

**SOUTH AUSTRALIAN FISHERIES
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**MANAGEMENT PLAN
FOR THE
SPENCER GULF AND WEST COAST
PRAWN FISHERIES**

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**prepared by the
Spencer Gulf and West Coast Prawn Fishery Management Committee
in association with
Primary Industries and Resources South Australia**

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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 on behalf of the general community, is to ensure that marine resources are used in an ecologically sustainable manner while yielding a reasonable return to the community.

In carrying out their management of the resource, the Government has the responsibility of ensuring that the basis for the sharing of the resource among all users is clearly understood and accepted as equitable. The Government also has to ensure that the allocation of fisheries resources and their level of utilisation take into account the needs of present and future generations.

To assist the Government in managing our marine resources, fishery management committees have been established for each fishery. These committees advise the Minister for Primary Industries, Natural Resources and Regional Development on issues relating to management of that fishery. The 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*. Management committees provide a framework for ensuring arrangements are developed taking into account the need to ensure the sustainability of the stocks while providing for equitable allocations to the established user groups.

All management committees are required to develop a management plan to ensure that the committee and the Government are able to meet their obligations under Section 20 of the *Fisheries Act 1982*. In managing the Spencer Gulf prawn fishery the Government and the industry have been able to establish a solid understanding of the ecological interactions within the fishery. This understanding and partnership between industry and government will ensure that the benefits of long term research programs and a robust management framework are realised.

This fishery management plan has been developed by the Spencer Gulf & West Coast Prawn Fisheries Management Committee with input from all stakeholder groups. It reflects the coordinated approach taken in managing our fisheries resources that is essential for providing the best outcome for the resource and the community.

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

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2 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 principle objectives of the *Fisheries Act 1982* 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 Spencer Gulf and West Coast prawn fisheries are:

- to maintain the biomass within historical levels and eliminate risk of recruitment decline due to over-fishing;
- to ensure harvesting procedures are directed towards optimising size at capture;
- to maintain and enhance the profitability of the fishery by optimising prawn size, market timing, minimising the costs of fishing and the administrative costs of managing the fishery; and
- to minimise bycatch and trawl impact to the benthos through the development of more effective and 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 Spencer Gulf and West Coast prawn fisheries. It represents the commitment of Government, the industry, and the community to manage these fisheries through application of the recommendations of "*The National Strategy for Ecologically Sustainable Development*" developed by the Council of Australian Governments (December 1992).

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 February 1998 subject to annual review and amendments as considered necessary by the Spencer Gulf and West Coast Prawn Fisheries Management Committee and the Minister for Primary Industries, Natural Resources and Regional Development.

3 Description of the fishery

3.1 Definition of the fishery

Commercial fishery licence holders in the Spencer Gulf and West Coast prawn fisheries may engage in the taking of western king prawn (*Penaeus latisulcatus*). In addition, commercial licence holders are permitted to retain, for the purpose of trade or business, other species where those fish are taken incidentally in prawn trawling (ie as bycatch):

Spencer Gulf

Lobster, slipper (*Ibacus* spp), Squid (*Sepioteuthis australis*)

West Coast

Slipper lobster (*Ibacus* spp), Octopus (*Octopus* spp), Scallop (Family Pectinidae), Calamary squid (*Sepioteuthis australis*), Arrow squid (*Nototodarus gouldii*).

The Spencer Gulf fishery includes all those waters of Spencer Gulf that are north of the geodesic joining Cape Catastrophe, Eyre Peninsula and Cape Spencer, Yorke Peninsula .

The West Coast fishery includes those waters east of the meridian of longitude 131° east to the meridian of longitude 137° east, but excluding the waters of Spencer Gulf that are north of the geodesic joining Cape Catastrophe, Eyre Peninsula and Cape Spencer, Yorke Peninsula (figure 1).

The Gulf St Vincent Prawn Fishery is the subject of a separate management plan.

There are presently 39 commercial fishery licences issued for the Spencer Gulf fishery and 3 licences for the West Coast fishery. Due to regulations that prohibit the taking of western king prawns in waters less than ten metres, there is no recreational fishery for king prawns in South Australia.

Commercial fishing is undertaken using the demersal otter trawl technique. This essentially consists of towing a funnel-shaped net leading into a bag (most commonly referred to as a cod end) 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 otter boards hold the mouth of the net open to assist in herding the prawns into the net. A separate large mouthed bag (crab bag) acts to retain blue crabs, while prawns flow to the cod end. The crab bag reduces crab mortality, incidental damage to prawns and allows the crabs to be discarded alive to the sea.

