reports received during 2001/02. During the year, 336 infringement warnings and 93 infringement notices were issued, and a further 76 cases resulted in prosecution of commercial fishers.

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 2001/02 financial year.

CONTACT WITH THE COMMERCIAL FISHING COMMUNITY	NUMBER
Hours delivered in bioregion	39,776
Fisher field contacts by Fisheries Officers	7,578
District Office contacts by Fisheries Officers	4,257
Fishwatch reports *	568
OFFENCES DETECTED	
Infringement warnings	336
Infringement notices	93
Prosecutions	76

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

There continued to be concerns over interference with commercial fishing gear in the Cockburn Sound and Peel/Harvey crab fisheries during peak periods. This was despite increased levels of surveillance, including joint patrols with police, during 2001/02. The Department is working with industry on a number of compliance and management initiatives aimed at minimising interference with gear.

A number of targeted compliance operations were conducted in Zone D (Comet Bay) of the South West Trawl Managed Fishery to ensure vessels were not fishing outside of their authorised trawl areas.

The overall level of compliance in the estuarine, purse seine, shark and wetline fisheries was good, with only a small number of compliance issues arising. Some stakeholders questioned the activities of certain fishing operations, however compliance checks found no illegal activity occurring.

Further north, the Mid West Regional Office conducted a pre-season briefing for operators in the Abrolhos trawl fishery. The use of VMS in the fishery will enable closer scrutiny of where vessels are operating to ensure fishing activities do not extend to closed areas at the Abrolhos Islands.

Initiatives in 2002/03

The Department, in its attempts to minimise the offence of gear interference, has continued the development and testing of new technologies to assist in the detection of illegal interference with fishing gear.

The Department's database system for recording field-related compliance activities has become a valuable tool for compliance planning, targeting of repeat offenders, and ensuring all vessels are regularly inspected. This tool has helped to improve the efficiency and effectiveness of compliance service delivery.

REGIONAL RESEARCH OVERVIEW OF WETLINE FISHING

The catch and effort statistics (CAES) database indicates that over half (57%) of the wetline catch in 2001/02 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*) 250 t, West Australian dhufish (*Glaucosoma hebraicum*) 219 t, whitebait (*Hyperlophus vittatus*) 125 t, sweetlip emperor (*Lethrinus miniatus*) 77 t, samson fish (*Seriola hippos*) 72 t, Australian herring (*Arripis geogianus*) 64 t, sea mullet (*Mugil cephalus*) 63 t, western sand whiting (*Sillago schomburgkii*) 41 t, redfish (*Centroberyx affinis*) 40 t and copper shark (*Carcharhinus brachyurus*) 39 t. With wobbegong (*Orectolobus* spp., 35 t) as the next most abundant species in the catch, it is interesting to note the increasing prominence of shark in the wetline catch.

Catches of dhufish, pink snapper and emperor are the main product of the demersal scalefish operations reported on pp. 41–46, noting that catches of emperors are mostly from the Abrolhos Islands. Whitebait, Australian herring, sea mullet, and western sand whiting comprise most of the catch of the beach bait fishers who operate between Tim's Thicket and Augusta (see pp. 35–37).

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 Cape Leeuwin using baited traps (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 t 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 single-species fishery, 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 (Zone A, which is effectively a subset of Zone B) for those fishing the Abrolhos Islands between March and June.

Following record catches of 13,000–14,000 t in 1998/99 and 1999/2000, the catch fell to around 9,000 t in 2001/02, but has returned in the current season to approximately 11,300 t. Such variations in catch are not unusual, and largely reflect the level of puerulus settlement four years earlier, which is in turn dependent upon environmental factors such as the Leeuwin Current.

This 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 very important for the fishery's management because arrangements and options can be assessed against the established objectives in the context of predicted catch trends.

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 rate and size at maturity of the lobsters.

All of the above elements of this management package have been maintained because they continue to be relevant in ensuring that the stock does not fall below the established biological reference point.

At the commencement of the 2001/02 season a major amendment to the West Coast Rock Lobster Management Plan 1993 came into effect, resulting in formal expression of 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 maximum quantity of gear that the individual licensee can use.

The Department is currently working on an extension of the current security register better designed to recognise levels of investment in units of entitlement. A decision rules framework was also further developed this year, which will assist the long-term sustainability of the fishery as well as providing greater access to management tools for industry and other stakeholders.

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 audit process, an environmental risk assessment and more recently an environmental management strategy have been completed. A number of risks were identified in the risk assessment at either a moderate or low level. In their assessment of the report, the MSC certifiers highlighted two key issues: the interaction of the fishery with protected fauna such as sea lions and leatherback turtles, and the lack of research data about the ecological impacts of removing rock lobster biomass from the environment, particularly from deep water. These issues have been the focus of additional research projects and reporting during 2002/03.

