

**Fishing effort**

Not assessed. However, while no specific measures of effort are available, it can be assumed the increase in valid licences issued (up 15% from the 1997/98 season) reflects at least the expectation by anglers that more people would consider freshwater angling during the year.

**Catch rate**

Not assessed.

**Stock Assessment**

Rainbow and brown trout are produced in the Pemberton hatchery and stocked into public waters as breeding in south-west dams and rivers by trout is negligible. A total of 255,000 rainbow trout fry and 50,000 brown trout fry from the hatchery were stocked into public waters during 1998. In addition, 81,000 rainbow trout fry were sold to private dam owners for tourist fishing and private club fishing. Older fish were also produced and sold from the Pemberton hatchery in 1998. Approximately 10,000 rainbow trout yearlings and 3,000 brown trout yearlings were sold during the year, while a quantity of rainbow trout broodstock entering their second and third years of life (770 and 790 fish respectively) were sold from the hatchery or stocked for the recreational fishery.

**Breeding Stock Levels**

To maintain the trout stock for recreational fishing, hatchery releases are required in most waters as there is very little natural breeding due to high summer temperatures and limited suitable spawning areas. Native cobbler are self-sustaining. Introduced red-fin perch breed and grow rapidly but tend to over-populate waterways and stunt within a few years. Stocks of red-fin appear to be spreading due to deliberate unsanctioned releases in waterways that were previously free of the species. The apparent increase in the range of red-fin may impinge on the breeding success of native species including marron and could reduce the survival of trout fry.

**Catch Projection for Year 1998/99**

Not available.

**General Comments**

The stocking of trout in public waters throughout the south-west supports a significant and growing recreational sport fishery which adds substantially to the region's tourism value. Similarly, private stocking of privately owned dams in the south-west supports a specialist tourist sector by providing quality pay-fishing opportunities. The installation of eight cooling towers at the Pemberton hatchery has recently been completed and will ensure the availability of fry in the

future by reducing the mortality of broodstock due to high water temperatures during summer.

Stocking programs may also be influenced in the future by a translocation evaluation of the environmental impact of trout stocking, initiated in 1997/98. This translocation review document, now being finalised, concludes that trout are much less of a threat to remaining populations of south-west native fish than red-fin perch. Stocking success with trout is also thought to be affected by the distribution and spread of red-fin perch as these fish prey directly on young trout. Trials are also planned to determine whether the stocking of yearling trout is a more cost-effective measure than stocking fry owing to the reduction in predation by red-fin. In addition, carp are being occasionally reported from the fishery, probably through escapes of ornamental fish. Carp could pose another threat to the quality of freshwater angling and fish habitats in the south-west.

A survey and logbook has been designed to access the scope, size and success of recreational freshwater fishing in the south-west. The implementation of the survey will depend on funding availability. Further information will also be compiled from fishing club logbooks and direct monitoring techniques.

## Inner Shark Bay Recreational Fishery

**MANAGEMENT OVERVIEW**

The stocks of pink snapper in the eastern and western gulfs of Shark Bay are genetically separate from each other and from the wide-ranging ocean stock. The stocks do not interbreed or 'top up' one another through migration. This makes them especially vulnerable to over-fishing.

Ongoing research has shown that the pink snapper stocks had been severely depleted in the eastern gulf and all available information indicated a very high risk of stock collapse. Following extensive public consultation, the following management objectives for pink snapper were agreed with stakeholders for the eastern gulf:

- to stabilise the fishery at current levels;
- to rebuild the breeding stock of pink snapper to 100 tonnes.

New management arrangements were introduced in the eastern gulf in June 1998 in response to serious concerns over the depletion of pink snapper stock. These included:

- a three-year ban on the take of pink snapper;
- a mixed bag and landing limit of five fish implemented to protect other species (black snapper, cod, groper) from a possible transfer of effort and subsequent over-fishing.

The snapper research to support stock management is being conducted in both the eastern and western gulfs of Shark Bay and incorporates juvenile trapping surveys, planktonic egg surveys, tagging programs, and sampling of recreational catches.

## COMPLIANCE AND COMMUNITY EDUCATION OVERVIEW

In June 1998, new recreational fishing management arrangements were introduced in the eastern gulf waters of Shark Bay in response to concerns over the sustainability of pink snapper stocks.

Staff from the Carnarvon and Denham Fisheries WA offices have modified their compliance and community education activities accordingly, with the focus moving to beachfront community education clinics and catch care awareness. Careful handling of fish to be released and the use of barbless hooks were also promoted.

An additional fisheries patrol team was relocated to the region over the peak tourist season to assist with the pink snapper compliance and education objectives.

Land patrols by officers were complemented by at-sea patrols using the new patrol vessel *John Brockman* in the inner gulfs of Shark Bay.

