



Assessment of the
Western Rock Lobster Fishery

Environment Australia

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This document is an assessment carried out by Environment Australia of a commercial fishery against the Commonwealth's Guidelines for the Ecologically Sustainable Management of Fisheries. It forms part of the advice provided to the Minister for the Environment and Heritage on the fishery in relation to decisions under Parts 13 and 13A of the EPBC. The views expressed do not necessarily reflect those of the Minister for the Environment and Heritage or the Commonwealth Government.

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Assessment of the ecological sustainability of management arrangements for the Western Rock Lobster Fishery

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EXECUTIVE SUMMARY

Background

The fishery targets western rock lobster (*Panulirus cygnus*), about 75% of which is marketed live. The species is endemic to the west coast of Australia and has greatest abundance between Geraldton and Perth, while the fishery extends from 34°24'S to 21°44'S. Kailoa *et al* (1993) indicate that the planktonic larvae are carried into the Indian Ocean up to 1500km from the coast, with the return of pueruli to the continental shelf dependent on shifts in ocean currents and number of puerulus settling influenced by the strength of the Leeuwin Current. Despite the wide larval dispersal taking place over 9-11 months, the species does not appear to be harvested outside Western Australia. Approximately 10,000 tonnes of western rock lobsters are harvested in the fishery annually, at a landed value of over A\$350 million. The gear used is a lobster pot placed on the seafloor and connected to a float on the sea surface.

Kailoa *et al* indicate that the target species reaches a maximum age of more than 20 years; attains a maximum carapace length of 200mm and a maximum weight of at least 4.5kg, (Anon, 2001 suggest animals may reach up to 5.5kg) although growth rates vary considerably along the coast. Juveniles migrate from shallow water to deeper as they mature; the greatest recorded migration of juveniles into deeper water is in the order of 170 nautical miles (Kailoa *et al*). Western rock lobsters are omnivorous feeders whose diet changes according to moult stage, season and habitat. Primary predators are finfish (on juveniles and adults), sharks and octopus (mainly on adults).

Byproduct taken in the fishery includes a variety of crabs including deep sea crab (target of a commercial fishery), some finfish and sharks (most of which is taken on lines and will be assessed through the wetline fishery assessment), and octopus. The most significant components of the bycatch are moray eels (captured in pots) and manta rays (entangled in pot lines). Protected species interactions include capture of juvenile Australian sea lions, and entanglement may occur with Australian sea lions, leatherback turtles and cetaceans; the incidence of this is low.

The area of the fishery also includes part of the distribution of the southern rock lobster (*Jasus edwardsii*), which can be found as far up the Western Australian coast as Dongara (Kailoa *et al*). No reference is made to the harvest of *J. edwardsii* in the submission, but as this species is harvested by similar pots and can be taken in depths of up to 200m it is likely that it comprises part of the bycatch or by-product of the fishery; any such harvest should be factored into the stock assessments and management regime for *J. edwardsii*. Western Australian Department of Fisheries (WADF) advise that *J. edwardsii* are not harvested in the western rock lobster fishery.

WADF also advise that sectors of the south coast fishery targeting *J. edwardsii* harvest some *P. cygnus*, but in inconsequential amounts.

The fishery is managed under an arrangement under the Offshore Constitutional Settlement that cedes management responsibility to the State to the outer edge of the

Australian fishing zone. Although most catch is taken at depths up to 160m, some may be taken at depths up to 200m. The fishery is divided into three zones (Big Bank, Abrolhos Islands, and southern or Zone C), with the Abrolhos Islands zone further divided into Zone A (the Islands themselves) and Zone B (the continental coastal strip). WADF advise that the fishery zones are a result of historical fishing patterns, and that effort is spread evenly across all zones. The C (southern) zone is an amalgamation of two previous zones (C and D zones). The shorter season in the Abrolhos means that fishers may start the season in Zone B and then half (those with appropriate authorisations) go into the Abrolhos Islands when that zone is opened. Commercial operators can only operate in zones for which they have licences.

The management regime implements licence limitation, minimum size limits, gear restrictions, closures, total pot number limit, zonation and a comprehensive monitoring regime.

The fishery has been rebuilding stock since 1993/94, at which stage it was estimated the legal sized biomass was 15% of virgin legal sized levels. The management target is that legal sized biomass should be above 20% of virgin legal size biomass; currently the fishery is above this level.

Process followed in the assessment

A submission entitled *Application to Environment Australia on the Western Rock Lobster Fishery Against the Guidelines for the Ecologically Sustainable Management of Fisheries for Continued Listing on Section 303DB of the Environmental Protection and Biodiversity Conservation Act 1999* was received in November 2001 after a period of discussion between the WA Department of Fisheries (WADF, formerly Fisheries Western Australia) and Environment Australia (EA) during which preliminary drafts were refined. The submission was released for a thirty-day public comment period that expired on 6 December 2001.

Notification that the submission was available on the Internet were sent to all persons on the Fisheries Public Comment Register, a register of interested persons maintained by Environment Australia, and published in *The Australian* and Western Australian newspapers. A total of three public comments were received and WADF provided a response on the issues raised in them. Comments also were sought from the Scientific Committee on Wildlife Use (SCWU), a body of scientists established by the Minister for the Environment and Heritage to provide independent advice.

Following the public comment period the assessment report was drafted by EA. In addition to the submission and associated documents, public comments and WADF's response informed the assessment.

A draft of the assessment report recommendations was provided to WADF for consideration in May 2002, and the assessment finalised when their views had been received.

Overall Assessment

The Western Rock Lobster Fishery is assessed as being a well managed fishery where the risks of being ecologically unsustainable are constrained in the short to mid term. The fishery has mechanisms in place which should control the ecological impact of

the fishery. As a consequence it is recommended that the export of species taken in the fishery should be exempt from the export controls of Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), with that exemption reviewed in five years. Specifically, EA recommends that western rock lobster (*Panulirus cygnus*), Octopus (*Octopus species*), snow crab (*Chacean bicolor*), spiny (champagne) crab (*Hypothalassia acerba*) and giant crab (*Pseudocarcinus gigas*), taken in accordance with the *Western Rock Lobster Limited Entry Notice 1993*, be included on the list of exempt native specimens of the EPBC Act. A number of issues have been identified which would need to be addressed prior to the next review to ensure ecological risks are contained in the mid to long term.

As the fishery area encompasses Commonwealth as well as State waters, consideration under Part 13 of the EPBC Act is required vis-à-vis the impact of the fishery on threatened species, migratory species, cetaceans and listed marine species. The submission indicates that the fishery may interact with leatherback turtles (*Dermochelys coriacea*, listed as vulnerable on the EPBC Act) and Australian sea lions (*Neophoca cinerea*, a listed marine species on the EPBC Act). As the level of interaction with both appears to be low, the fishery is unlikely to have a significant impact. Similarly, the submission indicates minimal interactions between the fishery and cetaceans and listed migratory species, such that the fishery is unlikely to have a significant impact. A declaration under ss.208A, 222A, 245 and 265 of the Act would be appropriate.

Recommendations

While the fishery is currently managed in an ecologically sustainable way, this assessment report identifies a total of 14 recommendations that need to be completed prior to the next review:

1. The Western Rock Lobster Fishery submission contains a number of detailed and explicit management triggers, decision rules and performance measures which are not included in the management plan. WADF and the Rock Lobster Industry Advisory Committee should formally incorporate these into the management regime and decision making process with clear timelines for implementation. These measures must ensure the total effort in the fishery from all sectors is controlled and within sustainable limits. Serious consideration should be given to a cap on total effort including both the recreational and commercial sectors.
2. WADF should undertake contingency planning to deal with breaches in the existing management triggers. In the event that a review is triggered by a breach of the performance measures and that review establishes that the management regime is under-performing, the management plan should require that action must be taken to return the fishery to a stage where it will satisfy the management objectives.
3. The compliance and enforcement strategy should continue to be periodically reviewed to ensure emerging compliance risks are identified and addressed. WADF should conduct an annual assessment of the risks to ensure that the

current compliance and enforcement regime is as effective for the recreational as for the commercial sector.

4. Recognising that consideration of issues relating to the impact of the fishery on the marine environment is currently undertaken as an implicit part of the development of the advice of the Rock Lobster Industry Advisory Committee, consideration should be given to including an explicit requirement to consider such impacts in the terms of reference for the Committee.
5. WADF should continue active encouragement of broad public notification of the potential to input into the environmental impact assessment processes. Furthermore WADF should ensure the external peer review of the existing stock assessment process is maintained.
6. WADF should continue to monitor the situation with respect to the harvest of immature animals to ensure any reductions in egg production or puerulus settlement are detected in a timely manner, and develop a management response for implementation in the event that a major issue develops.
7. WADF should continue to implement annual estimation of recreational and indigenous harvest of lobsters which is factored into management, including ongoing improvement of data collection and analysis.
8. Research into changes in fishing efficiency should be undertaken on a five yearly basis, and contingency plans and management strategies be developed to compensate for potential increases.
9. Monitoring should be undertaken to evaluate whether the impact of the fishery on octopus is increasing, and if so the impacts that harvest is having on the stock and ecosystem. A management response should be developed by WADF as a contingency.
10. The retention of deep sea crabs in the western rock lobster fishery should be actively managed by WADF to ensure the sustainability of the developing deep sea crab fishery.
11. WADF should undertake to develop appropriate triggers for endangered, threatened, protected or bycatch species and appropriate management strategies should the levels or sensitivity of interactions are shown to be greater than currently estimated. To facilitate this process it is important that:
 - WADF continue the recording of byproduct and bycatch taken by the fishery (using both fishery dependent and fishery independent methods). WADF analyse whether byproduct and bycatch recording by the fishery dependent methods are an effective mechanism for obtaining these data;
 - WADF continue the ongoing monitoring of sea lion and cetacean interactions. In the event that these interactions significantly increase,

WADF should implement appropriate mitigation measures in a timely fashion.