The process of addressing the MSC requirements both complements and is complemented by work being done to satisfy the Commonwealth Government's environmental legislation. Environment Australia has declared the fishery as being managed in an ecologically sustainable manner under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999*. While subject to a variety of recommendations, this approval allows product from the fishery to be exported for a five-year period.

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 coming seasons, in particular:

- the increasing need to research, address and mitigate interactions with specially protected species as listed in the *Wildlife Conservation Notice 2002*, such as sea lions and leatherback turtles;
- the development of an explicit harvest strategy in the form of fisheries management decision rules; and
- a review of the composition of, and process for appointing members to, the Rock Lobster Industry Advisory Committee (RLIAC) in response to a Labor Party commitment before the 2001 State Government election.

The Government's commitment to legislative reform in response to the requirements of the National Competition Policy has seen a number of changes implemented during 2002/03, including:

- removal of restrictions on 'domestic' rock lobster processing authorisations;
- development of a rock lobster aquaculture policy; and
- removal of the 150 maximum unit holding entitlement from the legislation.

The 2002/03 season has seen dramatic variability in the beach price (price paid to fishers) of rock lobsters. The season started with an average price of $36/kg, which is considered to be an inflated price for the 'whites'. The prices then dropped to significantly lower levels due to a number of influences, which included:

- elevated beach prices at the start of the season (in the 'whites' phase) that could not be maintained;

- realistic competitive behaviour between processors and catching sector to secure best beach prices for the available product;
- the severe acute respiratory syndrome (SARS) epidemic in south-east Asia and the consequences for demand in that market;
- loss of market share in past lucrative markets as increased volumes of cheaper, comparable product are imported from countries that previously were a minimal threat; and
- world currency exchange rates and the weakening of the US dollar.

The season finished on an average beach price of $14/kg, with an overall average price for the season of $23/kg.

Although many of these factors were external to the fishery, the Western Rock Lobster Council (the peak industry body), with input from industry representatives and processors, will be developing strategies designed to mitigate the risk of such large price fluctuations occurring in future seasons.

The Rock Lobster Industry Advisory Committee regularly considers strategic management issues, along with other matters that affect the management of the State's rock lobster fisheries. 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 2002/03 RLIAC met four times, held two stakeholder open forum meetings and conducted a coastal tour visiting Fremantle, Geraldton and Jurien.

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
Bi-annual 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 participants and community members understand, accept and adhere to the management rules.

The Regional Services Branch provides a range of at-sea and land-based compliance services in the west coast bioregion, with Fisheries Officers stationed in Denham, Geraldton, Dongara, Jurien, Lancelin, Fremantle, Mandurah, Bunbury and Busselton. Officers conduct offshore inspection work aboard the patrol vessels *Baudin*, *Hamelin*, *McLaughlin* and *Walcott* (noting that the *Hamelin* replaced the *Baudin* during the season). Offshore inspection work principally involves ensuring that fishers adhere to zone and closed-water requirements, gear restrictions and seasonal closures.

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

Services provided by land-based officers include processing, landing and gear inspections, licence checks, wholesale/retail inspections 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.

Activities during 2001/02

In 2001/02 the approach to management in partnership with industry continued, with the second 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. The major risks identified that continue to be of concern included illegal sale into the restaurant trade, interference with commercial fishing gear, over-potting, and holding of rock lobsters over 76 mm prior to the change in the minimum legal size.

The risk assessment process was reviewed and a decision made to continue this joint industry/Department approach on a bi-annual basis. A review of the risks identified during that assessment will be conducted in the alternate year.

Continuing with a planned compliance model, the Rock Lobster Compliance Coordinator conducted several across-region operations. These focused on the illegal trade of rock lobster in restaurants throughout the metropolitan area, over-potting at the Abrolhos Islands, and major roadside checkpoints targeting the transportation of illegally caught rock lobsters. Additionally, mobile factory patrols continued to operate throughout the season to complement increased time spent in the field by district-based Fisheries Officers. The patrol teams, based in Fremantle and Geraldton, travel throughout the fishery 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 2001/02. 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 between 3.3% and 4% of the catch consigned to processing factories (West Coast Rock Lobster Table 2).

Regional Services officers in the west coast bioregion delivered 31,526 hours to the West Coast Rock Lobster Managed Fishery in 2001/02. While compliance in the fishery was generally good, 323 infringement warnings and 70 infringement notices were issued. A total of 48 prosecutions were initiated or conducted (West Coast Rock Lobster Table 1).

