

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 the Department of Fisheries' Head Office in Perth as well as Regional Policy Officers in Albany, Fremantle, Geraldton, Carnarvon and Broome. Management of most aspects of the major fishing activities is achieved through formal management plans declared under the *Fish Resources Management Act 1994 (FRMA)*, while other forms of fishing activity are managed through a combination of controls derived from the *Fish Resources Management Regulations 1995*, orders under the FRMA 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, the Department's 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 final stage of cost recovery (100% cash costs plus capital accruals and employee entitlements) being reached in 2001/02.

The remaining fisheries paid a contribution towards their management costs of 1.75% of their gross value of production (GVP) in 2001/02. All fisheries also contributed to the Development and Better Interest Fund at a rate of 0.65% of their GVP.

A key achievement during 2001/02 has been the production of ecological sustainability reports to Environment Australia (EA) for continued listing of species taken in various export fisheries under section 303 DB of the *Environment Protection and Biodiversity Conservation Act 1999*. Reports were produced and submitted for the West Coast Rock Lobster, Shark Bay Prawn and Exmouth Gulf Prawn Managed Fisheries, while production of reports for the Shark Bay Scallop, Shark Bay Snapper and Abalone Managed Fisheries was substantially completed.

Other key achievements during 2001/02 have included the implementation of unitisation in the West Coast Rock Lobster Managed Fishery, the continued implementation of bycatch reduction devices (BRDs) in the State's trawl fisheries, gazettal of a management plan for the South Coast Estuarine Fishery and implementation of the Vessel Monitoring System (VMS) in the Exmouth Gulf and Nickol Bay Prawn Managed Fisheries.



The outcomes of the Government's review of legislation with respect to National Competition Policy (NCP), which were announced in early 2002, will result in significant changes to the domestic rock lobster processing sector and to some of the key fishery rules. Some other significant NCP-related possible changes to rock lobster processing and fishery rules were also flagged for examination in the period up to 2006.

Not all commercial fishing in Western Australia is subject to specific management regulation at this stage. The 'unmanaged' portion, comprising a number of fishing activities undertaken under the authority of a fishing boat licence, is known collectively as 'wetline fishing'. Usual methods include handlining, droplining, trolling and hand-hauled netting, while less commonly used methods include drop netting, squid jigging and lift netting. In total 2,236 tonnes of fish were reported as wetline catch during 2000/01, comprising 1,297 tonnes (58%) from the west coast bioregion, 490 tonnes (22%) from the north coast, 296 tonnes (13%) from the Gascoyne and 153 tonnes (7%) from the south coast.

Rationalisation of the wetline fishery continues to be a major focus and substantial progress has been made on the development of management for the wetline sector, which will be a key element of giving effect to the principles of Integrated Fisheries Management. The Mackerel Independent Advisory Committee concluded its meetings and provided its advice to the Executive Director of Fisheries on future management options for the mackerel fishery. Planning for the development of management arrangements for the general wetline sector has set the stage for substantial progress in this area during 2002/03. Meanwhile, gazettal of legislation to give effect to mutually agreed catch sharing arrangements in the barramundi fishery in the Kimberley region is a sign of the continued progress which is being achieved in the resource-sharing area.



West Coast Bioregion

REGIONAL MANAGEMENT OVERVIEW

The principal commercial fishery in this region targets the western rock lobster, but there are also significant fisheries for scallops, sharks, blue swimmer crabs, pilchards, and coastal and estuarine finfish, with many of the inshore fish resources shared with the recreational sector.

The size and importance of the West Coast Rock Lobster Managed Fishery make it a key focus of the activities of the Department on the west coast. There were also some significant events in the fishery over the year. These included unitisation of the entitlement (from pots to units), the announcement of the outcomes of the National Competition Policy review – which will see major changes to the rules for processing and changes to some of the key management rules for the fishery – and submission of the ecological sustainability report on the fishery to Environment Australia. There was also a continued focus on meeting the ongoing requirements of the Marine Stewardship Council (MSC)'s chain of custody certification process. Notably, the 2001/02 season catch of just under 9000 tonnes was well below expectations, primarily as a result of poor climatic conditions during the 'whites' phase.

Considerable progress was made during the year on management arrangements for the west coast estuaries, and on the development of a Mandurah–Bunbury trap-based crab fishery. Both of these areas should see significant changes implemented in 2002/03.

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 a fishing boat licence) and boats which hold managed fishery licences (e.g. west coast rock lobster) in addition to a fishing boat licence. Mackerel are also taken by both groups; however, the operation of the mackerel fishery has been examined by an independent review committee which has reported to the Minister on future management options. There is also a take of fish by beach seining and near-shore gillnetting using hand-hauled nets.

The activities of the wetline fishery are expected to come under review during 2002/03 to prepare the fishery for Integrated Fisheries Management.

REGIONAL COMPLIANCE AND COMMUNITY EDUCATION OVERVIEW

Commercial fishery compliance inspections on the west coast are conducted by Fisheries Officers working from offices located in Geraldton, Dongara, Jurien, Lancelin, Hillarys, Fremantle, Mandurah, Bunbury and Busselton. These officers undertake a variety of activities in the region, including sea-based inspections of licences, catch and fishing gear, and land-based inspections of catch, fish processing

factories, retail outlets and catch consignment deliveries.

The major single focus for commercial fishery compliance monitoring is the West Coast Rock Lobster Managed Fishery, and the outcomes for this fishery are reported separately on pp. 7–8. In addition, a number of other fisheries are serviced which target abalone, blue swimmer crabs, pilchards, scallops, prawns, coastal and estuarine finfish, and offshore demersal species (e.g. dhufish and snapper). Many of the inshore fish resources are shared with the large number of recreational fishers operating out of the metropolitan area, and this increases the need for rigorous compliance monitoring in some areas. Fisheries Officers also conduct gear inspections on the many north-west trawlers that are seasonally outfitted in the region.

Inshore at-sea compliance is generally conducted using patrol vessels less than 8 m, while two dedicated large patrol vessels (> 20 m) are based in Fremantle and Geraldton respectively and deployed to other regions as seasonal programmed duties are undertaken. In addition to duties conducted by district-based Fisheries Officers, the Serious Offences Unit conducts investigations into serious fishery offences on a needs basis.

Activities during 2000/01

During 2000/01, Regional Services personnel undertook 34,987 hours of service in compliance work in commercial fisheries in the west coast bioregion (West Coast Commercial Compliance Table 1), excluding aquaculture and duties concerned with fish habitat protection. Of these approximately 80% of the hours consisted of duties performed in the commercial rock lobster fishery, with the remainder dedicated to the wide range of other commercial fisheries within the bioregion.

Between January and June 2001, Fisheries Officers recorded 3,348 field contacts with commercial fishing operations and 1,823 office contacts with commercial fishers. A percentage of these contacts results from information received through the 24-hour Fishwatch hotline, a toll-free statewide telephone service to allow the public to report incidences of suspected illegal activity. During the year, 388 infringement warnings and 76 infringement notices were issued, and a further 30 cases resulted in prosecution of commercial fishers.

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

Unverified reports continued 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.

Compliance monitoring continued within the estuarine, purse seine, shark and wetline fisheries, with no significant issues arising. Overall, the level of compliance in 2000/01 for the minor commercial fisheries was good.

WEST COAST COMMERCIAL COMPLIANCE TABLE 1

Summary of compliance and educative contacts and infringement types in commercial fisheries within the west coast bioregion during the 2000/01 financial year.

CONTACT WITH THE COMMERCIAL FISHING COMMUNITY	NUMBER
Hours delivered in bioregion*	34,987
Fisher field contacts by Fisheries Officers (6 months)*	3,348
District Office contacts by Fisheries Officers (6 months)*	1,823
Fishwatch reports **	696
OFFENCES DETECTED	NUMBER
Infringement warnings	388
Infringement notices	76
Prosecutions	30

* These figures represent regional activities conducted between 1 January and 30 June 2001, following the introduction of a new, more comprehensive system for collection of regional activity data. Since this represents an incomplete year of data, collected while Fisheries Officers were still undergoing training in the system, figures should be treated with caution.

** This represents the total number of Fishwatch reports, both commercial and recreational, since the service provider reporting mechanism cannot currently differentiate between sectors.

Further north, the Mid West Regional Office conducted a pre-season briefing for operators in the Abrolhos trawl fishery. 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. The Vessel Monitoring System was introduced at the opening of the season and all vessels were 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. A dedicated two-man field operations team was established during 2000/01 to enhance regional services delivery to the Abrolhos Islands.

Initiatives in 2001/02

During 2001/02 the Regional Services Branch extended its use of risk assessment processes, both internally and in conjunction with the client base, to determine priority areas of concern in commercial fisheries. The identified major risks in both minor commercial and cost-recovered commercial fisheries were the black market and wholesale–retail sector, where avenues for the sale of illegally taken product could occur, and interference with commercial fishing gear.

One of the initiatives for 2001/02 was to focus on illegal sales of fish within the individual regions and across regions in targeted joint operations. A number of significant results were achieved in relation to illegal sales of rock lobster, abalone, finfish and squid. Some apprehensions were also achieved in connection with interference with fishing gear in the Peel/Harvey Estuary.

This joint industry/Departmental approach to risk assessments continues to provide a focus for relevant compliance operations.

In addition to these enforcement-centred initiatives, staff in the Mid West region conducted a number of public information displays and seminars targeting commercial and recreational rock lobster fishers. Material presented focused on new regulations and some of the identified problem areas around the possession of setose rock lobsters and rock lobster tails.

REGIONAL RESEARCH OVERVIEW OF WETLINE FISHING

The catch and effort statistics (CAES) database indicates that over half (58%) of the wetline catch in 2000/01 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 comprised pink snapper (*Pagrus auratus*) 210 tonnes, West Australian dhufish (*Glaucosoma hebraicum*) 191 tonnes, whitebait (*Hyperlophus vittatus*) 144 tonnes, Australian herring (*Arripis geogianus*) 117 tonnes, sweetlip emperor (*Lethrinus miniatus*) 64 tonnes, samson fish (*Seriola hippos*) 61 tonnes, sea mullet (*Mugil cephalus*) 57 tonnes, spangled emperor (*Lethrinus nebulosus*) 52 tonnes, redfish (*Centroberyx affinis*) 35 tonnes and baldchin groper (*Choerodon rubescens*) 33 tonnes. Catches of dhufish, pink snapper, emperor, and baldchin are the main product of the demersal scalefish operations reported on pp. 37–41, noting that catches of emperors are mostly from the Abrolhos Islands. 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. 32–34).

WEST COAST ROCK LOBSTER MANAGED FISHERY

Management Summary

Operators in the West Coast Rock Lobster Managed Fishery target western rock lobsters (*Panulirus cygnus*) between Shark Bay and Augusta using baited traps or pots. The fishing season runs from 15 November to 30 June of the following year and most of the catch, which has averaged 11,300 tonnes per season over the past 10 years, is exported to Asia, North America and, to a lesser extent, Europe.

This catch makes the fishery Australia's most valuable, with a seasonal gross value of production between \$300 and \$350 million.

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.

Following on from record catches of between 13,000 and 14,000 tonnes in the 1998/99 and 1999/2000 seasons, the 11,300 tonne catch in the 2000/01 season was equal to the 10-year moving average. However, in 2001/02, the catch of the fishery declined to approximately 9,000 tonnes. Variations in catch of this magnitude are not abnormal, and largely reflect the level of puerulus settlement four years

earlier, which is in turn 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. This said, the 2001/02 season's catch was below the range predicted by the Department of Fisheries' Research Division, but this is most likely to have been as a result of poor climatic conditions for catching lobster throughout the normally productive 'whites' phase. The safe breeding stock level 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 remain 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 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 potential breeding stock problem, a new management package was implemented at the beginning of the 1993/94 season. The core components of the 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.

With the exception of the maximum size restrictions, the above elements of this management package have been maintained because they continue to be relevant by ensuring that the stock does not fall below the established biological reference point. The maximum size rule was removed for the 2001/02 season following detailed scientific advice and consultation with stakeholders. This action was taken to increase the value of the catch in 2001/02 without increasing costs or presenting an unacceptable risk to sustainability. The maximum size restrictions will be automatically reinstated for the 2002/03 season.

At the commencement of the 2001/02 season a major amendment to the West Coast Rock Lobster Managed Fishery Management Plan 1993 came into effect, resulting in the unitisation of the fishery's capacity (measured as a number of pots per zone) and the entitlement associated with individual managed fishery licences. The licences of commercial fishers now refer to a number of units and a unit value, which is currently set at 0.82 pots per unit. The product of the number of units and the unit value determines the quantity of gear that the individual licensee can use. This change makes the nature of the commercial fishing right

clearer and provides a more explicit link to the overall (and adjustable) capacity or total allowable effort permitted in the fishery, as described in the management plan.

The Department is currently working on an extension of the unitisation process designed to recognise investment in units of entitlement through a register.

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. As part of this process, an environmental risk assessment has been completed, and the four moderate risks identified have been the subject of additional assessment and reporting during 2001/02.

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. The Department submitted its ecological sustainability report to EA in October 2001 and has responded to the public comments received through that body.

The evaluation of the fishery under an ecologically sustainable development (ESD) framework is becoming very much a part of rock lobster management. This is now evident through a number of key initiatives under consideration for the 2002/03, 2003/04 and 2004/05 seasons, in particular:

- new directions for the fishery's management program in response to the National Competition Policy;
- a review of the composition of, and process for appointing members to, the Rock Lobster Industry Advisory Committee (RLIAC);
- the development of an explicit harvest strategy in the form of fisheries management decision rules; and
- an assessment of the relative efficiencies of the current management system to determine where gains can be made by commercial operators.

These strategic management issues, along with other matters that affect the management of the State's rock lobster fisheries, are considered by RLIAC. This multi-sector committee is the Minister's primary source of expert advice on rock lobster-related matters. The committee engages stakeholders through regular open forum meetings, quarterly newsletters and an annual coastal tour conference. In 2001/02 the committee met four times, held four stakeholder open forum meetings and conducted a coastal tour visiting Fremantle, Dongara and Geraldton.

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
Annual RLIAC coastal tour
Stakeholder open forum meetings
Quarterly newsletter
Department–industry meetings

Compliance and Community Education Summary

The West Coast Rock Lobster Managed Fishery is Western Australia's largest and most valuable fish resource, and a comprehensive compliance program is in place to ensure its long-term sustainability and promote equity between commercial fishers and other members of the fishing community. A major part of the management package involves making sure that participants and community members understand, accept and adhere to the management rules. The Regional Services Branch provides many of the services aimed at achieving these objectives.

The Branch provides a range of at-sea and land-based compliance services within the west coast bioregion. These services are provided by Fisheries and Management Officers stationed in Denham, Geraldton, Dongara, Jurien, Lancelin, Fremantle, Mandurah, Bunbury and Busselton, and by Fisheries Officers aboard the patrol vessels *Baudin*, *McLaughlin* and *Walcott*.

Fisheries Officers from the Serious Offences Unit also conduct targeted specialised operations related to suspected serious offences in the commercial rock lobster fishery and provide specialist support to other officers as required.

Services provided by land-based officers include processing, landing and gear inspections, licensing checks, wholesale/retail checks and inshore sea-based patrols utilising vessels ranging in size from 5 to 12 m. They also provide support to the Department's larger seagoing vessels. Fisheries Officers conduct a wide variety of education and extension services, formally and informally, to commercial fishers, fishing organisations, schools and general community members.

