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MANAGEMENT PLAN FOR THE SOUTH AUSTRALIAN GULF ST VINCENT PRAWN FISHERY

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prepared by the
Gulf St Vincent Prawn Fishery Management Committee
in association with
Primary Industries and Resources SA

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Foreword

Management of Marine Resources in South Australia

Marine resources in South Australia are common property resources. The role of the Government, as custodian of the marine resources on behalf of the general community, is to ensure that marine resources are used in an ecologically sustainable manner and as efficiently as possible, while yielding a reasonable return to the community. This ensures that the benefits of the use of marine resources are maximised within the community.

Experience world-wide has shown that where there is unrestricted use of marine resources, there is little incentive for individuals harvesting the resource to conserve fish stocks and competition amongst users often leads to resource depletion. Left unmanaged, the increase in fishing effort that results from competition is reflected in lower individual catches in the recreational fishing sector, and over-capitalisation and reduced financial returns in the commercial fishing industry. Loss of these resources to the community can result in significant regional economic problems in some States.

In carrying out their management of the resource, Governments have the responsibility of ensuring that the basis for sharing of the resource among all users is clearly understood and accepted as equitable, and that the allocation of fisheries resources and their level of utilisation are consistent with the needs of present and future generations.

To provide for better decision making by Government in managing the marine resources, specific fishery management committees have been established to advise the Minister for Primary Industries, Natural Resources and Regional Development. These management committees are comprised of Government managers, research scientists, commercial and recreational fishers, and fish processors, and are chaired by independent chairpersons. Appointment of members and the terms of reference of the management committees are provided for under the *Fisheries (Management Committees) Regulations 1995*.

Where scientific data or evidence on some biological parameter for a fishery is lacking and management decisions must be made in an environment of uncertainty, the Government and management committee will take a precautionary approach to the management of these resources.

Hon Rob Kerin
MINISTER FOR PRIMARY INDUSTRIES,
NATURAL RESOURCES AND REGIONAL DEVELOPMENT

/ / 1997

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1 Scope of the management plan

Sustainable management of marine resources is the responsibility of Primary Industries and Resources South Australia (PIRSA) under the *Fisheries Act 1982*. The principal objectives of the Act (Section 20) are:

(a) ensuring, through proper conservation, preservation and fisheries management measures, that the living resources of the waters to which this Act applies are not endangered or overexploited; and

(b) achieving the optimum utilisation and equitable distribution of those resources.

The primary management objectives for the Gulf St Vincent prawn fishery are to:

- rebuild the biomass to historical levels and eliminate risk of recruitment decline due to over-fishing;
- ensure catching procedures are directed towards optimising size at capture;
- maintain and enhance the profitability of the fishery by optimising prawn size, improving the economic efficiency of fishing units and reducing the costs of fishing; and
- minimise by-catch and trawl impact on the benthic environment by the development of more efficient gear and harvesting strategies.

This management plan provides a statement of the policy, objectives and strategies to be employed for the sustainable management of the Gulf St Vincent prawn fishery. It represents the commitment of Government, the industry, and the community to managing the fishery in a manner which will ensure that the legislative objectives are achieved.

Regulations pertaining to the management of the prawn fisheries in South Australia are located in the *Scheme of Management (Prawn Fisheries) Regulations 1991*.

This management plan shall operate for a **five** year period from 1 November 1997 subject to annual review and amendments as considered necessary by the Gulf St Vincent Prawn Fishery Management Committee and the Minister for Primary Industries, Natural Resources and Regional Development.

2 Description of the fishery

2.1 Definition of the fishery

Commercial fishery licence holders in the Gulf St Vincent prawn fishery target the western king prawn *(Penaeus latisulcatus).*

In addition, they are permitted to take the following species, for the purpose of trade or business, where the fish are taken at the same time in the same net incidentally to the taking of prawns (ie bycatch): slipper lobster *(Ibacus* spp)and squid *(Sepioteuthis australis).*