Fisheries Officers reported 6,680 field-based contacts and 2,963 contacts in District Offices with commercial fishers during 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 2001/02 financial year. Note these data are included in the overall totals given in West Coast Commercial Compliance Table 1.

CONTACT WITH THE COMMERCIAL FISHING COMMUNITY	*NUMBER*
Hours delivered in fishery *	31,526
Fisher field contacts by Fisheries Officers	6,680
District Office contacts by Fisheries Officers	2,963
OFFENCES DETECTED	
Infringement warnings	323
Infringement notices	70
Prosecutions	48

* This figure has increased slightly compared with the previous financial year due to the inclusion of patrol vessel hours.

WEST COAST ROCK LOBSTER TABLE 2

Summary statistics of factory inspections of commercially captured western rock lobster in the 2001/02 fishing season.

STATISTIC	*VALUE*
Number of unique vessels checked	Entire fleet at least once
Average number of inspections per vessel	7
Average number of baskets checked per vessel *	20
Proportion of total commercial catch inspected	3.3%–4%
Non-compliance rate (per-animal basis) **	0.0014–0.0022
Total consigned commercial catch ('000 kg)	8,962
Estimated total illegal catch consigned ('000 kg)	13–19.7

* 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, though there was a 50% increase in the number of totally protected rock lobster detected. Minor infringement notices and warnings continued to be issued, with the majority for under-size animals, and a small amount for setose lobsters. A small number of prosecutions were also instigated for the consignment of under-size rock lobster. There was a significant increase in unlicensed commercial offences involving black market lobsters in restaurants in the metropolitan area. A number of closed-waters offences were again detected around Rottnest Island.

In the Mid West Region (principally Zones A and B), factory consignment compliance was similar to the previous season, though the number of totally protected fish detected was significantly higher than in the Metropolitan Region. A drop in the number of under-size animals detected was offset by a significant increase in setose animals being consigned. Minor infringement notices and warnings continued to be issued, and a number of prosecutions instigated for consignment of under-size rock lobster.

In the Southern Region, a good run of lobsters led to a migration of vessels to fish the area between Capes Leeuwin and Naturaliste, resulting in a corresponding increase in Fisheries Officer activity in that area.

Initiatives in 2002/03

In the Southern Region, a community consultation process has begun to address issues of community concern relating to the increase in effort by the rock lobster fleet in the Cape-to-Cape area (Leeuwin to Naturaliste).

A proactive approach to raising compliance issues in the fishery has been developed, and open discussions are regularly held in industry meetings to raise fishers' awareness of particular issues. Targeted activities have been identified to deal with some of the issues, such as early pulling and failing to release totally protected fish within five minutes of removal from the water, before they become a major compliance concern.

As an outcome of the risk assessment process, for the first time a major compliance operation was conducted in inland areas throughout the South West Land Division. This operation targeted the many retail establishments selling seafood in country towns throughout the region.

Research Summary

During the year, research activities continued to focus on the core business activities of forecasting future catch levels, monitoring levels of puerulus settlement, monitoring of breeding stock levels, monitoring of catches through both fishers' and processors' returns, promoting the voluntary logbook scheme and modelling and stock assessment. Research advice was provided to a range of clients including the Rock Lobster Industry Advisory Committee, Western

Rock Lobster Council, Western Rock Lobster Development Association, WA Fishing Industry Council, various fishermen's associations and the general public. New core business of ensuring the fishery complies with ecologically sustainable development principles focused on reporting to Environment Australia on issues arising from Commonwealth environment and biodiversity legislation and developing an environmental management strategy to be used in the assessment of the impacts of rock lobster fishing in the context of ESD 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 2001/02): 8,966 tonnes

Landings

Trends in the annual catches from the West Coast Rock Lobster Managed Fishery (WCRLF) 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 predicted 2001/02 catch range for the WCRLF, forecast from the puerulus settlement 3–4 years previously, was 9,550–10,350 t. The information from processor returns shows, however, that the catch from the WCRLF for the 2001/02 season was only 8,966 t. This was 17.1% less than the long-term average catch of 10,820 t and 20.4% lower than the previous season's catch of 11,266 t. In 2001/02, the catches in A Zone, B Zone and C Zone were 1,651 t (1.3% lower), 2,800 t (20.1% lower) and 4,515 (25.8% lower) respectively.

