

**FINAL APPLICATION TO AUSTRALIAN
GOVERNMENT DEPARTMENT OF THE
ENVIRONMENT AND HERITAGE
ON THE
SPECIMEN SHELL MANAGED FISHERY**

Against the Guidelines for the Ecologically
Sustainable Management of Fisheries

For Consideration Under Parts 13 and 13A of the
*Environment Protection and Biodiversity
Conservation Act 1999*

MARCH 2005



Department of Fisheries
Government of Western Australia



Fish for the future

DEPARTMENT OF FISHERIES, WESTERN AUSTRALIA

LOCKED BAG 39, CLOISTERS SQUARE

WA 6850

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1. INTRODUCTION TO THE APPLICATION

1.1 DESCRIPTION OF INFORMATION PROVIDED

This is an application to the Department of the Environment and Heritage (DEH) to assess the Specimen Shell Managed Fishery (SSMF) against the *Australian Government Guidelines for the ecologically sustainable management of fisheries*. The submission of a successful application against these guidelines is now needed to meet the requirements under Part 13 and Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), to enable specimen shells to be listed on the section 303DB list of species exempt from export regulations (previously Schedule 4 of the *Wildlife Protection (Regulation of Exports and Imports) Act, 1982*) past May 2005.

The information provided in this application covers all the elements specified in the *Guidelines for the Ecologically Sustainable Management of Fisheries* (located on the DEH website www.deh.gov.au/coasts/fisheries/assessment/guidelines.html) along with other information (at a variety of levels of complexity) considered relevant to those who wish to gain an understanding of the management for this fishery. The application includes:

- Comprehensive background information on the history of the SSMF and a description of the management arrangements, which provides the context for assessing this application and the biology of the primary species caught (see Section 2 for details).
- A description of the National Ecologically Sustainable Development (ESD) Reporting Framework and methodology, which was used to generate the information that is presented in the application (see Section 3 for summary and www.fisheries-esd.com for full details).
- Specific supporting statements relevant to each of the criteria within the Australian Government Guidelines. These criteria include the “General Requirements”, which cover many of the governance aspects related to the management of the SSMF, plus each of the objectives listed under “Principle 1” (target species issues) and “Principle 2” (broader ecosystem issues) of the Guidelines (see Section 4).
- Section 4 also has, where appropriate, specific links and references to the detailed ESD component reports contained in Section 5. Referral to this additional information is facilitated by the incorporation of appropriately placed hyperlinks (electronic version only).
- At the end of Section 4 there is an OVERVIEW TABLE that outlines for each issue, which Guidelines are relevant; if there is an operational objective, the availability of suitable data for the indicators, whether the current performance against the limit/measure chosen is acceptable, and a summary of what (if any) future actions are required.
- Section 5 includes a comprehensive account of the risk assessment outcomes and current performance of the fishery, presented in the National ESD Reporting format, covering each of the environmental and governance issues relevant to this application for the fishery. These reports cover each of the issues in a

comprehensive manner and include either; the explicit objectives, indicators, performance measures, current and future management responses and justification for each major component; or a full justification for why specific management of this issue within the SSMF is not required.

1.2 OVERVIEW OF APPLICATION

The SSMF operates in the shallow waters throughout Western Australia. There are 33 licences with no more licenses to be issued to the fishery. However, between six and nine of these licenses have been completely inactive over the last two years and most others are rarely fished; there are only six active divers. The fishery is unusual in that a wide variety of species are collected, each in very low numbers. In the four years of 2000 to 2003, nearly 550 separate species of molluscs were collected. Some of these, such as the cephalopods *Spirula spirula* and nautilus shells were collected after they washed up dead on beaches. A total of 69,771 specimen shells were collected during the period, an average of 17,317 shells per year for the fishery, or about 31 specimens per species. Full data on catch and effort by species are provided in Appendix 4.

Western Australia has three major biogeographic zones: a tropical north coast, which extends northeast from North West Cape to the Northern Territory Border (and across northern Australia to the southern limit of the Great Barrier Reef, Queensland); a temperate south coast, which extends from Cape Leeuwin to the South Australian Border (and across the south coast of the continent and up the east coast of the continent to southern Queensland); and an overlap zone on the west coast between North West Cape and Cape Leeuwin. The specimen shells are in three groups of species: tropical northern species which are part of the Indo-West Pacific; temperate southern Australian species; and a small proportion (about 10%) of the species which are endemic to Western Australia. The endemic species may have part of their range on the north or south coast but tend to be concentrated on the west coast. Some endemic species occur on all three coasts.

The specimen shells are collected throughout the State, but because of the biogeographic distributions, different species are collected in the various parts of the State. Primary emphasis is devoted to groups that are most popular with shell collectors; families such as cowries, cones, murexes and volutes. Ponder and Grayson (1998) examined the specimen shell industry on a nationwide basis, and rated their vulnerability to over-exploitation on the basis of their biology, accessibility to collection, and rarity. Primary management emphasis in Western Australia has been devoted to eight species listed as being of possible concern by Ponder and Grayson (1998).

The *Fish Resources Management Act, 1994* (FRMA) provides the legislative framework to implement the management arrangements for this fishery. The specific management plan for the SSMF is the Specimen Shell Management Plan 1995. The FRMA, the regulations in the *Fish Resources Management Regulations, 1995* (FRMR) adheres to arrangements established under relevant Australian laws with reference to international agreements as documented in Section 5.4.2. The above legislation, including the management plan, can be viewed on line at the State Law

Publisher website (www.slp.wa.gov.au) or through hyperlinks on the Department's website on www.fish.wa.gov.au.

The SSMF is a restricted entry fishery managed through input controls that restrict the number of licensees to 33. There are a number of controls to maintain the specimen shells stocks within Western Australia. The primary controls are natural: depth, time and tide. Most of the sought after species are collected through diving. There are physiological restraints which severely limit the amount of time divers can spend each day in depths > 20 m. In northern areas where the tidal range is great, diving can only be done during periods of slack water, largely at neap tides. The SSMF has minimal impacts on the wider ecosystem due to the selective method of fishing used (i.e. "by hand" collection only), the physiological constraints of diving, the numbers of fishers in the water (limited to two), and limit on the size of the boat to an 8 m length (except for one operator).

Consequently, the management regime for the SSMF should meet the *Guidelines for the Ecologically Sustainable Management of Fisheries*. Detailed justification for this conclusion is documented within the remainder of this application.

2. BACKGROUND ON THE SSMF

2.1 DESCRIPTION OF THE FISHERY

The Specimen Shell Managed Fishery in Western Australia is based on the collection of marine species of the Phylum Mollusca for the purposes of display, collection, cataloguing, classification and sale. The definition of specimen shells does not include any species within the Orders Sepioida, Teuthoidea and Octopoda, the family Tridacnidae, the genera *Haliotis*, *Pecten*, *Mytilus*, and *Pinctada* or the species *Pteria penguin*, *Tectus niloticus* and *Amusium balloti*, all of which are subject to separate management arrangements.

Australia has an estimated 20,000 species of marine, terrestrial and freshwater molluscs (Stanisic, 1991), only a small number of which are valued by specimen shell collectors. Management effort is focused on rare species that are individually valuable but are a minor component by number of the Fishery's activities. A significant component of the monetary value of the Fishery is composed of species that have been identified as being potentially vulnerable to over exploitation (Ponder and Grayson, 1998). Due to this status, their continued export was only permitted under a Declaration by the then Environment Australia, under section 303FN of the *Environment Protection and Biological Diversity Conservation (Wildlife Protection) Act 2001*.

The Declaration required the Western Australian Department of Fisheries to meet a number of commitments, including conducting a review of the distribution and possible stock structure of the species identified in the Declaration. This review was undertaken by Enzer (2002). The review included the known life history characteristics of the nominated species of specimen shells and the patterns of harvesting and operational characteristics of the fishery. The Enzer report will be available on the Department's website (www.fish.wa.gov.au).

The species collected in Western Australia, which had been identified by the then Environment Australia as potentially vulnerable to over-exploitation are:

- *Cypraea (Zoila) friendii vercoi*
- *Cypraea (Zoila) marginata (albanyensis)*
- *Cypraea (Zoila) marginata (consueta)*
- *Cypraea (Zoila) rosselli*
- *Cypraea (Zoila) venusta*
- *Cypraea (Austrocypraea) reevei*
- *Amoria damoni (keatsiana)*
- *Amoria damoni (reevei)*

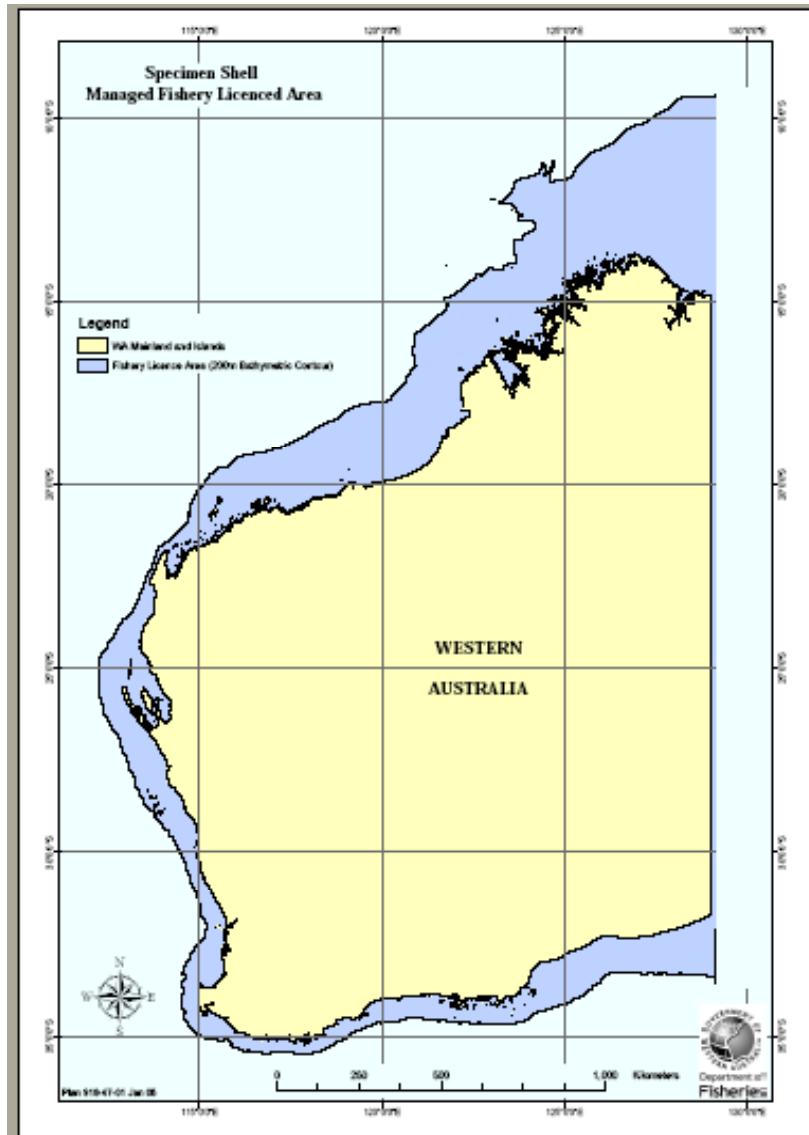


Figure 1 Licence area for the SSMF.

Management. The SSMF is managed by input controls.

Limited Entry. The fishery is limited entry; there are 33 licensees. Licenses are transferable. To provide a dive buddy for safety reasons while diving, the licensee and one nominated person are permitted to collect specimen shells.

Gear Restrictions. Specimen shells can only be collected by hand. Diving apparatus, including scuba and hookah equipment, may be used when operating in the fishery. Under the general guidelines for licensing fishing boats, as determined by the Minister for Fisheries, licensees in the Specimen Shell Managed Fishery are permitted to use a boat of not more than 8.0 m in length. If the holder of a licence wishes to use a boat of more than 8.0 m in length, the current Ministerial policy will oblige them to obtain a Western Australian Fishing Boat Licence for the boat.

One licensee has a boat significantly >8.0 m which is licensed to participate in the Specimen Shell Managed Fishery. This exception is because the boat was operating in the Fishery before the Management Plan came into operation in March 1995.

Restricted Areas. There are a number of marine parks, reserves and Fish Habitat Protection Areas in Western Australia. Specimen shells cannot be taken in all or part of these areas. Thus much of the west side of North West Cape and the Ningaloo Marine Park are prohibited areas for the fishery. Ningaloo Reef, which extends 260 km south from North West Cape is the largest fringing reef in Australia, and is exceeded in size only by the Great Barrier Reef in Queensland. The exclusion of Marmion Marine Park in the Perth metropolitan area is also important for its population of *Cypraea (Zoila) venusta sorrentensis* and *Cypraea (Zoila) friendii*.

The fishery operates between the high water mark and the 200 m isobath.

There are a number of other areas where the Specimen Shell Managed Fishery is not permitted to operate. These include all or parts of the following areas:

Marine Parks:

- Rowley Shoals Marine Park;
- Ningaloo Marine Park;
- Shark Bay Marine Park;
- Abrolhos Islands Fish Habitat Protection Area (reef observation areas);
- Shoalwater Islands Marine Park;
- Swan River Marine Park;
- Nornalup and Walpole Marine Parks; and
- Cottesloe Fish Habitat Protection Area.

Aquatic Reserves and Closed Waters:

- Point Maud Reserve;
- Point Quobba Conservation Area;
- Cowaramup Bay Reef Protection Area;
- *HMAS Swan* Artificial Reef;
- *Gudrun* Wreck Site;
- *Sanko Harvest* Wreck Site;
- Esperance Jetty Artificial Reef;
- Rottnest Island;
- Dyer Island; and
- Gantheaume Point.

Rotational closures may also be used to manage local depletion. In these cases the prime consideration in the opening of an area previously closed to the collection of specimen shells will be the abundance of specimen shells within the area in comparison to adjacent areas open to the collection of specimen shells. Experience has shown that the success of such closures is dependent upon the provision of sufficient enforcement resources to provide effective management. Rotational and seasonal closures are particularly effective for near shore areas where the cost of enforcement is minimal. Given the small size of the SSMF, closures of this type have not yet been used.

Several additional areas of Western Australia have been proposed and are being developed as marine parks: Jurien Bay and Southwest Capes on the west coast; the Recherche Archipelago near Esperance on the south coast, and Dampier and the Montebello islands on the north coast. The SSMF will be excluded from any sanctuary zones in these marine parks when they are established. The management plans for these parks will propose to exclude the fishery from many areas. These plans will be given effect under the Fish Resources Management Act 1994 over 2005 and 2006.

Ability to Increase Regulations. Where there is evidence of a substantial increase in effort resulting in overfishing, the Minister for Fisheries reserves the right to introduce, at his discretion, management controls to reduce the effort in the fishery. These effort controls may take the form of, but are not limited to, limitations to annual catch, introduction of seasons, and the introduction of minimum sizes, and are borne by all operators. Given the small size of the SSMF, closures of this type have not yet been used.

Industry Restrictions. Specimen shells are hand collected by divers. The market places a premium on “gem” shells; that is, those of the highest quality. The value of a shell is rapidly diminished by any irregularities such as breakage and subsequent repair of the shell by the living animal, the partial drill hole where a predator was not successful in gaining entry, colonisation by boring organisms, and other imperfections (Table 1). A licensee will ignore these shells as they cannot be sold for a high price, but their reproductive potential in the population is undiminished.

Table 1. Shell grading system for specimen shells.

Grade	Description
Gem	Specimen will be fully adult and of average size. Shells without any discernible blemish or flaw.
Gem-	Minor flaw or blemish which is hard to find and in no way detracts from the look of the shell.
Fine++	Noticeable flaws, growth lines or blemishes consistent with the species. Shells are still excellent for an aesthetically pleasing collection and are considerably cheaper than Gem specimens.
Fine	Shells have chip, growth line, nacre lift, blemish or other visible flaw. Note very fresh dead collected but otherwise good specimens are often classed as “Fine”.
Good/Fair	Either badly damaged, juvenile or obviously dead. Some species are only available as fair specimens. Suitable as a representative of the species or for a study collection.

Species and Minimum Size Limits. There are no mandatory species or size limits. Species in most demand are those which are rare, which in turn severely limits the ability of licensees to collect the specimen shells. Cowries (genus *Cypraea*) form a flared outer lip when the animal becomes an adult. There is no further growth. Only adult cowries are collected. In the other sought after family, the volutes, there is no clear indication of when the animal becomes mature. While growth slows after maturity it continues throughout the lifespan of the individual. There is a strong economic pressure to select the largest shells as they command the highest prices.

Licensees are not permitted to sell any part of a specimen shell other than the shell.

History. The specimen shell fishery was not regulated prior to the proclamation of the Commonwealth *Wildlife Protection (Regulation of Exports and Imports) Act 1982* in 1984. Prior to this time regulation of commercial specimen shellfish had been undertaken by prohibiting collecting in particular areas or by seasonal closures. The most significant of these was seasonal closure of intertidal platforms in the Perth metropolitan area to all forms of collecting of gastropod molluscs. The seasonal closures began in 1982 in response to over collecting of the abalone *Haliotis roei* by recreational fishers for human consumption.

After the proclamation of the *Wildlife Protection (Regulation of Exports and Imports) Act 1982*, the Western Australian Department of Fisheries developed a framework for management for the specimen shell fishery. Without this plan, shell dealers and private collectors would have been unable to export their shells from Australia.

New arrangements came into effect on 1 March 1995 as a result of Fisheries Notice No. 689, namely the Specimen Shell Management Plan 1995, and a comprehensive policy framework for the fishery was developed (Barrington and Campbell, 1996). The management plan is under constant review and was last amended in December 1997. There are several amendments currently in the final drafting stage which include access to two non-commercial species of abalone, *Pecten* species, and the use of assistant fishermen, that will still only allow a maximum of two divers in the water at any one time.

Recreational Fishery. There is no documented recreational fishery, however if the public wishes to collect shells for their own private collection they are permitted to do so. It is expected that the recreational collection of shells is significant, but mostly consists of dead shells.

2.2 BIOLOGY OF SPECIMEN SHELL SPECIES

Taxonomy

Specimen shells belong to the Phylum Mollusca. There are a number of classes within the phylum. While some collectors specialize in obscure groups such as chitons (Class Polyplacophora), the greatest interest is in the Families Cypraeidae (cowries), Muricidae (murex shells and their relatives), Conidae (cone shells) and Volutidae (volutes). Accordingly, these are the groups most sought after by licensees in the SSMF.

Distribution

All families sought by the SSMF are distributed throughout the tropical, temperate and west coast overlap regions of Western Australia. In general, the distributions of individual species are restricted to one of the three regions. However, many of the tropical species occur well down the west coast, and a few extend onto the south coast of the State. Conversely, virtually all of the temperate species reach Cape Leeuwin, and extend for varying distances up the west coast of Western Australia. West coast endemics are distributed in varying patterns. Some extend from areas such as Albany on the south coast, along the entire west coast, and onto the north coast. A small proportion of the species, less than 1%, are restricted to either the south or the north coast. The SSMF operates in all three biogeographic zones.