Larger patrol vessels ensure that fishers adhere to zone and closed-water requirements, gear restrictions, and seasonal closures.

Activities during 2000/01

In 2000/01 the approach to management in partnership with industry continued, with the first rock lobster compliance risk assessment workshop conducted prior to the season opening. Industry members and Departmental staff, including Fisheries Officers, managers, fishers and processing factory representatives, attended the independently facilitated workshop. The objectives for the day were to identify and evaluate compliance risks within the fishery, thereby allowing effective targeting of limited compliance resources. All participants agreed that it produced clear results and has established a participative model for further development. Major risks identified included illegal sale into the restaurant trade, interference with commercial fishing gear, and over-potting. It is envisaged that this process will occur on a yearly basis, and will lead to more effective and efficient compliance monitoring.

As part of the move toward a more focused and planned compliance model, 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 on rule changes and to obtain information on local compliance

issues that can then be incorporated into the compliance planning process. Additionally, mobile factory patrols were established late in the season to complement increased time spent in the field by district-based Fisheries Officers. The patrols, based in Fremantle and Geraldton, travel at random throughout the fishery area and primarily inspect landed catch at processing establishments.

The conservation of totally protected fish is a critical component of the management arrangements for the rock lobster fishery, and the emphasis on ensuring they are not caught and consigned for sale continued in 2000/01. The entire fleet had catch checked at least once, with an average of seven inspections (or nearly 20 baskets) per vessel checked during the season. It is estimated that Fisheries Officers checked 2.5–3.2% of the entire landed catch consigned to processing factories (West Coast Rock Lobster Table 2).

Regional Services officers in the west coast bioregion delivered 28,182 hours to the West Coast Rock Lobster Managed Fishery in 2000/01. While compliance in the fishery was generally good, 366 infringement warnings and 66 infringement notices were issued, and 22 prosecutions were initiated or conducted (West Coast Rock Lobster Table 1).

Fisheries Officers reported 3,111 field-based contacts and 1,244 contacts in District Offices with commercial fishers during the second half of the year (West Coast Rock Lobster Table 1).

WEST COAST ROCK LOBSTER TABLE 1

Summary of compliance and educative contacts and infringement types in the West Coast Rock Lobster Managed Fishery during the 2000/01 financial year.

CONTACT WITH THE COMMERCIAL FISHING COMMUNITY	NUMBER
Hours delivered in fishery	28,182
Fisher field contacts by Fisheries Officers (6 months)*	3,111
District Office contacts by Fisheries Officers (6 months)*	1,244
OFFENCES DETECTED	NUMBER
Infringement warnings	366
Infringement notices	66
Prosecutions	22

* These figures represent regional activities conducted between 1 January and 30 June 2001, following the introduction of a new, more comprehensive system for collection of regional activity data. Since this represents an incomplete year of data, collected while Fisheries Officers were still undergoing training in the system, figures should be treated with caution.

WEST COAST ROCK LOBSTER TABLE 2

Summary statistics of factory inspections of commercially captured western rock lobster in the 2000/01 fishing season.

STATISTIC	VALUE
Number of unique vessels checked	Entire fleet at least once
Average number of inspections per vessel	7.1
Average number of baskets checked per vessel*	19.95
Proportion of total commercial catch inspected	2.5%–3.2%
Non-compliance rate (per-animal basis)**	0.0014–0.0015
Total consigned commercial catch ('000 kg)	11,273
Estimated total illegal catch consigned ('000 kg)	16.3–16.9

* Calculated as the total baskets checked per vessel divided by total inspections per vessel.

** A rate of 0.001 indicates 1 illegal animal detected in every 1,000 animals checked.

In the Metropolitan Region (principally Zone C), factory consignment compliance was generally good. Minor infringement notices and warnings continued to be issued, some for setose rock lobster but the majority for over-size animals. Closed-water offences detected within the waters of Rottnest Island were again an issue during the 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 were about unauthorised pulling of pots. Complaints related to early pulling and recreational fishers interfering with fishing gear 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 A Zone prior to that area opening on 14 March. Operations were also conducted to ascertain whether vessels were pulling 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.

Initiatives in 2001/02

Following the successful introduction of the mobile rock lobster patrols in the latter part of 2000/01, industry agreed

to the full-time implementation of the patrols for the 2001/02 season. Compliance staff working with the Rock Lobster Coordinator also planned and implemented a number of joint regional initiatives targeted at areas identified through the risk assessment process. Additionally, priority was given to developing and testing new techniques and technology aimed at more effective compliance initiatives and outcomes.

The delivery of a new patrol vessel, the PV *Hamelin*, which is to replace the PV *Baudin*, will also enhance the seagoing capabilities of the Departmental patrol vessel fleet.

Research Summary

During the year, research activities continued to focus on forecasting future catch levels, monitoring levels of puerulus settlement on a lunar-monthly cycle, monitoring of breeding stock levels, monitoring of catches through both fishers' and processors' returns, and modelling and stock assessment. Research advice was provided to the Rock Lobster Industry Advisory Committee, Western Rock Lobster Development Association, WA Fishing Industry Council, various fishermen's associations and the general public. A Master's thesis entitled 'Time series modelling of the environmental factors affecting the daily catch rates of western rock lobster' also was completed at Edith Cowan University using data from the voluntary research logbook program and guidance from the Fisheries Research Division. Such projects add significantly to the knowledge base for the rock lobster fishery and demonstrate how good collaborative research can be undertaken by the Department of Fisheries and the Western Australian universities. In addition, a focus was placed on gathering quantitative data to be used in the assessment of the impacts of rock lobster fishing in the context of ESD issues arising from Commonwealth legislation and Marine Stewardship Council certification.

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 2000/01):
11,266 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 2000/01 catch in the WCRLMF was forecast from puerulus settlement to be 11,200–12,400 tonnes. Processors' figures show that the catch from the WCRLMF for the 2000/01 season was 11,266 tonnes, 4.1% greater than the long-term average catch of 10,820 tonnes and 22.4% less than the previous season's record of 14,523 tonnes. In 2000/01, the catches in A Zone, B Zone and C Zone were 1,673 tonnes, 3,504 tonnes and 6,089 tonnes respectively, with A Zone 4.3% lower, B Zone 23% lower and C Zone 26% lower than the record previous season.

In 2000/01, a survey of recreational rock lobster fishers estimated that they caught approximately 560 tonnes, which was a 25.3% decrease on the catch estimate for 1999/2000 of 750 tonnes. The decrease reflected the reduced recruitment of lobsters.

The total catch of western rock lobster from this fishery (commercial and recreational) was approximately 11,830 tonnes, 22.5% lower than the previous season's record catch of 15,270 tonnes.

Octopus may be caught in rock lobster pots, generally in shallow water (0–20 fathoms or 0–37 m), and a catch rate of about 0.035 octopus per pot lift was recorded in the 2000/01 voluntary research logbook data. This was 20.7% above the average of 0.029 per pot lift over the period 1985/86 to 1999/2000. This translates to an estimated 366,000 octopus caught in the fishery during 2000/01. Octopus catches in B Zone generally are twice those of the other two zones.

Fishing effort

The nominal fishing effort for 2000/01 was 10.46 million pot lifts, 2.4% lower than the 10.72 million pot lifts for 1999/2000 (West Coast Rock Lobster Figure 1). The nominal effort for the A, B and C Zones of the WCRLMF was 1.22 million, 3.78 million and 5.46 million pot lifts respectively, which was 6.1% more, 3.1% less and 3.7% less than the previous season's 1.15, 3.90 and 5.67 million pot lifts.

Effort equivalent to 0.52 million commercial pot lifts was used by the recreational fishery to land its catches. This was 5.5% lower than the 0.55 million pot lifts used in 1999/2000.

The total effort used in the WCRLMF during 2000/01 was 10.98 million pot lifts, 2.3% lower than the 11.24 million pot lifts made in 1999/2000.

The reduced level of pot usage maintained since 1993/94 has had the secondary effect of 'encouraging' a reduction in fleet size as vessels purchased additional pot entitlements to improve their economic efficiency. Over 1999/2000 and 2000/01 vessel numbers remained stable with a fleet of 594 licensed boats, indicating that the restructuring has slowed. Under new legislation introduced in 2000/01, new WCRLMF licences could be created if a minimum pot

holding was demonstrated. In addition, licensees could redistribute all pots by lease or sale down to a holding of a single pot on a licence, which then was considered dormant. Under this scenario, 146, 147 and 291 vessels actually fished for lobster in 2000/01 in A, B and C Zones respectively, with two A Zone, four B Zone and four C Zone licences dormant.

Catch rate

A decline in the abundance of rock lobsters from the record 1998/99 and 1999/2000 seasons was forecast for 2000/01. Trends in catch rates show a 'cyclical' pattern due to environmental effects on levels of puerulus settlement (Rock Lobster Figure 2) which are reflected in catches three and four years later. Accordingly, catch per unit of fishing effort in 2000/01 decreased substantially (20.6%) compared to the rate in the record catch season of 1999/2000 (1.08 and 1.36 kg/pot lift respectively) (West Coast Rock Lobster Figure 2).

Recreational component: **5% (approx.)**

See information in 'Landings' and 'Fishing effort' above, and the Recreational Western Rock Lobster Fishery Status Report (pp. 136–138).

Stock assessment completed: **Yes**

The stock remains fully exploited but under the current management arrangements, introduced in 1993/94, the breeding stock has been rebuilt and remains at or above the target levels of the late 1970s and early 1980s (West Coast Rock Lobster Figures 3–5).

Pot reductions continue to be an effective tool with which to manage fishing effort in the WCRLMF. Whilst some effort increase was evident between 1993/94 and 1998/99, nominal effort levels remained stable from 1998/99 to 1999/2000 and even declined slightly in 2000/01. The 18% temporary pot reduction has maintained an 18% reduction in nominal fishing effort when data from 1991/92 and 2000/01 are compared. The maintenance of these lower effort levels has ensured that the exploitation rate of the stock remains lower than prior to the introduction of the management package in 1993/94, as evidenced by the rebuilding of the breeding stock (see below). Nevertheless, effective fishing effort continues to increase as new technology and learning is incorporated into the catching sector. This is monitored and will be factored into stock assessments and future management advice.

Post-larval recruitment to the fishery is monitored and fluctuates in response to environmental conditions such as strength of the Leeuwin Current and westerly winds. Annual indices of puerulus settlement for 2000/01 were average to above average but within the historical range of values (West Coast Rock Lobster Figure 6). Fluctuations in catches are due primarily to variations in puerulus settlement three and four years prior to the season in which the catch was taken.

Stock assessment is undertaken using existing models but a new approach using depletion estimates currently is being investigated.

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 sets of indices show a considerable decline in 2001 in the coastal breeding stock measures used to assess levels of egg production. Whilst the declines appear dramatic, similar declines in water temperatures appear to have had an effect on the catchability of lobsters leading to lower catch rates during the independent breeding stock survey. The coastal indices have returned to levels equivalent to those in 1997 and 1998. Research advice always has been that, following the introduction in 1993/94 of the current management arrangements, an improvement followed by a stabilising of egg production should occur. This might suggest that the coastal indices in 1999 and 2000 (West Coast Rock Lobster Figure 5) were artificially high due to environmental influences on the survey catch rates. These issues are being examined, and a three-year moving average (smoothing) of the breeding stock indices is being considered. This would show the underlying trends in the breeding stock, rather than highlighting individual data points which can vary significantly as a result of unrelated environmental effects.

The Abrolhos Islands breeding index has also declined but is not considered problematical since approximately 70% of the egg production there comes from sub-legal-sized lobsters. The 1993/94 management arrangements were designed to focus on improving the coastal levels of egg production that had declined to very low levels in the early 1990s (West Coast Rock Lobster Figure 3).

These facts notwithstanding, the levels of egg production still are considered to be above the target levels set in 1993/94.

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. The breeding stock survey will be expanded in 2002 to include the original six locations (Fremantle, Lancelin, Jurien, Dongara, Kalbarri and the Abrolhos Islands) compared to the three representative sites (C Zone – Lancelin, B Zone – Dongara and A Zone – Abrolhos Islands) that have been sampled for the previous four seasons.

Projected catch next season (2001/02):
9,550–10,350 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, but

appear to be a little more accurate at this stage. Seasons 2001/02 and 2002/03 are expected to produce commercial catches of around 9,550–10,350 tonnes and 10,750–11,950 tonnes respectively, resulting from the lower puerulus settlements in 1997/98 and 1998/99 (West Coast Rock Lobster Figure 6). Forecast recreational catches indicate that total rock lobster landings (commercial and recreational) will be in the range of 10,030–10,830 tonnes in 2001/02.

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 an industry code of practice and education have significantly reduced the at-sea discard rate of the bands. The second interaction is the drowning of an apparently small number 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 infrequent and are reported to occur only 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).

Anecdotal information and some preliminary research data suggest that turtles can occasionally become entangled in the ropes of rock lobster pots, most being released alive and unharmed. Turtle deaths are rare. Six turtle species occur in the waters of the western rock lobster fishery, and species identification by fishers for reporting purposes is an issue. The entanglement of, specifically, leatherback turtles (*Dermochelys coriacea*) was identified as a moderate risk by the environmental risk assessment 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 indigenous harvest of leatherbacks in south-east Asian countries and elsewhere, the wholesale poaching of eggs from nests in these regions and the loss of suitable habitat for nesting due to tourism-related developments are significant causes of mortality for

this critically endangered species. By comparison, the entanglement of marine turtles in pot ropes, leading to a very occasional death, is unlikely to be a significant cause of mortality for any turtle species.

ECOSYSTEM EFFECTS

Food chain effects:

Low

The fishery is unlikely to cause significant 'food web' changes, as the sub-legal-sized lobsters and protected breeding stock components form a relatively constant significant proportion of the biomass (> 80%) 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. With current knowledge, the overall effect of the fishery on the wider ecosystem is assessed to be minimal. A low risk was assigned to this fishery impact during the formal ecological risk assessment conducted as part of the Marine Stewardship Council certification and Environment Australia assessment processes.

Habitat effects:

Low

The legislated design of rock lobster pots, the materials they are made from and the strict control of replacement pots prevent 'ghost fishing' problems arising. A study of human impacts (including rock lobster fishing) on the marine environments of the Abrolhos Islands, funded by the Fisheries Research and Development Corporation (FRDC), estimated that potting might impact on between 0.1% and 0.3% of the surface area of fragile habitat (corals) 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 high-energy coastal habitat is regularly subjected to swell and winter storms and so is considered highly resistant to damage from rock lobster potting.

SOCIAL EFFECTS

The western rock lobster fishery is an important sector of Western Australia's economy, with the catch from the current reporting season valued ex-vessel at \$300 million. Employment is seasonal, the fishing season covering seven and a half months from 15 November to 30 June. A total of 584 vessels and 1,647 people were engaged directly in fishing for rock lobster in 2000/01. This equates to one skipper and an average of about 1.82 deckhands per vessel. During the year, 11 processing establishments engaged between 150 employees in the closed season and 1,000 employees during 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), Jurien (1), Cervantes (1), Dongara (1) and Geraldton (3). Rock lobster fishing has been responsible for the establishment of, and is a critical element in the economic survival of, many towns along Western Australia's west coast from Mandurah to Kalbarri.