The catch in B and C Zones did not reach the forecast landings because of the extraordinary environmental conditions (calm conditions, little swell, low water temperature) present during November and part of December. These water conditions restricted the migration of 'whites' from the shallows to the deeper water and even though some of these lobsters were available to the fishery from March to June at a larger size following a moult, the total landings were still lower than expected. The proportions of 'whites' to the total catches in B and C Zones for the 2001/02 season were 40% and 37% respectively. The mean proportions of 'whites' to the total catches in B and C Zones from the introduction of the pot reduction in 1993/94 to 2000/01 were 43% and 48% respectively. A time-series model was developed as a prediction tool for intra-seasonal 'whites' and 'reds' catches. The model incorporates the puerulus indices and the management intervention in 1993/94. The model gave forecasts of 47% and 42% for the proportions of 'whites' to the total catches in B and C Zones respectively. While the model forecasts indicated a poor 'whites' catch in C Zone, environmental conditions contributed to a lower 'whites' catch than expected in both zones.

The 2001/02 survey of recreational rock lobster fishers estimated that they caught approximately 545 t, which was only a 3% decrease on the estimated catch of 564 t for the previous season (2000/01). The restricted 'whites' migration resulted in many lobsters remaining in the shallows and therefore being available to the recreational fishery for a longer period than is usual. Consequently, whilst a lower catch was forecast, recreational landings were relatively similar to the previous season.

The total catch of western rock lobster from this fishery (commercial and recreational) was approximately 9,510 t, 19.6% lower than the previous season's total catch of 11,830 t.

Octopus may be caught in rock lobster pots, generally in shallow water (0–20 fathoms or 0–37 m), and a catch rate of 0.039 octopus per pot lift was recorded in the 2001/02 voluntary research logbook data. This was 32.9% above the average of 0.029 per pot lift over the period 1985/86 to 2000/01. This translates to an estimated 400,000 octopus caught in the fishery during 2001/02. Octopus catches in B Zone were about 40% greater than those in C Zone, with those in A Zone estimated at approximately 26,000.

Fishing effort

The nominal fishing effort for 2001/02 was 10.33 million pot lifts, 1.2% lower than the 10.46 million pot lifts for 2000/01 (West Coast Rock Lobster Figure 1). The nominal effort for the A, B and C Zones of the WCRLF was 1.21 million, 3.79 million and 5.33 million pot lifts respectively, which was 0.8% less, 0.3% more and 2.4% less than the previous season's 1.22, 3.78 and 5.46 million pot lifts.

Effort equivalent to 0.61 million commercial pot lifts was used by the recreational fishery to land its catches. This was 17.3% higher than the 0.52 million pot lifts used in 2000/01.

The total effort used in the WCRLF during 2001/02 was 10.94 million pot lifts, 0.4% lower than the 10.98 million pot lifts made in 2000/01.

The reduced level of pot usage maintained since 1993/94 had the secondary effect of 'encouraging' a reduction in fleet size as vessels purchased additional pot entitlements to improve their economic efficiency. Under new legislation introduced in 2000/01, new WCRLF 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, respectively 146, 147 and 291 A, B and C Zone vessels (584 out of 594 in total) actually fished for lobster in 2000/01, with two A Zone, four B Zone and four C Zone licences dormant. Due probably to lower forecast catches in 2001/02, the number of dormant A, B and C Zone licences increased from 2 to 6, from 4 to 7 and from 4 to 17 respectively. In addition, six new licences were created in C Zone. Thus, in comparison to the 584 active boats in 2000/01, a fleet of 570 vessels fished in 2001/02, with 142 and 144 respectively carrying A and B Zone licences and 284 operating in C Zone (West Coast Rock Lobster Table 3).

WEST COAST ROCK LOBSTER TABLE 3

Number of rock lobster licences by category.

ZONE/CATEGORY	2000/01	2001/02
A Zone licences	148	148
A Zone licences with 1 pot	2	6
A Zone licences fishing	146	142
B Zone licences	151	151
B Zone licences with 1 pot	4	7
B Zone licences fishing	147	144
C Zone licences	295	301
C Zone licences with 1 pot	4	17
C Zone licences fishing	291	284

Catch rate

A further decline in the abundance of rock lobsters from the record 1999/2000 season was forecast for 2001/02. Trends in catch rates show a 'cyclical' pattern (West Coast Rock Lobster Figure 2) due to environmental effects on levels of puerulus settlement which are reflected in catches three and four years later. Accordingly, catch per unit of fishing effort in 2001/02 was forecast to be low. In fact, the environmentally driven poor 'whites' catch resulted in a catch rate even lower than expected, at 0.87 kg/pot lift. This was 19.4% less than the previous season (1.08 kg/pot lift) (West Coast Rock Lobster Figure 2) and 18.7% less than the average since the introduction of the current management arrangements in 1993/94 (1.07 kg/pot lift).

Recreational component: **6% (approx.)**

See information in 'Landings' and 'Fishing effort' above, and the Recreational Western Rock Lobster Fishery Status Report (pp. 149–150).