Biology

Molluscs are diverse, with an estimated 20,000 species in Australia. They are spread across a number of classes and over 100 families, so there is a huge range of biology. The key point is that almost all of the marine species have a planktonic larval phase in the life cycle. This allows young from one area to rapidly distribute into other areas, and to maintain widespread distributions. In general, species with planktonic larvae also tend to produce relatively large numbers of young. All of these features help to ensure that populations are rapidly replenished after any fishing activities. Some molluscs, such as mussels, abalone, pearl oysters, etc form the basis of productive fisheries, underpinned by the planktonic stage in the life cycle. These species are managed by other fisheries and are excluded from the Specimen Shell Managed Fishery.

The species collected in Western Australia, which were identified by the then Environment Australia as potentially vulnerable to over-exploitation were:

- *Cypraea (Zoila) friendii vercoi*
- *Cypraea (Zoila) marginata (albanyensis)*
- *Cypraea (Zoila) marginata (consueta)*
- *Cypraea (Zoila) rosselli*
- *Cypraea (Zoila) venusta*
- *Cypraea (Austrocypraea) reevei*
- *Amoria damoni (keatsiana)*
- *Amoria damoni (reevei)*

All of the *Zoila* cowries and volutes (including *Amoria*) are among the small group of marine molluscs that lack a planktonic distributional phase in their life cycle. Instead, eggs are laid attached to the sea bottom from which young emerge as crawling juveniles.

2.3 MAJOR ENVIRONMENTS

2.3.1 PHYSICAL ENVIRONMENT

The area of operation for the SSMF is the entire coastal environment of Western Australia. As indicated above, the key factor governing distributions of individual species is temperature.

2.3.2 ECONOMIC ENVIRONMENT

Some species of specimen shells are greatly valued and are in high demand throughout the world. The fishery supports a minor export industry. While the industry is minor in economic terms, it is a major component of the incomes for those licensees active in the SSMF. The price for specimen shells fluctuates largely depending on the size and condition of the shell with the market paying considerably higher prices for larger shells that are in gem condition (Table 1). This factor, in conjunction with the small market, ensures that there is little incentive for fishers to take substandard shells.

2.3.3 SOCIAL ENVIRONMENT

In general, the licensees started as recreational shell collectors many years ago and developed contacts for trading shells with counterparts around Australia and overseas. Over time the interest developed into an occupation and a business, but for most it remains as much a social activity as it is a business enterprise.

3. METHODOLOGY

3.1 SCOPE

Because of the very limited potential impact of the SSMF, no formal ESD report was undertaken. The basis of the ESD analysis is an examination of the detailed recent reports by Ponder and Grayson (1998) and Enzer (2002). The WA beche de mer industry also operates in wide areas with fishers collecting individual specimens in shallow water. Many of the issues in the two fisheries are similar, so the ESD analysis also draws on the formal ESD assessment which was done for beche de mer.

Given the timeframes involved, only the criteria required for the “Guidelines for the Ecologically Sustainable Management of Fisheries”, which cover mainly the environmental elements of ESD (outlined below in Table 2) were generated for this application.

Table 2 Main National ESD Reporting Framework Components.

Nb: Only those ESD components in bold* are reported in this application.

National ESD Framework – ESD COMPONENTS
Contribution to Ecological Wellbeing
Retained Species*
Non-Retained Species*
General Ecosystem*
Contribution to Human Wellbeing
Indigenous Community Issues
Community Issues
National Social and economic Issues
Ability to Achieve
Governance*
Impact of the environment on the fishery

3.2 OVERVIEW

The steps involved in completing an ESD assessment for the SSMF (Figure 2) were based upon using the National ESD Reporting Framework. This is outlined in detail in the WA ESD policy paper (Fletcher, 2002) and in the “*How to Guide*” (Fletcher *et al.*, 2002) located on the website (www.fisheries-esd.com):

- 1) The then Environment Australia contracted a nationwide assessment of the Australian specimen shell fishery. Ponder and Grayson (1998) established a ranking system of five categories, A to E with species in category A being at the highest potential risk. Criteria used were:
 - distribution;
 - type of development;
 - accessibility; and
 - market value.
- 2) The then Environment Australia used this report to develop a list of species considered to be of potentially high risk. Eight species were included from Western Australia. These were examined in detail by Enzer (2002).
- 3) The WA Department of Fisheries research staff for the fishery determined the issues that needed to be addressed for the SSMF. This process was facilitated

by adapting the set of “Generic ESD Component Trees” into a set of trees specific to the SSMF.

- 4) A risk assessment/prioritisation process was completed that objectively determined which of these identified issues was of sufficient significance to warrant specific management actions and hence a report on performance. The justifications for assigning low priority or low risk were, however, also recorded.
- 5) An assessment of the performance for each of the issues of sufficient risk to require specific management actions was completed using a standard set of report headings where operational objectives, indicators and performance measures, management responses etc. were specified.
- 6) An overview assessment of the fishery was completed including an action plan for activities that will need to be undertaken to enable acceptable levels of performance to continue or, where necessary, improve the performance of the fishery.

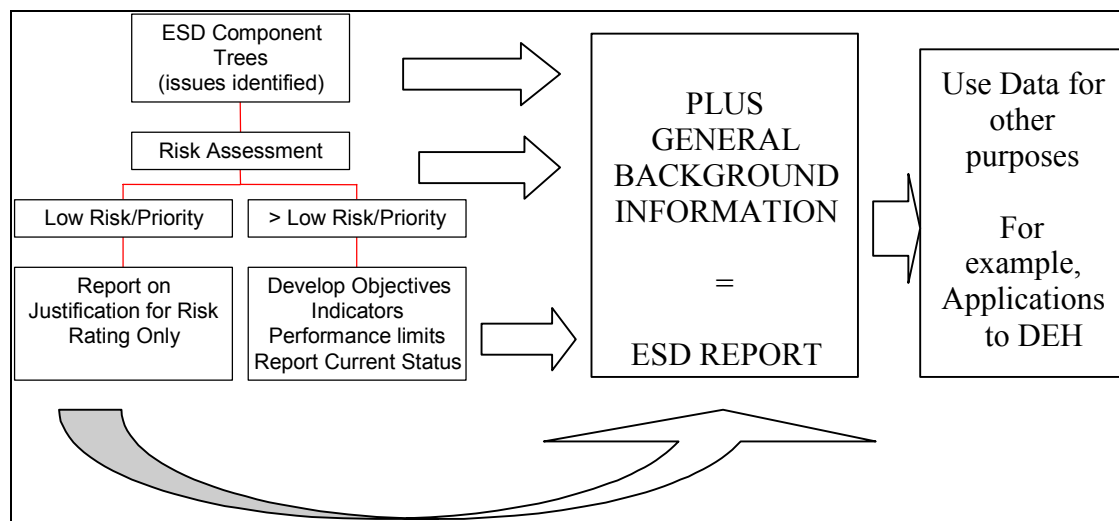


Figure 2 Summary of the ESD reporting framework processes.

3.3 ISSUE IDENTIFICATION (COMPONENT TREES)

The National ESD Reporting Framework has eight major components, which fall into three categories of the “contributions to ecological wellbeing”, “contributions to human wellbeing” and the “ability to achieve the objectives” (Table 3). Each of the major components is broken down into more specific sub-components for which operational objectives can ultimately be developed.

To maximize the consistency of the approach amongst different fisheries, common issues within each of the components were identified by the then Standing Committee on Fisheries & Aquaculture (SCFA) and the ESD reference group within each of the major component areas and arranged into a series of “generic” component trees (See

Fletcher (2002) and the www.fisheries-esd.com web site for a full description). These generic trees were used as the starting point for identifying the issues. These trees were subsequently adapted into trees specific to the SSMF by expanding (splitting) or contracting (removing/lumping) the number of sub-components as required (see Figure 3). The Department's research and policy staff developed the trees for the SSMF in October 2004.

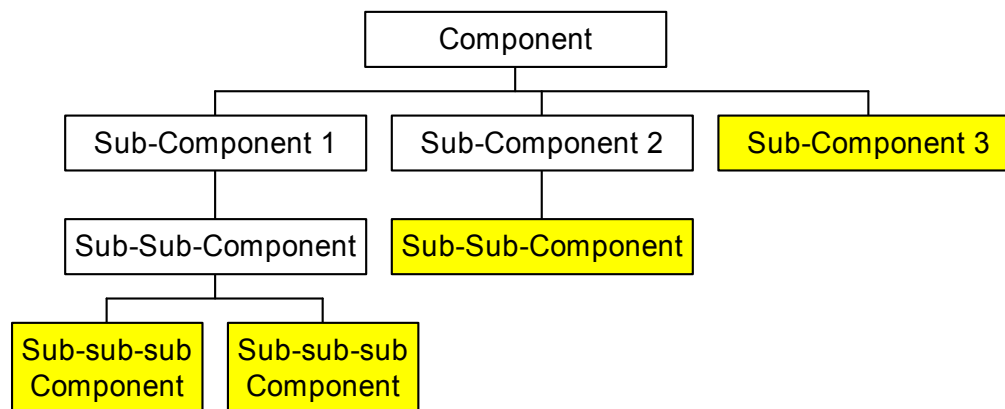


Figure 3 Example of a component tree structure.

3.4 RISK ASSESSMENT/PRIORITISATION PROCESS

After the components/issues were identified, a process to prioritise each of these needs was completed using a risk assessment process. The risk assessment framework was applied internally using expertise from both the research and management sections of the Department of Fisheries. The assessment was consistent with the Australian Standard AS/NZS 4360:1999 Risk Management, concentrating on the risk assessment components. The general Risk Assessment process is well documented but in summary, it considers the range of potential consequences of an issue/activity and how likely those consequences are to occur. The combination of the level of consequence and the likelihood is used to produce an estimated level of risk associated with the particular hazardous event/issue in question.

An estimate of the consequence level for each issue was made by the Department of Fisheries staff. This level was from 0-3, with 0 being negligible and 3 being high, with immediate or irreversible threat (see Appendix 2 for details of consequence tables).

The level of consequence was determined at the appropriate scale for the issue. Thus for target species the consequence of the SSMF was based at the population not at the individual level. Obviously catching one shell is always catastrophic for the individual but not always for the population. Similarly, when assessing possible ecosystem impacts this was done at the level of the whole ecosystem or at least in terms of the entire extent of the habitat, not at the level of an individual patch or individuals of non-target species.

The likelihood of a consequence occurring was assigned to one of four levels from remote to likely. In doing so, again it was considered the likelihood of the

“hazardous” event (consequence) actually occurring based upon collective wisdom, which included an understanding of the scale of impact required.

From these two figures (consequence and likelihood), the overall risk value, which is the mathematical product of the consequence and likelihood levels (Risk = Consequence x Likelihood), was calculated. Finally, each issue was assigned a Risk Ranking within one of five categories: High, Moderate, Acceptable, Low and Negligible based on the risk value (see Table 3).

Table 3 Risk ranking definitions.

RISK	Rank	Likely Management Response	Reporting
Negligible	0	Nil	Short Justification Only
Low	1	None Specific	Full Justification needed
Moderate	2	Specific Management Needed	Full Performance Report
High	3	Possible increases to management activities	Full Performance Report needed
Extreme	4	Likely additional management activities	Full Performance Report needed

In general, only the issues of sufficient risk (Moderate, High & Extreme), - those that require specific management actions need to have a full performance reports completed. Nonetheless, the rationale for classifying issues as low risk or even negligible were also documented and formed part of the ESD assessment. This allows all stakeholders and interested parties to see why issues were accorded these ratings. This process is summarized in Figure 2 (above).

It is important to note that the Risk Assessment involves the completion of reports that contain the completed justifications for the scores generated. Thus, the scores determined within the meeting by themselves are insufficient.

3.5 COMPONENT REPORTS

Only the issues of sufficient risk or priority that require specific management actions have a full performance report completed (which form section 5 of this application). Nonetheless, the rationale for classifying issues as low risk/priority were also documented and forms part of the report so that stakeholders can see where all the identified issues have finished.

For each of the lowest level sub-components (assessed as being of sufficient risk/priority to address), a detailed assessment of performance is generated. The Standing Committee on Fisheries & Aquaculture (SCFA) Working Group in conjunction with the ESD Reference Group agreed upon a set of 10 standard headings each of which need to be addressed (Table 4). Added to this list a further heading, “**Rationale for Inclusion**”, has been added. This specific heading allows the issues raised within the risk assessment process to be explicitly recorded. A full description of each of these headings is located in the WA ESD policy (Fletcher, 2002), which is available on the Department of Fisheries website.

Table 4 The National ESD reporting framework headings used in this report.

1. Rationale for Inclusion
2. Operational Objective (+ justification)
3. Indicator
4. Performance Measure (+ justification)
5. Data Requirements
6. Data Availability
7. Evaluation
8. Robustness
9. Fisheries Management Response
-Current
-Future
-Actions if Performance limit is exceeded
10. Comments and Actions
11. External Drivers

The completion of these component reports was initiated after the development of the component trees in October 2004. Progress towards completing these reports was subsequently made by a variety of Departmental staff. The draft application was sent to DEH and stakeholders including industry members and industry groups for review. This final application was generated after the review process.

4. ASSESSMENT OF THE SSMF MANAGEMENT REGIME AGAINST THE GUIDELINES FOR ASSESSING THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

4.1 GENERAL REQUIREMENTS OF THE GUIDELINES

The management arrangements must be:

Documented, publicly available and transparent;

As per the FRMA (1994) “the Executive Director is to cause a copy of every order, regulation and management plan in force under this Act:

- To be kept at the head office of the Department; and
- To be available for inspection free of charge by members of the public at the office during normal office hours.”

In addition to these legislative requirements, any discussion papers and proposals for modifications to these management arrangements are distributed widely to stakeholder groups automatically and other interested individuals by request in hard copy format. Where appropriate, they are also made available on the Departmental web site www.fish.wa.gov.au.

Finally, once completed, this assessment on the SSMF will be made publicly available via publication and electronically from the Departmental website. This will provide increased transparency through explicitly stating objectives, indicators, performance measures, management arrangements for each issue and how the fishery is currently performing against these criteria.

There is also a proposal to formally publish the relevant objectives and performance measures for each fishery, including the SSMF, in a series of Ministerial Guidelines.

Developed through a consultative process providing opportunity to all interested and affected parties, including the general public;

S64 and S65 of the FRMA define the requirements for procedures that must be undertaken before determining or amending all management plans.

Some licensees from the SSMF have recently reactivated The Professional Shell Fisherman’s Association of Western Australia (Inc.) that was recently formed should create a better overall communication base for the fishery, by providing FDWA staff with direct links to the SSMF licensees and by being invited to Association meetings.

Ensure that a range of expertise and community interests are involved in individual fishery management committees and during the stock assessment process;

The groups that have been involved in the review of the information contained within this application include:

- Department of Fisheries; and
- The Industry.

The general consultation methods used for this fishery are summarised in the Governance Section 5.4.2.1. It is a managed fishery.

Be strategic, containing objectives and performance criteria by which the effectiveness of the management arrangements is measured;

The ESD Component Reports (see [Section 5](#)) contains the objectives, indicators and performance measures for determining the effectiveness of the management for the SSMF. For some components, the objectives, indicators and performance measures are well established and the data are available to demonstrate levels of performance over time. For other components, the objectives, indicators and performance measures have only just been developed and/or the necessary data collection is only just being initiated. The status of this information is documented within each of the individual component reports within the ESD Reports in [Section 5](#).

The status of the fishery is reviewed and assessed on an annual basis through the monthly returns received by the fishers, which include the catch, effort and catch rates for the fishery. An annual report is provided to DEH outlining the performance of the fishery.

Be capable of controlling the level of harvest in the fishery using input and/or output controls;

The FRMA, conditions on the commercial fishing and the managed fishery licenses and specifically, the management plan for the SSMF provides the legislative ability to control the level of harvest within this fishery. This is achieved through the use of input control measures including limit entry, gear, boat and number of divers restrictions.

Contain the means of enforcing critical aspects of the management arrangements;

The Department has limited compliance resources dedicated to the SSMF (in light of the competing requirements of other fisheries). However, the emphasis of the management framework on specific effort restrictions and licencing requirements (for authorised “collectors”) allow a relatively small effort to ensure a high degree of compliance. These compliance measures are mostly checks of licences and reporting of catch. To date, there have not been any offences detected in this fishery.

The Department of Fisheries conducted a compliance risk assessment workshop in March 2003 to identify the compliance problems in the SSMF. The objectives of the workshop were:

- To identify and assess the severity of the compliance risks associated with the fishery and provide justification for the rankings assigned;
- To identify current and future compliance activities that could be undertaken to obviate the risks identified; and
- To identify any policy, management or legislative deficiencies with the fishery that may impact on the effectiveness of any compliance activities.

The results from this workshop highlighted a few difficulties with the current management plan for proficient compliance checks to be conducted within the fishery. The problems and gaps for compliance within this fishery will be dealt with when next reviewing the management plan for this fishery.

Nonetheless given the value of licences and the competitive nature of the industry, fishers themselves are also a source of information on illegal activities. A full summary of these compliance activities and their effectiveness is provided in Section 5.4.1.3. Through the combination of having employed operational staff as well as good dialog with the fishers, the Department is meeting this guideline.

Provide for the periodic review of the performance of the fishery management arrangements and the management strategies, objectives and criteria;

There is an annual review of the performance for the major aspects of the fishery through the completion of the annual reports required by DEH.

The ESD Component Reports contain comprehensive performance evaluations of the fishery based upon the framework described in the Department of Fisheries ESD policy (Fletcher, 2002). This includes the development of objectives, indicators and performance measures for this fishery and includes status reports for those components that are not subject to annual assessment. This full assessment, including an examination of the validity of the objectives and performance measures, is planned to be completed and reviewed externally every five years.

The Department is also meeting this guideline through the annual ‘State of the Fisheries’ report. This is updated and published each year including periodic review by the Office of the Auditor General (OAG). It forms an essential supplement to the Department’s Annual Report to WA Parliament with the latest version located on the Departmental website www.fish.wa.gov.au.

Be capable of assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species lives and the fishery operates;

Capabilities for the assessment, monitoring and avoidance, remedying or mitigating any adverse impacts on the wider marine ecosystem are documented in “General Environment” [Section 5.3](#). Due to the low amounts harvested for the specimen shell

species, the large area over which the fishery operates, and the limited number of “licensees” in the fishery no issues were identified as posing greater than a negligible risk. As a result, there is currently no need to implement specific monitoring for such impacts.