Both single and double rigs are permitted to be used in the Spencer Gulf and West Coast fisheries with a minimum mesh size of 4.5 centimetres and a maximum

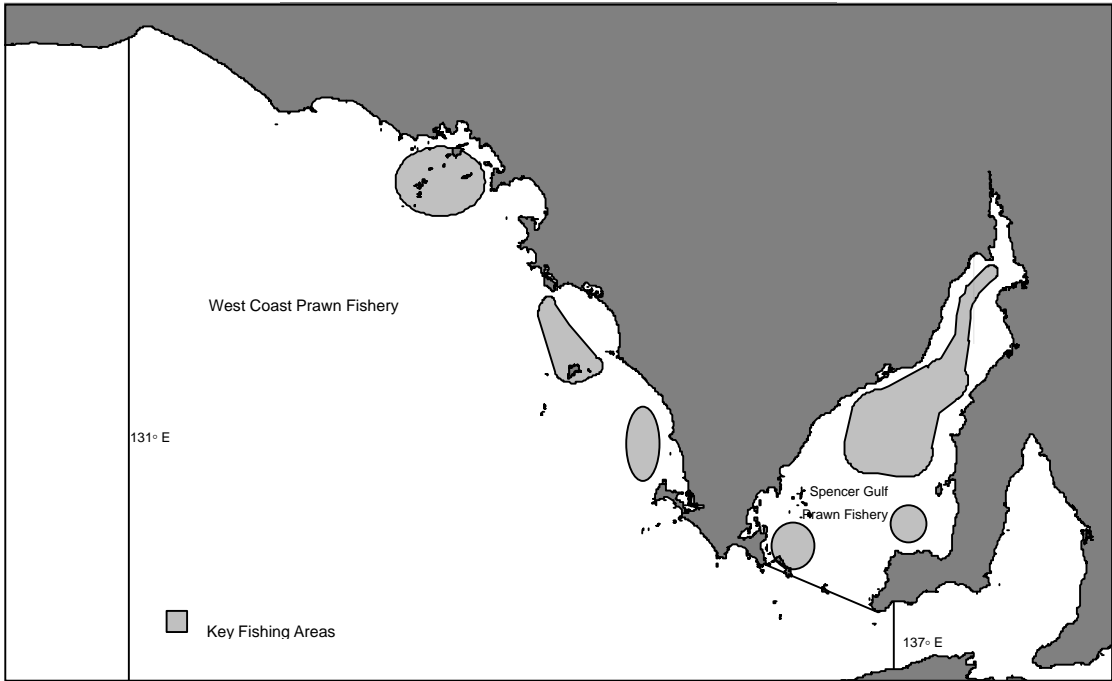
headline length of 29.26 metres (the headline length of any single prawn trawl net used in a double rig must not exceed 14.63 metres).

Trawling is undertaken during the night anytime between sunset and sunrise, depending on the season. Trawl shots are of short duration relative to other prawn fisheries and take on average 50 minutes in Spencer Gulf and of 60 - 90 minutes duration on the West Coast. After each shot the catch is emptied from the nets on to sorting trays. Separation racks are fitted to sorting tables to reduce the time for sorting prawns from the other catch and enable bycatch to be rapidly returned to the water with a minimum of handling.

After separation, prawns are graded either mechanically or by hand. The prawns are then either cooked or packed green to suit market demand before being snap frozen. Some catch is stored in large built-in refrigerated brine tanks for 1-2 days before delivery to on-shore processing facilities. At the end of each fishing trip, the catch is off-loaded at suitable ports adjacent to the fishing grounds and transported to fish processing factories. Major home ports for Spencer Gulf boats are Port Lincoln, Wallaroo, Port Adelaide, and Port Pirie. West Coast boats are based in Venus Bay, Streaky Bay and Ceduna.

Any boat used in the prawn fisheries must be registered and endorsed upon the licence under which it is being used. Boats in the Spencer Gulf and West Coast prawn fisheries must not have an overall length exceeding 22 metres and the main engine must not exceed 365 continuous brake horsepower.

Figure 1: Spencer Gulf & West Coast prawn fishery management zones



3.2 Biological Characteristics

Prawns are crustaceans with five pairs of swimming legs (pleopods) as well as five pairs of walking legs (pereopods) 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.