Stock assessment completed: **Yes**

The stock remains fully exploited and under the current management arrangements introduced in 1993/94, which included an 18% pot reduction, the breeding stock remains at or above the target levels of the late 1970s and early 1980s (West Coast Rock Lobster Figures 3 and 4).

Whilst some effort increase was evident between 1993/94 and 1998/99, nominal effort levels have now returned to 1993/94 levels: that is, an 18–19% reduction in nominal fishing effort when data from 1991/92 and 2001/02 are compared. The maintenance of these lower effort levels, in combination with other measures, has ensured that the exploitation rate of the stock remains lower than pre-1993/94 levels and has allowed 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 is factored into stock assessment modelling and management advice.

Post-larval recruitment to the fishery is monitored continuously and annual puerulus settlement fluctuates in response to environmental conditions such as strength of the Leeuwin Current and the frequency and intensity of low-pressure systems generating westerly winds. Annual indices of puerulus settlement for 2001/02 were below average at the Abrolhos Islands and average to above average in the centre of the fishery (West Coast Rock Lobster Figure 5). These reductions from the previous season's level of settlement were consistent with neutral El Niño/La Niña conditions in the tropical Pacific (which affect the strength of the Leeuwin Current) during the period of larval life and subsequent settlement. 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. The 2001/02 season was an exception where local environmental drivers resulted in poor catching conditions at the start of the season which produced lower landings than had been forecast from the levels of puerulus settlement.

Stock assessment is undertaken using existing models and a new approach using depletion estimates which provided good estimates of exploitation rates in the three zones of the fishery. This analysis showed that exploitation rates in A Zone have reduced marginally since 1993/94. In B and C Zones, a reduction in exploitation was noted after 1993/94 but an upward trend has been re-established, particularly in B Zone, since about 1996. Exploitation rates in the shallow (< 20 fathoms) and deeper (> 20 fathoms) waters are being investigated.

A journal article published in late 2001 (Hall and Chubb 2001) fully assessed the impact of the current management package on the WCRLF and concluded that the sustainability of the fishery was assured at the current rate of exploitation. The modelling confirmed that egg production levels were well above those before the 1993/94 package was introduced.

Exploitation status: **Fully exploited**

Breeding stock levels: **Adequate**

It is well known that water temperature and swell have an effect on the catchability of lobsters leading to the sometimes highly variable catch rates measured during the independent breeding stock survey (IBSS). Whilst these and other variables (such as moon phase) are included within the analyses, not all the impacts on catchability are known, which causes the IBSS catch rates and therefore the breeding stock indices to vary by 60%–120% between successive years. The effects of these changing environmental conditions on the fishery-dependent indices are not as large because the monitoring data used in these calculations cover the entire season. Consequently, a three-year moving average (smoothing) is now used to show the underlying trends in the trajectory of the breeding stock indices rather than highlighting individual data points which can vary significantly.

The north and south coastal fishery-dependent spawning stock indices, based on commercial monitoring data, together with the related coastal fishery-independent breeding stock survey index, are presented in West Coast Rock Lobster Figure 3. The Abrolhos Islands index from the IBSS is presented in West Coast Rock Lobster Figure 4.

Following the introduction of the management arrangements in 1993/94, the egg production indices and breeding stock increased quite dramatically and within five years had returned to target levels. Successive years of very high levels of recruitment (predicted from puerulus settlement and reflected in the high catches) provided a major boost to egg production during 1999/2000 and 2000/01. The egg production indices declined during 2001/02 but the significantly lower water temperatures present at the beginning of that season may have been responsible for considerably lower catch rates during the breeding survey which could have affected the calculations (West Coast Rock Lobster Figure 3).

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 by the early 1990s (West Coast Rock Lobster Figure 3).

Whilst the declines in egg production warrant surveillance, the current levels of egg production are still 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 to act as a calibration for indices derived from fishery data. The pre-season breeding stock survey was expanded in October 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 had been sampled for the previous four seasons. Only the three representative sites will be sampled in 2003.

Projected catch next season (2002/03): **10,600–11,700 tonnes**

Total catch predictions for the WCRLF 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 5). Catch estimates for C Zone also are forecast from combined puerulus settlement figures from a number of C Zone puerulus collection sites. These additional forecasts, for the most part, are not dissimilar to the predictions based on Alkimos settlement alone. Seasons 2002/03 and 2003/04 are expected to produce commercial catches of around 10,600–11,700 t and 13,450–13,750 t respectively, resulting from the high levels of puerulus settlement in 1999/2000 and 2000/01 (West Coast Rock Lobster Figure 5). Forecast recreational catches indicate that total rock lobster landings (commercial and recreational) will be in the range of 11,300–12,500 t in 2002/03.