## RESEARCH OVERVIEW

Research to support the management of Shark Bay pink snapper (*Pagrus auratus*) stocks was undertaken during the 1980s and included a survey of recreational catches in 1983. This research identified genetically separate stocks in each of the Shark Bay gulfs, which were different fish from those in the oceanic areas. Concerns about increasing recreational fishing pressure on the inner gulf stocks during the early 1990s, and the outcome of a research survey for juvenile snapper in November 1996, resulted in the development of a detailed research project beginning in June 1997. The specific purpose of this research is to provide scientific assessments of the status of the inner bay snapper stocks for management of this key target species in the important recreational fishery within Shark Bay. A further research project to provide information on the basic biology of black snapper (*Lethrinus laticaudis*), the second most commonly taken target species in the inner bay area, is due to commence in July 1999 and will be reported in the future.

The scientific information from these research projects has been used to compile this status report.

## Fishery Status Report

### Main Features

#### Stock assessment complete:

*Preliminary assessment of pink snapper breeding stocks in two gulfs*

#### Exploitation status:

*Pink snapper:*

<i>Eastern gulf</i>	<i>Over-exploited</i>
<i>Freycinet Estuary</i>	<i>Fully exploited</i>
<i>Denham Sound</i>	<i>Over-exploited</i>

#### Breeding stock levels:

*Pink snapper:*

<i>Eastern gulf</i>	<i>Inadequate but increasing</i>
<i>Freycinet Estuary</i>	<i>Adequate</i>
<i>Denham Sound</i>	<i>Inadequate (locally depleted)</i>

#### Catch current season (1998):

*Pink snapper, recreational (estimated):*

<i>Eastern gulf</i>	<i>Approximately 3 tonnes</i> <i>(prior to closure)</i>
<i>Western gulf</i>	<i>Approximately 38 tonnes</i>

*Pink snapper, commercial (estimated):*

<i>Eastern gulf</i>	<i>Less than 1 tonne</i> <i>(prior to closure)</i>
<i>Western gulf</i>	<i>Approximately 1 tonne</i>

#### Participation rate for year 1998:

*34,000 fisher days (estimated) for all recreational fishing in Shark Bay*

### Boundaries and Access

The Shark Bay recreational pink snapper fishery falls within the Gascoyne region recreational sector, which comprises the coastline extending northwards from latitude 27° S to the point where longitude 114°50' E intersects the coast (just south-west of Onslow).

The Shark Bay areas covered by this report comprise the sheltered inner gulf waters east of the Peron Peninsula and south of Cape Peron (the eastern gulf); west of the Peron Peninsula and south of Cape Bellefin (the Freycinet Estuary); and west of the Peron Peninsula between Cape Bellefin and Cape Inscription (Denham Sound). These latter two areas, where combined, are referred to as the western gulf (Shark Bay Recreational Figure 1).

Special bag and size limits apply to recreational fishing in these areas. In addition, a full closure to fishing for pink snapper in the eastern gulf was applied for three years from June 1998.

### Annual Production

#### Main fishing method

Recreational Rod and line.  
Commercial Handline, beach seine, haul net.

### Landings

Prior to the Gascoyne Recreational Fishing Survey (GRFS), conducted between April 1998 and March 1999, recreational catch data was lacking for both gulfs. There is some anecdotal evidence that recreational catches were low in the early 1980s, rising sharply until 1995 (particularly in the eastern gulf), but declined in 1996. For 1998, the GRFS provides estimated catch figures for pink snapper of approximately 3 tonnes for the eastern gulf for the period April to June (prior to the closure of the fishery in that area), and approximately 38 tonnes for the western gulf (Denham Sound approximately 12 tonnes, Freycinet Estuary approximately 26 tonnes).

Commercial catches of pink snapper by the nine licensed fishing units of the Shark Bay Beach Seine and Mesh Net Managed Fishery, while relatively small, indicated an upward trend in both gulfs up to last year. For 1998, however, the catches were considerably less than 1 tonne for the eastern gulf (prior to the closure in June 1998), and approximately 1 tonne for the western gulf.

### Participation level 1998

The full-scale recreational creel survey for the Gascoyne region as a whole (the GRFS), undertaken during the period April 1998 to March 1999, will be reported fully in future years. For the specific area within Shark Bay where pink snapper is the principal target species, the preliminary results from the 1998/99 survey indicate that there were approximately 34,000 fisher days expended, of which approximately 80% targeted the western gulf and oceanic stocks. Although the eastern gulf was totally closed to the take of pink snapper from June 1998, the effort in this sector was estimated to be 20% of the total effort expended in the inner bay.

### Stock Assessment

In the absence of a long time-series of data for catches and recreational effort applied to inner bay snapper stocks, the assessment method adopted has been to directly assess the status of the breeding biomass and recruitment for each stock within the fishery. The 'daily egg production method' (DEPM) involves plankton net surveys to count newly released eggs and larvae, and this information, taken in conjunction with the spawning condition of adult females, has been used to back-calculate the total biomass of spawning adults. In addition, research trawl and trap surveys are being conducted to provide information on the abundance of 0+ age juvenile snapper in both gulfs.