ECONOMIC EFFECTS

**Estimated annual value (to fishers) for year (2000/01):
\$300 million**

The price fishermen received for the western rock lobster in 2000/01 was an estimated average of \$27/kg in A and B Zones of the fishery and \$26.50/kg in C Zone. This was similar to the \$27/kg paid throughout the fishery in 1999/2000. These prices have been maintained by a reduced catch and the low value of the Australian dollar against the US dollar in particular. The value of the catch (ex-vessel) in the WCRLMF in 2000/01 was approximately \$300 million, with approximately 95% of product being exported to Japan, Taiwan, Hong Kong/China, the United States and Europe. Foreign exchange earnings from the fishery exceed this value by a considerable amount.

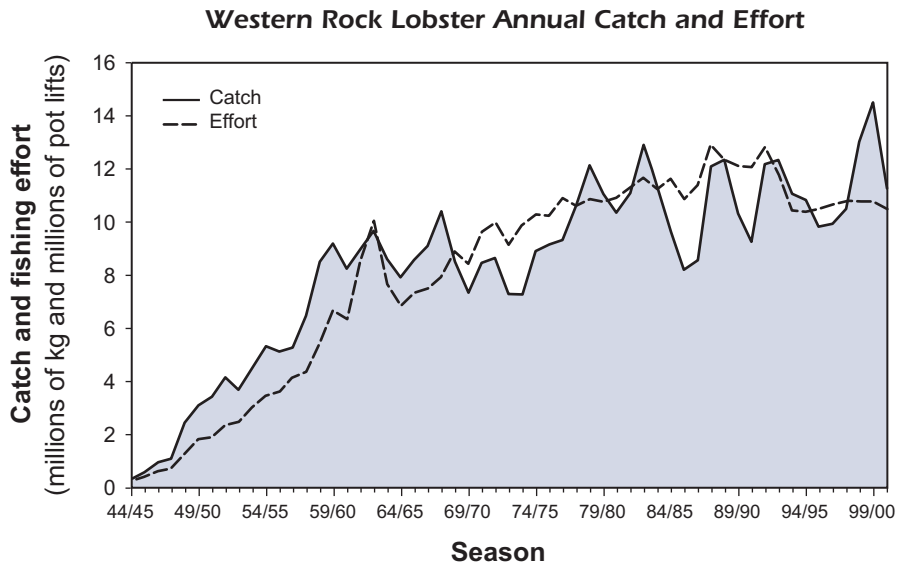
FISHERY GOVERNANCE

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

Between 1974/75 and 2000/01, fishing effort levels exceeded 10 million pot lifts. During this 27-year period, commercial catches ranged from 8,166 tonnes in 1985/86 to 14,523 tonnes in 1999/2000. The average catch was 10,820 ± 587 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 above range.

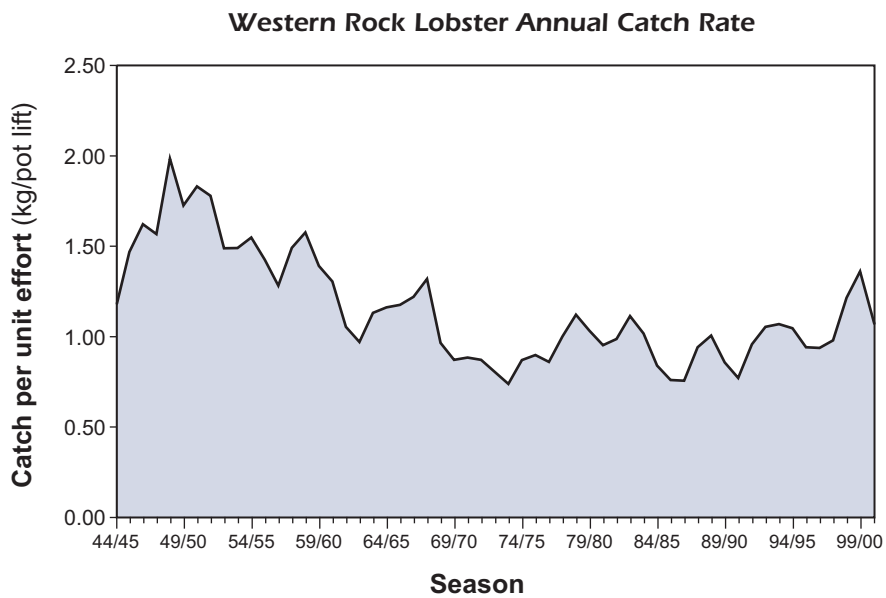
EXTERNAL FACTORS

Catches peaked in 1999/2000, with the second successive season of record landings, and declined to slightly above average levels in 2001/02 as expected. A further decline will occur in 2001/02 before average to very good catches forecast for two seasons following. 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 decreased in 2000/01 due to the reduced densities of lobsters in the shallower waters, but numbers of recreational licences remain high and are expected to increase in future years. Both the Department of Fisheries and the rock lobster industry have been addressing issues raised by the Marine Stewardship Council to maintain the world's first MSC certification, and those arising from Commonwealth legislative requirements to ensure an ecologically sustainable fishery.



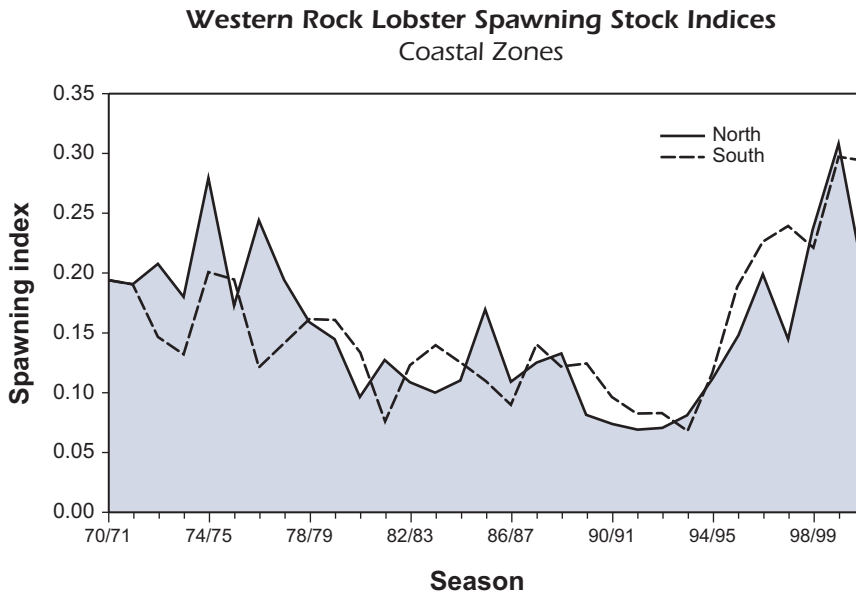
WEST COAST ROCK LOBSTER FIGURE 1

Annual catch and nominal fishing effort from fishers' compulsory monthly returns for the West Coast Rock Lobster Managed Fishery from 1944/45 to 2000/01.



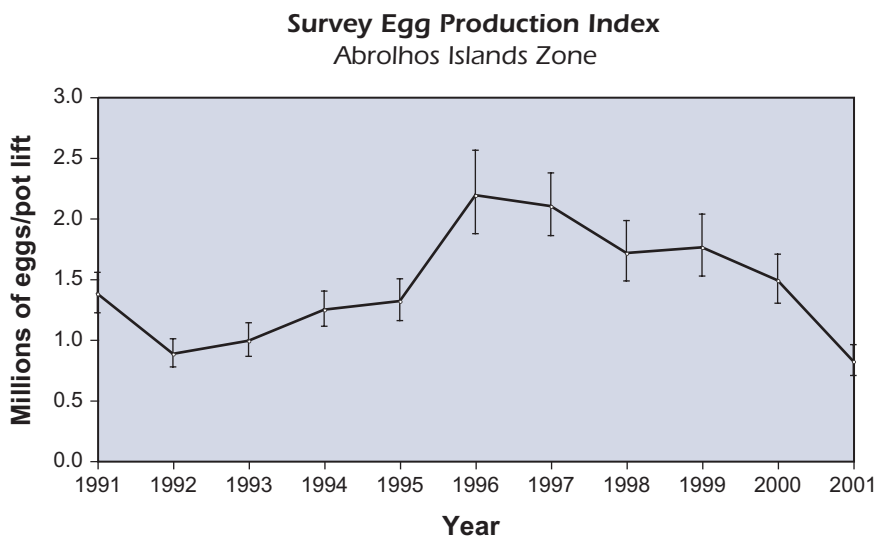
WEST COAST ROCK LOBSTER FIGURE 2

Annual catch rate (kg/pot lift) for the West Coast Rock Lobster Managed Fishery from 1944/45 to 2000/01.



WEST COAST ROCK LOBSTER FIGURE 3

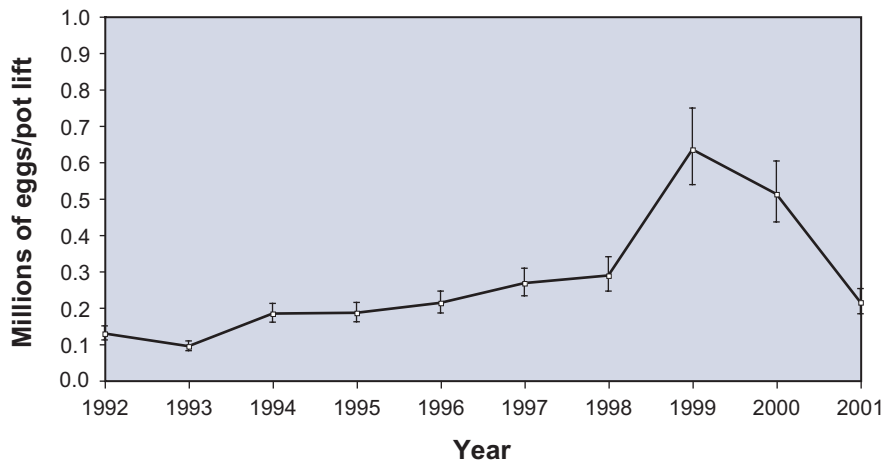
Time series of monitoring spawning stock index (an index of numbers of eggs/pot lift integrated over the whole season) for the north (Jurien and Dongara) and south (Fremantle and Lancelin) coastal regions.



WEST COAST ROCK LOBSTER FIGURE 4

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

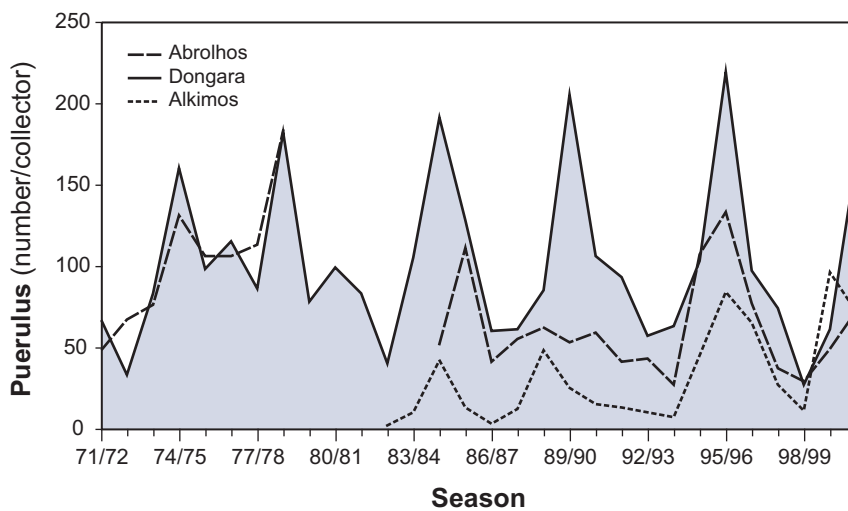
Survey Egg Production Index
Coastal Zones



WEST COAST ROCK LOBSTER FIGURE 5

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

Western Rock Lobster Puerulus Settlement



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).

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 (SWTMF) and 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. In particular, the catch in the south coast trawl has shown large variations in recent years with significant catches being taken in 2000 and 2001.

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

The South West Trawl Management Plan was amended during 2001/02 to allow for transferability of Zone A and D licences. The plan was also amended to allow for the unitisation of fishing gear, which will take effect on 1 October 2002.

Bycatch reduction devices were introduced to the AIMWTMF as a licence condition for the 2002 Abrolhos Islands season. For the 2002 season, licensees were required to have a BRD fitted to one net. In 2003, all nets will be required to be fitted with BRDs.

The Vessel Monitoring System, a satellite tracking system used to monitor the movement of vessels within the waters of a fishery, was introduced into management arrangements for the AIMWTMF in April 2001 and will be introduced into the SWTMF in 2003.

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

Consultation Process

Department–industry meetings

Research Summary

Research monitoring of the scallop stocks in each fishery is undertaken utilising fishers' monthly returns 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'.

The permitted fishing area opened on 3 April and closed on 31 May 2001. In this fishery, the fishing gear (net size) is unitised, with one headrope unit converting to 4 fathoms. For the 2001 season, the entire entitlement of 46 headrope units, or 184 fathoms, was utilised by the 16 boats which operated in the fishery.

The Port Gregory trawl fishery operates as part of the AIMWTMF. The permitted fishing area opened on 1 March for prawns and 3 April for scallops, and was closed on 31 October 2001.

Main fishing method

Otter trawl.

RETAINED SPECIES

Commercial production (season 2001):

1,182 tonnes whole weight

Landings

The total landings for the 2001 season were 1,182 tonnes whole weight of scallops compared to 429 tonnes whole weight in 2000 (Abrolhos Islands Scallop Figure 1). This was higher than the projected catch based on pre-season survey as approximately 300 tonnes came from an area not surveyed. The catch exceeded the defined acceptable catch range as a result of above-average recruitment. It was, however, less than the peak catches of the early 1990s when very strong recruitment occurred, and is therefore not of management concern. No prawns were caught in the Port Gregory area.

Fishing effort

A total of 4,773 trawl hours (nominal effort) were recorded for the 2001 season. This is equivalent to 3,998 standardised trawl hours (standardised to 14 fathoms headrope length), which is much higher than the 1,134 standardised trawl hours in 2000. This effort level represents a fishing season of 21 days' duration in 2001, compared to 7 days in 2000.

Catch rate

The catch rate in 2001 was 296 kg/hr (whole weight, standardised effort), compared with 378 kg/hr for 2000 achieved with lower effort.

Recreational component:

Nil

Stock assessment complete:

Not assessed

This fishery is highly variable, being dependent on sporadic recruitment, which appears to be 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 four years of surveys (1997–2000). The spatial distribution of the recruitment is very patchy and not all possible recruitment areas are covered by the survey. Derivation of a more reliable survey abundance–catch relationship will require several more years of data and an extension of the survey to cover more of the potential settlement area.

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 (2002):
200–300 tonnes whole weight

Using the November 2001 survey data, the projected catch range for 2002 is likely to be 200–300 tonnes whole weight for the surveyed areas, which is lower than the 2001 catch. During the survey, only one area showed reasonable levels of recruitment, with all other surveyed areas showing low levels of recruitment.

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 Arolhos 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 the Department of Fisheries in 1994 to delineate trawlable habitats in the Arolhos Islands and trawling is largely contained within these areas.