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–moderate**

The WCRLF interacts with the Australian sea lion, *Neophoca cinerea*, in a limited way with the accidental 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 restricted to one or two isolated areas where sea lion pups forage. 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. Whilst 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 (Shaughnessy 1999), a strategy for eliminating the accidental capture through minor pot modification is being developed.

Preliminary research data suggest that turtles occasionally can become entangled in the ropes of rock lobster pots, but that nearly all are being released alive and unharmed. Turtle deaths as a direct result of this interaction appear to be 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 risk assessment and data are being collected through as

many sources as possible to establish the level of mortality caused by rock lobster fishing. 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 when compared to a number of reports of bycatch from egg robbing and nest destruction and major gillnet, longline and purse seine operations in other parts of the world. Nevertheless, the leatherback turtle is a critically endangered species with populations in decline worldwide and any mortality from accidental entanglement is considered by some as inappropriate. An environmental management strategy for the WCRLF will include attempts to minimise this accidental mortality wherever practicable.

ECOSYSTEM EFFECTS

Food chain effects: **Low**

The fishery is unlikely to cause significant trophic ('food web') cascade effects, 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. Some proposals for research on the ecology of deep-water reefs inhabited by lobsters are being developed.

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 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. Fishing is not allowed in four and a half months of the year.

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 570 vessels and 1,597 people were engaged directly in fishing for rock lobster in 2001/02. This equates to one skipper and an average of about 1.8 deckhands per vessel. During the year, 11 processing establishments engaged between 150 employees in the closed season and about 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 (2001/02): $300 million

In 2001/02 the catch declined but the beach price improved dramatically. The price fishermen received for western rock lobster in 2001/02 was an estimated average of $33.75/kg in all zones of the fishery, which was well above the beach price of $27/kg paid in A and B Zones and the $26.50/kg paid in C Zone in 2000/01. These prices were 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 WCRLF in 2001/02 was approximately $300 million and equivalent to the previous season's value. Approximately 95% of product was being exported to Japan, Taiwan, Hong Kong/China, the United States and Europe. Foreign exchange earnings from the fishery exceed the ex-vessel 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 t in 1985/86 to 14,523 t in 1999/2000. The average catch was 10,820 ± 587 t (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.

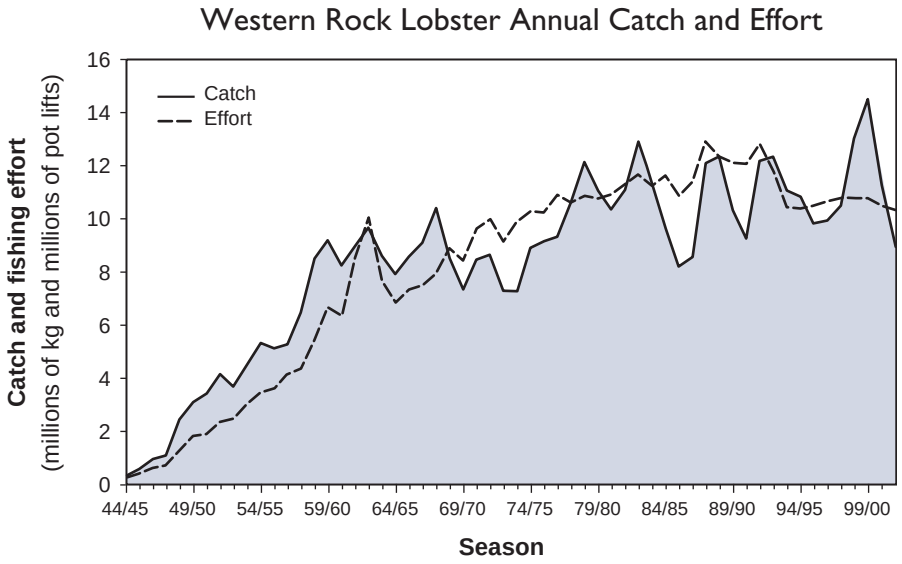
EXTERNAL FACTORS

Following the record catch of 14,523 t in 1999/2000, successive declines in catches led to a below-average catch of 8,966 t in 2001/02. Good catches are forecast for the next two seasons. The variations in catch are a result of variable levels of puerulus settlement 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. Catches are also dependent upon the environmental conditions at the time of fishing. For example, very calm and very clear conditions for one month at the commencement of the 2001/02 season led to a limited migration and very poor catches during the 'whites'.

However, once conditions returned to normal those lobsters not previously caught were available during the 'reds', with some at a larger size following the February moult.

