

Commercial Fisheries

General Overview

The Commercial Fisheries Program is responsible for the management of commercial fisheries throughout Western Australia. This work is undertaken by a team of Commercial Program Officers located in Fisheries WA head office in Perth as well as Regional Policy Officers in Albany, Fremantle, Geraldton, Carnarvon and Broome. Management of the major fishing activities is achieved through formal management plans declared under the *Fish Resources Management Act 1994*, while other forms of fishing activity are managed through a combination of controls derived from the *Fish Resources Management Regulations 1995*, orders under the Act and conditions attached to fishing boat and commercial fishing licences.

The major commercial fisheries rely on relatively high-value, low-volume products for their viability. Tight management controls ensure that each fishery is sustainable. These management controls may be input controls, such as limitations on the number of licences, gear restrictions, seasonal closures and limits on fishing time (effort quotas), or output controls (catch quotas) which directly limit the quantity of fish that can be landed. There are often also permanent closed areas or other measures, under both effort and catch quota regimes, to protect juvenile or breeding fish or to protect important habitats.

Key factors in the successful management of fisheries are the rational implementation of advice on management issues and industry support for sustainable fishery management practices. Consultation with industry is a key factor in achieving management approaches which have strong support, and this is achieved through a variety of forums. In the major managed fisheries, management advisory committees (MACs) provide key advice to the Minister for Fisheries, while in the smaller fisheries, Fisheries WA Commercial Program and Regional Policy Officers meet directly with industry. Consultation also takes place through the production of discussion papers on proposed fisheries management arrangements. MACs currently provide advice on the West Coast Rock Lobster, Shark Bay Prawn, Shark Bay Scallop, Exmouth Gulf Prawn, Abalone, Purse Seine, Demersal Gillnet and Longline and Northern Demersal Scalefish Managed Fisheries.

The five major commercial fisheries (West Coast Rock Lobster, Abalone, Exmouth Gulf Prawn, Shark Bay Prawn and Shark Bay Scallop) operate in a fully cost-recovered management environment, which requires that licensees in these fisheries pay fees to cover the total cost of management. Cost recovery has been phased in over a number of years, with the level of cost recovery operating at 100% of cash costs plus capital accruals in 2000/2001.

The remaining fisheries paid a contribution towards their management costs of 1.85% of their gross value of production (GVP). All fisheries also contribute to the Development and Better Interest Fund at a rate of 0.65% of their GVP.

A key development during 2000/2001 has been the formalisation by the Commonwealth Government of the requirement for Australian fisheries to have ecological sustainability certification in order to continue their export approval under Schedule 4 of the *Wildlife Protection (Regulation of Exports and Imports) Act 1982* beyond December 2003. This requirement will necessitate export fisheries developing documentation on their ecological status for review by Environment Australia and approval by the Commonwealth Minister for the Environment. Work on developing this documentation commenced during 2000/2001, and the five major cost-recovery fisheries (which are all important export fisheries) and a number of smaller export fisheries will finalise their documentation during 2001/02.

The *State of the Fisheries Report* for 2001 also contains, for the first time, a comprehensive report on the catch of Western Australia's 'wetline' fisheries. The holders of a fishing boat licence (FBL) in conjunction with a commercial fishing licence, irrespective of whether or not they have access to a managed fishery, are entitled to engage in a number of forms of fishing that are not otherwise prohibited. This is known as 'restricted access' or 'wetline' fishing (Crowe et al. 1999). Usual methods include handlining, droplining, trolling and hand-hauled netting, while less commonly used methods include drop netting, squid jigging, lift netting and diving. From 1984 onwards, those wishing to enter the commercial fishing industry could only do so by purchasing an existing FBL. Since 1984, the combined impact of this permanent 'cap' on the total number of registered fishing boats in Western Australia, together with a number of other management changes, has resulted in a reduction in the number of fishing boats without access to managed fish stocks. Although the catches of some sectors of the wetline fishery have been reported in previous years, this is the first year when the wetline catch is specifically reported for each bioregion. Defining and reporting on this component of the catch of the State's fisheries is an important step in the development and operation of the Integrated Fisheries Management strategy.

During 1999/2000, a total reported catch of 2068 tonnes of mostly finfish was attributed to wetline fishing, comprising 1176 tonnes (56%) from the west coast bioregion, 499 tonnes (24%) from the north coast, 306 tonnes (14%) from the Gascoyne and 136 tonnes (6%) from the south coast.

Key Achievements

During 2000/2001, the Commercial Fisheries Program updated management plans for a number of managed fisheries across the State. In addition, significant milestones were achieved in relation to ecologically sustainable development (ESD), resource sharing, implementation of new compliance technology and development of new fisheries, as follows:

- Completion of case study reports on the West Coast Rock Lobster and Marine Aquarium Managed Fisheries using the ESD framework developed for the Standing Committee on Fisheries and Aquaculture.
- Completion of an environmental risk assessment workshop and substantial preparation of an ecological risk assessment report as part of the ongoing Marine Stewardship Council (MSC) accreditation for the West Coast Rock Lobster Managed Fishery.
- Commencement of ecological sustainability reports to Environment Australia for west coast rock lobster, Shark Bay prawns, Shark Bay scallops, Shark Bay snapper, Exmouth Gulf prawns and abalone, for accreditation under Schedule 4 of the *Wildlife Protection (Regulation of Exports and Imports) Act 1982*.
- Completion of management plans and reports to Environment Australia for the extension of S.10(a) 'Controlled Specimens Declarations' under the *Wildlife Protection (Regulation of Imports and Exports) Act 1982* to maintain exports for deep-sea crabs, sygnathids, beche-de-mer and a number of specimen shell species.
- Progressing of voluntary resource-sharing discussions for the Demersal Gillnet and Demersal Longline (shark) Managed Fisheries and the Geographe Bay crab fishery.
- Amendment of the Cockburn Sound Crab Fishery Management Plan to give effect to the outcomes of the voluntary resource-sharing agreement, including a 50% reduction in crab pot entitlements for B-class licensees nominating as A-class licensees, the removal of gillnets as permitted gear and an increase in the minimum legal size for commercially caught crabs.
- Formal introduction of the Vessel Monitoring System (VMS) into the Abrolhos Islands and Mid West Trawl, Kimberley Prawn and Nickol Bay Prawn Fisheries, and Ministerial approval for implementation of the VMS in the Exmouth Gulf and Onslow Prawn Fisheries in 2002.
- Formation of a committee to advise the Executive Director on expressions of interest received under the policy on 'Developing New Fisheries in Western Australia', as a result of which a range of applications (mostly related to octopus and crabs) were dealt with and exemptions issued.
- Development of two further options for management of the mackerel fishery and completion of statewide consultation on the options.



Commercial Fisheries

West Coast Bioregion

Regional Management Overview

Commercial fishing in this bioregion is dominated by the western rock lobster fishery, but also involves significant fisheries for scallops, sharks, blue swimmer crabs, pilchards, and coastal and estuarine finfish, many of which are shared with the recreational sector.

During 2000/2001 the West Coast Rock Lobster Managed Fishery undertook the next step in the processes arising from being awarded Marine Stewardship Council chain of custody certification, which recognises the ecological sustainability of its fishing and management operations. This step involved holding an environmental risk assessment workshop, from which an ecological risk assessment report has been substantially prepared.

There were also some significant changes to the management arrangements for the West Coast Rock Lobster Managed Fishery, including an amendment of the management plan to provide for licence creation and retirement. Other changes included Ministerial approval for a one-season removal of the maximum size rule in 2001/02, as the fishery moves into a low catch year for that season. Ministerial approval was also received to amend the management plan to implement the unitisation of pot entitlements and to simplify the Big Bank boundaries.

The successful outcomes produced from the 'Guidelines for Voluntary Resource Sharing' process for the Cockburn Sound Crab Managed Fishery were formally implemented into the management plan for that fishery during 2000/2001. Mediated meetings for the Geographe Bay crab fishery and the 'shark' fishery under the resource-sharing guidelines continued through the year. A Fisheries Adjustment Committee for the South West Trawl Managed Fishery provided a report to the Minister.

The Abrolhos Islands and Mid West Trawl Managed Fishery, which mainly fishes for scallops in the Abrolhos Islands area, formally came under the VMS in the 2000/2001 season.

The 'wetline' fishery in the west coast bioregion operates in a number of areas:

- Demersal line fishing;
- Mackerel (primarily by trolling);
- Beach seining and near-shore gillnetting.

The demersal line fishery takes a range of demersal fish species including dhufish, snapper, baldchin groper and emperors from boats operating purely as wetliners (i.e. no form of access other than the fishing boat licence) and boats which hold managed fishery licences (e.g. west coast rock lobster) in addition to an FBL. Mackerel are also taken by both groups, but the current proposals for management of the mackerel resource will leave only the take of mackerel south of Shark Bay within the wetline fishery.

There is also a take of fish by beach seining and near-shore gillnetting using hand-hauled nets.

Regional Compliance and Community Education Overview

Within the west coast bioregion, the major single focus for commercial fishery compliance monitoring is the West Coast Rock Lobster Managed Fishery. Compliance activities and outcomes for this fishery are reported separately on p. 6-7. In addition, there are a number of smaller fisheries which are covered to a lesser extent.

There have been concerns over interference with commercial fishing gear in the Cockburn Sound (Crab) Managed Fishery during peak periods, and similar reports continue to be received from the Peel/Harvey Estuarine Fishery despite increased levels of surveillance, including joint patrols with police. Industry has been advised to take a more active role in providing accurate information to assist investigations.

Unverified reports continue to be received of trawling within closed waters in Zone D (Comet Bay) of the South West Trawl Managed Fishery, and there was one incident reported in the purse seine fishery which may have related to net rolling, but no further action was possible.

Overall, however, the level of compliance in these smaller commercial fisheries was generally good.

Further north, the Mid West regional office conducted a pre-season briefing for operators in the Abrolhos trawl fishery which was well attended. There were no significant compliance issues during the 2001 Abrolhos scallop season, although one operator was detected allegedly fishing outside the fishery in closed waters. VMS was introduced at the opening of the season and all vessels are fitted with VMS units. The introduction of this technology ran smoothly and is seen as a major tool in efficiently managing compliance within the environmentally sensitive Abrolhos Islands reserve.

Compliance monitoring was also carried out within the purse seine, shark and wetline fisheries, with no significant issues arising.

A dedicated two-man field operations team was established during 2000/2001 to enhance regional services delivery to the Abrolhos Islands reserve. Their work is reported in the Fish and Fish Habitat Protection section on p. 178-9.

Regional Research Overview

In addition to the research projects and activities noted in the research summary for each individual fishery, there has been a major focus during 2000/2001 on assessing the general wetline catch in each bioregion. This assessment, undertaken utilising the catch and effort statistics (CAES) database, indicates that over half (56%) of the wetline catch in 1999/2000 was reported from the west coast bioregion, which includes the waters of the populous lower west coast and the Abrolhos Islands. The top ten species include West Australian dhufish (173 tonnes), pink snapper (158 tonnes), whitebait (151 tonnes), Australian herring (98 tonnes), sea mullet (69 tonnes), spangled emperor (68 tonnes), sweetlip emperor (63 tonnes), samsonfish (61 tonnes), baldchin groper (33 tonnes) and trevally (32 tonnes). Catches of dhufish,

pink snapper, emperor, and baldchin are the main product of the demersal scalefish operations reported on pp. 34-8, noting that catches of emperor are mostly from the Abrolhos. Whitebait, Australian herring and sea mullet comprise most of the catch of the beach bait fishers who operate between Tim's Thicket and Augusta (see pp. 29-31).

West Coast Rock Lobster Managed Fishery

MANAGEMENT SUMMARY

Approximately 600 specialised rock lobster boats use about 57,000 pots to fish for rock lobster between Shark Bay and Augusta. The fishing season runs between 15 November and 30 June each year and most of the catch, which on a long-term basis averages around 10,500 tonnes per season, is exported to Asia.

The fishery is divided into two major zones, Zone B (north of Green Head) and Zone C (south of Green Head), with another zone (effectively a subset of Zone B) for those fishing the Abrolhos Islands between March and June.

Breeding stock required to provide the necessary recruitment is estimated to be between 20% and 25% of the virgin or unfished breeding biomass. In more recent times this biological reference point has been equated to a more tangible reference point – the size of the breeding biomass in 1980.

All the biological indicators for this fishery show that the breeding stock levels are indeed in good condition, a result that is attributed to the management action taken in the early to mid-1990s. This action was prompted by advice from the Fisheries WA Research Division that the breeding stock of rock lobster had been fished down to about 15% of the unfished or virgin size.

To address this problem a management package designed to leave an additional 1,000 tonnes of lobsters in the water at the end of the season was implemented at the beginning of the 1993/94 season. The implementation of this package was preceded by two years of debate and consultation, with some preliminary measures being taken in the 1992/93 season. The core components of this management package included:

- an 18% reduction in the number of lobster pots allowed to be used across the fishery;
- a total ban on taking females in breeding condition (setose and tarspot);
- an increase in the legal minimum size of lobsters from 76 mm to 77 mm from 15 November to 31 January; and
- separate maximum sizes for female lobsters in the north and south of the fishery (105 mm and 115 mm respectively) to reflect the geographical differences in both growth and maturation rates of the lobsters.

The above elements of this management package are still current to the end of the 2000/2001 season because they

continue to be relevant by ensuring that the stock does not fall below the established biological reference point.

Following on from record catches of between 13,000 and 14,000 tonnes in the 1998/99 and 1999/2000 seasons, the catch in the 2000/2001 season dropped to just over 11,000 tonnes. Fluctuations of this magnitude are not abnormal, and simply reflect the size of puerulus settlement four years earlier, which is largely dependent upon environmental factors such as the Leeuwin Current.

The fishery has a well developed catch prediction system, based on the puerulus settlement index (see following fishery status report). The ability to predict future catches is highly valuable to fisheries managers because arrangements and options can be assessed against the established objectives in the context of predicted catch trends.

In anticipation of the below-average catch expected for the 2001/02 season, options were examined to increase the value of the catch without compromising sustainability. To achieve this goal the maximum size limit for females will be removed for the 2001/02 season before being reintroduced in the following season. It is estimated that the 'one-off' removal of the maximum size rule will allow for an additional 290 tonnes of lobster to be taken in the 2001/02 season. This measure has been assessed to be a very low risk from a stock sustainability perspective with the net decrease in egg production expected to be approximately 1%, while increasing the value of the catch without any additional costs.

Other management changes now approved by the Minister and set to come into effect with the commencement of the 2001/02 season are:

- individual numbering of pot entitlements within Fisheries WA's licensing register;
- the ability of those with access to 63 or more pot entitlements and a fishing boat licence to apply for a new managed fishery licence;
- the ability of fishermen to retain an inactive managed fishery licence by retaining an inactive fishing boat licence and one or more inactive pot entitlements; and
- provision for temporary pot transfers.

In 1999/2000 the West Coast Rock Lobster Managed Fishery became the world's first fishery to receive Marine Stewardship Council certification, and since then the management process has moved on to address the MSC's annual audit requirements. The first requirement was to conduct an environmental risk assessment (ERA). Fisheries WA has completed the assessment in conjunction with key stakeholder groups and will have produced the resultant document for public review towards the end of 2001.

The ERA identified 33 issues which could impact on ecological sustainability, with four classified as moderate risks and the remaining classified as low risks. The report will also outline recommendations and actions to address these moderate risks.



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The process of addressing the MSC requirements both complements and is complemented by work being done to satisfy the new Commonwealth Government environmental legislation being administered by Environment Australia. Specifically, the implementation of the *Environment Protection and Biodiversity Conservation Act 1999* and amendments to Schedule 4 of the *Wildlife Protection (Regulation of Exports and Imports) Act 1982* have resulted in very close examination of the operations of the fishery and its sustainability and environmental standards.

The rock lobster fishery will be the first Western Australian commercial fishery to submit the necessary documentation to Environment Australia to meet these new ecological sustainability tests. In addition, the evaluation of the fishery under the new ESD framework is becoming very much a part of rock lobster management. This will be evident when consideration of management options for the 2002/03 and 2003/04 seasons are presented in the context of ESD towards the end of 2001.

Governing Legislation/Fishing Authority

West Coast Rock Lobster Management Plan 1993
West Coast Rock Lobster Managed Fishery Licence

Consultation Process

Rock Lobster Industry Advisory Committee (RLIAC)
Annual RLIAC coastal tour
Joint industry–RLIAC meetings
Agency–industry meetings

COMPLIANCE AND COMMUNITY EDUCATION SUMMARY

Interface with the industry has continued to improve in 2000/2001. The first ever rock lobster compliance risk assessment workshop, held prior to the season opening, was attended by industry members and agency staff including Fisheries Officers. The aim of the workshop was to identify and target areas of non-compliance within the fishery. Whilst industry attendance numbers were smaller than expected, it produced clear results and has established a participative model for further development. One risk identified as a concern was the illegal sale into the restaurant trade.

A Compliance Coordinator was appointed to enhance in-field contact with fishers and coordinate across-region operations. The Coordinator attends rock lobster association meetings to educate fishers regarding rule changes and obtain information on local compliance issues which can then be incorporated into the compliance planning process. Joint regional operations included checks on the Christmas trade in wholesale and retail outlets, roadside checkpoints near Lancelin, at-sea operations in the Abrolhos Islands, monitoring the 77 mm/76 mm gauge change, Easter roadside checkpoints and lower C Zone land and sea operations.

A mobile factory patrol (primarily to inspect landed catches of rock lobster at processing establishments) commenced late in the season to complement increased officer time in the field at sea and point of landing. The patrols, based in Fremantle and Geraldton, will travel at random throughout the fishery area and assist in

maintaining a 3.8% catch inspection rate, which is judged to be the required level.

In the Metropolitan Region (principally Zone C), factory consignment compliance has been generally good. Minor infringement notices and warnings continue to be issued, some for setose rock lobster but the majority for over-size animals. Closed-water offences detected within the waters of Rottne Island were an issue again this season. There was a significant increase in reports of the illegal pulling of fishing gear.

In the Mid West Region (principally Zones A and B), the majority of complaints received have been about unauthorised pulling of pots. Complaints related to early pulling, or recreational fishers pulling commercial pots or cutting them off in high-density recreational fishing areas, were also high. District operations included roadside checkpoints and aerial surveillance. Aerial checks covered fishing at Big Bank, A Zone vessels fishing in less than 20 fathoms after 1 March, and the southern and south-eastern portion of the A Zone prior to that area opening on 14 March. Operations were also conducted to ascertain whether vessels were pulling the pots belonging to other vessels, to check fishermen departing vessels for possession of totally protected fish, to carry out formal pot counts, and to monitor for the return of protected fish to the water.

Throughout the season, patrol vessel operations continued to target areas of complaint, these being mainly under-size/over-size/setose rock lobster, zone boundary offences, gear interference and over-potting. In the Gascoyne Region, one licensee was prosecuted for fishing in waters closed to the taking of western rock lobster. In the Southern Region, increased activity in the latter part of the season saw up to 50 boats fishing out of the Bunbury area.