Using the above data, the spawning biomass in 1997 and 1998 has been estimated as follows:

### 1997 (estimated):

Eastern gulf	approximately 4 tonnes
Freycinet Estuary	approximately 97 tonnes
	(no estimate for Denham Sound)

### 1998 (estimated):

Eastern gulf	approximately 14 tonnes
Western gulf	approximately 93 tonnes
	(including both Freycinet Estuary and Denham Sound)

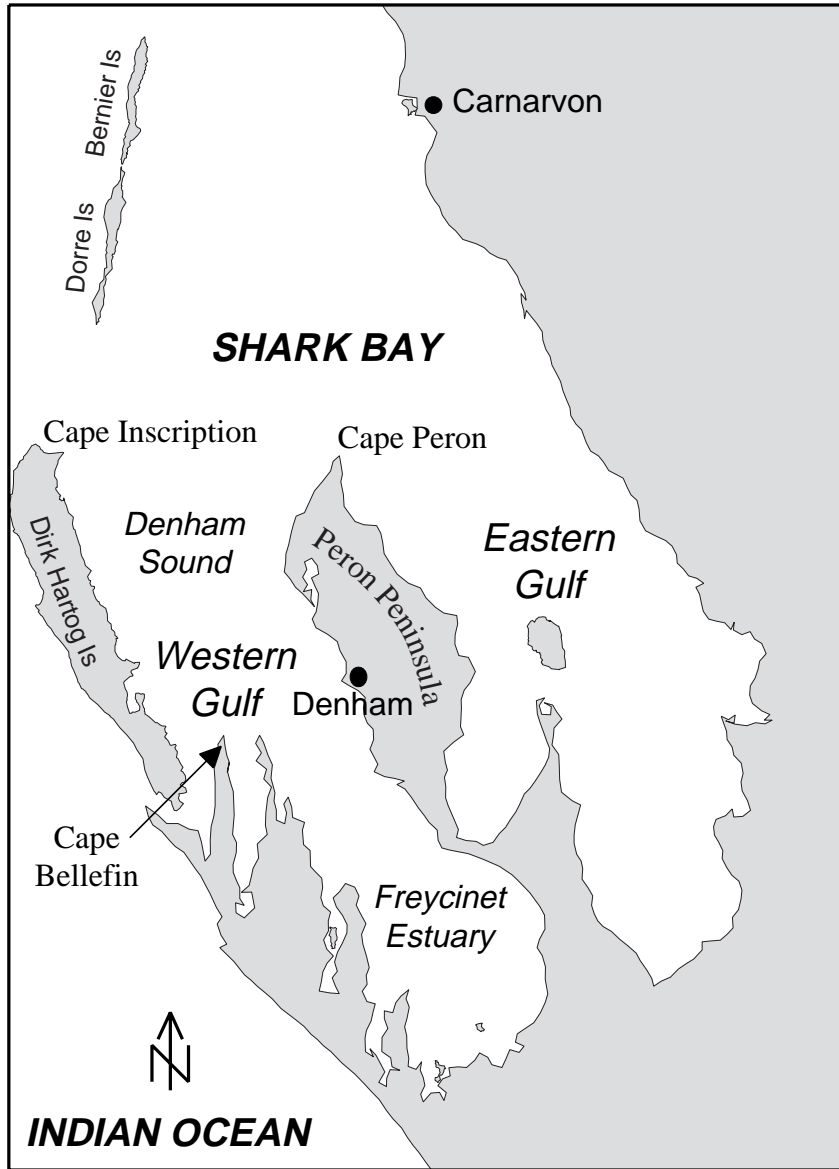
Recruitment surveys indicate that, in the eastern gulf, 0+ juveniles were more abundant in 1998 than in the previous two years, while in the western gulf, lower numbers of juveniles were encountered. These data, however, need to be treated with caution owing to the limited sampling on which they were based and the inherent difficulties in estimating schooling fish abundance.

The overall assessment is that the eastern gulf pink snapper stock remains over-exploited, based on spawning biomass estimates, and information on 0+ juvenile abundance from trawl and trapping surveys. The western gulf snapper stock is fully exploited, based on spawning biomass estimates, information on 0+ juveniles from trawl and trapping surveys, and estimates of annual recreational catch from the GRFS.

### General Comments

In addition to the surveys on juvenile and adult abundance, the research on inner Shark Bay snapper includes segments which aim to increase understanding of the relationships among the various snapper populations in the region (genetics and tagging), and to obtain biological data on parameters such as growth rates and size at maturity for use in modelling population biology and assessing future fishery management options.

The management of the depleted eastern gulf stock through a total closure appears, on preliminary data, to be appropriate for rebuilding that stock. Additional management measures such as an increase in minimum size to 50 cm and a reduction of the bag limit to two/day would bring the Freycinet Estuary population back to a sustainable exploitation level and start the rebuilding of the Denham Sound population. The early indications of rebuilding the eastern gulf stock under the total fishing closure are encouraging.



**Shark Bay Recreational Figure 1** Shark Bay, showing the recreational fishing areas of the inner gulfs.