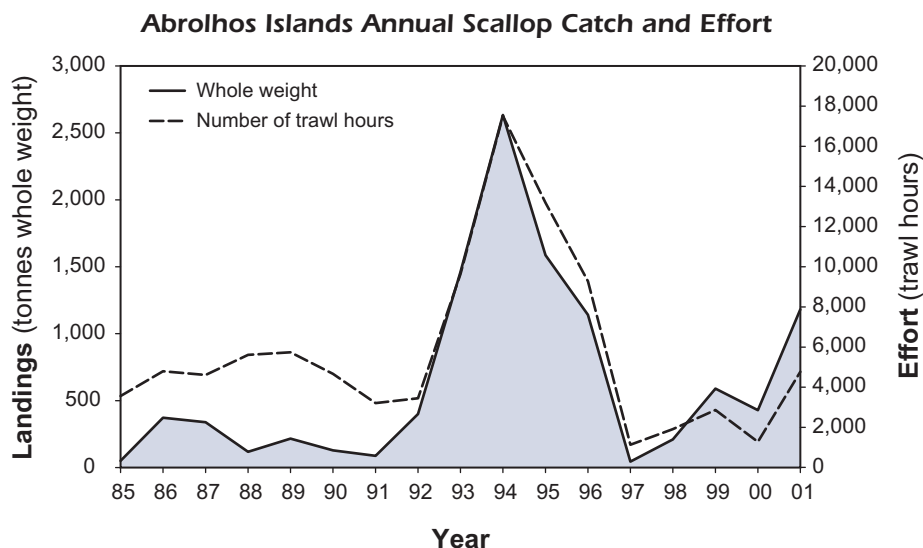
SOCIAL EFFECTS

This scallop fishery utilises large numbers of crew (up to 13 per vessel) to carry out on-board processing during the short annual season. The estimated employment for the year 2001 was 200 skippers and crew.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year 2001:
\$4.8 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 \$4.10/kg whole weight or \$20.50/kg meat weight. Meat weight is approximately 20% of the whole weight.



ABROLHOS ISLANDS SCALLOP FIGURE 1

Annual scallop landings for the Abrolhos Islands and Mid West Trawl Managed Fishery, 1985–2001.

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.

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 200 m 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 and B boats may fish between 1 January and 15 November, access to Zone C occurs between 1 July and 30 September, and Zone D boats can fish all year round. Seven boats operated in the fishery during 2001.

Main fishing method

Otter trawl.

RETAINED SPECIES

**Commercial production (season 2001): Prawns 10 tonnes
Scallops 23 tonnes whole weight**

Landings

The total landings for the season were 10 tonnes of western king prawns (*Penaeus latisulcatus*) and 23 tonnes whole weight of scallops. The catch of king prawns was down on the good catch of 32 tonnes in the previous season. The fishery also lands a mixture of by-product species, of which the most abundant species recorded were 11 tonnes of sand whiting (*Sillago* spp.), 4 tonnes of blue swimmer crabs (*Portunus pelagicus*), and 1 tonne each of sole, squid, flounder and mixed skates and rays.

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 2001 was 28 skippers and crew.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year 2001:
Prawns \$150,000
Scallops \$100,000

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 \$14.05/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 \$4.10/kg whole weight or \$20.50/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.

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) and is attached to all four licences. Condition 79 authorises demersal trawling for scallops within the Recherche Archipelago and is attached to only three of the current licences.

Main fishing method

Otter trawl.

RETAINED SPECIES

Commercial production (season 2001):
239 tonnes whole weight

Landings

The scallop catch of 239 tonnes whole weight was substantially lower than the very high catch of 2,722 tonnes seen in 2000, but still relatively high compared to the previous highest catch of 138 tonnes whole weight recorded in 1995. The south coast trawl fishery is principally a scallop fishery, though two licence holders reported landings of mixed finfish, of which leatherjacket, redfish and queen snapper 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 2001 was 16 skippers and crew.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year (2001):
\$1 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 2001 were higher than those seen in the fishery in general over the last 10 years (except the very high catch seen in 2000), indicating continued fishing down of the stock which was still available after the very strong settlement in 2000.

WEST COAST BLUE SWIMMER CRAB FISHERY

Management Summary

Blue swimmer crabs (*Portunus pelagicus*) are found along the entire Western Australian coast and comprise the major proportion of the State's inshore crab catches. 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.

The use of crab traps in the waters of Comet Bay (Mandurah), Shark Bay and Geographe Bay (Busselton) is controlled under a variety of arrangements provided by way of subsidiary legislation under the *Fish Resources Management Act 1994*. While the sustainability of the crab stocks is a primary concern, the commercial management arrangements have also been designed to ensure that any likely adverse impact on recreational fishing activities in the respective areas is minimised.

In the 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 after a Voluntary Fisheries Adjustment Scheme (VFAS) 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.

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 Minister has now approved the directions for future management arrangements, with a view to managing the State's crab stocks on a statewide zonal arrangement.

Governing Legislation/Fishing Authority

Cockburn Sound (Crab) Management Plan 1995
Warnbro Sound (Crab) Management Plan 1995
Exceptions to the *Fish Traps Prohibition Notice 1990* and
Fish Traps Restrictions Notice 1994
Exemptions under Section 7 of the *Fish Resources Management Act 1994*

Consultation Process

Department–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 FRDC, under the umbrella of the national collaborative blue swimmer crab research initiative. This research on the basic biology of crabs along the Western Australian coast, gear–catchability relationships, recreational catch surveys, commercial catch monitoring, discard mortality estimation and stock assessment modelling was completed in 2000/01. The FRDC has funded a sequel three-year project to enable the development of stock allocation and assessment techniques in the State's blue swimmer crab fisheries. The following status report summarises the research findings for this fishery.

WEST COAST BLUE SWIMMER CRAB STOCK STATUS REPORT

Prepared by L. Belchambers

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, 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 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 crabs 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 expire on 31 December 2002.

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 2000/01): 736 tonnes

Landings

A commercial catch of 736 tonnes of blue swimmer crab was taken in 2000/01, 9% up on the 673 tonnes caught in the 1999/2000 season. Commercial catches in Cockburn Sound contributed 212 tonnes (31% decrease), while other areas making a substantial contribution to total landings were the Peel/Harvey Estuary (70 tonnes, 14% increase) and Shark Bay (301 tonnes, 40% 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 81% of the commercial catch, while the balance of the catch was taken mostly by trawling (10%), gillnetting (6.9%) and drop netting (1.3%). Fishing effort overall decreased by 4% for traps while increasing by 1.9% for trawling, 2.3% for gillnets and 0.8% for drop nets in the last year.

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 (0.95 kg/trap lift) decreased by 26% compared with the previous season. In the Peel/Harvey Estuary (1.41 kg/trap lift), catch rates for traps increased by 16% but gillnet catches dropped to zero. In Shark Bay (1.77 kg/trap lift), trap catch rates increased by 30%.

Recreational component: 40% (approx.)

Recreational catches of blue swimmer crabs have been surveyed in the west coast bioregion, as reported in *State of the Fisheries 1999/2000*, and were estimated to be about 40% of the total catch at that time. The recreational take was dominated by the catch from the Peel/Harvey Estuary. With the lower commercial catches in the south and higher Shark Bay catches in 2000/01 it is likely that the recreational share of the overall catch has decreased in the current year.

Stock assessment completed: Preliminary assessment

A preliminary assessment has been made using trap catch rates for each of the three major blue swimmer crab fisheries in the State. Trap catches in Shark Bay (Blue Swimmer Crab Figure 3) show almost a five-fold increase since the commencement of the Shark Bay Experimental Crab Fishery in 1998, while effort and catch per unit effort (CPUE) have only increased three and 0.5 times respectively. These increases are due to more efficient fishing of blue swimmer stocks as the fishers' knowledge of the fishery has increased

over time. Following the change from gillnets to purpose-designed pots in 1994/95, trap catches in Cockburn Sound increased until reaching a peak of 333 tonnes in 1997/98 (Blue Swimmer Crab Figure 4), after which the catches declined. Similarly, effort peaked in 1997/98 and has subsequently declined due to industry buy-backs and latent effort in the fishery. However, on an annual basis the catch, effort and CPUE in Cockburn Sound display significant variation. Blue swimmer catches in Peel/Harvey (Blue Swimmer Crab Figure 5) have maintained fairly consistent levels in terms of catch, effort and CPUE since the implementation of pots in 1995/96, with a moderate increase in catch and CPUE evident in 2000/01.

Yield-per-recruit analysis has indicated that yields in the fishery may be increased by lowering the legal minimum size or carapace width (CW) (Melville-Smith et al. 2001). Egg-per-recruit analysis indicated that as blue swimmer crabs mature at a small size ($CW_{50} = 86.2$ mm females and $CW_{50} = 96.8$ mm males in Cockburn Sound, Potter et al. 2001), even substantial reductions in the minimum legal size may not be detrimental to egg production per recruit (Melville-Smith et al. 2001). However, optimising catch in the fishery by reducing size (age) at first capture is not economically viable, as market demands mean that premium prices are paid for animals > 130 mm CW. Similarly, catching smaller crabs with lower meat yields is unlikely to be satisfying to recreational fishers.

Exploitation status: Not assessed

Breeding stock levels: Adequate

As the legal size at first capture (127 mm CW) 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. The industry voluntarily applies a higher minimum size for marketing purposes, thus further increasing the level of spawning prior to capture.

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 implemented in Western Australian trawl fisheries, mainly to reduce the take of sharks and rays, which damage the quality of the target catch, but also to prevent the capture of turtles occasionally taken by conventional trawls.

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 locations along the west coast from Geographe Bay in the south to Shark Bay in the north. Additional employment is also being created in the Gascoyne region where post-harvest processing of the crab catch is occurring.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year (2000/01):
\$3.1 million

The catch was valued at approximately \$3.1 million in 2000/01, with most of the product going to local and interstate markets.

FISHERY GOVERNANCE

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

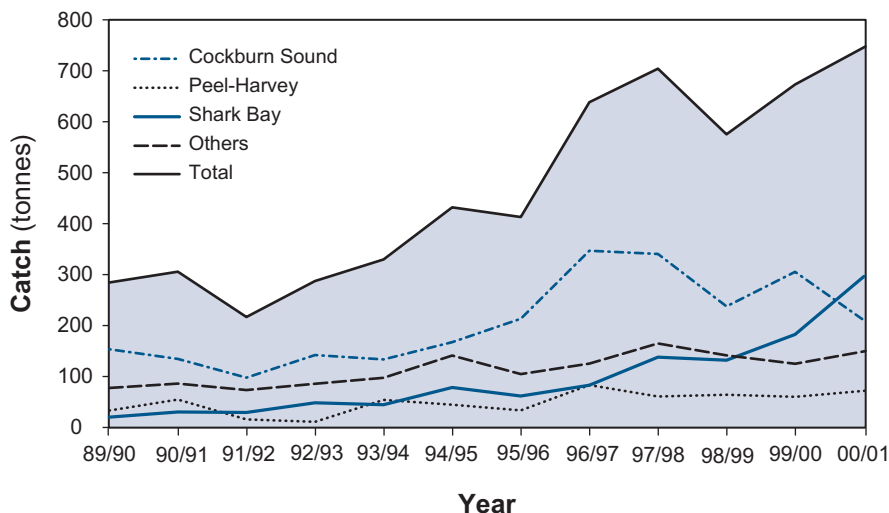
Commercial catches are expected to be in the range 600–800 tonnes, based on catches in the years 1997/98 to 1999/2000. For the managed fishery in Cockburn Sound the commercially acceptable range for the current management regime is approximately 200–350 tonnes, based on catches in the five-year period from 1995/96 to 1999/2000, since the fishing effort was converted to trapping and effort stabilised.

There is also interest in expanding the blue swimmer crab fishery into currently unexploited grounds such as Exmouth Gulf and Nickol Bay in the north and the coastal zone between Mandurah and Bunbury (excluding the key recreational areas) in the south. Acceptable catch rates for these areas are not available as yet due to the lack of a sufficient time series of commercial fishery data to allow ranges to be set.

EXTERNAL FACTORS

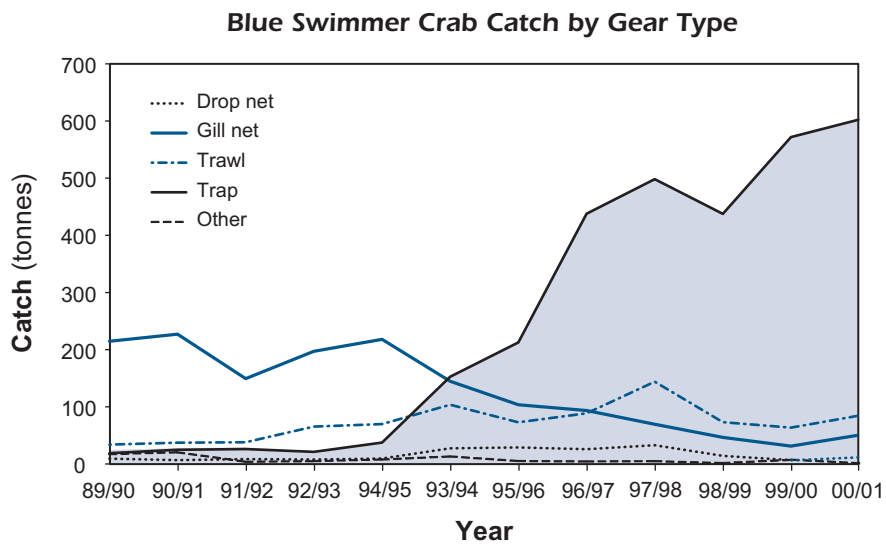
The commercial fishery has expanded since 1995/96, when the main commercial sectors converted from set nets to dedicated crab traps, and there is still potential for future commercial expansion in more remote areas not currently exploited. Currently, new commercial fishing grounds are being explored 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 competition is 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 under way to provide an information basis to review these arrangements in both Cockburn Sound and Geographe Bay.

Blue Swimmer Crab Catch by Fishing Area



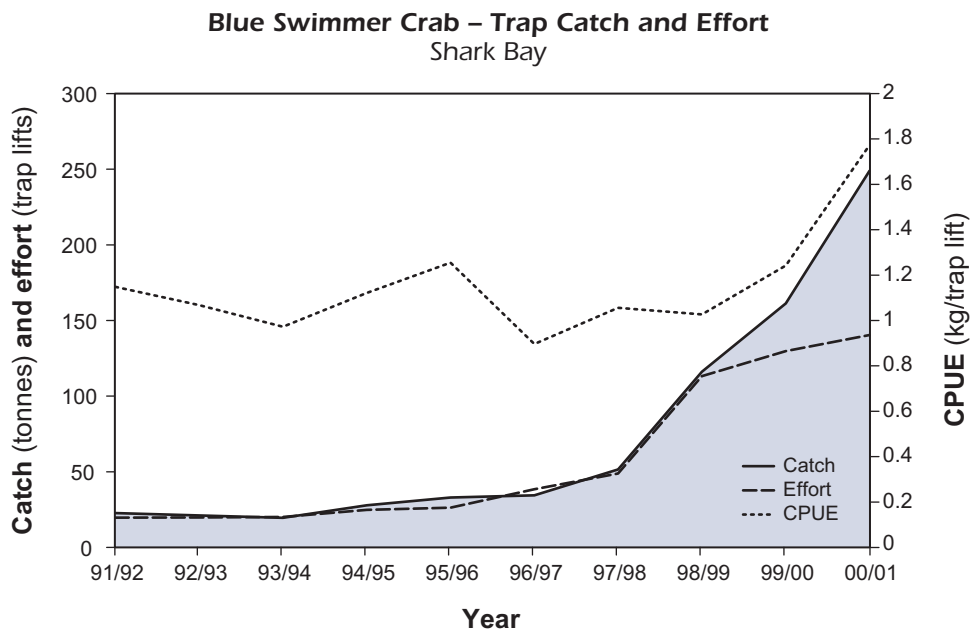
BLUE SWIMMER CRAB FIGURE 1

Commercial catch history for the blue swimmer crab (*Portunus pelagicus*) in Western Australia between 1989/90 and 2000/01, indicating main regions of commercial catches.