The infringement notice system was in its fifth year of operation. There were 287 infringement warnings given, 52 infringement notices issued and 23 breach reports filed in the 2000/2001 season (West Coast Rock Lobster Table 1). Trends indicate a 100% increase in infringement warnings and a 25% increase in infringements issued for similar offences. Prosecution offences were primarily under-size and closed-water offences.

Overall the majority of fishers appear to be operating professionally with a sound attitude to sustainability of stock. Equity disputes relating to illegal pot pulling continue to be problematic and remain a key theme for targeted intervention.

Planning has commenced to implement a coastal tour by the Supervising Fisheries Officers, Mid West and Metropolitan Regions. The aim is to conduct a pre-season information session for deckhands and skippers, and to ensure consistency in messages and application of the law for fishers along the coast.

The western rock lobster compliance models have continued to show leadership on the national scene in terms of approach and industry participation. The strength of the industry commitment to compliance has been noted as a strong factor in support of the Marine Stewardship Council certification process. Presentations utilising new land and sea compliance data collection

WEST COAST ROCK LOBSTER TABLE 1

Summary of commercial rock lobster breaches, warnings and infringements for the years 1999/2000 and 2000/2001.

| Offence Type | Breaches | 1999/2000 | | 2000/2001 | | |
|-----------------|-----------|------------|---------------|-----------|------------|---------------|
| | | Warnings | Infringements | Breaches | Warnings | Infringements |
| Closed season | 0 | 0 | 0 | 1 | 0 | 0 |
| Illegal gear | 1 | 3 | 2 | 0 | 4 | 3 |
| Obstruction | 0 | 0 | 0 | 0 | 0 | 0 |
| Processing | 7 | 2 | 2 | 0 | 1 | 0 |
| Records>Returns | 0 | 0 | 0 | 0 | 2 | 7 |
| Spawners | 2 | 48 | 3 | 2 | 73 | 8 |
| Under-size | 11 | 96 | 33 | 8 | 186 | 26 |
| Excess gear | 4 | 0 | 0 | 1 | 0 | 0 |
| Licence offence | 1 | 0 | 0 | 1 | 7 | 7 |
| Over-size | 0 | 2 | 1 | 0 | 0 | 0 |
| Closed waters | 10 | 0 | 0 | 8 | 0 | 0 |
| Other | 2 | 4 | 0 | 4 | 14 | 1 |
| Total | 38 | 155 | 41 | 23 | 287 | 52 |

processes were made on the RLIAC coastal tour. Throughout the season, the RLIAC Compliance Subcommittee continued its planning in partnership with industry. New initiatives such as the Compliance Coordinator, mobile factory patrol, joint industry risk assessment and pre-season briefing continue to create new approaches to compliance in response to changing demands.

RESEARCH SUMMARY

Research activities continued to focus on forecasting future catch levels, monitoring of breeding stock levels, modelling and stock assessment. During the year, results from length-structured/age-structured simulation models assessing management options for maximising the value of the fishery were presented to industry. Researchers also attended the Sixth International Conference and Workshop on Lobster Biology and Management to present data for peer review on the impacts of individual elements of the management package introduced in 1993/94; western rock lobster migration; the prediction of recreational catches; and an assessment of environmental factors affecting commercial catch predictions. These data were also presented to industry.

The following status report summarises the research findings for this fishery.

West Coast Rock Lobster Managed Fishery Status Report

Prepared by C. Chubb

FISHERY DESCRIPTION

Boundaries and access

The boundaries of this fishery are *'the waters situated on the west coast of the State bounded by a line commencing at the intersection of the high water mark and 21° 44'*

south latitude drawn due west to the intersection of 21° 44' south latitude and the boundary of the Australian Fishing Zone; thence southwards along the boundary to its intersection with 34° 24' south latitude; thence due east along 34° 24' south latitude to the intersection of 115° 08' east longitude; thence due north along 115° 08' east longitude to the high water mark; thence along the high water mark to the commencing point and divided into zones'. The fishery is managed in three zones: south of latitude 30° S (C Zone), north of latitude 30° S (B Zone) and, within this northern area, a third offshore zone (A Zone) around the Abrolhos Islands.

Main fishing method

Rock lobster pots.

RETAINED SPECIES

Commercial production (season 1999/2000):

14,523 tonnes

Landings

Trends in the annual catches from the West Coast Rock Lobster Managed Fishery (WCRLMF) are shown in West Coast Rock Lobster Figure 1. The Australian Bureau of Statistics catch recorded from 1944/45 to 1970/71 was replaced by processors' production figures in 1971/72. The 1999/2000 catch in the WCRLMF was forecast from puerulus settlement to be 13,500–14,500 tonnes. Processors' figures show the catch from the WCRLMF for the 1999/2000 season was 14,523 tonnes, 33.9% greater than the long-term average catch of 10,850 tonnes and 11.7% greater than the previous season's 13,009 tonnes. In 1999/2000, the catches in A Zone, B Zone and C Zone were 1,749 tonnes, 4,548 tonnes and 8,226 tonnes respectively, with A Zone 11.2% lower and B and C Zones 9.2% and 19.7% higher than the previous season. This was the fishery's second record catch in successive seasons.



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In 1999/2000, a survey of recreational rock lobster fishers estimated that they caught approximately 750 tonnes, which was a 19.3% increase on the catch estimate for 1998/99 of 630 tonnes. The increase again was due to larger catches in the southern sector, adjacent to the Perth metropolitan area, reflecting the much higher abundance of lobsters available this season in C Zone.

The total catch of western rock lobster from this fishery (commercial and recreational) was approximately 15,270 tonnes, 12.0% higher than the previous season's catch of 13,630 tonnes.

Octopus may be caught in rock lobster pots, generally in shallow water (0–20 fathoms or 0–37 m), and catch rates of about 0.02–0.03 octopus per pot lift were recorded in voluntary research logbook data between 1992/93 and 1999/2000. This translates as an estimated 220,000–300,000 octopus caught in all zones in each of the past eight seasons.

Fishing effort

The nominal fishing effort for 1999/2000 was 10.72 million pot lifts, 0.3% lower than the 10.75 million pot lifts for 1998/99 (West Coast Rock Lobster Figure 1). The nominal effort for the A, B and C Zones of the WCRLMF was 1.15 million, 3.9 million and 5.67 million pot lifts respectively, 5.7% less, 2.4% more and 0.9% less than the previous season's 1.22, 3.81 and 5.72 million pot lifts.

Effort equivalent to 0.55 million commercial pot lifts was used by the recreational fishery to land its catches. This was 5.8% higher than the 0.52 million pot lifts used in 1998/99.

The total effort used in the WCRLMF during 1999/2000 was 11.24 million pot lifts, 0.3% lower than the 11.27 million pot lifts made in 1998/99.

Catch rate

Due to the record abundance of rock lobsters on the grounds in 1999/2000, catch per unit of fishing effort increased substantially (12.4%) over the rate in 1998/99 (1.36 and 1.21 kg/pot lift respectively) (West Coast Rock Lobster Figure 2). Trends in catch rates show a 'cyclical' pattern due to environmental effects on puerulus settlement; however, the overall decline in catch rate (abundance) from the 1950s to the early 1990s (Rock Lobster Figure 2) was one of the contributory reasons for the introduction in 1993/94 of management arrangements designed to rebuild breeding stock levels. The catch rates in the past seven seasons have remained high due to the improved survival of lobsters, higher recruitment of lobsters in the last two years (from previous high puerulus settlements), and lower levels of fishing effort resulting from the management package introduced in 1993/94.

Recreational component: 5%

See information in 'Landings' and 'Fishing effort' above, and the Recreational Western Rock Lobster Fishery Status Report (pp. 128-9).

Stock assessment completed:

Yes

The stock remains fully exploited. The current management arrangements, introduced in 1993/94, have achieved their objective of rebuilding the breeding stock. The 18% pot reduction and minimum size increase to 77 mm carapace length (15 November to 31 January) have meant that a proportion of the 'whites' catch has been shifted through to the 'reds' fishery in each season since 1992/93. However, because of the geographic variation in the size distribution of lobsters (generally smaller lobsters in the north), this has had a greater impact in the northern regions than in the south. Greater overall survival meant that some lobsters grew to a larger size before contributing to the catches in each of those years, with greater recruitment to the breeding stock and a flow of product through to following seasons. Modelling suggests that the catch in 1999/2000 was 90.5% of the estimated catch that might have been achieved if the new regulations had not been implemented in 1993/94. This notwithstanding, successive record catches were taken in the past two seasons.

Under the management arrangements introduced in 1993/94, only 82% of each vessel's pot entitlement could be used for fishing. This reduced the number of pots being operated in the fishery to 56,910, and decreased the rate of exploitation of the stock. This reduced effort level has been maintained since 1993/94, and has had the secondary effect of 'encouraging' a reduction in fleet size as vessels purchase additional pot entitlements to improve their economic efficiency.

This industry restructuring continued during 1999/2000 when three vessels left the fishery, leaving a fleet of 593. Since latent effort has largely been removed from the fishery, pot reductions have proved to be an effective tool with which to manage fishing effort in the WCRLMF. Some effort 'creep' was evident between 1993/94 and 1998/99, but nominal effort levels since 1998/99 have remained relatively stable, so that 1999/2000 levels were 3% greater than the 10.38 million pot lifts of 1993/94 and 1994/95. Practically all of this movement occurred in C Zone, where a 9% increase in nominal effort was noted between 1993/94 and 1998/99. However, the huge catches of 1998/99 and 1999/2000 have seen a stabilisation of effort in C Zone, where 5.64 million, 5.72 million and 5.67 million pot lifts respectively were recorded in the three seasons from 1997/98 to 1999/2000. Although effort seems to have levelled out at a little over 10.7 million pot lifts, the lower catch seasons predicted for the next few years may generate increases in fishing effort above current levels. Effective fishing effort continues to increase through the improved use of sophisticated fish-finding and navigational technology. This is monitored and will be factored into stock assessments and future management advice.

Exploitation status:

Fully exploited

Breeding stock levels:

Adequate

The north and south coastal fishery-dependent spawning stock indices, which are based on commercial monitoring data, are presented in West Coast Rock Lobster Figure 3. The coastal and Abrolhos Islands indices from the fishery-

independent survey of the breeding stock are presented in West Coast Rock Lobster Figures 4 and 5 respectively.

Both indices show that there has been substantial and very significant growth of the breeding stock in response to the management package introduced for the 1993/94 season, which specifically aimed at improving egg production. Current indications from both sets of indices used to monitor the breeding stock are that egg production has now reached or is above the target levels set in 1993/94. Currently, egg production is assessed at 34% above the 1980/81 target level.

Indices of egg production derived from fishery-based data may become distorted as a result of the effects of technology and increases in fishing efficiency; variations in the distribution of fishing effort in response to annual variations in puerulus settlement and subsequent recruitment to the fishery; fishers' responses to the regulations (e.g. the setose regulation); and/or market-driven factors. Therefore, fishery-independent breeding stock surveys to assess the strength of egg production will continue, and will act as a calibration for indices derived from fishery data

**Projected catch next season (2000/2001):
11,200–12,400 tonnes**

Total catch predictions for the WCRLMF are made by summing the regional catch predictions from puerulus settlement at the Abrolhos Islands (A Zone), Seven Mile Beach (Dongara) (B Zone) and Alkimos (C Zone) (West Coast Rock Lobster Figure 6). Catch estimates for C Zone also are forecast from combined puerulus settlement figures from a number of C Zone puerulus collection sites. These additional forecasts, for the most part, are not dissimilar to the predictions based on Alkimos settlement alone. Seasons 2000/2001 and 2001/02 are expected to produce commercial catches of around 11,200–12,400 tonnes and 9,500–10,500 tonnes respectively, the lower catches resulting from declining puerulus settlement following the large numbers of pueruli settling in 1995/96 and 1996/97 (West Coast Rock Lobster Figure 6). Forecast recreational catches indicate that total rock lobster landings (commercial and recreational) will be in the range of 11,800–13,000 tonnes in 2000/2001.

NON-RETAINED SPECIES

Bycatch species impact: Low

Fishery-independent monitoring indicates that the impact of rock lobster fishing on the bycatch of fish and invertebrates, other than octopus (see retained species), is minimal.

Protected species interaction: Low

The WCRLMF interacts with the Australian sea-lion, *Neophoca cinerea* (status based on IUCN (1994) criteria: lower risk, near threatened), in two ways. The first is due to the discard at sea of the plastic bands around boxes of bait and the subsequent snaring of the bands around the sea-lion's neck or body. This is not common, and education has significantly reduced the at-sea discard rate of the bands. The second interaction is the drowning of

sea-lion pups in rock lobster pots as the pups attempt to rob the traps of either bait or rock lobsters. Such incidents appear to be very rare and are only reported to occur where pots are set adjacent to the few islands on which this species breeds. An ecological risk assessment has identified this issue as a moderate risk until further data are collected to quantify the risk to the sea-lion population. However, the mortality rate from lobster potting is expected to be very small and perhaps insignificant when compared to the reported highly variable mortality suffered by pups up to five months old in Western Australia. This rate varied between 7% and 24%, depending upon whether pupping occurred in summer or winter (Shaughnessy 1999). Significant non-fishery factors responsible for the high mortality rate of young sea-lions are attacks on pups by territorial bulls and adverse environmental conditions (Shaughnessy 1999).

Turtles are rarely affected by lobster fishing. Anecdotal information suggests a very occasional entanglement of turtles in pot ropes (about one per year). Again the issue of the entanglement of, specifically, leatherback turtles was identified as a moderate risk by the ERA and data are being collected through as many sources as possible to establish the level of mortality caused by rock lobster fishing. It is understood that leatherback populations are in decline worldwide. Recent research by Spotila et al. (1996, 2000) suggests Indian Ocean and western Pacific populations cannot withstand even moderate levels of adult mortality and that the current level of indigenous harvest and incidental mortality in commercial fisheries will lead to the extinction of these populations if they continue. The interaction with fisheries (outside Western Australia) relates to bycatch from shrimp/prawn trawls without turtle exclusion devices, longlines, gillnets and shark nets. The indigenous harvest of leatherbacks in Indonesia and other south-east Asian countries and the poaching of eggs from nests in this region are also highly significant causes of mortality for this endangered species. By comparison, the occasional entanglement of a marine turtle in a pot rope, even assuming that all entanglements result in death, is unlikely to be a significant cause of mortality for any turtle species.

ECOSYSTEM EFFECTS

Food chain effects: Low

The legislated design of rock lobster pots, and the strict control of replacement pots, prevents 'ghost fishing' problems arising. In terms of ecosystem effects, the fishery is unlikely to cause significant 'food web' changes, as the sub-legal-sized lobsters and protected breeding stock components form a significant proportion of the biomass (> 50%) and remain relatively constant from year to year. The western rock lobster is an opportunistic omnivore feeding on a wide range of food items from coralline algae to molluscan and crustacean fauna, the populations of which have high productivity and short life cycles. Overall, the effect of the fishery on the wider ecosystem is assumed to be minimal. Notwithstanding this, and noting the magnitude of the fishery, a formal ecological risk assessment has been conducted as part of the Marine Stewardship Council accreditation and will formally document this assessment.



Commercial Fisheries

Habitat effects:

Low

A study of human impacts (including rock lobster fishing) on the marine environments of the Abrolhos Islands is under way with funding from the Fisheries Research and Development Corporation (FRDC). This study estimated that potting might impact on between 0.1% and 0.2% of the surface area of fragile habitat at the Abrolhos. Generally, throughout the fishery, rock lobster fishing occurs around limestone reef habitat covered with coralline and macro-algae such as kelp (*Ecklonia* spp). This type of habitat is highly resistant to damage from rock lobster potting.

SOCIAL EFFECTS

The western rock lobster fishery is an important sector of Western Australia's economy, the current reporting season generating some \$500 million of export income. Employment is seasonal, the fishing season covering seven and a half months from 15 November to 30 June. A total of 593 vessels and 1,625 people were engaged in fishing for rock lobster in 1999/2000. This equates to one skipper and an average of about 1.75 deckhands per vessel. During the year, 12 processing establishments engaged between 200 employees in the closed season and 1,100 employees in the fishing season. The processing establishments' receival depots or trucks serviced practically every location where fishing occurred, whilst the factories were located in the Perth metropolitan area (5), Lancelin (1), Jurien (1), Cervantes (1), Dongara (1) and Geraldton (3). Rock lobster fishing is responsible for the establishment and survival of many towns along Western Australia's west coast from Mandurah to Kalbarri.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year (1999/2000): **\$390 million**

The price fishermen received for the western rock lobster in 1999/2000 was an estimated average of \$27/kg in all zones of the fishery. This was a 33.3% increase on the \$20.25/kg paid in 1998/99, and the first significant movement in price following three seasons of prices ranging between \$19.25/kg and \$20.25/kg. This substantial increase in price was due in large part to the devaluation of the Australian dollar against other currencies. The value of the record landed catch in the WCRLMF in 1999/2000 was approximately \$390 million.

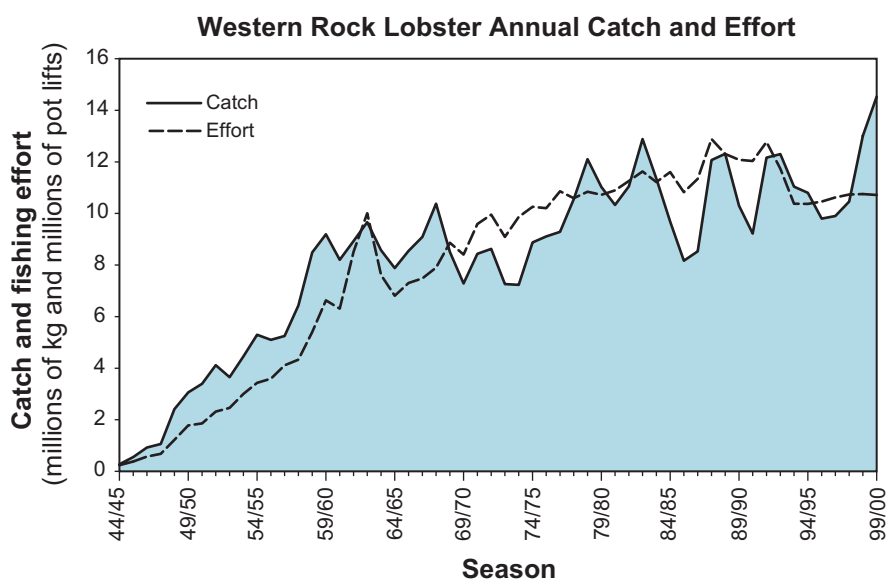
FISHERY GOVERNANCE

Acceptable catch range: **8,166–14,523 tonnes**

Between 1974/75 and 1999/2000, fishing effort levels exceeded 10 million pot lifts. During this 26-year period, catches ranged from 8,166 tonnes in 1985/86 to 14,523 tonnes in the current reporting year. The average catch has been $10,802 \pm 628$ tonnes (95% confidence limits of the mean). The variation in catches results primarily from variable levels of recruitment, driven by the environmental conditions experienced by western rock lobster larvae and post-larvae, and levels of fishing effort. As fishing effort has been reduced and now has stabilised around the current levels, catches are expected to fall within the 26-year range.