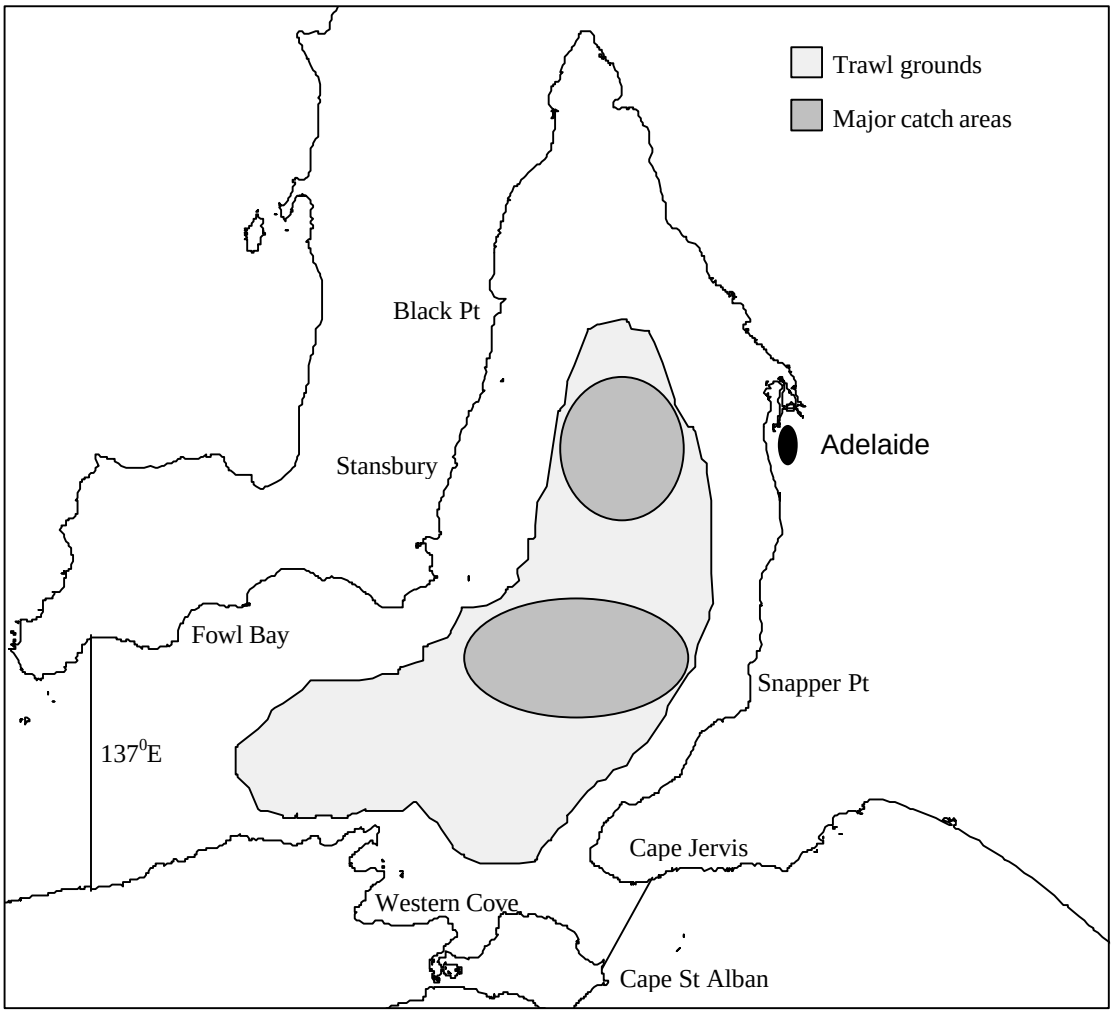
The Gulf St Vincent prawn fishery is contained in those waters within the area bounded by a line commencing at the intersection of the southern shore of Yorke Peninsula at high water mark with the meridian 137° east longitude, then proceeding due south along that meridian to its intersection with the northern shore of Kangaroo Island at high water mark, then easterly along that shore at high water mark to Cape St. Alban (latitude 35°48.7' south, longitude 138°07.4' east), then in a direction of 030°T to Porpoise Head on the southern shore of Fleurieu Peninsula (latitude 35°39.6' south, longitude 138°13.6' east), then along the high water mark of the eastern and western shoreline of Gulf St Vincent back to the point of commencement (figure 1).

There are 10 commercial fishery licences issued for the Gulf St Vincent prawn fishery. Due to regulatory restrictions there is no recreational fishery for western king prawns in South Australia.

Commercial fishing is undertaken using the demersal otter trawl technique which essentially consists of towing a funnel-shaped net leading in to a bag (most commonly referred to as a codend) over the sea bottom behind a boat. Otter boards (or doors) are used to keep the trawl nets open horizontally whilst being towed. During trawling operations, the disturbance of the seabed created by the otter boards assists in herding the prawns into the path of the approaching net.

Both single, double and triple rigged nets are permitted to be used in the Gulf St Vincent fishery with a minimum mesh size of 4.5 centimetres and a maximum headline length of 27.43 metres. At present all of the boats are operated with triple-rigged trawl nets.

Trawling is undertaken during the night anytime between sunset and sunrise. Each trawl shot takes between thirty minutes to two hours. After each shot the catch is emptied from the nets on to sorting trays. The prawns are then separated from the rest of the catch and stored in large built-in refrigerated brine tanks. One boat has freezer facilities.



1Figure 1: Gulf St Vincent prawn fishery showing trawl grounds investigated between 1986 and 1994 and areas of major catch from the 34 annual fishing nights.

After one or two nights fishing, the catch is off-loaded at suitable ports adjacent to the grounds, such as Edithburgh or Port Adelaide, and transported by road to processing factories.

Any boat used in a fishing activity under a fishery licence must be registered and endorsed upon the licence under which it is being used. Boats in the Gulf St Vincent prawn fishery must have an overall length not exceeding 15.2 metres and a main engine which does not exceed 300 continuous brake horse power.

Licence holders in the fishery may be either a natural person or a proprietary company. During fishing activities the boat is operated either by the licensee or their registered master.

2.2 Biological Characteristics

The Gulf St Vincent prawn fishery is based on the exploitation of a single species of penaeid prawn, the western king prawn *(P. latisulcatus).* Prawns are crustaceans with five pairs of swimming legs (pleopods) as well as five pairs of walking legs (pereiopods) with the front three having claws. Although they are capable of swimming, prawns spend most of their life on, or close to, the seabed. They are nocturnal and burrow into the seabed during the day and emerge at night to feed.

Life cycle

Adult prawns occur in the deeper waters of the Gulf (15 to 40 metres) in association with sand/mud sediment. Spawning occurs between October and March with two peaks occurring in mid December and late January/early February. Between 60,000 and 800,000 eggs may be released by an individual, with larger females releasing proportionately more than smaller prawns. The male sperm is retained by the female in a sperm capsule which is ruptured during the release of eggs. After fertilisation, the eggs develop through planktonic larval stages for a period of six to eight weeks and are transported in the water column.

During the planktonic stage, larvae undergo morphological changes and develop from eggs to nauplii, to myses and then to post-larval stages. The success of larval dispersal to optimal nursery grounds is important for stock replenishment. During this period mortality may be exceedingly high.

The post-larvae settle into sheltered shallow water nurseries and grow rapidly into juvenile prawns. Juvenile prawns remain in the nursery areas for 5 to 10 months and then move offshore as recruits into deeper waters. They join the biomass at a size of 26 to 28 millimetres carapace length (CL) and are sexually mature at about 33 millimetres CL. A major objective in the fishing strategy is to minimise the catch of prawns in the juvenile and recruit stages.

