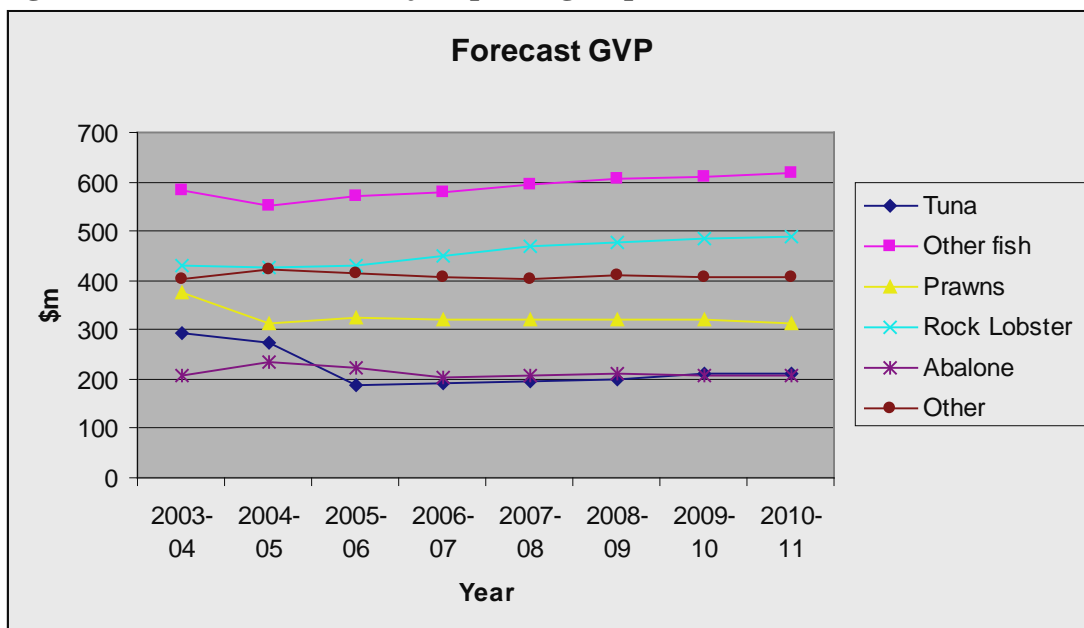
value of seafood exports (excluding pearls) was also forecast to slowly recover from the fall in 2004-05 but still remain below 2002-03 levels until 2010-11. The largest falls in real GVP were expected to be with tuna and prawns while the largest recoveries were expected in the GVP of rock lobster and other fish (figure 2) (Newton, Wood, Szakiel, Tedesco and Gooday, 2006).

Figure 1: Forecast Fisheries GVP Average GVP and exports



Source: Newton, Wood, Szakiel, Tedesco and Gooday, 2006

Figure 2: Contributions of major species groups to GVP



Source: Newton, Wood, Szakiel, Tedesco and Gooday, 2006

(e) Specific research projects

In addition to ongoing series, ABARE has undertaken a range of research that has a direct bearing on GVP estimation. For example, Love and Langenkamp (2003)

developed a profile of selected aquaculture industries, updating and expanding an earlier publication, which assisted in defining value and production of the aquaculture sector of the industry.

2.2 Australian Bureau of Statistics (ABS)

The ABS has overall responsibilities for public data collection. While it no longer collects and publishes specific fisheries production and value data (see below), it maintains several series that are relevant to the fishing industry and its contributions to the economy. Most ABS publications are now available free from the ABS website (www.abs.gov.au).

(a) Census of Population and Housing

The ABS Census of Population and Housing (the Census) is undertaken every five years, with the last undertaken in 2001. The Census provides the most complete enumeration of the Australian population and depends on self assessment of respondents, covering occupants in a household on a specific date (7 August 2001). Data is processed according to statistical local area, regions established according to the geographic area of responsibility of local government councils, and are aggregated, where necessary, into statistical districts within each state and territory to represent the major areas of population such as cities and large towns.

According to the 2001 Census, around 19 600 people were employed in the seafood industry, with 11871 employed in the catching sector and aquaculture, 5540 in seafood wholesaling and 2213 in seafood processing (table 2.3). This is believed to be an underestimation of actual employment levels in the industry, and inconsistent with other information, such as vessel registrations (see Section 5.7). A full list of seafood industry employment by state, district and Statistical Local Area for those areas where the seafood industry is a significant source of employment is shown in Appendix 1.

Other sectors included in the FRDC industry definition cannot be identified in the census data. For example, bait and tackle retailing (9519) is incorporated within sports and camping retailing. The statistics do not distinguish between different types of cafes and restaurants and it is not feasible to examine the employment growth associated with seafood restaurants within this sector.

Table 2.3: Employment in the fishing industry, 2001 Census

Category	NSW	Victoria	Qld	SA	WA	Tas	NT	ACT(a)	Total
Commercial fishing undef	724	311	816	459	493	249	94	6	3152
Marine Fishing, undefined	196	24	230	66	35	19	10		580
Rock Lobster	54	145	70	221	722	242	5		1459
Prawn	223	6	472	109	150		80		1040
Finfish trawling	93	26	90	40	27	9	3		288
Squid jigging	3	6		3	3				15
Line fishing	12	6	31	26	10				85
Marine Fishing nec	135	101	160	171	210	205	49		1031
Aquaculture	926	320	592	764	601	846	166	6	4221
Wholesaling	1333	856	1473	583	742	455	79	19	5540
Processing	303	269	377	457	239	545	20	3	2213
Total	4002	2070	4311	2899	3232	2570	506	34	19624

(a) ACT includes Cocos Island and Queanbeyan

Manufacturing Industry (cat. no. 8221.0)

The seafood processing industry is covered by ABS as part of the Manufacturing Survey that assesses economic activities of the processed food and manufacturing industries. Prior to 2001-02, the statistics were collected on the basis of a census of all establishments every five years and a sample survey in other years. Full details were collected on around 7000 companies.

Beginning with the 2001-02 collection, major changes were implemented, with a shift in the base from manufacturing establishments to manufacturing businesses¹. This resulted in a loss of detail on individual establishments but an increase in the accuracy of overall manufacturing sector estimates because of the higher sampling of a smaller population.

The survey population is drawn from the Australian Taxation Office Australian Business Number (ABN) register. The ABN framework requires details of the industry that the entity operates in. The fishing industry is specifically identified. Fishing is defined as catching, gathering, breeding and cultivation of marine life from ocean, coastal and inland waters. The subsequent question relates to the main activity from which the entity derives the majority of its business income. Some assistance is provided in defining specific industries, such as wholesale industries (selling to other businesses) and retail industries (selling to householders) but the response is open.

An important consideration is accurate definition of the seafood processing population. For many seafood processors, wholesaling and exporting are both major activities so it is difficult to assess whether firms in the seafood industry are covered by the manufacturing survey or under wholesale industries (outlined below).

Table 2.4: Seafood processing sector financial performance indicators

		2001-02	2002-03
Sales income (a)	\$m	1594.8	1575.3
Wages and salaries (b)	\$m	278	132.9
Industry value added ©	\$m	637.6	225.2

Source: ABS Manufacturing, cat. no. 8221.0

- (a) includes rental and lease income
- (b) Excludes the drawings of working proprietors
- (c) Industry value added is a measure of the value added by an industry to the intermediate goods used. It is measured as sales and service income plus government funding of operational costs plus capital work done for own use plus closing inventories minus opening inventories minus intermediate good expenses (d) less capitalised purchases.
- (d) Intermediate good expenses include purchases of materials, packaging, electricity and water; goods for resale; motor vehicle running expenses; freight: repairs and maintenance; rent and leasing expenses; contract subcontract and commission expenses.

Wholesale industries (cat. no. 8638.0)

The ABS defines a wholesale business as one which is primarily engaged in the resale of goods to other businesses or institutions. Businesses engaged in wholesale trade are merchants who take title to the goods they sell, separate sales branches (not retail stores) operated by manufacturers, commission agents, import and export agents, purchasing agents and cooperatives and marketing boards. Where there are overlaps

¹ A manufacturing business may operate a number of manufacturing establishments.

with processing (included in Manufacturing) the key criteria is where the operation derives most of its income.

The wholesale survey is only undertaken once every six years with the last survey undertaken in 1998-99 and the next due in 2005-06. Table 2.5 shows the main statistics from the 1998-99 survey.

Table 2.5: Seafood wholesale sector financial performance 1998-99

No of management units	no	430
Employment	no	3641
Total sales income	\$m	1637.5
Other income	\$m	49.5
Costs		
Purchases	\$m	1423.9
Labour	\$m	105.4
Other	\$m	123.5
Total expenses	\$m	1652.8

Source: ABS Wholesaling, cat. no. 8638.0

Retail Sales (cat. no. 8510.0)

This publication provides broad information only on monthly and annual retail sales by aggregate groupings of outlets. The main food retailing categories are:

- Supermarkets and grocery stores
- Takeaway food outlets
- Cafes and Restaurants
- Other Food Retailing

Fish retailing is covered within Other Food Retailing and is combined with fresh meat and poultry retailing (ANZSIC code 5121) and not identifiable separately. Food retail sales are also published by DAFF in *Australian Food Statistics* in both hardcopy and electronic formats (foodinfo@daff.gov.au).

ABS Fisheries (cat. no. 7603.0)

Prior to 1985 ABS collected and published production and gross value of production (GVP) statistics in but increasing gaps in data and budget cutbacks resulted in the termination of series. ABS also undertook processing of state catch data for Western Australian Fisheries. ABS now relies on *Australian Fisheries Statistics* as the source of data on fisheries production and gross value of production.

Consumer Price Index (cat. no. 6401.0)

Average Retail Prices of selected items (cat. no. 6403.0)

The Consumer Price Index is the official record of changes in retail prices. The index is constructed by weighting the changes in prices for a basket of goods purchased in each capital city. Seafood representation is limited with the series covering only canned and packaged fish, while the weighting given to these products is around 3 per cent of food consumption expenditure. State data is also published (cat. no. 6401.1-6)

Apparent Consumption of Foodstuffs (cat. no. 4306.0)

Apparent consumption data is generally calculated as the difference between domestic production and net trade outcomes.

Production *less* exports *plus* imports = total apparent consumption.

The accuracy of any apparent consumption estimates depends on reliable production estimates and comparable data for exports and imports.

Table 2.6 Apparent Consumption of seafood, 1997-98 and 1998-99

	1997-98			1998-99		
	Fish Australia n	Fish Importe d	Crustaceans Molluscs	Fish Australian	Fish Importe d	Crustacean s Molluscs
Commercial production Estimated home production	73725		38312	71598		39946
Imports	13189	77217	5170	12888	84040	5368
Exports	14246	314	24712	16002	116	25791
Apparent total consumption	72647	76903	16870	68385	83924	17131
Per person (kg)	3.9	4.1	2.8	3.6	4.5	2.9

Source: ABS, Apparent Consumption of Foodstuffs, cat. no. 4306.0

For fisheries products apparent consumption data is reported as edible weight. A basic issue is the determination of a standardised weight measure. Fish and seafood consumption is either measured as edible weight or liveweight, to allow addition of different product forms. Catches are recorded as liveweight while trade is measured as product weight, thereby requiring the need for conversion factors to establish the edible weight of domestic catches and its relationship to trade.

A second issue is seafood consumption from non-commercial sources. Catches by recreational fishers represent a significant source of consumption. The National Recreational Fishing Study undertaken in 1999-2000 reported total recreational catches of fish as 33 000 tonnes liveweight and 3 000 tonnes of crustaceans and molluscs (see table 5.1). This suggests that the allowances for home production may be too low for fish and too high for crustaceans and molluscs. The next publication of apparent consumption data is due to cover 2005-2006.

Household Expenditure (cat. no. 6530.0)

This survey is undertaken as part of a wider survey of household income and income distribution (cat. no. 6523.0) undertaken every five years. The 2003-04 Household expenditure survey is based on expenditure diaries completed by a sample of 6957 households and provides very comprehensive detail on expenditure by state, capital city and by household income quintile. Expenditure on fisheries products is separated into fresh, frozen, canned and other fish and seafood. Data is also provided on expenditure on meals eaten outside the home (table 2.7).

Table 2.7 Average weekly household expenditure on fish and seafood 2003-04

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Aust 1,128
Household income/week \$	1,212	1,134	1,036	1,033	1,098	897	1,401	1,399	8
AVERAGE WEEKLY HOUSEHOLD EXPENDITURE (\$)									
Fish and seafood	4.64	3.92	3.21	2.82	3.42	3.10	3.41	4.17	3.85
Fresh fish and seafood	2.73	2.02	1.44	1.15	1.59	1.87	1.41	2.10	2.02
Frozen fish and seafood	0.48	0.60	0.64	0.39	0.71	0.46	0.46	0.61	0.56
Canned and bottled	1.15	1.10	1.00	1.03	0.93	0.67	1.33	1.27	1.07
Fish and seafood nec	0.22	0.14	*0.09	0.06	0.10	*0.09	0.14	*0.08	0.14
Fish and seafood nfd	*0.06	*0.05	**0.03	*0.18	*0.09	**0.01	**0.07	**0.11	0.06
Meals out and fast foods	47.79	43.33	35.70	36.59	36.83	32.87	47.87	58.22	42.1
Restaurants, hotels, clubs	22.66	20.44	13.65	16.36	15.38	14.46	19.45	29.64	18.98
Fast food and takeaway	24.82	22.61	21.77	19.90	20.90	18.23	27.91	28.13	22.79
Other	0.31	0.28	0.28	0.33	0.54	*0.18	*0.52	**0.45	0.32

nfd not further described, **nec** not elsewhere included

* rse is between 25 and 50 per cent and should be used with caution

** rse is greater than 50 per cent

Source: ABS Household expenditure survey, cat. no 6535.0

The household expenditure survey also provides information on the relationships between household income and food expenditure. As would be expected there is a strong relationship between household income and expenditure on fish and seafood with households in the highest income quintile (the top 20 per cent of households classified by income) spending nearly two and a half times the amount spent by the lowest quintile, mainly on fresh fish and seafood.