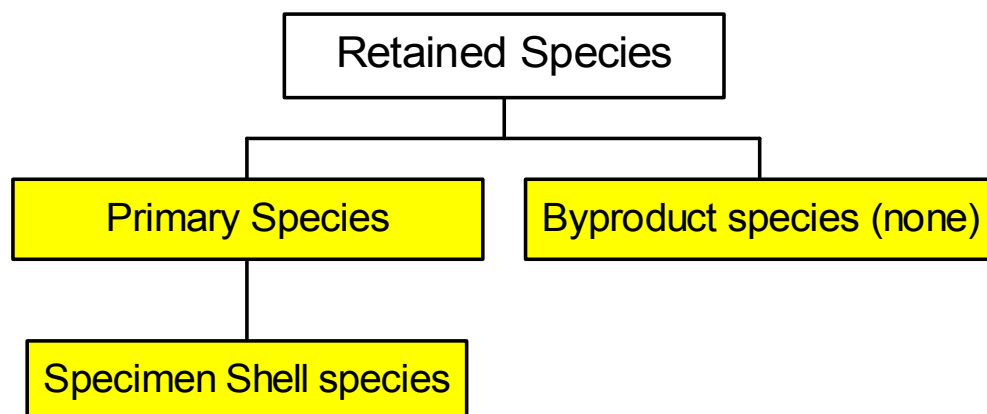
Require compliance with relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy;

The management regime for SSMF complies with all the relevant threat abatement plans for species where there are significant interactions. Details are provided in the ‘non-retained species’ section of this application ([Section 5.2.](#)). There are no known non-retained species taken in this fishery.

4.2 PRINCIPLE 1 OF THE GUIDELINES

OBJECTIVE 1. MAINTAIN VIABLE STOCK LEVELS OF TARGET SPECIES

A fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability.



The component tree detailing the stocks of retained species relevant for this fishery is shown above. All of the specimen shell species caught by this fishery have been assessed together in the one report. This full report is located in [Section 5.1](#). It was determined that the fishery was of **Low risk** to specimen shell stocks.

The SSMF is managed through a series of input controls including limited entry, gear restrictions and closed areas.

Analysis of the current performance by the SSMF demonstrates that the specimen shells stocks are being maintained at ecologically viable stock levels. Thus, in summary:

- Catch, effort and catch rate data is collected and analysed for this fishery on an annual basis. These data show that the fishery is currently maintaining or increasing catch rates, with a 4-year average catch of around 17,317 specimens. There is no evidence that the fishery is depleted.
- There are no by-product or bycatch species taken by this fishery nor are any detrimental impacts on the habitat of specimen shells likely to occur (i.e. nothing else is “touched”).

Consequently, this fishery is meeting the requirements of Principle 1. The information relevant to this principle for these species is detailed below.

Information Requirements

1.1.1 There is a reliable information collection system in place appropriate to the scale of the fishery. The level of data collection should be based upon an appropriate mix of fishery independent and dependent research and monitoring.

This is a small fishery with only six consistently active operators harvesting specimen shells in a fishery that has operated as a managed fishery since 1995. As a result, information is collected through fishery dependent means.

Current fishery dependent data collection systems monitor the catch (species specific), effort and catch rates for the fishery. Fishers within the SSMF provide monthly returns under the statutory catch and effort system (CAES). These returns contain information on catch (species and numbers and spatial area - 60 x 60 nmile grids), days and hours fished by month and year. As of August 2004, the SSMF has been reporting on a finer spatial scale of 10 x 10 nmile blocks. This finer scale reporting was implemented partly due to the multi-species nature of the fishery and to provide more accurate information on the distribution of certain species. In addition, the licensees have been voluntarily reporting the number of shell seen versus the number of shell taken for those eight species identified as vulnerable. This information is valuable when assessing the long-term sustainability of the fishery.

The specific data requirements needed to assess performance for each of the relevant objectives are detailed in the relevant sections of the ESD report, which is in [Section 5.1. Retained Species](#). These requirements are summarised as follows:

Monitoring Program	Information Collected	Robustness
CAES returns	Provided on a monthly basis since 1988. Includes the total catch for all specimen shells species, effort, area of take and catch rates.	Medium

Assessments

1.1.2 There is a robust assessment of the dynamics and status of the species/fishery and periodic review of the process and the data collected. Assessment should include a process to identify any reduction in biological diversity and/or reproductive capacity. Review should ideally take place at regular intervals but at least every three years.

A review is conducted annually which assesses the effort, both in terms of the days fished and the diver effort, total catch and the catch rates. This assessment examines the current year's results compared to the previous historical data from the fishery and a set of preliminary performance measures for the fishery.

1.1.3 The distribution and spatial structure of the stock(s) has been established and factored into management responses.

While there is a good base of biological knowledge and the overall geographical distribution for specimen shells species (see Section 2), very limited information is known regarding the distribution and abundance of the local fishery and stocks. Data are now collected at a 10 x 10 nautical mile spatial resolution which will provide a more accurate record of the spatial structure of the stocks.

1.1.4 There are reliable estimates of all removals, including commercial (landings and discards), recreational and indigenous, from the fished stock. These estimates have been factored into stock assessments and target species catch levels.

Sector	Catch Data Collected	Frequency
Commercial	Catch and effort data	Monthly
Recreational	N/A	N/A
Indigenous	N/A	N/A
Illegal	Estimated from compliance data.	Annually

The monitoring programs for the SSMF, outlined above, covers the catch by the commercial fishers and any illegal fishing activities, which are obtained on a monthly and yearly basis, respectively. There is a presumed recreational take that is unknown and there is only limited take of specimen shells species by the indigenous communities.

The compliance risk assessment workshop held in March 2003 identified the need for bag/possession limits for the recreational take of specimen shells. The inclusion of specimen shells in Schedule 3 of the Fish Resources Management Regulations 1995 which states bag limits for recreational take will be considered when the management plan is reviewed.

1.1.5 There is a sound estimate of the potential productivity of the fished stock/s and the proportion that could be harvested.

The Department of Fisheries is currently monitoring the status of the fishery through an analysis of the information provided within the CAES returns. These returns provide the Department with the catch, effort and catch rates for the fishery on a monthly basis. During the past three years, the fishery has maintained or increased the catch rates whilst collecting close to the 4 year average catch of around 17,317 shells. The most active fishers tend to fish in the area in which they live, and there has been no movement into new areas during recent years to maintain catch rates.

The analyses conducted indicate that the fishery at the current levels of effort and catch is sustainable.

Management Responses

1.1.6 There are reference points (target and/or limit), that trigger management actions including a biological bottom line and/or a catch or effort upper limit beyond which the stock should not be taken.

A preliminary performance measure has been developed of a total annual catch range from 10,000 to 25,000 shells, which encompasses the range from 2000 to 2003.

These preliminary performance measures have been developed to ensure that any major change in the patterns of fishing are noticed and investigated. If they are triggered, this may not necessarily indicate any problem with the stocks (see Section 5.1.1.1) but rather fluctuations in the natural environment or market dynamics.

1.1.7 There are management strategies in place capable of controlling the level of take.

There are natural processes which act as significant constraints on the industry: depth, visibility, currents, time, tide, etc. Most of the sought after species are collected through diving. There are physiological restraints which severely limit the amount of time divers can spend each day in depths > 20 m. In northern areas where the tidal range is great, diving can only be done during periods of slack water, largely at neap tides.

A full discussion of the main regulations and their justifications are located in Section 2.1. The following is a summary of the management arrangements for the fishery which has:

- Limited entry (33 licensees) operating on a State-wide basis; and
- Gear and effort restrictions (boats of 8.0 m or less, maximum number of divers per boat is 2 and collection by hand only).

It should also be noted that The Professional Shell Fishermen's Association of Western Australia (Inc.) have a Code of Practice (Appendix 3), which advocates responsible fishing practices above and beyond what is legislated. The Code formalises common practises such as not collecting damaged or deformed shells, juveniles and shells on eggs.

1.1.8 Fishing is conducted in a manner that does not threaten stocks of by-product species.

There are no by-product species caught in this fishery.

1.1.9 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

The SSMF is currently managed through input controls including gear and effort restrictions and limited entry. The relatively limited area where fishing occurs (in shallow water near shore in areas where there is access for boat launching) compared to the wide distribution of these species both in WA and across this geographic region, combined with the small number of operators in this fishery make it highly likely that the objective of maintaining adequate stocks of these species will be met.

OBJECTIVE 2. RECOVERY OF STOCKS

Where the fished stocks are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes.

There are no stocks within the SSMF that are currently below defined reference points/limits.

4.3 PRINCIPLE 2 OF THE GUIDELINES

OBJECTIVE 1. BYCATCH

The fishery is conducted in a manner that does not threaten bycatch species.

There are currently no known bycatch species taken in this fishery due to the highly selective fishing methods and gear restrictions.

Information Requirements

2.1.1 Reliable information, appropriate to the scale of the fishery, is collected on the composition and abundance of bycatch.

Not applicable.

Assessments

2.1.2 There is a risk analysis of the bycatch with respect to its vulnerability to fishing.

No bycatch species are known to be taken in this fishery.

Management Responses

2.1.3 Measures are in place to avoid capture and mortality of bycatch species unless it is determined that the level of catch is sustainable (except in relation to endangered, threatened or protected species). Steps must be taken to develop suitable technology if none is available.

Not applicable.

2.1.4 An indicator group of bycatch species is monitored.

Not applicable.

2.1.5 There are decision rules that trigger additional management measures when there are significant perturbations in the indicator species numbers.

Not applicable.

2.1.6 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

Given that there are no known interactions of the SSMF with non-retained species and the selective method of fishing used (diving or wading, collection by hand only) is likely to continue, the minimal level of interaction will also be maintained.

OBJECTIVE 2. PROTECTED, THREATENED AND ENDANGERED SPECIES

The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities.

Information Requirements

2.2.1 Reliable information is collected on the interaction with endangered, threatened or protected species and threatened ecological communities.

There are no known interactions between the SSMF and any endangered, threatened, or protected species and threatened ecological communities. Due to the relatively selective method used in this fishery it is unlikely that the SSMF has interactions with endangered, threatened or protected species. Furthermore, there is minimal chance for interactions through boat strikes because the boats are anchored when fishing.

Assessments

2.2.2 There is an assessment of the impact of the fishery on endangered, threatened or protected species.

There are no endangered, threatened or protected species caught by this fishery.

2.2.3 There is an assessment of the impact of the fishery on threatened ecological communities.

There are no threatened ecological communities associated with the fishery.

Management Responses

2.2.4 There are measures in place to avoid capture and/or mortality of endangered, threatened or protected species.

There are no measures in place because to date there have been no reported captures or interactions between the fishery and any endangered, threatened and/or protected species.

2.2.5 There are measures in place to avoid impact on threatened ecological communities.

Not applicable.

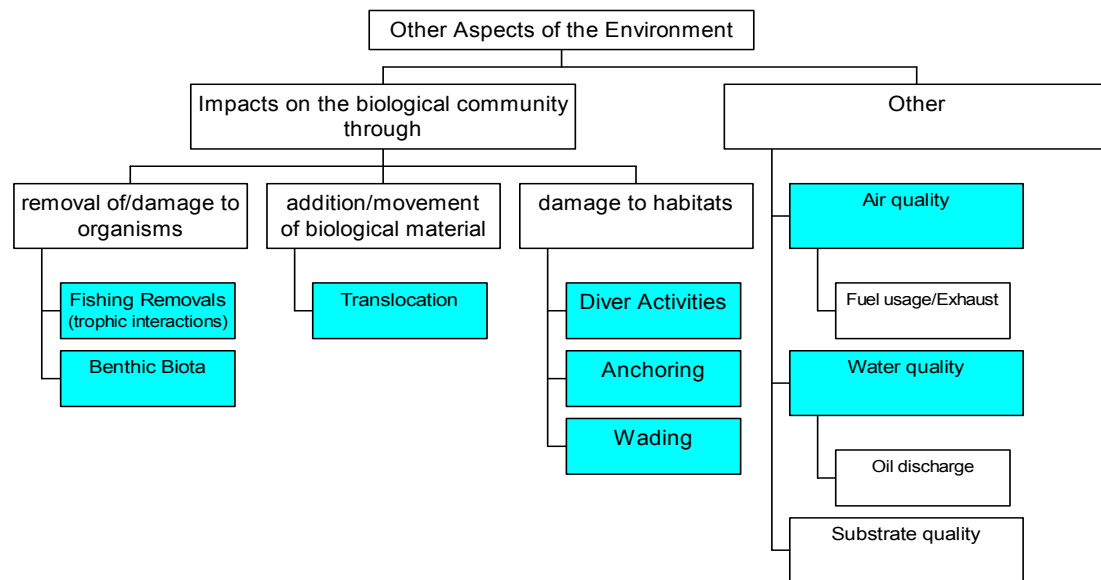
2.2.6 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

There have been no reported interactions (including captures) of endangered, threatened and/or protected species with this fishery therefore it is unlikely that this fishery is having any unacceptable impacts on these species. Nonetheless, if they are

inappropriate and/or the level of interactions increases, appropriate alterations to practices will be taken.

OBJECTIVE 3. GENERAL ECOSYSTEM

The fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally.



The issues that relate to the broader ecosystem, which were identified for this fishery are shown above in the component tree. An internal risk assessment process subsequently assessed each of these issues with the information relating to each issue detailed in [Section 5.3](#).

There were five issues identified, all of which were given a **Negligible risk** rating. Consequently, the fishery’s current performance meets Objective 3.

Information Requirements

2.3.1 Information appropriate for the analysis in 2.3.2 is collated and/or collected covering the fisheries impact on the ecosystem and environment generally.

Appropriate levels of information (in relation to the scale of the fishery) have been obtained for most of the issues identified, which has allowed for a sensible assessment of the level of risk to be determined. This information includes data collected directly relating to the SSMF – in terms of catch and effort.

Given the nature of the SSMF (i.e. geographically and taxonomically widespread) and the small amount of catch and other direct impacts it has on the environment, a large amount of information is not needed to assess its level of impact on the broader ecosystem.

Assessments

2.3.2 Information is collected and a risk analysis, appropriate to the scale of the fishery and its potential impacts, is conducted into the susceptibility of each of the following ecosystem components to the fishery.

A risk assessment was completed (see [Section 5.3](#) for details) on each of the identified issues relevant to the SSMF (see component tree for issues). The identified issues that were assessed and a summary of the outcomes are located in Table 5 complete justification are located in the performance reports in [Section 5.3](#).

Table 5 Summary of risk assessment outcomes for environmental issues related to the SSMF.

ISSUE	RISK	SUMMARY JUSTIFICATION	FULL DETAILS
Impact from removal of/damage to organisms:			5.3.1
Trophic Interactions	Negligible	This fishery harvests only a small amount (around 20,000 shells per annum) across nearly 550 target species. The effect from this harvesting on the rest of the ecosystem, given that the catch is spread over a wide region, would be insignificant. In addition, while the molluscs would be eaten by predators such as fish, they would be spread across the entire State. There is no area where the impact would be concentrated.	5.3.1.1
Impact from addition/movement of biological material:			5.3.2
Discarding of undersized specimen shells	Negligible	Fishing for specimen shells species is highly selective, undersize animals are not targeted and if inadvertently caught are returned directly to the fishing grounds after sorting on deck.	5.3.2.1
Damage to habitats:			5.3.3
Diver activities	Negligible	Divers collect specimen shells as they swim over the bottom, there is minimal impact on the habitat as divers are highly selective in their fishing effort and no fishing gear/lines contact the seabed.	5.3.3.1
Anchoring	Negligible	There are only 33 licensees many of whom are relatively inactive and not all have or use boats. The boats used are	5.3.3.2

		small vessels that work during the day and anchor at night usually further inshore where they are protected from the open ocean which is subject to higher seas and wind. Most fishers are mindful of the habitat they choose to anchor over, so they avoid more diverse bottom habitat.	
Wading	Negligible	There are some areas, which fishers can access specimen shells by wading through the shallow water lagoons and estuaries, but this is a minor component of the fishery.	5.3.3.3

Thus, all of these issues were rated as **Negligible risk**.

Management Responses

2.3.3 Management actions are in place to ensure significant damage to ecosystems does not arise from the impacts described in 2.3.1.

The most important management method required to ensure that there is minimal impact on the broader ecosystem includes maintaining significant stock/biomass levels of specimen shell species. In most cases this serves to achieve both objectives of having a sustainable fishery and minimizing the potential for any negative trophic interactions. Other management measures such as limited entry and gear restrictions further minimize the potential for impacts.

2.3.4 There are decision rules that trigger further management responses when monitoring detects impacts on selected ecosystem indicators beyond a predetermined level, or where action is indicated by application of the precautionary approach.

None of the issues were of sufficient risk to require specific target levels as they are effectively covered by the other management arrangements and trigger points.

2.3.5 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

Given the risk assessment identified that under current management arrangements there have been minimal or negligible impacts from the SSMF on the broader ecosystem, it is highly likely that the fishery will continue to meet the objectives of having acceptable levels of impacts.

5. PERFORMANCE REPORTS

5.1 RETAINED SPECIES

COMPONENT TREE FOR RETAINED SPECIES OF THE SSMF

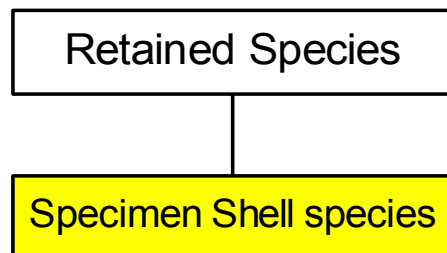


Figure 4 Component tree for retained species.

A **Yellow box** indicates that the issue was considered a high enough risk to warrant having a full report on performance.

5.1.1 PRIMARY SPECIES

5.1.1.1 SPECIMEN SHELL SPECIES

Rationale for Inclusion:

Clearly, with approximately 550 species being collected in the SSMF, data cannot be obtained on the population levels of all species. However, the report by Ponder and Grayson (1998) prompted DEH to consider several taxa of cowries (*Cypraea*) and volutes (subspecies of *Amoria damonii*) to be of possible concern. These were investigated in detail by Enzer (2002).

The *Cypraea* species involved all occur from a depth of a few metres to at least 200 m, and possibly 300 m. All of the *Cypraea* (*Zoila*) species live on sponges, though there is little information on preference for particular species of sponges. *Cypraea* (*Austrocypraea*) *reevei* live on bryozoans. In the mid 1970s, the Western Australian Museum undertook a trawling expedition from Fremantle up the west coast to the southern tip of the Abrolhos Islands. The expedition found a sponge zone on outer continental shelf at depths of 50 m and more. The extent of this zone, both into deeper water and further north and south along the coast is not known (but there are anecdotal reports of a similar zone on the south coast), but it is a prime habitat for *Cypraea* (*Zoila*) species. The inability of divers to access these deep water populations means that all of the species are at low risk because of the SSMF. All of the shells in the fishery come from depths of less than 60 m, and most are from shallower depths.

Table 6 demonstrates that there is low risk to any of the *Cypraea* species under consideration from the SSMF. This is because all species, even the prized subspecies, occur over wide ranges geographically (in the hundreds or thousands of kilometres), and wide depth ranges (up to 200 m), where substantial portion of the population cannot be collected. Even in shallow water, many localities cannot be collected because of the lack of access to the beach and the small (<8 m) boats used by the fishery. Additionally, collecting is prohibited in many of the more easily reached areas as they are now in marine parks and reserves. Based on the catch data for 2001, *Cypraea (Zoila) venusta*, the species with the highest catch on a square kilometre basis had a catch of only 0.0035 animals/ km², or one individual for every 286 km².