12. WADF should assess options for system-based management objectives and associated biological reference, target and limit levels, and implement system-based performance measures in the fishery. This should include a determination of the appropriate levels of protection for larger lobsters. WADF therefore are encouraged to undertake the proposed additional work on the issue of the role of large western rock lobsters in the system, including work on the catchability of larger lobsters.
13. WADF should examine mechanisms for monitoring ecosystem impacts of the fishery, including the appropriateness of reference areas that would allow comparison of fished and unfished areas.
14. WADF should establish an environmental management plan for the fishery that deals with effective waste management in the fishery and minimises the impacts of gear loss.

This assessment does not cover any harvest of southern rock lobster (*Jasus edwardsii*) in the fishery, and therefore does not address export of this species taken in the fishery.

PART I - MANAGEMENT ARRANGEMENTS

The Western Rock Lobster Fishery is managed by the Western Australian Department of Fisheries (WADF); it has been a limited entry fishery since 1963 and the number of pots has been controlled since 1965. The current management regime was introduced in 1993, but modified in 1994/95 to introduce a temporary reduction in pot numbers with a view to reducing effort and enabling the stock to rebuild. Management is based on input controls.

The management regime consists of two documents, both of which are documented and publicly available:

- The *West Coast Rock Lobster Limited Entry Notice 1993*, made under the *WA Fish Resources Management Act 1994* (the management plan).
- The *WA Fish Resources Management Act 1994*.

There are a number of other documents, including research reports, scientific literature and discussion papers, which are germane to the management of the fishery.

Objectives and performance criteria are not contained in the *West Coast Rock Lobster Limited Entry Notice 1993* but are outlined in the submission, which states they conform to a framework described in the WADF Ecologically Sustainable Development (ESD) policy. This policy is yet to be released publicly. The submission contains an undertaking for external review of objectives and performance measures every five years, presumably under the aegis of the WADF ESD policy.

WADF advise that all triggers and decision rules are to be dealt with in future by a subcommittee of the Rock Lobster Industry Advisory Committee (RLIAC, an advisory committee established under the *WA Fish Resources Management Act 1994*). That subcommittee, which exists already, will examine all triggers and decision rules. Industry have indicated that they wish to have decision rules and triggers incorporated into the formal management regime, but as this would require referral to the State Parliament it is a lengthy process. Triggers may be incorporated into either the fishery management plan or a policy document; WADF suggest that the preferred option is to incorporate them into a policy document, to ensure greater flexibility in case changes need to be made.

The regime performance indicators and triggers for the fishery indicated in the submission are focused mainly on target species and byproduct species.

The commercial fishery management regime comprises a combination of:

- licence limitations (596 commercial vessels active, after industry restructuring has largely removed latent effort) with licensees able to fish only in zones for which they are authorised;
- a limit to the total number of pots which can be used in the fishery (69,288 are nominally in the fishery, but only 56,906 can be used after pot reductions and pots lost through prosecutions);
- a minimum size limit of 76mm carapace length (CL) applied across the fishery from 1 February to 30 June, and 77mm CL from 15 November to 31 January;
- maximum size limits for females (105mm CL N of 30°N, 115mm CL S of 30°N) ;
- gear restrictions (pot dimensions, escape gaps, floats regulated);

- seasonal closures (an overall annual closure from 1 July to 14 November (1 July to 14 March in the Abrolhos Islands));
- closed areas;
- controls over when pots may be lifted;
- restrictions on the take of berried, setose, and tar-spot females.

Recreational fishing also is controlled using recreational fishing licences with pot limits and a prohibition on spearing; daily bag limits; the same closures and size limits as commercial operations; and a requirement that tails be clipped.

Although there is a freeze on the number of commercial licences, that does not extend to recreational fishing. Current levels of recreational fishing are estimated to be about 5% of commercial catch levels. Recreational fishing licence numbers are increasing, with effort concentrated around population centres, particularly Perth and Geraldton. Environment Australia (EA) is concerned that this concentration of recreational effort may have potential to create localised depletions around population centres. WADF suggest that the increase in recreational harvest is in the order of 300-600t, and are not concerned about the risk of localised depletions because as *P. cygnus* breeds the length of the Western Australian west coast, localised depletions will be short-lived. In addition, most of the breeding stock will be in deep water beyond the reach of recreational fishers. A model has been developed to forecast recreational catch prior to each season and the way in which licences will increase in response to good years, but consideration should be given to placing an overall effort cap on the recreational as well as commercial sector.

WADF advise that a subcommittee comprising representatives of the RLIAC and the Recreational Fishing Advisory Committee are looking at possible ways to manage the recreational fishery in the future. Resolution of the issue is on hold pending the outcome of an inquiry being conducted by the Integrated Fisheries Management Committee.

Fishery-dependent data is obtained through voluntary daily logbooks, monthly fisher and processor returns, and onboard observer programs. The submission indicates that the observer program conducted by WADF involves a total of 180 trips per year, consistently distributed in terms of seasonal and spatial coverage of the fishery. Brown *et al* (1994) indicate that commercial catch monitoring is undertaken for each month of the fishing season and from four depth categories at five coastal locations. Fishery independent information is obtained through independent surveys, including a survey of the breeding grounds; the breeding ground surveys do not include collection of data on species other than western rock lobster. Independent surveys are undertaken on chartered commercial vessels outside the fishing season; commercial pots are used, baited with baits commonly used in the fishery (Melville-Smith *et al*, 1996).

The fishery is managed with the assistance of the RLIAC. The Act states that the RLIAC consists of an independent Chairman, Executive Director, officer from WADF, two rock lobster processors, 8 commercial fishermen, and one recreational fisherman. The submission indicates that in addition to the above, the RLIAC

includes one representative of the Conservation Council of Western Australia. The RLIAC functions are set out in the Act and focus on issues affecting the fishery; there is no explicit requirement to consider the effect of the fishery on the marine environment. Submissions on management matters may be requested from groups other than the RLIAC, but there does not appear to be a mechanism for seeking this input automatically. The current consultation mechanisms are largely focused on all sectors of the industry, with the degree of public (non-industry) input unclear; management indicators relate to licensee perceptions, not all stakeholders.

The submission indicates that the management plan is comprehensively reviewed every three years, but it is not clear on what basis (legislative, policy or otherwise) that review is undertaken, nor the parameters which are reviewed. A comprehensive review would suggest that all management controls, performance measures, triggers and indicators are reviewed, however the performance measures, triggers and indicators are not contained within the formal management regime. The *WA Fish Resources Management Act 1994* requires annual reporting on the status of all managed fisheries. *State of the Fisheries* reports prepared in response to this obligation must include an acceptable range of management for each fishery, and under the *Fish Resources Management Act 1994* there is an obligation upon WADF to take action if any such range is exceeded.

Development of these annual status reports would be expected to involve a review of the fishery performance to some degree. Public exposure of the review appears to occur only after the report is finalised, although the RLIAC would be involved in the review itself and some non-industry input is possible through that mechanism.

There are no international or regional management regimes to which Australia is a party which relate specifically to western rock lobster. The prime international regime affecting the fishery is the UN Convention on the Law of the Sea (UNCLOS). The management regime essentially complies with this. Australia is developing a National Plan of Action – Sharks (NPOA-Sharks) as required under the International Plan of Action – Sharks developed by the Committee on Fisheries of the United Nations Food and Agriculture Organisation (FAO), which places some obligations upon managers of all fisheries in which sharks are taken. Given that the bycatch in the fishery includes some shark species, albeit at low levels, the NPOA-Sharks also may be germane to the fishery.

The target species (*Panulirus cygnus*) is believed to be a single population endemic to the west coast of Australia; there is no evidence that subspecies have developed, and the nature of the marine environment is such that there has been no opportunity for subspecies to develop (Gray, 1992). The fishery is subject of an agreement under the fisheries component of the Offshore Constitutional Settlement. This arrangement cedes to Western Australia management responsibility for the fishery to the outer edge of the Australian fishing zone. As a consequence, the species is harvested under a single State jurisdiction and the fishery encompasses an area of the Commonwealth marine area as defined under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Commonwealth legislation relating to the impact of actions on the Commonwealth marine area therefore is in force.

The fishery is the subject of a comprehensive surveillance and enforcement program involving sea patrols, factory inspections, on-shore patrols and covert operations. A compliance risk assessment relating to the commercial sector was conducted prior to the 1999/2000 season. The results of that assessment has lead to the introduction of a new field operations approach. The detection of illegal catch, through random sampling of factory-consigned animals, suggest there is an average infringement rate of 0.5%, and that this is mostly of undersized animals.

WADF indicate that compliance for the recreational sector is obtained through a combination of education campaigns; checking boats at sea and at boat ramps; and licence checking. Given this is an area of effort expansion, WADF should continue to periodically conduct an assessment of the risks that the current compliance and enforcement regime is not as effective for the recreational as for the commercial sector.

Fishery assessments suggest that egg production and the biomass of legal sized animals is increasing statewide, and current legal sized biomass appears to be above the management target. If illegal activity is and continues to be low and current management arrangements are maintained, it would be reasonable to expect the fishery to continue to rebuild. As the fishery currently is above the rebuilding target of 22% of virgin egg production, a new rebuilding target may be appropriate.

Conclusion

The harvest of the single population of *P. cygnus* occurs in a single Australian jurisdiction. Management arrangements in the fishery are precautionary and are quite solid.

The management strategies appear to have the capacity to control harvest in the commercial fishery, and to a lesser degree over recreational harvest. Measures also are in place to minimise illegal activity.

There are areas of the management regime that may need tightening to ensure the fishery continues its current good performance. Some management performance measures outlined in the submission (notably that for management effectiveness) appear to be a measure of the capacity to predict future catches, rather than a measure of management effectiveness. In addition, there are few deadlines for management action proposed, nor indications of contingency planning for the event of a performance trigger being breached.

There is a strong monitoring regime in place which would be expected to detect reasonable levels of non-compliance with commercial management arrangements. Compliance and enforcement activity should be strengthened further by undertaking regular evaluation of emerging risks and by exploring options for improving monitoring of recreational fishing compliance. Contingency planning should take place to deal with the risk of an increase in, or the revelation of higher levels than estimated of, illegal activity.

Although the development of the management regime involves a degree of public input, the breadth of representation on consultative mechanisms should be increased

to ensure all stakeholders have a significant and more or less equivalent opportunity for input. One mechanism to achieve this could be for WADF to actively indicate to the wider community that they would welcome the input of any individual who wished to be part of the assessment process.