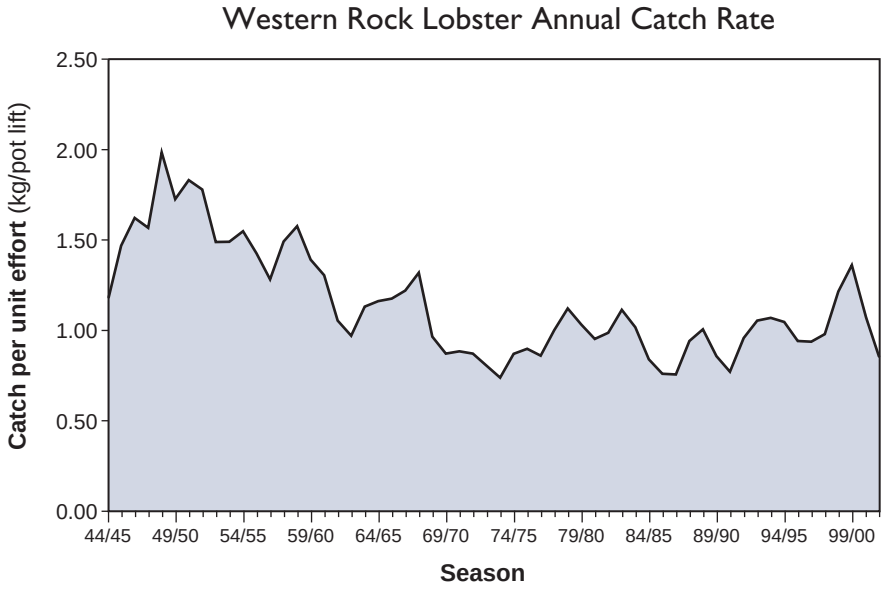
It is noteworthy that whilst the increases in fishing effort seen since the mid-1990s have abated for the present, nominal fishing effort remains about 3% higher than it was in 1993/94 when an 18% temporary pot reduction came into effect as part of the new management package. Nevertheless, increases in effective effort continue and will be taken into account in stock assessments.

Both the Department of Fisheries and the rock lobster industry have been addressing issues raised by the Marine Stewardship Council's annual audit to maintain the world's first MSC certification. Similar issues arising from Commonwealth legislative requirements to ensure an ecologically sustainable fishery were dealt with successfully during 2001/02.



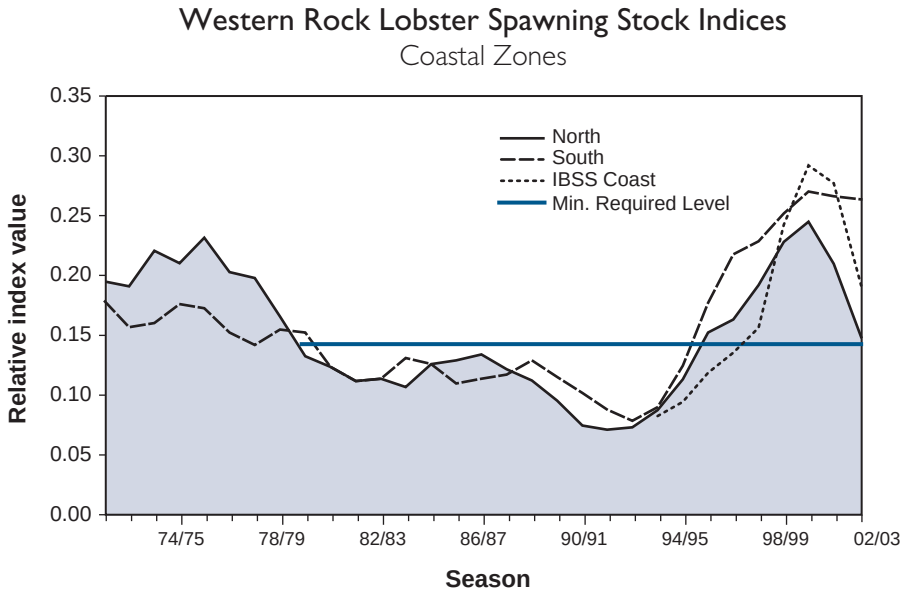
WEST COAST ROCK LOBSTER FIGURE 1

Annual catch and nominal fishing effort from fishers' compulsory monthly returns for the West Coast Rock Lobster Managed Fishery from 1944/45 to 2001/02.