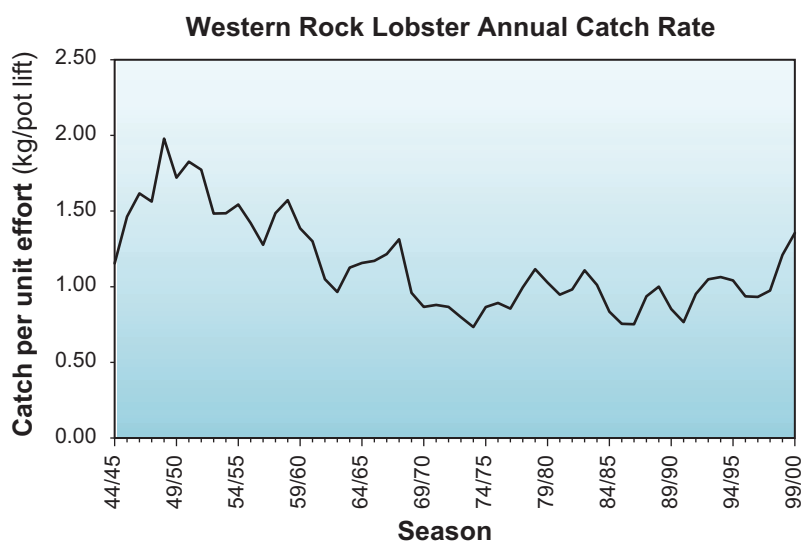
EXTERNAL FACTORS

The management package introduced in 1993/94 achieved its objectives of reducing the exploitation rate, increasing the breeding stock and allowing egg production to be maintained at or above the target levels. Catches peaked in 1999/2000, with the second successive season of record landings, and are expected to decline to average or above-average levels over the next few years. The forecast reductions are a result of lower puerulus settlements due to changes in the balance of El Niño Southern Oscillation/La Niña events in the Pacific Ocean and their effect on the Leeuwin Current. A positive relationship exists between Leeuwin Current strength and levels of puerulus settlement. It is noteworthy that whilst the increases in fishing effort seen since the mid-1990s have abated for the present, nominal fishing effort remains about 3% higher than it was in 1993/94 when an 18% temporary pot reduction came into effect as part of the new management package. The recreational catch increased again in 1999/2000, due primarily to forecasts of another record catch, a greater number of licences being issued (increase of 13% compared to 1998/99), and a high proportion of licensees actually undertaking some fishing activity (see Recreational Western Rock Lobster Fishery Status Report). Both Fisheries Western Australia and the rock lobster industry have been addressing issues raised by the Marine Stewardship Council to maintain the world's first MSC accreditation, and those arising from Commonwealth legislative requirements to ensure an ecologically sustainable fishery.



WEST COAST ROCK LOBSTER FIGURE 1

Annual catch and nominal fishing effort from fishers' compulsory monthly returns for the West Coast Rock Lobster Managed Fishery from 1944/45 to 1999/2000.

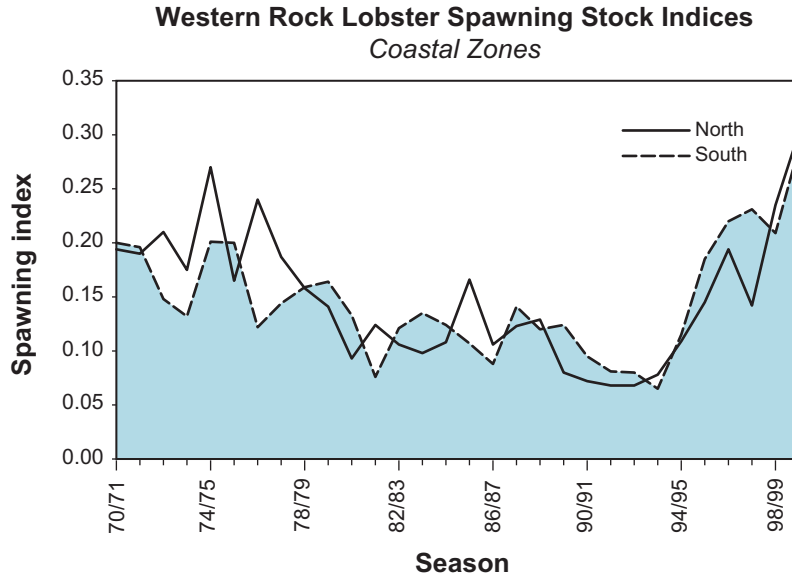


WEST COAST ROCK LOBSTER FIGURE 2

Annual catch rate (kg/pot lift) for the West Coast Rock Lobster Managed Fishery from 1944/45 to 1999/2000.

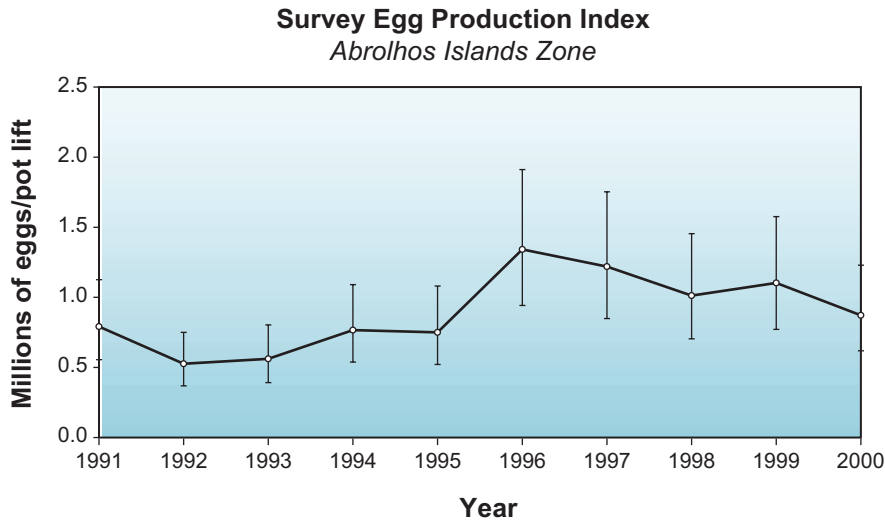


Commercial Fisheries



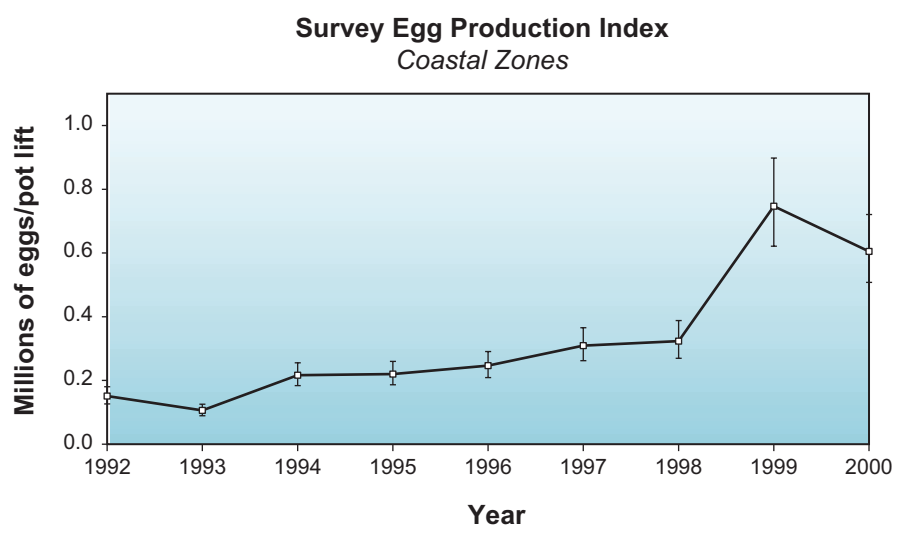
WEST COAST ROCK LOBSTER FIGURE 3

Time series of monitoring spawning stock index (an index of numbers of eggs/pot lift integrated over the whole season) for the north (Jurien and Dongara) and south (Fremantle and Lancelin) coastal regions.



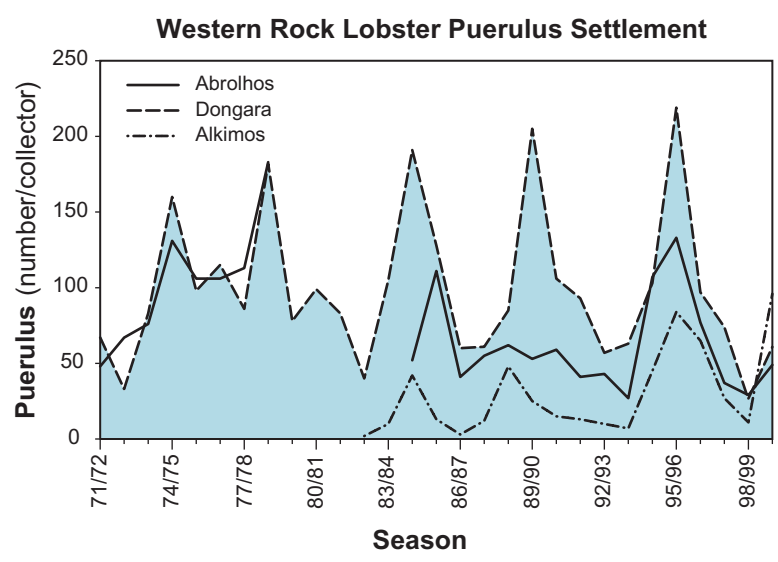
WEST COAST ROCK LOBSTER FIGURE 4

Egg production indices as measured by the independent breeding stock survey at the Abrolhos Islands.



WEST COAST ROCK LOBSTER FIGURE 5

Egg production indices as measured by the independent breeding stock survey at the coastal sampling sites.



WEST COAST ROCK LOBSTER FIGURE 6

Annual indices of puerulus settlement for the Abrolhos (A Zone), Seven Mile Beach (Dongara) (B Zone) and Alkimos (C Zone).



Commercial Fisheries

Minor Scallop Fisheries

MANAGEMENT SUMMARY

Several minor trawl fisheries contribute to the Western Australian scallop catch – primarily the Abrolhos Islands and Mid West Trawl Managed Fishery (AIMWTMF), the South West Trawl Managed Fishery and, in 2000/2001, the trawl fishery off the south coast east of Esperance. Each fishery takes saucer scallops (*Amusium balloti*), which typically have highly variable recruitment. As a consequence, the catch in these fisheries varies greatly from year to year.

All scallop fisheries operate under input controls, with restrictions on boat numbers and gear as well as seasonal and area closures.

The Vessel Monitoring System, a satellite tracking system used to monitor the movement of vessels within the waters of the fishery, was introduced into management arrangements for the AIMTMF in April 2001. VMS can also be used for electronic catch reporting, communication and emergency position reporting.

Governing Legislation/Fishing Authority

Abrolhos Islands

Abrolhos Islands and Mid West Trawl Management Plan 1993

Abrolhos Islands and Mid West Trawl Managed Fishery Licence

South West Trawl

South West Trawl Management Plan 1989
South West Trawl Managed Fishery Licence

South Coast

Trawling Prohibition (Whole of State) Notice 1992 (Order) Condition 73 and/or 79 on a Fishing Boat Licence

RESEARCH SUMMARY

Research monitoring of the scallop stocks in each fishery is undertaken utilising fishers' monthly return data, and an industry-based pre-season survey in the case of the Abrolhos sector.

Advice on the status of stocks and appropriate season opening and closing dates is provided to industry advisory bodies.

The following status reports summarise the research findings for these smaller scallop fisheries.

Abrolhos Islands and Mid West Trawl Managed Fishery Status Report

Prepared by M. Kangas and E. Sporer

FISHERY DESCRIPTION

Boundaries and access

The boundaries of this fishery are 'all the waters of the Indian Ocean adjacent to Western Australia between 27°51' south latitude and 29°03' south latitude on the landward side of the 200 m isobath'.

There are 17 boats licensed to fish for scallops in this limited entry fishery. However, 14 boats fished during the 2000 season. The permitted fishing area opened on 4 April and closed on 31 May 2000.

The Port Gregory trawl fishery operates as part of the AIMWTMF. The permitted fishing area opened on 1 March for prawns and 4 April for scallops, and was closed on 31 October 2000.

Main fishing method

Otter trawl.

RETAINED SPECIES

Commercial production (season 2000):

429 tonnes whole weight

Landings

The total landings for the 2000 season were 429 tonnes whole weight of scallops (Abrolhos Islands Scallop Figure 1). No prawns were caught in the Port Gregory area.

Fishing effort

A total of 1,281 trawl hours were recorded for the 2000 season.

Catch rate

378 kg/hr (whole weight).

Recreational component:

Nil

Stock assessment complete:

Not assessed

This fishery is highly variable, being dependent on sporadic recruitment which is strongly influenced by environmental conditions, e.g. the Leeuwin Current. A pre-season survey has occurred since 1997 and is planned to continue. A preliminary investigation of the relationship between catch rates during surveys and subsequent catch has been undertaken for three years of surveys (1997–1999). Derivation of a more reliable survey abundance–catch relationship will require several more years of data.

Exploitation status:

Fully exploited

Breeding stock levels:

Adequate

The annual fishing season is managed so that the majority of the mature scallops are able to spawn before fishing occurs. Breeding stocks are therefore adequate, and recruitment is dependent only on environmental conditions each year.

Projected catch next season (2001):

465–700 tonnes whole weight

Using the November 2000 survey data, the projected catch range for 2001 is likely to be 465–700 tonnes whole weight and may exceed the historically acceptable range of catches. During the survey, several areas indicated reasonable levels of recruitment and higher catches are expected in 2001 compared to 2000.

NON-RETAINED SPECIES

Bycatch species impact: Low

The trawl fleet operates over a very small portion of the licensed fishing area, focusing on scallop aggregations on relatively bare sand habitat associated with this species. Owing to the focused nature of this fishery and the large mesh size (100 mm), little bycatch is taken during the typically short fishing season.

Protected species interaction: Low

Turtles occur in the Abrolhos Islands but are rarely taken during the short trawling season. Interaction with turtles is minimal and few other protected species occur in this area.

ECOSYSTEM EFFECTS

Food chain effects: Low

Due to the high natural variability of this scallop stock it is unlikely that any predators are fully dependent on this species.

Habitat effects: Low

The trawl areas associated with scallops are sandy habitats and these are not impacted significantly by trawl gear. An underwater survey was undertaken by Fisheries WA in 1994 to delineate trawlable habitats in the Abrolhos Islands and trawling is largely contained within these areas.

SOCIAL EFFECTS

This scallop fishery utilises large numbers of crew due to on-board processing during the short annual season. The estimated employment for the year 2000 was 180 skippers and crew.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year 2000: \$2.3 million

The estimated value of the catch has been based on the average wholesale price per kilogram obtained in the Shark Bay fishery, that is \$5.25/kg whole weight or \$26.25/kg meat weight. Meat weight is approximately 20% of the whole weight.

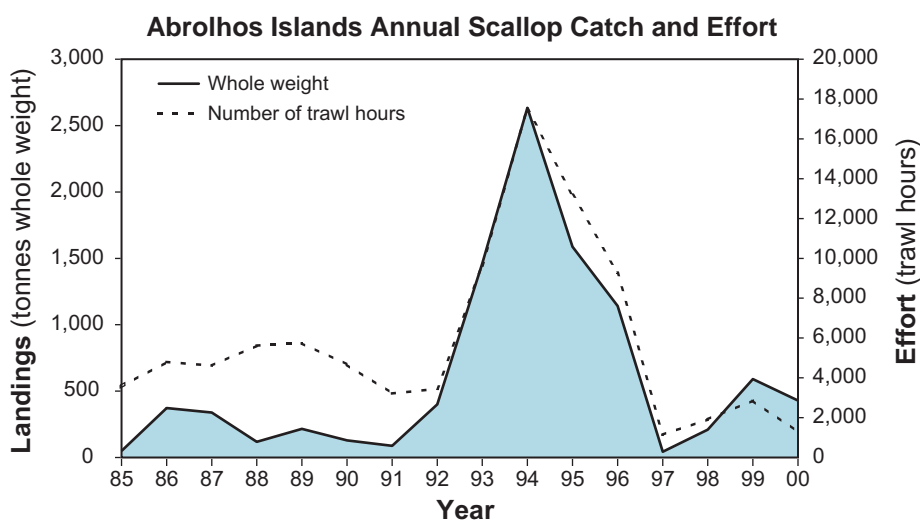
FISHERY GOVERNANCE

Acceptable catch range: 50–600 tonnes whole weight

Apart from the exceptional catches of the mid-1990s, which were due to unusual environmental conditions increasing the success of recruitment, the catch range for this fishery is expected to be in the range of 50–600 tonnes whole weight at the current level of permitted effort.

EXTERNAL FACTORS

This fishery is highly variable, being dependent on sporadic recruitment that is apparently strongly influenced by environmental conditions such as the Leeuwin Current. As more years of pre-season survey and catch/effort data become available, the relationship between environmental factors and recruitment will be further evaluated.



ABROLHOS ISLANDS SCALLOP FIGURE 1

Annual scallop landings for the Abrolhos Islands and Mid West Trawl Managed Fishery, 1985–2000.



Commercial Fisheries

South West Trawl Managed Fishery Status Report

Prepared by M. Kangas and E. Sporer

FISHERY DESCRIPTION

Boundaries and access

The boundaries of this fishery are 'all the waters of the Indian Ocean adjacent to Western Australia between 31°43'27" south latitude and 115°08' east longitude where it intersects the high water mark at Cape Leeuwin, and on the landward side of the 200m isobath'.

The area is further divided into four management zones, with a limited number of operators (indicated in brackets) permitted access to fish within each zone as follows:

- Zone A from 31°43'27" S to 32°16' S (3 boats)
- Zone B from 32°16' S to 115°08' E (12 boats)
- Zone C north-east of Cape Naturaliste (4 boats)
- Zone D Comet Bay off Mandurah (3 boats)

A total of 14 boats are licensed to operate in this fishery, some in more than one zone. Zone A, B and D boats may fish all year round. Seasonal access to Zone C occurs between 1 July and 30 September. Seven boats operated in the fishery during 2000.

Main fishing method

Otter trawl.

RETAINED SPECIES

Commercial production (season 2000):

Prawns 32 tonnes
Scallops 23 tonnes whole weight

Landings

The total landings for the season were 32 tonnes of western king prawns and 23 tonnes whole weight of scallops. The fishery also lands a mixture of by-product, of which the most abundant species recorded were 12 tonnes of western sand whiting, 6 tonnes of blue swimmer crabs, 2 tonnes each of sole, squid, and mixed skates and rays, and 1 tonne each of flounder and red mullet.