Nursery Areas

Shallow waters of the northern part of the Gulf are the main nursery areas. The largest concentrations generally occur on the eastern side of the Gulf from Barker Inlet north to Port Wakefield, and around to Price and Ardrossan on the western side. Juveniles are also found in a number of areas north of Black Point through to Port Vincent, Stansbury and Edithburgh. There are also several nursery areas in the bays on the northern side of Kangaroo Island, such as Eastern and Western Cove.

Size and Growth

There has been significant data collection on this species through tagging, surveys and commercial size data to make assessments of the growth and

maximum size of prawns in this fishery. While the same species of prawn is found in the Spencer Gulf and West Coast fisheries, there are sufficient environmental and management differences to require separate stock analysis for Gulf St Vincent.

Growth is highly seasonal with the growth rate increasing in late summer and slowing significantly in late winter. Growth rate is influenced by water temperature and prawn activity patterns. However, growth is still low in October/November because of high reproductive activity at this time. Water temperature ranges between 23 and 25°C in February/March and 12 to 13°C in August in northern parts of the Gulf.

Based upon this analysis *P. latisulcatus* can be expected to reach a mean length of 48.1 millimetres CL for males and 62.0 millimetres CL for females at an age of 65 months. At these large sizes there are between 10 to 15 prawns to a kilogram. The growth estimates for *P. latisulcatus* in Gulf St Vincent are shown in table 1.

2.3 Ecological characteristics

Like all trawling methods used in the fishing industry, the demersal otter trawl technique used in Gulf St Vincent may cause some damage to the benthos. This is due to the very nature of the operation, which necessitates contact with the seabed in order to catch these bottom feeding crustaceans. There are, however, some mitigating factors which tend to minimise adverse effects on the ecology of the regions fished. These include:

- prawn trawling can only take place where the water is relatively deep (greater than 10 metres in depth) and seagrass beds are avoided. The sand and mud bottom is generally smooth and free of snags;

- due to long term management strategies that have reduced fishing times, the disturbance to the benthos has been reduced by progressive reductions in the actual number of annual fishing hours. Table 2 below shows the trend over the past 15 years;

- legislation under which this fishery operates specifically prohibits the taking of the majority of the incidental catch species for purpose of sale or personal use. Although it is true that much of the fish bycatch does not survive, crustacea, such as blue swimmer crab, do survive and are returned to the sea as the catch is sorted; and

- the Gulf St Vincent Prawn Fishery Management Committee (GSVPFMC) is supporting work to be undertaken to assess bycatch reduction devices. Those devices most suitable to conditions within the fishery will be assessed as part of a national research program being carried out by the CSIRO (Marine Division) in collaboration with the South Australian Research and Development Institute (SARDI).

Table 1: Growth characteristics of the western king prawn *P. latisulcatus* in Gulf St Vincent.

AGE (from 1 January)	YEAR 1 (Juveniles)	YEAR 2 (Recruits to fishing grounds)	YEAR 3 (Target size)	YEAR 4	YEAR 5
Mean CL (‹)	21.0 mm	34.1 mm	41.9 mm	45.1 mm	47.2 mm
Mean CL (Œ)	27.5 mm	44.2 mm	54.2 mm	58.2 mm	60.9 mm
No/Kg	96 - 178	23 - 41	13 -24	11 - 20	10 - 19

Table 2: Change in fishing effort in the Gulf St Vincent prawn fishery between the 1980/81 and 1995/96 season.

YEAR	1980/81	1985/86	1990/91	1995/96
HOURS FISHED	17,262	9,568	3,968	2,984

Habitat dependency

P. latisulcatus, like other crustaceans, exist at the lower levels of the food chain. They are omnivorous at smaller sizes and carnivorous scavengers at larger sizes. A wide range of food materials has been found in examinations of the gut, including shell grit, plant material, crustacea, polychaeta, bryozoa and the scales of small fish.

Prawns tend to prefer to live in warmer tropical or sub-tropical water regimes. The Gulfs and West Coast of South Australia are considered to be at the lower limit of temperatures for activity in many species of penaeid prawns. An important consideration in the distribution of prawns is also the topography of the seabed. In the Gulfs there is a preference for depressed gutters comprised of soft, sandy substrate into which the prawns are able to burrow.

Catch rates vary considerably on a seasonal basis. Catchability decreases at water temperatures of less than 14°C as prawns “hibernate” and all fishing in the Gulf is suspended between July and October. Catchability usually declines from March to June.

Diel and lunar influence on behaviour

Numerous studies have shown that penaeid prawns are far less susceptible to being caught during daylight hours. Optimum catches and quality coincide with the dark phases of the moon and fishing is limited to periods corresponding to these peak periods. This strategy is employed in all of the State's prawn fisheries. The proportion of soft shelled prawns is increased over the full and quarter moon phases in some months, which can result in reduced returns through lower prices.

2.4 Research and stock assessment

While this fishery has been subject to extensive research since the early 1970s the fishing strategies applied to gain effective optimisation of catch and catch per unit of fishing effort (CPUE) and the provision of data essential in ensuring the long term sustainability of the resource are now largely based upon fishery dependent information. This is verified through information collected by an independent monitor from SARDI who is required to assess the status of a sample of prawns from each shot undertaken onboard the commercial boats. This monitoring occurs throughout the fishing season, but is most intense during critical periods where spawning status and recruitment are measured.

An extensive review of the fishery was conducted by Morgan (1994, 1995) and this report provided recommendations on harvesting strategies, performance indicators and research programs. A recent report on the status of the fishery has also been provided by Kangas and Jackson (1997).

The major research activity in the fishery is conducted by way of catch and effort data, size composition information, sex and spawning status data which is collected from nightly fishing operations. This information is either collected on a shot by shot basis or from a designated shot on each night.

The primary objective of the research program is to undertake an annual stock assessment. This is needed to assist in developing harvesting plans; minimising the catch of small prawns; optimising trawl value; determining the optimum level of effort for stock rebuilding; monitoring movement of juveniles and recruits to the fishing grounds; and determining strategies to maintain recruitment to the fishery.