Even if the amateur and illegal “shamateur” catches were 10 times the registered catch, this would still be only one specimen of *Cypraea (Zoila) venusta* for every 29 km².

Ponder and Grayson (1998) examined the specimen shell fishery on a national basis. They established a ranking system of five categories, A to E with species in category A being at the highest potential risk. Criteria used were:

- distribution;
- type of development;
- accessibility; and
- market value.

The analysis reached essentially similar conclusions to those reached by Enzer (2002). *Cypraea (Z.) marginata albanysensis* and *C. (Z.) rosselli* were listed in the B category, and *C. (Z.) venusta* was in the C category in both South Australia (not considered in this report) and Western Australia. *Cypraea reevei* was not discussed by Ponder and Grayson (1998) because fewer than 300 specimens were exported in 1997.

Cypraea (Z.) friendii vercoi was the only species listed as being of potential concern by the then Environment Australia that received an A rating by Ponder and Grayson (1998). It was given the following ratings on a scale of 1 to 5: distribution (2), development (1), accessibility (3), and market value (1), for a total of 7. As indicated in Table 6, only 209 animals were caught in 2001 in the approximately 88,000 km² where the subspecies occurs. Table 2 shows that for the 10 years of 1990-1999, an average of 215 specimens were collected annually, though catches in the last several years were higher than in the first few. In 1997 there were 306 specimens collected, which barely exceeded Ponder and Grayson’s (1998) arbitrary cutoff for consideration of 300 animals.

Table 6. Analysis of threat to populations of cowry species through the SSMF (Enzer, 2002). Threat categories are from Ponder and Grayson (1998).

Species	Threat Category	Area of habitat (km ²)	Catch (2001)	Overall catch density (no./km ²)
<i>Cypraea friendii vercoi</i>	A	88,000	209	0.0024

<i>Cypraea marginata albanensis</i>	B	211,000	470	0.0022
<i>Cypraea rosselli</i>	B	211,000	85	0.0004
<i>Cypraea venusta</i>	C	211,000	744	0.0035
<i>Cypraea reevei</i>	--	211,000	109	0.0005

One consistent theme in the literature on the marine molluscs is that the effects of human induced pollution and environmental degradation are much greater threats to shell populations than removal of specimen shells. Virtually all authors have commented on this (e.g. Ponder and Grayson, 1998; Boray and Munro, 1998). Cockburn Sound, particularly Woodman Point, just south of Perth, was once known as an easily reached shelling locality for a variety of species, including *Zoila*. The marine environment of Cockburn Sound was severely affected by pollution, and approximately 90% of the seagrasses were lost. Many species of molluscs no longer occur in the area, but this is due to environmental degradation, not shell collecting.

Similarly, Enzer (2002) concluded there is little risk to any of the three subspecies of *Amoria damonii* from the SSMF. The species ranges overall from Geographe Bay, Western Australia to the east coast of Queensland, a distance of some 6500 km. *Amoria damonii reevei* on the west coast of Western Australia has the smallest range, but even it extends for over 1000 km. The subspecies have wide depth ranges (up to 200 m), where substantial portion of the population cannot be collected. Even in shallow water, many localities cannot be collected because of the lack of access to the beach and the small (<8 m) boats used by the fishery. Additionally, collecting is prohibited in many of the more easily reached areas as they are now in marine parks and reserves. The continental shelf in northern Australia is vast and continuous with that of Indonesia. The North West Shelf in the Pilbara alone has an area of 130,000 km².

Ponder and Grayson (1998) listed both subspecies in their Category A, species with the highest potential threat. *Amoria damonii reevei* was given a ranking of 2 (out of 5) because of its limited distribution, but this is still on the order of 1000 km. Accessibility was also given a 2, but the fishery is concentrated north of Shark Bay, which is very inaccessible, and the population extends well beyond diving depths. The rating of *A. damonii keatsiana* was split between the Northern Territory and Western Australia, with each area having a 1 for distribution. However, a combined analysis of the actual area inhabited by the species would have a much lower ranking as it straddles the border, and populations extend out over the continental shelf to Indonesia. Similarly, the accessibility ranking of 2 in each area is doubtful as the shells come from trawlers in an area most of which cannot be dived safely and can hardly be considered to be accessible.

Some *A. damonii damonii* are collected by diving or wading on extreme low tides. The remainder, and specimens of the other two species, are collected as bycatch from trawlers.

ERA Risk Rating: Impacts on breeding stock (C1 L1 LOW)

As indicated above, the populations of species of specimen shells are widely distributed both geographically and from very shallow waters across the entire continental shelf. Only small numbers of each species are collected, and these shells come from only a small portion of the available habitat. There is thus very little chance for an impact on breeding stocks.

Operational Objective

To maintain sufficient spawning stock, at or above a level that minimises the risk of recruitment overfishing, to ensure recruitment at levels will replenish what is taken by fishing, predation and other environmental factors.

Justification:

The operational objective is in place to meet the environmental and commercial objective of sustaining specimen shell populations. As with any fishery species, it is important to minimise the risk of recruitment overfishing.

Indicators

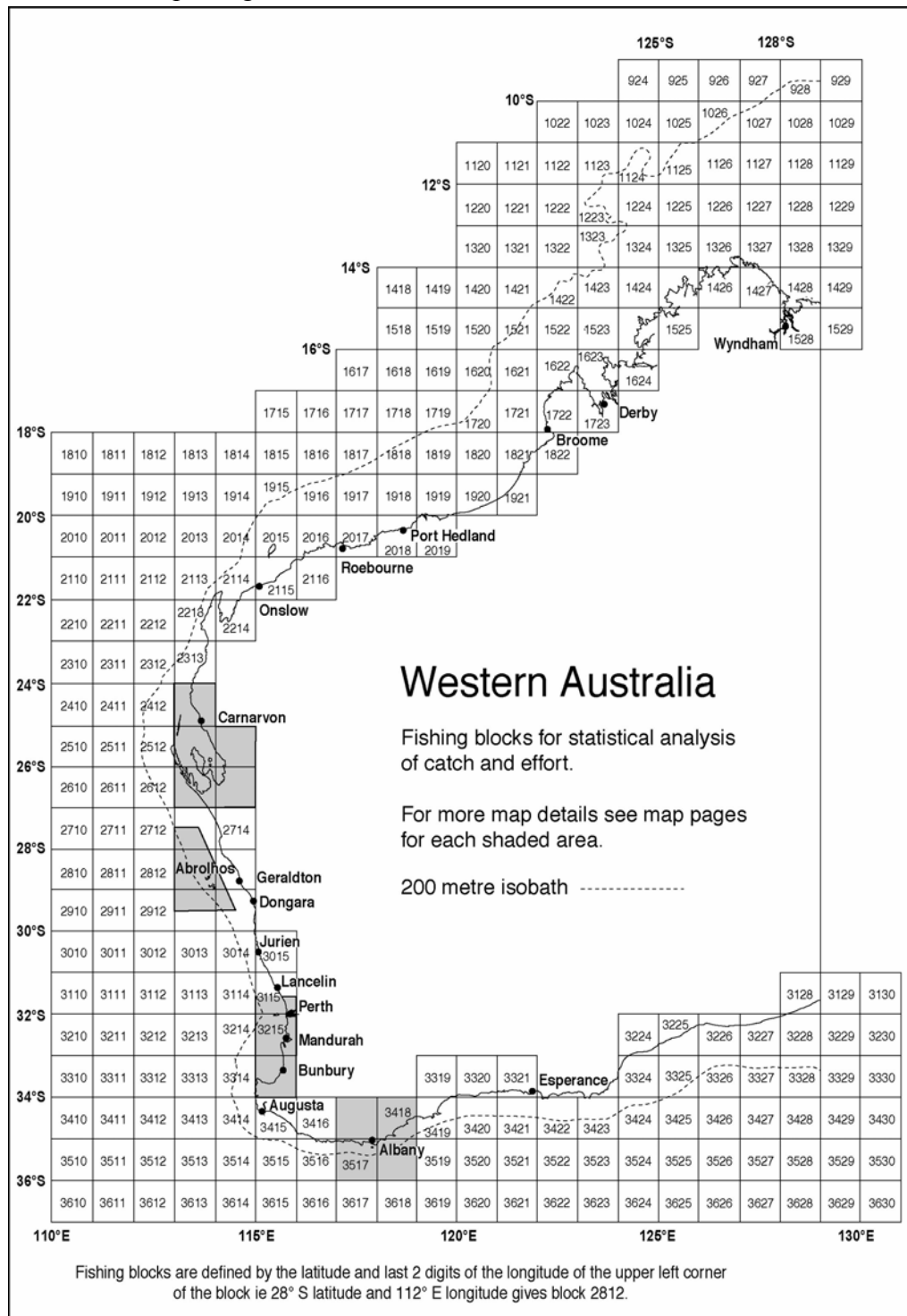
Catch

The catch is recorded in detail by number of shells for each species in each area.

Effort

Specimen shell fishers provide monthly returns under the statutory **CAES**. These returns contain data on **catch** (number for each species), **days** and **hours** fished by **month** and **year**, and number of **crew** on each vessel. Catch and effort are spatially allocated to **10 x 10** nautical mile statistical **blocks**. The entire WA coastline can be fished by the SSMF and is comprised of numerous blocks (see Figure 5).

Figure 5 Fishing blocks for catch and effort reporting for commercial fishing. The blocks below represent 60 x 60 nautical miles. For the Specimen Shell Fishery, these blocks are further divided into 36 smaller blocks of 10 x 10 nautical miles to allow a finer scale of reporting.



Performance Measures

Catch

The preliminary acceptable catch range is from 10,000 to 25,000 shells.

Justification:

This range covers the likely catch by the SSMF during the next few years, and encompasses the range of the period from 2000 to 2003. However, it should be noted that the range can vary considerable depending on the activities of one or two fishers.

Catch Rate

The preliminary acceptable catch rate is from 10 to 40 shells per day.

Justification:

As a small fishery, the effort varies considerably depending on the activities of one or two fishers. In the period of 2000 to 2003 the effort was relatively stable, and ranged from 1110 to 1353 fisher days. The catch rate ranged from 11 to 19 shells per day.

Given that the SSMF is predominately still in an exploratory/developing phase it is not mature enough to have fully developed performance measures. These preliminary performance measures have been developed to ensure that any major change in the patterns of fishing are noticed and investigated. If they are triggered, given the developmental nature of the fishery, this may not necessarily indicate there is a problem with the stocks. Therefore, these preliminary measures may be subject to review over the next 2-3 years as more information comes from the fishery.

Data Requirements for Indicator

Data Required	Availability
Catch rate utilizing commercial catch and effort information provided through monthly returns by the fishers.	Yes; available on a monthly basis since 1988.
Method fished.	Yes; available on a monthly basis since 1988.

Evaluation

Summary

Very good data are available on the catch and effort for the fishery. In recent years the effort has ranged between 1110 and 1353 fishing days spread over 28-35 fishers (including dive buddies). Effort has been relatively widespread, with 90% coming from 23 blocks. However, 54% of the effort was been concentrated among five to six individual fishers in six blocks (Table 8).

Table 7 demonstrates that over the period of 2000 to 2004 the number of fishers has varied from 28 to 35, including dive buddies. The range of effort undertaken by individual fishers varied considerably, from 1 to 202 days per year. The total effort ranged from 1110 to 1353 days per year. It should be noted that every year half the total collecting effort was undertaken by five to six fishers.

Table 7. Total catch and effort and distribution by fisher 2000-2004.

	2000	2001	2002	2003	2004
Total number of shells collected	20372	15193	13100	21106	
Total number of days fished	1353	1110	1174	1118	1125
Shells collected per day	15.1	13.7	11.2	18.9	
Number of fishers (includes buddies)	35	32	33	28	25
Number of fishers comprising half the fishing effort	6	6	5	5	5
Range of individual effort (days)	4-202	2-158	2-171	1-160	2-159

Table 8 demonstrates that fishing occurred over a wide range of Western Australian coastal waters, but was concentrated in six blocks. These included blocks adjacent to areas such as the Perth metropolitan area, Albany, Bunbury and Port Hedland, where the fishers with the greatest collecting effort live.

Table 8. Total effort (number of fisher days) and distribution of effort by block 2003-2004 to comprise 90% of total fishing effort.

Block	2003	2004	Total	Average	Percentage of 2003-2004 effort	Cumulative percentage
3215	174	162	336	168	15.0	15.0
2016	98	117	215	107.5	9.6	24.6
3314	122	92	214	107	9.5	34.1
2114	132	29	161	80.5	7.2	41.3
9603	103	46	149	74.5	6.6	47.9
3517	50	92	142	71	6.3	54.3
2413	5	103	108	54	4.8	59.1
9601	42	44	86	43	3.8	62.9
2714	65	18	83	41.5	3.7	66.6
3418	42	35	77	38.5	3.4	70.0
3415	35	26	61	30.5	2.7	72.8
3518	32	18	50	25	2.2	75.0
3315		46	46	23	2.0	77.0
3315	27	14	41	20.5	1.8	78.9
3321	1	40	41	20.5	1.8	80.7
2413		39	39	19.5	1.7	82.4
3419	19	15	34	17	1.5	84.0
2914	13	18	31	15.5	1.4	85.3
2814	2	27	29	14.5	1.3	86.6
2017		26	26	13	1.2	87.8

3516	14	9	23	11.5	1.0	88.8
2018	14	7	21	10.5	0.9	89.7
3417		20	20	10	0.9	90.6

Robustness
Medium - High

Fisheries Management Response

Current: To ensure the maintenance of the breeding stock the following measures are employed:

- The fishery is managed through input controls (limited entry, maximum number of divers, maximum boat size); and
- The fishers provide monthly returns under the statutory CAES.

Future: The Department of Fisheries recognises the need to increase the robustness of the data used to monitor the status of stocks by obtaining better data on catch (e.g. isolating the catch by species) and effort (validating crew days; accounting for visibility and other conditions).

Actions if Performance Limit is Exceeded: The following approach would be used prior to the beginning of the next season if either of the performance limits was exceeded:

1. Find out why the acceptable catch range has not been met. Evaluate if there has been a shift in the targeting or market prices for the specimen shells to significantly alter effort/catch. If the lowered catch levels are due to effort reduction then no action to be taken.
2. If there were a drop in the catch rate below the limit of 10 shells/ crew-day, an assessment of the fishery operations would be made to determine if this was a reflection of a decline in the relative abundance or due to changes in the way the fishery was operating. If it was caused by a drop in abundance, strategies available to offer further protection to the breeding stock if required include:
 - Possible reductions in the total effort expended in the fishery through a reduction in the length of the fishing season.
 - Possible area closures.

The precise actions taken would be determined in consultation with industry. The ability to implement these strategies is provided for within the FRMA.

Comments and Actions

Not applicable.

External Driver Check List (Constraints to Harvesting)

The following external drivers promote harvesting constraints by limiting effort and possibly affecting the catch rates of any one year:

- Isolation – vessel effort restricted because is an isolated fishery;
- Limited entry fishery (33) with few active fishers;
- Large distances and inaccessibility of many areas;
- Weather: cyclones restrict fishing to winter-spring in the north and to summer/autumn in the south; and
- Depth – dive safety profiles limit effort in deeper (20m+) waters.

5.2 NON-RETAINED SPECIES

There are no known non-retained species taken in this fishery.

5.3 GENERAL ENVIRONMENT

COMPONENT TREE FOR THE GENERAL ENVIRONMENT

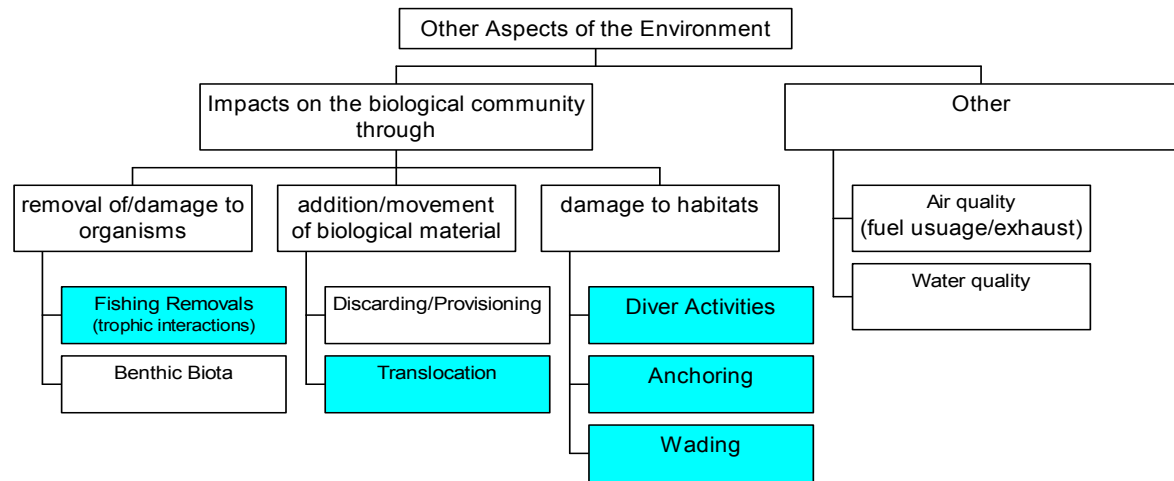


Figure 5 Component tree for the general environment.

5.3.1. IMPACT OF REMOVING OF/DAMAGE TO ORGANISMS

5.3.1.1 TROPHIC INTERACTIONS

Rationale for Inclusion:

ERA Risk Rating: Removal of specimen shells species on the ecosystem (C0 L1 NEGLIGIBLE)

As with all fisheries, the impacts of the removal of the target species on other elements of the ecosystem needs to be thoroughly examined. Predation on specimen shells provides a food source for species at higher trophic levels. However, the wide spread of the specimen shells taxonomically and geographically means there is little chance that they constitute a significant food source to a single species of predator or in a localised area. Furthermore, the limited number of active operators coupled with the relatively small amounts harvested of the different species is unlikely to have any significant impact on the environment resulting in a **Negligible risk** rating.

5.3.2 ADDITION/MOVEMENT OF BIOLOGICAL MATERIAL

5.3.2.1 DISCARDING OF UNDERSIZED SPECIMEN SHELLS

Rationale for Inclusion:

ERA Risk Rating: Impact on environment from discards (C0 L1 NEGLIGIBLE)

Fishing for specimen shells is highly selective, juvenile animals are not targeted and if inadvertently caught are returned directly to the fishing grounds after sorting/measuring on deck.

5.3.3 DAMAGE TO HABITATS

5.3.3.1 DIVER ACTIVITIES

Rationale for Inclusion:

ERA Risk Rating: Impact on habitat from diver activities (C0 L1 NEGLIGIBLE)

Fishing for specimen shells is similar to fishing methods employed in the abalone wildstock fishery i.e. a small boat anchored to the bottom using one or two divers. However, in the SSMF the divers tend to use scuba rather than the hookah system used in abalone fishing. Divers collect specimen shells as they swim over the bottom, there is minimal impact on the habitat as divers are highly selective in the fishing effort and there is no fishing gear/lines to have contact with the seabed.