At about 12 months of age female prawns mature and spawn in the deeper waters of the Gulf (15-60 metres). Spawning occurs between November and March with peak activity occurring in two waves - late November/early December and late January/early February. Each female can release between 60,000 to 800,000 eggs, with proportionately more eggs released with increasing size. Maturity increases from 0 to 20 percent between 25 to 33 millimetres CL (carapace length), increasing further from 20 to 30 percent between 42 to 48 millimetres CL. Viable spawners are considered to be those prawns in the range 42 to 50 millimetres CL. Mating occurs between hard shell males and soft shell (recently moulted) females.

After fertilisation, larvae undergo morphological changes and develop from nauplii, to mysids and then to post-larval stages during 4-5 weeks of planktonic larval life. The success of larval dispersal to favourable nursery habitats is an important factor affecting reproductive success. During this period of dispersal high mortality occurs.

Post larvae grow rapidly and juvenile prawns remain in the nursery areas for between 5 to 10 months. They then move offshore into the deeper waters at a size of 20 to 28 millimetres CL as new recruits. The major nursery areas in the Gulf are found from Blanche Harbour to Cowell on the western side of the Gulf, and from Chinaman's Creek to Chinaman's Well on the eastern side of the Gulf. Important nursery areas on the west coast include Tourville Bay, Streaky Bay, Smoky Bay, Bairds Bay, Venus Bay and Coffin Bay.

The growth of prawns is seasonal with maximum growth occurring in autumn, even though spring and summer water temperatures are higher, and little growth takes place between July and December. Temperature alone does not control growth. Growth is also subject to a number of other factors such as spawning date, tidal amplitude and day length. The growth rate of females is faster than males, with there being substantial differences in sizes for fish from two to three years of age. Annual differences in growth rates also occur and this can significantly affect annual harvest. There are large annual differences in survival and density dependent mortality may be important in limiting population numbers.

There is a significant relationship between the number of large spawners and recruits, as well as, between annual recruit numbers and water temperature. In the West Coast fishery, this is complicated by the oceanic nature of the region which has seen it experience large declines in numbers of prawns. Carrick (1993) suggested that the large decline in the catch from the West Coast was attributable

to ENSO induced current changes which affected the distribution of spawners and the supply of recruits to the nurseries.

3.3 Ecological characteristics

Like all trawling methods used in the fishing industry, the demersal otter trawl technique used in Spencer Gulf and West Coast fisheries may cause some damage to the benthos. There are, however, some mitigating factors that tend to minimise adverse effects on the ecology of the regions fished. These include:

- 1) Prawn trawling only takes place on sandy or mud bottom where the water is relatively deep (greater than 10 metres). Accordingly, fishing does not take place in seagrass areas;
- 2) the prawn fishery is spatially focussed in a relatively small area of Spencer Gulf and fishing takes place on average only 75 days a year;
- 3) the fishery is based upon catches from a relatively small area of the gulf (<15%), with over 60% of the catch taken in two areas which cover less than 8% of the gulf.
- 4) legislation under which these fisheries operate specifically prohibits the taking of the majority of bycatch species. Some of the bycatch taken in the trawling process does not survive, but the majority of bycatch taken by these fisheries, being blue swimmer crabs, do survive and are returned immediately to the sea after each trawl shot;
- 5) as the duration of trawl shots are relatively short, compared to other prawn fisheries, trawl induced mortality of bycatch is relatively low;
- 6) fishers are sensitive to the question of bycatch and have supported bycatch studies which describe the type, variety and number of marine organisms that find their way into the trawl nets (Carrick 1997); and
- 7) the Spencer Gulf and West Coast Prawn Fisheries Management Committee (SG&WCPFMC) is supporting further research to assess prawn bycatch reduction devices which have been developed in other prawn fisheries.

Table 1: The number of hours fished (effort) in the Spencer Gulf and West Coast prawn fisheries between 1981 and 1996 (Morgan 1996).

Number of hours fished	Spencer Gulf	West Coast
1980/81	39,000	3,471
1985/86	37,000	3,605
1990/91	30,591	3,788

Habitat dependency

Western king prawns, like other prawns, exist at the bottom of the food chain. They are omnivorous at smaller sizes and carnivorous scavengers at larger sizes. A wide range of food material 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 Gulf 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 Spencer Gulf 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” with all fishing in the Gulf being suspended between July and October. Catchability shows little variation from March to early June.

Conditions also vary on the West Coast where winter fishing activity continues to be profitable in the more oceanic waters adjacent to Venus Bay, where bottom waters temperatures are generally higher than in autumn.

Influences on behaviour

Prawns are far less susceptible to capture during daylight hours. Optimum catches and quality of prawns coincide with the dark phases of the moon and fishing is usually 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 increases over the full - quarter moon phase in some months, which can result in reduced returns through lower prices.