Methods

The research is primarily based on fisheries dependent data provided by the fishing boats. Catch and effort data are provided for spatial blocks within the Gulf. These blocks have been established by many years of research, which has shown differences in size and abundance within a number of these areas. Some relative size data are also provided by fishers based on the count of prawns in a standard volume. Independent surveys aboard commercial boats provide information on the size composition and sex ratio of prawns. Analysis of catch and effort data, size composition and sex ratio information is used to provide estimates of spawning stock abundance and rates of exploitation.

Before fishing can be undertaken the fleet is required to sample an area to ensure the prawns meet the target size and there are not a large number of recruits or spawning females present.

Sampling is carried out with only one of the net codends closed. The trawl shot is limited to twenty minutes in length. Based upon the catch taken from that shot and a sample of the prawns an assessment as the fishing ground is made.

Where the size of the prawns in the samples taken from across the fleet averages 24 prawns per kilogram or less then fishing may commence.

2.5 Economic factors

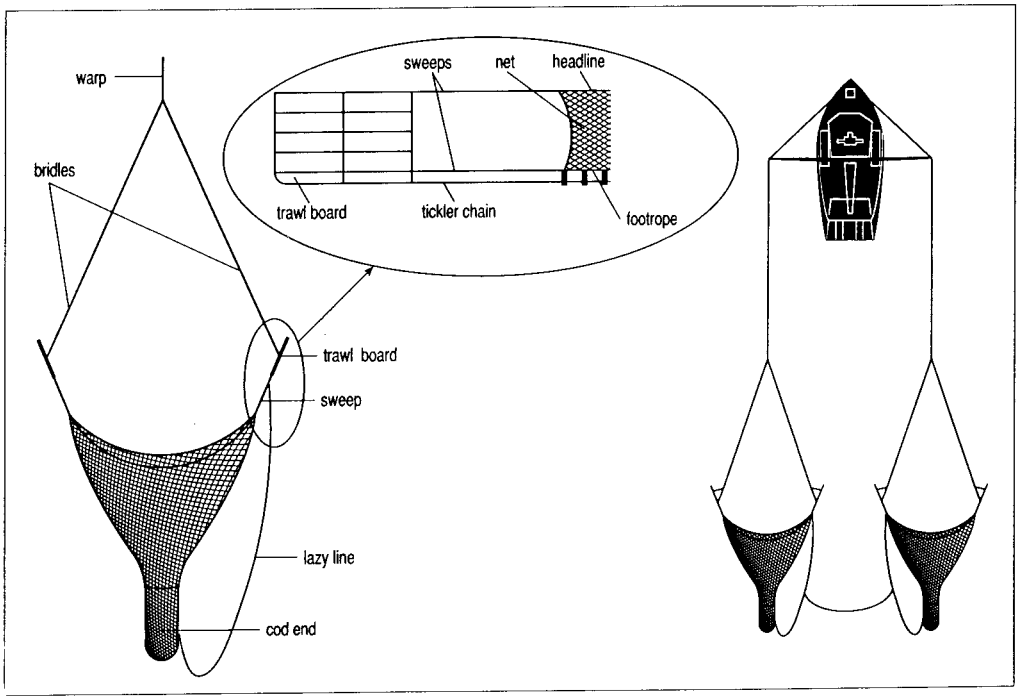
Within the constraint of limited exploitation, and to enable stock rebuilding, the harvesting strategy is determined to achieve economic optimisation. Harvesting is targeted to gain price advantages in the market due to peak demand periods, such as Christmas, and a size for the product which gains maximum value from the limited fishing time available.

A slightly larger prawn is now being targeted in Gulf St Vincent than in other prawn fisheries. Sizes fished have increased since the late 1980s when the target size was 27 per kilogram, to 22 per kilogram in response to the fishery's decline in the early 1990s, and recently down to the current target of 24 per kilogram. This larger prawn is intended to attract a premium price.

Beach prices for the 1996/97 season averaged $13.88 per kilogram.

2.6 History of fisheries management

The existence of Western King prawns in South Australian waters has been known for many years, yet it was only in the late 1960s that the first commercial catches were made. Small prawns have always been found in shallow water areas of the gulfs and were recorded over many years as shrimps.



2Figure 2: Diagram of a typical prawn trawl double rig. Boats in the Gulf St Vincent prawn fishery currently use triple rig gear.

Commercial prawn fishing began in Gulf St Vincent in 1967. Previous attempts to trawl for prawns in the State during daylight hours had produced little success, due to the fact that the prawns are less vulnerable to trawl nets during daylight hours, as they burrow beneath the sea-floor, only returning to the surface to forage after dark.

In 1968, the then Department of Fisheries closed all South Australian waters to trawling and offered permits for fishing in a number of different management zones. The *Preservation of Prawn Resources Regulations 1969* were introduced with vessels being licensed to fish for prawns. The fishery was divided into geographical zones and licences issued to operate within specific zones. These early steps were critical to preventing over-exploitation in the early stages of the development of our fisheries and are still a major management tool applied in the successful management of this State's major fishery resources. The Gulf St Vincent prawn fishery was established within Zone F which included all waters between 136°30'E and 139°E, except inland waters and the waters of Spencer Gulf (Zone D).

Gulf St Vincent

The fishery was developed as a single fishery with operators fishing all of the waters of the gulf, including Investigator Strait which lies between Kangaroo Island and the mainland. In 1975, some operators were provided with permits to specifically fish the Investigator Strait area only. From that time until 1983 the fishery was managed as two separate zones. The boundary between the two zones was a line from Cape Jervis (Fleurieu Peninsula) to Troubridge Point (Yorke Peninsula).