5.3.3.2 ANCHORING

Rationale for Inclusion:

ERA Risk Rating: Impact on habitat from anchoring (C0 L1 NEGLIGIBLE)

Small vessels which use anchors are used in the fishery. Vessels work during the day and anchor in areas where the divers are operating. At night they anchor inshore or take the boat out of the water; some diving is done at night. Most fishers are mindful of the habitat they chose to anchor, so avoid more diverse bottom habitat. In addition, the fishery extends the entire coastline of Western Australia, there are relatively few consistently active licensees and some collection activities are not undertaken from a vessel (ie. wading).

5.3.3.3 WADERS

Rationale for Inclusion:

ERA Risk Rating: Impact on habitat from waders (C0 L1 NEGLIGIBLE)

There are some areas where fishers can access specimen shells by wading on shallow water rocky intertidal reefs. This is a minor fishing method employed and may be suitably applied in areas such as the Kimberley region that are accessible and prone to extreme tidal movements. Wading usually occurs with minimal impact on these habitats and in different areas than those accessed by boats.

5.4 GOVERNANCE

COMPONENT TREE FOR THE GOVERNANCE OF THE SSMF

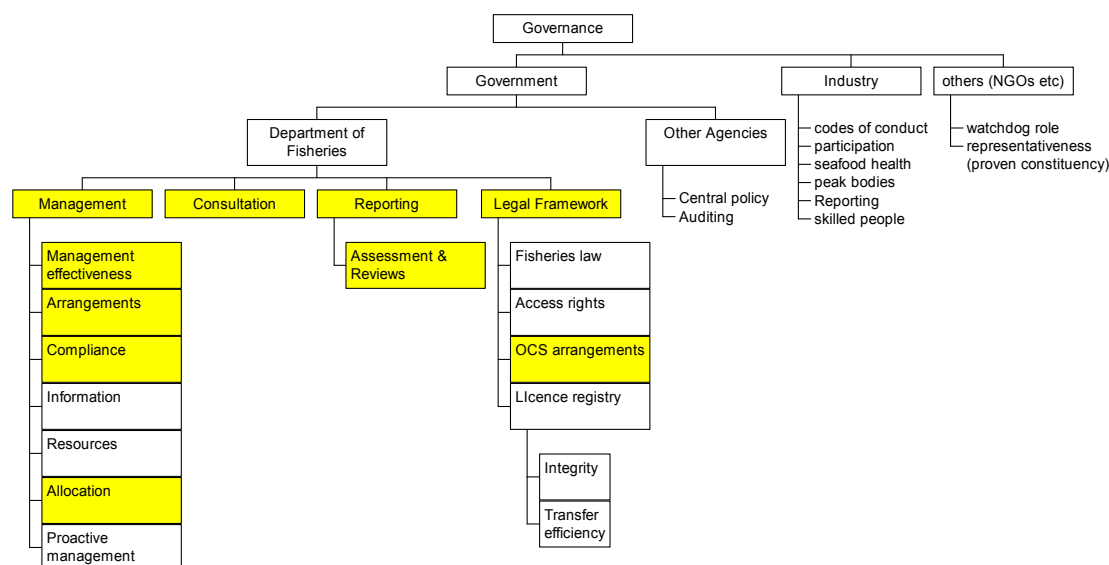


Figure 6 Component tree for governance.

NB- no generic components have been removed from the tree but only those boxes that are yellow will be reported in this application.

5.4.1 DEPARTMENT OF FISHERIES – MANAGEMENT

5.4.1.1 MANAGEMENT EFFECTIVENESS (OUTCOMES)

Rationale for Inclusion:

The effectiveness of management arrangements in the SSMF is ultimately measured by assessing the outcomes of various strategies employed to manage this fishery.

The commercial exploitation of specimen shells in WA remains as a small fishery spread across the State. The fishery's catch and effort has been controlled, since 1990, via a number of methods (see below) including limiting the number of licensees.

Catch and effort are recorded on the standard CAES return forms (submitted monthly) and an annual report is submitted from each operation summarising the nature and success of fishing operations over the previous 12 months.

Given that effort in fishing specimen shells has been minimal in WA and is spread across the State, it is believed that specimen shells stocks are under-exploited at this time. The operational objectives with regard to management are largely directed

towards capping effort, and ultimately maintaining a sustainable catch level for the fishery.

If the annual acceptable catch range of specimen shells is maintained, then the community's expectation is that variations in annual catch result only from annual changes in environmental conditions, or planned changes to the management of the level of commercial exploitation, and not from the depletion of the stock. Any large unexplained variation in catch is likely to be a reflection of a reduction in management effectiveness and therefore reduce the community's confidence in the management of the resource and raise concerns about the on-going sustainability of the fishery.

Operational Objective

The commercial catch of the species of specimen shells taken in the fishery be maintained within a determined acceptable range on an annual basis.

Justification:

If effective management arrangements are operational in the fishery (including the restrictions on effective effort levels, compliance with the regulations are being maintained effectively, combined with our understanding of the size of the exploitable stock), then the actual total catch for the species of specimen shells caught should remain at or below a sustainable level. Any major variations in catch and catch rates would elicit the need to explain the cause of this deviation and potentially result in changes to management arrangements.

Indicator

That management arrangements exist to permit the take of a predicted, sustainable quantity of specimen shells whilst also being flexible enough to facilitate changes in effort (and therefore catch) if the predicted level of catch is not achieved (the amount of catch within the fishery)

Performance Measure

The amount of catch within the fishery relative to the amount of effort.

Justification:

Given it is believed that the specimen shells resource is currently under-exploited, the current restrictions on allowable effort in the fishery should ensure that the risk of over-exploitation remains low

Data Requirements for indicator

The following data are required for this indicator:

Data Requirement	Data Availability
Commercial catch and effort	Yes; available through monthly CAESS data.
Historical catch levels	Yes; records available and accessible.
Level of fishing effort and fishing power	Yes; number of vessels, days fished, areas of operations and activity and fishing power comparisons readily available.
Environmental indicators	No – no real understanding of impact of environmental conditions on stock abundance.

Evaluation

Summary: Despite the small scale of the SSMF, the available data shows that it has been through an initial expansion and contraction phase but now catch rates are being maintained or increased.

Robustness Medium / High

The data required for the indicators in most cases are readily available. However, the small scale of the fishery requires that any significant variations in catch and catch rate be thoroughly investigated to ensure that the current management measures continue to be relevant.

5.4.1.2 MANAGEMENT ARRANGEMENTS

Rationale for Inclusion:

In WA, a number of instruments are used to articulate the management arrangements for fisheries. The FRMA has elements that affect all fisheries. The FRMA provides for the creation of Management Plans, Orders, Regulations, Ministerial Policy Guidelines and Policy Statements.

The FRMA sets out the objects for the sustainable management of fish resources in WA (Table 9), and provides the framework for developing and implementing management plans for each of the State's fisheries.

Table 9 Objects of the FRMA.

Objects

The objects of this Act are to conserve, develop and share the fish resources of the State for the benefit of present and future generations.

In particular, this Act has the following objects-

- to conserve fish and protect their environment;
- to ensure that the exploitation of fish resources is carried out in a sustainable manner;
- to enable the management of fishing, aquaculture and associated industries and aquatic eco-tourism;

- to foster the development of commercial fishing and recreational fishing and aquaculture;
- to achieve the optimum economic, social and other benefits from the use of fish resources;
- to enable the allocation of fish resources between users of those resources;
- to provide for the control of foreign interests in fishing, aquaculture and associated industries;
- to enable the management of fish habitat protection areas and the Abrolhos Islands reserve.

The Specimen Shell Management Plan 1995 is effectively a set of rules for the fishery and includes, closed fishing areas, prohibited species, gear and licence restrictions. This Management Plan is available online at the State Law Publisher website www.slp.wa.gov.au/statutes/subsiduary.nsf/Fisheries. This website also provides access to electronic versions of the Act and regulations.

Management arrangements are also provided through the Managed Fishery Licence, the Commercial Fishing Licence and the Fishing Boat Licence.

The Specimen Shell Managed Fishery has recently reactivated a formal Association called The Professional Shell Fishermen's Association of Western Australia Inc. Current membership consists of 22 of the 33 licensees and 2 have indicated they will be joining shortly. Of the remaining non-members, one resides interstate, some lease their licenses and some are not very active. The reactivation of this Association and their Code of Practice (see Appendix 3) indicates the level of commitment to the Industry that is exhibited by the licensees. The Association should create a better overall communication base and provide a 'professional' lobby group for the industry. The objects of the Association (as outlined in their Constitution) are:

- (a) To self-manage the industry by encouraging members and amateur shell collectors to take only non-breeding shells in prime condition, and in quantities so as to ensure the conservation of localised populations and the species in general.
- (b) To ensure that all persons engaged in the collecting of specimen shells of Phylum Mollusca for sale shall be properly licensed by the WA Department of Fisheries.
- (c) To ensure that all overseas exporters only export shells purchased or acquired from licensed collectors.
- (d) To work towards the equitable review of conditions and restrictions that may apply to this fishery.

Operational Objective

In consultation with the industry members and other stakeholders, the Department periodically reviews the Specimen Shell Management Plan 1995, and related legislation (FRMA, Orders and Regulations), to ensure the management framework remains relevant and aligned with the management objectives.

To have an effective and understandable plan for the management of this fishery.

Justification:

Management arrangements ultimately constrain exploitation of a natural resource where the potential to harvest the resource could exceed the ability of the resource to replenish itself. The development of rules can restrict the potential to harvest (effort) to an appropriate level, and management arrangements can define processes within which access to the resource can be allocated to competing user groups (including natural ecosystems).

Indicator

The extent to which the FRMA, FRMR, Management Plans and other management arrangements allow for the timely setting of appropriate effort levels and resource allocation in the fishery.

The extent to which the Specimen Shell Management Plan 1995 and supporting documentation addresses each of the issues and has appropriate objectives, indicators and performance measures along with planned management responses.

Performance Measure

This should be 100%.

Evaluation

Management meetings are held with Industry every one or two years to discuss management arrangements and raise any issues. Any problems with the management arrangements can be raised by anyone (industry or internally) at any time and they will be addressed. However, annual assessment of the catches in the SSMF suggest that management arrangements for the fishery are adequate in that little potential exists for fishermen to activate inappropriately high levels of effort that could place the target resource at risk.

Robustness

High

The management plan; licence conditions and related legislation have provided a diverse but reasonably complete set of fisheries management legislation. The fact that the management arrangements are contained within legislation provides a high degree of stability with respect to how the fisheries are managed. The process for achieving management framework changes is well understood by the majority of stakeholders

and the system is flexible enough for the management process to respond to external stimuli.

Fisheries Management Response

The Department has successfully administered the management framework and related legislation to achieve and pursue the stated objectives for the SSMF. Changes to the management framework may occasionally occur in order to address key concerns or issues.

External Driver Check List

Potential resistance of fishers to support Department initiated management arrangements.

Potential reluctance of Minister to exercise power.

5.4.1.3 COMPLIANCE

Rationale for Inclusion:

Effective compliance is vital to achieve the management objectives of any fishery. This involves a mix of sea and land patrols. The ability to conduct at sea compliance patrols on the entire Western Australian coast is limited because of patrol boat size and availability.

Operational Objective

To have sufficiently high levels of compliance within the management framework to lend credibility to recorded catch and effort data.

Justification:

The activities of the participants in the fishery need to be sufficiently consistent with the management framework and legislation in order to make it likely that the expected outcomes and objectives of the fishery will be achieved.

Indicators

The levels of compliance with the legislation and compliance with conditions of licences.

Degree of understanding and acceptance of rules governing the operation of the SSMF by licensed operators and the broader community.

Performance Measure

The performance of the compliance program for the fishery will be a measure of the proportion of offences to the number of inspections.

Data Collection Requirements and Processes

Random inspections of vessels at sea and catch on landing.

Ongoing collection of data on illegal activities.

Comparative data on the relative effectiveness of certain compliance techniques.

Monitoring of closed areas.

Evaluation

The Department has limited compliance resources dedicated to the SSMF (in light of the competing requirements of other fisheries). However, the emphasis of the management framework on specific effort restrictions and licencing requirements (for authorised “collectors”) allow a relatively small compliance effort to ensure a high degree of compliance.

Since the fishery’s inception in 1995 there have been numerous ‘opportunistic’ compliance checks (i.e., encounters with specimen shells fishing operations by compliance staff in the area chiefly for reasons to do with other fisheries). To date, there have not been any offences by licensed operators detected in this fishery.

A risk assessment workshop was conducted in March 2003 to identify problems associated with compliance within the SSMF. A few minor deficiencies in the provisions of the Management Plan were identified and will need to be corrected. These include tightening up Clause 5 to prohibit selling live molluscs and requiring notification of regional Department of Fisheries offices of when collecting will occur.

Robustness

Medium

The robustness of compliance is listed as medium simply because this is a small fishery to which limited resources can be devoted.

Fisheries Management Response

Despite the relatively low levels of compliance work being done in the SSMF, the Regional Services branch of the Department continues to gather intelligence on suspected breaches within this fishery. The Department will continue to provide high standard compliance services within budgetary and resource constraints.

Comments and Actions

The Department will continue to provide high standard compliance service, within budgetary and resourcing constraints, to the SSMF. It is expected that continuing compliance risk assessments it will enable the Department to better direct resources to further increase the effectiveness of the limited compliance activities. The

Management Plan will be amended to tighten up on the identified compliance ‘loopholes’.

SSMF fishing activities occurs over a large part of the State and currently there is no requirement for fishers to notify the Department that they intend to fish. It has been suggested by the Department that SSMF licensees should have to nominate the area/s that they intend to operate which will assist compliance officers with their inspections.

External Driver Check List

The high prices of specimen shells may provide a greater incentive for non-compliance.

5.4.1.4 ALLOCATION AMONG USERS

Rationale for Inclusion:

Within the broad context of ESD, the issue of how fish resources can best be shared between competing users requires consideration. In WA, the government has established an Integrated Fisheries Management initiative aimed at addressing the issue of how fish resources can be best shared between competing users within the broad context of “ecologically sustainable development”. To assist the process a set of guiding principles for allocating fish stocks to ensure optimal benefits are realised for the WA community have been released.

Specimen shells are generally not targeted in WA by other commercial fisheries. The Department is aware that there are some shells taken as bycatch in demersal gillnets and trawl fisheries; sometimes without authority, but these catches have minimal impact with shell numbers averaging less than one per trip. The Department is also aware that commercial pearl shell divers have been using a legislative loophole to take specimen shells nominally as a recreational catch. Reports indicate that this catch is significant and the Department has initiated changes to prohibit this activity.

There are shell collectors who collect recreationally, and the Department of Fisheries recognises that the integrated fisheries management approach applies to the SSMF. However, given the relative priority of SSMF, no consideration has currently been given to the fishery under the process.

The level of indigenous take is believed to be limited.

Operational Objective

To ensure that adequate management practices are in place to allow for the inclusive management of a variety, even if of limited influence, of stakeholders in the fishery.

To ensure that allocation decisions aim to maximize the overall benefit to the Western Australian community from the use of fish stocks and take account of the economic, social, cultural and environmental factors.

Indicator

The level of resource sharing conflict between users and the level of participation of interested groups in any focused resource sharing process.

The willingness of the various interest groups to participate in the resource sharing process and include other user-groups.

Robustness

High

Presently there is no significant take by the indigenous sector and the indigenous take is likely to remain limited. It is considered unlikely that the recreational take will conflict with the SSMF. Recreational collectors tend to collect broadly in their first few years then focus on one or a few families.

It should however be noted that a significant increase of indigenous take would prompt a reassessment of current management arrangements for all sectors.

External Driver Checklist

Resource sharing issues being raised with the Minister independently of the IFMRC recommended process.

5.4.2 DEPARTMENT OF FISHERIES - CONSULTATION

5.4.2.1 CONSULTATION (INCLUDING COMMUNICATION)

Rationale for Inclusion:

The FRMA has certain requirements with regard to consultation that must be undertaken in the course of managing fisheries. The management of the SSMF is based around a robust consultation and communication process and a management plan.

There are sections in the FRMA that relate to the consultation process in the development of management plans (Section 64) and to the amendment of a management plan (Section 65).

Section 64 of the FRMA states:

“Before determining a management plan for a managed fishery under section 54(1) the Minister must –

(a) consult with -

(i) any advisory committee established in respect of the fishery; and

(ii) such other advisory committees or persons, if any, as the Minister thinks

appropriate; and

(b) consider any representations made under subsection (3).

Section 65 of the FRMA states:

- (1) A management plan must specify an advisory committee or advisory committees or a person or persons who are to be consulted before the plan is amended or revoked.*
- (2) Before amending or revoking a management plan the Minister must consult with the advisory committee or advisory committees or the person or persons specified for that purpose in the plan.*
- (3) Despite subsection (2), the Minister may amend a management plan without consulting in accordance with that subsection if, in the Ministers opinion, the amendment is –*
 - (a) required urgently; or*
 - (b) of a minor nature*
- (4) If–*
 - (a) the Minister amends a management plan; and*
 - (b) the amendment is made without consultation because it is, in the Minister’s opinion, required urgently,*

the Minister must consult with the advisory committee or advisory committees or the person or persons specified for that purpose in the plan as soon as practicable after the plan has been amended.

Any amendments to the SSMF management plan would include a forum of discussion in which the interests of the various stakeholders in this resource would be formally determined and considered. Meetings held with the SSMF typically involve the Western Australian Professional Shell Fishermen’s Association Inc., the WA Fishing Industry Council and Departmental staff to discuss management, research and compliance issues in the fishery and provide a forum for Industry to raise concerns and/or ask questions of the Department concerning management arrangements.

Operational Objective

To administer a consultation process that is in accordance with the requirements of the FRMA and allows for the best possible advice from all relevant stakeholders to be provided to the decision maker (Minister/ED) in a timely manner.

Indicators

The Minister (or the Department on his behalf) conforms to the consultation requirements of the FRMA and the management plan.

The level to which licensees and other stakeholders consider that they are adequately and appropriately consulted.

Performance Measures

Proper consultation procedures have been followed in amendments of the management plan.

Industry meetings held annually.

Data Requirements

The views of industry are collected from stakeholders at each annual meeting.

When an amendment is proposed, the formal consultation procedures are documented.

Evaluation

Even though this is a minor fishery there has been considerable consultation undertaken. Consultation on management of the SSMF is conducted in an open, accountable and inclusive environment where all sectors of the industry and the Department's managers and researchers collectively identify and discuss appropriate courses of action.

Decision makers are provided with advice based on this consultation and reasons are provided for decisions that vary from consultation-based advice.

Were the fishery to continue under a more formal management framework, the Department would embark on an expanded consultation effort to encompass the views of the broader stakeholder group including the community of WA as is currently done with other managed fisheries in WA.