The differences in household expenditure are much greater in relation to spending on meals eaten outside the home. Weekly expenditure on meals eaten at restaurants hotels and clubs and on takeaway food by households in the highest income quintile was more than six times higher than for the lowest income quintile (table 2.8).

Table 2.8 Average weekly household expenditure on fish and seafood in 2003-04, by income quintile; \$ per week

Income Quintile	Lowest	Second	Third	Fourth	Highest	All households
Fish and seafood	2.50	2.92	3.59	4.12	6.16	3.85
Fresh fish and seafood	1.30	1.42	1.75	2.07	3.54	2.02
Frozen fish and seafood	0.38	0.47	0.64	0.62	0.69	0.56
Canned and bottled	0.71	0.90	1.00	1.20	1.53	1.07
Fish and seafood nec	0.08	0.07	0.14	0.16	*0.27	0.14
Fish and seafood nfd	*0.02	*0.05	*0.05	*0.06	*0.13	0.06
Meals out and fast foods	13.11	22.52	39.70	51.59	83.66	42.10
Restaurants, hotels, clubs	6.46	9.72	17.15	21.26	40.37	18.98
Fast food and takeaway	6.57	12.66	22.25	29.78	42.76	22.79

Other	**0.08	0.14	0.30	0.55	0.53	0.32
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Source: ABS Household expenditure survey, cat. no 6535.0

International Trade (cat. no. 5464.0)

The international trade data is based on data reported to the Australian Customs Service by customs agents and subsequently edited by the ABS. The data is classified according to an internationally agreed Harmonised System framework (known as AHECC for exports and HTISC for imports) that theoretically allows for comparison of trade between countries and between exports and imports. It is broken into a seven digit code for exports and a nine digit code for imports, covering combinations of species, common names, processing, preservation and pack sizes. There are 183 codes currently used for live fresh or frozen seafood exports and a further 81 codes used for processed seafood. Fresh or frozen seafood imports are covered by 195 codes and around 84 codes for processed products. However, the codes are periodically revised.

Information is collected on species (often grouped according to genus), product form (fresh or chilled, frozen, processed (fillets, dried, canned cooked etc)), weight and value, destination, mode of transport and origin. For some imports, the actual species involved is not specified despite their importance in trade. The descriptions often relate to Northern Hemisphere trade so relatively few species relevant to Australian domestic fish trade are represented. Two examples are imports of Nile Perch and Vietnamese Basa, both involving significant trade but unidentified except by country of origin.

Some of the groupings also result in errors. For example, Australian salmon imports from New Zealand are included with other salmons (such as Atlantic salmon) resulting in a lower reported average unit value for the category than should be the case. Australian salmon is imported as bait and has a low value. This issue has previously been raised with no changes likely.

The ABS data is accessible for any code. Data is processed and available monthly for a charge. However, it is usually quite difficult to accurately identify requirements because of the large number of species in trade and the structure of the data. As many of the distinctions are based on the level of processing then the species it is easily misclassified. The extent of misclassification of products and misreporting of products and values is difficult to assess but there is often high variation in values over a year within a classification, suggesting that there may be significant errors from this source.

A second source of potential error is in the information provided by traders to Customs. Traders or their agents are required to classify the product traded according to the Harmonised System, identify the destination, shipping and the value. Many items are sold on consignment so that the actual price received is not known at the time of providing data to customs. There can also be incentives for undervaluation of the product involved, and opportunities to misclassify the product because of the sequential nature of the classification system itself. While some of these problems are picked up during the ABS editing of the data, undoubtedly many are not discovered.

The ABS trade data can be used to provide a range of information important in monitoring fishing industry developments (further discussed in Section 3.3 and

Chapter 6). This includes exports by state, and exports to a specific country or group of countries (such as trade with APEC countries) and examination of the mode of transport used. For example, airfreight is a significant mode of transport for seafood exports, accounting for more than one third of total seafood exports. Seafood, in turn, represents around half of the value of airfreighted food (table 2.9).

Table 2.9 Australian airfreight exports of seafood

		2000-01	2001-02	2002-03	2003-04	2004-05
		\$m	\$m	\$m	\$m	\$m
Live or Fresh						
	Fish	244	238	192	186	133
	Shellfish	549	552	445	404	411
		793	790	637	590	544
Frozen Processed						
	Seafood	38	45	34	38	35
Total Seafood		831	835	671	628	579
All Food and Beverages		1568	1672	1436	1262	1267
Seafood/Total	%	53	50	47	50	46
Airfreight/Total	%	38	39	34	37	38

Source: ABS, unpublished data, *Australian Food Statistics*

2.3 Other economic data

Economic surveys

Economic surveys are undertaken in several states. In South Australia, an annual state of commercial fisheries study, based on industry surveys, is undertaken by an independent consulting group for the Department of Primary Industries and Resources South Australia (Econsearch 2004). In 1999 an economic survey was undertaken of all commercial licence holders by the Queensland Department of Primary Industries (Taylor-Moore 1999). Both studies were consistent in approach to that used by ABARE. There have been several studies of the economics of individual state fisheries based on individual economic surveys.

Market data

Some domestic trade databases are also important providers of economic information on the industry. The Sydney Fish Market (www.sydneyfishmarket.com.au) provides a high quality price information database on daily and weekly sales on that market by species, grade, processed form and the like, that enables detailed analysis of price and supply trends. This data is now only available to traders registered with that Market and their access is restricted. Melbourne Fish Market is currently developing a website but detailed prices are generally available.

International data

The Food and Agriculture Organisation of the United Nations maintains two extensive databases on fisheries. The first, fisheries production by country lists production by species for all FAO member countries. The second is an extensive trade database covering exports by product and by market. The FAO fisheries website is at apps.fao.org and the individual organisation's sites, such as Infofish and Globefish, can be accessed on subscription.

The FAO also maintains country profiles in fisheries on their website. For Australia this contains general economic and geographic data, catch and utilisation tables for 2001 and a description of Australian fisheries contribution to the economy. It is of note that the reported values of trade do not correspond with those of AFS while there are also a number of questionable statements (such as that all Australian fisheries remain highly profitable).

Most countries maintain internet accessible trade databases organised according to the Harmonised System guidelines, although the aggregations of codes may vary. Generally, it is feasible to develop supply and use tables for most products traded by Australia to establish the sources of all products supplied to specific markets. There is less information on the supply of different forms and prices for different categories of product. For this information it is usual to refer to trade publications, such as *Infofish*, available on subscription.

The United States National Marine Fisheries Service also maintains a comprehensive website www.nmfs.noaa.gov/st1/publications that provides information on both the US and the Japanese seafood markets.

2.4 Catch information

State and Commonwealth fisheries data

Most Australian fisheries fall under state jurisdiction. In 2002-03, over 85 per cent of the total value of wild catch and aquaculture production was derived from within state boundaries as well as nearly all recreational fishing activity. All states maintain a fisheries web site, with varying levels of economic data available on the fisheries under their jurisdiction. These vary widely in format.

New South Wales

Fisheries not available online

Aquaculture www.fisheries.nsw.gov.au/data/assets/26974/Production-Report-0304.pdf

Victoria

Fisheries production www.dpi.vic.gov.au/DPI/nrenfaq/nsf/

South Australia

www.sardi.sa.gov.au/pdfserv/aquatics/fish_stats/2003_04_prodn_new.pdf

www.pir.sa.gov.au

Western Australia

www.fish.wa.gov/docs/sof.

Queensland

www.chrisweb.dpi.qld.gov.au

Aquaculture not available online

Tasmania

www.dpiwe.tas.gov.au

Northern Territory

www.fisheries.nt.gov.au

Commonwealth Fisheries

www.afma.gov.au/information/fishery/data_summ

There have been major improvements in industry coverage in most states. The approaches adopted by Western Australia and by Queensland in relation to information dissemination provide a contrast of the approaches in use. Western

Australian Fisheries produce an annual *State of the Fisheries* report that, since 2000-01, integrates commercial and recreational fisheries and the aquaculture industry according to region (West Coast, Gascoyne, North Coast and South Coast bioregions) (www.fish.wa.gov/docs/sof). The latest report covers 2003-04.

For each main fishery, the report provides information on the fishery, governing legislation, consultation processes, and management processes. The research summary includes total landings, fishing effort, catch rate and recreational catches. The report includes the latest stock assessment and report on breeding stock levels as well as projected catch (in the case of Western Rock Lobster), interactions with non target and protected species. Other aspects reported include social impacts, economic effects as well as new management initiatives. However, to establish state estimates it is necessary to aggregate across a range of individual reports.

By comparison, Queensland Department of Primary Industries production estimates are maintained on an extensive database. The Coastal Habitat Resources Information System (CHRIS), developed by the Department, provides information on commercial and recreational catches (www.chrisweb.dpi.qld.gov.au). For the commercial sector the database allows for extraction of catch by species and area, number of boats and number of days fished, catch by month and GVP for each species. The data covers catches by month from January 1988 to December 2003. Coverage of recreational catches is more limited, restricted to reporting the results of the 1997 survey is displayed, although there is a recreational survey planned in 2006. It would seem desirable to include the Queensland results from the 2000-01 national survey. However, there is always potential for errors in interpretation of databases without explanation of the data details.

Fisheries assessments

A very considerable amount of biological information on a fishery has been prepared by fisheries management authorities in the form of *Fisheries Status Reports* to meet the requirements of the Environmental Protection and Biodiversity Act 1999, (see www.deh.gov.au/coasts/fisheries). administered by the Commonwealth Department of Environment and Heritage. Under the Act, approval to export product from the fishery can be withdrawn on the Department's advice if fishing activities are deemed unsustainable. Approval is given to export for a set period of time before new status reports are required.

3. Applications of economic statistics on the fishing industry

Economic statistics are an important part of the information mix required to address a range of issues in an industry. While there is a large volume of information published on the fishing industry, most of this relates to the scientific or administrative issues associated with use of fisheries resources. There is still relatively little economic information on the industry, or on the issues facing it, particularly at a national level.

The original intention in developing *Australian Fisheries Statistics* was to address the information needs of both government and industry on the fishing industry, to provide information comparable to that provided for agriculture. However, the needs have changed significantly. It is now the official measure of the value of industry production and consequently has considerably greater demands placed on it.

The demand for economic statistics has also changed significantly. The industry faces a wider range of issues that require a different mix of information to assist in their resolution. Consequently, a review of some of these demands in relation to the level of public information is warranted. These applications can be broadly grouped as:

- Maintaining the profile of the fishing industry to the wider community;
- As an aid in policy development and review, and in performance assessment;
- To provide information to the fishing industry and suppliers of goods and services to the industry to assist industry development; and
- As an input to administration, such as determining research funding levels.

3.1 Profile of the industry

Many sectors of the fishing industry access a public resource for the generation of economic benefits, so public perceptions of the industry, its use of resources and the benefits that flow to the community are crucial to the overall health of the industry. Data on commercial catches, their value and the use made of those catches are all important in establishing the level of resources and conditions of access.

The principal need is for economic information that while straightforward, adequately represents the activities of the Australian fishing industry. A major area of payoff to publication of *Australian Fisheries Statistics* is that it is an efficient resource for handling inquiries in relation to the fishing industry in Australia, both at Commonwealth and State levels. However, the publication provides only a partial cross-sectional profile of the industry.

Additional information is desirable if the publication is to provide an adequate cross sectional representation of the industry. Information on the value added by the processing and wholesale sectors would be valuable in terms of determining their overall contribution to the economy from using the fisheries resources. Another such area is industry employment. There is little robust information on employment, particularly in relation to the catching sector and aquaculture.

At present the only information available is of commercial catches, exports and imports. The absence of 'gates' that allow for efficient measurement prevent routine assessment of domestic utilisation. However, many of the elements of the domestic supply chain (processing and wholesaling) are monitored but within different

frameworks. Seafood processing information is collected as part of information on the manufacturing sector, not as an element of the seafood supply chain. Information is lost on the linkages between sectors in this approach. Consequently, it is difficult to identify the relationships.

As many decisions in relation to fisheries development are made on a State base it is important that the post harvest implications be considered. At present there is very little information available on the post harvest sectors in each State and this should be remedied. With the changes to ABS data (discussed in Section 2) State data is no longer available from this source.

Specific information in relation to state fisheries catches can now be accessed through state fisheries websites. However, neither the ABARE publication nor the state fisheries sites have links with these other sources.

3.2 Policy development and review

The main users of national economic statistics on the fishing industry are those involved in policy development and review. The quality of the information available has a major impact on the efficiency of policy development and implementation processes, both by government and industry.

Changes in gross value of production estimates are often used incorrectly as a proxy for changes in industry profitability. Such data takes no account of changes in costs and management, and consequently may provide a misleading indicator of industry efficiency changes. There is a need for economic surveys of operators to provide this information and to provide other information important to the industry, such as the level of industry capitalisation, and the excess capacity in individual fisheries.

Fisheries management, and reviews of that management, require economic information from surveys and market information to complement the biological data collected to develop an accurate representation of the fishery and enable better evaluation of management options. Most of the economic information used in review of fisheries management arrangements at the Commonwealth level at least is based on economic surveys of the industry to ascertain the economic resources being applied in that fishery. It has been consistently argued that the goal for fisheries management should be to maximise economic yield from the fishery rather than maximum sustainable yield, and this would lead to outcomes more consistent with resource conservation objectives (see, for example, Kompas 2005). Such an approach requires information on fishing costs over the range of fishery yields and information on prices.