3.4 Research, stock assessment and management surveys

The major research activity in the Spencer Gulf and West Coast prawn fisheries is conducted by way of periodic stock assessment surveys. For the year ended 30 June 1996, these surveys were carried out as follows: Spencer Gulf - 67 boat nights; West Coast - 9 boat nights. These pre-fishing trawl surveys have been an effective tool in ensuring optimisation of catch and CPUE (catch per unit effort), and the continuation of surveys is essential in ensuring the long term sustainability of the resource. The stock assessment surveys provide information on the status of the stocks, recruitment levels and the effects of fishing.

The surveys allow the management committee to:

- minimise the catch of small prawns;
- optimise the value and size of the catch for each fishing period;
- determine optimum levels of spatial effort for stock maintenance;
- increase the store of knowledge of the relationship between numbers of spawners and recruits and environmental factors;
- determine spatial changes in the distribution, abundance and size of prawns;
- monitor movement of juveniles and recruits to the fishing grounds; and
- determine strategies to maintain recruitment to the fishery.

Both the Spencer Gulf and West Coast prawn fisheries have been divided into discrete areas for the purpose of stratified sampling because of the differences in prawn size and abundance that has been identified over many years.

Sampling Procedures

Each boat engaged in the surveys conducts a series of trawl shots with specific instructions concerning the timing, location and number of nets to be used by each boat. All boats employ the use of GPS satellite control tracking equipment to ensure the accuracy of trawl shots.

The boat's master is required to ensure that a report is furnished showing, for each trawl shot, the following information:

- total weight of catch;
- size (as determined by measurement of the carapace on a representative sample); and
- any data on bycatch.

Survey boats are also required to ensure that the survey catch is processed in such a manner that the larger prawns can be sold to offset the cost of the surveys.

In Spencer Gulf, the five major trawl areas are:

Northern area (Whyalla to Wallaroo) - This area covers regions referred to as the Channel, the Basin, Lowly, Eastern Shoal, East Yarraville and the East side, but does not extend further north than Point Lowly.

Wallaroo - this is the largest trawl ground in the Gulf. The region is divided into 10 blocks with one random sample taken from each block to obtain an overall estimate of density and abundance.

Gutter - this region is a deep channel and the region is divided into nine blocks with three strata within each block and one random sample taken from each stratum.

Cowell and Western Gutter - Three zones are sampled with seven strata within each zone and two random trawl stations in each stratum. However, in February, the

sampling plan is increased to include more sites in the top region to gain a better estimate of the spawning population.

Corny Point and Thistle Island - this is a large ground which produces larger prawns between March and May.

The West Coast fishery is based upon three major trawl areas:

Nuyts Archipelago - an area of offshore islands including Denial Bay, Murat Bay and Smoky Bay with trawl grounds in waters of between 30 to 50 metres.

Anxious Bay - an area adjacent to Bairds Bay and Venus Bay nursery areas with trawl grounds in waters of between 50 to 60 metres.

Coffin Bay - an area adjacent to Coffin Bay and north of Point Sir Isaacs in waters deeper than 30 metres.

3.5 History of management

Western king prawns (*P. latisulcatus*) were first trawled from Spencer Gulf by “FIS Endeavour” in 1909. The first unsuccessful attempt at commercial prawn trawling in Spencer Gulf was not made until 1948 by a New South Wales danish seine boat. The South Australian Department of Fisheries and Fauna Conservation carried out exploratory trawling using the “Weeruta” on a number of occasions between 1957 and 1964 with no commercial success. Port Lincoln fishermen Gavin Scott with Roger and Clyde Haldane had limited success in 1961 on the “Mameena”.

The industry showed its true potential through the work of Port Lincoln fisherman Roger Howlett in 1967. He is considered the pioneer of the South Australian prawn fishery as he began an extensive resource survey of Spencer Gulf without financial assistance in July 1967. After two and a half months of surveying the southern area during daylight and dark he finally caught the first commercial quantity of prawns from the bend of the “Gutter” in October 1967. Mr Howlett was soon joined by other fishermen and an infant fishery was established. Soon after, commercial quantities were also found in Venus Bay on the West Coast.

In March 1968, the Government closed all South Australian waters to trawling and 40 permits for prawn fishing in a number of different management zones were offered, of those 25 were taken up. These early steps were critical in preventing over-exploitation of the resource and over-capitalisation within the fishery while providing for rational development of the fishery and quantification of the resource. These principles are still the cornerstone to the successful management of this important fishery resource. This vision prevented the gross over-capitalisation and over-exploitation that plagues many Australian and overseas fisheries today.