Robustness High

Consultation on the management of the SSMF will continue to be conducted in an open, accountable and inclusive environment where all sectors of the industry and the Department's managers and researchers collectively identify and discuss appropriate courses of action.

Comments and Actions

The Department will continue to provide a commercial fisheries management officer who coordinates and further develops the consultation process for the SSMF.

External Driver Check List

Despite the aforementioned consultation processes that are in place, disaffected parties may still seek to use political avenues to further their cause.

5.4.3 DEPARTMENT OF FISHERIES - REPORTING

5.4.3.1 ASSESSMENT AND REVIEWS

Rationale for Inclusion:

It is important that the outcomes of the fisheries management processes administered by the Department for the SSMF are available for review by external parties. It is also important that the community is sufficiently informed on the status of the fisheries, given that industry is utilising a community resource.

The reports that are currently developed and publicly available include: an Annual “State of the Fisheries” Report, an Annual report to the Auditor, the ESD report, and this application to DEH. There is also a longer-term plan to have the entire system of management audited by the WA Environmental Protection Agency (EPA).

Operational Objective

To continue to report annually to the Parliament and community on the status of all fisheries including the SSMF and to prepare a framework for reporting on ESD for all Western Australian fisheries.

Indicators

The extent to which external bodies with knowledge on the management of fisheries resources have access to relevant material and the level of acceptance within the community.

Performance Measure

General acceptance of the management system by the community.

Data Requirements

The majority of data required to generate reports are already collected in the course of pursuing resource management objectives. The Department conducts an annual survey of the community with respect to the community’s opinion on the status of the State’s fisheries and attitudes to the performance of the Department.

Evaluation

The Department has implemented more than one process to report on the performance of this fishery and in doing so has acted to ensure that the community has access to this information.

The Department has been the recipient of a number of awards for excellence including for its standard of reporting - Premiers Awards in 1998, 1999, 2002, 2004 for Public

Service excellence, Category Awards in Annual Reporting in 1998, 1999, 2000; Lonnie Awards in 2000, 2001, 2003.

Current Reporting Arrangements for this fishery include:

State of the Fisheries Report

There is annual reporting on the performance of the fishery within the “State of the Fisheries Report”. The document is available in hard copy format but is also available from the Department’s web site in PDF format.

Annual Report

A summary of this report is presented within the Department’s Annual Report and is used in some of the Performance Indicators that are reviewed annually by the Office of the Auditor General (OAG). Exemptions for Aboriginal fishing are also reported in the Annual Report.

In addition, an annual report is developed and submitted to DEH on the SSMF as a requirement under its current declaration.

ESD

Once this application is completed it will become published in the ESD report series and be available from the web site.

Robustness High

Fisheries Management Response

Current: For many years the Department has produced substantial and high quality documents that report on the operation of the Department and the status of its fisheries – these reports are the Annual Report and the State of the Fisheries.

Future: The Department is working with the EPA to prepare a framework for reporting on ESD for all Western Australian fisheries. It is proposed that this framework will be linked to a regular audit cycle involving the EPA and periodic reporting to the OAG. The Department is working to combine the processes for reporting to the States and the Australian Government and believes that this can best be achieved by using a Bilateral Agreement with DEH under the EPBC Act.

Comments and Actions

The assessment and review processes already established together with proposed external review processes should ensure that there would be many opportunities for the appropriateness of the management regime and the results it produces to be reviewed.

External Driver Check List

The assessments provided by independent review bodies and the community.

5.4.4 DEPARTMENT OF FISHERIES– LEGAL ARRANGEMENTS

5.4.4.1 OCS ARRANGEMENTS

Rationale for Inclusion:

The Offshore Constitutional Settlement (OCS) arrangements between Western Australia and the Commonwealth Government of 1988 established that it is the sole responsibility of the State of Western Australia to manage the SSMF. The OCS “*was developed to simplify legal arrangement for the management of fisheries operating in both State and Commonwealth waters*”. (Anon., 1988).

This OCS agreement, jointly signed by Ministers Kerin, for the Commonwealth Government, and Grill for WA, prescribes that all aquatic invertebrate fishing in WA (including specimen shells) out to the limit of the AFZ is under the jurisdiction of WA. This simplified the management of the fishery from the previous system where jurisdiction was split between WA within 3 nm of the coast and the Commonwealth, outside of this area.

These arrangements were developed under State Law using Part 3 of the FRMA relating to the Commonwealth State management of fisheries and Commonwealth law at the time; Section 12H of the *Fisheries Act 1952* (now revoked). The *Fisheries Management Act 1991* replaced the *Fisheries Act 1952* and the new Act has powers to make OSC agreement under Division 3, Section 71 of the Act.

Operational Objective

To uphold the existing jurisdictional arrangements for the management of this fishery.

Indicators

Approaches from the Commonwealth Government to alter the existing OCS in SSMF.

Performance Measure

Maintenance of the existing responsibility of the State for the management of the fishery.

Data Requirements

None specific.

Evaluation

The current jurisdictional arrangements are appropriate given the distribution of specimen shells and the good track record that exists under these arrangements for the management of these fisheries.

Robustness

Very high

Fisheries Management Response

The Department has successfully managed the SSMF to date and sees no reason to alter the jurisdictional arrangements that currently exist as they relate to specimen shells.

Comments and Actions

No action required.

External Driver Check List

Pressure to change any of the OCS arrangements.

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APPENDIX 1 ACRONYMS

CAES	Catch and Effort System
CFL	Commercial Fishing Licence
DEH	Australian Government Department of the Environment and Heritage
ED	Executive Director of the Department of Fisheries
EPA	Western Australian Department of Environment Protection
EPBC	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ESD	Ecologically Sustainable Development
FBL	Fishing Boat Licence
FRDC	Fisheries Research and Development Corporation
FRMA	<i>Fish Resources Management Act 1994</i>
FRMR	<i>Fish Resources Management Regulations 1995</i>
IFMRC	Integrated Fisheries Management Review Committee
MSY	Maximum Sustainable Yield
OAG	Office of Auditor General
SCFA	Standing Committee on Fisheries & Aquaculture
SSMF	Specimen Shells Managed Fishery
WA	Western Australia
WAFIC	Western Australian Fishing Industry Council

APPENDIX 2 DETAILS OF A CONSEQUENCE TABLE

Level	Ecological
Negligible	<p>General - Insignificant impacts to habitat or populations, Unlikely to be measurable against background variability</p> <p>Target Stock/Non-retained: undetectable for this population</p> <p>Byproduct/Other Non-retained: Area where fishing occurs is negligible compared to where the relevant stock of these species reside (< 1%)</p> <p>Protected Species: Relatively few are impacted.</p> <p>Ecosystem: Interactions may be occurring but it is unlikely that there would be any change outside of natural variation</p> <p>Habitat: Affecting < 1% of area of original habitat area</p> <p><i>No Recovery Time Needed</i></p>
Minor	<p>Target/Non-retained: Possibly detectable but little impact on population size but none on their dynamics.</p> <p>By-product/Other Non-retained: Take in this fishery is small (< 10% of total) compared to total take by all fisheries and these species are covered explicitly elsewhere.</p> <p>Take and area of capture by this fishery is small compared to known area of distribution (< 20%).</p> <p>Protected Species: Some are impacted but there is no impact on stock.</p> <ul style="list-style-type: none"> • Ecosystem: Captured species do not play a keystone role – only minor changes in relative abundance of other constituents. <p>Habitat: Possibly localised affects < 5% of total habitat area</p> <p><i>Rapid recovery would occur if stopped - measured in days to months.</i></p>
Moderate	<p>Target/Non-retained: Full exploitation rate where long term recruitment/dynamics not adversely impacted</p> <p>By-product: Relative area of, or susceptibility to capture is suspected to be less than 50% and species do not have vulnerable life history traits</p> <p>Protected Species: Levels of impact are at the maximum acceptable level</p> <ul style="list-style-type: none"> • Ecosystem: measurable changes to the ecosystem components without there being a major change in function. (no loss of components) <p>Habitat: 5-30 % of habitat area is affected.</p> <p>:or, if occurring over wider area, level of impact to habitat not major</p> <p><i>Recovery probably measured in months – years if activity stopped</i></p>
Severe	<p>Target/Non Retained: Affecting recruitment levels of stocks/ or their capacity to increase</p> <ul style="list-style-type: none"> • By-product/Other Non-retained: No information is available on the relative area or susceptibility to capture or on the vulnerability of life history traits of this type of species. Relative levels of capture/susceptibility greater than 50% and species should be examined explicitly. • Protected Species: Same as target species <p>Ecosystem: Ecosystem function altered measurably and some function or components are missing/declining/increasing outside of historical range &/or allowed/facilitated new species to appear.</p> <p>Habitat: 30- 60 % of habitat is affected/removed.</p> <p><i>Recovery measured in years if stopped</i></p>
Major	<p>Target/Non retained: Likely to cause local extinctions</p> <p>By-product/Other Non-retained: N/A</p>

	<p>Protected Species: same as target species Ecosystem: A major change to ecosystem structure and function (different dynamics now occur with different species/groups now the major targets of capture) Habitat: 60 - 90% affected <i>Recovery period measured in years to decades if stopped.</i></p>
Catastrophic	<p>Target/Non-retained: Local extinctions are imminent/immediate By-product/Other Non-retained: N/A Protected Species: Same as target Ecosystem: Total collapse of ecosystem processes. Habitat: > 90% affected in a major way/removed <i>Long-term recovery period will be greater than decades or never, even if stopped</i></p>

APPENDIX 3 WESTERN AUSTRALIAN PROFESSIONAL SHELL FISHERMEN'S ASSOC. (INC) ENVIRONMENTAL MANAGEMENT SYSTEM (EMS) AND ECOLOGICALLY SUSTAINABLE DEVELOPMENT (ESD) (CODE OF PRACTICE)

BACKGROUND

Human beings have had a fascination for shells for many thousands of years. Seashells are amongst the oldest recorded items used for decoration and jewellery used by mankind, as has been widely documented by archaeological science around the world. The habit of collecting shells by humans reaches back to the very beginning of recorded history. Shells have been a source of food for just as long, and continue to be of interest to professional scientists and amateurs alike.

Although shell collecting is nowadays a hobby with only a small following in Australia, it is more popular overseas. Most countries have their own endemic species of shells, but Australia's unique seashells are amongst the most sought after.

Most shell collectors worldwide prove to be extremely discerning and are as a rule only interested in perfect, undamaged and mature specimens.

Due to this selectiveness of shell collectors, the Specimen Shell Fishery is very different from all other fisheries. The fastidious and discerning nature of shell collectors and dealers in the shell trade provides a very effective safeguard against over-collecting, and for that we can be thankful.

In the search for suitable shells for the specimen shell collecting trade, any damaged (i.e. commonly by fish bites, etc), deformed and blighted specimens are left behind. Such specimens are virtually worthless in monetary value, but the animal within the shell will usually be in perfect condition, able to reproduce and so ensure the survival of the species. As the ocean is a tough environment, there are always a significant number of shells that are unsuitable for collection. These "rejects" would well serve their purpose if they were fish or some other form of edible sea-life, but in the case of the specimen shell hobby they are left behind to breed.

Any juvenile shells are also left to breed, as they are of no interest to collectors and so have little or no monetary value.

Any breeding shells — i.e. females on eggs — are easily recognised as such, and if left undisturbed, will continue to reproduce. Again, in other fisheries it is difficult to identify an animal in roe, and therefore it would be taken regardless.

And finally, specimen shells are not a consumer product like seafood or the like. They are not consumed one day and another wanted the next. Once a collector has a particular specimen, he is usually satisfied with that and rarely returns for another. Thus there is virtually no "turn-over" and the individual market is small. Add this to the very small number of collector customers for specimen shells world wide (compared to any other marine fishery customers), and the demand overall is not great.

LEGISLATION

Having said all the above, there is a demand of course. There is also the legitimate concern that satisfying that demand must not be at the expense of depleting populations of shells to an unsustainable level.

Legislation in the form of the *Wildlife Protection (Regulation of Exports and Imports) Amendment Act 1991* was enacted by the Federal Government in to ensure that Australia's natural flora and fauna is not plundered to extinction, and this is applauded by all responsible collectors — both amateur and professional alike.

The keeping with the Federal legislation, our State Government has introduced a management plan for the specimen shell industry, and the licensed collectors under that management plan have produced their own Code of Practice.

CODE OF PRACTICE

Many of the people now licensed to collect shells for the specimen shell hobby began as shell collectors and have extensive shell collections themselves. Involvement in the hobby as professional collectors is in the main a lifestyle thing without any substantial financial gain. For many years there have been unwritten rules in the hobby that by necessity have now become a written Code of Conduct that specimen shell fishermen adhere to:

- **damaged, blighted, and deformed specimens should not be collected.**

Specimens should be things of beauty and shells with heavy growth lines, chipped or with fungus, or similar blight, should not be taken. They should be left to breed, as they will produce beautiful shells.

If discovered after collecting, that the specimen is still alive, it should be immediately put back in its same habitat.

- **juvenile specimens should not be collected.**

Juvenile shells have no commercial value and should be left to grow to maturity and hopefully breed.

If discovered after collecting that the specimen is still alive, it should be immediately put back in its same habitat.

- **shells on eggs should be left undisturbed.**

Whilst it may be a temptation to take a lovely shell that is on eggs, remember that those eggs may hatch out into many lovely specimens. Do not disturb a shell sitting on eggs, but if you do, then put it back. Experience has shown that females will quickly settle onto their eggs again.

- **don't damage the environment.**

We have all seen what damage anchors, crappots, etc. do to the sea floor and the creatures that live on it.

Where possible do not anchor, but let the person in the boat follow your hookah hose, bubbles, or use another method of keeping in touch. This is safer too, as the boat is always at hand in case of need.

- **don't over-collect.**

Collect only enough specimens to meet your immediate or foreseeable requirements. Seashells don't move about much and will usually be near the same location when you come back to it later. In the meantime they may have bred and hopefully produced a number of offspring

- **don't flaunt your catch..**

Not everybody shares your love of shells and some people may resent them being collected at all. Go about your business discreetly and avoid attracting unnecessary attention. Do not display your take to curious onlookers. If you have a number of specimens, display only one or two if you must.

Department of Fisheries Western Australia

Status Report for the

Specimen Shell Managed Fishery

January 2004

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Western Australia

1.0 MANAGEMENT OVERVIEW.

THIS FISHERY OPERATES ALONG THE WHOLE WA COAST WITH 34 LICENSEES OPERATING FROM THE SHORE OR IN SMALL BOATS.

2.0 RESEARCH OVERVIEW.

RESEARCH MONITORING IN THIS FISHERY CONSISTS OF AN ANNUAL REVIEW OF THE CATCH OF SPECIMEN SHELLS FOR EACH SPECIES AND DAYS SPENT COLLECTING IN 60 BY 60 NAUTICAL MILE BLOCKS.

In a report to Environment Australia, Ponder and Grayson (1998) evaluated specimen shells collected in Australia and rated them on vulnerability to over-exploitation on biology, accessibility to collection, and rarity.

Eight species collected in WA were identified by Environment Australia as vulnerable to over-exploitation: *Cypraea (Zoila) friendii vercoi*, *Cypraea (Zoila) marginata (albanyensis)*, *Cypraea (Zoila) marginata (consueta)*, *Cypraea (Zoila) rosselli*, *Cypraea (Austrocypraea) reevei*, *Cypraea (Zoila) venusta*, *Amoria damonii (keatsiana)*, *Amoria damonii (reevei)*.

This status report includes information on the 8 species identified by EA and a further three species with high catches in WA: *Cypraea (Zoila) comptoni*, *Notogibbula lehmanni*, *Turbo torquatus*.

3.0 CATCH AND EFFORT

3.1 COMMERCIAL CATCHES

The commercial Specimen Shell fishery in Western Australia is a managed fishery with 34 licensees. The licensees are required to submit monthly returns of days fished and numbers of each species collected. The catch reported by commercial operators in 1999 to 2002 and for approximately 90% of the returns for 2003 is reported in Table 1. The species reported are those suggested by Ponder and Grayson (1998) as being vulnerable to over-exploitation as well as other species with high catches. The following abbreviations are used in the table.

<i>Amoria damonii keatsiana</i>	<i>A. da</i>	<i>Cypraea</i> (Zoila) <i>friendii vercoi</i>	<i>C. fv</i>
<i>Cypraea</i> (Zoila) <i>friendi</i>	<i>C. fr</i>	<i>Cypraea</i> (Zoila) <i>marginata (albanyensis)</i>	<i>C. ma</i>
<i>Cypraea</i> (Zoila) <i>rosselli</i>	<i>C. ro</i>	<i>Cypraea</i> (Austrocypraea) <i>reevei</i>	<i>C. re</i>
<i>Cypraea</i> (Zoila) <i>venusta</i>	<i>C. v</i>	<i>Cypraea</i> (Zoila) <i>comptoni</i>	<i>C. co</i>
<i>Notogibbula lehmanni</i>	<i>N. le</i>	<i>Turbo torquatus</i>	<i>T. to</i>
<i>Argonauta argo</i>	<i>A. ar</i>	<i>Spirula spirula</i>	<i>S. sp</i>

Cypraea marginata was not divided into sub-species by collectors, those reported south of Cape Leeuwin are probably *Cypraea marginata (albanyensis)* and those reported north of Cape Leeuwin are probably *Cypraea marginata (consueta)*.

Amoria damonii was reported by collectors only north of North West Cape and is here reported as *Amoria damonii keatsiana*. It is assumed the catch of *Amoria damonii (reevei)* is zero. The catch of *Cypraea friendii* is reported separately as the sub-species was not reported.

Table 1. Commercial catches of 10 species of shells reported in compulsory monthly returns for 1999 – 2002 and for approximately 90% of 2003 returns. The total is the number of all species landed at or near each location. The effort is the total days effort reported.