Investigator Strait

This zone was established in 1975 after some limited fishing by the Gulf St Vincent fleet. Subsequently a High Court decision established that Investigator Strait was under Commonwealth jurisdiction, being outside of the three nautical mile State territorial limit. With the mixed jurisdiction there were five operators entitled to fish state and commonwealth waters and three entitled to fish the commonwealth waters only from 1977 until 1981. At that time, one of the dual State and Commonwealth fishers surrendered his entitlement. By 1982, the number of fishers was further reduced to two, after an agreement between the governments that the Commonwealth would not renew the fishing permits for this area.

Jurisdiction over this area was transferred from the Commonwealth to the State in February 1983. However, this zone continued to be managed separately until the 1986/87 licensing year. The licence numbers in the Gulf St Vincent prawn fishery, since its inception in 1968, is shown in table 3.

Fishing Methods

The fishery has been based upon the use of the otter trawl method with the nets either single, double or triple rigged. Double and triple rigged nets were first permitted in the fishery in 1980 and became the standard net configuration within a year (figure 2). Trawling involves towing the nets over the sea-bed at a speed of less than three knots. Fishing commences at dusk and extends over the period of darkness.

Closures

In 1968, all State waters less than 10 metres deep were closed to trawling. Additionally, areas have been closed permanently and seasonally to protect spawning females, juvenile and newly recruited prawns. The current management approach in this fishery relies on the fleet operating as a single fishing unit, working the same area and fishing only after sampling indicates the target prawns are large enough. The level of annual catch and value of the fishery is shown in table 3.

Table 3: Summary of prawn catch and beach price value from the Gulf St Vincent fishery.

YEAR	CATCH (tonnes)	VALUE ($M)	YEAR	CATCH (tonnes)	VALUE ($M)
1979/80	358	1.84	1988/89	247	3.20
1980/81	361	1.84	1989/90	169	2.18
1981/82	481	2.54	1990/91	134	1.72
1982/83	549	4.29	1991/92	*	0
1983/84	456	3.47	1992/93	*	0
1984/85	241	2.22	1993/94	225	3.27
1985/86	262	2.82	1994/95	145	1.89
1986/87	221	2.70	1995/96	258	3.46
1987/88	211	2.99	1996/97	210	2.93

* fishery closed

2.7 Rationalisation of licences

The decision by the Government to introduce a licence rationalisation strategy was based upon the recommendations of Professor Copes who undertook a review of the fishery in 1986. One of the terms of reference for the review was 'To investigate and report to the then Minister for Fisheries on additional management measures, where appropriate, for the Gulf St Vincent/Investigator Strait prawn fishery' (Copes 1986).

In his report Professor Copes described the fishery's problems as 'The prawn stocks of the Gulf St Vincent and Investigator Strait in the mid 1970s yielded substantial catches of large prawns, providing exceptionally good financial returns. The fishery in Gulf St Vincent was referred to as a "liquid gold mine". Now, in the mid-1980s, catches and catch rates are greatly reduced, the average size of prawns taken is much smaller and several fishermen are experiencing financial difficulties'.

Table 4: Number of licence holders in the Gulf St Vincent prawn fishery from the beginning of the fishery in 1968. The reduction from 14 to 10 licences in 1987 was the result of the rationalisation scheme and subsequent buyback.

YEAR	GULF ST VINCENT	INVESTIGATOR STRAIT	YEAR	GULF ST VINCENT	INVESTIGATOR STRAIT
1968			1983	14	2
1969	5	-	1984	14	2
1970	10	-	1985	14	2
1971	10	-	1986	14	2
1972	10	-	1987	10	2
1973	10	-	1988	11	-
1974	12	-	1989	11	-
1975	12	5	1990	10	-
1976	12	5	1991	10	-
1977	14	8	1992	10	-
1978	14	8	1993	10	-
1979	14	8	1994	10	-
1980	14	6	1995	10	-
1981	14	6	1996	10	-
1982	14	2	1997	10	-

Among the recommendations from the review, the following specifically focussed on restructuring the fishery:

- measures should be taken to remove six vessels from the Gulf St Vincent/Investigator Strait prawn fishery at the earliest opportunity, by a process of buy-back;

- any fishing allowed in the Gulf St Vincent/Investigator Strait prawn fishery before the withdrawal of six vessels has been achieved should be subject to much more restrictive time and area closures than have been applied in the fishery so far;

- after the initial buy-back of six vessels from the Gulf St Vincent/Investigator Strait prawn fishery has been completed, the fleet should be allowed to upgrade to vessels with optimum specifications. A further buy-back should also be effected to reduce the fleet to what is then found to be the optimum number of vessels; and

- arrangements should be made for an ongoing buy-back system that will buy out vessels whenever surplus fleet capacity is in evidence. Reserve funds for this purpose should be accumulated from rent earnings drawn from the industry.

As a consequence of these recommendations, the Government introduced the *Fisheries (Gulf St Vincent Prawn Fishery Rationalisation) Act 1987* in April 1987. This lead to the removal of the two Investigator Strait entitlements and the

subsequent removal of four Gulf St Vincent licences. The last of the licences was removed in 1991.

The *Fisheries (Gulf St Vincent Prawn Fishery Rationalisation) Act 1987* contained a number of provisions. These provisions included:

- precluding transferability of licences, until the optimum number of licences (10) had been reached;

- the basis of determining compensation were specified, including methods for resolving disputes as to the value of licences and other property to be purchased; and

- the management of the buy-back fund, including the ability to borrow money required under the Act and the setting of the surcharge and the provisions for the recovery of the debt.

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The buy-back of licences was funded through borrowing from State Treasury. The debt is being repaid by a surcharge collected as a component of the annual licence fee. Repayments to the loan funds have been limited to-date due to the slower than expected recovery of the fishery, and the Government's acceptance of a recommendation from a House of Assembly select committee, that the fishery be closed for two years (Quirke 1991). No surcharge fee was set during the closure periods (1989/90 and 1990/91).

In 1991, a report by a House of Assembly Select Committee made a number of recommendations related to the rationalisation of the fishery. These included the restructuring of the debt incurred under the rationalisation arrangements that was to apply from the time the fishery reopened in 1992 (Quirke 1991).