Recommendations

1. The Western Rock Lobster Fishery submission contains a number of detailed and explicit management triggers, decision rules and performance measures which are not included in the management plan. WADF and the Rock Lobster Industry Advisory Committee should formally incorporate these into the management regime and decision making process with clear timelines for implementation. These measures must ensure the total effort in the fishery from all sectors is controlled and within sustainable limits. Serious consideration should be given to a cap on total effort including both the recreational and commercial sectors.
2. WADF should undertake contingency planning to deal with breaches in the existing management triggers. In the event that a review is triggered by a breach of the performance measures and that review establishes that the management regime is under-performing, the management plan should require that action must be taken to return the fishery to a stage where it will satisfy the management objectives.
3. The compliance and enforcement strategy should continue to be periodically reviewed to ensure emerging compliance risks are identified and addressed. WADF should conduct an annual assessment of the risks to ensure that the current compliance and enforcement regime is as effective for the recreational as for the commercial sector.
4. Recognising that consideration of issues relating to the impact of the fishery on the marine environment is currently undertaken as an implicit part of the development of the advice of the Rock Lobster Industry Advisory Committee, consideration should be given to including an explicit requirement to consider such impacts in the terms of reference for the Committee.
5. WADF should continue active encouragement of broad public notification of the potential to input into the environmental impact assessment processes. Furthermore WADF should ensure the external peer review of the existing stock assessment process is maintained.

PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

Stock Status and Recovery

Principle 1: *‘A fishery must be conducted in a manner that does not lead to over-fishing, or for those stocks that are over-fished, the fishery must be conducted such that there is a high degree of probability the stock(s) will recover’*

Maintain ecologically viable stocks

Objective 1: *‘The fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability’*

Information requirements

The fishery has a comprehensive monitoring system, which includes both fishery dependent and independent sources of information. Fishery dependent sources are: monthly fisher returns; processor returns; factory returns regarding size and quality; voluntary daily logbook; onboard observer programs; annual recreational fisher surveys; and data flowing from the compliance programs. Fishery independent information is obtained from fishery independent surveys; puerulus settlement data; and analysis of climatic data (as the target species is susceptible to environmental variation, this latter may be a useful prediction tool). The fishery independent monitoring program samples six locations throughout the fishery, and from all depths covered by the fishery. Data is collected for each month of the fishing season. Additional fishery-independent research also is undertaken, for instance Chubb *et al* (1999) outline the results of a substantial number of tagging studies undertaken in the fishery from 1988 and 1996, largely on juvenile animals, with regard to mortality, growth and movement of western rock lobster. That study indicated that the majority of movements were less than 50km, and that most lobsters were caught within 10km of where they were released.

The distribution of *P. cygnus* overlaps to a degree with the Western Australian fisheries targeting southern rock lobster (*Jasus edwardsii*) in the Great Australian Bight to Esperance. The *State of the Fisheries* report for 2000/01 (Penn, 2000) indicates that catches of *P. cygnus* have been taken in the western part of the south coast fishery, adjacent to the Windy Harbour/Augusta rock lobster fishery. WADF advise that the harvest of *P. cygnus* in the south coast fishery is of a low order, measured in kilograms rather than tonnes, and although some large breeding animals are taken WADF do not consider the harvest of consequence. The grounds for this view are that the management arrangements are not reliant upon a stock assessment model, based on actual harvest, to determine the biomass of breeding stock. Management arrangements instead rely on direct measures of breeding stock obtained through the indices used for the fishery. Breeding stock estimates and egg

production estimates are based on at-sea monitoring of breeding females and the fishery independent survey of breeding grounds.

WADF indicate that the percentage of vessels participating in the voluntary daily logbook program is over 30%, or about 200 vessels, and submit that this is a high rate of return. While all vessels fish the entire season, WADF indicate that there are no trends for the zone from which voluntary logbooks come. WADF suggest that the high percentage of returns suggests a reasonably wide coverage across the fishery. The rationale for obtaining voluntary logbook information is that reliable data will come from fishers supplying information willingly, whereas mandatory logbook data is frequently unreliable. In addition, the voluntary logbooks yield a greater variety of data, as fishers include: catch by 5 depth categories per day; byproduct species taken; entanglement incidents; and breeding status.

WADF advise that the voluntary daily logbooks are not a fundamental source of data for the management of the fishery, but are used to verify and flesh out data flowing from the compulsory monthly catch returns. EA would be concerned if fishery management was reliant upon voluntary logbooks as the only significant source of fishery-dependent data, but is prepared to accept this arrangement where voluntary logbook data is an additional source of data to improve management.

Assessment

There is an annual assessment of the state of the target species, including any changes in reproductive capacity, using a synthesis of information from: commercial fishery independent sources; onboard monitoring of commercial vessels; monthly returns from commercial operators; and annual estimates of recreational and indigenous harvest.

There is a high level of concordance with the model's estimates of the next year's catch, and the actual harvest the following year. An additional predictive tool is the puerulus settlement index, which has proven useful for predicting the level of catch in four year's time; this index is based on monthly numbers of puerulus from collectors at five standard sites along the lower west coast. Harvest levels have been relatively stable for 8-10 years, and the stock is considered fully exploited.

The submission recognises that western rock lobsters mature at different rates, for example males have a higher moult increment and therefore grow more rapidly than females (Gray, 1992). Brown *et al* (1994) indicate that reproductive maturity of females in coastal areas generally occurs 12-24 months after they reach legal size; accordingly, these animals will enter the fishery before they are reproductively mature. Walters *et al* also suggest that the current minimum legal sizes are too low to prevent immature lobsters from entering fishery, except in the Abrolhos Islands where animals mature at 60-70mm carapace length. The submission indicates that the Abrolhos Islands are considered a significant source of recruitment to the fishery, and WADF advise that in the Abrolhos Islands there is a continuous stock below the legal size.

In contrast, a large proportion of animals coming from the coastal strip is immature; WADF submit that the rule requiring return to water of setose animals, plus the

“whites” migration (the migration of lobsters which have just moulted in a synchronised event), results in lower catchability of these coastal animals and the overall effect is that the level of breeding stock is increasing. Caputi *et al* (1998) suggest that if the decline in puerulus settlement in the Abrolhos Islands between 1970's and 1990s was due to a decline in spawning stock, then spawning stocks from other parts of the fishery must provide an important contribution to the Abrolhos settlement. Caputi *et al* further suggest that the 9-11 month oceanic larval life would ensure a certain degree of mixing that would prevent reliance upon local stocks for puerulus settlement.

Breeding stock numbers in the fishery have trended upwards since 1992, albeit at different rates depending on location; for example, egg production is up markedly in coastal sampling sites, while egg production in the Abrolhos Islands declined in 1996-98 and was been steady in 1999. WADF indicate that the decline in the Abrolhos Islands egg production is not a sustainability issue for the following reasons: a) size at maturity in the Abrolhos Islands is below the legal-size limit, as a consequence of which the breeding stock at the area did not suffer the large declines seen in the coastal areas in the late 1980's and early 1990's; b) current levels are still more than 50% above the levels prior to the introduction of the 1993/94 management measures that reduced fishing effort; and c) the fluctuations seen since 1996 reflect natural variations in the recruitment strength of cohorts moving through the fishery.

The submission indicates a 29.1% increase in catch estimate for recreational sector between 1997/98 and 1998/99, leading to an overall increase in total harvest of 24.5%; the recreational take in the past 8 years has been 3-6% of the commercial harvest. The submission indicates information on indigenous harvest is obtained as part of the recreational survey. WADF submit it is not, and apparently has never been, very large.

Currently the breeding stock has recovered from 15% of estimated virgin levels in 1993/94 to above 22% in most areas of fishery. The submission indicates that WADF consider 22% of virgin breeding stock levels "safe", because it approximates the biomass level of the late 1970s when the deepwater fishery on breeding grounds was developing (i.e. exploitation levels would not have been at a maximum) and there was no indication that the fishery was affecting recruitment in the fifteen years prior to the introduction of the current, more restrictive management measures. In contrast, Walters *et al* (1993) indicate that under the scenario in their model that they considered the more likely, results suggested that it would not be prudent to allow the total egg production to fall below 25-35% of virgin egg production.

The model developed by Walters *et al* suggests that, while a minimum legal size of 80mm would reduce the average catch per unit effort by 5% and increase spawning up to 22%, it would have market implications because smaller sizes are preferred. The model also suggested that a minimum size limit of 72mm, combined with a maximum size limit of 96mm (reduced from 105mm or 115mm, depending on latitude) would result in a spawning increase of approximately 25%. Similarly, a simulation by Hall (1989, cited in Hill 1990) suggests that increasing the minimum length from 76 to

77mm would result in about 2% increase in the long term catch, but after 2 years would also result in 22% more breeding lobsters.

In light of the current performance of the fishery, EA is not convinced that there is a pressing need for overall changes to size limits. However, there are some concerns that the high rate of production in the Abrolhos region relative to the coastal regions may provide a false sense of security should the Abrolhos production mask a decline in production in other areas of the fishery. Given the fishery already is zoned and fishers are licensed to fish in specific zones (both of which should facilitate compliance), consideration should be given to the introduction of different minimum size limits on a zone basis.

The submission indicates that the maximum size limit is to be relaxed for the 2001/02 season. WADF advise that this is to encourage the removal of some larger females from the fishery, as there is potential for the large number of big lobsters in deep water to inhibit subsequent recruitment of smaller lobsters into these areas. The effect of the relaxation of the upper size limit is unclear, but a modelling exercise commissioned by RLIAC suggested this would have less than 1% impact on breeding stock. Although the bulk of the market (Japan and Taiwan for whole animals; the United States of America for tails) favours smaller animals, Donohue 1998 suggests that taking large animals could be a means of increasing the value of the catch, because large live animals could obtain a high price in the Hong Kong and China markets. Donohue 2000 suggests that the removal of the maximum size limit would have limited risk because at the time the markets are most receptive (Chinese New Year and April-May) most of the larger females would be protected by the rules regarding harvest of setose animals.