1999	<i>A.</i>										total	effort		
	<i>A. da</i>	<i>C. co</i>	<i>C. fr</i>	<i>C. fv</i>	<i>C. ma</i>	<i>C. re</i>	<i>C. ro</i>	<i>C. ve</i>	<i>N. le</i>	<i>T. to</i>	<i>A. ar</i>	<i>S. sp</i>		
Albany		180	35	216	187	66	107	249		586			3561	441
Augusta		2					9					63	448	55
Broome	51												3541	90
Bunbury			215		48	9	18	99	385	18			2351	194
Carnarvon					6		2						20	71
Esperance		194	90	286	155	34	40	192		241			1551	257
Exmouth														
Geraldton			31		63	14	12	23					147	67
Mand/Jurien			68		87	12	31	153					680	150
Pt Hedland	66												745	34
Pt Samson	17												3602	172
SharkBay					11		4						36	8
unknown				60	32	12	8	14					130	17
Total	134	376	439	562	589	156	222	730	385	845			16812	1556

A.														
2000	<i>A. da</i>	<i>C. co</i>	<i>C. fr</i>	<i>C. fv</i>	<i>C. ma</i>	<i>C. re</i>	<i>C. ro</i>	<i>C. ve</i>	<i>N. le</i>	<i>T. to</i>	<i>A. ar</i>	<i>S. sp</i>	total	effort
Albany		145	88	177	128	30	76	288		173		22	2873	506
Augusta			96		42	13	20	88		5	835	1020	2703	84
Broome	52												6798	152
Bunbury			368		112	35	25	197		24		800	2279	187
Carnarvon			35		15		5	18					2177	36
Esperance		100	4	143	178	2	23	115					1857	109
Exmouth														
Geraldton			72		63	26	26	41					285	47
Mand/Jurien			65		72	5	9	138					629	118
Pt Hedland	5												461	35
Pt Samson	34												717	61
SharkBay			10					6					16	6
unknown			7	3	2			3	3				18	9
Total	91	245	738	320	610	111	184	891		202	835	1842	20813	1350

S.														
2001	<i>A. da</i>	<i>C. co</i>	<i>C. fr</i>	<i>C. fv</i>	<i>C. ma</i>	<i>C. re</i>	<i>C. ro</i>	<i>C. ve</i>	<i>N. le</i>	<i>T. to</i>	<i>A. ar</i>	<i>S. sp</i>	total	effort
Albany		63	34	139	128	15	48	356		27			2093	369
Augusta			68		49	3		48		10	248		808	69
Broome	41												552	35
Bunbury			311	2	129	54	29	174		73			1799	181
Carnarvon			10		15		6						3031	10
Esperance		52	45	79	125	34	11	116			818			88
Exmouth													100	10
Geraldton			3		31		5	6					390	56
Mand/Jurien			92		110	18	9	161		1128				139
Pt Hedland	13												2552	89
Pt Samson	19												2191	49
SharkBay													160	9
unknown														
Total	73	115	563	220	587	124	108	861		110	248		15622	1104

S.														
2002	<i>A. da</i>	<i>C. co</i>	<i>C. fr</i>	<i>C. fv</i>	<i>C. ma</i>	<i>C. re</i>	<i>C. ro</i>	<i>C. ve</i>	<i>N. le</i>	<i>T. to</i>	<i>A. ar</i>	<i>S. sp</i>	total	effort
Albany		56	8	183	95	13	62	281		58			756	349
Augusta			14	6	5	3		6			318	245	597	44
Broome	56												56	37
Bunbury			321		77	22	18	132		45			615	163
Carnarvon			13		6		8	3					30	7
Esperance			28	51	58	1	13	142					293	62
Exmouth														6
Geraldton			51		230	10	28	43					362	278
Mand/Jurien			116	3	138	10	36	137					440	136
Pt Hedland	5												5	56
Pt Samson	8		14				3	6					31	47
SharkBay														

unknown														
Total	69	56	565	243	609	59	168	750	0	103	318245	31851185		
S.														
2003	<i>A. da</i>	<i>C. co</i>	<i>C. fr</i>	<i>C. fv</i>	<i>C. ma</i>	<i>C. re</i>	<i>C. ro</i>	<i>C. ve</i>	<i>N. le</i>	<i>T. to</i>	<i>A. ar</i>	<i>sp</i>	total effort	
Albany			11	111	86	7	33	187					437	128
Augusta			19		5			9			44	975	1052	23
Broome	9												9	2
Bunbury			175		43	2	13	58					291	58
Carnarvon					4								4	5
Esperance		43		45	21	2	2	48					161	18
Exmouth														4
Geraldton			42		45		6	22					115	64
Mand/Jurien			72		157	5	20	186					440	131
Pt Hedland														15
Pt Samson														135
SharkBay														
unknown														
Total	9	43	319	156	361	16	74	510	0	0	44975	2509	583	

The reported catch of all species by year is shown in Appendix 1.

3.2 Recreational Catch

The recreational catch is unknown, but is expected to be significant in areas of higher population.

3.3 Fishing effort

TOTAL EFFORT ON THE MAJOR SPECIES HAS DECREASED FROM 1999 (1556 DAYS) TO 2003 (583 DAYS), ALTHOUGH 2003 DATA ARE ESTIMATED TO BE 90% COMPLETE (TABLE 1). THE DISTRIBUTION OF EFFORT IS REPRESENTED IN FIGURE 1. THE FIGURE INDICATES THAT MOST COMMERCIAL EFFORT IS FOCUSED AROUND A SMALL NUMBER OF REGIONAL CENTERS. RECREATIONAL FISHING IS ALSO EXPECTED TO BE FOCUSED IN THESE AREAS.

4.0 Stock Assessment.

Ponder and Grayson (1998) rated many shell species on vulnerability to over-exploitation on a 5 point scale A, B, C, D, E (A most vulnerable, E least vulnerable) using the four criteria (geographic distribution, depth distribution offshore, development before recruitment, market value).

Their rating for the 8 species of interest to DEH are:

<i>Cypraea</i> (Zoila) <i>friendii</i> (<i>vercoi</i>)	A
<i>Cypraea</i> (Zoila) <i>marginata</i> (<i>albanyensis</i>)	B
<i>Cypraea</i> (Zoila) <i>marginata</i> (<i>consueta</i>)	B
<i>Cypraea</i> (Zoila) <i>rosselli</i>	B
<i>Cypraea</i> (Austrocypraea) <i>reevei</i>	B
<i>Cypraea</i> (Zoila) <i>venusta</i>	C
<i>Amoria</i> <i>damonii</i> <i>keatsiana</i>	A

Amoria damonii reevei

A

In the 2000 report *Cypraea* (*Zoila*) *friendii* (*vercoi*), was reported as the species probably most vulnerable to over-exploitation. The catch of this species decreased between 1999 and 2003 (Table 1). The catch of *Cypraea* (*Zoila*) *marginata* has been relatively stable from 1999 to 2003, *Cypraea* (*Zoila*) *rosselli* catch in 2000 was similar to 1999, halved in 2001, and increased again in 2002, although indications are that it will be lower again in 2003 (Table 1). *Cypraea* (*Austrocypraea*) *reevei* catch has oscillated, but generally declined between 1999 and 2003. *Cypraea* (*Zoila*) *venusta* catch has been stable between 1999 and 2003, and *Amoria damonii* catches have declined from 1999 to 2003.

Catch rates of have little meaning as an indication of stock status of individual species due to the very low catches, the wide spatial scale of fishing and reporting, and the difficulty of attributing effort to individual species.

- **The review of the catch and effort from 1999 to 2003 indicates that the commercial catch (and probably recreational catch) is focused in 9 out of the 43 one degree (60 nmile) sectors of the coast. The variation in abundance of the target species along the coast is unknown but if the populations of most of the target species are continuous along the coastline, the impact on these vulnerable stocks appears to be manageable with approximately 80% of the species within their range receiving little impact. In addition, advice from the commercial collectors is that for the cowrie (*Cypraea* sp.) species, only specimen quality shells without chips or blemishes are collected and this makes up less than 50% of those observed.**

Overall, the assessment is that at current effort levels, the stocks of the reported species are sustainable. A review of the status of the major species will continue through an annual analysis of the catch of the important species and the effort in major areas.

4.0 References

Ponder, W. F. and Grayson, J. E. (1998), The Australian Marine Molluscs considered to be potentially vulnerable to the shell trade. A report to Environment Australia.

Wilson B. (1994). "Australian Marine Shells, Volume 2". Odyssey Publishing, Kallaroo WA.

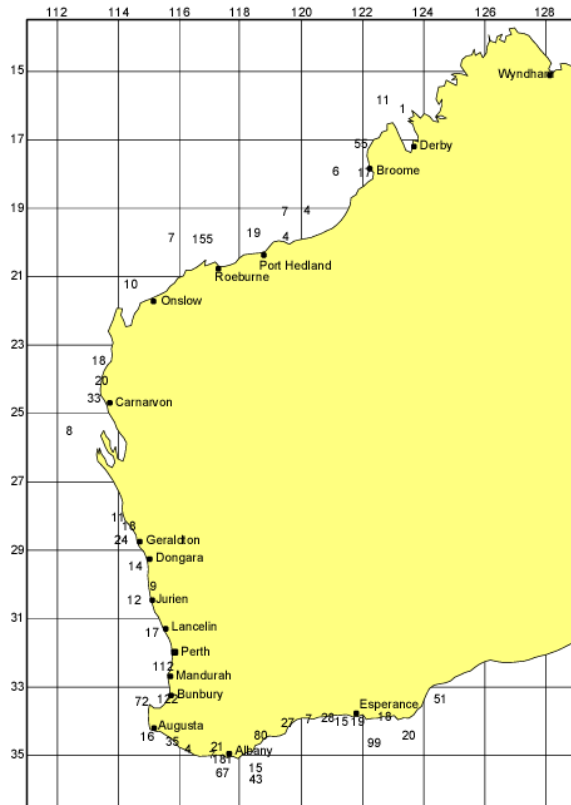


Figure 1a. Specimen Shell Managed Fishery 1999 effort (days)

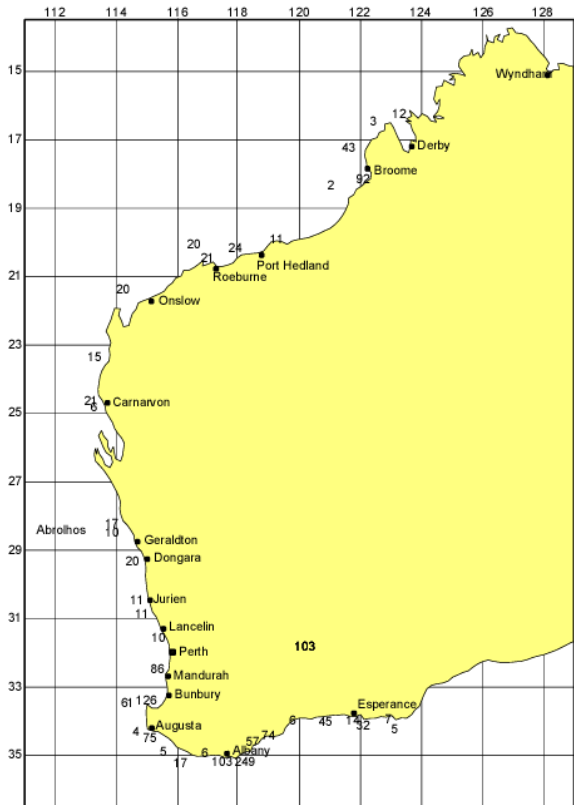


Figure 1b. Specimen Shell Managed Fishery 2000 effort (days)

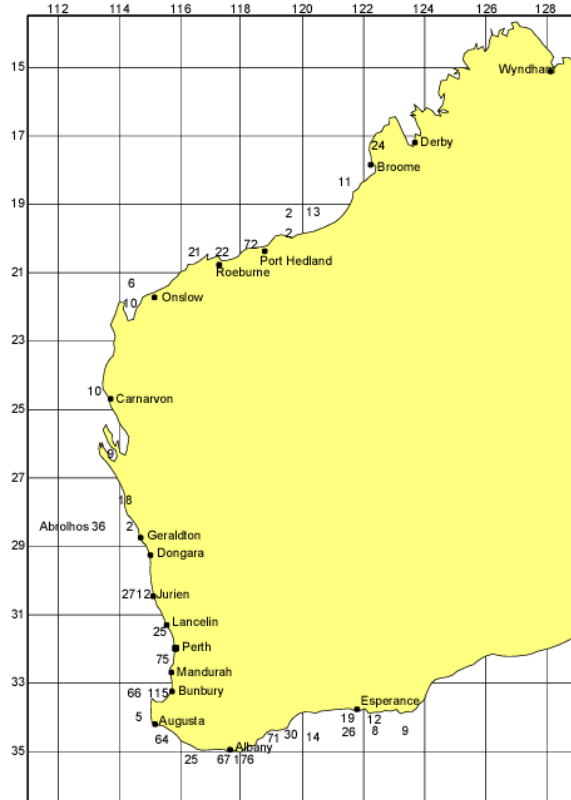


Figure 1c. Specimen Shell Managed Fishery 2001 effort (days)

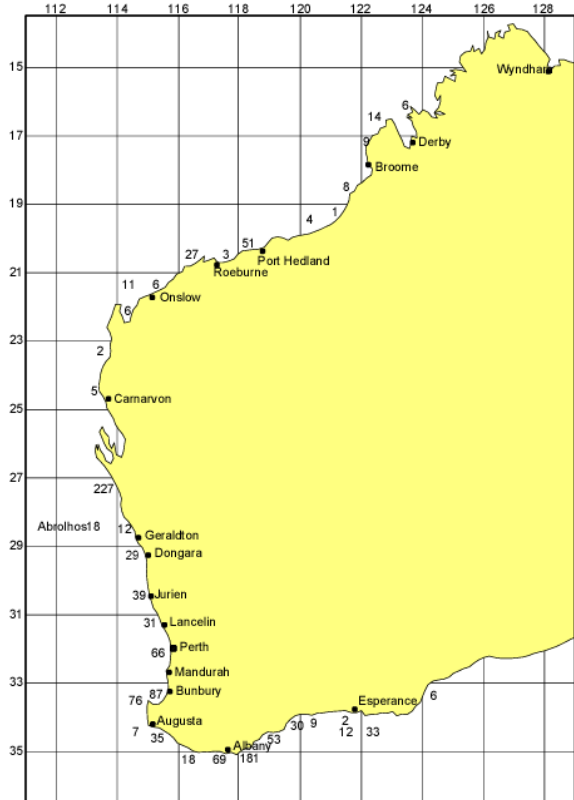


Figure 1d. Specimen Shell Managed Fishery 2002 effort (days).

Figure 1. Effort (days) in the Speciman Shell Collection Fishery 1999 – 2002 and January to July 2002.

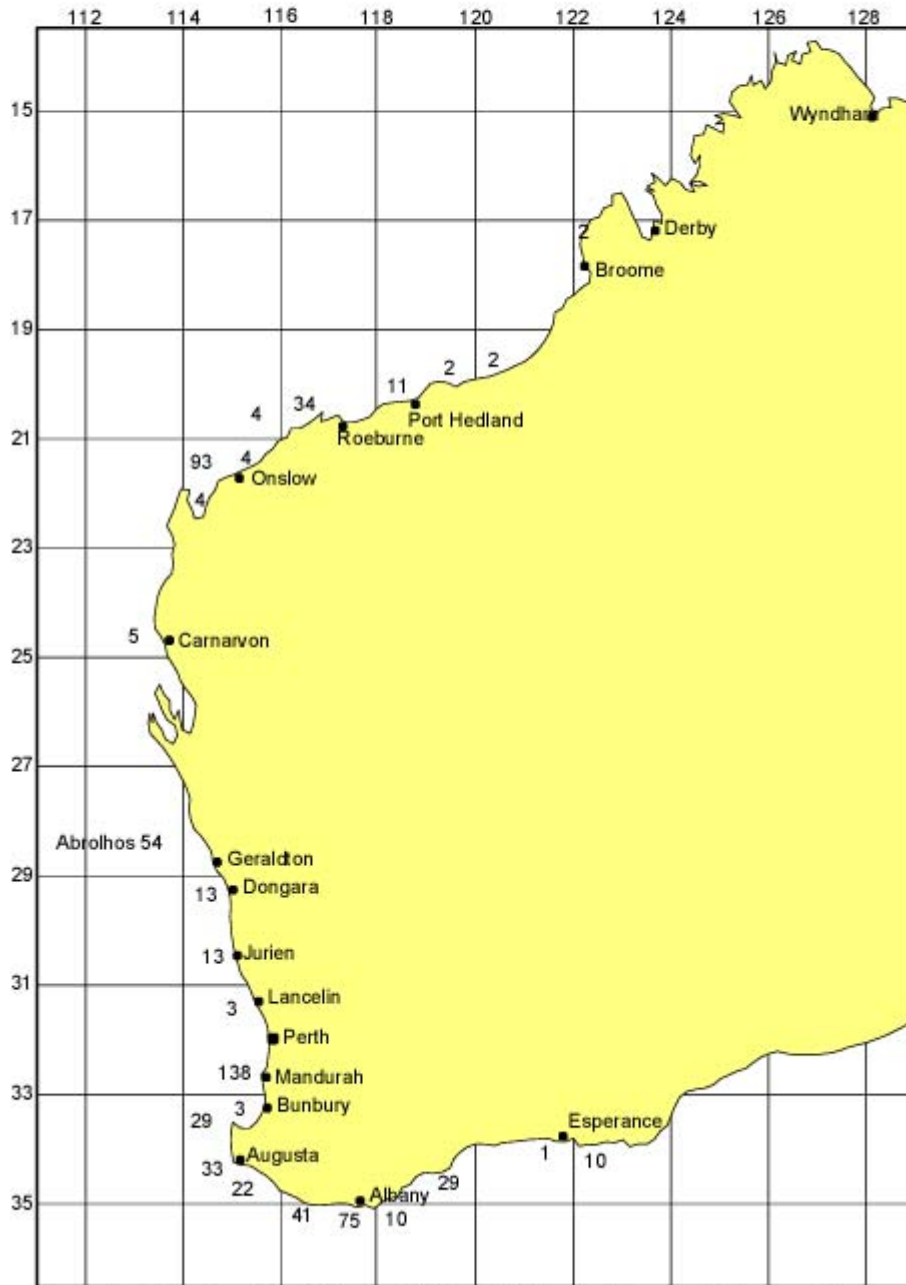


Figure 1e. Specimen Shell Managed Fishery 2003 effort (days)_data incomplete

Figure 1 (continued). Effort (days) in the Specimen Shell Collection Fishery 2003 (January to July).

Appendix 1. Reported landings of all species from 1999 to 2003 (90% of returns).