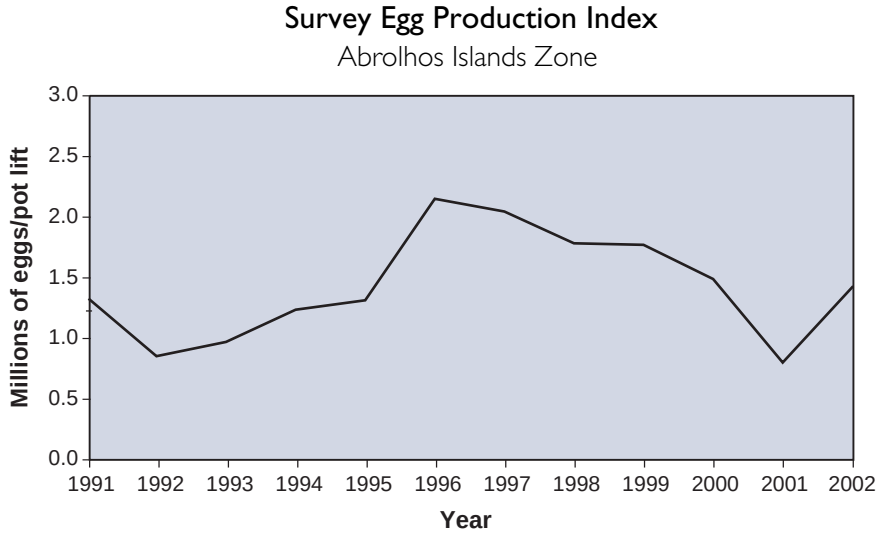
WEST COAST ROCK LOBSTER FIGURE 2

Annual catch rate (kg/pot lift) for the West Coast Rock Lobster Managed Fishery from 1944/45 to 2001/02.



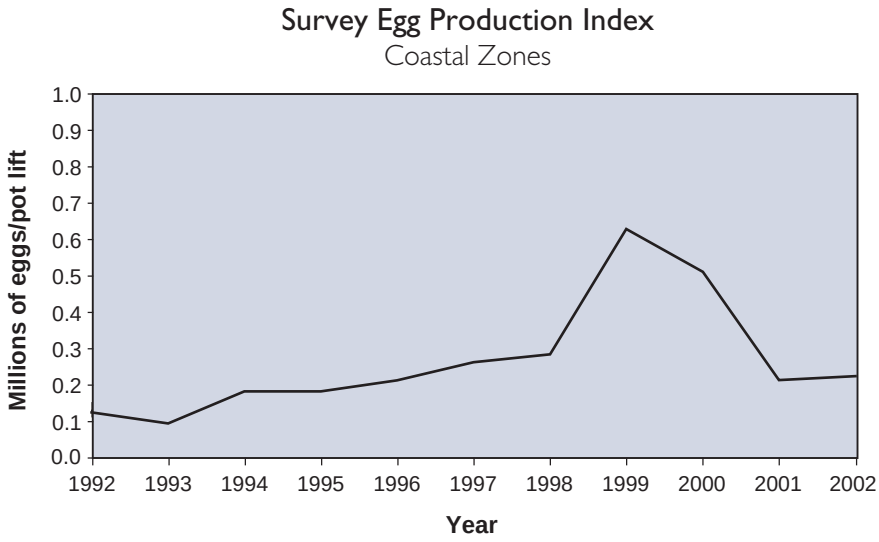
WEST COAST ROCK LOBSTER FIGURE 3

Time series of monitoring spawning stock index (an index of numbers of eggs per pot lift integrated over the whole season) for the north (Jurien and Dongara) and south (Fremantle and Lancelin) coastal regions and the independent breeding stock survey index of egg production adjusted to be equivalent to the 1992/93 average of the monitoring indices. Proportional adjustments to that point have been applied and all indices have been smoothed to reduce the large variation seen in successive individual points caused by changes in catchability (moving average of three).



WEST COAST ROCK LOBSTER FIGURE 4

Egg production indices as measured by the independent breeding stock survey at the Abrolhos Islands smoothed by a moving average of three.



WEST COAST ROCK LOBSTER FIGURE 5

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 (AIMWTF), the South West Trawl Managed Fishery (SWTF) and the small South Coast Trawl Fishery. 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 2002/03 to allow for the unitisation of fishing gear, which took effect on 1 October 2002.

Bycatch reduction devices were fully implemented in the AIMWTF as a licence condition for the 2002 Abrolhos Islands season.

The Vessel Monitoring System (VMS), a satellite tracking system used to monitor the movement of vessels within the waters of a fishery, was introduced into management arrangements for the AIMWTF in April 2001.

A draft application has been submitted for the AIMWTF and the South Coast Trawl as part of Environment Australia's ecological sustainability reporting process under the *Environment Protection and Biodiversity Conservation Act 1999*. A final application is being developed which will be submitted to EA in 2004.

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)
Surface Trawl Net Fishery (South Coast) Notice 1992
Trawling for Scallops (South Coast) Notice 1992
Condition 73 and/or 79 on Fishing Boat Licences

Consultation

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.