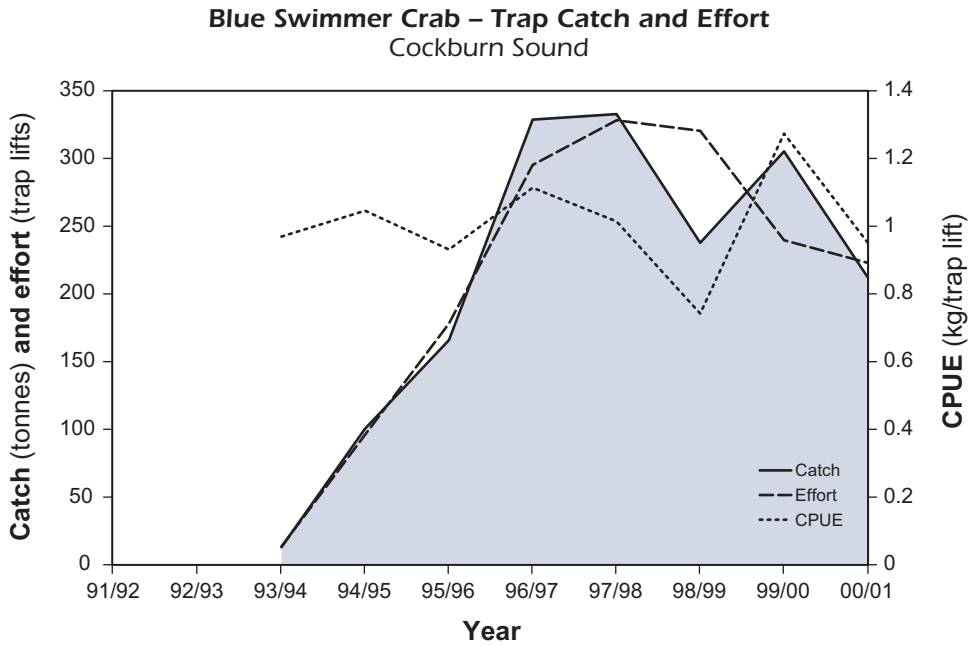
BLUE SWIMMER CRAB FIGURE 2

Blue swimmer crab catch taken by different gear types in Western Australia during the period 1989/90 to 2000/01.



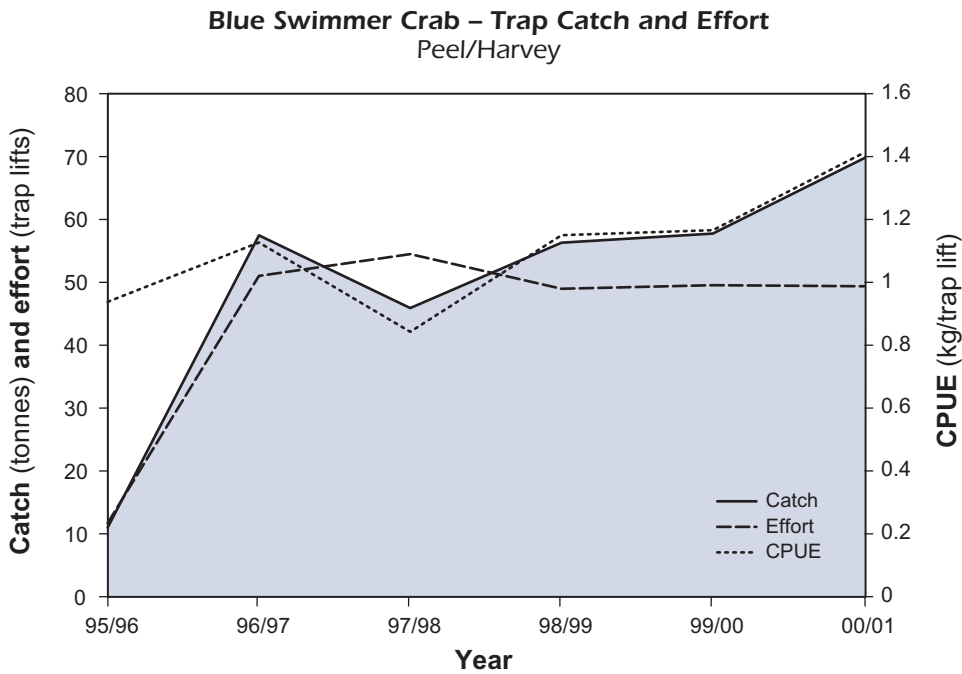
BLUE SWIMMER CRAB FIGURE 3

Blue swimmer crab catch (kg), effort (trap lifts) and catch per unit effort (kg/trap lift) in Shark Bay during the period 1991/92 to 2000/01 using traps.



BLUE SWIMMER CRAB FIGURE 4

Blue swimmer crab catch (kg), effort (trap lifts) and catch per unit effort (kg/trap lift) in Cockburn Sound during the period 1991/92 to 2000/01 using traps.



BLUE SWIMMER CRAB FIGURE 5

Blue swimmer crab catch (kg), effort (trap lifts) and catch per unit effort (kg/trap lift) in the Peel/Harvey Estuary during the period 1995/96 to 2000/01 using traps.

WEST COAST DEEP-SEA CRAB FISHERY

Management Summary

The West Coast Deep-Sea Crab Fishery is presently a developmental fishery. Fishers target giant (king) crabs (*Pseudocarcinus gigas*), snow crabs (*Chaceon bicolor*) and champagne crabs (*Hypothalassia acerba*). Stocks are currently accessed via a condition on a WA fishing boat licence. There are seven boats currently authorised to participate within this fishery. Given the vulnerability of deep-sea crab stocks to over-exploitation, the Department has concerns about the ability of the fishery to continue to support all licensees, and will be giving consideration to ways of equitably sharing reduced access to the resource.

There have been several submissions to Environment Australia in 2001/02 regarding the sustainability of this fishery. Part of EA's requirements is that a formal management plan be in place by December 2002. The Department intends to implement an interim management plan for this fishery shortly, the details of which have been discussed with industry and other interested parties over the past 12 months.

Governing Legislation/Fishing Authority
Condition 106 on a Fishing Boat Licence

Consultation Process
Department–industry meetings

Research Summary

Research in this sector involves assessing the current status of the West Coast Deep-Sea Crab Fishery based on commercial catch returns and logbook information. Information from these sources is reflected in the following status report.

WEST COAST DEEP-SEA CRAB STATUS REPORT

Prepared by R. Melville-Smith

FISHERY DESCRIPTION

Boundaries and access

The developmental West Coast Deep-Sea Crab Fishery operates between Cape Leeuwin and the Northern Territory border. Vessels are only permitted to fish outside the 150 m depth contour.

There are seven licences in this fishery, with each licence holder permitted to use 700 small moulded plastic pots. Current access arrangements result from a voluntary agreement among the fishers. To limit the level of exploitation, but still obtain a sufficient spread of fishing effort across the fishery for stock assessment purposes, three fishers have been allocated 'full-time' access (9–12 months) and four 'part-time' access (0–3 months). Fishers are required to nominate one of five areas in which they will fish. The maximum fishing effort in any one area is 18 fisher months (e.g. one full-time fisher = 12 fisher months plus two part-time fishers at 3 months each = 6 fisher months).

In 2006, all licensees are expected to be granted equal access to whatever portion of the deep-sea crab stocks is made available by the Department of Fisheries for commercial harvesting. The allocation may be in the form of time access, effort or catch quota units.

Main fishing method

Moulded plastic pots operated in longline formation.

RETAINED SPECIES

Commercial production (season 2000/01): 213 tonnes

Landings

A catch of 213 tonnes of snow crabs was taken in the fishery in 2001, an increase of 49% on the catch taken in the 2000 season (143 tonnes). Champagne crabs decreased from the 12.4 tonne landings reported by five licence holders in 2000 to a negligible catch reported in 2001. Small volumes of giant crabs were landed by vessels in the southern region of the fishery in 2000, but no catch was reported in 2001.

Fishing effort

Effort increased by 74% from an estimated 51,000 pot lifts in the 2000 season to 88,750 pot lifts in the 2001 season. This effort estimate is based on a combination of compulsory catch and effort and research logbook data.

Catch rate

The catch per unit of fishing effort for snow crabs decreased by 14%, from 2.8 kg/pot lift in 2000 to 2.4 kg/pot lift in 2001. This catch per unit effort estimate is based on research logbook data.

Recreational component: Nil

There is no recreational fishery for any of the deep-sea crab species, as a result of the distance off shore and depth of the fishing grounds, which require large vessels and specialist gear.

Stock assessment completed: No

No stock assessment results are yet available, as research on the snow crab fishery only commenced in July 2001, and the small landings of champagne and giant crabs do not justify an assessment.

Exploitation status: Not assessed

Breeding stock levels: Adequate

In snow, champagne and giant crab species, the males grow considerably larger than the females. The legal minimum sizes of 92 mm carapace length for champagne crabs and 140 mm carapace length for giant crabs, together with the voluntarily agreed minimum of 120 mm carapace width for snow crabs, therefore offer protection for the female portion of the populations. Furthermore, preliminary evidence shows that size at maturity for males and females of both snow and champagne crabs is well below the minimum size in both species (Kim Smith, Murdoch University, unpub. data) and that therefore the broodstock is protected to some extent.

Much more research has been undertaken on the state of the breeding stock levels of giant crabs than for snow and champagne crabs. Estimates made by Andrew Levings of Deakin University (unpub. data) suggest that the 140 mm carapace length minimum size protects 40% of pristine egg

production in the Western Australian portion of Australia's giant crab population.

NON-RETAINED SPECIES

Bycatch species impact: **Low**

The gear used in this fishery generates minimal bycatch and the design of the pots is such that they do not 'ghost fish' if lost.

Protected species interaction: **Negligible**

The pots and ropes used in crab longlines have minimal capacity to interact with protected species in this fishing area.

ECOSYSTEM EFFECTS

Food chain effects: **Negligible**

Catches of both species landed represent a very small biomass, and any impact of fishing on the general food chain is expected to be minimal.

Habitat effects: **Low**

Crab potting is considered to have a low impact on the largely soft mud habitat over which the fishery operates.

SOCIAL EFFECTS

The developing fishery is based on mobile vessels that employ two or three crew. The product is landed live at ports between Carnarvon and Fremantle, generating some additional economic activity and benefits.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year (2001):
\$2.8 million

The beach value of the fishery was about \$2.8 million in 2001, based on an average beach price of \$13/kg for snow, \$9.5/kg for champagne and \$25/kg for giant crabs.

FISHERY GOVERNANCE

Acceptable catch range: **Not assessed**

The effort in this developing fishery is restricted to three full-time and four part-time fishers spread throughout the range of the fishery. At this stage, not all these licences are being utilised.

WEST COAST ESTUARINE FISHERIES

Management Summary

There are three 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)
- 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 level of commercial presence and production while encouraging a resource shift towards the recreational sector, a number of Voluntary Fisheries Adjustment Schemes have been run in the last five years. The outcome of these schemes has seen a significant reduction in the number of commercial fishing units in these estuarine fisheries. This included the total removal of commercial fishing units in the Leschenault Estuarine Fishery.

A discussion paper on alternative management options for a proposed West Coast Estuarine Fishery incorporating the three existing estuarine fisheries was released for comment in December 2001. It is anticipated that the changes to the management arrangements for these fisheries will be finalised in 2002/03.

Governing Legislation/Fishing Authority

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

Consultation Process

Department–industry meetings

Research Summary

Research monitoring of fisheries and fish stocks in the west coast estuaries is primarily based on CAES returns provided by industry. These data are interpreted using the extensive scientific knowledge of the fish stocks in estuaries derived from research by Department of Fisheries 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. Ayyazian and G. Nowara

FISHERY DESCRIPTION

Boundaries and access

Swan/Canning: level of access – 4 units
Peel/Harvey: level of access – 8 units
Leschenault: level of access – no commercial access
Hardy Inlet: level of access – 1 unit

The levels of access listed above are as at May 2001. Unit holders in the three west coast estuaries are endorsed to fish a single west coast estuary system only. During 2000/01, all six of the licence holders in the Leschenault Estuary accepted an offer from the Government's buy-back scheme with the result that commercial fishing no longer occurs in that estuary.

The status of the fishery in each of the above estuaries is reviewed annually. Please note that where fewer than five fishers are actively involved in a particular fishery, the data are subject to the Department of Fisheries' 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 (*Acanthopagrus butcheri*), cobbler (*Cnidogobius macrocephalus*) and King George whiting (*Sillaginodes punctata*). These stocks are not subject to species-specific management plans, but are fished under each estuary's licence arrangement.

Main fishing method

Gillnet/haul net.

RETAINED SPECIES

Commercial production (season 2001): 264 tonnes

Landings

The total landings of 264 tonnes from west coast estuaries include the following catches of key target species:

Blue swimmer crabs	<i>Portunus pelagicus</i>	93.0 tonnes
Sea mullet	<i>Mugil cephalus</i>	69.4 tonnes
Yellow-eye mullet	<i>Aldrichetta forsteri</i>	51.4 tonnes
Western sand whiting	<i>Sillago schomburgkii</i>	16.4 tonnes
Tailor	<i>Pomatomus saltatrix</i>	6.2 tonnes
Australian herring	<i>Arripis georgianus</i>	4.9 tonnes
Other species		22.4 tonnes

Swan/Canning: The 2001 catch level showed a small increase over 2000 following a generally declining trend throughout the 1990s (actual figure not available as there were fewer than five operators). The catch from the Swan/Canning Estuary during 2001 was composed primarily of blue swimmer crab, Perth herring and sea mullet with small quantities of black bream 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. While there was little variation in the catches during the early 1990s, a dramatic decline occurred between 1998 and 2000. However, the total catch for 2001 of 196.5 tonnes was similar to the 2000 catch figure. Approximately 54% of the finfish catch comprised sea mullet and yellow-eye mullet during 2001, with approximately 37% of the total 2001 catch consisting of blue swimmer crabs.

Hardy Inlet: The 2001 catch remained similar to that of 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, with small quantities of 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 and the Hardy Inlet during 2001. The reported catches from these estuaries showed a minor increase from the 2000 catches.

Cobbler: Minor catches of cobbler were reported from the Swan/Canning Estuary and Peel/Harvey Estuary during 2001. The reported catches of cobbler in the Swan/Canning Estuary have been declining from the late 1980s, with 2001 being the lowest on record. The 2001 catch in the Peel/Harvey Estuary is also at an historically low level. There was no catch reported from the Hardy Inlet for 2001.

King George whiting: King George whiting catches for 2001 were reported from the Peel/Harvey Estuary only. Total annual catches from these west coast estuaries have declined considerably since the high catch values in 1998 and 1999, 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 3 in 2001.

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). More recently there has been a pronounced decline in the number of boats actively fishing, from approximately 16 fishing units in 1998 to the current level of 7.