Existing monitoring programs provide some data on byproduct species; monitoring data collected is obtained from the observer program and is keyed into the database as part of normal monitoring process. Analysis is undertaken on an annual basis.

Octopus (largely gloomy octopus, *Octopus tetricus*) are the main byproduct, with catches estimated at 220,000-300,000 individuals per year; they are caught generally in shallower water operations. WADF indicate that data from four of the locations sampled in the fishery-independent monitoring program show a slight increase in catch rate over the last ten years. The submission indicates that annual monitoring of octopus catch commenced in 2001, and that this will be based on an analysis of catch rates calculated from the fishery-independent observer program and from research logbooks.

The submission indicates that WADF consider the risk posed by the harvest of deep sea crabs (snow crab (*Chacean bicolor*), found throughout the fishery area) spiny or champagne crab (*Hypothalassia acerba*), found in the central and northern area of the fishery, and at greatest depths, and giant crab (*Pseudocarcinus gigas*), found in the southern area of the fishery) in the western rock lobster fishery to be low although the total percentage of harvest is very variable. The take of deep sea crabs in this fishery occurs in 150-200m In contrast, evidence from the directed deep sea crab fishery suggests that the core population of these species is deeper than 200m, which potentially would encompass a greater body of water. The submission notes that C.

bicolour, which comprises the bulk of deep sea crab taken in the western rock lobster fishery, may be targeted occasionally and is considered vulnerable to overfishing.

Overlap between deep sea crabs and the western rock lobster fishery really only occurs when the fishery follows the "whites" migration offshore (a time of about 2 weeks), and about 90% of the western rock lobster fishery is where deep sea crabs do not occur. Levings *et al* (2001) suggest that *P. gigas* may be migratory and put forward the tentative hypothesis that this species moves from deeper water to feed, but returns to deeper water in autumn when the shallow water temperature becomes too hot. This may influence the susceptibility of this species to the fishery at particular times of year, as if the hypothesis is correct *P. gigas* would be expected to be in shallower waters at the time the fishery is open. Levings *et al* also hypothesise that, as the Leeuwin Current seems to be the main influence along southern Australia, Western Australian populations of this species may be a major source of recruits for the eastern populations.

The total annual catch of deep sea crabs in the western rock lobster fishery is increasing; in the last 3 years it was 3-4 times the historical annual catch of 10t (albeit less than half total crab catch in WA). EA is concerned that the increasing catch may be unsustainable, potentially a result of targeting, and must be accounted for in assessment of deep sea crab stocks.

There is a lesser harvest of scale fish and sharks (including wobbegongs) as byproduct, and existing monitoring programs are not geared to obtain data on these catches beyond the scope of voluntary logbooks. The bulk of scalefish and shark are taken by crewmembers handlining and WADF indicate that this harvest will be accounted for in the assessment of the wetline fishery. The submission indicates that the escape gaps required for all pots are considered to have reduced catch, and that it is not practicable to further reduce harvest.

Management response

The management regime uses a limit reference point of 22% of virgin breeding stock. Currently the fishery is above this, and WADF advise that the rebuilding strategy introduced in 1993-94 has resulted in increased production from coastal stocks. As a result the fishery has become less reliant upon the Abrolhos stock for recruitment. EA recognises that the current stable performance of the fishery suggests management is in a position to react to a fall in biomass before over-exploitation takes place. As the legal size limit is below the average size at maturity, the maintenance of regular egg production and puerulus settlement surveys is an important element of the fishery to ensure sustainability issues do not develop, for example if the proportion of lobsters reaching maturity and spawning before entering the fishery drops substantially. The submission notes that undersized lobsters generally survive release back into the water, provided they are released within 5 minutes of reaching the deck of the boat.

It is unclear whether the 1970's fishery would have been a "fish-down" phase¹ in the fishery's development (it can be argued that the "fish-down" phase of the fishery

¹ defined in Caton and McLoughlin (2000) as follows: "Where a stock has not been heavily fished there may be an accumulation of older fish. Fishing of such stocks can produce initial high catches

lasted to 1993-94, when the fishery entered a decline). EA would be concerned if the fishery limit reference point (the performance measure) was based on exploitation levels on previously unfished biomass, since this could be based on the removal of "excess" biomass that had built up in the system. If this was the case, the "safeness" of the 22% assumption would be in question and a more precautionary approach may be to adopt the 25-35% egg production target recommended by Walters *et al.* That the fishery is operating above the 22% level in most areas suggests that this reference level may be appropriate, but does not mean that a more precautionary level such as that suggested by Walters *et al.* would not be equally appropriate, particularly if the overall good performance masks localised declines. In addition, a higher percentage of breeding biomass would be expected to better ensure the species can continue to fulfil its ecological role.

The submission indicates that comprehensive management strategies are in place to deal with both commercial and recreational sectors (outlined in the "management" section of this assessment). There is no limit on the number of recreational licenses which may be issued, but WADF monitor licence numbers and computer models have been developed to estimate the recreational harvest prior to each season. As noted above, a 1998-99 survey suggests there has been an increase in recreational harvest of 29.1% over a year; this was localised on population centres. Given the magnitude of the increased recreational harvest and its concentration on population centres there may be some risk that localised depletions may occur. While the capacity of the Abrolhos stock to supplement coastal stocks may alleviate this, it would be prudent for management to place a limit to recreational fishing effort. A structured approach to estimating recreational and indigenous harvest should be implemented and factored into management.

The submission identifies a number of strategies for dealing with breaches of trigger points for both western rock lobster and octopus (the main byproduct). The submission does not, however, give a clear commitment to their implementation if such breaches occur. EA believes it would be precautionary for WADF to make such a commitment, not only in terms of ensuring the ecological sustainability of the fishery but also in terms of providing certainty for fishers.

The submission recognises that faster pot hauling practices may increase catching efficiency and that effort creep is occurring (the nominal effort is now 3.6% greater than that in 1993/94, when the fishery was at 15% of virgin breeding biomass and considered in need of rebuilding). Given that a proportion of animals enter the fishery before they are mature, fishing pressure (eg through maintaining catch under poor recruitment scenarios, or a greater degree of effort creep than estimated), there is a risk that egg production could be reduced to a point that recruitment was affected. While effort creep is to be factored into stock assessments, given the fishery is managed through effort control the fact that it is occurring has consequent implications for levels of management control; the submission makes no reference to further measures to reduce effort or contingency planning for this eventuality.

McLaughlan (1994) notes that new, better equipped vessels entered the fishery in the late 1980s early 1990s. These vessels are capable of setting pots over a wider area, in

that cannot be sustained once the abundance of older fish has been reduced. Removing the older aged fish in this way is termed fish-down."

smaller groups or even singly, and of moving them swiftly. Although McLaughlan's report relates to the fishery before the 1993-94 effort reduction, such flexibility in operations represents not only increased fishing efficiency but additional compliance risks that would be expected to be relevant to the present-day fishery. Although the submission refers to research into changes in fishing efficiency, it does not commit to deadlines by which such research should take place. Given that the management approach adopted for the fishery is of managing effort rather than catch, EA believes it would be precautionary to develop such contingency plans and management strategies to compensate for the potential increase in harvest.

The submission suggests that WADF are prepared to explore research into habitat enhancement and puerulus harvesting for grow-out purposes. In EA's view artificial methods of enhancing production, such as puerulus harvest and grow-out, are not a desirable approach as they may have unforeseen ecological consequences; the preferred option is to manage the total wild harvest of the species such that artificial means of enhancement are not necessary.

With regard to the octopus catch, the submission indicates management is predicated on the relative inefficiency of rock lobster pots at catching octopus (octopus would be swift to go out through escape gaps as the pot is hauled), although that efficiency may increase with faster hauling. The performance indicator in the submission is based on very basic data (annual weight per pot and trap lift). This may be appropriate at current scales of harvest, but the increasing interest in developing a commercial and recreational fishery for octopus may require development of more sophisticated indicators and data requirement. Among others, data on the type of species caught should be collected to facilitate identifying any changes in species composition; similarly, data on ages, whether the animals are alive when hauled onboard, and survivorship if returned to the water should be obtained. EA notes that there is no clear commitment in the submission to enhanced monitoring and analysis should a directed fishery occur, and believes such a commitment would be precautionary.

As octopus are part of the diet of many other important and vulnerable marine species, some research to evaluate the impacts of increased harvest on the ecosystem would be precautionary. There also is a possibility that octopus are moving into the fishery area from other waters, attracted by the relatively easy prey afforded by trapped lobsters, with unknown ecological ramifications.

Deep sea crabs are subject of a separate directed fishery, which generally takes place further offshore than the western rock lobster fishery. Management measures within the western rock lobster fishery to deal with deep sea crabs include the adoption of the minimum size limits in force in the directed deep sea crab fishery (i.e. 92mm CL for *C. bicolour*; 120mm carapace width for *H. acerba*; and 140mm CL for *P. gigas*).

The submission indicates that a proposal to ban or establish trip limits on the retention of deep sea crabs by lobster fishers is before the WA Fisheries Minister. WADF advise that most rock lobster fishers do not sell deep sea crabs. EA is of the view that, to facilitate the effective management of the fishery targeting deep sea crabs, the

retention of these species in the western rock lobster fishery should be actively managed.

WADF submit that a joint WADF-Murdoch University study, funded by the Fisheries Research and Development Corporation, looking at the survivability after capture of deep sea crabs is finding that deep sea crabs survive capture and release well when returned to the water in a timely fashion. WADF advise that they were unaware of much work suggesting the shallower-water deep sea crabs were at a more vulnerable stage in their life cycle, but note that Murdoch University is sampling deep sea crabs by depth. Preliminary results from this study suggest there is a slight trend associated with depth, but WADF did not believe it was a particular issue.

Conclusion

Based on current fishery performance, the information collection and data analysis conducted for the harvest of *P. cygnus* in the fishery is adequate and the management regime should have a high chance of achieving the objective. The stability of the fishery since effort reduction measures were introduced in 1993-94 and ability to predict harvest levels four years in advance indicate robustness in the management arrangements.

However, the regime lacks contingency planning and commitment to specific strategies, for example if further protection of the breeding stock is required. Data collection and analysis for byproduct species is less advanced and should be improved, and EA is concerned that this should take place to better facilitate effective management of emerging fisheries for deep sea crabs and octopus.