Fishing effort

Not assessed.

Catch rate

Not available.

Recreational component: Nil

Stock assessment complete: Not assessed

Exploitation status: Not assessed

Breeding stock levels: Not assessed

NON-RETAINED SPECIES

Bycatch species impact: Low

Trawling for scallops is focused on a few small offshore

areas, while the prawn catch is mainly taken from Comet Bay. An extensive study (Laurenson et al. 1993a) of the environmental effects of this fishery has shown that the fishery has minimal impact on bycatch species.

Protected species interaction: Negligible

Protected species susceptible to capture by trawling do not occur significantly in this fishing area.

ECOSYSTEM EFFECTS

Food chain effects: Low

The food chain effects are considered to be low owing to the low overall exploitation rate and the very small percentage (< 5%) of the fishing area within the legislated boundary that is trawled annually.

Habitat effects: Low

Laurenson et al. (1993a) consider that the fishery has minimal impact on the benthic sand habitats involved.

SOCIAL EFFECTS

The estimated employment for the year 2000 was 28 skippers and crew.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year 2000:

Prawns \$555,000
Scallops \$120,000

Prawns: Wholesale prices for prawns vary depending on the type of product and the market forces operating at any one time. Generally, prices for king prawns averaged \$17.30/kg.

Scallops: The estimated value of the catch has been based on the average wholesale price per kilogram obtained in the Shark Bay fishery, that is \$5.25/kg whole weight or \$26.25/kg meat weight. Meat weight is approximately 20% of the whole weight.

FISHERY GOVERNANCE

Acceptable catch range: Not available

EXTERNAL FACTORS

The level of fishing activity and quantity of catch within the South West Trawl Managed Fishery is variable. This variability has largely been driven by the level of scallop recruitment to these grounds and also the product price paid to fishers. The 2000 king prawn catch was significantly higher than in recent years, returning to the level of the mid-1990s.

South Coast Trawl Fishery Status Report

Prepared by M. Kangas and E. Sporer

FISHERY DESCRIPTION

Boundaries and access

Access to the south coast trawl zone is limited, with only four boats currently endorsed to take scallops in the fishery. These endorsements are governed by two fishing boat licence conditions. Condition 73 authorises the use of demersal trawl nets off the south coast of Western Australia in State waters east of 115° E longitude (Cape Leeuwin), while Condition 79 authorises demersal trawling for scallops within the Recherche Archipelago.

Main fishing method

Otter trawl.

RETAINED SPECIES

Commercial production (season 2000):
2,722 tonnes whole weight

Landings

The scallop catch of 2,722 tonnes whole weight was the highest recorded for this small fishery, with the previous highest catch being 138 tonnes whole weight in 1995. The south coast trawl fishery is principally a scallop fishery with only one licence holder reporting landings of mixed finfish, of which leatherjacket and redfish were the main species recorded.

Fishing effort

The annual effort expended in this scallop fishery is an outcome of initial fishing surveys used by operators to estimate stock abundance and likely benefits of continued fishing. As a consequence, the level of effort utilised each year closely follows stock abundance and catch levels.

Catch rate

Not available.

Recreational component: Nil

Stock assessment complete: Not assessed

Exploitation status: Not assessed

Breeding stock levels: Not assessed

NON-RETAINED SPECIES

Bycatch species impact: Low

The large-mesh (100 mm) trawl gear used in scallop fisheries takes minimal bycatch. The areas trawled by the fleet also represent a very small percentage of the fishing area within the legislated boundary, therefore bycatch species impact is considered to be minimal.

Protected species interaction: Negligible

Protected species susceptible to capture by trawling do not occur significantly in this fishing area.

ECOSYSTEM EFFECTS

Food chain effects: Low

The extremely variable recruitment and resultant fluctuating biomass of the scallops which occur in this area preclude the fishery having any significant impact on the general food chain in the region.

Habitat effects: Low

Trawling has minimal impact on the benthic sand habitats in this scallop fishery.

SOCIAL EFFECTS

The estimated employment for the year 2000 was 16 skippers and crew.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year (2000):
\$14.3 million

FISHERY GOVERNANCE

Acceptable catch range: Not available

EXTERNAL FACTORS

The level of fishing activity and quantity of catch within the south coast trawl is highly variable. This variability has largely been driven by the level of scallop recruitment to these grounds and also by the product price paid to fishers. The scallop catches in 2000 were very much higher than those seen in the fishery over the last 10 years, indicating a very strong settlement in the region.



Commercial Fisheries

West Coast Blue Swimmer Crab Fishery

MANAGEMENT SUMMARY

Blue swimmer crabs are found along the entire Western Australian coast and comprise the major proportion of inshore crab catches in Western Australia. They may be targeted by a variety of fishing gear. The primary methods used by commercial fishers targeting crabs are crab traps or drop nets. Crabs are also taken by trawl gear in several prawn and scallop trawl fisheries.

Commercial access to oceanic areas with abundant blue swimmer crab stocks is controlled under a series of separate management arrangements. In Cockburn and Warnbro Sounds, commercial access is managed under the provisions of the Cockburn Sound and Warnbro Sound (Crab) Management Plans. For the major fishery in Cockburn Sound, a review was carried out under the voluntary resource-sharing guidelines, resulting in amendments to the Cockburn Sound (Crab) Management Plan in 1999 and 2000 to incorporate the negotiated outcomes. These new management arrangements included an initial 20% 'across the board' crab pot reduction, an increase in the legal minimum size for crabs to 130 mm (for the commercial sector only), removal of gillnets as a permitted means of fishing, the introduction of a Fisheries Adjustment Scheme, and provision for non-transferable B Class licence holders to convert to A Class licences with a 50% reduction in crab pots. B Class licensees had until the commencement of the 2000/2001 fishing season to re-nominate as A Class licensees. These measures have seen the number of authorised crab pots reduced from 1,600 to 840. The daily permitted operating times have been adjusted to reflect the reduction and consolidation of pot numbers that has resulted from the recent management changes.

The use of crab traps in waters off Mandurah, Shark Bay and Geographe Bay is controlled under a variety of arrangements provided by way of subsidiary legislation under the *Fish Resources Management Act 1994*.

In the south and lower west coast estuaries set nets are still used. However, commercial crab fishing no longer occurs in the Leschenault Inlet, as this estuary was closed to all commercial fishing in the latter half of 2000, after a Voluntary Fisheries Adjustment Scheme removed all commercial operators. In the Mandurah Estuarine Fishery, crab traps are now the principal method used.

The total annual commercial catch of crabs is monitored through information provided by fishermen on their monthly catch and effort returns. Fishermen also provide more detailed information via a voluntary daily research logbook program.

In past years there has been significant competition for access to blue swimmer crabs in south-west estuaries and south-west oceanic waters between some commercial and recreational fishers. However, the decline in the number of commercial fishermen in the estuaries and the introduction of specific arrangements for commercial crab fishing in Geographe Bay has reduced the friction between the two sectors.

Following a statewide review of the inshore crab fishery in the years 1997 to 1999, recommendations for the future of the fishery were developed. The recommendations have been the subject of further input at the request of the Minister, pending the development of a final position on crab fishery management arrangements.

Governing Legislation/Fishing Authority

Cockburn Sound (Crab) Management Plan 1995
Warnbro Sound (Crab) Management Plan 1995

Consultation Process

Agency–industry meeting

RESEARCH SUMMARY

Research monitoring of the expanding fishing activity for blue swimmer crabs was initially based on monthly returns and interviews with commercial crab fishers. Following a rapid increase in commercial catches during the 1990s, combined with a high level of participation by recreational fishers, additional research became necessary to address key biological parameters and collect fishery information required for stock assessments in the future. A number of new research projects were instigated during 1997/98, with funding from the Fisheries Research and Development Corporation, under the umbrella of the national collaborative blue swimmer crab research initiative. This research on the basic biology of crabs along the WA coast, gear–catchability relationships, recreational catch surveys, commercial catch monitoring, discard mortality estimation and stock assessment modelling will be completed in 2000/2001. The following status report summarises the research findings for this fishery.

West Coast Blue Swimmer Crab Stock Status Report

Prepared by L. Bellchambers

FISHERY DESCRIPTION

Boundaries and access

Blue swimmer crabs inhabit coastal waters throughout Western Australia. The majority of commercially fished stock is concentrated in coastal embayments between the Peel/Harvey Estuary in the south and Shark Bay in the north. Blue swimmer crabs are found in a wide range of inshore and continental shelf areas, from the intertidal zone to at least 50 m in depth.

There are two managed commercial crab fisheries, namely the Cockburn Sound and Warnbro Sound (Crab) Managed Fisheries. The Cockburn Sound fishery includes all waters within a line drawn from South Mole at Fremantle to Stragglers Rocks, then through Mewstone to Carnac Island and Garden Island, along the eastern shore of Garden Island and back to John Point on the mainland. The Warnbro Sound fishery includes Warnbro Sound itself and adjacent waters, extending generally from Becher Point to John Point. One licence holder has access to the Warnbro Sound managed fishery, while access to the Cockburn Sound managed fishery is by 11 licence holders.

Licence holders in the Exmouth Gulf Beach Seine Fishery, Shark Bay Beach Seine and Mesh Net Managed Fishery, and estuarine fisheries south of latitude 32° S, are permitted to take blue swimmer crab by drop net or set net. Seven licence holders have been issued an exemption to take crabs using traps (40 traps each) in the waters of Geographe Bay. These exemptions expired on 31 December 2000.

Two commercial fishers are permitted to take crabs by traps (80 traps each) in the waters of Comet Bay. The Carnarvon Experimental Crab Trap Fishery is also continuing, with two fishers permitted to take crabs using 200 traps each. Exemptions to fish in the Carnarvon Experimental Crab Trap Fishery are granted on an annual basis. One Shark Bay beach seine fisher and one Cockburn Sound fisher are also permitted to take crabs using up to 200 traps each in Shark Bay. These two fishers have a long-standing and continuing history of targeting crabs in these waters.

Recreational fishers also take significant quantities of crabs, particularly in the south-west of the State. Surveys to estimate the recreational take have been undertaken for some regions during the past five years.

Main fishing method

Purpose-designed crab traps.

RETAINED SPECIES

Commercial production (season 1999/2000):
673 tonnes

Landings

A commercial catch of 673 tonnes of blue swimmer crab was taken in 1999/2000, 17% up on the 577 tonnes caught in the 1998/99 season. Commercial catches in Cockburn Sound contributed 305 tonnes (28% increase), while other areas making a substantial contribution to total landings were the Peel/Harvey Estuary (60 tonnes, 8% decrease) and Shark Bay (182 tonnes, 38% increase) (see Blue Swimmer Crab Figure 1).

Fishing effort

The commercial crab catch is made using a large variety of fishing methods (see Blue Swimmer Crab Figure 2). In the past year, traps took 85% of the commercial catch, while the balance of the catch was taken mostly by trawling (8.1%), gillnetting (4.6%) and drop netting (0.5%). Fishing effort overall increased by 7.6% for traps while decreasing by 3% for trawling, 4.2% for gillnets and 2% for drop nets in the last year. This continues the trend from the mid-1990s towards use of purpose-designed crab traps in commercial crab fishing.

Catch rate

Because of the variety of fishing methods in use and areas being fished, a single catch rate statistic has not been produced. Comparative rates are given here for the three areas contributing the majority of the blue swimmer crab catch for the past year. The catch rate using traps, in Cockburn Sound, increased by 36% compared with the previous season. In the Peel/Harvey Estuary, catch rates remained the same for traps but increased by 34% for

gillnets compared with the previous year. In Shark Bay, trap catch rates increased by 17.7%, whilst trawl catch rates decreased by 20.2%.

Recreational component: 40%

Recreational catches of blue swimmer crabs have been surveyed in the west coast bioregion, as reported in *State of the Fisheries 1999–2000*, and are estimated to be about 40% of the total catch. The recreational take was dominated by the catch from the Peel/Harvey Estuary.

Stock assessment completed:

Preliminary assessment

A preliminary assessment has been made using catch rates for traps and gillnets. Trap catches show an increase between 1993/94 and 1997/98 and again in 1999/2000. The increases have been accompanied by an increase in overall effort. A slight decline in catches and catch rates was observed in 1998/99 (Blue Swimmer Crab Figure 3), but generally catch rates (kg/traplift) have remained relatively stable over the last eight years, with no trend evident at this stage.

Exploitation status: Not assessed

Breeding stock levels: Adequate

As the legal size at first capture is well above the size at maturity in all sectors of the fishery, the breeding stock levels are expected to be adequate to maintain stocks in all current fishing areas.

NON-RETAINED SPECIES

Bycatch species impact: Low

The shift from using gillnets to traps in most areas has resulted in a substantial reduction in bycatch from crab fishing. Discarded bycatch from trawl fisheries taking crabs as a by-product is dealt with in those specific reports.

Protected species interaction: Low

The crab trap longline system utilised in the targeted crab fisheries has little possibility of interacting with protected species. Bycatch reduction devices are currently being trialled in Western Australian trawl fisheries, mainly to reduce the take of sharks and rays, which damage the quality of the target catch.

ECOSYSTEM EFFECTS

Food chain effects: Low

As the commercial take of crabs represents a relatively small portion of the biomass, which is effectively renewed annually, secondary food chain effects are likely to be minimal in these fisheries.

Habitat effects: Negligible

Fishing with traps results in limited habitat disturbance, with only minor dragging of traps on the bottom during trap retrieval.

SOCIAL EFFECTS

Approximately 43 people are employed as skippers and crew on vessels fishing for blue swimmer crabs at various



Commercial Fisheries

locations along the west coast from Geographe Bay in the south to Shark Bay in the north.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year (1999/2000): **\$2.9 million**

The catch was valued at approximately \$2.9 million in 1999/2000, with most of the product going to local and interstate markets.

FISHERY GOVERNANCE

Acceptable catch range: **600–800 tonnes**

Commercial catches are expected to be in the range 600–800 tonnes, based on catches in the last three years.

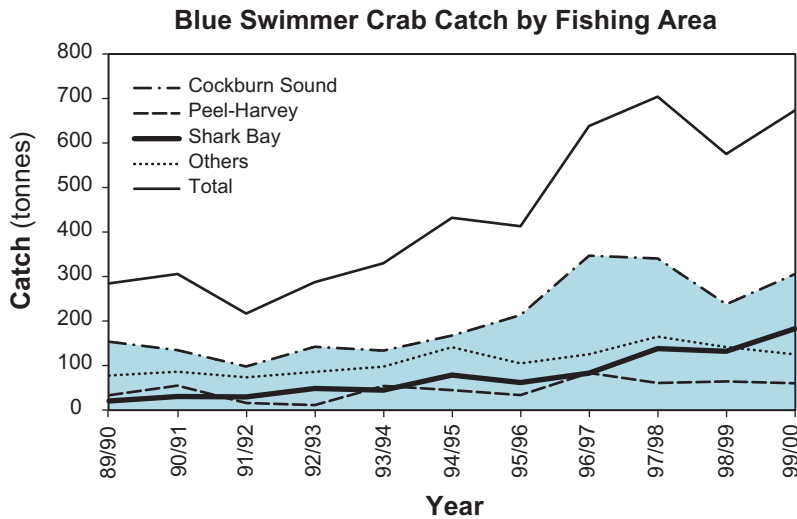
For the managed fishery in Cockburn Sound the commercially acceptable range for the current management regime is approximately 200–350 tonnes, based on catches in the last five years.

There is also interest in expanding the blue swimmer crab fishery into currently unexploited grounds in the north of the state such as Exmouth Gulf and Nickol Bay. Acceptable catch rates for these areas are not available as yet due to the lack of commercial fishery data.

EXTERNAL FACTORS

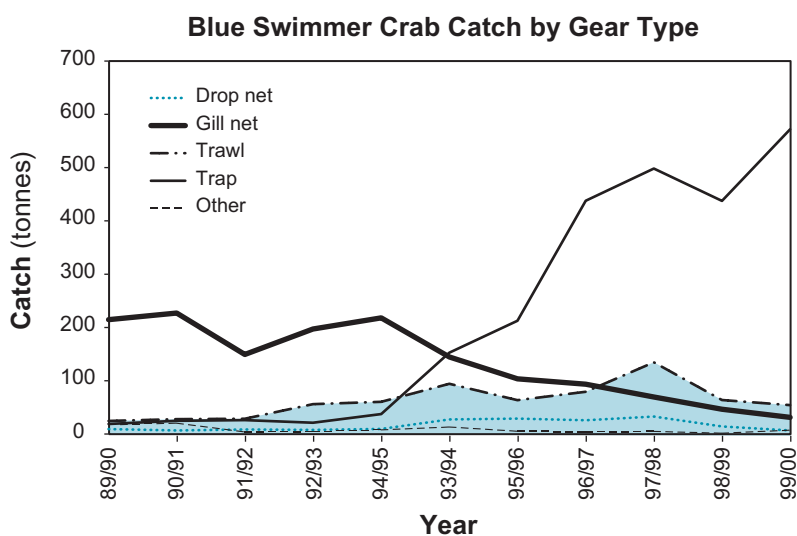
The commercial fishery has been expanding in the last few years as the main commercial sectors converted from set nets to dedicated crab traps, and there is still potential for future commercial expansion in areas not currently exploited. Currently, new commercial fishing grounds are being explored along the State's northern coastline. This will allow the further expansion of blue swimmer crab catches without impacting on the more heavily fished south-western areas of the State where recreational and commercial conflicts are a concern.

The commercial pressure on stocks in these areas, together with increasing demand from the recreational sector, has resulted in a number of management changes to maintain catch shares between the two sectors, such as the Cockburn Sound catch share arrangement. Given this pressure from both the commercial and recreational sectors of this fishery, catch allocation has become a major issue and there is research planned to review these arrangements in both Cockburn Sound and Geographe Bay.



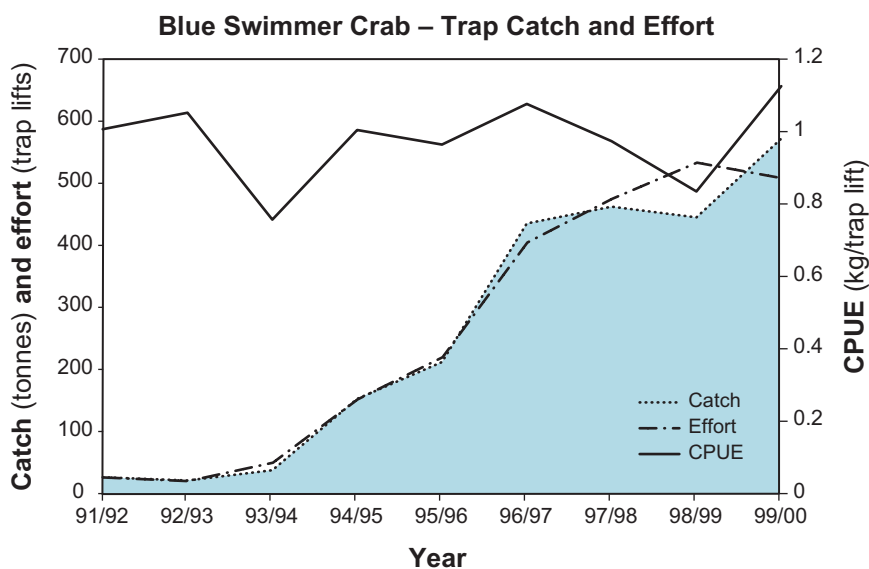
BLUE SWIMMER CRAB FIGURE 1

Commercial catch history for the blue swimmer crab (*Portunus pelagicus*) in Western Australia between 1989/90 and 1999/2000, indicating main areas of commercial fishing.