Market information can also provide management with early warning of possible problems. Using market information on the volume of catches and prices is an effective means of assessing developments in a fishery and can highlight some management problems. For example, market information on changes in the grade composition being marketed can shed light on developments in the fishery, such as changes in the abundance of fish of particular age cohorts.

Apart from the specific demands for economic information in managing the public property aspects of fisheries, there is a need for information to address other industry

issues. *Australian Fisheries Statistics* is extensively used in addressing trade policy issues, such as the possible impacts of bilateral trade agreements on the industry exports and the impacts of exchange rate changes. Import risk assessments also depend extensively on the availability of fisheries trade information.

The fishing industry is an important contributor to state economies and regional economies. The fishing industry makes an important contribution to many regional economies. The industry is a primary employer in several regions, such as Port Lincoln, Geraldton and Eden and is significant in others (see appendix 1). Aquaculture is a strong growth industry at a time when there is a search for greater diversity in economic activities in rural areas.

The availability of suitable economic information is an important prerequisite to obtaining effective government responses for the industry, particularly given its diversity in activities and its spread. Policy issues arise in common with other rural industries, such as in marketing issues, the provision of infrastructure and training. The existence of quality current information on the industry, its prospects and issues assists in local government planning processes.

National databases do not address these issues well. While state fisheries data can identify regional fishing and industry development patterns from their catch databases there is not comparable economic and social data. The main current source of such data is the ABS Census, which has important deficiencies as a data source on fishing industry employment and does not provide the information required for these decisions (discussed in Section 5).

3.3 Economic statistics and industry development

Commercial industry development is an important part of commercial fisheries R&D. Cost-price pressures, increasing competition on domestic and export markets from new products and changes in both domestic and export markets all represent major forces for change. Demographic changes in seafood markets and trade access issues may have significant longer term impacts on the fishing industry. Much of the strong growth in fisheries GVP over recent years has been due to favourable exchange rates and an industry adept at export marketing.

Trade

Strong emphasis on international trade has increased the demand for economic information on that trade. The development of bilateral trade agreements with the United States, Thailand and potentially China, and an increased emphasis on non-tariff issues, such as phytosanitary requirements, has all increased the need for information. Risk assessments require detailed information in relation to the composition, characteristics and sources of imports and the markets for exports. It is also desirable to have information on the characteristics of those markets to facilitate both the industry and government in their assessments of risks and opportunities.

For some sectors of the industry there may be high payoffs from active monitoring of trade developments because of the potential impacts that imports can have on their operations. Prawn and salmon producers, among others, face significant direct competition from imported products and, while some producers may have the necessary size economies to meet those challenges, it is important to ensure that all

producers have access to information on the level and composition of supplies on the market.

Trade information can also assist producers in targeting appropriate markets and monitoring developments that are likely to impact on their operations. While large producers may have access to such information it is unlikely to be universal, bearing in mind that the large majority of aquaculture licenses are held by small producers.

The difficulties to all industry participants in accessing information on fisheries trade is a major weakness in current arrangements surrounding fisheries economic statistics. Such statistics need to be current and capable of direct interrogation. The New Zealand fishing industry has access to such data on a monthly basis.

Aquaculture industry development

The aquaculture industry has emerged as an important component of the fishing industry since the inception of Australian fisheries statistics in 1991. Moreover, there has been a strong focus on expanding the industry with the establishment of the National Aquaculture Council and development of the National Aquaculture Strategy to define a path for this growth.

The aquaculture industry umbrella comprises a range of industries in different stages of development. The GVP of the industry in 2003-04 at the farm gate was around \$730 million, with the majority of this derived from southern bluefin tuna, pearls, Atlantic salmon and prawns. However, there is a significant small industry component. Of the 3200 aquaculture licenses in Australia, 60 per cent were for freshwater aquaculture which accounted for around 4 per cent of aquaculture GVP.

There are a number of demands for economic statistics in the aquaculture sector. To demonstrate the importance to the regional and national economy of the industry, it is important to have accurate estimates of GVP and employment levels together with some estimates of regional flow-on effects. Given that many sectors of aquaculture are emerging they have to compete for resources with more established industries it is important to have information on a regional base. As many also use public resources it is also often necessary to be able to demonstrate net public benefits comparable to other uses.

Economic statistics also assist the aquaculture industry in obtaining access to funding. In a recent examination of information requirements of aquaculture investors, bank loans managers commented that there tended to be a lack of good current information on the aquaculture industry. It was difficult to access the same level of public domain information as other rural sectors (Love 2004).

While the study found no intrinsic distortion to capital market for aquaculture, it found that aquaculture experts, financiers and joint venture specialists do regard the lack of information on the current state of the industry and its prospects as an impediment to the industry. The report suggested that government and industry may have a role in developing such information through an ongoing survey or reporting.

There have also been a number of requests to improve the availability of domestic market information. While there is some information available on prices at the main centres, it has generally been necessary to supplement this data with information on

other factors, such as the quality and developments in other, less visible, markets. Moreover, reduced access to market information from the main centres (discussed in Section 2) will represent a significant loss to the aquaculture industry.

Infrastructure

There are many other industries outside of the fishing industry itself with an interest in fishing industry developments, which require information to facilitate their activities, such as banking and freight. The existence of good economic information on fishing industry developments assists in provision of those services.

While lending institutions require considerably more detail on financial and physical parameters of the individual operation as the basis for lending, the existence of readily accessible economic information on the industry could be expected to have a large impact on the industry's treatment by lending institutions, particularly because it lowers the search costs faced by those institutions in establishing performance benchmarks. Moreover, the economic statistics provide lending institutions with independent verification of the industry's production history as well as some of the key issues that may arise.

While it is difficult to establish independent verification of costs and output parameters for an individual operation, industry-wide economic statistics can provide some benchmarks for the sector, such as the average farm gate price, aggregate production and some information on distribution between domestic and export markets.

3.4 Roles in research funding processes

Fisheries statistics have several main roles in the research processes.

- They are used in determining the level of funding to FRDC and the levies to be met by the industry;
- They make an important contribution in identifying research priorities;
- They should help in determining whether these objectives were met.

Determination of research funding

The government's funding of fisheries research is substantially based on the resulting public good. The government's contribution of 0.5 per cent of fisheries GVP is made on the grounds that the government exercises a stewardship role in relation to fisheries resources on behalf of the Australian community (FRDC 1994, p168).

The industry makes its contribution to research and development (a goal of around 0.25 per cent of GVP) recognising that it will deliver economic and social benefits to it. In turn, the Government's matching of industry contributions up to 0.25 per cent of GVP is in line with general policy principles that:

- The beneficiaries of research should pay roughly in line with the benefits they receive.
- The greater the spillover of benefits the greater the proportion that the government should contribute.

This function imposes two main requirements on developing the estimates:

- The timing of development of estimates needs to fit with the Australian Government Budget processes and with the processes associated with the

collection of industry levies by the DAFF Levies Collection Unit under the Collection Act.

- The estimates must accurately reflect industry GVP as this accuracy has a direct impact on the level of research funding.

Robust statistics on production and ex vessel or farm gate values are required to apply the fisheries research funding model. Many sectors have agreed to meet the research levy at least 0.25 per cent of average GVP². It is important therefore that these industries accept the GVP value and its basis for calculation. However, the basing of industry levies on GVP does provide industry with incentives to under report values.

These statistics are required on an industry, state and probably a regional base if the management of research funds is to meet its equity requirements.

Project selection and review

All project selection processes require information on the likely payoffs to that research to ensure that funds are allocated as efficiently as possible. Depending on the area addressed, there are various types of market and non-market benefits that may need to be compared to develop rankings of projects.

The factors influencing the likely payoffs to research include

- size of the fishery and scope for adoption
- impact on costs and prices
- spillovers of benefits to other sectors
- potential for dissipation of benefits, including
 - the existence of excess capacity in the production sector
 - number of close substitutes
 - potential for leakage to overseas competitors.

Other considerations include the source of funds and regional impacts. Under Ministerial Direction of May 1995 spending of industry contributions is to be of direct relevance over a five year period to the fishery, industry sector or state in which funds were collected. Regional impacts are also to be considered.

While existing data can provide considerable guidance in relation to some aspects, such as the size of the fishery and potentially a baseline for costs and prices in Commonwealth Fisheries, additional information would be required for a framework for project selection and review. The key areas would be to build information on costs for state fisheries, prices along the supply chain and the level of excess capacity for all fisheries.

Financial reporting

Economic statistics are important in meeting FRDC's program reporting obligations. The FRDC (as with other Commonwealth programs) is required to report on the outcomes of its investment in research in several different frameworks. FRDC reports in relation to the PIERD Act under which it operates through its Research and Development Plan, Annual Operating Plan and Annual Report.

² Several industries have contributed more than the 0.25 per cent (see table 7 2003-04 FRDC annual report)

FRDC is also required to address a range of criteria and use the outputs and outcomes framework established by the Department of Finance and Administration (DOFA) to evaluate programs. This framework requires performance assessments to be undertaken to establish whether the program goals (the outcomes) have been met.

There are challenges in developing effective performance indicators and in applying the framework in the FRDC research management context. Some of the measures currently used to assess individual programs bear little relationship to the planned outcome. An example is for the Industry Development Program (Program 2). The planned outcome is that the commercial sector is profitable and internationally competitive, and the commercial, recreational and customary fishing sectors are socially resilient (FRDC 2004, p72). The measure is that industry GVP increases.

The difficulty is that the indicators and measures selected bear little relationship to the planned outcomes. Changes in either the level of catch or the value of production have very limited bearing on either the profitability or the competitiveness of the commercial sector (because costs are unknown). Moreover, strong role of external factors, such as changes in exchange rates, make it difficult to establish the contribution of the development program to the measured outcome and conclude whether the program goals have been met. More appropriate key performance indicators are required.

4. Issues associated with Australian fisheries statistics

The use of GVP data as the basis for establishing the level of research funding allocated to FRDC raises several issues that require further examination. In this section some of the main issues are examined in greater detail.

4.1 Definition

The definition of the fishing industry adopted by FRDC is significantly wider than the commercial production focus of *Australian Fisheries Statistics*. The FRDC definition covers

- Commercial production, which includes the
 - Wild catch sector
 - Aquaculture sector
 - Post Harvest sector, which includes importers of seafood products
- Recreational fishing, which includes charter boat operators; and
- Customary Fishing (otherwise known as indigenous fishing).

Fish is defined to include living vertebrate and invertebrate organisms, including marine mammals and reptiles, and such organisms after they have been harvested (FRDC Annual Report 2003-04, p34).

The definition of the fishing industry used in *Australian Fisheries Statistics*, and in industry statistics generally, reflects the coverage of fisheries management regulations when the statistics were first developed in the case of the wild catch sector, and regulations applied to the aquaculture industries of each state. For example, the ABS defines the fishing industry as catching, gathering, breeding and cultivation of marine life from ocean, coastal and inland waters. The ABS defines the post harvest sector as a separate entity and does not include either recreational or customary fishing. In fact, large parts of recreational and customary fishing are not regarded as industries because participants do not derive income from their activities.

For aquaculture, the main differences relate to crocodile farming and hatchery production. The latter is excluded because of difficulties in valuation, as some of the main hatcheries are involved in restocking inland waterways while some are research establishments, and difficulties in publishing data while maintaining confidentiality rules³. As a marine reptile, crocodile production is excluded from fisheries production statistics. The feasibility of expanding economic statistics to cover other components is examined in Section 5.

4.2 Data accuracy

There is always potential for error in GVP estimates in the absence of verifiable systems for recording of catches and valuation of the products involved. Moreover, with the introduction of industry levies for research based on the value of production there are incentives to understate the value of catches or of aquaculture production.

Catch data

The production data is generally sourced from logbook information for capture fisheries and from producer surveys for aquaculture production. There are many

³ The standard rule of confidentiality used is that for details of an activity to be published separately there must be five or more operators in that activity.

aspects of data collection procedures that can influence the accuracy of the production data used in the statistics and consequently the GVP of commercial fisheries.

- Logbooks used to measure catch and effort in the wild fisheries are the principal source of catch statistics in state fisheries and these rely on the cooperation of operators in those fisheries to accurately record catch levels, often under difficult conditions. Usually there is significant reliance on operator recall because the logbooks are completed after the fishing operations are finished.
- The logbook design can have an impact on the accuracy of the data collected. Generally there are tradeoffs between the amount of information sought and the accuracy of the information provided. Logbooks also vary in terms of the amount of information collected on non-target species.
- There is potential for misclassification of fish species. Many species have multiple common names in commercial use and some may not be correctly specified in operational reporting of catches. Australian commercial production covers diverse species – around 400 (Yeardsley, Last and Ward 1999).

Fisheries management authorities are aware of such issues and attempt to maximise data accuracy while minimising respondent burden, recognising the trade-offs involved. There have been considerable efforts to improve fish identification at the catch level and in the market chain. However, it is generally accepted that reported fish catches may have a level of error involved.

Where it has been possible to verify the accuracy of logbooks through an alternative source, some understatement of catches has been identified. For example, in fisheries managed by output controls, the data from logbooks can be compared with data derived from catch disposal records, used to match landings with quotas. Comparisons of these records with logbooks in the same fishery suggest that logbooks may understate landed catches in some circumstances.

In the Commonwealth gillnet, hook and trap fishery, catch disposal records exceeded logbook catches by around 8 per cent in 2003-04 and 10 per cent in 2004-05 (D. Galeano pers. com.). Similar differences were experienced in the south east trawl fishery when catch disposal records were introduced (R. Tilsey pers. com.). In the Northern Prawn fishery logbook reports of catches of king prawns were significantly understated (Garvey and Lilly, 2001). Similar situations have been highlighted when catch records have been used as the basis for fisheries adjustment or quota allocation.