Recommendations

6. WADF should continue to monitor the situation with respect to the harvest of immature animals to ensure any reductions in egg production or puerulus settlement are detected in a timely manner, and develop a management response for implementation in the event that a major issue develops.
7. WADF should continue to implement annual estimation of recreational and indigenous harvest of lobsters which is factored into management, including ongoing improvement of data collection and analysis.
8. Research into changes in fishing efficiency should be undertaken on a five yearly basis, and contingency plans and management strategies be developed to compensate for potential increases.
9. Monitoring should be undertaken to evaluate whether the impact of the fishery on octopus is increasing, and if so the impacts that harvest is having on the stock and ecosystem. A management response should be developed by WADF as a contingency.
10. The retention of deep sea crabs in the western rock lobster fishery should be actively managed by WADF to ensure the sustainability of the developing deep sea crab fishery.

Promote recovery to ecologically viable stock levels

Objective 2: *‘Where the fished stock(s) are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes’*

The submission indicates that the stock is in rebuilding phase after previous heavy fishing pressure. It is not below a defined reference point, and the management measures that are in place to enable the stock to rebuild addressed above would address this objective. As byproduct species also do not appear to be below a defined reference point, a specific response to this objective does not appear necessary.

Ecosystem impacts

Principle 2: *‘Fishing operations should be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem’*

Bycatch protection

Objective 1: *‘The fishery is conducted in a manner that does not threaten bycatch species’*

Information requirements

The submission indicates that the take of bycatch species in the fishery is considered to be too low to warrant ongoing monitoring. WADF indicate that the amount of bycatch coming up in pots is negligible. Some finfish is taken by the crew's hand lining, and that harvest is to be incorporated into the review of the wetline fishery. The lobster pot fishing method generally is considered to take little bycatch relative to other fishing methods, and the submission suggests that most bycatch species can escape through escape gaps. WADF indicate that there is an observer-based monitoring program that records byproduct and non-retained species, including incidents of entanglement. Data flowing from this program are currently being entered into the WADF database, and reports are to become part of the ongoing monitoring system from 2003.

The degree of bycatch information collected suggests that data on temporal or spatial variations in bycatch (species, quantities, stages of life cycle) taken in the past will not be available. While the degree of bycatch is likely to be very low, as assessed, EA suggests it maybe useful to obtain both fishery dependent and fishery independent data on bycatch levels over a range of sites and at various times during the fishing season. The submission indicates that this is being done through the voluntary industry logbooks and the observer program, however an approach that places greater emphasis on the importance of obtaining such data may be more appropriate.

Assessment

The submission indicates that the formal risk analysis undertaken by WADF identified moray eels and manta rays as being the bycatch most at risk from the fishery. Kailoa *et al* suggest the eels would be green moray eels (*Gymnothorax prasinus*), which are common in NSW and extend westward to the WA coast; and western moray eels (*G. woodwardi*), which are endemic to WA and distributed mostly in the area of the fishery (although some are found in the Great Australian Bight). The latter species is considered fairly common. Moray eels are usually returned alive, although their survivorship after release is uncertain. The submission suggests current pot design probably allows most to escape and that pots are inefficient at taking moray eels, however the submission also notes that moray eels frequently are caught in lobster pots. While the submission suggests the frequency of capture is an indicator of high abundance of moray eels, and the information obtained from Kailoa *et al* would support this, an alternative interpretation is that it is an indication that the fishing efficiency of pots at taking moray eels may be greater than estimated. EA is aware of no conservation concerns with regard to moray eels and in the absence of information to the contrary is inclined to the former interpretation. As there is no advantage to fishers in retaining moray eels, and the animals are themselves quite dangerous, there is a strong incentive for fishers to avoid taking them if possible.

Manta rays are infrequently tangled in pot ropes; mortalities (if any) associated with this is not reported in the submission. Last and Stevens (1994) suggest manta rays have wide circum-tropical and pelagic distribution, mainly over continental shelf in northern areas, but they occasionally are found as far south as Rottnest Island. This distribution means that manta rays would not be encountered throughout the fishery. It is possible that the fishery occurs towards the outer edge of their range, and as a consequence there is limited scope for interactions.

Although the fishery regime does not demonstrate robust knowledge of the capture of non-bycatch species in the fishery and its implications, analysis of existing data suggests bycatch is not high. This would be in keeping with the general view that bycatch in rock lobster pots is low relative to other fishing methods.

Management response

The management response to bycatch relies on current pot design, particularly the limit on pot numbers and size of escape gaps, to reduce the risk of interactions taking place. An additional management factor is the decrease in pot lifts over the past eight years that would have the consequent effect of reducing levels of bycatch. There have been no specific trials of pot designs to reduce bycatch. Given the relatively low levels of bycatch this may be an appropriate management response. There are no known management responses to mitigate manta ray entanglement; management responses to deal with turtle entanglement (see below) may be sufficient.

The submission indicates WADF is of the view that very low bycatch numbers and the low levels of risk mean bycatch monitoring is not required. However, the risks to bycatch are to be reassessed within five years. A more frequent assessment interval would be appropriate until more robust data are obtained and the validity of the low-risk assessment is established; EA recommends that the risks the fishery poses to bycatch be reassessed in three years.

The submission indicates that there is no evidence that decision rules for bycatch management are needed, and none currently are in place. Although EA recognises the constraints on obtaining more useful data on bycatch from any fishery, it would be useful to develop (and refine over time as more bycatch data becomes available) precautionary contingency trigger points and management responses.

Conclusion

The generally low levels of interactions suggest the management response is appropriate for the fishery operating at current levels of effort. This situation may change if there is an increase in activity in the fishery, which the submission recognises may occur if the rebuilding strategy continues to be successful.

Overall, the available information suggests levels of bycatch are low relative to that taken in other fishing methods, but the data sources for making this assessment are minimal. Some modification to the management arrangements to address bycatch more specifically would appear to be warranted, particularly with respect to obtaining and analysing data. The regime lacks contingency planning and commitment to specific strategies to deal with changes in assessed risks.

Recommendation

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| A recommendation relating to this objective is embedded in recommendation 11. |
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Protected species and threatened ecological community protection

Objective 2: *‘The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities’*

Information requirements

Marine turtles (specifically leatherback turtles, *Dermochelys coriacea*) and Australian sea lions (*Neophoca cinerea*) are identified as species protected under the EPBC Act with which the fishery may interact. Bannister *et al* (1996) indicate that very occasionally whales have been entangled in lobster pot buoy lines, and it is feasible that some of those interactions with cetaceans may have occurred in the Western Rock Lobster Fishery. There are no listed ecological communities identified in the area of the fishery.

Information on interactions with cetaceans is collected and collated by the Western Australian Department of Conservation and Land Management (CALM) who are also responsible for attending any cases of interaction in State waters. Reports are also provided to WADF and CALM by industry. Advice from CALM indicates that while interactions with cetaceans on Australia’s west coast on an annual basis is not significantly high; the majority of these involve entanglement with rock lobster gear. 17 cetaceans have become entangled in gear associated with the fishery since 1985 (Coughran, *pers comm.*).

In the last month there has been two confirmed and one unconfirmed interactions with humpback whales (*Megaptera novaeangliae*) in the fishery. In each case the whale became entangled in the float lines of lobster pots in the shallower waters of the fishery. Following these recent interactions, WADF have undertaken to provide EA with a report on management of cetacean interactions in the fishery. EA strongly recommends the ongoing monitoring and collection of information on all cetacean interactions in the fishery.

Information on turtle interactions has in the past been collected in an *ad-hoc* fashion. The data available suggests incidence of entanglement is very low, however as reporting is voluntary there is a possibility that interactions are not being reported. Few turtle sightings are demonstrated by data collected during preparation of the draft *Recovery Plan for Marine Turtles in Australia* (Anon, 1998).

Sea lion data similarly has been collected in an *ad-hoc* fashion. The submission asserts that the data suggest a low level of interactions, with the most significant being occasional drowning in pots of juvenile Australian sea lions. The submission indicates that Australian sea lions also interact with discarded waste such as bait bands, but is not clear on the frequency of such interactions.

Ongoing monitoring programs, based on onboard observers, are now in place for those species recognised during the risk assessment workshop as being at some risk (leatherback turtles and Australian sea lions). Given the recent level of interaction with humpback whales in the fishery, EA strongly encourages WADF to include cetaceans in the monitoring program. Similarly, logbooks contain provision for fishers

to record interactions. This monitoring program will assess interactions with Australian sea lions and leatherback turtles. Data on interactions with cetaceans and seabirds is also to be obtained through the general data collection program logbooks and surveys; these data are to be reviewed annually. Some previous data on leatherback turtles, Australian sea lions and cetaceans is available from CALM.

Overall, the reliability of data collected on interactions with endangered, threatened or protected species is unclear. With low levels of interactions there is limited prospect for data validation.

Assessment

The submission indicates that the reduction in fishing effort since 1993-94 should have reduced the risk of interactions with protected species. WADF conducted a formal assessment of the risks posed to protected species by the fishery, and concluded the risk to Australian sea lions and leatherback turtles was moderate while the risk to cetaceans and seabirds was low.

The workshop identified two ways in which Australian sea lions may interact with the fishery: juveniles may become caught in pots and drown; and animals may become entangled in plastic bands such as those used for bait boxes. Australian sea lions breed off Western Australia on low lying limestone islands protected by perimeter reefs; the largest colonies of WA are located on Beagle and North Fisherman Islands (Shaughnessy, 1999). The submission suggests that the mortality of pups associated with the fishery would be insignificant compared with natural mortality rates (identified in Shaughnessy, 1999, as varying between 7.1-24.3%). However, as sea lion populations off WA maybe decreasing and the species distribution is limited to waters off southern and south-western Australia (Jefferson *et al*, 1993), any source of mortality is of concern. The historically low level of catch indicates the fishery is unlikely to be a major source of mortality, but none the less precautionary management is desirable to minimise interactions overall.

Shaughnessy also notes that as Australian sea lions have a broad diet of which rock lobster is only one component, it is likely that there will be only limited competition between Australian sea lions and fisheries.