In the early days, it was the fishermen themselves who by agreement restricted their fishing times. Furthermore, unlike most other fisheries, the Spencer Gulf prawn fishery has a detailed database from commercial fisher's logbooks that have provided detailed catch and effort statistics since the fishery's inception in 1968. Since 1981 Spencer Gulf prawn fishers have enjoyed a unique lifestyle fishing on average 75 days per year with a consistent catch. The Spencer Gulf and West Coast Prawn Fishermen's Association with its strong membership and dedicated committee have played a major role in the management of both the fisheries, and in making them so successful.

Management

Licence limitation has been applied since the beginning of the fishery with numbers being gradually increased with caution. In 1969, *Prawn Resources Regulations* were introduced with vessels being licensed to fish for prawns. The fishery was divided into a series of geographical zones and licences issued to operate within such zones. Spencer Gulf was originally split into two zones, these being merged into one zone in 1971. The West Coast was separated into three zones (Zones A, B and C). In 1976, these management areas were redefined and all those fishers operating in the West Coast Zone C, which included the Anxious Bay and Coffin Bay grounds, were offered the opportunity to take up a place in Spencer Gulf (Zone D) only.

Catch Statistics

Licence holders are required to supply accurate daily logs detailing estimated catch, hours trawled, and areas fished. This has provided valuable data in establishing, not only the economic evaluation of the fishing effort, but also in managing exploitation of the fishery. A summary of commercial catches taken in the fishery is shown below in table 2.

Closures

In 1968 all waters of the State less than 10 metres deep were closed to trawling. In addition, since 1981 there has been a number of areas closed seasonally or during each fishing period. These are all aimed at protecting newly recruited and juvenile prawns or ensuring maintenance of adequate levels of egg production. The closures have also been used to improve the size of prawns caught in order to optimise the value of the catch and to protect areas of juvenile finfish, such as whiting.

There are several areas within the gulf that are of ongoing significance to the fishery that have been maintained as closed areas during all fishing periods since 1981. These areas include all of the waters north of Point Lowly in upper Spencer Gulf as well as the waters adjacent to Port Broughton. The closed areas are significant refuge areas for prawns prior to their becoming vulnerable to fishing pressure.

Table 2: A summary of prawn catches (tonnes) taken in the Spencer Gulf and West Coast prawn fisheries between 1968 and 1996/97 [Production figures available by calendar year up to 1984. From 1984/85 production figures available by financial year].

Year	Spencer Gulf	West Coast	Total
1968	383.7	7.6	391.3
1969	557.3	99.2	656.5
1970	815.5	237.4	1052.9
1971	936.5	237.5	1174.0
1972	1076.3	214.1	1290.4
1973	1485.3	289.9	1775.2
1974	2521.1	175.0	2691.1
1975	1736.1	156.5	1892.6
1976	2130.1	51.0	2181.1
1977	2040.7	22.8	2063.5
1978	1734.6	16.4	1751.0
1979	1924.9	32.5	1957.4
1980	2255.0	93.1	2348.1
1981	2186.1	112.8	2298.9
1982	2380.2	151.3	2531.5
1983	2353.3	215.0	2568.3
1984	1663.7	160.9	1824.6
1984/85	1657	109	1766
1985/86	1543	104	1647
1986/87	1048	124	1172
1987/88	1532	119	1653
1988/89	1629	107	1736
1989/90	1670	130	1800
1990/91	1768	184	1952
1991/92	2072	83	2155
1992/93	1645	0	1645
1993/94	1681	12	1693
1994/95	1807	104	1911
1995/96	1812	201	2013
1996/97	1640	167	1807

3.6 Fishery management committee

The role of the Spencer Gulf and West Coast Prawn Fisheries Management Committee is to provide advice to the Minister for Primary Industries, Natural Resources and Regional Development on the management of these fisheries. Membership and responsibilities of the management committee has been determined under the *Fisheries (Management Committees) Regulations 1995*. Corporate objectives and goals of the management committee are described in the committee's five year strategic and business plan, which is a separate document to this fishery management plan.

These objectives are achieved through the use of a "real time" management approach. This approach ensures the strategies can be adjusted to suit the fishery's needs within short time frames. To achieve this the management committee has established a "Committee at sea". This sub-committee monitors the effectiveness of harvesting arrangements during fishing and provides recommendations on

adjustments to the harvesting strategy including redirecting fishing into other areas, the opening and closing of fishing grounds and the monitoring of boats in complying with the established fishing strategies.

Membership of the management committee is shown in Appendix II.