Where there are discrepancies in catches between sources, the issue is generally resolved by the data analyst prior to completion of the catch summaries. For those fisheries where catch disposal records are maintained, these are used for determination of GVP because these are verified data and provide information relatively quickly, by comparison with more detailed logbooks.

Valuation of commercial catches and aquaculture production

The objective of catch valuation is to provide a representative ex vessel (or farm gate) price that is comparable to values in agriculture. Marketing costs are subtracted from prices to get a net GVP value.

There are several areas for potential undervaluation of fisher returns.

- While the major Sydney and Melbourne fish markets are used to value products, a significant proportion of product is sold under private treaty outside of those markets. For example, in 1992-93 it was found that around half of the fish from the South East fishery was sold outside of the main auction markets (Smith, Tran and Ruello, p30).
- Similar problems may arise in relation to fish which may have large differences in prices associated with different characteristics (such as size and fishing method). Very often these fish are sold outside the main market centres so it is difficult to ascertain the appropriate values and they may be undervalued in the overall valuation calculations.
- Catch data from logbooks may not provide information on the grade composition or the level of product processing. In these circumstances average prices are used which may not be appropriate to the fishery or the product. Catch information from several of the major fisheries, such as Northern Prawn and Western Rock Lobster, includes grade information which aids valuation of catches. However, in many other fisheries grade information is not collected, often because of the absence of standard grades.
- Prices (and volumes) may be understated to reduce the research levy contribution.

Similarly there are some areas where catches may be overvalued by comparison with ex-vessel values.

- For some fisheries it is difficult to separate the value adding activity from the fishing component. This occurs when products are exported directly to overseas markets by the catcher.
- States valuing catches at major fish markets use a gross price including marketing and freight costs, because of a lack of cost information.

For some species (such as bluefin and yellowfin tunas, Kuruma prawns) the most proximate market is overseas and even then prices reported on overseas markets may not be a good indication of prices actually obtained because private treaty is a common form of selling directly to overseas markets.

For some fisheries, such as the catching of live tuna for subsequent growout in cages, it is necessary to make the separation of values of fish catches from those of fish growout (because the former is attributed to the SBT fishery and the latter a significant part of aquaculture). In general, there is often insufficient information to verify the values used.

There are also differences in the methods of valuing fish sold at the Sydney and Melbourne markets. The Sydney fish market reports are based on the average price for the category (for many different categories including size, level of processing and the like) while Melbourne reports are based on the modal (most traded) price for only a few categories (usually based on subjective size assessment). The difference in outcome depends on the distribution of sales. If sales in a category are normally distributed around the average the two will be the same but if sales are skewed around the mean, the two values will be different.

4.3 Valuation of catch in Commonwealth fisheries

While it is not feasible to assess the absolute accuracy of the valuation estimates used in calculating GVP without separate sources of validation, conceptually the consistency of values used for Commonwealth fisheries can be assessed against the values obtained through the ABARE fisheries surveys.

To compare GVP estimates with survey information, freight and marketing costs were deducted from average fishing revenue per operator obtained from the fisheries surveys data and the number of operators in the fishery was used to establish the total revenue from the fishery and the standard errors associated with this estimate⁴. These estimates were then compared with those used for fisheries GVP. The results for Commonwealth fisheries are shown in table 2 with those values apparently inconsistent between the two sources highlighted.

Table 4.1: Comparison of fisheries surveys data and GVP estimates; 2004-05 dollars

Fishery	Year	GVP			Survey		
		estimate	+ 2 se	+1 se	estimate	-1 se	-2 se
Northern		\$m			\$m		
Prawn	1998-99	137.8	175.5	167.6	159.8	151.9	144.2
	1999-00	126.7	137.1	130.7	124.3	118	111.6
	2000-01	183.4	212.6	201.5	190.4	179	168
	2001-02	145.7	155	149	142	136	130
South	2000-01	73.5	103.3	93.3	83.3	73.4	63.41
East	2001-02	85.1	77.8	73.5	69.1	64.8	60.5
Trawl	2002-03	71	78.9	72.8	66.8	60.7	54.6
	2003-04	75.8	77	70.4	63.8	57.2	50.6
East	1998-99	60.1	87.6	81.9	76.1	70.3	64.5
Coast	1999-00	66	85.6	79.2	72.9	66.5	60.2
Tuna	2000-01	67	92.3	86.6	81	75.3	69.6
	2001-02	81.6	98.5	92.7	87	81.2	75.4
	2002-03	69.1	73.8	71.2	68.6	65.9	63.3

⁴ ABARE fisheries surveys are based on a sample of boats in a fishery so that the estimates obtained from the survey are likely to be different from those obtained if a census was undertaken. The survey estimates are calculated with standard errors to establish their likely reliability. There are two chances in three that the true value is within one standard error of the estimate and nineteen chances in twenty that it is within two standard errors of the mean (ABARE 2004b, p52).

Sources: ABARE fisheries surveys 2001, 2002, 2003, 2004; Australian Fisheries Statistics 2001, 2002, 2003, 2004.

For the Northern Prawn Fishery three of the four survey estimates were consistent with GVP. For 1998-99 it appears that GVP was an underestimate of the 'true' value. While the GVP values for the south east fishery were higher than the survey estimates, the surveys did not include factory trawlers operating in the fishery that would have been included in the GVP estimates. Two of the five estimates for GVP for the east coast tuna longline fishery were below the survey estimates, suggesting that the values applied to catches in GVP calculation were below those achieved by the industry.

This comparison would indicate that the majority of the values used for calculating the GVP for these fisheries are reasonable. There are problems in assessing values for products that are directly exported. However, the difficulties in obtaining independent verification of values should be noted.

4.4 Issues in relation to use of GVP data to determine research appropriations

Some of the issues relating to GVP data relate to its suitability for some of the applications discussed in section 3. A key concern has been its use in establishing the level of government funding. FRDC's annual funding appropriation is based on a 3 year moving average of industry gross value of production (AGVP), as measured by ABARE and associated contributors, such as state and Commonwealth fisheries managers. The purpose in adopting a 3 year moving average has been to smooth out any fluctuations in yearly GVP.

The AGVP calculation involves use of lagged values. The current 2005-06 AGVP was determined as the average of GVP in 2002-03, 2003-04 and 2004-05. This was initiated to link with the GVP estimation process. However, it means that the current funding is established on past industry revenue and not the current economic conditions in the industry. Moreover, there is no adjustment for the reduction in purchasing power resulting from inflation in the intervening period.

Adjusting the AGVP for inflation between the component years and the year that the AGVP values were used to determine research funding makes a significant difference. Over the period 1992-93 to 2004-05 the impact of adjusting for inflation was to increase the AGVP value on average by 5.6 per cent. Based on funding of 5 per cent of AGVP this difference averaged \$5.3m per year, increasing in importance with the strong growth in GVP over the period. The differences involved are illustrated in table 4.2.

While use of a moving average smooths variations in year to year GVP, it is nonetheless countercyclical. This characteristic is important when industry is being levied for their research contribution. During periods of falling GVP the research levy is a higher proportion of industry revenue for that year.

Table 4.2 Estimation of AGVP with adjustment for inflation

	GVP		AGVP	Inflation	AGVP	
	Actual	Provisional			adjusted	Difference
	\$m	\$m			\$m	\$m
1989-90	1092	1089				
1990-01	1203	1177		5.3		
1991-92	1307	1287		1.9		
1992-93	1501	1369	1194.00	1	1247.21	53.21
1993-94	1686	1607	1293.00	1.8	1377.42	84.42
1994-95	1813	1745	1471.67	3.2	1567.90	96.23
1995-96	1700	1633	1644.00	4.2	1781.77	137.77
1996-97	1788	1756	1710.67	1.3	1824.13	113.47
1997-98	1879	1860	1756.33	0	1807.93	51.60
1998-99	2061	2039	1782.67	1.2	1817.92	35.26
1999-00	2362	2322	1902.00	2.4	1970.18	68.18
2000-01	2428	2479	2087.33	6	2268.28	180.94
2001-02	2431	2406	2300.67	2.9	2458.90	158.24
2002-03	2305	2297	2398.67	3.1	2579.47	180.81
2003-04	2095	2180	2385.33	2.4	2521.51	136.17
2004-05		1979	2305.33	2.4	2396.79	91.45

GVP data used was that published in Australian Commodities, March Quarter. This is used as an approximation of the actual values used in AGVP estimation.

AGVP calculated on published data only.

Sources: *Australian Commodities; Australian Commodity Statistics 2005*

Preparation of AGVP

There is a very narrow window for development of GVP estimates under current arrangements. The timeline for preparation of GVP statistics is as follows:

September - Initial request sent to State fisheries and AFMA for current year data.

September - Receive revised catch data for the previous year.

Late September - Receive preliminary GVP estimates for current year.

Establish GVP for Commonwealth fisheries

October - Provide DAFF with GVP estimates for levy determination process.

December - Receive final estimates of GVP from States

February- Publish *Australian Fisheries Statistics*

States only have a limited timeframe for collecting logbooks, entering and editing data, resolving discrepancies and developing catch and value estimates. While the initial production estimates are sought in September, the experience in some states is that this is insufficient to allow for collection and processing of catch data.

Consequently, it is necessary to introduce estimates based on incomplete data. Some of the suppliers estimate that a five month period is required, taking into account getting the information from fishers, data editing and entry. While the response varies, in some fisheries only around 80 per cent of financial year catch data is received by the end of September. Some other states, such as Victoria aim for completion of fisheries returns by the end of October.

A consequence of this timeline is that AGVP is calculated on the basis of preliminary estimates of production and value of production in the third year. State and commonwealth data managers may revise catch data after the initial estimates have been provided to ABARE, usually because of late submission of logbooks. Similarly,

the valuation of catches may be revised following comments from fisheries managers or from industry. While the actual extent of the revisions made after AGVP was calculated was not available some measure of the extent of revisions can be made through comparing the preliminary GVP estimates published in the March⁵ *Australian Commodities* with the final values published in the subsequent year.

Over the period 1989-90 to 2004-05, the average revision to the initial GVP estimates published in March *Australian Commodities* was 1.7 per cent, with most revisions (13/15) increasing the GVP valuation. The largest revisions were in the value of prawn catches (4.6 per cent per year). The smallest value revisions were to fish (0.8 per cent), although there were larger revisions to catches, an average of (4.8 per cent per year) suggesting the problems were in estimating the catches of lesser valued species.

Because the initial estimates tend to underestimate GVP and this is subsequently reflected in AGVP and research funding, there are strong incentives to invest in improvements in processing and validation of both catch and value data.

Many of the issues associated with validation of catch data have been extensively explored by fisheries management agencies in their recent submissions to the Commonwealth Department of the Environment and Heritage (www.deh.gov.au/coasts/fisheries) to meet the requirements of the Environmental Protection and Biodiversity Act 1999.

There has been no examination of the validation of value data. Given the implications of incorrect value data for the level of research funding, it would appear worthwhile to develop more systematic means of assessment and verification. This would also assist the providers of data for inclusion in GVP estimates.

There is considerable variation in the treatment of value data by State fisheries so it would need to be examined in the light of the supply chains for individual products. All States now provide value data but the basis for this data varies, from the use of processor surveys in the Northern Territory and South Australia, the use of Melbourne Fish Market data combined with some processor surveys (for rock lobster and abalone) in Victoria and Sydney Fish Market data in New South Wales. Queensland and Western Australia rely on informal surveys of processors and some traders.

There are difficulties associated with the collection and publication of some aquaculture data, principally associated with reluctance on the part of growers to provide data because of confidentiality concerns. These concerns often extend to the publication of specific data because of the small numbers of operators in some industries.

⁵ The data used was extracted from the March *Australian Commodities* because it is first published series following the completion of GVP estimation processes.

5. Developing the FRDC definition of the fishing industry in a GVP framework

As discussed earlier, the FRDC definition of the fishing industry is considerably broader than that covered by the existing statistical collections. The FRDC definition covers the:

- Commercial production sector, including
 - Wild catch;
 - Aquaculture; and the
 - Post harvest sector, which includes importers of seafood products.
- Recreational fishing, which includes charter boat operators; and
- Customary Fishing (otherwise known as indigenous fishing).

The purpose in this section is to examine whether a GVP framework can be applied to this definition to provide a more complete picture of the uses made of marine resources.

Gross value of production is a simple measure of economic value of the output of the industry. Its main advantage is that it is readily applied, depending solely on information on the level of production and the prices paid for that production. It is not an indicator of the economic performance of the industry because it takes no account of either the inputs used.

5.1 Recreational fishing

A key problem in incorporating recreational fishing activity in a GVP framework is that, for the most part, it is not an industry in any normal sense because participants do not derive income from their activities. There are exceptions, such as charter boat and tour operators.

The development and use of economic statistics on the recreational fishing sector has been limited by several factors:

- the problems associated with measuring recreational activities in economic terms;
- the difficulties in identifying the participants in recreational fishing; and
- high costs associated in measuring these activities.

Despite these problems, there have been major improvements in the level of information generated on recreational fishing activities both at the national and state level. The *2000-01 National Recreational Fishing Survey* (Henry and Lyle eds 2003) provided a comprehensive national cross-sectional examination of fishing activities, including catches and retention of fish for subsequent consumption and estimates of participant expenditure on fishing over a 12 month period. State fisheries also have ongoing programs of management and monitoring of the more important recreational fishing activities in those states.

The national survey allows for development of some estimates of fish taken through recreational fishing. The survey was based on collecting information on the number of fish caught so estimates were required of the average size of those fish to establish the

volumes of species taken. There are obviously many potential sources of error, including the sampling error of the survey itself, non sampling errors associated with completing the diaries, the potential for misclassification of catches, and the difficulties in establishing the size of fish. As a result, the volume estimates from that survey, shown in table 5.1, are only a very general indication of catches retained by the recreational sector.