Leatherback turtles may become entangled in pot lines. WA Museum data suggests 65% of turtle mortalities in WA waters are associated with the western rock lobster fishery, although the overall frequency is 1-2 incidents (including those that are not fatal) per year. The general effort reduction in the fishery in 1998 would be expected to have the effect of reducing interactions with leatherback turtles; similarly, if effort should increase as the submission suggests is feasible as the fishery recovers, the risk for further interactions would be expected to increase. Recent research suggests Indian Ocean populations of marine turtles cannot withstand current levels of indigenous harvest and incidental mortality in commercial fisheries. In light of this any management actions to reduce interactions are desirable.

The submission indicates that cetaceans may be at risk of entanglement in pot lines. Bannister *et al* 1996 indicates that the extent of cetacean entanglement with rock

lobster fisheries generally is likely to be very low. However, the entanglement of humpback whales in recent months demonstrates an actual risk, and as the humpback whale is protected under the EPBC Act as a cetacean, listed migratory and listed vulnerable species, ongoing interaction with the species is of concern.

It appears that the increased level of interaction in the fishery may be related to two factors: the movement of fishers into shallower waters without shortening float lines; and the overlap between the start of the fishing season and the southward migration of the humpback whales, and the end of the fishing season with their northward migration (Coughran, *pers comm.*). WADF recognise these two potential contributing factors but also suspect that an increase in abundance in humpback whales has contributed to the increased level of interaction. WADF are investigating these recent incidences and will provide EA with a report on the matter in the near future. EA strongly encourages WADF to review the management strategies in place to minimise interactions, including looking at the overlap between whale migration and fishing season and the practice of fishers operating in the shallower waters of the fishery.

The submission also indicates that there is some limited risk that dolphins may become habituated by provisioning. WADF advise that the provisioning issue should not be attributable to the loss of bait during pot hauling, because the type of bait used (in the past salmon heads, North Sea herring, and cow hide) is unattractive to dolphins and, after being in the pot for some hours, would be even less appealing. WADF suggest the issue may relate to some individuals who had been encouraging dolphins to follow boats, but notes that fishers themselves have embargoed feeding dolphins. WADF has now prohibited the practice. The submission does not suggest provisioning occurs with dolphins taking rock lobsters from the pots, and in the view of EA such interactions, if they occur, are unlikely to affect the conservation status of the species. The issue of provisioning is complicated by the degree to which cetaceans, particularly dolphins, are fed around the coast of Australia. Bannister *et al* cite research into the effects of the land-based dolphin feeding program at Monkey Mia in Shark Bay; that research found dolphin feeding had risks of significantly and detrimentally modifying behaviour, including distracting animals from the presence of other threats.

The migratory route and breeding areas for some seabirds (eg wedge-tailed shearwaters or mutton birds) theoretically could place them at risk from the fishery, for example through competition for feed or possibly entanglement in pot lines. Shearwaters breed on islands throughout the fishery and are only present during the breeding season of September-April. WADF advise that, as the Abrolhos Islands fishery commences in March, it does not overlap greatly with the shearwater breeding season, and note that little change in shearwater numbers or behaviour has been seen along the coast that could be attributed to the fishery. EA is unaware of any significant concerns regarding interactions between the western rock lobster fishery and shearwaters, but consider the interaction is highly unlikely to affect the conservation status of the species.

The submission does not indicate whether research into impacts on listed species is currently in train.

Management response

There is a management objective to minimise capture and direct interactions with Australian sea lions, leatherback turtles, cetaceans, seabirds and other protected species. The management response to this is to monitor efforts in other pot fisheries to discourage and minimise interactions. In addition, WADF have implemented a data collection system intended to monitor the levels of interactions (for example, to validate the ranking of moderate risk to the sea lion population); that system is based on fishery logbooks and observer trips (currently 180 trips per year, providing a reasonable spatial and temporal coverage of the fishery).

Current management practice relies on pot designs to minimise capture. The submission indicates that a review of pot modifications to deal with sea lion captures and the results of any gear trials should be completed by June 2004. With respect to interactions with leatherback turtles, the submission suggests the frequency of hauling should increase the chance of entangled leatherback turtles being released alive. This would also increase survivability of any cetaceans that may become entangled. The management response to an increase in levels of interactions is to review potential methods to reduce interactions. For both Australian sea lions and leatherback turtles interactions, WADF undertake to increase fisher awareness of the risks of interactions and what measures they may undertake to ameliorate those risks. In light of the recent humpback whale interactions, EA encourages WADF to implement similar actions for cetaceans.

It appears that there are no specific management arrangements in place to minimise entanglement of cetaceans in the fishing gear although minimising pot soak times could increase the chance of survival of entangled animals. In addition, CALM officers immediately attend to reports of entanglements and have a high rate of success in releasing captured animals. Advice from CALM indicates that the willingness of industry to report cetacean interactions is increasing.

As outlined previously, one potential contributing factor to entanglement in the fishery occurs when fishers move from the deeper waters of the fishery to shallower water. While operating in deep water the float lines on lobster pots are taut, minimising the potential for animals to become entangled. When fishers move to shallow waters the lines should be shortened to account for the change in depth and void excess line suspended in the water column or floating on the surface. WADF and CALM have advised that failure by some operators to shorten their lines when in shallow water may be a contributing factor to the recent entanglement of humpback whales in rock lobster gear. Following these recent entanglements, RLIAC released a media alert to all rock lobster fishers advising that lines should be shortened prior to entering shallow waters.

WADF have undertaken to provide EA with a report on the recent interactions with humpback whales and are working with industry and CALM to address the issue. EA encourages the cooperation on this matter between industry and the management agency and recommends the continuation of monitoring of interactions and the development of suitable mitigation measures should interactions increase.

With regard to the issue of sea lion entanglement in plastic bands, the submission indicates that a fisher-education program has been successful in substantially reducing the practice of discarding bait bands at sea. WADF encourages fishers to bring all waste back to port, in part to reduce the risk of Australian sea lions becoming entangled in bait bands. The submission indicates that investigations into this have shown most fishers dispose of bait bands and other plastics responsibly and do not discard them overboard. In addition, industry has ensured waste disposal receptacles are available at all points where commercial rock lobster vessels tie up. The submission indicates that WADF will discuss options for better management of bait bands, but does not speculate as to what those options might entail.

The submission contains no commitment to implement mitigation measures, if the need is identified, although it does suggest that trials could be conducted into mitigation measures. The submission also suggests that closures could be considered for sea lion habitat, as the actual capture of sea lion pups occurs in a relatively smaller area.

A review of the management regime performance limits is possible as monitoring programs continue and further data comes from the fishery. If these data suggest that performance limits are inappropriate, or the level of interactions increases, the submission indicates that changes will be made to fishing practices, but gives no indication of what changes might be considered. EA assumes that, as review of performance measures is good fisheries practice, WADF will review those relating to protected species as regularly as those relating to target species. However, the submission is silent on deadlines by which reassessment of data flowing from the monitoring program and review of potential measures of mitigation should be completed.

Although at this stage there are no recovery or threat abatement plans under the *Environment Protection and Biodiversity Conservation Act 1999* relevant to the Western Rock Lobster Fishery in Commonwealth waters off Western Australia, the management regime should include provisions to oblige compliance with any such plans that may be developed in the future.

Conclusion

EA considers that it is unlikely that under current fishing gears and levels of effort interactions will increase, but this situation may change if there is an increase in activity in the fishery as the stock recovers, or as effort creep continues. Management regulations and operational practices (e.g. limited soak times, closures, escape gaps) should reduce mortalities of protected species, but may not reduce overall interactions.

Available information suggests the level of interactions between endangered, threatened or protected species and the fishery is low, although EA notes the recent interactions with humpback whales. EA considers that contingency planning for modifications to the management arrangements to address the impact of the fishery on endangered, threatened or protected species would appear to be precautionary, particularly if populations of protected species recover and the risks of interactions increase. Furthermore, EA requests the continuation of monitoring of interactions

with protected species and a commitment to developing mitigation measures should interactions increase.

EA recognises that WADF are working with industry and CALM to address the issue of whale entanglement in the fishery and EA encourage WADF, in conjunction with industry and the relevant officers in CALM, to review the management strategies in place to minimise these interactions. Particular attention should be given to the overlap between the fishing season and whale migration and the activities of fishers when operating in shallow waters.

Recommendations

11. WADF should undertake to develop appropriate triggers for endangered, threatened, protected or bycatch species and appropriate management strategies should the levels or sensitivity of interactions are shown to be greater than currently estimated. To facilitate this process it is important that:

- WADF continue the recording of byproduct and bycatch taken by the fishery (using both fishery dependent and fishery independent methods). WADF analyse whether byproduct and bycatch recording by the fishery dependent methods are an effective mechanism for obtaining these data;
- WADF continue the ongoing monitoring of sea lion and cetacean interactions. In the event that these interactions significantly increase, WADF should implement appropriate mitigation measures in a timely fashion.

Minimising ecological impacts of fishing operations

Objective 3: *'The fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally'*

Information requirements

A substantial quantity of information on the environment has been collected through various avenues. The main sources of information appear to be various research projects (such as those addressing current biomass of western rock lobsters *vis-à-vis* unfished conditions; studies into distribution of western rock lobster at various stages in its life cycle; studies on predator-prey relationships in seagrass beds; and studies on the impact of potting on coral reef habitats), and normal fishery monitoring programs. The submission indicates that WADF has sought information on similar situations in other fisheries to address areas where information directly related to the fishery is lacking. The submission also notes that the number of commercial pots lost in each fishing season is unknown, but that it is being assessed; some 30 pots were recovered on the south side of Rottnest Island following the 2000/01 season, which would suggest gear losses occur and may be substantial. The submission is silent on whether fishers are required to report lost fishing gear. However, the ghost fishing capacity of lost pots is unlikely to be substantial as pots without bait do not appear to attract much wildlife, and the material from which pots are made readily disintegrates.

Assessment

The ratio of undersize to legal size western rock lobster biomass is estimated to be over 4:1. The submission indicates that the result of this ratio is that over 90% of virgin total biomass is left in the marine environment after fishing removals, or about 5kg/hectare pa. Current indices indicate that the breeding stock is as high as it has been in the past 30 years.