BLUE SWIMMER CRAB FIGURE 2

Blue swimmer crab catch taken by different gear types in Western Australia during the period 1989/90 to 1999/2000.



BLUE SWIMMER CRAB FIGURE 3

Blue swimmer crab catch (kg), effort (trap lifts) and catch per unit effort (kg/trap lift) in Western Australia during the period 1991/92 to 1999/2000 using traps.



Commercial Fisheries

West Coast Estuarine Fisheries

MANAGEMENT SUMMARY

There are four restricted entry estuarine fisheries operating in the metropolitan and south-western regions of the Western Australian coastline, as follows:

- Swan/Canning Estuarine Fishery
- Mandurah Estuarine Fishery (Peel/Harvey Estuary)
- Leschenault Estuarine Fishery
- Hardy Inlet Estuarine Fishery

Management arrangements include gear restrictions, seasonal and time closures, area closures and boat restrictions. Many of the seasonal and time closures are designed to provide spatial separation between user groups and equitable sharing arrangements for the fish resource.

Estuarine fishing areas, fishing practices and resource-sharing issues are increasingly becoming the subject of community interest. In order to maintain a basic level of commercial presence and production while encouraging a resource shift towards the recreational sector, a number of Voluntary Fisheries Adjustment Schemes (VFAS) have been run in the last five years. The outcome of these schemes has been a significant reduction in the number of commercial fishing units in these estuarine fisheries, with 7 fishing units being withdrawn in 2000/2001 (Peel/Harvey – 1, Leschenault – 6). The VFAS in the Leschenault Inlet has resulted in all commercial fishing units being removed. The number of fishing units remaining for each fishery as at 30 June 2001 is Swan/Canning – 4, Peel/Harvey – 8, Hardy Inlet – 1, Leschenault – 0.

Management of these fisheries continues under the policy directions set by the Integrated Fisheries Management Strategy (Fisheries WA 1999b). This paper proposes a target (or optimum) number of fishing units that should be attained in each fishery before transferability is considered.

In 2000/2001, there was continued industry and public consultation as part of the review of the west coast estuarine fisheries and development of the Integrated Fisheries Management Strategy. In support of these initiatives, a management paper is being prepared recommending specific management options for these fisheries. It is anticipated that this management paper will be released for further consultation with client groups and interested parties in 2001/02.

Governing Legislation/Fishing Authority

Fishing Boat Licence Condition 19
Commercial Fishing Licence Condition 17
Various orders under Section 43 of the *Fish Resources Management Act 1994* (closed waters and permitted gear)

Consultation Process

Agency–industry meetings

RESEARCH SUMMARY

Research monitoring of fisheries and fish stocks in the west coast estuaries is primarily based on catch and effort statistics (CAES) returns provided by industry.

These data are interpreted using the extensive scientific knowledge of the fish stocks in estuaries derived from research by Fisheries WA and Murdoch University scientists during the 1970s and 1980s. This database from commercial fishermen has provided a valuable and consistent source of information for monitoring recreationally important stocks where they are harvested by both groups.

The following status report summarises the research findings for these fisheries.

West Coast Estuarine Fisheries Status Report

Prepared by S. Ayvazian and G. Nowara

FISHERY DESCRIPTION

Boundaries and access

Swan/Canning: level of access – 4 units
Peel/Harvey: level of access – 9 units
Leschenault: level of access – 6 units
Hardy Inlet: level of access – 1 units

The levels of access listed above are as at April 2000. Unit holders in the four west coast estuaries are endorsed to fish a single west coast estuary system only.

The status of the fishery in each of the above estuaries is reviewed annually. Please note, where fewer than five fishers are actively involved in a particular fishery, the data are subject to the Fisheries WA confidentiality policy as it relates to the *Fish Resources Management Act 1994* and are not reported. This report presents information for three of the most valuable finfish species from the west coast estuaries, namely black bream, cobbler and whiting. These stocks are not subject to specific management plans, but are exploited as a part of the larger estuarine fishery.

Main fishing method

Gillnet/haul net.

RETAINED SPECIES

Commercial production (season 2000): 305 tonnes

Landings

The total landings of 305 tonnes from west coast estuaries include the following catches of key target species:

| | |
|----------------------|-------------|
| Sea mullet | 88.8 tonnes |
| Blue swimmer crabs | 73.0 tonnes |
| Yellow-eye mullet | 48.3 tonnes |
| Western sand whiting | 36.2 tonnes |
| Cobbler | 5.0 tonnes |
| Tailor | 9.6 tonnes |
| Perth herring | 9.3 tonnes |

| | |
|---------------------|-------------|
| Australian herring | 8.5 tonnes |
| King George whiting | 7.0 tonnes |
| Black bream | 5.0 tonnes |
| Other species | 14.3 tonnes |

Swan/Canning: The 2000 catch was a further decrease from the 1999 catch figure and continued the overall decline in catches during the 1990s (actual figure not available as there were fewer than five operators). The catch from the Swan/Canning during 2000 was composed primarily of blue swimmer crab, sea mullet and Perth herring, with small quantities of black bream, Australian herring, and yellow-eye mullet.

Peel/Harvey: Reported catches in the Peel/Harvey Estuary over the past 25 years are shown in West Coast Estuarine Figure 1. The total catch for 2000 of 192.1 tonnes was a decrease from the 1999 catch figures. While there was little variation in the catches during the early 1990s, there has been a dramatic decline since 1998. Approximately 62% of the finfish catch was comprised of sea mullet and yellow-eye mullet during 2000. Approximately 32% of the total 2000 catch was comprised of blue swimmer crabs.

Leschenault: The total catch for 2000 showed a decrease from the 1999 value (actual figure not available as there were fewer than five active operators). While the overall total catches over the past 25 years display a declining pattern, the catches during the past decade remained fairly stable until 1998 when they began to decline. Sea mullet and western sand whiting dominated the finfish catch. Approximately 1% of the total 2000 catch was comprised of blue swimmer crabs.

Hardy Inlet: The 2000 catch remained stable from the previous year (actual figure not available as there were fewer than five operators). The majority of the catch was composed of western sand whiting, sea mullet and yellow-eye mullet. There were no reported catches of blue swimmer crabs in 2000.

Key indicator species

Black bream: Catches of black bream were reported from the Swan/Canning Estuary, the Peel/Harvey Estuary and the Hardy Inlet during 2000, with an insignificant quantity from the Leschenault Inlet. The reported catches from the Swan/Canning and Peel/Harvey Estuaries and Hardy Inlet showed an increase from the 1999 catches, while the reported catch from Leschenault Inlet declined from 1999.

Cobbler: Catches of cobbler were reported from all four estuaries during 2000. The reported catches of cobbler in the Swan/Canning Estuary have been declining from the late 1980s, with 2000 being the lowest on record. The 2000 catches in the Peel/Harvey Estuary have decreased to approximately half of the 1999 levels. In the Leschenault Inlet, the reported catch in 2000 continued to decline from mid-1990s values. There was a small catch reported from the Hardy Inlet for 2000.

King George whiting: King George whiting catches for 2000 were reported from the Swan/Canning and Peel/Harvey Estuaries, with the majority coming from

Peel/Harvey. Total annual catches from these estuaries declined to half of the 1999 value, noting that high catches in the late 1990s appear to have resulted from an above-average recruitment into these estuaries.

Fishing effort

Fishing effort has been reported as the average number of boats fishing per month. This measure of effort provides a general indication of effort changes over time. In most of these fisheries, the general licence buy-back scheme applying to commercial fishing licences has resulted in a decline in effort and hence reduced catches.

Swan/Canning: The general trend in effort has been a decrease in the mean monthly number of fishing units from around 25 in the mid-1970s to four in 2000. There has been a 33% reduction in the number of fishing units from 1999.

Peel/Harvey: Fishing effort remained at fairly constant levels during the 1990s after a rapid decline during the 1970s and 1980s (West Coast Estuarine Figure 1). There has been a decline in the mean monthly number of fishing units from approximately 40 in the early 1970s to the current level of nine boats actively fishing, and the number of units in 2000 has decreased by 26% from the previous year.

Leschenault: The general overall trend has been a decline in the mean monthly number of fishing units from approximately 10 in the 1970s to the current level of four units actively fishing in 2000.

Hardy Inlet: Fishing effort (mean monthly number of fishing units) in the Hardy Inlet has declined from three in the 1970s to the current level of only one unit operational in 2000, a decrease from two in 1999.

Catch rate

Swan/Canning: While the annual values of the catch per unit effort (CPUE) for the finfish fishery in the Swan/Canning Estuary have varied over the past 15 years, the overall catch rate trend generally has been stable, as a result of reduced effort and corresponding reductions in catch. While targeted fishing effort cannot be determined for individual stocks, the general stability of the overall CPUE suggests the abundance of the suite of species which make up the overall catch has remained constant.

Peel/Harvey: The catch rate has followed the catches in this fishery. After a sharp decline in 1989 the CPUE has remained relatively stable during the past 10 years. The 2000 CPUE has decreased slightly from the 1999 values. While targeted fishing effort cannot be determined, the general stability of the overall CPUE over this period suggests the abundance of the suite of species which make up the overall catch has remained constant, although it should be noted that it is significantly lower than the average catch rates experienced during the 10-year period between 1975 and 1985.

Leschenault: The overall trend since the late 1980s has been a stable catch rate, with some annual variation, generally following the fluctuations in catches. The 2000 CPUE has increased slightly from 1999 CPUE levels.



Commercial Fisheries

While targeted fishing effort is not reported, the general stability of the overall CPUE suggests the abundance of the suite of species which make up the overall catch has remained constant.

Hardy Inlet: Since the early 1990s the trend in the CPUE has generally followed the fluctuations in the catches. The 2000 CPUE has decreased slightly from the 1999 value.

Recreational component:

Overall percentage not assessed

Swan/Canning: A 1998/99 survey (Malseed and Sumner 2001) estimated the boat- and shore-based catch of the top five recreational finfish species in the Swan and Canning estuaries (tailor, whiting other than King George whiting, Australian herring, black bream and flathead) at about 3 tonnes. The commercial catches of the top five recreational species were of a similar magnitude to the recreational catches, but explicit data are not available for publication as fewer than five operators landed these species. This estimate of the recreational catch will be an under-estimate, as the survey covered only the estuary basin, excluding upstream areas where most of the black bream catch occurs. In addition to the finfish catch, recreational fishers also took about a quarter of the crab catch when surveyed in 1998/99.

Peel/Harvey: A 1998/99 survey (Malseed and Sumner, in press) estimated the boat- and shore-based recreational catch of key finfish species (Australian herring, tailor, King George whiting, whiting other than King George whiting, black bream and skipjack trevally) from the Peel/Harvey Estuary at 8 tonnes. This represents approximately 17% of the combined recreational and commercial take of these species in that year. These recreational finfish estimates can be regarded as the minimum taken, as the survey design focused on crab fishing times and locations. The recreational sector also took about 80% of the crab catch from the estuary in 1998/99.

Leschenault: Results from the recreational survey of the Leschenault Inlet in the 1998 calendar year (Malseed et al. 2000) indicated that boat- and shore-based catches of key recreational finfish species (tailor, King George whiting, whiting other than King George whiting and Australian herring) totalled less than one tonne. This represents about 9% of the combined recreational and commercial catch of these species in 1998. These figures represent minimum estimates of finfish taken recreationally from the Leschenault Inlet, noting that the focus of the survey was crabbing. The recreational sector took about 90% of the crabs in the survey year.

Stock assessment completed:

Yes

Preliminary assessments have been completed for select targeted species only (black bream, cobbler and King George whiting).

Black bream: Black bream populations are genetically unique within each west coast estuary. A preliminary yield-per-recruit stock assessment was developed for the black bream (*Acanthopagrus butcheri*) stock in the Swan

River using biological data for the Swan River population from research by Sarre (1999), the results of which were presented in the *State of the Fisheries Report 1999–2000*. No additional information is available.

Cobbler: Cobbler populations are genetically unique within each west coast estuary. A preliminary yield-per-recruit stock assessment was developed for the cobbler (*Cnidogobius macrocephalus*) stock in the Swan River using biological data for Swan River cobbler from research by Nel (1983), the results of which were presented in the *State of the Fisheries Report 1999–2000*. At this time, age structure information is not available to determine the current level of fishing mortality. Considerable research was conducted on the cobbler during the 1980s and early 1990s. From this work the current legal minimum length of 430 mm was set. Since that time there has been little research directed at this species. Cobbler catches have remained low during the 1990s, except for a peak in 1995. These low commercial catches reflect the lower number of fishers operating in the estuaries, but may also reflect a decline in the stock due to reduced availability/quality of estuarine habitat.

King George whiting: King George whiting spend the early part of their life history (1–3 years) in estuaries before migrating to offshore reef areas at about age 4 where they grow to maturity and breed. They are most vulnerable to capture while residing in the estuaries. The results of a preliminary yield-per-recruit stock assessment which was conducted for King George whiting (*Sillaginodes punctata*) along the lower west coast using biological data from research by Hyndes et al. (1998) and Potter et al. (1997) were reported in the *State of the Fisheries Report 1999–2000*. The lower catches of King George whiting during 1999 and 2000 appear to be due to lower recruitment generally and the maturing and offshore movement of the fish previously recruited.

Exploitation status:

Fully exploited

Breeding stock levels:

Not assessed

Black bream: A preliminary egg-per-recruit model was developed for the black bream stock in the Swan River using biological data for the Swan River population from research by Sarre (1999), the results of which were presented in the *State of the Fisheries Report 1999–2000*. Because the size at maturity is less than the legal minimum length, breeding stock levels are believed to be adequate. Black bream possess different growth rates in different estuaries. In all cases, the legal minimum length is set above the length at maturity.

Cobbler: A preliminary egg-per-recruit model was developed for the cobbler stock in the Swan River using biological data for the Swan River population from research by Nel (1983), the results of which were presented in the *State of the Fisheries Report 1999–2000*. As the size at maturity is less than the legal minimum length, breeding stock levels are believed to be adequate. Cobbler exhibit different growth rates depending on the estuary in which they reside. In all cases the size at maturity is less than the legal minimum total length affording protection to the breeding stock.

King George whiting: The age of King George whiting at first capture is 2+ to 3+ years at approximately 250 mm length. The length at 50% maturity is 413 mm for females. King George whiting breed in the open ocean at age 4, with juveniles using estuaries and coastal waters as nursery habitats for the first few years of their life. Because the legal minimum length is considerably less than the size at maturity, extra care needs to be taken to ensure overall fishing mortality does not exceed safe limits.

NON-RETAINED SPECIES

Bycatch species impact: **Low**

These small-scale, multi-species fisheries using mesh nets are unlikely to generate significant impacts such as discarding, as virtually all species taken are marketed in the greater metropolitan area.

Protected species interaction: **Negligible**

No protected species occur in these fisheries which are susceptible to capture by the fishing gear used.

ECOSYSTEM EFFECTS

Food chain effects: **Not assessed**

Habitat effects: **Low**

The operation of the gillnets and haul nets over predominantly sand and mud bottoms is unlikely to have any impact on the habitat of these estuaries.

SOCIAL EFFECTS

During 2000, there was an average of about 44 fishers operating in west coast estuarine fisheries.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year (2000):
\$0.91 million

FISHERY GOVERNANCE

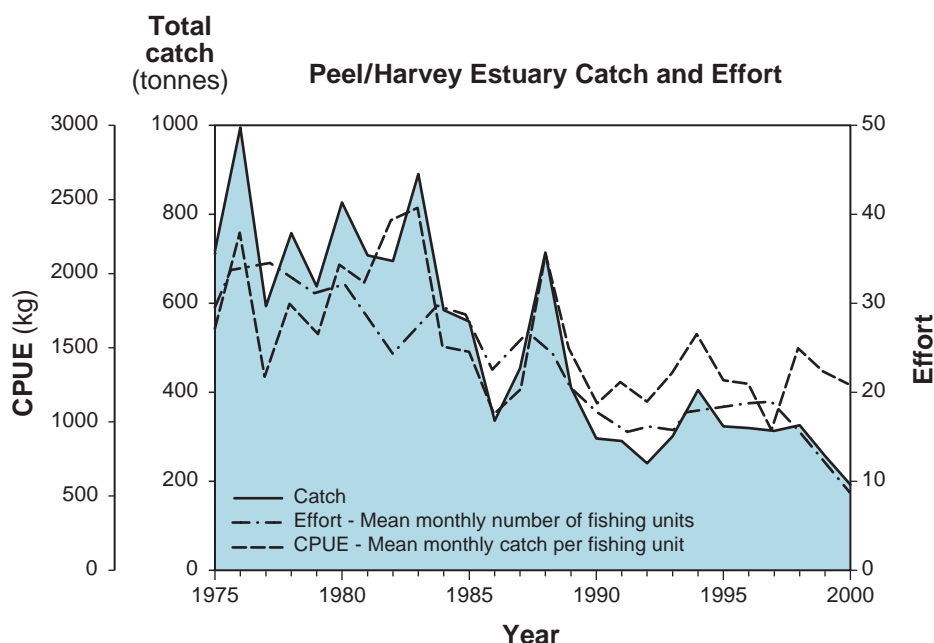
Acceptable catch range: **Not available**

The appropriate ranges cannot be assessed at this time owing to the limited data available from the decreasing number of commercial fishers.

EXTERNAL FACTORS

The estuarine catches for 2000 have generally been lower than in previous years. This appears to be related to a decline in the mean monthly number of boats actively fishing in all three estuaries. These reduced levels of fishing activity as a result of voluntary buy-back of commercial access will almost certainly render these commercial catch and effort data sets less useful in assessing the status of estuarine species in future years. For example, this will be the last year of reporting of the Leschenault commercial catches, as all the fishing licences have now been bought back under the Voluntary Fisheries Adjustment Scheme.

This will necessitate far greater reliance on the recreational sector and/or independent surveys to provide data that can be used to determine the status of our important estuarine fish and crustaceans. In addition, even greater cooperation will be required from the remaining commercial fishers to provide information on targeted fishing effort and catches needed to develop a catch curve for these species. Additional information to support this assessment process will be collected as a part of the FRDC-funded project to develop a methodology for a long-term annual index of recruitment for finfish species from south-western Western Australia.