Table 5.1 Estimated recreational catches, by state, 2000-01

Species/group	Tonnes							Total
	NSW	Vic	Qld	SA	WA	Tas	NT	
Finfish								
Australian bass/perch	46.6	37.5	68.5	4.3	2.5		0.6	159.8
Australian herring		1.1		297.3	522.9			821.4
Australian salmon	222.0	270.9		372.2	136.3	110.0		1111.4
Barracouta		217.8		4.8		56.6		279.2
Barramundi			230.1		79.0		368.0	677.0
Blue mackerel	213.5	3.5	4.5	22.5	39.3	1.3		284.7
Bream	728.8	202.7	556.0	31.6	144.2	29.1	8.3	1700.6
Butterfish			11.1		86.7			97.9
Catfish	94.2	7.4	294.9	2.5	27.5		3.7	430.2
Cod (various)	8.1	2.4	386.1	6.8	79.4	31.4	19.9	534.2
Coral trout			549.5		108.0		20.2	677.7
Dart	115.3		231.1		11.8			358.2
Dhufish					575.9			575.9
Drummer	37.4				2.9			40.3
Eels	10.7	294.5	15.5		3.3	16.5		340.5
Emperors	6.0		785.4		237.3		7.3	1036.0
European carp	876.7	246.1	60.2	275.5				1458.5
Flatfish	25.0	9.4	11.3	0.7	3.7	17.8		67.9
Flathead	886.8	596.9	419.0	19.0	43.5	358.1	0.7	2324.0
Garfish	24.2	25.5	7.0	151.1	37.2	2.0	0.5	247.4
Golden perch	325.3	85.4	316.6	91.1	0.8		0.0	819.1
Grunters/trumpeters	5.7		276.8	335.5	85.7		27.3	731.0
King George whiting		214.6		604.3	106.1			925.0
Leatherjackets	108.0	46.6	1.5	43.4	9.6	5.6		214.8
Luderick	280.1	13.3	0.9	1.6		0.8		296.8
Mackerels	128.6		1160.9		360.4		90.1	1740.0
Morwong	139.9	3.5	13.2	11.1	89.5	45.9		303.1
Mullet	151.3	60.4	94.5	85.3	64.7	26.8	17.3	500.1
Mulloway/jewfish	273.7	10.8	84.2	90.2	358.7		156.7	974.4
Murray cod	94.0	27.5		22.8			0.0	144.2
Pike	47.2	386.7	75.2	278.9	91.3	15.7	17.1	912.2
Red emperor			908.1		66.5		9.5	984.1
Red mullet	1.8	5.0		12.4	0.5			19.7
Redfin perch	61.1	237.3		10.1	16.6	2.3		327.5
Redfish	31.4			13.6	8.0			53.0
Rock-cod/groper	1.2		29.4		129.9			160.6
Scads/mackerel	87.3		37.8	1.1	50.3	13.4		189.9
Scorpionfish/gurnard	28.6	1.8	0.6	0.8	1.1	11.0		43.8
Sea perch/snappers	18.5		360.7		47.5		144.9	571.5
Sharks/rays	300.9	894.2	359.0	307.2	244.3	98.1	79.4	2283.2
Pink snapper	117.0	332.4	309.0	370.6	291.8			1420.7
Sweep	55.6	15.8		34.7	17.4			123.5
Tailor	252.7	14.4	162.8		187.9	0.4		618.1
Threadfin salmon			361.5		156.5		129.1	647.2

Table 5.1 cont'd

Trevally	87.5	37.5	235.2	18.5	249.1	5.5	27.0	660.4
Trout/salmon	122.2	172.9		3.4	4.6	156.6		459.9
Tuna/bonitos	844.5		242.8	28.4	144.3	45.3	21.8	1327.1
Whiting	394.1	1.1	444.5	104.9	233.9	1.3	0.3	1180.2
Wrasse/tusk/groper	52.4	84.5	308.6	22.6	305.7	13.4	14.8	802.0
Kingfish/Samson fish	180.0		13.1	61.6	99.1	3.0		356.8
Other	71.5	30.2	133.0	26.3	36.1	29.0	14.0	340.0
Total finfish	7557.5	4591.8	9560.0	3768.8	5599.3	1097.0	1178.4	33352.7
Crustaceans								
Blue swimmer crab	154.8		46.3	387.5	486.5			1075.2
Crabs (other)	8.0	5.4	111.2	26.7	10.2	1.5		163.1
Lobsters	7.4	61.5	13.8	95.5	201.9	73.1		453.1
Mud crab	30.0		585.5		134.4		82.4	832.3
Crayfish (fw)	135.7	132.2	161.0	41.5	45.2	0.1	1.1	516.7
Macrobrachium	0.8			42.6	5.2		0.6	49.3
Murray crayfish	51.6	13.9						65.5
Prawns (freshwater)	29.5	55.9	26.0	4.5				116.1
Prawns (saltwater)	524.2	3.5	247.0	0.5	47.2	0.5	0.5	823.4
Yabbies (saltwater)	60.7	7.4	333.4		0.2			401.7
Total Crustaceans	1002.7	279.7	1524.3	598.9	930.8	75.2	84.6	4496.1
Octopus	5.1	1.0			12.8			18.9
squid/cuttlefish	46.4	59.8	18.4	314.4	65.1	13.3		517.3
Abalone	21.1	6.2		10.7	128.6	65.1		231.7
other bivalves	5.1				0.5			5.6
Mussels	0.4	30.8		0.7	34.4	3.9	0.3	70.4
Other	0.3		0.1	0.3		0.9	0.1	1.6
Oysters	2.6		3.3		0.3	0.7	0.1	6.9
Pippi	53.8	31.9	49.3	73.7				208.8
Razorfish				23.5				23.5
Scallops		4.2		3.0	3.5			10.6
Total Molluscs	134.7	133.9	71.1	426.3	245.0	84.0	0.5	1095.4

Notes: Only species with catches greater than 1000 fish were included. Conversion factors used were those listed in table 5.7 Henry and Lyle *eds* 2003, or modal values for the species in Yearsley *et al.*

Source: Henry and Lyle *eds* 2003

Establishing appropriate values to apply to catches from the recreational sector raises several issues. If the recreational catch is to be included in the GVP estimates, one measure would be to establish the catch values at those used in relation to commercial fishing of the same species. This approach has many advantages, not the least of which is pragmatism in relation to valuation. It may also provide some estimate of the economic opportunity cost involved. Many recreational fisheries have been enhanced by excluding commercial operators who could have provided such fish for sale. Similarly, these values would approximate the prices that consumers would expect if purchasing product from commercial operators.

If the same techniques and values used to value commercial catches for GVP purposes were applied to retained catches from the recreational sector an implicit assumption is that the catches were comparable. This is unlikely to be the case, particularly in relation to the size and handling of the fish. For example, a large part of the commercial fish catch is caught through trawling. However, it is difficult to

conclude whether commercial prices are below those that could be applied to the recreational take.

To establish a GVP value to recreational catches, the retained catches for 2000-01 (shown in table 5.1) were valued using weighted average prices for the three years 1999-00, 2000-01 and 2001-02. Where possible, the values were those used in Australian Fisheries Statistics 2002 but additional values were required because many of the important recreational catches are not important commercially⁶. The results are shown in table 5.2.

Table 5.2 Estimated value of recreational catches, 2000-01, \$000

Species/group	\$'000							
	NSW	Vic	Qld	SA	WA	Tas	NT	Total
Finfish								
Australian bass/perch	489.0	374.7	684.5	42.7	25.3		5.5	1621.7
Australian herring		3.0		368.7	444.5			816.2
Australian salmon	239.7	265.5		469.0	68.2	268.3		1310.7
Barracouta		507.5		11.2				518.7
Barramundi			1633.6		410.8		1913.4	3957.8
Blue mackerel	232.7	3.8	4.5	22.5	39.3	1.3	0.0	304.2
Bream	6544.2	1392.4	2223.8	126.5	562.5	116.2	33.0	10998.7
Butterfish			18.9		147.4			166.4
Catfish	113.1	8.9	442.3	3.7	41.2		5.6	614.8
Cod (various)	41.5	12.4	1930.3	34.2	373.2	43.0	101.6	2536.2
Coral trout			6869.3		1079.6		201.8	8150.7
Dart	235.2		462.2		23.6			721.0
Dhufish					5125.9			5125.9
Drummer	59.9				4.6			64.5
Eels	103.8	2868.5	150.7		32.3	159.8		3315.1
Emperors	30.7		6283.1		735.5		40.2	7089.5
European carp	876.7	246.1	60.2	275.5				1458.5
Flatfish	45.0	16.9	20.4	1.3	6.6	32.0		122.2
Flathead	3848.8	2387.6	1676.2	75.9	73.9	1432.4	2.9	9497.7
Garfish	84.6	103.1	34.9	606.0	148.7	7.8	1.9	987.1
Golden perch	3415.3	853.7	2849.8	712.2	7.5			7838.4
Grunters/trumpeters	20.0		968.9	1174.1	299.8			2462.9
King George whiting		2147.9		6369.1				8517.0
Leatherjackets	129.6	69.9	2.3	74.3	14.5	8.4		298.9
Luderick	383.8	18.6	1.3	2.2		1.2		407.1
Mackerels	146.6		7545.9		2252.7		356.7	10301.8
Morwong	535.9	13.4	52.6	42.0	340.2	384.6		1368.7
Mullet	239.1	96.6	306.0	188.5	122.9	42.8	27.6	1023.5
Mulloway/jewfish	2151.3	86.7	673.8	721.5	2869.5		383.9	6886.9
Murray cod	1315.6	384.6		318.9				2019.1
Pike	61.3	502.7	112.8	418.4	136.9	23.6	25.7	1281.5
Red emperor			9081.4		664.6		95.1	9841.1
Red mullet	6.9	15.0		37.3	1.6			60.8
Redfin perch	262.9	1020.6		43.4	71.3	10.0		1408.3
Redfish	25.1			10.9	6.4			42.4
Rock-cod/groppers	7.4		147.2		649.7			804.2
Scads/mackerel	94.3		151.1	2.7	125.7	33.6		407.4

⁶ The values used came from Sydney or Melbourne fish market prices. Where these species were not sold the prices used were those of a close species as indicated in Yeadsley and Last *op cit*

Table 5.1 Cont'd

Scorpionfish/gurnard	28.6	1.8	0.6	0.8	1.1	11.0		43.8
Sea perch/snappers	73.9		3065.8		232.7		854.7	4227.1
Sharks/rays	993.1	2977.8	1795.0	1013.8	806.3	477.6	373.3	8436.8
Pink snapper	1014.1	2307.0	1854.2	2034.3	933.6			8143.2
Sweep	106.2	30.0		66.0	33.0			235.2
Tailor	649.5	35.9	406.9		469.6	1.1		1563.0
Threadfin salmon			1445.9		626.1		253.1	2325.2
Trevally	236.3	101.3	634.9	50.1	672.7	14.8	72.9	1783.0
Trout/salmon	611.2	864.7		17.2	23.1	783.2	0.0	2299.4
Tuna/bonitos	2415.2		694.4	141.8	952.3	226.7	85.2	4515.6
Whiting	1328.1	3.6	1200.2	543.3	912.3	2.0	1.1	3990.7
Wrasse/tusk/groper	204.3	329.5	1172.6	88.3	1192.1	52.4		3039.1
Kingfish/Samson fish	1319.4		95.7	431.2	693.7	21.1		2561.1
Other	221.7	75.4	664.9	31.5	61.5	62.3	42.6	1159.9
Total finfish	30941.6	20127.1	57419.1	16571.1	24516.5	4217.4	4877.7	158670.5
Crustaceans								
Blue swimmer crab	929.0		277.7	2325.2	2919.1			6451.0
Crabs (other)	40.0	26.9	556.2	133.5	51.0	7.7		815.3
Lobsters	288.5	1967.2	165.1	3179.8	5330.6	2235.6		13166.8
Mud crab	177.0		4684.0		752.6		461.3	6074.9
Crayfish (fw)	814.0	792.9	966.2	249.1	271.1	0.6	6.5	3100.4
Macrobrachium	3.7			196.0	24.0		2.8	226.6
Murray crayfish	309.5	83.3						392.7
Prawns (freshwater)	135.9	257.3	119.8	20.9				533.9
Prawns (saltwater)	2516.0	16.7	1235.2	2.6	226.4	2.3	2.3	4001.6
Yabbies (saltwater)	242.7	29.6	1333.8		0.6			1606.6
Total Crustaceans	5456.3	3173.9	9337.9	6107.1	9575.4	2246.3	472.9	36369.8
Molluscs								
Octopus	15.4	3.2			39.0			57.7
squid/cuttlefish	79.3	102.2	31.4	537.6	111.2	22.8		884.6
Abalone	306.5	90.1		154.7	1864.9	943.9		3360.1
other bivalves	10.2				1.0			11.2
Mussels	0.6	53.9		1.3	60.1	6.8	0.6	123.3
Other	0.5		0.1	0.4		1.7	0.1	2.9
Oysters	5.1		6.7		0.5	1.4	0.1	13.9
Pippi	81.8	48.5	74.9	112.1				317.4
Razorfish	0.0			35.3				35.3
Scallops	0.0	18.3		13.0	15.2			46.5
Total Molluscs	499.6	316.2	113.2	854.4	2091.9	976.6	0.8	4852.7
Total Value	36897.5	23617.2	66870.2	23532.6	36183.8	7440.3	5351.4	199893

There are many potential sources for error involved in estimating the GVP equivalent values for recreationally caught and retained fish, with the result that the estimates shown in table 5.2 must be regarded as a general approximation. These potential sources for error include the sampling error in estimating the number of fish (the standard error for fish numbers was 2.3 per cent, 11.96 per cent for crustaceans and 19.25 per cent for mollusc numbers) and non-sampling errors involved in maintaining and completing the diaries over the period involved. Additional sources of potential error include those involved in converting fish numbers to weight and in applying market values to estimate the GVP equivalent.