4. Compliance and enforcement

The annual compliance activities in the Spencer Gulf and West Coast prawn fisheries involve monitoring the landing of catches from surveys, 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 line closures are used across the fishery. On behalf of the management committee and in the spirit of self-regulation, a “Committee at sea” is responsible for the implementation and monitoring of closures lines. Infringements are reported to the management committee and PISA (Fisheries Compliance Unit). If non-compliance with the closure lines becomes difficult for the “Committee at sea”, additional compliance options for use in the fishery include a vessel monitoring system (VMS), a fisheries patrol vessel or aerial surveillance.

5 Management objectives and strategies

The priority for managing the Spencer Gulf and West Coast prawn fisheries 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 Spencer Gulf and West Coast Prawn Fisheries Management Committee to complement the broad directives of section 20 of the *Fisheries Act 1982*.

The following objectives and strategies assist in meeting the principal management objectives for these fisheries:

5.1 Biological objectives

1. To maintain spawning stock biomass above 50% of the virgin biomass.

2. To prevent growth overfishing and minimise the capture of small prawns.

Strategies

- adopt a ‘precautionary approach’¹ to the management of both fisheries;

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.

- collect catch and effort data, on a shot by shot basis, supported by fishery independent surveys to provide the essential biological data necessary to monitor the fishery's performance against the reference points and performance indicators;
- maintain an exploitation rate in the Spencer Gulf prawn fishery and in the West Coast prawn fishery that ensures sustainable fisheries that are adaptable in order to maintain the efficiency of the fishery;
- receive an annual stock assessment report upon which to determine appropriate harvesting levels for following years;
- ensure monitoring of the level of effort applied in each fishery;
- review annually all biological research programs to ensure they are effective in meeting the needs of each fishery and the management committee;
- provide for ongoing improvements in harvesting practices and strategies that ensure the biological sustainability of the stocks and conserve the integrity of the ecosystems of the Spencer Gulf and West Coast.

5.2 Economic objectives

- 1. To maintain prawn stocks at a level that provides an optimum return on investment by licence holders;***
- 2. To provide for economic efficiency and flexibility in management and compliance arrangements by developing harvest strategies that minimise costs;***
- 3. To recover attributed costs of management, research and compliance for the fishery based on best practice and efficient management.***

Strategies

- provide for flexible harvesting strategies to achieve maximum returns from the market for each fishery's production;
- undertake regular assessments of the economic performance of harvesting strategies and identify opportunities for improved returns on investments;

- to participate in meaningful discussions and negotiations aimed at setting licence fees at a level sufficient to recover attributed management, research and compliance costs;
- promote world best practice in the harvesting, processing and management of the resource.
- Comply with the Government Management Framework (GMF) principles for the period to July 2002.

5.3 Environmental objectives

- 1. To ensure that the activity of prawn trawling is carried out in such a manner as to minimise the environmental impact within the region of each fishery;***
- 2. To research options for minimising the incidence of bycatch in order to maintain the biodiversity of the marine environment; and***
- 3. To maintain close vigilance on the marine environment of Spencer Gulf and the West Coast to prevent the fisheries being threatened by pollutants or other harmful activities of other users of the marine environment.***

Strategies

- maintain an ongoing assessment of bycatch levels to conserve the marine ecology of the fishing grounds;
- develop harvesting techniques and gear technology to assist in minimising impacts on the benthos within the area of each fishery;
- promote and maintain practices which minimise the impacts of prawn trawling on other commercial and recreational fisheries;
- maintain a close dialogue with other users of Spencer Gulf and West Coast waters, particularly the industrial business sector; and
- promote the conservation of seagrass and prawn nursery habitat areas.

5.4 Social Objectives

- 1. To provide the community with a safe source of naturally produced seafood;**
- 2. To provide an amenable lifestyle for those engaged in the industry;**
- 3. To minimise conflict between other users of the marine environment through the development of transparent and clearly defined policies;**
- 4. To ensure good relationships between the Government, the industry and the community are maintained; and**
- 5. To be known as a responsible corporate citizen.**

Strategies

- to inform and educate the community about the responsible management of the prawn resources in Spencer Gulf and the West Coast;
- establish and maintain regular contact with other fishery management committees and other interest groups;
- develop information articles on the prawn fisheries for the public and provide an annual report to the Minister for Primary Industries, Natural Resources and Regional Development on the operations and economic status of the fishery.

6 Reference points and performance indicators

Reference points are agreed quantitative measures used to assess performance of the 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.

As part of a major review of the fishery in 1996, biological reference points were recommended as part of this review (Morgan 1996). The following target and limit reference points are based upon the assessments in the review.