The *Fisheries (Gulf St Vincent Prawn Fishery Rationalisation) Act 1987* remains in force until such time as the debt incurred by the Minister in restructuring the fishery has been cleared.

3 Fishery management objectives and strategies

The priority for management of the Gulf St Vincent prawn fishery is to ensure that annual harvest levels are sustainable so that future generations may benefit from exploitation of the resource. Commensurate with this priority are a number of more specific biological, economic, environmental, and social objectives that have been developed by the Gulf St Vincent Prawn Fishery Management Committee to complement the broad directives of Section 20 of the *Fisheries Act 1982*.

The principle management objectives for the Gulf St Vincent prawn fishery are:

1. *To adopt a stock rebuilding strategy that maintains and increases the level of the spawning biomass.*

2. To optimise value per recruit.

The following specific objectives and strategies assist in meeting the principal management objectives for this fishery.

3.1 Biological objectives

1. Maintain fishing effort at a level which provides for an optimum level of spawning biomass necessary to rebuild the stock.

2. To optimise size at capture.

Strategies

- adopt a 'precautionary approach'[1] in the management of the prawn resource;
- monitor ongoing changes in catch efficiencies within the fishery that influence the level of effective fishing effort in the fishery;
- collect catch and effort data, on a shot by shot basis, supported by fishery independent information to provide the essential biological data necessary to monitor the fishery's performance;
- ensure an annual stock assessment report is provided for the fishery upon which an appropriate harvesting strategy can be determined; and
- provide for improvements in harvesting practices and gear technology to ensure the biological sustainability of the stock and the marine ecology within the area of the Gulf St Vincent prawn fishery.

3.2 Economic Objectives

1. To optimise returns to stakeholders through the development of cost-effective fishing strategies.

2. To improve returns per unit effort by facilitating programs that improve handling and processing of the catch.

3. To improve profitability by optimising prawn size and the timing of fishing consistent with biological constraints.

[1] the management committee shall be more cautious when information is uncertain, unreliable or inadequate. The absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures to prevent overfishing.

Strategies

- monitor the size of prawns captured to ensure that harvesting is achieving optimum returns for fishing effort expended;

- provide for flexible harvesting strategies to achieve optimum returns from within the market place for the catch;

- provide for value adding of product by allowing for on-board processing of product;

- develop harvesting techniques and practices that minimise costs; and

- undertake regular assessments of the economic performance of harvesting strategies and identify opportunities for improved returns from the fishery.

3.3 Ecological objectives

1. ***To minimise the impact of prawn trawling on the benthic environment of Gulf St Vincent.***

2. ***To minimise the incidental catch through the use of bycatch reduction technology.***

3. ***To identify areas within the Gulf St Vincent prawn fishery for which improved conservation measures are appropriate.***

Strategies

- develop harvesting techniques and gear technology that minimise the impact of trawl operations on the benthic environment and small prawns;

- promote and maintain practices which minimise the impacts of prawn trawling on other commercial and recreational fisheries; and

- support research programs into the ecological interaction of the prawn fishery with the marine environment of Gulf St Vincent.

3.4 Social objectives

1. ***To provide the community with a source of high quality seafood.***

2. ***To minimise conflict between participants in the fishery.***

3. ***To ensure good relationships between the Government, industry and the community are developed and maintained.***

Strategies

- ensure the public and special interest groups are aware of the responsible practices and policies applied in managing the fishery;

- establish and maintain regular contact with other fishery management committees and special interest groups;

- develop clearly defined and transparent fishing policies for licence holders; and

- promote a better understanding in the community of the application of responsible and sustainable fisheries management practices within prawn fisheries in South Australia.

4. Compliance and enforcement

The annual compliance budget for the Gulf St Vincent prawn fishery is about $30,000 and accounts for costs incurred checking on bycatch, maximum trawl headline length and the landed prawn catch.

To maximise the size of capture and total catch for each fishing period, regular sampling trawls are undertaken during fishing operations. On behalf of the management committee, a "Committee At Sea" is responsible for the implementation and monitoring of fishing practices and infringements are reported to PIRSA (Fisheries Compliance Unit) and the management committee. If non-compliance with the fishing areas becomes difficult for the committee at-sea, additional compliance resources using the fisheries patrol vessel may be necessary.

A possible future compliance option for this fishery is the introduction of a vessel monitoring system (VMS) to allow for electronic monitoring and reporting of fishing operations.

5 Reference points and performance indicators

Reference points are agreed quantitative measures used to assess performance of fishery based on clearly defined management objectives.

Reference points begin as conceptual criteria which capture in broad terms the management objectives for the fishery. To implement fishery management it must be possible to convert the conceptual reference point into a technical reference point, which can be calculated or quantified on the basis of biological or economic characteristics of the fishery (Caddy and McMahon 1995)

Reference points used for rational exploitation of fish resources can be placed in two categories: target reference points and limit reference points. Target reference points are considered as indicators of stock status which are a desirable management target, whilst a limit reference point is an agreed level at

which stock stress may occur, and immediate action is required to remedy the situation before long term damage to resource productivity may result.

5.1 Key performance indicators

5.1.1 Sustainability

(a) Maintain exploitation rates at conservative levels of effective effort.

Effective effort is measured through the assessment of the number of nights and hours fished (including sampling) adjusted by annual reviews of fishing power within the fishery.

The target reference point for effective effort in this fishery at this time (97/98 season) is a total of 36 fishing nights, with a maximum of 11 nights being fished during November and December in each year.

The limit reference points for effort are 34 and 38 fishing nights with a minimum of 9 and maximum of 11 nights fished during November and December. Should the limit reference points be exceeded, effort may need to be constrained until such times as it can be determined that the spawning stock biomass has reached a level which ensures a sustainable resource.

(b) Maintain an exploitation rate at or near 20 percent of the biomass.