The national survey used the numbers of retained fish as the basis for measuring recreational catches. This takes no account of the significant numbers of fish that are discarded or released. Catch may not be retained for a range of reasons, including size, damage, eating quality and fisheries regulations (restrictions on number and/or size limits) or because of ethical reasons such as catch and release (Henry and Lyle, p 83)⁷.

A key issue is that this approach does not take account of the catch and release activities by recreational fishers. Surviving catch and released fish would be unvalued in this approach as they are not a take from the fishery. A special case could be made for their inclusion in the GVP estimates (on the grounds that their release was not due to any of the normal reasons associated with discarding but due to individual preference). However, the national survey provided no information on the proportion of catch involved. It could be expected that there would be significant errors associated with estimating such information from the national survey.

The level and frequency of ongoing monitoring of catches will be an issue in incorporating recreational catches in the GVP framework. Licensing is required in WA, Victoria and NSW but not in other States. Western Australia and Victoria have ongoing systematic approaches to monitoring recreational fisheries, both through telephone interview and direct interviews, which would allow for regular updates of catch levels, to which commercial values could be applied. Queensland is undertaking a recreational fishing survey in 2006, updating the last state survey in 1997.

5.2 Inputs to recreational fishing

The national survey included measurement of expenditures on recreational fishing inputs over 2000-01 (see Campbell and Murphy 2005). Though this survey it was estimated that attributable expenditure on recreational fishing was \$1 854 million, with over half of this on boats and trailers, and a further 21 per cent on travel associated with fishing (table 5.3).

Because the GVP framework aims to measure the value of output, not inputs, the survey information does not generally address the information needed to develop a framework to value the recreational industry components. The main value of this component of the survey is that it provides information on the size of the Australian market for various fishing inputs. For example, the total value of fishing tackle was estimated to be \$109 million (Appendix A, Campbell and Murphy).

The estimates obtained from the national recreational fishing survey are in general significantly below those used previously. McIlgorm and Pepperell (1999) estimated recreational fishing expenditure at \$2.9 billion, with higher values (but wider confidence intervals) for all categories. The major differences between the studies were in travel expenditure (with the McIlgorm and Pepperell estimate of \$829 million compared with \$183 million) and in accommodation (\$179 million compared with \$50 million). The estimates of the values of boats and trailers in the two studies are relatively similar (\$1062 million compared with \$940 million). The key differences appear to be due to the better attribution of expenditure permitted by the more comprehensive survey and the use of diaries.

⁷ It should be noted that GVP estimates for the commercial fishery take no account of discarded fish.

Table 5.3 Expenditure on recreational fishing, 2000-01, by state of residence (\$m)

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
Accommodation	17.7	13	6.3	2.9	8.4	0.7	0.2	1.1	50.3
Camping gear	36.2	30.4	21.4	13.6	26.7	3.3	0.5	1.9	134
Bait	12	8.3	8.2	3.8	7	0.4	0.4	0.6	40.6
Boats and trailers	303.9	158.6	160.6	72.6	200.6	24.4	16.3	3	940
Clothing	6.5	9.5	4.6	1.8	1.6	1	0.1	0.5	25.6
Dive gear	0.7	-	0.8	0.5	3.2	0.5	-		5.7
Fees and licenses	8.7	8.3	2.7	1	3.2	1.6	0.9	0.5	26.9
Fishing gear	56.7	34.4	39.9	11.2	31	5.1	2.2	2.5	182.9
Travel	107.5	97.5	64.5	40.2	55.6	14.7	5.8	9.2	395
Other	4.2	36.3	10.6	0.9	1.2	0.2	0.2	0.1	53.8
Total	554.2	396.3	319.6	148.8	338.4	51.9	26.7	19.4	1854.8

Source: Campbell and Murphy (2005)

The national survey provides detail on the nature of the fishing undertaken, with around half (48 per cent) of the expenditure made on marine fishing, 32 per cent in estuarine waters and 20 per cent in inland waters (Campbell and Murphy, table 3.6).

5.3 Customary fishing in a GVP Framework

To incorporate customary fishing into a GVP framework it is necessary to have reliable estimates of consumption by indigenous fishers. The National Recreational and Indigenous Fishing Survey provides some usable estimates of customary fishing in northern Australia, despite obvious difficulties in surveys of remote communities. Unlike the recreational component of the survey, which was based on telephone/diary methodologies, the indigenous fishing survey was based on face to face interviews of indigenous communities in remote areas from Broome to Cairns. Within the region there were 144 communities representing a population of 40 708 persons 5 or older. Of these, 46 communities were selected and 44 remained in the survey. For details refer to pp 98-104, Coleman, Henry, Reid and Murphy (2003).

To estimate the volume and value of indigenous fishing in northern Australia, similar procedures were employed to those used for recreational fishing. Values used were commercial values for the average of the three years 1999-00 to 2001-02. The estimated total customary fishing catch and its GVP value are shown in table 5.4.

Indigenous communities in Northern Australia consume significant volumes of fish, crustaceans and other marine foods. Based on survey results, the estimated average per person consumption of fish was around 28 kg (whole weight) and 3.5 kg of crustaceans. While this consumption may appear high by comparison with the rest of Australia, it is consistent with (or lower than) previous studies cited by the authors.

To derive a value for customary fishing, the GVP framework was again used. Where available, the GVP prices used for commercial catches for the period 1999-2000 to 2001-02 were applied. For other species, estimates were made based on values for

similar species. No attempt was made to value crocodiles, dugong or turtles because of the absence of trade⁸.

Table 5.4: Indigenous fishing in Northern Australia

Fish	Volume (tonnes)				Value (\$'000)			
	Qld	WA	NT	Total	Qld	WA	NT	Total
Mullet	6.9	7.6	16.7	31.1	21.3	13.6	30.0	64.9
Catfish	30.7	26.9	60.8	118.4	61.3	53.8	121.7	236.8
Sea perch/snappers	34.0	12.9	24.8	71.8	289.0	63.4	146.5	498.9
Bream	14.6	3.2	7.2	24.9	59.8	12.5	28.6	100.9
Barramundi	14.9	46.6	154.5	216.0	106.1	242.4	803.2	1151.7
Grunters/trumpeter	33.3	74.7	18.0	125.9	129.7	291.2	70.3	491.2
Trevalley	33.3	7.1	12.4	52.8	90.0	19.2	33.4	142.5
Threadfin Salmon	41.8	31.4	30.0	103.2	168.1	100.6	58.8	327.5
Wrasse/groper	17.1	18.0	8.8	43.8	64.9	68.3	33.4	166.5
Garfish	1.8	0.0	0.0	1.8	7.3	0.0	0.0	7.3
Whiting	6.0	1.6	0.2	7.8	16.1	6.5	0.6	23.2
Cod	24.3	3.9	4.3	32.5	123.9	20.0	21.7	165.6
Shark/rays	38.2	20.1	124.6	182.9	236.8	50.3	585.8	872.9
Freshwater perch	0.2	0.4	6.4	7.0	1.0	2.2	33.3	36.4
Emperors	16.6	4.1	0.4	21.1	94.6	12.7	2.0	109.3
Coral trout	14.2	0.2	0.8	15.2	210.4	1.8	6.3	218.5
Rock cod/groppers	0.0	7.2	0.0	7.2	0.0	33.9	0.0	33.9
Red Emperor	5.4	0.3	4.8	10.5	30.6	1.9	27.4	60.0
Mackerels	4.0	0.7	2.4	7.2	24.3	4.5	14.4	43.3
Butterfish	1.5	0.8	0.0	2.3	2.6	1.3	0.0	3.9
Flathead	2.6	0.1	0.0	2.7	4.5	0.2	0.0	4.6
Tuna/bonito	0.0	1.7	4.3	5.9	0.0	11.0	16.6	27.6
Pike	1.5	0.2	0.7	2.4	2.5	0.4	1.2	4.0
Redfish	0.2	0.1	0.0	0.3	0.3	0.2	0.0	0.5
Other finfish	10.9	6.3	31.8	49.1	55.8	10.8	95.4	162.0
Pilchards	0.2	0.1	0.0	0.3	0.2	0.1	0.0	0.3
Total fish	354.0	276.3	513.8	1144.1	1800.6	1022.6	2130.6	4954.1
Blue swimmer crab	0.3	0.1	0.2	0.6	1.8	0.8	1.8	4.4
Other crabs	0.5	2.2	10.2	12.9	3.4	13.8	93.4	110.6
Lobsters	9.0	0.0	0.7	9.7	200.5	0.0	14.7	215.2
Mud crab	12.9	11.7	69.3	93.9	79.8	72.7	637.2	789.7
Freshwater crayfish	0.2	0.0	0.4	0.6	1.4	0.0	2.5	3.9
Macrobrachium	0.0	25.6	0.2	25.8	0.0	153.7	1.2	155.0
Prawns	1.3	0.0	0.0	1.3	15.6	0.0	0.1	15.7
Total crustaceans	24.3	39.7	80.9	144.9	302.5	241.0	750.9	1294.4
Total	378.3	316.0	594.7	1289.0	2103.1	1263.6	2881.4	6248.1

Source: Derived from Coleman, Henry, Reid and Murphy (2003), Australian Fisheries Statistics.

The estimated average commercial value of indigenous fishing in northern Australia over the period was nearly \$6.25 million, made up of \$4.95 million for fish and \$1.29 million for crustaceans. The most valuable components of indigenous catches were barramundi (\$1.15 million) and sharks/rays (\$873 000) while for crustaceans the main

⁸ While crocodiles are farmed in the north and have a value of between \$460-\$520 per head, most of this is skin value (Foster 2005)

component was mud crab (\$790 000). Nearly half (46 per cent) of the total value of consumption was associated with the Northern Territory.

5.4 Charter Boats

The charter boat industry is a growing component of the recreational sector. Boats are now required to be licensed in most states. South Australia is in the process of completing licensing, while Victoria and Tasmania have not introduced regulation under fisheries legislation.

Expenditure on boat charters was examined in the National Recreational Fishing Survey. According to this source, expenditure on boat charters in 2000-01 was \$35.5 million, with nearly 60 per cent of this sourced from fishers resident in New South Wales (Campbell and Murphy, Appendix A). The survey does not provide detail on where this expenditure was made, nor of the reliability of the estimates. To use this estimate as a basis for valuing boat charters it would be necessary to add expenditure by tourists. The Bureau of Tourism Research identified that 191 131 tourists (4.17 per cent) reported recreational fishing activity during their stay but no information was provided on their expenditure (Henry 2003, quoted in Campbell and Murphy).

In charter fishing the key outputs are the number of hires and the revenue generated from those hires. ABARE undertook a survey of charter boat operators associated with the east coast tuna and billfish fishery in 2004, covering their economic performance in 2001-02 (Galeano et al). This research showed that there were a little over 100 charter boats in the fishery in 2001-02 and an estimated 235 000 people days fished by private recreational boats in that fishery.

Table 5.7: Charter operations in the East Coast Fishery 2001-02

	NSW	<i>se</i>	Qld	<i>se</i>	Tasmania	<i>se</i>	Total	<i>se</i>
No of boats	49		46		16		111	
Charter revenue/boat (a)	41665	23	157458	16	24369	26	87158	13
mean + 1 <i>se</i>	51248		182651		30705		98488	
mean - 1 <i>se</i>	32082		132264		18033		75827	
Total charter revenue	2041585		7243068		389904		9674557	
mean + 1 <i>se</i>	2511152		8401946		491280		10932168	
mean - 1 <i>se</i>	1572018		6084144		288528		8416797	
Total revenue/boat	91982	16	184570	12	30682	21	121515	9
Est no days fished	43	21	83	15	50	18	60	11
Tournaments	5	17	9	23	4	23	7	14

(a) Revenue estimates are for all charter operations, not only those operating in the East Coast Tuna and Billfish fishery. Source: Galeano et al, 2004.

Even within the east coast game fishery there are wide differences in daily revenue from charter boat operations, ranging from \$460 per day fished in Tasmania to \$860 in NSW and to over \$1700 per day fished in Queensland. The average number of days fished in Queensland was also higher than in the other states.

The east coast game fishery is a small (and probably specialised) subset of the overall charter boat industry in Australia. No expenditure was recorded in this fishery during the National Recreational Fishing study so it is likely that these types of charter

fishing are a relatively thin industry⁹. Queensland operators estimated that around three quarters of the operators had greater than 50 per cent of clients from overseas while the majority of NSW and Tasmanian boats relied on domestic clients.

Developing estimates of industry GVP for the sector depends on several factors, the number of vessels in the fishery, the number of charters and the cost of charter. A further distinction may also apply to whether boats were on fishing charter or other activities. For example only around half of the charters in WA were for fishing. Some further distinction may also be required to distinguish between inshore and offshore charters because of the pricing differences involved.

Logbook programs have been established in those states where licensing has been introduced so most of the required information will be available in these states. Although a new industry under fisheries jurisdiction, most states now have a commitment to logbook monitoring. Tasmania is introducing a mandatory logbook program in 2006 while SA is finalising the licensing of charter vessels with provisions for logbook. Only the charter industry in Victoria would remain unregulated and unmonitored.

5.5 Ornamental Fish

The ornamental fish trade has been estimated to be worth around \$350 million, including the commercial fish breeding facilities, wholesale traders, retail outlets and the hobby industry (Marine and Coastal Committee draft report 2005). The same report estimates that the total turnover of aquarium industry in Australia at the retail level is approximately \$65 million. There are approximately 1,500 retailers (aquariums and pet shops) across Australia dealing in aquarium fish. According to the Pet Industry Association of Australia (PIAA) approximately 60% of aquarium fish are supplied domestically by local breeders and 40% of fish are imported.