6.1 Biological reference points

6.1.1 Sustainability

(a) Maintain exploitation rates at present levels of effort.

(i) Spencer Gulf fishery

Effort is measured through assessment of the number of nights fished within the fishery. The target reference point for effective effort is between 70 to 80 fishing nights at the current level of efficiency. Effective effort is also assessed using relative changes in efficiency of the fleet.

The limit reference point for effort is set at 85 fishing nights. The limit reference point should not be exceeded.

(ii) West Coast fishery

Effort is measured through assessment of the number of nights fished within the fishery. The target reference point for effective effort is between 100 to 110 fishing nights at the current level of efficiency. Effective effort is also assessed using relative changes in efficiency of the fleet.

The limit reference point for effort is set at 120 fishing nights. The limit reference point should not be exceeded.

(b) Maintain at least 50 percent of the virgin spawning biomass.

The spawning biomass level is indicated by the number of female prawns greater than 33 millimetres carapace length observed in the commercial catch during November and December.

While effort is contained within established limits, current stock assessment advice indicates that at least 50 percent of the virgin spawning biomass will be protected. This target reference point will be assessed through the annual stock assessment research program.

The limit reference point for protecting the resource should impose limits on levels of exploitation where the spawning biomass may be reduced to 40 percent of the virgin spawning biomass.

(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 will be based upon assessment of recruits on the fishing grounds over the period from February to April each year. The recruitment level is determined from the number of prawns less than 30 millimetres carapace length. This information

will be collected from both pre-fishing surveys and from information collected by fishers during commercial fishing activities. The recruitment index is a relationship between the number of prawns less than 30 millimetres carapace length taken from a standardised trawl shot.

The target reference point will be to maintain a recruitment index of 40. The limit reference point for the recruitment index is set at 35.

6.1.2 Economics

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

Considering the stated economic objectives for the fishery, the following reference points are used to assess the economic status of the Spencer Gulf and West Coast prawn fisheries:

- size of prawns landed

- price per kilogram

The size of prawns taken during fishing is monitored nightly to ensure that effort is being targeted at fish which provide the best return based upon market demand while meeting the sustainability objectives.

The target size to achieve optimum economic performance is subject to variation and is dependent on a range of factors including - market demand, the exchange rate of the Australian dollar.

The limit reference point is 40 or more prawns per kilogram. At a size in excess of this point, there is significant potential to impact on the spawning biomass through overfishing of recruits to the fishery.

Management action on reaching a limit reference point

1. notify the Minister for Primary Industries, Natural Resources and Regional Development and participants in the fishery as appropriate,
2. implement alternative management strategy as defined in decision rules or as developed by the management committee,
3. undertake an examination of the causes and implications of 'triggering' a limit reference point,
4. provide a report to the Minister and industry, within three months of the initial notification, on the outcomes of a review of the effect of triggering a limit reference point.

Table 3: Summary of biological and economic reference points for use in the Spencer Gulf prawn fishery.

Reference Point	Target	Limit
Effort (days)	70 - 80	85
Spawning biomass (% virgin biomass)	50%	40%
Recruitment index	40	35
Prawns per kilogram	< 40 prawns per kilogram	40 or more prawns per kilogram

Table 4: Summary of biological and economic reference points for use in the West Coast prawn fishery.

Reference Point	Target	Limit
Effort (days)	100 - 110	120
Spawning biomass (% virgin biomass)	50%	40%
Recruitment index	40	35
Prawns per kilogram	< 40 prawns per kilogram	40 or more prawns per kilogram

6.2 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 Spencer Gulf and West Coast 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, the quality of information supplied to the Minister and the feedback from the “Committee at Sea”. Further information on the strategic direction of the management committee and key performance measures can be found in the Spencer Gulf and West Coast Prawn Fishery Management Committee Strategic and Business Plan.

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.

6.3 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.

An outline of the compliance program is as follows:

OBJECTIVE	STRATEGY	INDICATOR
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Compliance with survey plans	1. Point of landing inspections 2. Periodic on-board monitoring of surveys by observers.	1. Number of boats checked on landing for each period. 2. Frequency of reported non-compliance.
Compliance with gear configuration	Random inspection of trawl gear.	1. Frequency of non-compliance with trawl gear. 2. Random inspections conducted.
Compliance with bycatch restrictions	Random inspection of boats on landing (at sea on suspicion)	1. Frequency of non-compliance. 2. Random inspections conducted.
Compliance of boats regarding closure lines	Support for "Committee at sea" and reporting to Fishwatch 1800 number of breaches.	1. Frequency of non-compliance.
Compliance of boats regarding fishing periods	Support for "Committee at sea" and reporting to Fishwatch 1800 number of breaches.	1. Frequency of non-compliance.