Hardy Inlet: Fishing effort (mean monthly number of fishing units) in the Hardy Inlet has declined from 3 in the 1970s to the current level of only one unit operational in 2001.

Catch rate

Swan/Canning: While the annual values of the catch per unit effort 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 generally followed the downward trend in catches in this fishery. During the past 10 years, however, the CPUE has remained relatively stable even though the catch and effort have declined, particularly since 1997. 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, though apparently at a significantly lower level than during the period 1975–1985.

Hardy Inlet: Since the early 1990s the trend in the CPUE has generally followed the fluctuations in the catches. The 2001 CPUE has decreased slightly from the 2000 value.

Recreational component:

Overall percentage not assessed

The most recent recreational catch survey data, for the year 1998/99, were reported in the *State of the Fisheries Report 2000/01*.

In summary, the recreational catch at that time in the Swan/Canning Estuary was estimated to be of a similar magnitude to the commercial catch. For the Peel/Harvey Estuary, the recreational finfish catch at that time was estimated to be about 20% of the total, while for blue swimmer crabs the recreational catch was about 80% of the total.

With the cessation of commercial fishing in Leschenault Inlet, the recreational sector takes all of the catch.

Stock assessment completed:

Yes

Basic assessments have been undertaken previously for select targeted species (black bream, cobbler and King George whiting). Annual monitoring assessment of stock trends is undertaken using catch and effort indicators.

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 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*. In 2000/01, the catch data for the Swan River stock indicate a slight increase in the catch associated with a further decline in the number of units actively fishing.

Cobbler: Cobbler populations are genetically unique within each west coast estuary. A preliminary yield-per-recruit stock assessment was developed for the cobbler 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*. The low level of catch of this once important species in 2000/01 suggests that cobbler stocks are no longer a target of the commercial fishers in either the Swan/Canning or Peel/Harvey Estuaries. The decline in catch appears to be the result of several factors, including lower numbers of fishers operating in the estuaries, and a shift in target species to blue swimmer crabs, particularly in the Peel/Harvey Estuary.

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 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 2001 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+, and juveniles use estuaries and coastal waters as nursery habitats for the first few years of their life. Although the legal minimum length is considerably less than the size at maturity, the current inshore exploitation rate and low fishing effort in offshore waters appear to afford sufficient protection for these stocks. Targeted recreational fishing for these fish will need to be monitored to ensure overall fishing mortality does not reduce breeding stock below 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 that are susceptible to capture by the fishing gear used.

ECOSYSTEM EFFECTS

Food chain effects:

Not assessed

Habitat effects:

Low

The operation of 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 2001, there was an average of about 18 fishers operating in west coast estuarine fisheries, largely supplying fresh fish to meet demand for locally caught product.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year (2001):

\$730,000

FISHERY GOVERNANCE

Acceptable catch range: **Not available**

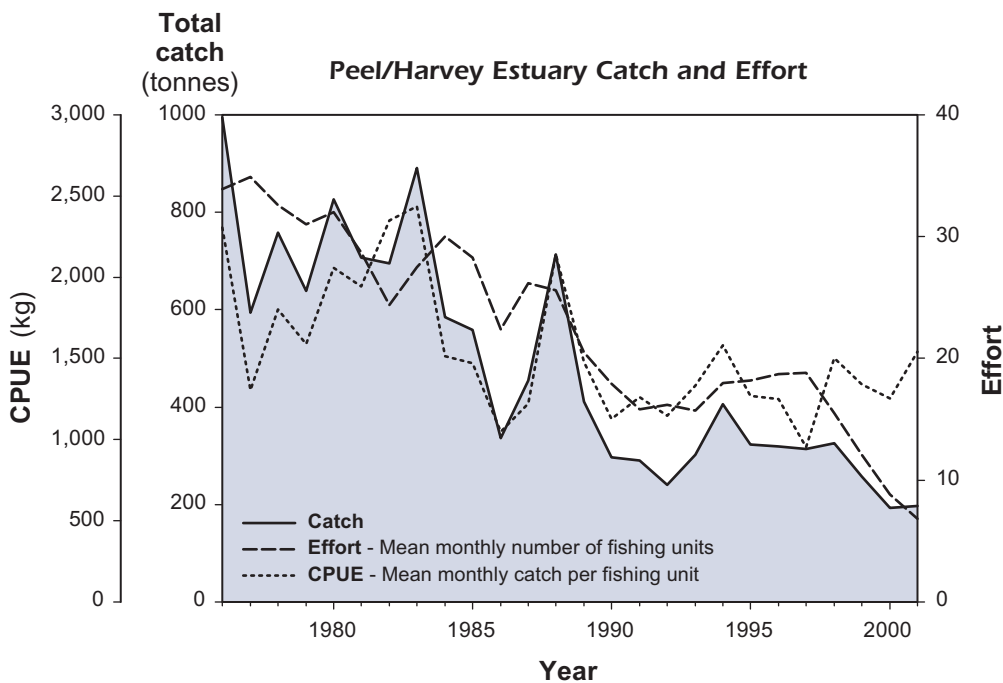
The appropriate ranges cannot be assessed at this time owing to the limited data available from the decreasing number of commercial fishers.

EXTERNAL FACTORS

The estuarine catches for 2001 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 the estuaries. These reduced levels of fishing activity as a result

of voluntary buy-back of commercial access will almost certainly render these valuable long-term commercial catch and effort data sets less useful in assessing the status of estuarine species in future years.

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.



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 1976–2001.

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: The fishery primarily targets small pelagic fish 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.

Continued beach access remains the main management issue relevant to this fishery, particularly where coastal developments restrict vehicle access. The fishery has been approved for a Voluntary Fisheries Adjustment Scheme, which will be implemented in 2002/03.

Management of south-west beach seine fishing is being reviewed in association with the South West Coast Salmon and West Coast Purse Seine Managed Fisheries. Increased development, tourism and marine recreational activities in the area mean there is increasing resource-sharing pressure on these fisheries. There is also a need to introduce more formal management for these fisheries, which are currently managed through a number of gear and species prohibitions. A VFAS is also planned to help address some of the resource-sharing issues.

The major target species for the beach seine 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 Fishery, p. 19.

Cockburn Sound (Fish Net) Managed Fishery: Fish are taken in this fishery by gillnet, beach seine and haul net and the main species targeted are garfish (*Hyporhamphus melanochir*) and Australian herring (*Arripis georgianus*). 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. The fishery has been approved for a VFAS.

Cockburn Sound (Mussel) Managed Fishery: Fishing activity in this wild capture fishery continues to be 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 24 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 that scheme were surrendered. This would be expected to continue with the implementation

of VFASs for the West Coast (Beach Bait) and Cockburn Sound (Fish Net) Managed Fisheries.

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 (*Pagrus auratus*), garfish and Australian herring.

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

Department–industry meeting

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. Ayyazian and G. Nowara

FISHERY DESCRIPTION

Boundaries and access

There are four managed fisheries that operate wholly and two managed fisheries that 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 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 2001 there were 2 licensees in the fish net fishery and 25 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. 32–23, 34–36, 170 and 19–23 respectively).

Main fishing method

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

RETAINED SPECIES

Commercial production (season 2000): 46.2 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 2001 catch represents a decline to 46.2 tonnes (Cockburn Sound Figure 1). The composition of the 2001 catch included over 20 finfish and elasmobranch species. Over 90% of the total catch consisted of sea garfish (*Hyporhamphus melanochir*), Australian herring (*Arripis georgianus*) (20 tonnes), pink snapper (*Pagrus auratus*), yellow-eye mullet (*Aldrichetta forsteri*) (1.6 tonnes) and sea mullet (*Mugil cephalus*) (1.3 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 2001 was 20 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 has continued to decline to 943 boat days for 2001.

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 2001 catch rate was 49 kg/boat day. The 2001 catch rate for Australian herring was 21.2 kg/boat day (Cockburn Sound Figure 2).

Recreational component: 45% (approx.)

The most recent recreational survey data, relating to 1996/97, was reported in the *State of the Fisheries Report 2000/01*. In summary, the recreational finfish catch for that year was estimated to be about 45% of the combined recreational and commercial catch, and the recreational catch of blue swimmer crabs about 5% of the total.

Stock assessment completed: Not assessed
For an assessment of Australian herring stocks, see pp. 113–115.

Exploitation status: Not assessed
For an assessment of Australian herring stocks, see pp. 113–115.

Breeding stock levels: Not assessed
For an assessment of Australian herring stocks, see pp. 113–115.

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 2001, 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 21. Production supplies restaurant and retail sectors in the metropolitan area.

ECONOMIC EFFECTS

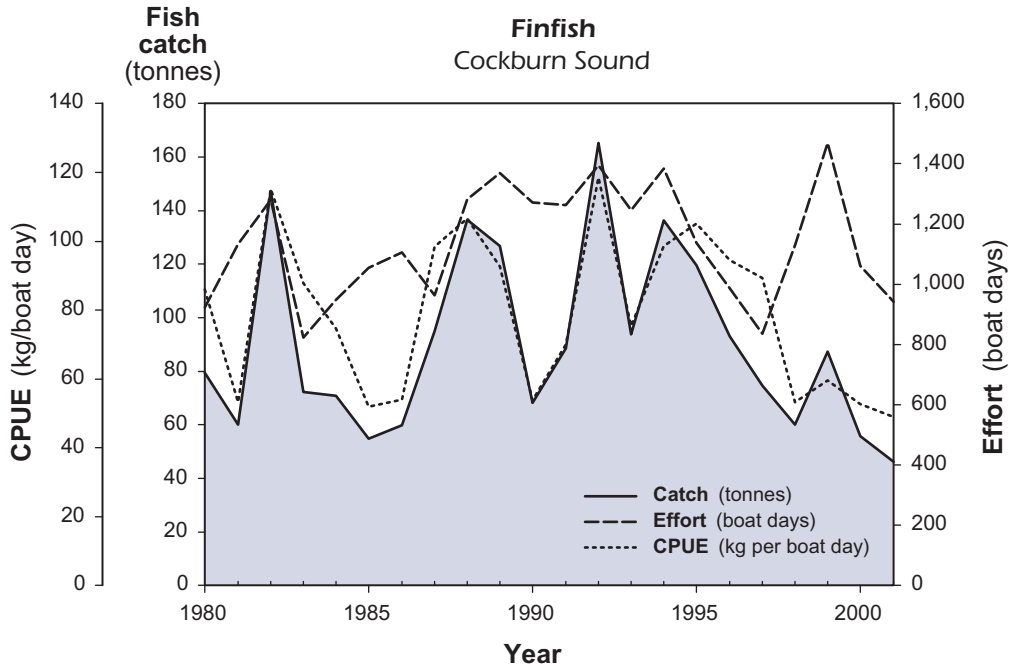
Estimated annual value (to fishers) for year (2001):
\$103,000
While relatively limited in overall value, the production from the commercial fishery provides a valuable input to the metropolitan fresh fish market.

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 still at the lower end of the acceptable catch range, apparently as a result of the significant downward trend in effort over recent years.

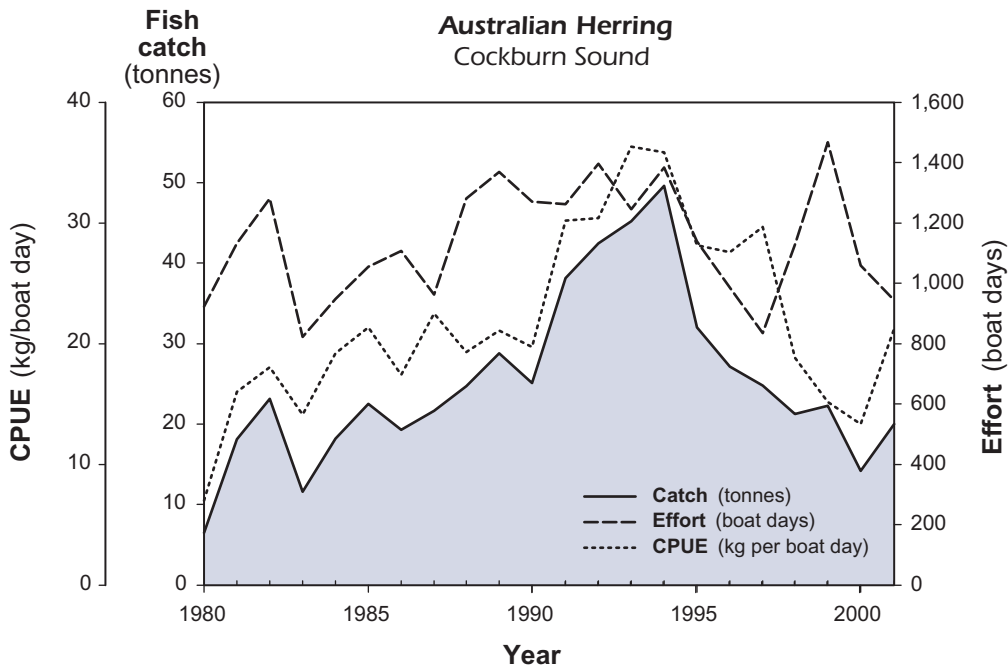
EXTERNAL FACTORS

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 1980–2001.



COCKBURN SOUND FIGURE 2

The annual catch, effort and catch per unit effort (CPUE) for Australian herring (*Arripis georgianus*) in the Cockburn Sound fisheries over the period 1980–2001.

WEST COAST BEACH BAIT (FISH NET) MANAGED FISHERY STATUS REPORT

Prepared by R. Mitchell, 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 2001):

All species 344 tonnes
Whitebait 240 tonnes

Landings

The main target species in this fishery is whitebait, of which 240 tonnes were caught in the 2001 season. The catches of all other species landed in this fishery, which amounted to 104 tonnes, are shown in West Coast Beach Bait Tables 1 and 2. Sea mullet, blue sprat, yellow-eye mullet and western sand whiting 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 form part of the managed fishery, while Bunbury landings are from the south-west beach seine fishing.

Metropolitan: The catch of whitebait for the metropolitan region during 2001 was 11 tonnes, a major decrease from the average of 24.8 tonnes over the previous three years (West Coast Beach Bait Figure 1).

Mandurah: The whitebait catch at Mandurah was 32.1 tonnes, very similar to that in 2000.

Bunbury: The Bunbury catch increased again, from 175 tonnes in 2000 to 197 tonnes in 2001 (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 do 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, abundance in the dominant Bunbury sector in 2001 was higher than in the previous year, while in the metropolitan and Mandurah sectors it was lower.

The 2001 catch of 240 tonnes was considerably less than the catch range of 272–375 tonnes predicted by the Leeuwin Current/whitebait model, which utilises the previously observed positive relationship between the Fremantle sea level (Leeuwin Current) and subsequent catch. These results indicate that further refinement of the model is needed, and this will be undertaken as more data becomes available in future years. The average monthly Leeuwin Current in 2001 was again stronger than average. The Leeuwin Current/whitebait model suggests that the 2002 catch should be at the higher end of the range.

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.

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 pilchards, 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.

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 59 fishermen and crew worked in the whitebait industry in 2001.

ECONOMIC EFFECTS

**Estimated annual value (to fishers) for year (2001):
\$430,000**

The price for whitebait was similar to that obtained in 2000, at an average of \$1.80/kg. Total catch value was about \$430,000.