It is difficult to reconcile these numbers with official statistics (table 5.8). Imports of ornamental fish in 2003-04 were estimated to be worth about \$4.1 million (ABARE 2005). This would value aquarium ornamental fish at around \$10 million at the total primary wholesale level. In addition, exports of ornamental fish were valued at around \$2 million suggesting that the primary value of the industry is around \$12 million. However, there are problems in assigning values to some fish, particularly Koi Carp, which may bring very high values for some individual fish.

The difficulty in identifying the smaller breeders of aquarium fish, particularly the large hobbyist and backyard breeder, prevents a more accurate estimation of the market. Monitoring of the aquarium fish GVP (and of developing more robust statistics) is made difficult by the absence of effective industry regulation. However, given the potential for introduction of exotic diseases, considerably greater attention is being given to the industry (see Marine and Coastal Committee draft report 2005) with the result that more robust estimates should be forthcoming. The issues associated with valuation of the industry are being examined by the Committee, so some ongoing improvements in determining production levels and valuation may be feasible.

⁹ The national Recreational Fishing survey was based on 0.6 per cent of households, so it is unlikely to have picked up smaller, specialised fisheries

Table 5.8 Aquarium Fish Production, Exports and Imports

		Year					
		1998-99	1999-00	2000-01	2001-02	2002-03	2003-04
Production							
NSW	no (000)	969.8	885.4		543.8		
Value	\$'000	521.4	349.1	575.4	337.8	620	554
Victoria	no (000)	3543	3587	3569	3871		
Value	\$'000	2673	2673	2713	3006	3126	2702
Queensland	no (000)	1506.9	1435.8	1506.8	2073.4		
Value	\$'000	676	666.7	823	925.6	900	900
WA	no (000)	120	126	288	300	255.3	
Value	\$'000	170	170	288	300	536	304
Total value		4040	3859	4399	4569	4537	4460
Exports	no	100134	154200	162270	141214		
	\$'000	1267.7	1816.6	2169	2039.7	1726	1858
Imports	no (000)	7483	7400	8151	9053		
	\$'000	2107	2268	2838	3458	3870	4087

WA includes 130700 wild caught aquarium fish valued at \$206 000.

Source: Australian Fisheries Statistics 2004, WA State of the Fisheries Report 2004.

5.6 Post Harvest sector

The key problems in estimation of GVP of the post harvest sector are that it is difficult to define, the actual level of industry value added is not transparent, and there is little monitoring of post harvest activities. The sector potentially includes the entire supply chain from producer to final consumer, including wholesaling, transport, processing, and retailing. It would also include all activities involved in seafood exporting and importing.

The only available statistics that provide coverage of the post harvest sector are those developed by the Australian Bureau of Statistics. The statistical frameworks used are designed to provide national coverage rather than the depth of detail of individual industries. The ABS coverage of the fishing industry post harvest sector includes the processing and wholesaling sectors with no clear delineation that will unambiguously determine which parts of the post harvest sector are processing and hence included in manufacturing statistics, and which are wholesaling. It is not feasible to extend the coverage to the retail sector because the various forms of retailing (supermarkets, fish shops and restaurants) are not identified separately.

The standard measure of industry activity in the ABS framework is industry value added which is a net value measure (by comparison, GVP is a gross measure, taking no account of the resources used to produce it). However, it is feasible to establish the aggregate GVP for those sectors provided that total sales and the total cost of fish used is known. In principle, the GVP of the post harvest sector can be estimated as the total sales of the wholesale sector less the direct product costs (to avoid double counting). The data from the ABS Wholesale Survey (cat. no. 8638.0) and the Manufacturing Industry Survey (cat. no. 8221.0) relating to the seafood industry can be combined to provide some estimates for 1998-99, as shown in table 5.9.

Table 5.9 Estimated GVP of seafood wholesaling and processing sectors

		Wholesaling 1998-99	Processing 1998-99	Both Sectors 1998-99
No of management units	No	430	126	556
Employment	No	3641	3584	7225
Wholesale sales	\$'million	1609.2	1126.5	2764
Retail Sales	\$'million	28.3		
Purchases		1423.9	825.55	2249.5
Estimated GVP (sales less purchases)		213.6	300.95	514.5

All estimates are approximate because of differences in the definitions. Estimates are also subject to (unrecorded) standard errors and subject to non – sampling errors.

Source: ABS (Cat. Nos. 8638.0 and 8221.0)

The ABS has been developing a new approach to measurement of economic activity of Australian industry from its economic activity survey. The major change is that the survey is linked with data available from the taxation system used to improve the efficiency coverage and sample design. The changes have led to improvements in survey methodology and greater consistency of estimates (ABS 2005). However the experimental estimates for both seafood wholesaling and processing are associated with large standard errors (table 5.10).

Table 5.10 ABS Experimental estimates of economic activity 2002-03

ANZSIC		Sales	Expenses	Wages	OPBT
04	Commercial Fishing	\$m	\$m	\$m	\$m
0411	Rock lobster	627.8	446.7	62.2	182.4
0412	Prawn	392.1	317.2	42.4	77.4*
0413	Fish trawling	346.4	283.7	36.5	66.6
0414	Squid Jigging	nas	nas	nas	nas
0415	Line fishing	nas	nas	nas	nas
0419	Marine fishing nec	734.9	547.4	64.6	185.9*
	Total	2285.7	1751.4	226.9	541
042	Aquaculture	915	783.2	109.7	146.2*
	Total Fishing	3200.7	2534.5	336.5	687.2
2173	Seafood processing	1535.2	1563.7	136.2	10.5*
4714	Seafood wholesaling	3216.1	3200.6	156.8*	19.9**

* Estimate has a standard error of between 10-25%

**Estimate has a standard error of between 25-50%

The experimental estimates of economic activity derived by ABS provide significantly higher value of sales for commercial fishing than do the comparable GVP estimates. For examples, rock lobster GVP for 2002-03 was reported as \$459.9 m and total fishing was reported as \$2297.4 m. This discrepancy needs to be examined further, as it raises doubt about the current GVP processes.

5.7 Employment Data

There are several main reasons why census data may understate true employment levels in the industry. These may include:

- Measurement at a specific date. The date of the last census (7 August 2001) corresponds to a period of low activity in the commercial fishing sector. For example, it is outside the fishing season of the rock lobster industry.

- Part time employment may be increasing in importance. There is evidence that this is the case in Queensland fisheries.
- Employment information may be otherwise grouped. There may be a substantial proportion of the aquaculture industry where the fish production component is part of other activities such as farming or tourism.
- As previously discussed the ABS industry groupings are horizontally oriented (such as manufacturing) rather than vertically oriented (such as suppliers of services to the fishing industry).

(See FRDC 2005, p52 and ABARE 2004 for further discussion of possible disparities).

Conclusion

While it is feasible in principle to develop some GVP estimates of most components of the wider FRDC definition, much of the data required is unlikely to be updated regularly – such as the National Recreational Fishing Survey and some of the ABS data.

While values for recreational catches could be updated using a GVP framework, measurement of changes in the levels of catches would be required. One solution may be to use the ongoing state recreational management program monitoring to index changes in catch levels involved while applying the values from the commercial fishery for that year. For those with no catch updates, such as customary fishing, the GVP would then be directly linked with commercial values using the last available information.

With other State fisheries initiatives, such as charter fisheries, there is the opportunity to integrate data within the current GVP arrangements. The information generated by WA Fisheries provides a good template (such as the WA State of the Fishery reports). Similarly, with the increasing concern at the potential threats imposed by ornamental fish the efforts to incorporate those parts of the industry involved that presently remain outside of the main commercial operators will assist in generating improved information.

Inclusion of the post harvest sector in GVP imposes more challenges. It is presently poorly defined. The FRDC approach of incorporating it as one sector is preferable to the standard definitions of fish wholesaling and processing where there are ongoing problems of determining which category is appropriate.

6. Future directions

There are many strengths of the current arrangements involved in the publication of *Australian Fisheries Statistics*. It has been an effective collaboration between a number of organisations involved in fisheries management over a significant period of time, is low cost to develop and produce, and it meets many of the demands for information on the commercial catching sector of the fishing industry.

Expansion of the current publication much beyond what is already covered would have considerable implications for the level of resources needed to develop the data. Nonetheless, there are areas where improvements are required. There would appear to be a need to strengthen the approaches and market coverage to improve the valuation of catches. There is a need for larger font in the printed version and for better summary graphics to illustrate key features.

There are several areas of potential improvement within the current framework that would enhance its use as a policy resource. Within the structural data it should be feasible to provide some information on the extent of activities within fisheries, such as the number of active licences and the number of days fished in relation to the total, to derive a measure of capacity utilisation. A more holistic approach to coverage of fisheries to highlight the interactions between fisheries would be useful.

Some measures of changes in key economic parameters, such as changes in prices paid and received changes in fuel prices and labour costs would enhance the industry profile. However, the most important information would be to enhance data on the level of employment in the industry and the seasonality of that employment. The only viable means of collecting such information is through licensing and logbook information. Cost information can be derived from economic surveys.

Australian Fisheries Statistics is a summary of the commercial activities in the industry and should remain so. While there is some demand for more species detail than is provided in the summaries this is better dealt with at the state level or through improving access to the database itself. There should be vertical consistency between state level data and the summary data, which requires some decision rules in relation to the changes made to either, to ensure that consistency. There is also demand for the tables to be available in computer readable format other than PDF so that trends can be better analysed. While the publication is widely distributed this can be further enhanced through better cross referencing with state publications.

The short timeline imposed on the providers of data to meet the various administrative requirements associated with determining the level of research funding and levy collection imposes a number of challenges. However, the outcome is that information is available earlier than would otherwise be the case. Any effects of current estimation procedures on funding considerations can be overcome through incorporating two stages in the administrative processes to allow for subsequent revision of initial estimates. In using a lagged three year moving average of GVP values to establish research funding, allowances should be made for inflation to provide constant dollar estimates.

The fishing industry faces many challenges that will require improvements in other forms of economic information if they are to be effectively addressed. Much emphasis in fisheries management is on the triple bottom line – the need to focus on overall environmental, economic and social outcomes. This focus on the wider uses of fisheries resources can be expected to increase the need for information on which to base decisions. The need for better data on the post harvest sectors is an example of this.

Simultaneously, the wider industry definitions incorporating the post harvest sector, recreational and customary fishing also drive a need for a wider information set. Not only is information needed on their activities, but their needs for economic information also need to be considered.

Historically, the main emphasis of research and data collection has been on the identification of fish stocks and estimation of yield relationships in wild fisheries to establish the maximum sustainable yields of those fisheries. There has been far less focus on economic information on the costs of fishing and on prices. For commercial fishing to remain a viable long term economic use of fisheries resources in the wild it is essential that management decisions focus more on the economic issues associated with commercial fisheries. This is not to downplay the need for biological information on catch and effort but rather a requirement for greater attention be given to the economic information needed to complement the biological information and to assist industry to maintain profitability.

The increased focus on conservation goals while encouraging efficiency in the fishing industry will need to result in greater emphasis on the economic efficiency of fishing than has been the case. Maximum economic yields occur at lower levels of fishing effort and catch levels than do maximum sustainable yields. Fish stocks are less exploited at maximum economic yield levels, allowing for stronger conservation strategies and greater stock resilience against negative shocks to the fish population. Against this, adjustment issues are likely to assume greater importance.

Basing fisheries management on achieving maximum economic yields has considerable implications for the demand for information, particularly in relation to the costs of fishing and fish prices. While stock information is required to establish total allowable catches and catch yield relationships, there is also a need for information on fishing costs and prices to establish the economic yield.

Cost information

It is becoming increasingly important to have available current information on fishing costs and their components so that the implications of policy decisions and external shocks, such as increasing fuel prices, are explicit. Where the costs are explicit, it is more feasible to establish the worth of a particular course of action. Economic surveys provide this information.

Economic surveys are regularly undertaken in Commonwealth fisheries and there have been some surveys of costs and returns in state fisheries, such as in Queensland. However, the methodologies are well established and fisheries managers can apply these with relatively little difficulty. As with most surveys, the costs can be significant although there are prospects for reducing those costs through better use of new

technologies, such as through greater internet use. However, the problems associated with bias in internet based surveys, particularly in capturing information from smaller operators, would need to be addressed.

Fisheries economic surveys should always be undertaken by an organisation at arms length from fisheries management to ensure the confidentiality of the data collected and integrity of the analysis. Providing fishers with the results and comparisons of their performance in relation to those of their stratum group has generally been welcomed by survey participants as a means of identifying their strengths and weaknesses and has significantly enhanced the cost-effectiveness of surveys.

Price information

In addition to its role in active fisheries management, price information is an important element of policy development and administration, such as with GVP estimation, trade issues and the economic health of the industry. However, the availability of price information has much wider implications for the efficiency of the industry at all levels.

The relationship between the volume of production and price is fundamental to both effective management and marketing. Any proposals to reduce commercial catches would need to consider two impacts on the industry revenue.

- The loss of revenue directly associated with the catch reduction.
- The higher prices for the remainder of catches that would result from the lower volume of sales. For example, a 10 % reduction in the daily volume of medium redfish sold on the Sydney Fish Market would, other factors equal, increase prices for the remaining redfish by around 3.9% (Smith et al. 1998, p40).

Price information helps identify revenue maximisation opportunities. Unlike agriculture and aquaculture, the common property characteristics of fisheries in the wild can restrict the opportunities for revenue maximisation unless addressed through fisheries management. Some Australian fisheries have done this through ensuring that demand considerations are addressed in management plans, such as taking account of market opportunities in setting seasonal openings.