While effective effort is contained within the constraints in 6.1.1 *(a)* above current evidence indicates that this will continue to be achieved. This should be confirmed through an annual stock assessment. The exploitation rate is the level of available prawns taken by the fishery.

This target reference point of an exploitation rate at 20 percent should ensure economic and sustainable performance by maintaining at least 70 percent of the virgin spawning biomass (Morgan 1995).

The limit reference point for protecting the resource should constrain the exploitation rate below 30 percent.

(c) Maintain the recruitment index at a level which ensures suitable recruitment to the fishery

The target reference point for measuring an appropriate level of recruitment to the fishery should be based upon the assessment of recruits on the fishing grounds over the period from April/May to June each year. A recruitment index is collected from commercial fishing activities and some independent monitoring, and is based on an assessment of the number of 1+ cohorts (year class) of prawns (less than 36 millimetres carapace length) taken per hour of trawling.

The target reference point is to maintain a recruitment index of 25 (Morgan 1995).

The limit reference point for the recruitment index should be not less than 20. Where the limit for the index is reached fishing effort should be reduced to ensure that the exploitation rate can be maintained above its limit point.

5.1.2 Economics

(a) Establish a size at first capture which ensures the optimum utilisation of the resource.

The size of prawns taken during fishing is to be monitored nightly to ensure that effort is being targeted at fish which best meet the objectives for the fishery.

The target reference point is 24 or less prawns per kilogram.

The limit reference point is 27 or more prawns per kilogram. At target sizes equal to or in excess of this point there is potential to adversely impact on the spawning biomass.

Table 4: Summary of biological and economic reference points for use in the Gulf St Vincent prawn fishery.

Reference Point	Target	Limit
Effort (days)	36	34 lower, 38 upper
Exploitation rate	20%	30%
Recruitment index *	25	20
Prawns per kilogram	24	28

* the recruitment index is calculated on an assessment of the number of 1+ cohorts of prawns (less than 36 mm carapace length) taken per hour of trawling.

5.2 Management committee performance indicators

The primary responsibility for ecologically sustainable development of the prawn resource rests with the Minister for Primary Industries, Natural Resources and Regional Development. However, to assess the effectiveness and efficiency of the Gulf St Vincent Prawn Fishery Management Committee in managing the resource, and to provide for transparency in the management process and improve accountability, performance indicators are required.

The primary performance indicators used to assess the effectiveness and efficiency of the management committee is the acceptance of advice from the committee by the Minister for Primary Industries, Natural Resources and Regional Development, and the quality of information supplied to the Minister. Further information on the strategic direction of the management committee and key performance measures can be found in the Gulf St Vincent Prawn Fishery Management Committee Strategic and Business Plan.

5.3 Compliance performance indicators

Compliance costs for the prawn fishery are a small part of the overall management costs for the fishery. The effectiveness and efficiency of compliance protocols and programs needs to be assessed annually to ensure effectiveness in service delivery and that costs are minimised where possible without raising the level of compliance risk.

A primary objective of the management committee is to move towards a high degree of self regulation in the prawn fisheries. The following performance indicators are used to assess the effectiveness and efficiency of the fishery compliance operations for the Gulf St Vincent prawn fishery:

- reduction in illegal activity as determined by the number of reports for offences, specifically infringements of the fishing strategy and reported landing of bycatch;
- cost effectiveness of compliance programs; and
- increased support by all licence holders and masters for the "Committee At Sea".

Biological reference points and performance indicators will be reviewed on an annual basis. Changes may occur to biological reference points as more scientific information on the stock status of the prawn fisheries are provided from the strategic research program. Other performance indicators may also change to ensure the management of the fishery is subject to a continuous improvement program.

6 Review of the management plan

The Gulf St Vincent Prawn Fishery Management Committee is required under the *Fisheries (Management Committees) Regulations 1995* to provide the Minister for Primary Industries, Natural Resources and Regional Development, on or before 30 November each year, a report on the operations of the management committee during the preceding financial year. This report will include a report on any target or limit reference points which were reached during the reporting period and any actions that resulted. The performance of the management committee and fishery operations will also be rated against the stated objectives.

This management plan is a dynamic document which reflects current understanding of the prawn fishery and as such may change over time. No radical departure from the stated management arrangements, biological reference points or performance indicators will occur unless the management committee is otherwise directed by the Minister for Primary Industries, Natural Resources and Regional Development during the life of this plan.

Six months before the end of the five year period (1 May 2002) this management plan will undergo a major review.

7 References

Copes, P (1986) Prawn fisheries management in South Australia, with specific reference to problems in Gulf St Vincent and Investigator Strait. *A report to the Minister of Fisheries of South Australia*

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Appendix I

FIVE YEAR STRATEGIC RESEARCH PLAN FOR THE SOUTH AUSTRALIAN GULF ST VINCENT PRAWN FISHERY

Principles

- linked to explicit quantifiable management objectives
- provide defensible values of the performance indicators to evaluate stock status
- annual stock assessment reports in uniform format
- cost effective delivery of information with accountable use of resources

Guidelines

The development of a five-year strategic plan for the Gulf St Vincent prawn fishery reflects a need of the industry and of managers for reliable, cost-effective, performance indicators of the status of the prawn resource. These performance indicators are quantitative indices which can be updated annually and can be used to reliably assess the effectiveness of current management of prawn stocks in South Australia.

The plan also takes into account the findings of a major review of the research and management of the Gulf St Vincent prawn fishery (Morgan 1995). This review identified potential performance indicators, priorities for research and resources necessary to deliver prioritised research programs.

Further to the core research programs funded through licence fees, are discrete non-essential projects which nonetheless have demonstrable value in providing additional information to the prawn industry. For example, an issue of immense public concern of relevance to the Australian prawn industry is bycatch and measures to constrain the impact of prawn fishing on the marine environment. In the plan, projects such as the evaluation of bycatch reduction devices are promoted through the fisheries management committee for external funding (eg. FRDC).