The following performance indicators are used to assess the effectiveness and efficiency of the fishery compliance operations for the Spencer Gulf and West Coast prawn fisheries:

- reduction in illegal activity as determined by the number of reports for offences, specifically infringements concerning closure lines and reported landing of bycatch,
- cost effectiveness of compliance programs, and
- increased support by all licence holders and masters for the "Committee at sea".

A primary goal of the management committee is to continue to move towards self-regulation in the prawn fisheries.

7 Review of the management plan

The Spencer Gulf and West Coast Prawn Fisheries 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 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 living document that 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 *advises* the Minister for Primary Industries, Natural Resources and Regional Development during the life of this plan that significant management changes are necessary to conserve the prawn resources.

Six months before the end of the five year period (1 July 1998 to 30 June 2003) this management plan will undergo a major review.

8 References

Carrick, N (1996) Key factors which affect prawn recruitment and implications to harvesting prawn stocks. *Final report to **FRDC 91/3***.

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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*

Morgan, G (1996) Review of research and management of the Spencer Gulf prawn fishery. *South Australian Fish. Man. Series **20***.

Wallner, B (1985) An assessment of the South Australian West Coast western king prawn (*Penaeus latisulcatus*) fishery. *Department of Fisheries, South Australia*.

Appendix I

FIVE YEAR STRATEGIC RESEARCH PLAN FOR THE SOUTH AUSTRALIAN SPENCER GULF AND WEST COAST PRAWN FISHERY

Principles

- linked to explicit quantifiable management objectives
- provide measurable and defensible 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 Spencer Gulf and West Coast prawn fisheries 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 Spencer Gulf prawn fishery (Morgan 1996). This review identified potential performance indicators, priorities for research and resources necessary to deliver research programs.

Further to the core research programs, funded through licence fee contributions, 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.

Assessing stocks of prawns in Spencer Gulf and West Coast fisheries: core research programs 1997–2002

1. Performance indicators

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

- effort (nights/hours fished)
- spawning stock biomass
- abundance of pre-recruits

These performance indicators are described below:

effort (nights/hours fished)

This is a measure which indicates the relative level of fishing required to achieve the optimal harvest level. The indicator provides a consistent measure of effort for each year.

spawning stock biomass

Catch rates are good indicators of the relative biomass of prawns. Catch rate data on the numbers of female prawns will be derived from catch sampling aboard commercial vessels.

abundance of pre-recruits

An index of potential recruitment to the fishery. Expressed in two ways:

- the relative abundance of juvenile prawns sampled at selected sites
- the abundance of prawns of less than 30 millimetres carapace length retained in the catch during February to April 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 engaged on surveys of prawn grounds
- estimates of growth, movement, size at maturity, and length/weight relationship by MFA derived from previous biological studies of prawns in South Australia
- seasonal information on abundance and size composition of juvenile prawns at selected sites

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.

- development of technology and its transfer to industry
- promotion of South Australian prawn fisheries as world leaders in reducing environmental impacts of prawn trawling
- collaboration between the industry, fisheries management committee and the United States National Marine Fisheries Service

start: 1997 **finish:** 1998 **funding:** Industry

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 to increase public awareness of the environmental programs of the prawn industry.

start: 1998/99

finish: 2001/2

funding: FRDC

Post-harvest technology

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

start: 1999/20

finish: 2001/2

funding: possible FRDC

Spencer Gulf & West Coast prawn fisheries – five year plan

Research activity	1997/98	1998/99	1999/20	2000/01	2001/02
Spawning stock survey	November #	November #	November #	November #	November #
Recruit survey	February/April	February/April	February/April	February/April	February/April
Juvenile survey/nursery ground assessment	#			#	
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 stock/recruitment relationship	#				
Analyse and publish information on prawn insemination rates	#				
Analyse and publish information on growth		#			
Develop spatial model of the prawn fishery			#		
Habitat relationships*			#		
Ecological interactions*				#	
Post-harvest technology*					#
# = final report; * = externally funded					

Appendix II

MEMBERSHIP OF THE MANAGEMENT COMMITTEE

Independent chairperson

8 members representing Spencer Gulf licence holders

1 member representing Spencer Gulf skippers

1 member representing West Coast licence holders

1 fish processor representative

fishery manager (PIRSA) - non voting

research scientist (SARDI) - non voting

SAFIC representative

SARFAC representative