<i>Species</i>	1999	2000	2001	2002	2003
ACMAEIDAE				44	
Acrosterigma dupuchense					8
Acrosterigma fultoni	6			3	
Acrosterigma reeveanum				1	7
Acrosterigma wilsoni	3			1	2
Agnewia tritoniformis				100	
Alocospira marginata				1	
Amblychilepas nigrata	32				
Amblychilepas oblonga	23			4	
Amoria damonii	134	91	73	69	9
Amoria ellioti	168	18	160	20	
Amoria exoptanda	2				
Amoria grayi	54	77	53	34	4
Amoria jamrachi	16	10	13	11	
Amoria praetexta	7		1		1
Amoria turneri	1				
Anadara granosa (Wells & Bryce no. 550)	4	10			
Anadara trapezia (Wells & Bryce no. 549)		2	6		
Ancillista cingulata		5	6		
Ancillista muscae	6	8	5	5	
Angaria delphinus		3	5		51
Angaria tyria		46	77	145	18
Anomalocardia squamosa		16			
Antigona chemnitzii			12		
Antigona lamellaris		7			
ARCIDAE (Source: Seashells of Western Australia, Wells & Bryce)			10		
Argonauta argo	82	821	251	318	44
Asaphis violascens		25			
Aspella platylaevis	6	73			
Aspella ponderi	3				
Astele ciliare	6	9		6	1
Astele monile		26			
Astralium pileolum		66	40		143
Astralium rotularia	32	103			
Astralium squamiferum	47	163		35	10
Astralium stellare	13	116			
Astralium tentorium	41		51	17	
Atrina pectinata		10			
Austrocochlea concamerata			13	200	
Austrocochlea constricta				100	
Austrocochlea rudis		22		100	
Austroharpa loisae	19	13	1		1
Austroharpa punctata	25	15			2
Bembicium auratum			16	100	

Bembicium nanum				100	
BIVALVE-CLASS		215		224	
Brechites vaginiferus (Wells & Bryce no. 662)	6		3		
BUCCINIDAE	1	7		165	750
BULLIDAE (source: Short & Potter, Shells of Queensland and the Great Barrier Reef)				12	
Bullina lineata		5			
Bursa granularis	11	20	11	4	1
Bursa rosa					1
BURSIDAE				3	
Cabestana tabulata	12	12	75	2	8
Calliostoma similarae				18	
Callista planatella	6	47	1		
Calthalotia strigata	159				
Campanile symbolicum	120	99	73	44	11
Cancellaria melanostoma	3	9			
Cancellaria spirata	17	10	8		
CANCELLARIIDAE				43	
Cantharus erythrostromus	123		83	3	
Cantharus undosus			10		
Capulus liberatus	30				
CARDIIDAE	5	5	3	2	2
Cardita crassicosta	4	7		2	
Cardita incrassata	34				
Cardita marmorea			24	16	
CARDITIDAE		27			
Casmaria erinacea				1	
Casmaria ponderosa				1	2
CASSIDAE			1		
Cassis fimbriata	12	13	4	6	1
Cerithidea cingulata	35				
Cerithidea largillierti		50			
CERITHIIDAE	30	8		1	
Cerithium novaehollandiae	17	90			
Charonia lampas	36	61	62	42	3
Charonia lampas rubicunda	28	15	5	7	
Charonia tritonis			1		
Chicoreus banksii		10	30	6	8
Chicoreus cervicornis	10	196	4	92	
Chicoreus cornucervi	76	33	18	47	
Chicoreus microphyllus			1		
Chicoreus rubiginosus	36	56		5	65
Chicoreus trivialis	64	84	3	7	
CHITONIDAE	19	898	291	197	149
Chlamys aktinos	18	23	3		
Chlamys squamosa	17	7			
Circe nummulina		28	32		
Clanculus atropurpureus	16			2	
Clanculus bicarinatus	9	10			
Clanculus comarilus	7				
Clanculus consobrinus	29				

Clanculus dunkeri	40			100	
Clanculus limbatus	73	20	12	22	
Clanculus personatus	9		9		
Clanculus ringens	11	25	9		
Clanculus undatoides	41				
Clanculus undatus	54	97	34	71	
CLAVAGELLIDAE (Source: Seashells of Western Australia, Wells & Bryce)	59	444		4	
Clypeomorus brevis	14				
Collisella septiformis			55	100	
COLUMBELLIDAE		93			
Cominella acutinodosa		226			
Cominella eburnea		56		13	
Cominella torri		2	1		
Complicachlamys dringi	5	36	1	3	
Complicachlamys wardiana			8	7	
Comptopallium radula		34			
CONIDAE	28	20	23	36	812
Conus anenome	155	161	31	58	28
Conus capitaneus		2	5		
Conus clarus				2	2
Conus cocceus	29	26	19	28	3
Conus connectens					2
Conus dorensis	10	64	6	37	4
Conus generalis			3		8
Conus imperialis					1
Conus klemae	32	39	11	22	7
Conus miles	14				
Conus monachus	25	8	24	20	
Conus novaehollandiae		12	45	14	10
Conus planorbis					2
Conus rattus		1			
Conus reductaspiralis	6		72	4	
Conus rutilus	70	27	5	14	
Conus spectrum	8		2		
Conus striatellus					9
Conus tenuistriatus	3				
Conus terebra		4			2
Conus textile		1			4
Conus trigonus	9	17	2	3	
Conus tropicensis					15
Conus victoriae	124	196	208	217	
Coralliophila costularia	1			1	
Coralliophila mira	4	13			
Coralliophila sp		2			
Coralliophila wilsoni	5				
Cronia avallana	9				
Cronia crassulnata		14			
Cryptoplax striata			25		
Cyllene pulchella	12				
Cymatium exaratum	7			7	2

Cymatium labiosum			7		5
Cymatium mundum	5				
Cymatium nicobaricum			1		
Cymatium parthenopeum	41	39	104	84	1
Cymatium rubeculum	1				
Cymatium succinctum	1				
Cymatium vespaceum	48	50	8		1
Cymbiola nivosa	25	10	28	7	
Cymbiola oblita	9	8	12	33	12
Cypraea alisonae					9
Cypraea annulus	6			1	
Cypraea arabica	8				
Cypraea armeniaca	3	4	17	8	2
Cypraea brividatata	1				
Cypraea caputserpentis	18	22	32	45	60
Cypraea carneola					13
Cypraea caurica	23	4	16		15
Cypraea cernica	1	3	9	2	113
Cypraea chinensis	1		1		26
Cypraea clandestina	28				
Cypraea comptoni	376	245	64	56	43
Cypraea cribraria	48	70	139	75	49
Cypraea cylindrica	95	103	35		
Cypraea decipiens	7		12	3	
Cypraea declevis	3	2	2		
Cypraea depressa				6	
Cypraea eglantina	25	23	103	75	7
Cypraea eludens			10	10	110
Cypraea erosa	2	1		17	
Cypraea erronea	222	202	30	38	39
Cypraea fallax	1		12		
Cypraea fimbriata	7				
Cypraea friendii	439	730	546	422	308
Cypraea friendii friendii	91	64	59	141	11
Cypraea friendii jeaniana	10	2		2	
Cypraea friendii vercoi	562	310	209	243	156
Cypraea gracilis	58	19	58		
Cypraea hammondae	17	1	4		
Cypraea helvola	18	28	41	10	23
Cypraea hirundo		1		9	
Cypraea histrio	34	24	18	16	
Cypraea lutea		2	6	7	4
Cypraea lynx		18	1	4	4
Cypraea marginata	589	563	570	609	361
Cypraea miliaris	10			34	
Cypraea minoridens					6
Cypraea moneta	109	143	111	202	49
Cypraea ovum					15
Cypraea perlae					0
Cypraea piperita	142	97	32	65	18
Cypraea pulicaria	65	44	46	15	2
Cypraea quadrimaculata	10				

Cypraea reevei	156	106	109	59	16
Cypraea rosselli	222	181	85	168	74
Cypraea saulae	2				
Cypraea subviridis	129	25	81	56	1
Cypraea talpa	1	6			
Cypraea teres		2			3
Cypraea tigris	42	4	22	30	7
Cypraea venusta	730	876	844	750	510
Cypraea vitellus		1	6	2	6
CYPRAEIDAE	18	10		144	723
Cystiscus sp	21				
Diminovula punctata			27		
Diodora jukesii	6	14	4		
Diodora lincolnensis	6				
Diodora singaporensis	31	51			
Diodora ticaonica	9				
Divaricella ornata		64			
Donax faba			114		
Dosinia contusa			115		
Dosinia exasperata		24			
Dosinia grata			6		
Dosinia incisa		6			
Dosinia scalaris		12	40		
Drupella rugosa	8				
Duplicaria australis	11				
Duplicaria crakei	31				
Duplicaria duplicata			10		
Emarginula dilecta	5				
Emarginula patula	52				
Engina concinna	68				
Engina curtisiana	7	22			
EPITONIIDAE	17				66
Epitonium auritum		1			
Epitonium imperialis	8		2		
Epitonium jukesianum	2				
Epitonium perplexum	24	4			
Epitonium pyramidalis	5				
Ericusa nodiplicata	4			2	
Eucrassatella kingocola			4		
EULIMIDAE	8				
Eunaticina albosutura			3		
Exiquaspira ornata			4		
Favartia salmonea			1		1
Ficus eospila	6	1	3		
Fimbria sowerbyi	17	8	12		
FIMBRIIDAE	26	8	4	3	
FISSURELLIDAE	10			4	
Fragum unedo		21			
Fulvia tenuicostata				44	
Fusinus australis	10	5		7	4
Fusinus sp	4				
Fusinus tessellatus		19	2	7	3

Fusinus undatus			5		
Fusus bednalli			3		
Gafrarium tumidum		9			
Gari lessoni		33			
Gari maculosa		5			
Globivenus embrithes		8			
GLYCYMERIDIDAE		1	6		
Glycymeris crebriliratus		4			
Gracilispira lineata	28		1		
Gracilispira monilifera	3	5	7	6	
Granata imbricata				2	
Gyrineum lacunatum	30				
HALIOTIDAE			3		
Haliotis asinina	74	11	6		
Haliotis conicopora					1
Haliotis crebriusculpta		1			
Haliotis elegans	35	24	21		2
Haliotis scalaris	49	50	26		2
Haliotis semiplicata	13	6	11	2	2
Haliotis squamata	3	8	30		
HARPIDAE	4				
Hastula rufopunctata	6				
Hastula strigilata	96				
Haustellum multiplicatus		3		31	
Hemidonax donaciformis					
australiensis			46		
Hemitoma submarginata	22	2		2	
Herpetopoma aspersa	10				
Herpetopoma rubra	53				
Hexaplex conatus	4	2		1	
Hexaplex stainforthi	119	93	103	128	27
Homalocantha secunda	2		4		
Hybochelus cancellatus		25			
Hydatina physis	5	15		5	
ISCHNOCHITONIDAE		2	7		
Janthina exigua		2			
Janthina janthina	1	40	17	111	3
Janthina pallida	153				
JANTHINIDAE		285	391		
Jujubinus lepidus				173	44
Lambis chiragra					60
Lambis truncata	12				
Latirus belcheri	89	76			
Latirus paetelianus	14	6	5	1	
Latirus polygonus				10	
Latirus recurvirostris					8
Latirus turrius		3			2
Latirus walkeri		27	68	41	9
Lepsiella flindersi				22	
Lepsiella vinosa			96		
Lima lima vulgaris		6			
Limaria fragilis		13			

LIMIDAE			6		
Liotina peronii	36	123			
Littoraria undulata		118			
Littorina unifasciata		110		100	
Lyria miraeformis	117	79	10	13	10
Macoma consociata			20		
Macroschisma bakiei	8	2		20	2
Macroschisma munita				6	
Macroschisma producta	7	6		3	3
Mactra antecedens			11		
Mactra grandis		116			
Mactra incarnata		3			
Mactra olorina		41			
Mactra sericea			7		
Marcia hiantina		77	15		
MARGINELLIDAE	55	13	14		
Melo amphora	90	71	46	54	2
Melo miltonis	25	25	20	7	8
Meropesta nicobarica		8			
Mesoginella australis			43		
Mesopeplum anguineum	78	60	82	114	10
Micromelo undatus		52			
Mimachlamys asperrima	29	15	23	1	
Mimachlamys funebris	36	19	11	12	
Mimachlamys scabricostata	7	14	70	43	
Mitra carbonaria		1		2	
Mitra chalybeia	8	2	1		
Mitra coffea					4
Mitra gilbertsoni					1
Mitra glabra					1
Mitra sowerbyi melvilli		1	1		
Mitra variabilis	37	26	196		
Mitrella acuminata	23				
Mitrella australis	28				
Mitrella essingtonensis	95	100			
Mitrella lincolnensis	18				
Mitrella semiconvexa	19				
Mitrella venulata	44				
MITRIDAE		2	35	6	
MODULIDAE		6			
Monodonta labio	34	132			
MOPALIIDAE			7		
Morula marginalba		36			
Murex acanthostephes	34	29	24	9	6
Murex brevispina		2			
Murexiella tatei	1			1	3
MURICIDAE	9	34	15	1	
Muricopsis planilirata	11				
Nassa francolina		6			
Nassarius bicallosus	26				
Nassarius clarus			115		
Nassarius concinnus		7			

Nassarius fraudator	200				
Nassarius glans	3		4		
Nassarius particeps	5	12		9	
Nassarius pauperatus		14		100	
Natica fasciata		232			
Natica gualtieriana		145			
NATICIDAE		178	1	1	
Nemocardium lyratum					7
Nerita albicilla		5			
Nerita atramentosa	18	49		17	
Nerita balteata		26			
Nerita plicata					73
Nerita polita		364			
Nerita squamulata		83			
Nerita undata		120			23
Nodilittorina australis				100	
Notogibbula lehmanni	385				
Notogibbula preissiana	12				
Notopecten translucidum	2			1	1
Notovoluta baconi	1				
Notovoluta kreuslerae	2	10		3	
Oliva australis				1	
Oliva caldania	7	30	10		
Oliva lignaria		14	13	12	
Oliva paxillus	11	26			
Oliva sp	7				
OLIVIDAE	15				
Opalia australia	23	16	1	8	2
Opalia granosa	15	9			
Ovula ovum		6			
OVULIDAE					30
Paphia semirugata		12			
Paphia undulata		8			
Paphies striata			81		
Patella chapmani			85		
Patella flexuosa	15				15
Patella laticostata	18		265	26	
Patella peronii			65		
PATELLIDAE	76	36	1		
Patteloida alticostata			100		
Patteloida insignis	21				
PECTINIDAE	6			8	
Peristernia incarnata	18		242		
Persicula deburghi	43		15		
Persicula sp	227	21	13	20	4
Phalium areola		1	11		
Phalium bandatum		2		4	1
Phasianella australis	3	45	31	41	6
Phasianella variegata	37				
Phasianella ventricosa	40		1		
Phasianotrochus apicinus	6				
Phasianotrochus bellulus	22				

Phasianotrochus eximius	8	1			
Phasianotrochus irisodontes				13	
Phenacovolva philippinarum	30	26		8	
Phenacovolva tokioi	6	2			
PHOLADIDAE (Source: Seashells of Western Australia, Wells & Bryce)		5			
Phos sculptilis	4		8		
Phos senticosus	21				
Pillarginella sp	18		3		
Pinna bicolor	21				
Pitar bullatus			6		
Pitar japonicus		5			
Placemen calophyllum		240			
Placemen gravescens		5			
Plagiocardium setosum			20		
Pleuroploca australasia	4				
Polinices conicus		96	12		
Polinices mammilla	20				
Polinices melastomus			62		
Prionovolva cavanaghi			5		
Prototyphis angasi		1		2	6
Pseudostomatella decolorata	16				
Pteria penguin			1		
Pterygia barrywilsoni		8	5	6	
Pterygia crenulata	8				
Pterygia fenestrata		7			
Pterynotus acanthopterus	96		8	1	
Pterynotus akation	32	13	87	5	
Pterynotus bednalli	18	26		6	
Pterynotus elongatus			1		
Pterynotus triformis	74	14			
Pterynotus undosus	17	16	31	19	18
Ptychobela crenularis	43	11			
Pupa solida		9			
Pupa sulcata	24	53			
Purpura bufo			1		
Pyrene bidentata	12	65	20		
Pyrene flava	140		157		
Pyrene punctata	6				
Pyrene varians	38		121		
Ranella australasia	77	60	25	20	23
RANELLIDAE	17	6	24	22	
Rhinoclavis bituberculata	13			23	
Rhinoclavis kochi	46				
Sassia bassi				1	
Sassia subdistorta				2	
Scabricola casta	20				
Scutus antipodes	4	92	17	3	
Scutus unguis	37	57			
Semele casta		6			
Semele jukesii		18			

Semele sinensis		26	4		
Semicassis adcocki		2			
Semicassis paucirugis	6	1		101	
Semicassis pyrum	2	3			
Serpulorbis siphon	12	49			
Serpulorbis sp		4			
Siliquaria australis		80			
Siliquaria ponderosa	10	62	146		
Siliquaria weldii	15		233	11	
SILICULARIIDAE	20	57	20		
Sinum zonale			2		
SIPHONARIIDAE (source: Short & Potter, Shells of Queensland and the Great Barrier Reef)					100
Soletellina ecolorata			15		
Spirula spirula	22	1820	54	245	975
SPONDYLIDAE	12	2	38	8	19
Spondylus albibarbatus	3		16		
Spondylus echinatus	4	68			
Spondylus tenellus	23	12		119	
Spondylus wrightianus			1		
Stomatella impertusa	14	5	17	9	
Stramonita javanica	22				
Strombus campbelli	39	16	30	6	
Strombus mutabilis	2	6	2	2	
Strombus sinuatus					6
Strombus urceus	13	7	3	71	
Strombus vomer		31	109	26	30
Strombus wilsoni	1				20
Sunetta contempta		13			
Sunetta perexcavata		6			
Syrinx aruanus	10	14	77	8	
Tapes dorsatus		4	9		
Tapes variegatus		118			
Tectus fenestratus	6				11
Tectus pyramis	2427		38		10
Telescopium telescopium			222		
Tellina inflata		34			
Tellina piratica		91			
Tellina virgata		9			
Terebralia palustris			223		
Terebralia sulcata			315		
TEREBRIDAE	54				
Thais echinata	13	6	2	4	
Thais kieneri		8			2
Thais orbita		1	3	6	
Thalotia chlorostoma	108		9		
Thalotia conica	158	3	35	168	6
Tonna cepa					2
Tonna chinensis	8	12	14	15	
Tonna tessellata		4		2	
Trigonostoma bicolor		5			

Trigonostoma scalarina	3				
Tripterotyphis lowei colemani		38			
Trisidos tortuosa (Wells & Bryce no. 548)			2		
Trivia globosa	13				
Trivia merces	51	21	11	4	2
Trivia oryza	108				
TRIVIIDAE			1	4	
TROCHIDAE	243	2287	3112	3083	2301
Trochus hanleyanus	11	32			11113
Trochus histrio	5	3			6
Tucetona odhneri			8		
Tudivasum inermis	3		6	3	
TURBINELLIDAE	2	7	11	8	
TURBINIDAE	619	331	154	802	745
Turbo argyrostomus		3			
Turbo cinereus	63	269			44
Turbo gruneri	1		1	3	
Turbo jourdani	168	50	178	32	20
Turbo petholatus	19	6			1
Turbo pulcher	68	196	74	116	
Turbo squamosus		22	53		
Turbo torquatus	845	194	76	103	
Turricula granobalteus	54	25			
TURRIDAE	28	70			
Turris crispa			52		
Turritella terebra		2			
Tutufa bubo				4	2
UNIDENTIFIED	55	130	205	20	171
VANIKORIDAE		15			
Vanikoro cancellata	9				
Vasum flindersi	22	1	10	9	6
Velacumantus australia			137		
Venericardia cardioides			6		
VENERIDAE		3	10		
VERMETIDAE		6			
Vexillum australe				2	
Vexillum cafferum			5		
Vexillum hansenae	2		4		
Vexillum microzonias	7	31			
Vexillum rusticum			12		
Vexillum vulpeculum	65	30	11		
VOLUTIDAE	4	2	19	33	6
Volutoconus coniformis		1	1		
Volvarina sp	22	83	11		
Xenophoroa flindersi	78				
Grand Total	16812	20372	15193	13100	21106