Assessing stocks of prawns in the Gulf St Vincent prawn fishery: core research programs 1997–2002

1. Performance indicators

The research has been designed to deliver the following performance indicators annually:

- total effort
- spawning stock biomass
- abundance of pre-recruits

These performance indicators are described below:

total effort

This is a measure of effective effort which takes into account the relative densities of prawns in different spatial areas (statistical blocks of the fishery) and changes in unit efficiency (fishing power). The indicator provides a consistent measure of effort for each year.

spawning stock biomass

Catch rates are used to indicate of the relative biomass of prawns. Catch rate data will be derived from logbook data. Size composition data is also important in determining the spawning stock biomass. This information is derived from vessel-based measurement of the catch.

abundance of pre-recruits

An index of potential recruitment to the fishery. Expressed as the abundance of prawns of less than 36 millimetres carapace length retained in the catch during April/May and June of each year.

2. Sources of data

The following will be used as inputs to the derivation of performance indicators:

- catch and effort data;
- seasonal information on abundance and size composition of prawns taken from commercial vessels; and
- estimates of growth, movement, size at maturity, and length/weight relationship by fishing block derived from previous biological studies of prawns in South Australia

Other projects

Other projects of potential benefit to South Australia are summarised below:

Bycatch studies

A project to investigate methods to minimise the impact of prawn trawling on the marine environment.

- transfer of existing and proven technology to South Australia
- promotion of South Australian prawn fisheries as world leaders in reducing environmental impacts of prawn trawling.

start: 1997 **finish:** 1998 **funding**: FRDC

Ecological interactions

This is an important study to measure the effects of prawn trawling on the marine environment. In particular, the interaction between fisheries for prawns and crabs could be determined as part of food chain studies. Importantly, the results of appropriately focussed, objective studies could be promoted by the prawn industry to increase public awareness of the environmental programs of the prawn industry.

start: 1998/99 **finish:** 2001/2 **funding:** FRDC

Habitat studies

Claims by prawn fishers that prawn habitat has been lost by colonisation of Gulf St Vincent with an encrusting bryozoan will be investigated and potential solutions advanced.

start: 1998/99 **finish:** 2000/1 **funding:** FRDC or NHT

Post-harvest technology

This project will consider any potential technology to improve marketability of prawns.

start: 1999/20 **finish:** 2001/2 **funding:** FRDC

Gulf St Vincent prawn fishery – five year research plan

Research activity	**1997/98**	**1998/99**	**1999/20**	**2000/01**	**2001/02**
spawning stock biomass	December/Feb #	December/ Feb #	December/ Feb #	December/ Feb #	December/ Feb #
recruit index	April/May/June	April/May/June	April/May/June	April/May/June	April/May/June
bycatch evaluation	#				
produce stock assessment report	by July 30	by July 30	by July 30	by July 30	by July 30
analyse and publish information on growth	#				
analyse and publish information on fishing power and exploitation rates		#			
habitat relationships *			#		
ecological interactions *				#	
post-harvest technology *					#
# = final report; * = externally funded					

Appendix II

MEMBERSHIP OF THE MANAGEMENT COMMITTEE

Independent chairperson

Independent member (Government nominee)

3 members representing Gulf St Vincent licence holders

fishery manager (PIRSA) (non voting)

research scientist (currently SARDI) (non voting)

South Australian Fishing Industry Council (SAFIC) representative

South Australian Recreational Fishing Advisory Committee (SARFAC) representative

SOUTH AUSTRALIAN FISHERIES MANAGEMENT SERIES

Paper No.	Title	Issue Date
1	A draft management plan for the blue crab fishery in South Australia	August 1994
2	A discussion paper on the management options for the South Australian recreational rock lobster fishery	September 1994
3	South Australian Shellfish Quality Assurance Program Report no. 1	November 1994
4	A review of net fishing in South Australia	November 1994
5	A review of the management arrangements for the Southern Zone Rock Lobster fishery	September 1995
6	Options for the management of the White Shark in South Australia	May 1995
7	Cost recovery in South Australia's commercial fisheries	October 1995
8	The role of management committees, peak industry bodies and government in fisheries management decision making	October 1995
9	A review of the management and prioritisation of fisheries research	November 1995
10	A management proposal for the Northern Zone Rock Lobster Fishery's 1995/96 season and an assessment of the effort reduction package implemented during the 1994/95 season	October 1995
11	Management plan for the South Australian abalone fishery	February 1996
12	Assessment, management and research support for the Gulf St Vincent prawn fishery	November 1995
13	A management plan for the experimental Pilchard Fishery	November 1995
14	South Australian Shellfish Quality Assurance Program Report No .2	November 1995
15	A draft plan for the management of the specimen shell fishery in South Australia	March 1996
16	A discussion paper on issues relating to the development of rock lobster aquaculture and rock lobster holding systems at sea in South Australia	March 1996
17	A draft plan for structural adjustment in the South Australian River Fishery	April 1996
18	Economic analysis of management options for the Gulf St Vincent Prawn Fishery	April 1996
19	The roles and structure of fisheries management committees and the responsibilities of chairpersons and members	October 1996
20	Review of research and management of the Spencer Gulf prawn fishery	October 1996
21	South Australian Shellfish Quality Assurance program Report No. 3	November 1996
22	The cost recovery process for 1996/97	November 1996
23	A discussion paper on the management and development of recreational fishing in South Australia	May 1997
24	Development of at-sea rock lobster holding systems in South Australia	May 1997
25	South Australian recreational fishing survey 1997	May 1997
26	Fishcare South Australia - fish for the future	June 1997
27	Management plan for the South Australian abalone fishery	September 1997
28	Management plan for the South Australian northern zone rock lobster fishery	November 1997
29	Management plan for the South Australian southern zone rock lobster fishery	December 1997
30	Management plan for the South Australian Gulf St Vincent prawn fishery	December 1997