WEST COAST ESTUARINE FIGURE 1

The annual catch, effort and catch per unit effort (CPUE) for the total fishery of the Peel/Harvey Estuary over the period 1975–2000.



Commercial Fisheries

Lower West Coast Beach and Embayment Fisheries

MANAGEMENT SUMMARY

Within this sector there are five managed fisheries focused mainly in the Cockburn Sound area, details of which are listed below.

West Coast Beach Bait (Fish Net) Managed Fishery:

There are 11 licensees in this fishery. Small pelagic fish are taken primarily by the beach seine method within the coastal waters between the mouth of the Moore River, north of Perth, and Tim's Thicket, south of Mandurah.

Continuation of beach access remains the main management issue relevant to this fishery, particularly where coastal developments restrict vehicle access.

Management of beach seining activities further south will be examined in a review of south-west beach seine access arrangements.

The major target species for these fisheries is whitebait, *Hyperlophus vittatus*, with small quantities of other species being taken.

As the whitebait stock in the south-west of Western Australia is found mainly in a thin coastal strip close to the coast and the stock size is relatively small, the exploitation rate by commercial fishers should not be permitted to increase above current levels.

Cockburn Sound (Crab) Managed Fishery: See West Coast Blue Swimmer Crab Stocks, p. 18.

Cockburn Sound (Fish Net) Managed Fishery: There are two licence holders in this fishery. Fish are taken by gillnet, beach seine and haul net. The main species targeted are garfish and Australian herring. Other fish species including shark, whiting and mullet are taken opportunistically.

The catch of garfish and Australian herring has been rising steadily since the 1970s. The rate at which the catch of these two species is increasing is of some concern as they are both important recreational species.

Cockburn Sound (Mussel) Managed Fishery: There are two licensees with access to this fishery. Fishing activity in the wild capture fishery was very low due to the integration of the fishery with the mussel aquaculture operations in Cockburn Sound.

Cockburn Sound (Line and Pot) Managed Fishery: There are currently 25 licensed fishers in this fishery, although not all licensees exercise their fishing entitlement. Reductions in the number of licensees have come about, in part, through the Fisheries Adjustment Scheme for the Cockburn Sound (Crab) Managed Fishery, where all licences associated with fishing units exiting through the scheme were surrendered.

The fishing methods employed include handline, longline and squid jigging; the pots used are unbaited octopus pots. Many of the species targeted by this fishery are also

targeted by recreational fishers, e.g. shark, pink snapper, garfish and Australian herring.

Commercial landings of King George whiting, western sand whiting, squid and octopus from Cockburn Sound have declined in recent years. Possible reasons may include environmental factors, fishing pressure and market-driven forces, or a combination of these factors. While Fisheries WA remains cautious about this trend, the underlying reasons for these declines are yet to be revealed.

Governing Legislation/Fishing Authority

West Coast (Beach Bait) Management Plan 1995
Cockburn Sound (Crab) Management Plan 1995
Cockburn Sound (Fish Net) Management Plan 1995
Cockburn Sound (Mussel) Management Plan 1995
Cockburn Sound (Line and Pot) Management Plan 1995
Warnbro Sound Crab Management Plan 1995
Relevant Managed Fishery Licence

Consultation Process

Agency–industry meetings

RESEARCH SUMMARY

Data for monitoring the status of the various coastal stocks exploited in the southern half of the west coast bioregion are obtained primarily from the CAES records provided by industry. These data, together with biological knowledge from historical research, provide the basis for the following two status reports.

Cockburn Sound Finfish Fisheries Status Report

Prepared by S. Ayvazian and G. Nowara

FISHERY DESCRIPTION

Boundaries and access

There are four managed fisheries which operate wholly and two managed fisheries which operate partly within Cockburn Sound. The Cockburn Sound (Mussel, Crab, Fish Net, and Line and Pot) Managed Fisheries operate entirely within Cockburn Sound, while the West Coast Beach Bait (Fish Net) and the West Coast Purse Seine Managed Fisheries operate partly within Cockburn Sound.

The gillnetting, crab netting (and potting), mussel diving and line and pot fisheries are all restricted to the waters of Cockburn Sound. The catches in this report are for finfish only and are mainly from the Cockburn Sound (Line and Pot) and the Cockburn Sound (Fish Net) Managed Fisheries. As at May 2000 there were two licensees in the fish net fishery and 26 licensees in the line and pot fishery.

Separate status reports are given elsewhere in this volume for the West Coast Beach Bait, West Coast Purse Seine, mussel and crab fisheries (see pp. 29-31, 31-4, 158 and 18-21 respectively).

Main fishing method

Gillnet (set net), haul net, handline, octopus pot, beach seine and purse seine.

RETAINED SPECIES

Commercial production (season 2000): 55.7 tonnes

Landings

The total catch of finfish from Cockburn Sound reported here excludes bait fish (whitebait, pilchard, scaly mackerel, anchovy and blue sprat), molluscs and crustaceans. The reported catch is primarily from the Cockburn Sound (Line and Pot) and the Cockburn Sound (Fish Net) Managed Fisheries; however, the figures include the catch of finfish, other than those five species mentioned above, recorded from the West Coast Beach Bait (Fish Net) and the West Coast Purse Seine Managed Fisheries, which conduct part of their respective operations within Cockburn Sound.

From the early 1990s the finfish catches increased to a peak catch in 1992 and then declined to 60.1 tonnes in 1998. This rose sharply to 90.9 tonnes in 1999. However the current 2000 catch represents a decline to 55.7 tonnes (Cockburn Sound Figure 1). The composition of the 2000 catch included over 20 finfish and elasmobranch species. Over 80% of the total catch was comprised of sea garfish, Australian herring (14.2 tonnes), pink snapper and sea mullet (2.8 tonnes).

The catch of sea garfish increased steadily from 1980 to a high level in 1994, after which time the catch declined, with a substantial drop in 1997. The catch peaked again in 1999; however, the current catch has declined (actual figures are not available as there are fewer than five operators catching this species).

Australian herring catches showed a steady increase from 1980, reaching a peak in 1994 (around 50 tonnes). Since that time, catches have declined significantly. The catch for 2000 was 14.2 tonnes (Cockburn Sound Figure 2).

Fishing effort

The fishing effort is measured as the number of fishing boat days for finfish catches (excluding purse seine and pot catches) from the Cockburn Sound (Line and Pot) and the Cockburn Sound (Fish Net) Managed Fisheries (Cockburn Sound Figure 1). This provides only an indication of the overall usage of the area by the commercial sector, which is composed of a number of different fisheries and various fishing methods.

The fishing effort peaked during the early 1990s at 1,400–1,600 boat days. It declined to 882 boat days in 1997, rose to 1,562 boat days for 1999 and subsequently declined to 1,060 boat days for 2000.

Catch rate

The catch rate for the different fisheries and the various fishing methods has averaged around 80 kg/boat day during the past 10 years (Cockburn Sound Figure 1). The peak catch rate during the 1990s was 101.8 kg/boat day in 1992 and the lowest reported catch rate was 43.4 kg/boat day in 1990. The 2000 catch rate was 52.6 kg/boat day. The 2000 catch rate for Australian herring was 13.4 kg/boat day (Cockburn Sound Figure 2).

Recreational component: 45% (approx.)

A 12-month survey of boat-based recreational fishing in coastal waters from Augusta to Kalbarri was conducted

during 1996/97 (Sumner and Williamson 1999). Catch and effort data collected as part of this survey identified the key recreational species in Cockburn Sound as Australian herring, King George whiting, other whiting, skipjack trevally, tailor and garfish. The estimated catch of these species was 39 tonnes. During the calendar year of 1997, the commercial catch of the same species in Cockburn Sound was approximately 45 tonnes. The recreational fishery therefore takes approximately 45% of the combined recreational and commercial catch of these key recreational finfish species. In addition, the recreational sector took about 5% of the crab catch from the area.

Stock assessment completed: Not assessed

Exploitation status: Not assessed

Breeding stock levels: Adequate for herring
See Australian Herring Stock Status Report, pp. 107-9.

NON-RETAINED SPECIES

Bycatch species impact: Low

This small-scale, multi-species fishery using line and mesh nets to target primarily surface species is unlikely to generate significant impacts such as discarding, as virtually all species taken are marketed in the metropolitan area.

Protected species interaction: Not assessed

ECOSYSTEM EFFECTS

Food chain effects: Not assessed

Habitat effects: Low

The fishing methods used in this fishery do not impact on the habitat.

SOCIAL EFFECTS

During 2000, the average number of crew fishing for finfish in the Cockburn Sound (Line and Pot) Managed Fishery and Cockburn Sound (Fish Net) Managed Fishery was approximately 22. Production supplies restaurant and retail sectors in the metropolitan area.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year (2000): \$142,000

While relatively limited in overall value, the production from the commercial fishery provides a valuable input to the metropolitan fresh fish trade.

FISHERY GOVERNANCE

Acceptable catch range: 40–95 tonnes

The expected catch range under the current management regime is 40–95 tonnes of finfish. This projection is derived by double exponential smoothed forecasting of the annual catches to 1998 and the variation of observations around the predictions. The confidence intervals are set at 80%. The current annual catch is within the acceptable catch range. Future annual catch values which fall outside of this range will be investigated. Where consecutive values occur outside of the range, management arrangements may need to be reviewed.

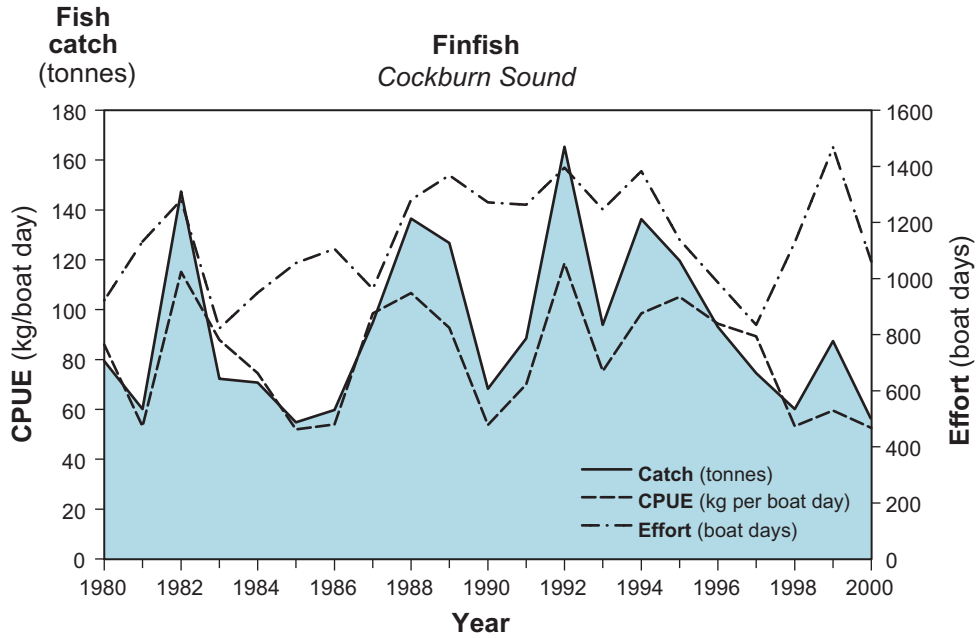


Commercial Fisheries

EXTERNAL FACTORS

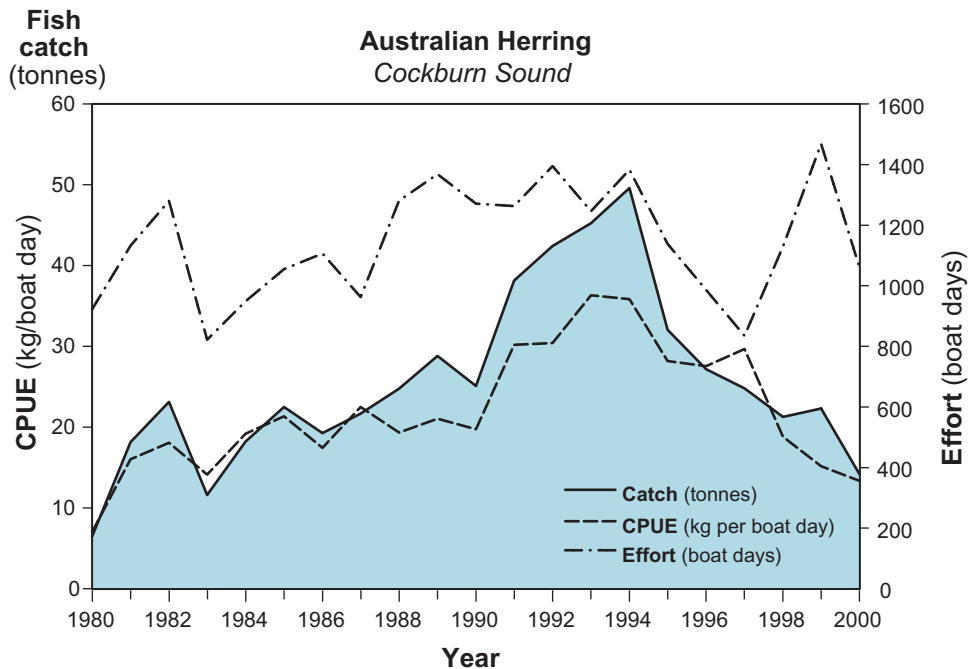
Catch information from the small commercial sector provides a valuable input to the research database for monitoring the abundance of these stocks, which are also

important to recreational fishing. However, the gradual decline in numbers of commercial fishers in recent years may render the catch statistics less useful in future.



COCKBURN SOUND FIGURE 1

The annual catch, effort and catch per unit effort (CPUE) for finfish (excluding bait fish) for the Cockburn Sound fisheries over the period 1980–2000.



COCKBURN SOUND FIGURE 2

The annual catch, effort and catch per unit effort (CPUE) for Australian herring (*Arripis georgiana*) in the Cockburn Sound fisheries over the period 1980–2000.



West Coast Beach Bait (Fish Net) Managed Fishery Status Report

Prepared by G. Baudains and D. Gaughan

FISHERY DESCRIPTION

Boundaries and access

The West Coast Beach Bait (Fish Net) Managed Fishery primarily targets whitebait (*Hyperlophus vittatus*). Because this species is also the primary target south of the managed fishery boundary, the catches of south-west beach seiners have been included in this status report.

The West Coast Beach Bait (Fish Net) Managed Fishery extends from the mouth of the Moore River, north of Perth, to Tim's Thicket in the south, with access currently via limited entry licence. The south-west beach seine fishing activities, also targeting whitebait, occur from Tim's Thicket south to Point D'Entrecasteaux, with activity typically concentrated in Geographe Bay (Cape Naturaliste to Preston Beach). While the management arrangements for this 'southern whitebait fishery' have yet to be finalised, a discrete group of fishers is endorsed to operate in this area using similar methods to the managed beach bait fishers in the metropolitan and Mandurah areas.

Main fishing method

Beach seine net.

RETAINED SPECIES

Commercial production (season 2000):

All species 336 tonnes
Whitebait 240 tonnes

Landings

The main target species in this fishery is whitebait, of which 240 tonnes were caught in the 2000 season. The catches of all other species landed in this fishery, which amounted to 96 tonnes, are shown in West Coast Beach Bait Tables 1 and 2. Sea mullet and Perth herring dominated the remainder of the catch.

Catches of whitebait are discussed here according to the region in which they were landed. Metropolitan and Mandurah landings are from the managed fishery, while Bunbury landings are from the south-west beach seine fishing.

Metropolitan: The catch of whitebait for the metropolitan region during 2000 was 32.1 tonnes, a major increase from the average of 20.3 tonnes over the previous three years (West Coast Beach Bait Figure 1).

Mandurah: The whitebait catch at Mandurah (33.6 tonnes) again narrowly exceeded that for the metropolitan region in 2000.

Bunbury: The Bunbury catch almost doubled this year to 174.8 tonnes from the 96 tonnes caught in 1999 (West Coast Beach Bait Figure 1).

Fishing effort

Given the schooling behaviour of whitebait and most of the other retained species, and the targeting of schools by

fishermen, the catch and effort data from this fishery does not provide a reliable measure of abundance.

Catch rate

See 'Fishing effort' above.

Recreational component: **Not assessed**

There is no recreational fishery for whitebait. While some of the other retained species are also fished recreationally, there is no assessment for these recreational catches.

Stock assessment completed: **Yes**

The annual assessment for the whitebait stocks utilises the total catch as an indicator of abundance, on the reasonable assumption that catchability remains stable but that fishing effort adjusts so as to take a similar proportion of the available stock in all years. On this basis, the abundance in the dominant Bunbury sector in 2000 was higher than in the previous year, as was also the case in the metropolitan and Mandurah sectors.

The 2000 catch was much as expected from the previously observed positive relationship between the Fremantle sea level (Leeuwin Current) and catch in the following year. That is, the high annual catch of whitebait expected in 2000 following a very strong Leeuwin Current during 1999 did eventuate.

Exploitation status: **Fully exploited**

Breeding stock levels: **Adequate**

Previous modelling and plankton sampling indicate that the typical stock size of whitebait is probably less than 1,000 tonnes for the entire west coast. The cyclical nature of the fishery, whereby very good catches continue to be followed by one to two years of low catches, suggests that breeding stocks may become a limiting factor in years following environmentally driven low recruitment, and needs to be carefully monitored.

Projected catch next season (2001): **Whitebait 272–375 tonnes**

The average monthly Leeuwin Current in 2000 was again very strong, only dropping slightly below the 1999 level which was the highest ever recorded. The Leeuwin Current/whitebait model suggests that the 2001 catch will be in the range 272–375 tonnes. (This range exceeds the acceptable catch range owing to the wide confidence limits around the regression model.)

NON-RETAINED SPECIES

Bycatch species impact: **Low**

There is typically no bycatch in the targeted whitebait fishery. Where multi-species schools occur, for example of mixed whitebait and juvenile pichards, catches are released because of the difficulty of sorting.

Protected species interaction: **Low**

No protected species occur in this fishing area which could be caught by the beach seine gear.



Commercial Fisheries

ECOSYSTEM EFFECTS

Food chain effects: **Low**

The highly variable recruitment cycle of whitebait, apparently related to oceanographic effects, means that predatory birds and fish cannot rely on the availability of whitebait as a major food source in all years.

Furthermore, the constraints of the beach seine gear and fishing method largely limit fishing to within 80 m of the shore, whereas the fish stock is more widely distributed, suggesting that natural predators have greater access to the stock than does the fishery. There may be competition in years of low whitebait abundance between fishermen and the little penguins that breed on Penguin Island and feed in the metropolitan and Mandurah regions of the whitebait fishery, but the impact of any such interaction is not yet understood. Overall, therefore, the ecological impact of the fishery is considered to be low.