FISHERY GOVERNANCE

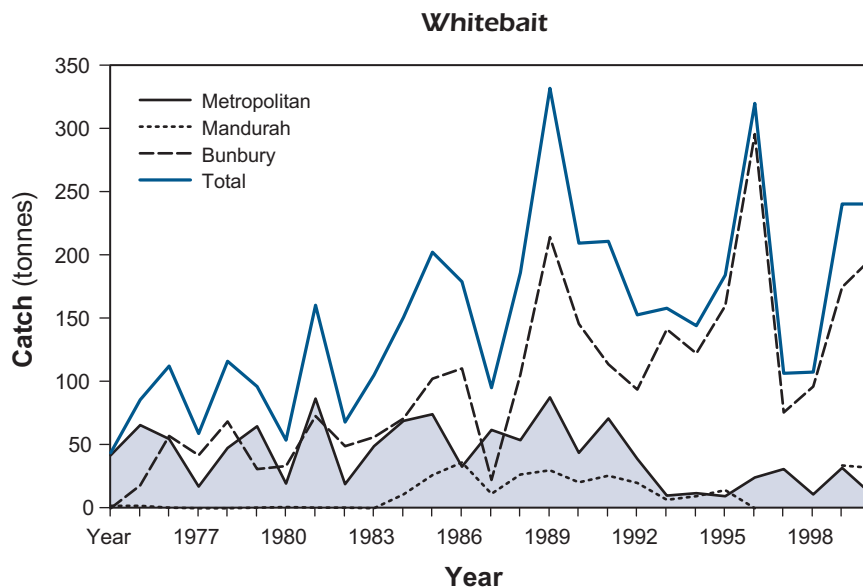
Acceptable catch range: Whitebait 106–331 tonnes

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 however 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 2001.

WEST COAST BEACH BAIT TABLE 1

Catches in 2001 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)
Mullet, sea <i>Mugil cephalus</i>	2.8 (1.2)
Mullet, yellow-eye <i>Aldrichetta forsteri</i>	1.6 (1.6)
Pilchard <i>Sardinops sagax</i>	1.0 (1.0)
Sprat, blue <i>Spratelloides robustus</i>	2.6 (2.6)
Whiting, western sand <i>Sillago schomburgkii</i>	1.7 (0.1)
Others	1.4 (1.0)
Total	11.1 (7.5)

WEST COAST BEACH BAIT TABLE 2

Catches in 2001 of retained species other than whitebait from the south-west beach seining sector.

SPECIES	CATCH (tonnes)
Mullet, sea <i>Mugil cephalus</i>	34.2
Mullet, yellow-eye <i>Aldrichetta forsteri</i>	5.8
Tailor <i>Pomatomus saltatrix</i>	1.3
Sprat, blue <i>Spratelloides robustus</i>	12.3
Garfish, sea <i>Hyporhamphus melanochir</i>	2.4
Whiting, western sand <i>Sillago schomburgkii</i>	33.1
Others	4.1
Total	93.2

WEST COAST PURSE SEINE MANAGED FISHERY

Management Summary

This fishery is based primarily 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; however, the management plan also covers the take of perth herring (*Nematalosa vlaminghi*), yellowtail scad (*Trachurus novaehollandiae*), Australian anchovy (*Engraulis australis*) and maray (*Etrumeus teres*). 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 through the west coast in 1995 and again in 1998/99 had a serious impact on the pilchard 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.

The fishing season runs from 1 April to 31 May. The pilchard catch allocation (cap) for the 2001/02 licensing period was set at 720 tonnes, a significant increase over the previous year when the take was set at 260 tonnes due to the severely depressed state of pilchard stocks following the Herpesvirus outbreak.

The determination of a pilchard catch cap and the process for allocation among licensees are considered to be temporary measures in response to the mass pilchard mortality events. 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 an individually transferable quota (ITQ) arrangement.

The framework that would see the change to ITQ management is being developed in consultation with stakeholders but is yet to be finalised. The proposed arrangements could also see the development of a zoned fishery in which the northern and southern development zone endorsement holders would be incorporated into the West Coast Purse Seine Managed Fishery Management Plan.

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
Department–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. Another egg survey is scheduled for August 2002.

The need to introduce a new management approach, following the post-mass mortality period when the fishery was essentially closed in some regions, has been presented to the Purse Seine MAC during 2001. This initiative would focus on capping TACs at a level that would enable the fishery to endure severe downturns in recruitment. In addition, annual changes in TACs, whether up or down, would not be allowed to exceed 25%. Under this relatively conservative management approach, TACs could be set for

three-year periods with appropriate trigger points, thereby providing a significantly more stable fishery than is presently the case, allowing industry to make better informed business decisions.

WEST COAST PURSE SEINE MANAGED FISHERY STATUS REPORT

Prepared by R. Mitchell, T. Leary and 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.

Main fishing method

Purse seine net.

RETAINED SPECIES

Pilchard 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 are commonly caught, while small catches of anchovies and yellowtail scad also occur periodically.

Commercial production (season 2001): 879 tonnes

Landings

The combined catch of pilchards, sardinella and maray for the managed fishery area and the developmental zone increased to 879 tonnes in 2001; however, this level of harvest is still considerably less than the catches in the mid-1990s (West Coast Purse Seine Figure 1). Encouragingly, the contribution of pilchards to the combined catch increased from less than 14 tonnes in 2000 to over 148 tonnes in 2001. The sardinella catch decreased slightly from 610 tonnes in 2000 to 596 tonnes in 2001. In addition, a substantial catch of 135 tonnes of maray (traditionally a minor retained species) was landed for the year. No anchovy were landed in 2001. Overall the catch reflects an increased availability or abundance of pilchards, and an increasing trend toward the utilisation of other species available to the fishery.

Fishing effort

A small number of vessels participated in the fishery in 2001 compared to 2000. Together they fished a total of 738 days compared to 367 days in 2000, an effort increase of greater than 100%. 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 not possible to estimate effort separately for the different species being targeted.

Catch rate

The estimated catch rate for all small pelagics was 1,202 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.

A spawning biomass survey conducted in 2000 provided evidence that the stock was recovering strongly after the 1998/99 mass mortality event. The age structure of the west coast pilchard catches is dominated by 3- and 4-year-olds, which is indicative of a healthy stock, and there was again a good level of recruitment. However, assuming there has been strong recovery, as has been the case at Albany and Bremer Bay, availability to the fleet has remained very low.

If the west coast stock were gradually being displaced (offshore, to deeper water or southwards) by high water temperatures – as seen with a number of tropical species, including mud crabs which have been discovered in several lower west coast estuarine systems in recent times – then low catches might still continue even though the stock had recovered. However, the issue of stock size and stock availability has yet to be adequately resolved.

Exploitation status:

Fully exploited

Pilchards and sardinella are fully exploited.

Breeding stock levels:

Increasing

See 'Stock assessment' above.

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, blue mackerel (*Scomber australasicus*) and *Decapterus macrosoma*, a tropical scad.

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 in this region.

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. It should be noted, however, that in 'normal' circumstances (i.e. in the absence of disease events or extended periods of very poor recruitment) the quota for pilchards is set at 10–15% of the spawning biomass, thus leaving 85–90% available to natural predators.

The concept of managing ecosystems, rather than single species, has been presented to the Purse Seine MAC during 2001. Small pelagic fish represent a conceptually easy group for which to begin implementing ecosystem-based fisheries management. For example, various seabirds will predate on a variety of species of small pelagics and therefore the whole suite of small pelagic fish must be considered during management deliberations, not simply the primary target species. This is particularly the case in pelagic ecosystems (a) characterised by low productivity, as is the case in southern WA, and (b) in which the dominant species can change in abundance inter-annually (e.g. due to environmental factors), as is the case along the lower west coast. It is anticipated that this concept will be adopted by the Purse Seine MAC during 2002.

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 16 people during 2001.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year (2001):
\$660,000

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 ranged between \$620/tonne and \$750/tonne.

FISHERY GOVERNANCE

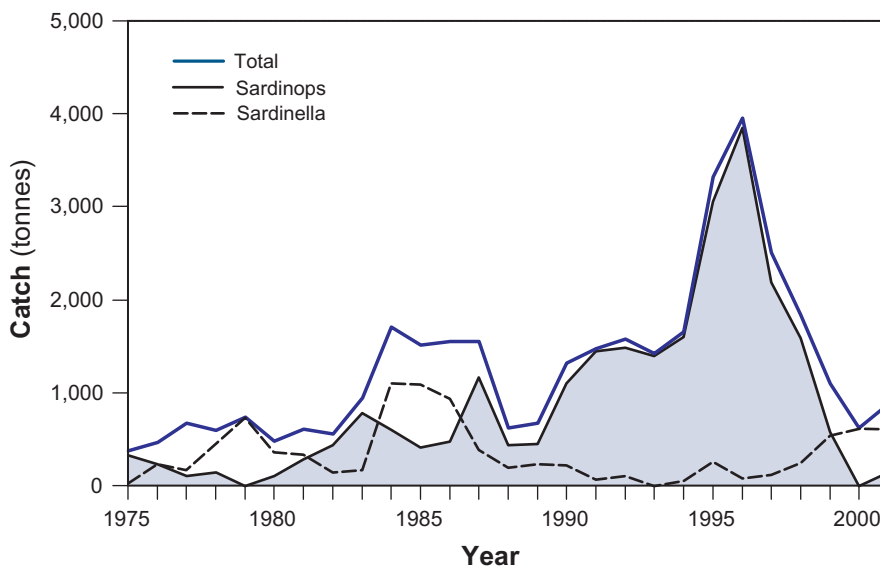
Acceptable catch (or effort) range: **Not available**

Management arrangements are currently based on limited entry with 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 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.

West Coast Purse Seine Annual Catch



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 focuses primarily on West Australian dhufish (*Glaucosoma hebraicum*) and pink snapper (*Pagrus auratus*), but also takes baldchin groper (*Choerodon rubescens*) and a range of other species. These species are also caught in the demersal gillnet and longline fishery and by the recreational sector, including charter boats.

Common community concern over the unrestricted access of the wetline fishery to a wide range of species led to a study of the fishing activity of wetliners published as Fisheries Research Report no. 118 (Crowe et al. 1999). 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. Dhufish are essentially managed by using a legal minimum length of 500 mm, which until recently has created a 'buffer' for the stocks, as it is estimated that male dhufish mature at 250–300 mm (three years of age) and females at 300–350 mm (three to four years of age).

Around 466 boats of the wetline fleet took pink snapper between June 1992 and 1998, but 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, with the highest catches being in August, March and April. The legal minimum length for pink snapper is 410 mm.

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. The legal minimum length for baldchin groper is 400 mm.

There was significant progress on the development of a process to implement formal management arrangements for the wetline fishery. The process will commence during 2002/03 and is expected to result in the development of a management plan for wetline fishing.

Governing Legislation/Fishing Authority

Fish Resources Management Regulations 1995

Fishing Boat Licence

Research Summary

Previous research was presented in the *State of Fisheries Report 2000/01*.

The current FRDC-funded project on short-term release mortality of under-size dhufish and snapper has been completed; however, longer-term mortality will continue to be examined until June 2005 through a tagging program. The research indicates that in the short term, the release mortality of under-size dhufish and snapper after capture by line is affected more by depth of capture than by hook type or release method (i.e. venting). For dhufish caught at depths greater than 40 m, preliminary analysis suggests that more than half will not survive more than three days after release.

While there has been a series of discrete research projects on dhufish in the west coast bioregion in recent years, and a large amount of research on pink snapper in the Gascoyne bioregion over the last two decades, there are significant gaps in our knowledge of dhufish and pink snapper in the west coast bioregion. Information on the basic biology of pink snapper south of Shark Bay is lacking and preliminary data indicate that biological parameters, such as growth rates and reproductive cycles, vary strongly with latitude. Also, age structures of pink snapper populations in this region are not available, but are required to assess stock status. Stock assessments will be vital to the upcoming integrated management of this bioregion to provide estimates of sustainable catch levels. A proposal for funding was submitted to FRDC to study the stock structure of dhufish and pink snapper populations along the west coast to determine the appropriate geographical scale for management, as well as to gain information on the biological parameters for pink snapper. This application was unsuccessful in 2001/02, but is being resubmitted in 2002/03.

Research into the biology of pink snapper on the lower west coast has commenced this year with an Honours student at Curtin University studying reproductive biology. Preliminary information on the biology of the demersal breaksea cod (*Epinephelides armatus*) is also available in an Honours thesis jointly supervised by Curtin University and the Department of Fisheries.

The preliminary assessments of major demersal species in the west coast bioregion will be refined as the commercial data set is improved and additional biological information becomes available. In the interim, the fishery will continue to be monitored annually using primarily CAES data.

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. The fishing activities are assessed within the boundaries of the west coast bioregion, i.e. in the waters of the Indian Ocean south of latitude 27° S and west of longitude 115°30' E. During 2000/01 a total of 59 'wetline only' vessels, and another 158 vessels that were licensed in other fisheries, operated within this bioregion using handline and dropline to target demersal species.

Main fishing method

Handline and dropline.

RETAINED SPECIES

Commercial production (season 2000/01): 896 tonnes

Landings

During 2000/01, 204 of the 216 boats in the west coast bioregion wetlined for demersal finfish. Of these, 197 boats reported catching West Australian dhufish, 184 boats caught pink snapper and 127 caught baldchin groper. Landings of pink snapper were highest at 210 tonnes, followed by dhufish (191 tonnes); baldchin groper was also in the top four with 33 tonnes. Major species in the catch from the northern area of the west coast included two lethriniid species, *Lethrinus nebulosus* and *Lethrinus miniatus* (variously reported as spangled emperor, sweetlip emperor, sweetlips and nor-west snapper), with 126 tonnes caught by 72 boats, and coral trout (*Plectropomus maculatus*), with 15 tonnes caught by 50 boats. These six major demersal species represented 64% of the total catch of all species caught by handline and dropline in the fishery. The remaining 36% comprised approximately 100 other species.

The above demersal scalefish catches do not include catches taken under other managed fishery licences. For example, in 2000/01 the West Coast Demersal Gillnet and Demersal Longline Interim Managed Fishery (WCDGLIMF) landed 69 tonnes of scalefish, including 16 tonnes of dhufish and 7 tonnes of pink snapper (see demersal gillnet and longline fisheries status report on pp. 119–124). The Cockburn Sound finfish fishery also lands small quantities of large mature pink snapper, which are likely to form part of an oceanic stock.

Dhufish: Over the last 10 years the reported total catches of dhufish along the west coast reflect general trends in fishing effort (West Coast Demersal Scalefish Figure 1). At 191 tonnes, the 2000/01 catch was well above the 10-year average of 155 tonnes, and second only to the peak catch of 197 tonnes in 1997/98. It also fell outside the acceptable range of 125–179 tonnes calculated last year. Monthly catches were over 20 tonnes in January and April 2001. The increase over the 1999/2000 catch was 17.3 tonnes, with most of this (13.4 tonnes) taken by wetliners without specific managed fishery licences. The previous catch peak in 1997/98 appeared to be due to a high abundance of dhufish that year, as dhufish catch rates were high in both the

demersal gillnet fishery and in the top 10 boats of the line fishery off Fremantle.

Pink snapper: For the first time in four years, the pink snapper catch was above the 10-year average of 204 tonnes (West Coast Demersal Scalefish Figure 2), with landings of 210 tonnes in 2000/01 representing an increase of 51.9 tonnes over the previous year. In contrast to other demersal species, catches of snapper are highly variable, reflecting large natural annual fluctuations in recruitment to the stock, particularly in the north of the bioregion. The monthly catches for the current year were highest (greater than 20 tonnes) from February to May 2001.