The submission indicates that WADF undertook a formal assessment of the risks the fishery may pose to the marine environment generally. This identified as a low risk all issues other than potential for pots to impact on coral reef structure of Abrolhos Islands. The rationale for this low risk ranking was a combination of: the high proportion of lobster biomass left in system; the lack of strong trophic reliance on western rock lobsters; escape gaps and pot design which causes the pot itself to deteriorate if left for long periods; the limited time the pot is on the bottom and susceptible to dragging; the low percentage of limestone reef (a habitat which might otherwise be at risk); the prohibition on feeding cetaceans; the migratory or seasonal nature of seabirds; and the use of fuel-efficient boats with waste handling codes in place.

The submission shows that useful work has been done on the role of western rock lobster in its trophic role sense which supports the low risk ranking afforded trophic interactions. Fishery mortality affects about 7% of the biomass and is significantly lower than natural variations in abundance (which are in the order of 50%). This would suggest total mortality (fishing combined with natural) would be in the order of 57%. For this to be sustainable, there would need to be a high level of redundancy in the system, however the submission suggests there have been no noticeable substantial changes resulting from the fishery. As western rock lobsters are generalist feeders, a significant degree of redundancy may be reasonable – for example, the submission asserts that studies have shown western rock lobsters reduce densities of a number of gastropods in seagrass areas, but there are other predators on these species that would be expected to fill any gap created by western rock lobster removal.

WADF indicate that western rock lobster is not a keystone species in the system. Juvenile animals move offshore as they mature, therefore under a natural system there would be few large animals in the inshore zone. The fishery, by targeting mature animals, should not be having a major impact on the inshore zone. Given the length of time the fishery has existed it would appear reasonable to assume the size structure of the western rock lobster population is substantially different. Larger western rock lobster predominate in deeper water; it is feasible that large animals eat items which small animals cannot (if only by physical size and strength). Such large animals may be important contributors to the population and ecosystem processes. The proportion of larger lobster remaining in the system after fishing would be expected to be below natural levels.

WADF advise that the 90% of virgin biomass is not uniformly distributed; about 80% of the catch is taken inshore (depths 0-10 fathoms), and 20% offshore. In general, the breeding stock is not found until around 70 fathoms, where fishing effort is low, and

WADF estimate that the population of unfished biomass in deeper waters is around the 1960s-70s level.

EA is concerned that the argument that the fishery is operating at 80-90% of unfished levels² does not recognise that, where there is movement of mature animals to deeper water fishing grounds, the cumulative effect of the fishing pressure is a very significant reduction in the abundance of year 8+ animals. If this is the case it is feasible that biomass has been significantly reduced. EA is concerned that while the 22% virgin breeding biomass level adopted as a limit reference point for the stock may be appropriate from a stock assessment point of view, it may not take adequate account of the system-level role of western rock lobster. The success of stock rebuilding strategies would be enhanced in a systemic sense if a specific system-based management objective were to be developed for the fishery. Such an objective would be useful in addressing the issues outlined above. The development of system-based objectives in Australian fisheries is a fairly new concept, but none the less EA believes WADF should direct some effort into assessing options for system-based management objectives and associated biological reference, target and limit levels and performance measures for application in the fishery, including consideration of the merits of increasing the proportion of larger lobsters that is protected.

WADF indicate that preliminary information suggests that the species assemblage and communities in these waters is not very complex, and as a consequence there is little that is likely to be affected by the removal of quantities of western rock lobster. Furthermore, the use of a maximum size limit should have reduced the risk of decimation of this stratum of the population, although there may be undetected population effects caused by changes in lobster behaviour which may have affected pot selectivity. WADF advise that the one-year removal of the restriction on the harvest of large females was a result of industry concerns that, as the breeding stock increases, there may be reduced recruitment to deeper waters, leading to cannibalism. The view was taken that there needed to be a reasonable balance between large and smaller animals, and a single season harvest of larger animals would take a little pressure off deeper waters.

The submission indicates that bait usage in the fishery may contribute 5kg/hectare pa, considered by WADF to be trivial, and that a comprehensive study has concluded there was little likelihood disease would be introduced into the system through imported bait.

The submission indicates that the main habitat type likely to be affected by the fishery is the coral reef habitat of the Abrolhos Islands; the impact was considered to pose a moderate risk, as branching corals were believed to grow swiftly when broken, even from bits broken off. Other habitats (limestone reefs and seagrass beds) were considered to be at low risk from the fishery. Coral reef impacts in Abrolhos are mitigated by the limited fishing season in that area of 3.5 months pa and the limited amount of potting occurring in depths less than 20m (larger boats with larger pot

² This is based on an assessment of removals under simulated recruitment scenarios based on fished population recruitment, which indicate that fisheries mortality on mature age classes is 60%+, with a significant impact on expected age and maximum size

allocations tend to operate in deeper waters around the Abrolhos reefs). WADF suggest that the potting in the Abrolhos Islands, which does occur in depths less than 20m, occurs where the ecological communities are considered to have low or moderate sensitivity to fishing impacts. Some effort is directed at targeting western rock lobsters on sensitive coral habitats (areas where coral cover more than 50% of the area), where damage may occur as the pot settles and possibly during hauling if the pot line tangles around structures. Less than 10% of total Abrolhos Islands reef area shows evidence of damage by potting, and WADF calculates that the percentage of this area which would be disturbed would be 0.1-0.3%; similarly, 0.2-0.4% of moderately sensitive habitat may be affected.

The submission recognises that there is some risk of vessels grounding on reefs, but notes that the frequency of this is unknown and would not be confined to western rock lobster vessels. WADF submit that damage caused by grounding would not be as serious as that caused by violent storms, and that most accidental groundings occur on reef tops rather than on the more sensitive coral. WADF submit that, as pots generally lift straight off the ground and are not dragged across the seafloor, impact on seagrass is low.

WADF advise that few vessels anchor overnight, although some may in the Big Bank area; operations are day trips, as a result of which the risk of damage to the seafloor from anchors is minimal.

Management response

The management response to impacts of the fishery on the wider marine environment is that the high level of western rock lobster biomass remaining in the system should enable the system to operate, and that the reduction in effort since 1993-94 should have reduced the potential for adverse impacts. It is possible that potential impacts may be further reduced by the design of pots and operational restrictions, although no clear commitment is given to undertaking work in this area. WADF advise that ongoing work will be instigated on the issue of the role of western rock lobsters in the system, and suggest that dive-based work could be done to dovetail with a proposal to look at the catchability of larger lobster. Research undertaken in the late 1970s-early 1980s did not look very closely at larger animals.

A specific management objective and performance indicator for habitats other than coral reefs is considered unnecessary because the impacts of the fishery are assessed as being of low risk. Rather than have specific mechanisms in place to address this, WADF believe other management arrangements and trigger levels in the management regime will adequately manage the risk to these habitats.

With respect to coral reefs, the management response is an undertaking to address impact of lobster pots on coral reefs and the grounding of fishing vessels, to be progressed in the next 2-3 years as part of the overall management of the Abrolhos Islands. The submission suggests that work on impacts on coral may generate limits and practices to be followed, but does not speculate on what those actions might be.

Conclusion

The level of understanding of the impact of the fishery on the general marine environment is reasonable in some areas but not extensive. Given nature of the fishery, impacts on the sea floor should not be great - the gear used, although bottom-set, is not dragged across the sea floor and would be expected to have little impact on the benthos. The combination of the following factors suggest that the fishery is unlikely to have a significant impact on the marine environment generally:

- the fishing method has limited interaction with, and therefore is not believed to have a significant impact on, the benthos
- low levels of bycatch are suggested by available data
- management arrangements for the target species are intended to maintain the biomass at 80-90% of virgin levels, thereby reducing the risk of ecological shift
- lobsters are not identified as a keystone species in the system.

Evidence suggests the fishery is having stable impact on the marine ecosystem, i.e. the system continues to support removal of 10,000t of lobsters while allowing 90% of virgin biomass to remain in system. The lack of a discernible change in bycatch composition supports this.

Notwithstanding the success of current management strategies, the ecological sustainability of the fishery would be enhanced in a systemic sense if a specific system-based management objective were to be developed. Such an objective would be useful in addressing the issues outlined above. EA believes effort should be directed at assessing options for system-based management objectives and associated biological reference, target and limit levels and performance measures for application in the fishery.

Recommendations

12. WADF should assess options for system-based management objectives and associated biological reference, target and limit levels and implement system-based performance measures in the fishery. This should include a determination of the appropriate levels of protection for larger lobsters. WADF therefore are encouraged to undertake the proposed additional work on the issue of the role of large western rock lobsters in the system, including work on the catchability of larger lobsters.
13. WADF should examine mechanisms for monitoring ecosystem impacts of the fishery including the appropriateness of reference areas that would allow comparison of fished and unfished areas.
14. WADF should establish an environmental management plan for the fishery that deals with effective waste management in the fishery and minimises the impacts of gear loss.