Habitat effects: **Low**

All fishing occurs over sandy substrate and the impact of the relatively light fishing gear is minimal.

SOCIAL EFFECTS

Approximately 28 fishing units involving about 60 fishermen and crew worked in the whitebait industry in 2000.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year (2000):
\$0.46 million

The price for whitebait was similar to that obtained in 1999, at an average of \$1.80/kg. Total catch value was about \$0.46 million.

FISHERY GOVERNANCE

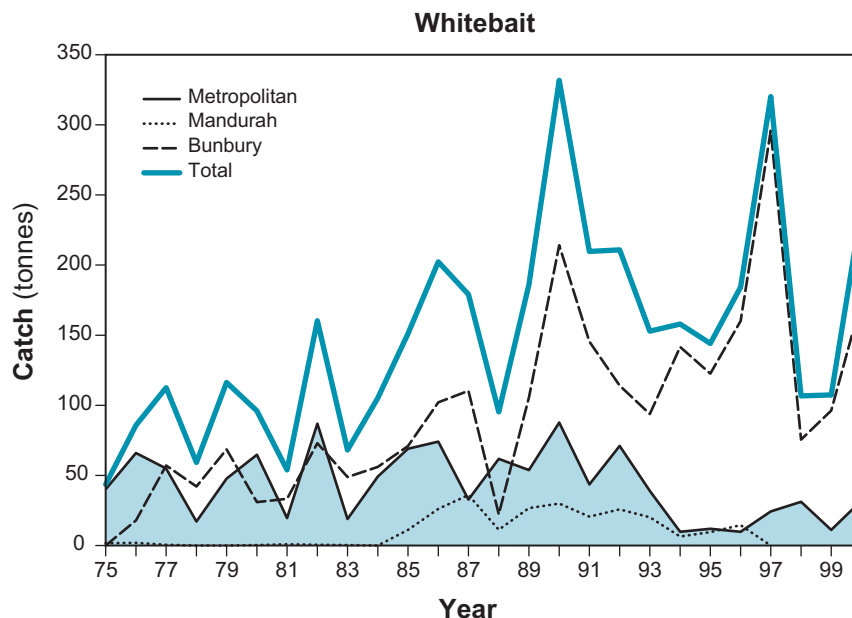
Acceptable catch range: Whitebait 106–331 tonnes

The range provided for whitebait reflects catches achieved since 1990 by the limited numbers of operators with access to these stocks. It should be noted that the major portion of the whitebait catch is taken from the Bunbury sector, which does not yet have a formal management plan in place.

EXTERNAL FACTORS

Annual catches in this fishery will most likely continue to exhibit large fluctuations under the influence of environmental factors. The fishery will therefore continue to be regulated through limited entry access and gear restrictions, and is partway through the process of becoming fully managed to ensure that appropriate effort levels are maintained. Further research into the Leeuwin Current/whitebait relationship is needed, and will be undertaken when time becomes available.

Ongoing urbanisation of Western Australia's south-west region may have implications for this fishery, as sectors of the community press to restrict access to beaches by the four-wheel-drive vehicles needed to transport the beach seining gear and catches.



WEST COAST BEACH BAIT FIGURE 1

Total annual catch of whitebait for each sector from 1975 to 2000.

WEST COAST BEACH BAIT TABLE 1

Catches in 2000 of retained species other than whitebait from the West Coast Beach Bait (Fish Net) Managed Fishery. Numbers in brackets indicate that part of the catch taken from Cockburn Sound.

| Species | Catch (tonnes) |
|--------------------|--------------------|
| Anchovy | 3.5 (3.5) |
| Garfish, sea | 1.7 (1.7) |
| Herring, Perth | 2.0 (2.0) |
| Mullet, sea | 3.4 (2.0) |
| Mullet, yellow-eye | 1.9 (1.1) |
| Others | 1.2 (0.7) |
| Total | 13.7 (11.0) |

WEST COAST BEACH BAIT TABLE 2

Catches in 2000 of retained species other than whitebait from the south-west beach seining sector.

| Species | Catch (tonnes) |
|-----------------------|----------------|
| Garfish, sea | 2.0 |
| Herring, Australian | 33.5 |
| Mullet, sea | 24.3 |
| Mullet, yellow-eye | 2.8 |
| Sprat, blue | 10.5 |
| Whiting, western sand | 7.2 |
| Others | 1.6 |
| Total | 81.9 |

West Coast Purse Seine Managed Fishery

MANAGEMENT SUMMARY

This fishery is based on the capture of pilchards (*Sardinops sagax*) and scaly mackerel (*Sardinella lemuru*) by purse seine nets in the waters off the west coast of Western Australia. It is managed under the provisions of the West Coast Purse Seine Management Plan 1989. The product has a variety of uses, being sold for human consumption, angling bait, commercial bait, tuna food and pet food. The recreational angling bait sector is currently the main market.

As in the South Coast Purse Seine Managed Fishery, the spread of a Herpesvirus throughout the west coast in 1995 and again in 1998/99 has had a serious impact on the stock. Understanding of the pathogen has increased significantly since the first outbreak, but there are still important knowledge gaps, such as the source of the virus. The possibility of a further outbreak represents a real threat to the industry.

In response to concerns for the fishery, the Minister for Fisheries announced in March 2000 that the maximum quantity of pilchards that might be taken in the fishery for the 2000/2001 licensing period was to be 260 tonnes.

Management arrangements are currently based on limited entry and controls on gear and boat size; however, it has been accepted for some time that the fishery should be managed under a quota arrangement. The framework of arrangements that would see the change to quota management has been developed following consultation with stakeholders but has yet to be legislated.

Governing Legislation/Fishing Authority

West Coast Purse Seine Management Plan 1989
West Coast Purse Seine Managed Fishery Licence

Consultation Process

Purse Seine Management Advisory Committee
Agency–industry meetings (as required)

RESEARCH SUMMARY

Research on this fishery continues to utilise CAES data, biological monitoring of catches and spawning biomass estimates from egg surveys. The most recent survey of spawning biomass was undertaken in July–August of 2000.

These data are compiled into the following status report and ultimately will be used to set and review total allowable catches (TACs) once the fishery moves to quota management.

West Coast Purse Seine Managed Fishery Status Report

Prepared by D. Gaughan

FISHERY DESCRIPTION

Boundaries and access

The boundaries of this fishery are 'all Western Australian waters between 31° south latitude (near Lancelin) and 33° south latitude (near Cape Bouvard) and on the landward side of the 200 nautical mile Australian Fishing Zone limit, but excluding those waters within the boundaries of the Marmion Marine Park Reserve No. 1'. Access to the fishery is under a limited entry system with eight full licences and six supplementary access holders. No quota system is in place at present. As there is currently no evidence for separate adult assemblages along the lower west coast (in contrast with the situation on the south coast), catch data from the developmental purse seine fishing zone, which lies between Cape Bouvard and Augusta, is included in the total for the West Coast Purse Seine Managed Fishery.



Commercial Fisheries

Main fishing method

Purse seine net.

RETAINED SPECIES

Pilchard (*Sardinops sagax*) is typically the dominant species in the catch, with the tropical sardine *Sardinella lemuru* (previously called scaly mackerel, hereafter referred to as sardinella) also important in some years. In addition, smaller quantities of maray (*Etrumeus teres*) are commonly caught, while small catches of anchovies (*Engraulis australis*) occur periodically.

Commercial production (season 2000): 624 tonnes

Landings

The combined catch of pilchards and sardinella for the managed fishery area and the developmental zone once again decreased from 1,103 tonnes in 1999 to 624 tonnes in 2000; this follows on from similarly sharp declines in 1997, 1998 and 1999 (West Coast Purse Seine Figure 1). Similarly, the contribution of pilchards to the combined catch decreased dramatically from 571 tonnes in 1999 to less than 14 tonnes. The decrease in pilchard abundance following the 1998/99 mortality event, coupled with a temporary closure of the pilchard fishery during the first half of the year, caused a switch in effort from pilchards to sardinella. This was reflected in the sardinella catch, which increased again from nearly 50% (532 tonnes) in 1999 to about 98% (610 tonnes) of the combined catch in 2000. In addition, when pilchard fishing resumed in the second half of the year this species was in low abundance at the traditional fishing grounds, and catches were largely composed of maray (traditionally a minor retained species), to the extent that more than 50 tonnes were landed for the year compared to less than 8 tonnes in 1999. There was also an increase in catch of anchovy to 5.8 tonnes (up from 83 kg in 1999).

Fishing effort

Eight vessels participated in the fishery in 2000 and together fished a total of 367 days. The recent significant changes in the stocks (i.e. fewer pilchards) and associated restructuring in the fishery (e.g. development of new markets for sardinella) have impacted on the effort being applied in the fishery. It is no longer possible to estimate effort separately for the different species being targeted.

Catch rate

The estimated catch rate for all small pelagics was 1,700 kg/day. Note that because factors other than abundance are influencing fishing effort, it is currently difficult to determine how this estimate relates to those from previous years.

Recreational component: Nil

Stock assessment completed: Yes

Stock assessment is completed for pilchards, which are fully exploited on the west coast. Although no stock assessment has been undertaken for sardinella in the Fremantle region, application of results obtained from a detailed study on sardinella in the Geraldton region indicate that the stock on the lower west coast is at the

southern limit of its geographic range and is fully exploited when it occurs off Fremantle.

In early 1999, a second mass mortality event affecting only pilchards passed through the west coast stock after originating in South Australian waters and passing through the south coast of Western Australia. Pilchard mortalities were estimated to be much higher than in the initial disease event in 1995. As a result, a post-mortality biomass survey was considered necessary to estimate the size of the remaining stock.

A spawning biomass survey was therefore conducted in 2000. The spawning biomass was estimated to be 8,516 tonnes if a sex ratio of 73% was used, or 9,622 tonnes if the sex ratio was assumed to be 65% (see below). This result provides evidence that the stock is recovering strongly after the 1998/99 mass mortality. However, these estimates equate to a 60–80% increase from the 1999 estimate of 5,725 tonnes. Since an annual increase of 40% can be considered exceptional for a stock during times of very strong growth, the magnitude of increase appears to be too high for the west coast pilchard stock in a period of only one year, and may be indicative of poor estimation of adult parameters resulting from the low number of samples (n=4). The poor number of adult samples could be interpreted to mean that the estimates of adult parameters are not reliable, hence the two possible sex ratios presented above. However, examination of the relative changes in spawning biomass, as depicted by the changes in both proportion of sampling stations with pilchard eggs and the average egg density, support the estimated changes in spawning biomass. If portions of the west coast stock had been displaced during 1999 by unusually high water temperatures (either offshore, to deeper water or southwards), as suggested by some industry members, an increase in estimated biomass of 60–80% might be possible if this same portion had returned prior to the 2000 survey. This possibility is not contradicted by the age structure of the west coast pilchard catches. Assuming there has been strong recovery, availability to the fleet has remained very low.

Exploitation status: Fully exploited
Pilchards and sardinella are fully exploited.

Breeding stock levels: Depleted
See 'Stock assessment' above.

Projected catch (or effort) next season (2001):
100–720 tonnes

A notional TAC of 720 tonnes was based on an exploitation rate of 7.5% of the spawning biomass estimate obtained using a sex ratio of 65% female (i.e. 720 tonnes equals 7.5% of 9,622 tonnes). Given that stock may not be available to the fleet it is possible, however, that the catch may be much lower than the notional TAC. Thus it has been assumed that, if availability of the stock is reasonable, it should be possible to catch at least 100 tonnes.

NON-RETAINED SPECIES

Bycatch species impact: Low
This fishery targets specific schools of small pelagic fish

so bycatch is insignificant. Small pelagic fish which are sometimes caught but for which there are no stable markets for the quantities involved include yellowtail scad (*Trachurus novaezelandiae*) and blue mackerel (*Scomber australasicus*). *Decapterus macrosoma*, a tropical scad, occurred apparently for the first time on the metropolitan purse seine grounds in 2000. This species represents an example of a non-retained small pelagic which may periodically occur on the lower west coast due to anomalous environmental conditions. Such infrequent occurrences would have negligible impact.

Protected species interaction: Low

Pilchards and other small pelagic fish are consumed by several species of seabirds, pinnipeds, cetaceans and protected sharks, but there is currently no evidence to indicate any interaction between these and the purse seine industry.

ECOSYSTEM EFFECTS

Food chain effects: Medium

Small pelagic fish, typically pilchards or anchovies, occupy a pivotal position of energy transfer in food webs in which they occur and are often the main link between primary (phytoplankton) and secondary (zooplankton) production and larger predators. This trophic position has been termed the 'wasp's waist' since pilchards feed on many species and are eaten by many species. As a result of the mortality event outside of the control of the fishery, the reduced biomass of pilchards is likely to have a significant impact on predatory species such as seabirds, mammals and tuna. It should be noted, however, that in 'normal' circumstances the quota for pilchards is set at 10–15% of the spawning biomass, thus leaving 85–90% available to natural predators.

Habitat effects: Negligible

Purse seining appears to have very little effect on the habitat. Although the purse seine gear used in Western Australia can contact the sea floor in some areas, the relatively light construction of the gear suggests that there is no significant impact occurring to, for example, seagrass beds.

SOCIAL EFFECTS

The west coast purse seine industry has undergone a major restructure in recent years. Following the mass mortality event of 1998/99, many licence holders and their crew have had to obtain income from elsewhere. Including vessel crews, the industry provided direct employment for 6–12 people during 2000.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year (2000): \$0.5 million

The relatively small quantities of pilchards and maray were sold as individually quick frozen bait, while the majority of the sardinella were processed for human consumption. Average price of sardinella was \$800/tonne.

FISHERY GOVERNANCE

Acceptable catch (or effort) range: Not available

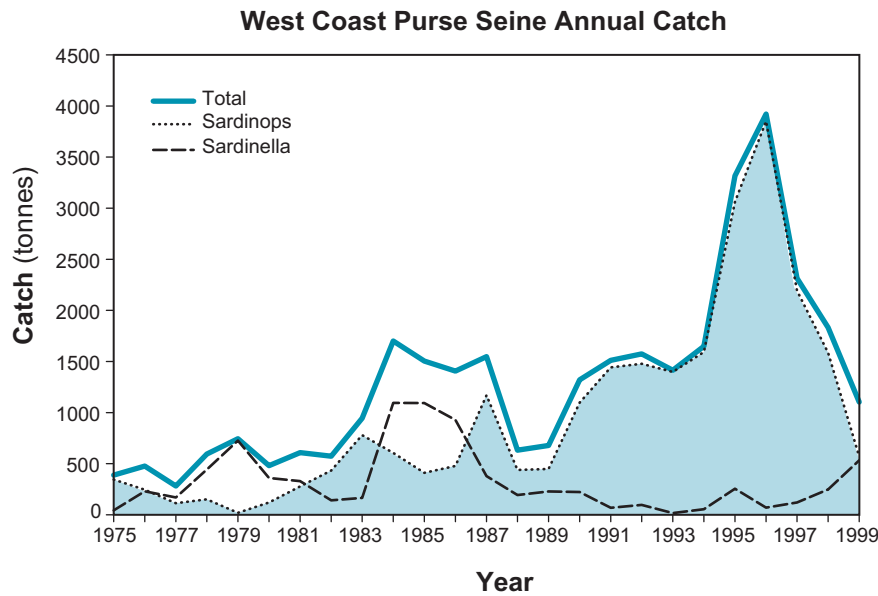
Management arrangements are currently based on limited entry and controls on gear and boat size; however, it has been accepted for some time that the fishery should be managed under a catch quota arrangement. The framework of arrangements that would see the change to quota management has been developed following consultation with stakeholders but has yet to be legislated. This situation remains unchanged from last year and has been delayed due to uncertainty about the recovery of the pilchard stocks. Until this issue is addressed, an acceptable catch range cannot be provided.

EXTERNAL FACTORS

The major factor influencing the pilchard stock has been the impact of the virus epidemic in 1998/99. The fishery is also heavily influenced by the contribution of the two dominant pelagic species, which dictates the make-up of the catch in any one year. The influences of environmental factors on the two species are not yet well understood, but oceanographic variability appears to affect the distribution and availability of both species.



Commercial Fisheries



WEST COAST PURSE SEINE FIGURE 1

Annual catches of pilchards and sardinella along the lower west coast.

West Coast Demersal Scalefish Fishery

MANAGEMENT SUMMARY

The 'west coast demersal scalefish fishery' describes the most important subset of the State's wetline fishery that has access to species or fishing methods not currently subject to a management plan. The wetline fleet comprises both 'wetline only' vessels and vessels with other managed fishery licences, and is only limited by the overall ceiling on fishing boat licences. Wetline fishing targets mainly demersal finfish using handlines and droplines. The major areas for wetline catches within the west coast bioregion are the Abrolhos Islands, Perth metropolitan area and the south-west coast.

The west coast demersal scalefish fishery includes two of the three most important line-caught species of the wetline catch for the state, West Australian dhufish (*Glaucosoma hebraicum*) and pink snapper (*Pagrus auratus*), as well as baldchin groper (*Choerodon rubescens*) and many other species. In addition to this fishery, these species are also caught in the demersal gillnet and longline fishery and by the recreational sector, including charter boats.

A common community concern that the wetline fishery has unrestricted access to a wide range of species led to a study of the fishing activity of wetliners published as Fisheries Management Paper no. 135 (Fisheries WA 2000a). This document took a 'snapshot' of the fleet at 30 June 1998 and examined its seven-year fishing history

(six years for the Abrolhos Islands). The report summarised catch data of dhufish, pink snapper and baldchin groper.

Two-thirds of the wetline fleet, or 442 vessels, took dhufish between June 1991 and 1998. Most catches of the 'wetline only' fleet (97 boats) were small, with only 27 boats landing more than one tonne a year for more than three years. A variety of licensed fishing boats from other fisheries, including 178 rock lobster boats, reported taking dhufish by wetlining. Dhufish are caught mostly from waters deeper than 20 m extending from Kalbarri to near Esperance. Few dhufish are taken on the south coast, while the reported catch in the Abrolhos Islands has increased substantially over the study period. Most dhufish are caught in summer.

Around 466 boats of the wetline fleet took pink snapper between June 1992 and 1998, and only 45 boats recorded landing more than one tonne a year in three of the six years. Of the boats catching pink snapper, 103 were 'wetline only' and 165 were rock lobster boats. The major wetline catches of pink snapper are from the Abrolhos Islands area. August, March and April recorded the highest catches of pink snapper.

Altogether 291 boats of the wetline fleet landed baldchin groper, including 86 'wetline only' and 116 rock lobster boats. Six 'wetline only' boats and one other recorded landing more than one tonne a year in three of the six years. Although baldchin groper is caught between the Perth metropolitan area and Ningaloo, 46% of the catch comes from the Abrolhos Islands. The catch has little seasonal variation.