Baldchin groper: Both catch and catch rates for baldchin groper have remained relatively consistent over the last 10 years (West Coast Demersal Scalefish Figure 3). The catch of baldchin groper in 2000/01 was 33 tonnes, similar to last year's catch and close to the 10-year average of 31.8 tonnes. Monthly catches ranged from 1.6 tonnes to 3.9 tonnes, with catches greater than 3 tonnes reported in four months of the year.

Fishing effort

Throughout 2000/01, 216 boats fished a total of 9,318 days in the west coast demersal scalefish fishery. Compared to the previous year, the number of active boats in the fishery was down by 26 and effort was reduced by 383 days. When the latent effort in the sector is considered, small annual changes in effort, such as this 5% reduction in total effort for the fishery, are unimportant.

Catch rate

In this multi-species fishery, the overall catch rates calculated for individual species are not a reliable measure of their abundance owing to the targeting behaviour of the fishers. To examine the catch rates of individual species caught throughout the bioregion, catch and fishing effort from boats that targeted these species was examined in two areas expected to differ in fishing pressure, namely Geraldton and Fremantle. It should be noted that the method for calculating catch rates was revised this year. Previously, catch rates depicted the changes in catch rates of the same boats over 10 years. This year, annual catch rates were calculated using the top 10 boats with reliable data for each year, thus allowing for the frequent changes in boat ownership or skippers that are common in the wetline sector. Catch rates were calculated for dhufish and snapper in both regions and for baldchin groper in the Geraldton region only (West Coast Demersal Scalefish Figures 1, 2 and 3). Catch rates were averaged and standard errors were calculated to depict variability of catch rates among boats.

In addition, catch rates for dhufish have been adjusted to allow for increases in fishing efficiency due to technological improvements. (The introduction of GPS on boats in the early 1990s impacted primarily on dhufish, which is a sedentary species.) Therefore, to account for this increase in fishing efficiency, the nominal effort of each boat used to calculate dhufish CPUE has been increased by 5% for 1992/93, by 10% for 1993/94 and by 15% from 1994/95 to the present. These nominal increases are best estimates that were based on discussions with expert fishers and will need to be validated in the future.

Recreational component: 30% (approx.)

The recreational catch of the west coast was last estimated from boat ramp surveys in 1996/97 (Sumner and Williamson 1999) and was reported in detail in the *State of Fisheries Report 2000/01*. Of the total catch in 1996/97, the recreational sector took approximately 46% of the dhufish, 10% of the snapper and 44% of the baldchin groper, with an overall catch share of around 30%. Results of the national telephone survey of recreational fishing conducted from May 2000 to April 2001 will provide an update of the recreational catch for the bioregion. In addition, since September 2001 the catch from charter boats has been monitored through compulsory returns, and figures for their catch of demersal finfish in this bioregion will become available next year.

Stock assessment completed: Yes

A preliminary stock assessment has been carried out for dhufish, the main species in the west coast demersal scalefish fishery, but more precise information on age structure of populations will be required to complete a comprehensive stock assessment (see *State of the Fisheries Report 2000/01*). To assess trends in the major demersal stocks targeted in this fishery, standardised catch rate and overall catch and effort data are monitored.

Dhufish: Adjusted catch rates of dhufish around Fremantle have declined in the last four years from the exceptionally high rates in 1997/98 (West Coast Demersal Scalefish Figure 1). Over this period, the catch rates have halved from 58 kg/day in 1997/98 to 29 kg/day in 2000/01. Current catch rates are lower than the 10-year average of 37 kg/day. This recent decrease in the catch rates of the top boats in Fremantle indicates a localised decline in dhufish stocks, despite the high catch in the bioregion in the current year. In contrast to the Fremantle area, adjusted catch rates of dhufish in Geraldton have remained consistent throughout the decade, with the highest catch rate of 38 kg/day occurring in 1991/92, 1999/2000 and 2000/01. Thus current catch rates in Geraldton are higher than the 10-year average of 32 kg/day. Although Geraldton catch rates during 2000/01 were about 10 kg/day higher than in Fremantle, they vary widely among boats in each region.

Pink snapper: In contrast to dhufish, the average catch rate of pink snapper for the top 10 boats differed significantly between the two regions. Over the decade, average catch rates were relatively low and stable in Fremantle, ranging from 15 kg/day to 32 kg/day, compared to Geraldton where average catch rates varied annually from 67 kg/day to 174 kg/day (West Coast Demersal Scalefish Figure 2). Catch rates were more variable among boats in Geraldton than in Fremantle. Furthermore, over the past decade catch rates of pink snapper in Geraldton have been two to seven times higher than catch rates in Fremantle (West Coast Demersal Scalefish Figure 2). The snapper fishery is renowned for its high variability in catch due to natural annual fluctuations in recruitment to the stock. The CPUE in Geraldton has followed annual trends in the total catch of snapper for the bioregion, because most pink snapper is caught in the north of the bioregion. Fluctuations in recruitment of pink snapper in the north may be related to spawning events of the oceanic stocks of pink snapper in Shark Bay, with eggs and larvae transported southward on the Leeuwin Current. In contrast, the CPUE in Fremantle over the decade did not

follow this trend, and average catch rates of pink snapper in that area have remained very low and steady. These large differences in both the magnitude and the annual trends of average catch rates between the two areas suggest that the population of pink snapper in Fremantle is not influenced by recruitment events occurring in the Geraldton region.

Baldchin groper: The average CPUE for baldchin groper by the top 10 boats at Geraldton has remained steady around 15 kg/day over the last decade (West Coast Demersal Scalefish Figure 3). After the introduction of GPS in some boats in 1992/93, the variability of catch rates increased among the top 10 boats, but overall catch rates of baldchin groper did not increase. Catch and catch rates of baldchin groper are the least variable of the major species in the west coast demersal scalefish fishery.

Exploitation status: Not assessed

Breeding stock levels: Not assessed

At present the adjusted catch rate for the three main target species, which provides an indication of spawning biomass, does not suggest that breeding stock levels are affecting recruitment. Direct measurements of breeding stock, however, are needed to confirm this assessment.

NON-RETAINED SPECIES

Bycatch species impact: Low

Line fishing is a highly selective fishing method that targets demersal fishes using baited lines. Bycatch therefore comprises only a small proportion of the catch, and includes small numbers of inedible species (e.g. silver toadfish) or small fishes (e.g. wrasses), which are discarded.

Protected species interaction: Not applicable

ECOSYSTEM EFFECTS

Food chain effects: Not assessed

Habitat effects: Negligible

Fishing methods used in the wetline fishery, targeting demersal fishes with baited lines, have little physical impact on the benthic environment.

SOCIAL EFFECTS

Employment in this fishery is difficult to assess as the majority of boats (157) in the wetline fleet are associated with other licensed fisheries. Only 59 boats in the wetline fleet hold no other licences and thus are 'wetline only'. These vessels employed around 150 skippers and crew to take demersal finfish during 2000/01.

ECONOMIC EFFECTS

Estimated annual value (to fishers) for year (2000/01): \$4.74 million

The estimated value of the fishery in 2000/01 includes all species caught by handlines and droplines on the west coast of Western Australia. More than 97 species or groups of seafood were recorded as catch and sold for an estimated \$4.74 million. The highest-valued catch was dhufish at 38% of the total value, followed by pink snapper (23%), the lethrinids (12%), baldchin groper (5%) and coral trout in descending order of value. Catch of all other species

represented less than 20% of the value of this fishery. In 2000/01 dhufish, pink snapper and baldchin groper sold on average for \$9.41/kg, \$5.24/kg and \$6.72/kg respectively. Compared to last year, the prices for dhufish, pink snapper and baldchin groper increased by 4%, 14% and 11% respectively. Of all species in the fishery, coral trout commanded the highest average price of \$10.54/kg.

FISHERY GOVERNANCE

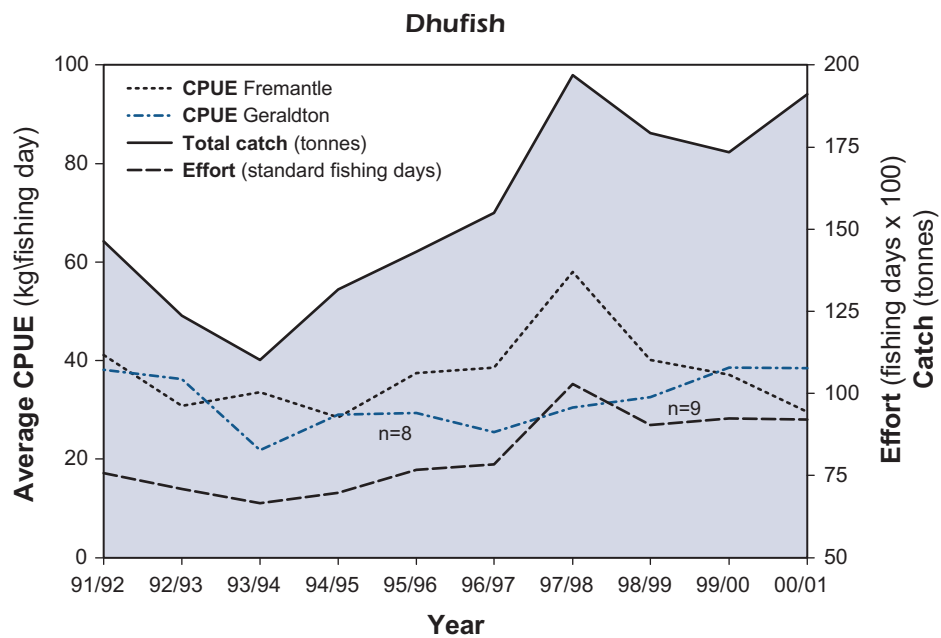
Acceptable catch range: 558–798 tonnes

The acceptable catch range is based on the mean from catches in the decade 1990/91 to 1999/2000. Using 80% confidence limits around that 10-year mean, the acceptable

catch ranges are 125–179 tonnes for dhufish, 153–254 tonnes for pink snapper and 27.5–35.5 tonnes for baldchin groper.

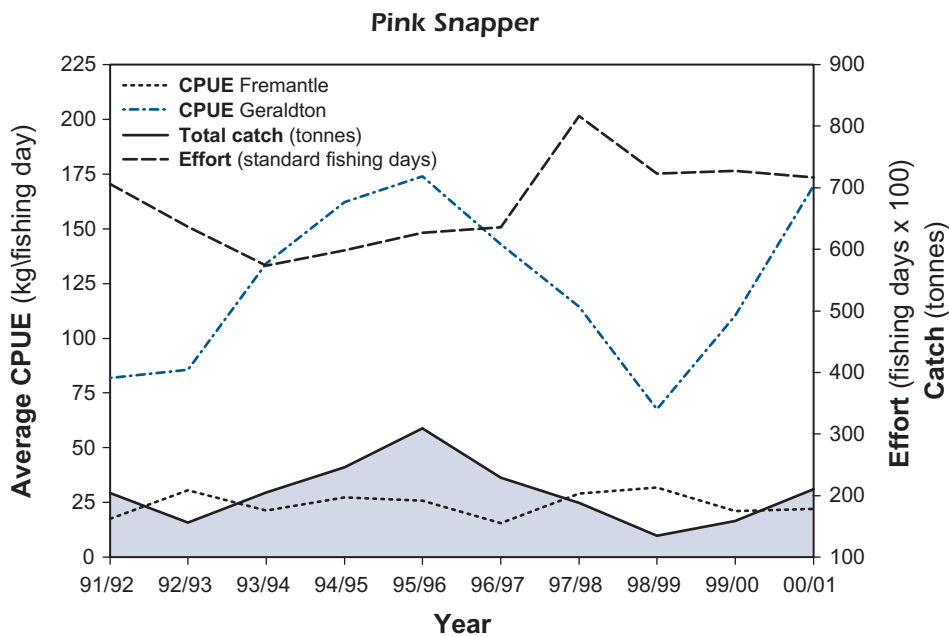
In 2000/01, the catches of pink snapper and baldchin groper were both within the acceptable range based on 1990s catches. The catch of dhufish, the major target of the fleet, at 191 tonnes was above the acceptable range, indicating a greater focus on this species and possibly increasing rates of exploitation.

Until specific management arrangements are implemented for this sector the levels of exploitation, particularly for dhufish, can be expected to continue to rise as market demand remains favourable.



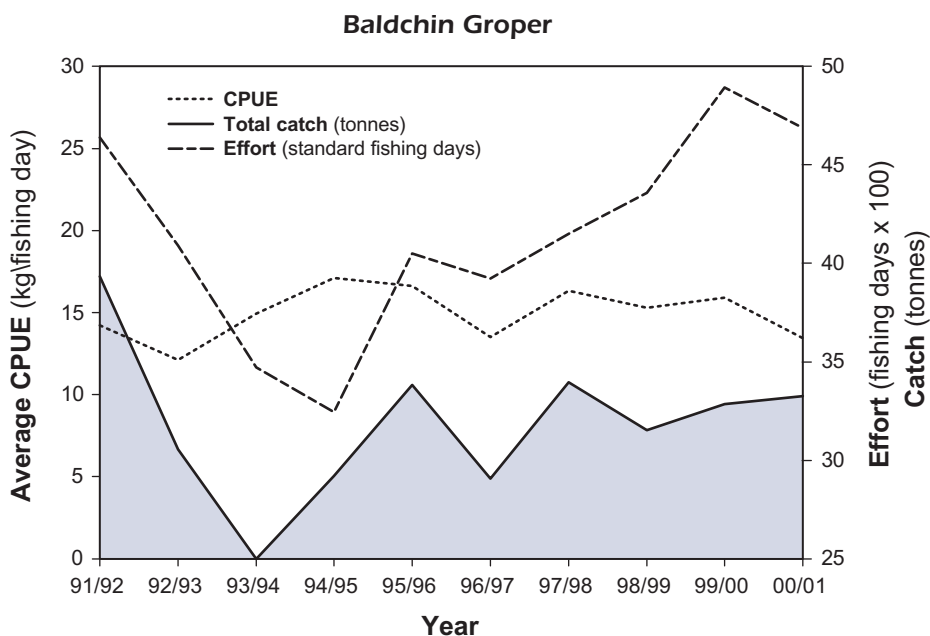
WEST COAST DEMERSAL SCALE FISHERY FIGURE 1

Annual catch and adjusted effort for dhufish in the west coast demersal scalefish fishery over the decade from 1991/92 to 2000/01. Catch per unit effort (CPUE, kg/adjusted fishing day) is shown for dhufish caught by the top 10 boats (unless indicated otherwise) each year in two regions, Fremantle and Geraldton.



WEST COAST DEMERSAL SCALE FISHERY FIGURE 2

Annual catch and effort for pink snapper in the west coast demersal scalefish fishery over the decade from 1991/92 to 2000/01. Catch per unit effort (CPUE, kg/standard fishing day) is shown for pink snapper caught by the top 10 boats each year in two regions, Fremantle and Geraldton.



WEST COAST DEMERSAL SCALE FISHERY FIGURE 3

Annual catch and effort for baldchin groper in the west coast demersal scalefish fishery over the decade from 1991/92 to 2000/01. Catch per unit effort (CPUE, kg/standard fishing day) is shown for baldchin groper caught by the top 10 boats each year off Geraldton.