The quality of price information used to value catches has been identified as a major weakness of GVP estimation. In the absence of better price information, conservative values are used to value production. One payoff to developing better price information for the industry is in improving the quality of those estimates. If product traceback is to be introduced to the industry this would provide a framework for monitoring supply chains and obtaining prices. However, such a development involves high respondent burden and significant cost because of the large number of trades involving low lot sizes in a diverse market.

The best way of improving the availability of price information is through better engagement of the post harvest sector. Improving the flow of information to that sector will have payoffs in enlisting their cooperation in validating production values.

Development of trade information

Trade has a major bearing on the fishing industry. Industry GVP is highly correlated with export revenue while imports of fisheries products account for around half of total domestic consumption of seafood. Many of these products are in competition with Australian product in at least some market segments and all contribute to the status of seafood with Australian consumers.

Marketing issues are increasing in importance to the industry. The appreciation of the Australian dollar has reduced export returns over those achieved at the beginning of the decade and put increased pressure on exporters and the domestic industry to maintain prices. New suppliers, such as Vietnam, Indonesia and China, have emerged with new products, such as Basa and Vannamei prawns, presenting challenges on the domestic market. The structure of domestic marketing is changing with the major supermarket chains emerging as major seafood retailers.

In an industry with such high exposure to trade it is important that developments be monitored and reported in relation to their potential impacts on the industry and the threats and opportunities that may be presented. It is suggested that a trade database be developed, based initially on monitoring monthly exports and imports and progressively extending to cover developments in other major markets relevant to the Australian industry. There are many users of trade information if it were available, including the industry, fisheries managers, suppliers of inputs to the industry and marketers.

The main advantage of the information generated is that it results in better decision making. From an FRDC perspective this has several benefits in relation to estimating likely funding and in identifying the strategic challenges facing the industry. Similarly, the availability of such information will assist the industry in its decision making and will go some way toward addressing the information gaps raised by other organisations, such as banks and freight forwarders.

The industry is responding to the marketing challenges with the formation of a national body with responsibilities for promotion and addressing national marketing issues¹⁰. Information on price relationships is fundamental to the success of a marketing and promotion campaign. The success of a promotion campaign depends on the demand and supply characteristics of the products being promoted. It is desirable to know how prices or volumes (and revenue) will respond to an increase in demand and whether the benefits will be secured by those funding the campaign, or be largely dissipated to other products or to the same or substitute products from other sources. The database and distribution of current trade data to the industry could be

¹⁰ The Australian Seafood Promotions Corporation was established in 2005 with the draft objectives to:

- engage in national and international promotion of seafood;
- develop and coordinate promotion activities where it is judged that normal market forces would not result in an optimal outcome for the Australian seafood industry;
- support the collection and dissemination of market intelligence to assist members in promoting Australian seafood;
- support industry trade and market access activities;
- represent the interests of members in consultations with government, industry associations and the public in matters relating to seafood promotion; and
- work with industry associations and government agencies to ensure a coordinated response to the Australian seafood industry's needs. (Draft Constitution 2 December 2005).

highly effective support for the promotion initiative, although it should be operationally separate.

There is a need to establish the impact of currency fluctuations on fisheries trade and on the fishing industries themselves. The same currency change will have different effects on industry revenue for different industries, depending on the supply and demand relationships facing a particular product. An industry that faces strong demand with few direct competitors will secure more of a change in currency value than another which may trade away a part of the advantage in order to secure sales in a highly competitive market. There is industry interest in establishing factor shares to determine how much of a given change in exchange rates is distributed to different industry sectors.

Demand for Australian products on overseas markets has not been closely examined¹¹. The factors influencing our overseas markets need to be examined in partnership with Australian exporters to ensure that both the short and longer term issues are addressed. As global market database is being developed for Western rock lobster that is also relevant to the industry in other states. Similar initiatives could cover other key products to ensure that the industry has an information base that will support its continued innovation.

Incorporation of the post harvest sector

One criticism of the current dependence on GVP data as a representation of the seafood industry is that it undervalues other industry sectors. Given the wider definition of the fishing industry adopted by FRDC it would appear logical to expand GVP reporting to cover these sectors. Reporting on value adding activities through an annual survey would provide a more complete picture of the seafood industry and would assist in adoption of a whole of industry perspective for a range of issues, such as market development, disease risks, and employment.

Development of data on the processing, wholesaling and importing sectors (the post harvest sector) has some challenges. To be consistent with the production sector, GVP for the sector would be derived as total value of sales less the fish product cost. The ABS data on these sectors, while still experimental, is based on a wider definition of sales and the cost of those sales. The ABS data is associated with high standard errors, possibly because of difficulties in capturing the diversity of operations in the sectors.

If it is not possible to use the ABS data, a survey of the sectors could be undertaken. This would be a significant undertaking but would provide information on the main economic parameters influencing operations in the sector. The ABS framework and populations for the individual sectors would be suitable but it would be desirable to combine the sectors into the post harvest sector. The survey would also link with the monitoring activities currently undertaken to establish catch values for GVP purposes.

Seafood consumption

While there have been more recent studies of consumption patterns in Sydney, Perth and Melbourne (Ruello and Associates 1999, 2000, 2005) it has been over fifteen

¹¹ Fitzgerald (DAFF Fisheries Branch) has produced three useful overview reports covering European, US and China markets.

years since a national seafood consumption survey was undertaken and longer since such information was published. While the capital city studies provide valuable information on consumption and distribution within those cities, they provide no assessment of overall seafood consumption patterns in Australia and in areas not included by the capital city studies. As a result it is difficult to examine overall trends and issues in relation to seafood and other consumption, such as the impact of demographic changes and changes to incomes.

A national seafood consumption study involves relatively long lead times and is expensive to undertake, if it is to be representative of the national picture. However, the previous studies have provided baseline information to all sectors of the industry. Given the number of public policy organisations (such as those involved with health, aging, indigenous affairs, conservation, business development as well as fisheries) that would be able to use such a study, a feasibility study could be initiated into undertaking and funding a joint survey.

Recreational and customary fishing

Market value of those fish caught and retained by recreational and customary fishers is considered a comparable (if conservative) figure to commercial GVP for valuing their take. This is the approach recommended earlier in this report for incorporating recreational fishing and customary fishing into the GVP framework. Publication of these figures would improve the information base available for the fishing industry and would assist in gaining acceptance for more comparable data across the industry.

Developing appropriate data for the levels of catches taken by recreational fishers is more problematic. It should be feasible to develop indices of catch levels through using the results of State Fisheries recreational fishing studies that can be applied to the National Recreational Fishing Survey and updates. The issues associated with the mortality of 'catch and release' fish would need to be resolved to get indices of fish withdrawals. Fisheries management agencies have given a commitment to continue to survey recreational and indigenous fishing at intervals of not more than 5 years (FRDC 2005, p36)

Information on the value of recreational fishing is important because it determines the expenditure made by fishers and the size of the market for recreational fishing inputs. However, the use by some parts of the community of the value of recreational fishing, determined from data on total expenditure on fishing and related activities, as a basis for decision making in relation to resource access issues leads to poor decisions¹². Aside from that there are significant problems in 'unbundling' expenditure into that correctly attributable to fishing only¹³ and there is no comparable data available on commercial activities. The GVP for the commercial sector is not a comparable figure as it measures only the farm gate output, taking no account of the final value of all expenditure on commercially sourced seafood on domestic and overseas markets or of the costs involved in getting it there.

¹² For discussion of the issues involved, refer Hundloe (ed) *Valuing Fisheries: An Economic Framework* or Hundloe, T. *Is My Fish Worth More than Yours. Comparing the values of fish caught by commercial and recreational fishers in an economic framework.*

¹³ The approach used by Campbell and Murphy (2005) was to report expenditure only, without ascribing any implications for the actual value of recreational fishing.

Increased emphasis on social reporting.

As an industry substantially based on the use of public resources there is little doubt of the need for a cohesive set of information on participants in the fishing industry. Details on the level of employment, the skills base, levels of investment and community contribution are all valuable tools in representing the industry to the public and an aid in effective policy development.

For most industries detail on employment and income levels is largely derived from ABS census information and associated economic data series covering industry activities. However, the census data appears to significantly understate employment levels and there is little information on other key characteristics such as income levels. Some of the characteristics that make the industry difficult to measure, such as the levels of seasonal and part time employment or the wide geographical spread, are all the reasons why such information is important. An examination of industry employment over 2006-07 would allow comparison with the results of the 2006 Census.

The industry is widely regulated with the exception of recreational and customary fishing. As a result it is feasible to collect information on regulated sectors through coordinated surveys at the time of licensing or as part of ongoing monitoring over the fishing season, such as part of logbook systems, if such information is sufficiently justified. Recreational fishing participation information can be easily collected if the activity is licensed, such as in Western Australia or New South Wales. If it is not licensed then the only means of measuring participation are through surveys or through indirect measurement, such as boat or tackle sales.

The purpose of social reporting *per se* needs to be clear. There is no doubt that greater information is required on the social implications of many fisheries management decisions, particularly in periods of fisheries adjustment. However, the value of such information is limited if it is collected in isolation from economic impacts because there is no means of relating the impacts of the policy, such as lifting economic performance of the industry, directly to the social impacts.

Table 6.1 Recommendations for improvements to national economic statistics.

<i>General Findings</i>	<i>Recommendations for Actions</i>
<i>Australian Fisheries Statistics is widely used and valued</i>	The Australian Fisheries Statistics publication meets the needs of a range of users and should be continued with only minor changes. A summary 'industry profile'
<i>Electronic and hard copy. Around 2000 copies are distributed annually</i>	There is still a preference for hard copies of Australian Fisheries Statistics. The current arrangements, whereby FRDC publishes the hardcopy while ABARE provides the electronic copy, appear to satisfy users.
<i>Currently there are few web links between State Fisheries and Australian Fisheries Statistics websites.</i>	Links between Australian Fisheries Statistics and State Fisheries websites should be strengthened. Data in Australian Fisheries statistics and state publications should be consistent, requiring agreed decision rules in relation to the number of revisions.
<i>Insufficient detail is given in Australian Fisheries Statistics for some purposes.</i>	More detailed production and value statistics should be available in an extended electronic database format to ensure transparency of the valuation process. If additional regional detail is required this should be kept in the database in preference to increasing the size of the publication.
<i>Data in Australian Fisheries Statistics is difficult to access in current formats.</i>	The data should be made available in an accessible format, such as Excel, to allow users to easily incorporate data in their applications.
<i>While difficult to independently verify, some values used appear to understate true returns.</i>	More resources may need to be put into identifying fish values, through use of a wider list of collaborators and through closer monitoring of overseas prices. Development and distribution of trade data to the post harvest sector would assist in confirming values used and improve the availability of information.
<i>There is an under-emphasis on identifying factors influencing changes in fishing costs</i>	More use should be made of the results of ABARE <i>Fisheries Surveys</i> in relation to industry cost changes in Australian Fisheries Statistics, such as changes in prices paid/prices received.
<i>There is a need for more economic information on the post harvest sectors of each State</i>	Decisions in relation to the catching sector have downstream effects on the post harvest sector. A concerted effort is required to develop economic information on this sector in each State and provide updates.
<i>There are important weaknesses in using the GVP estimates published in Australian Fisheries Statistics as the basis for setting research funding.</i>	<p>The use of a lagged average of 3 years GVP estimates with no adjustments for changes in purchasing power reduces the level of research funding below the prescribed levels. Adjustments for inflation would address this problem.</p> <p>The narrow window available to prepare GVP estimates results in use of conservative preliminary estimates which reduce funding levels. Changes in the timetable and administrative arrangements may reduce this problem.</p> <p>Improvements in the availability of price information would make estimation more robust</p>
<i>The commercial fishing charter sector can be incorporated in fishing GVP estimates using current methodologies.</i>	The charter boat industries are now licensed in most states and required to provide logbook information. Valuation is difficult with a range of charging methods used. However, it should be possible to determine an agreed standardised method of valuation for statistical purposes.
<i>The recreational and customary fishing sectors can potentially be incorporated in a GVP framework.</i>	Valuing recreational catches at commercial values can provide a measure broadly comparable to commercial GVP. An index of recreational activity based on state monitoring of key fisheries could be a feasible means of updating catch data. Details on the level of catches will depend on updates of national recreational fishing survey data.
<i>The mainstream aquarium fish industry is currently incorporated in GVP estimates.</i>	A significant part of production is believed to be outside the recognised industry. A review of current policy in relation to the disease risk posed by the aquarium fish trade should provide independent validation of the size and value of the industry. Current value estimates are disputed by industry, mainly through misunderstandings of the concept of farm gate prices.
<i>Incorporating the post harvest sector of the</i>	Current ABS data collections covering these sectors a subject to wide confidence limits and do not provide the exact measure of GVP that would be comparable to

*seafood industry appear
feasible*

other industry estimates.
Using the ABS surveys would appear to be the most feasible means of collecting data on the sectors in future.

*Employment levels
reported by the ABS
Census appear to
understate employment in
the seafood industry.*

The Census may be unsuited to recording fishing industry employment mainly because of the high seasonality of that employment.
It is feasible to capture employment data through licensing and logbooks. This would require coordination between management authorities to develop national data and to prevent overlaps.
If understatement of employment is a major concern then a study of employment over 2006-07 would allow examination of the problems involved and comparison with the 2006 Census.
Industry organisations need to publicise the importance of ensuring the correct employment classifications are used in the 2006 Census, to ensure that the industry is accurately reflected in national data.

*National consumption
study*

That an initial investigation be undertaken of the cost of undertaking a National Seafood Consumption Study and the interest of a consortium of potential sponsors in jointly funding such a study.

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