Governing Legislation/Fishing Authority

Fish Resources Management Regulations 1995
Fishing Boat Licence

RESEARCH SUMMARY

A detailed FRDC-funded research project on the biology of dhufish was completed at Murdoch University (Hesp and Potter 2000). This study determined the biological parameters of age, growth and reproduction, providing much of the scientific knowledge base for management (see 'Stock assessment'). A new FRDC-funded project commenced in 2000 by Fisheries WA will examine the mortality of under-size dhufish, snapper and, when possible, other species that are released after capture by line. The results of this project will provide an understanding of fishing mortality for the entire population and, together with CAES data, will be used to assess dhufish stocks.

Research on the life history of the baldchin groper at the Abrolhos Islands examined reproductive biology, age, growth and mortality (Nardi 1999). Baldchin groper can live up to 20 years or longer, and individuals will change sex from female to male mostly between the ages of 8 and 12 years. Spawning occurs from early spring to mid-summer. Size at first sexual maturity is estimated at 29 cm total length; however, this species changes sex from female to male at around 40–45 cm (Nardi 1999). The legal minimum length is 40 cm at age 9 years.

Although the Gascoyne bioregional component of the pink snapper stocks has been researched extensively, there has been little research on the species on the mid-west and lower west coast. Research on the biology of the breaksea cod was begun in 2001 by an honours student at Curtin University. Stock assessments of these species are planned as biological information becomes available. Until stock assessments are completed, monitoring of the fishery will continue to be undertaken annually using CAES data. This monitoring data is used to provide this status report.

West Coast Demersal Scalefish Stocks Status Report

Prepared by J. St John

FISHERY DESCRIPTION**Boundaries and access**

Wetlining for west coast demersal scalefish is not yet subject to a specific management plan. For convenience, the fishing activities are assessed within the boundaries of the west coast bioregion, i.e. in waters south of latitude 27° S and west of longitude 115°30' E. During 1999/2000, 77 'wetline only' vessels operated in the west coast bioregion using handline and dropline. A further 165 vessels that were licensed in other fisheries also carried out wetline activities in the bioregion.

Main fishing method

Handline and dropline.

RETAINED SPECIES

Commercial production (season 2000): 768 tonnes

Landings

During 1999/2000, 242 boats wetlined for demersal finfish with 197, 181 and 134 boats catching dhufish, pink snapper and baldchin groper respectively. With landings of 173 tonnes of dhufish, 158 tonnes of pink snapper and 33 tonnes of baldchin groper, these three species comprised almost half of the total catch. Other major species in the catch are from the northern area of the west coast bioregion and include coral trouts (11 tonnes) and two lethrinid species, *Lethrinus nebulosus* and *Lethrinus miniatus*, reported as spangled emperor, sweetlip emperor, sweetlips and nor-west snapper (129 tonnes).

Demersal scalefish catches from other fisheries are not included here, however the scalefish catch accounted for 16% of the total catch of the West Coast Demersal Gillnet and Demersal Longline Interim Managed Fishery (WCDGDLIMF) in 1999/2000. This scalefish catch was dominated by dhufish (17.7 tonnes), followed by pink snapper (10.2 tonnes). For a full status report on the WCDGDLIMF, see pp. 113-18.

Dhufish: In general, catches of dhufish along the west coast over the last 10 years reflect trends in fishing effort (West Coast Demersal Scalefish Figure 1). Dhufish catch peaked in 1997/98 at 196 tonnes when effort was highest; the current year's catch of 173 tonnes is still higher than the 10-year average of 152 tonnes. Peak catches for the current year were recorded in December 1999 and January and May 2000.

Baldchin groper: Both catch and catch rate for the baldchin groper have been consistent over the last 10 years (West Coast Demersal Scalefish Figure 2). The baldchin groper catch in 1999/2000, at 33 tonnes, was higher than the 10-year average of 31.5 tonnes. Catches of baldchin groper are similar throughout the year, but the highest recorded catch for the current year was in April 2000.

Pink snapper: The pink snapper catch in 1999/2000 was 158 tonnes, and catches in the last three years have been below the 10-year average of 204 tonnes (West Coast Demersal Scalefish Figure 3). Snapper catches, however, now appear to be on the rise, as the current year's catch was slightly higher than in the previous year, and recently fishers have reported an abundance of small snapper off the west coast. The snapper fishery is renowned for its high variability in catch due to natural annual fluctuations in recruitment to the stock. Peak catches for the current year were recorded in November 1999 and May 2000.

Fishing effort

Throughout 1999/2000, 242 boats fished a total of 9,701 days in the west coast demersal scalefish fishery. This was similar to the previous year's level of effort.

Catch rate

In this multi-species fishery, catch rates of individual species are not a direct reflection of abundance because effort targeted at each species is not available.



Commercial Fisheries

To estimate catch rates for dhufish and baldchin groper, both catch and fishing effort on boats that targeted these species were examined in two regions, Geraldton and Perth. The fishing boats that landed the most fish in the last nine years were identified, and 10 boats with consistent records were used to estimate the catch rates. Rates were calculated for dhufish in both regions and for baldchin groper in the Geraldton region (West Coast Demersal Scalefish Figures 1 and 2). Catch rates of snapper were averaged over the entire fleet that caught the species along the west coast (West Coast Demersal Scalefish Figure 3).

Dhufish: For dhufish at Perth and Geraldton, CPUE has increased almost threefold since 1991/92 (West Coast Demersal Scalefish Figure 1). CPUE in the Perth region peaked at 40 kg/day in 1994/95 and 1998/99, and in Geraldton at 36.5 kg/day in 1998/99. This increase in catch rates may in part be explained by the introduction and use of the global positioning system (GPS), which was installed on these boats gradually over a three-year period starting in 1991/92. After installation, fishing efficiency on boats increased as new productive fishing sites were found and plotted on GPS. Now, however, five years after its installation on the last boat, improvements in catch rate due to GPS can be expected to level off. Comparing catch rates in the two regions, it can be seen that CPUE varies more among boats in Perth and generally is higher than on boats in Geraldton.

Baldchin groper: For baldchin groper at Geraldton, CPUE jumped from 10 kg/day in 1993/94 to 16 kg/day in 1994/95, which was the highest CPUE for the last nine years (West Coast Demersal Scalefish Figure 2). The gradual introduction of GPS to boats since 1991/92 does not appear to have had the same degree of impact on the catch rates of baldchin groper as it did for dhufish. Catches and catch rates for baldchin groper are the least variable of the major species in the west coast demersal scalefish fishery.

Pink snapper: In contrast to the other two species, the general catch rates of pink snapper for the whole west coast ranged widely, from 18.6 kg/day to 49.3 kg/day for the same period (West Coast Demersal Scalefish Figure 3). The current year's catch rate for snapper is 22 kg/day.

Recreational component: **30% (approx.)**

The recreational catch of the west coast was estimated from boat ramp surveys in 1996/97 (Sumner and Williamson 1999), giving estimated catches for dhufish, pink snapper and baldchin groper of 132, 27 and 23 tonnes respectively. Since this survey did not include estimates of the recreational catch from the Abrolhos Islands, the recreational catch of this species is most likely an under-estimate. Based on the survey data, the estimated recreational catch shares in 1996/97 were dhufish 46%, snapper 10.5% and baldchin groper 44%, giving an overall recreational share of the total catch of the three key target species of about 30%.

Stock assessment completed: **Yes**

A preliminary stock assessment has been undertaken for dhufish, the main species in the west coast demersal

scalefish fishery. Nardi (1999) described the biology of the baldchin groper from the Abrolhos Islands. South of the managed Shark Bay snapper fishery, knowledge of the biology of the west coast pink snapper is limited.

Dhufish: Hesp and Potter (2000) have provided recent biological information for dhufish. Using the above data source, yield-per-recruit analysis suggests that maximum yield would be gained from dhufish stocks if fishing began at age 10 years. The legal minimum length (LML) for dhufish is 50 cm, which equates to an age of around 6 years for males or 7 years for females. Both sexes mature at between 2 and 5 years of age. At present, the sustainability of dhufish stocks on the west coast is uncertain because the degree of protection of under-size fish is unknown. Some under-size fish can be caught at 30 cm; however, both their catchability at this size and the level of mortality after they are released is currently unknown. Research into the survival of released under-size dhufish and pink snapper is under way, and will provide estimates of short-term survival (up to 4 days after capture). Problems associated with barotrauma caused by bringing these benthic-dwelling fishes up from the deep are considered to be the major factor influencing release mortality, and therefore survival rates from various capture depths will be compared. A more formal stock assessment on the dhufish will be carried out when the causes of fishing mortality are better understood.

Exploitation status: **Unknown**

Breeding stock levels: **Not assessed**

For dhufish, the preliminary stock assessment indicates that the species spawns for three years before reaching legal size. Thus at the existing LML when females are 7 years old, calculations on egg production suggest that 40% of the females present before fishing will remain unexploited in dhufish populations. Although baldchin groper mature at around 29 cm, this species changes sex from female to male at around 40–45 cm (Nardi 1999). Thus, the existing LML of 40 cm suggests that few of the males in the population are protected from fishing. At present there are no indications of insufficient breeding stock from the catch or catch rates of dhufish and baldchin groper, but the breeding stock level has not been measured directly for any of the three species in the west coast demersal scalefish fishery. The variation in snapper catch most likely reflects natural recruitment variability in the population

NON-RETAINED SPECIES

Bycatch species impact: **Low**

As targeting demersal fishes using baited lines is a highly selective fishing method, bycatch comprises only a small proportion of the catch. Typically, bycatch includes small numbers of inedible species (e.g. silver toadfish) or small fish (e.g. wrasses), which are discarded.

Protected species interaction: **Negligible**

ECOSYSTEM EFFECTS

Food chain effects: **Low**

Effects on the food chain are considered to be negligible, as each of the three main species is at the upper end of the

chain and each targets different prey types. Although all three species are carnivores, dhufish mainly eat other finfish and baldchin groper target shellfish, whereas pink snapper eat a wide variety of prey types. For these reasons, the ecological impact of the fishery is considered to be minimal.

Habitat effects: **Negligible**

The method of targeting demersal fishes using baited lines has little impact on the benthic environment.

SOCIAL EFFECTS

Employment in this fishery is difficult to measure, as the many boats in the wetline fleet are also associated with other licensed fisheries. A rough average of all boats in this fishery suggests that in 1999/2000 242 boats fished an average of 6 weeks and employed approximately 500 people.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year (1999/2000): **\$3.68 million**

The estimated value of the fishery in 1999/2000 includes all species caught by handlines and droplines on the west

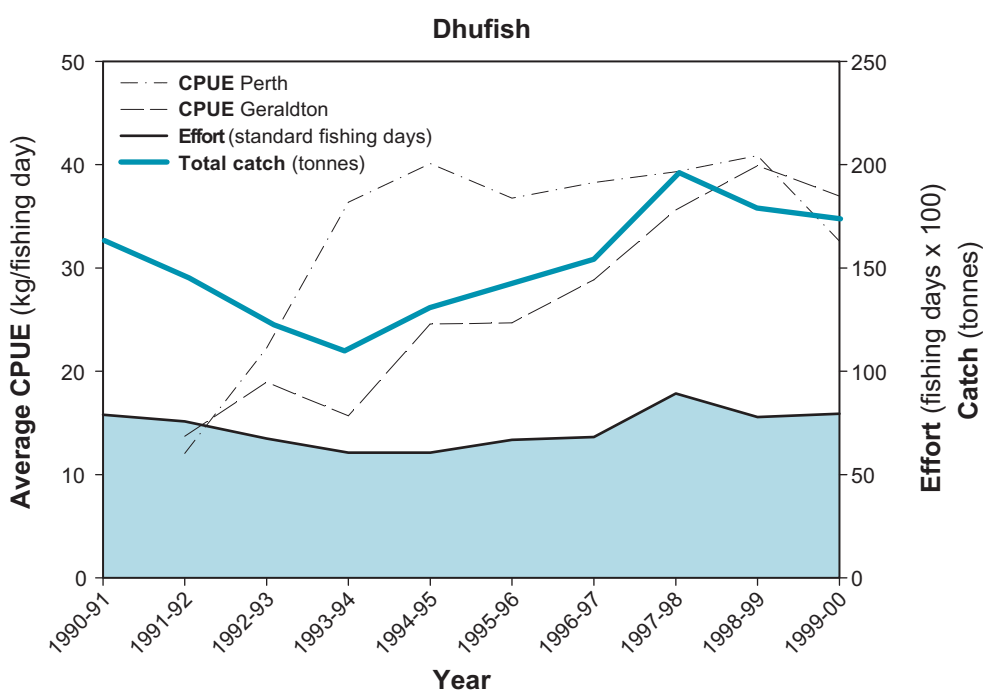
coast of Western Australia. More than 94 species or groups of seafood were recorded as catch and sold for an estimated \$3.68 million. The highest-valued catch was dhufish at 42% of the total value, followed by pink snapper (19%), baldchin groper (5%), and nor-west snapper, sweetlip emperor, coral trout and spangled emperor in descending order of value. Catch of all other species represented less than 20% of the value of this fishery. In 1999/2000 dhufish, pink snapper and baldchin groper sold on average for \$9/kg, \$4.50/kg and \$6/kg respectively. Of all species in the fishery, coral trout commanded the highest average price of \$9.92/kg.

FISHERY GOVERNANCE

Acceptable catch range: **558–798 tonnes**

Using 80% confidence limits around a 10-year mean to 1999/2000, the acceptable catch range is calculated to be 125–179 tonnes for dhufish, 153–254 tonnes for pink snapper and 27.5–35.5 tonnes for baldchin groper.

As the fishery for these species is not under a formal management arrangement, the catch may move outside this range if a higher proportion of the State’s fishing fleet, particularly ‘wetline only’ vessels, move into this bioregion.

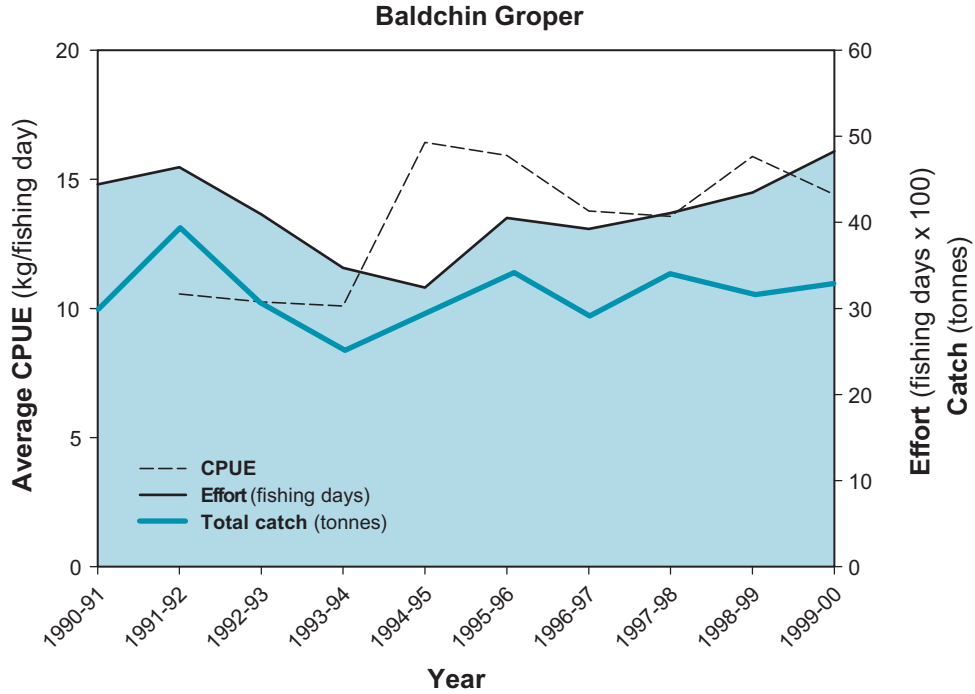


WEST COAST DEMERSAL SCALEFISH FIGURE 1

Annual catch and effort for dhufish in the west coast demersal scalefish fishery over the period 1990/91 to 1999/2000. Catch per unit effort (CPUE, kg/standard fishing day) for is shown for dhufish caught by 10 boats in the Perth region and 10 boats in the Geraldton region over the period 1991/92 to 1999/2000.

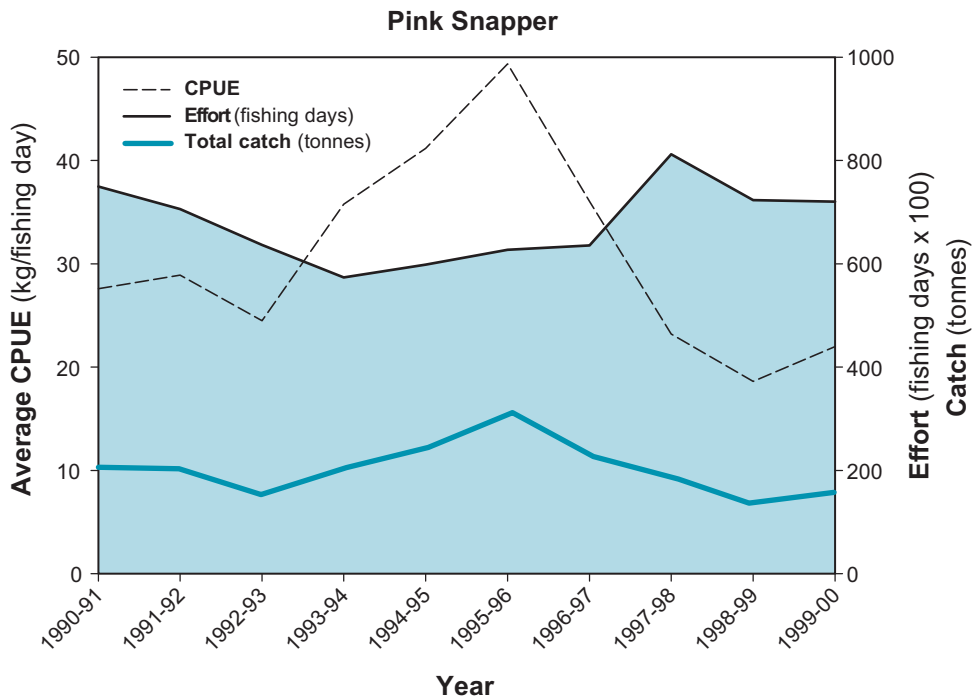


Commercial Fisheries



WEST COAST DEMERSAL SCALEFISH FIGURE 2

Annual catch and effort for baldchin groper in the west coast demersal scalefish fishery over the period 1990/91 to 1999/2000. Annual catch per unit effort (CPUE, kg/standard fishing day) is shown for baldchin groper caught by 10 fishing boats in the Geraldton region over the period 1991/92 to 1999/2000.



WEST COAST DEMERSAL SCALEFISH FIGURE 3

Annual catch, effort and catch per unit effort (CPUE, kg/standard fishing day) for pink snapper in the west coast demersal scalefish fishery over the period 1990/91 to 1999/2000.