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List of acronyms

| | |
|-----------------------|--|
| CL | carapace length |
| EPBC Act | <i>Environment Protection and Biodiversity Conservation Act 1999</i> |
| ESD | ecologically sustainable development |
| FAO | Food and Agriculture Organisation (of the United Nations) |
| FRDC | Fisheries Research and Development Corporation |
| FRMA | (WA) Fisheries Resources Management Act |
| FRMR | (WA) Fisheries Resources Management Regulations |
| NPOA | National Plan of Action |
| NSW | New South Wales |
| RLIAC | Rock Lobster Industry Advisory Committee |
| SCWU | Scientific Committee on Wildlife Use |
| UNCLOS | United Nations Convention on the Law of the Sea |
| WA | Western Australia |
| WA CALM Management | Western Australian (Department of) Conservation and Land Management |
| WADF | Western Australian Department of Fisheries |
| WRL | western rock lobster |

Annex 1

Summary table of the assessment of the Western Rock Lobster Fishery

| Guidelines | Y/N | Comments |
|--|--|--|
| <u>MANAGEMENT REGIME</u> | | |
| The management regime must meet principles 1 and 2 of the <u>Guidelines</u> | S/NI | See comments below |
| The management regime must take into account arrangements in other jurisdictions. | NA | not applicable – the target species does not occur in any other jurisdiction |
| <p>The management regime must comply with any relevant international or regional management regime to which Australia is a party.</p> <p>The management regime does not have to be a formal statutory fishery management plan as such, and may include non-statutory management arrangements or management policies and programs. The regime should:</p> <ul style="list-style-type: none"> • be documented, publicly available and transparent; • be developed through a consultative process providing opportunity to all interested and affected parties, including the general public; • ensure that a range of expertise and community interests are involved in individual fishery management committees and during the stock assessment process. • be strategic, containing objectives and performance criteria by which the effectiveness of the management arrangements are measured; • be capable of controlling the level of harvest in the fishery using input and/or output controls; • contain the means of enforcing critical aspects of the management arrangements; • provide for the periodic review of the performance of the fishery management arrangements and the management strategies, objectives and criteria; | <p>S</p> <p>S</p> <p>S</p> <p>NI</p> <p>NI</p> <p>NI</p> <p>S</p> <p>S</p> <p>NI</p> | <p>Rock Lobster Industry Advisory Committee functions set out in the Act do not explicitly cover conservation of the marine environment, but focus on issues affecting the fishery. Submissions may be requested from other groups but external input does not seem to be automatically obtained. Consultation appears largely focused on all sectors of the industry, with the degree of public (non-industry) input unclear; management indicators relate to licensee perceptions, not all stakeholders.</p> <p>As above. Other groups have provided input to the submission (unknown whether they have provided input to the stock assessment process per se)</p> <p>Objectives and performance criteria are not contained in the management regime <i>per se</i>. A framework is described in the WADF ESD policy</p> <p>Some management performance measures (i.e. that for management effectiveness) seem to be a measure of capacity to predict, rather than necessarily of management effectiveness. Few deadlines for management action proposed, nor indications of contingency planning for the event of a performance trigger being breached</p> |

| Guidelines | Y/N | Comments |
|--|--------------------|----------|
| <ul style="list-style-type: none"> • be capable of assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species lives and the fishery operates • require compliance with relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy. | <p>S</p> <p>NA</p> | |
| <p>PRINCIPLE 1.</p> <p>A fishery must be conducted in a manner that does not lead to over-fishing, or for those stocks that are over-fished, the fishery must be conducted such that there is a high degree of probability the stock(s) will recover.</p> | | |
| <p>Objective 1. The fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability.</p> | | |
| <p><i>Information requirements</i></p> <p>1.1.1 There is a reliable information collection system in place appropriate to the scale of the fishery. The level of data collection should be based upon an appropriate mix of fishery independent and dependent research and monitoring.</p> | <p>S</p> | |
| <p><i>Assessment</i></p> <p>1.1.2 There is a robust assessment and periodic review of data collected on the dynamics and status of the species/fishery that should include, where relevant, an assessment of the status and trends in age and sex composition. Assessment should be with a view to identification of reduction in biological diversity and/or reproductive capacity. Review should take place at regular intervals but no greater than three years should elapse between reviews.</p> | <p>S</p> | |
| <p>1.1.3 The distribution and spatial structure of the stock(s) has been established and factored into management responses.</p> | <p>S</p> | |
| <p>1.1.4 There are reliable estimates of all removals, including commercial (landings and discards), recreational and indigenous, from the fished stock. These estimates have been factored into stock assessments and target species catch levels.</p> | <p>S</p> | |
| <p>1.1.5 There is a sound estimate of the potential productivity of the fished stock/s and the proportion that could be harvested.</p> | <p>S</p> | |

| Guidelines | Y/N | Comments |
|---|-----|---|
| <p><i>Management response</i></p> <p>1.1.6 There are reference points (target and/or limit), that trigger management actions including a biological and/or effort bottom line beyond which the stock should not be taken.</p> | NI | Strategies for dealing with breaches of trigger points identified for both rock lobster and octopus, but no commitment given to their implementation . Faster pot hauling may increase catching efficiency, with consequent implications for levels of management control; effort creep recognised as occurring and to be factored into stock assessments |
| <p>1.1.7 There are management strategies in place capable of controlling the level of take.</p> | S | |
| <p>1.1.8 Fishing is conducted in a manner that does not threaten stocks of by-product species. (Guidelines 1.1.1 to 1.1.6 should be applied to byproduct species to an appropriate level).</p> | NI | <p>Very basic data required for fishery performance indicator (annual weight per pot and trap lift). Increasing interest in developing commercial and recreational fishery for octopus, but no clear commitment to enhanced monitoring and analysis should this occur.</p> <p>Lesser harvest of scale fish and sharks as byproduct, monitoring programs not geared to deal with these (i.e. beyond the scope of voluntary logbooks).</p> <p>Harvest of deep sea crabs considered a low risk (core crab population is deeper than WRL operations) but total annual catch deep sea crabs in rock lobster fishery in last 3 years 3-4 times the historical annual catch of 10t. Spiny crab vulnerable to overfishing and known to be targeted sometimes.</p> |
| <p>1.1.9 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.</p> | NI | Lacks contingency planning and commitment to specific strategies if further protection of the breeding stock is required. |
| <p>Objective 2. Where the fished stock(s) are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes.</p> | | |
| <p><i>Management response</i></p> <p>1.2.1 A precautionary recovery strategy is in place specifying management actions, or staged management responses, which are linked to reference points. The recovery strategy should lead to the recovery of the stock within a specified period of time, or until the species recovers.</p> | NA | |
| <p>1.2.2 If the stock is estimated as being at or below the biological and / or effort bottom line, management responses such as a zero targeted catch, temporary fishery closure or a ‘whole of fishery’</p> | NA | |

| Guidelines | Y/N | Comments |
|---|-----|----------|
| effort or quota reduction are implemented. | | |
| <p>PRINCIPLE 2.</p> <p>Fishing operations should be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem.³</p> | | |
| <p>Objective 1. The fishery is conducted in a manner that does not threaten bycatch species.</p> | | |
| <p><i>Information requirements</i></p> <p>2.1.1 Reliable information, appropriate to the scale of the fishery, is collected on the composition and abundance of bycatch.</p> | S | |
| <p><i>Assessments</i></p> <p>2.1.2 There is a risk analysis of the bycatch with respect to its vulnerability to fishing.</p> | S | |
| <p><i>Management responses</i></p> <p>2.1.3 Measures are in place to avoid capture and mortality of bycatch species unless it is determined that the level of catch is sustainable (except in relation to endangered, threatened or protected species). Steps must be taken to develop suitable technology if none is available.</p> | S | |
| <p>2.1.4 An indicator group of bycatch species is monitored.</p> | S | |
| <p>2.1.5 There are decision rules that trigger additional management measures when there are significant perturbations in the indicator species numbers</p> | S | |
| <p>2.1.6 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.</p> | S | |
| <p>Objective 2. The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities.</p> | | |

³ The issues addressed under the principle are those that define components of ecosystem integrity

| Guidelines | Y/N | Comments |
|---|-----|--|
| <p><i>Information requirements</i></p> <p>2.2.1 Reliable information is collected on the interaction with endangered, threatened or protected species and threatened ecological communities</p> | S | |
| <p><i>Assessments</i></p> <p>2.2.2 There is an assessment of the impact of the fishery on endangered, threatened or protected species.</p> | S | |
| <p>2.2.3 There is an assessment of the impact of the fishery on threatened ecological communities.</p> | NA | |
| <p><i>Management responses</i></p> <p>2.2.4 There are measures in place to avoid capture and/or mortality of endangered, threatened or protected species.</p> | NI | No commitment to implement mitigation measures, if the need is identified, although trials may be undertaken into the use of weighted pot ropes and seal spikes, and closures could be considered for sea lion habitat. No time lines given for completion of actions involving reassessment and review of potential measures of mitigation. |
| <p>2.2.5 There are measures in place to avoid impact on threatened ecological communities</p> | NA | |
| <p>2.2.6 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.</p> | NI | Needs contingency planning to cover case if there is an increase in activity in the fishery as the stock recovers. |
| <p>Objective 3. The fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally.</p> | | |
| <p><i>Information requirements</i></p> <p>2.3.1 Information appropriate for the analysis in 2.3.2 is collated and/or collected covering the fisheries impact on the ecosystem and environment generally.</p> | S | |
| <p><i>Assessment</i></p> <p>2.3.2 Information is collected and a risk analysis, appropriate to the scale of the fishery and its potential impacts, is conducted into the susceptibility of each of the following ecosystem components to the fishery.</p> <ol style="list-style-type: none"> 1. Impacts on ecological communities <ul style="list-style-type: none"> • Benthic communities • Ecologically related, associated or dependent species • Water column communities 2. Impacts on food chains <ul style="list-style-type: none"> • Structure • Productivity/flows | S | |

| Guidelines | Y/N | Comments |
|---|-----|----------|
| 3. Impacts on the physical environment <ul style="list-style-type: none"> • Physical habitat • Water quality | | |
| Management responses 2.3.3 Management actions are in place to ensure significant damage to ecosystems does not arise from the impacts described in 2.3.1. | S | |
| 2.3.4 There are decision rules that trigger further management responses when monitoring detects impacts on selected ecosystem indicators beyond a predetermined level, or where action is indicated by application of the precautionary approach. | S | |
| 2.3.5 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective | S | |

Annex 2

Tabulation of objectives, strategies, triggers and indicators relevant to the ecological sustainability of the Western Rock Lobster Fishery (derived from Department of Fisheries Western Australia, 2001)

| objective | management strategy | Performance indicator | trigger |
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| <p>1. Ensuring there is sufficient breeding stock to continue recruitment at levels that will replenish that taken by fishing, predation and other environmental factors by maintaining the spawning stock of western rock lobster at or above a level that minimises the risk of recruitment overfishing.</p> | <ol style="list-style-type: none"> 1. The fishery is managed through input controls based on individual transferable effort units with the ability to vary the total number of pots used in the fishery during a fixed fishing season. 2. The annual fishing season is for a fixed period from 15 November to 30 June limiting the opportunity for fishermen to take lobsters. 3. There is a limit on the total number of pots used within the fishery, within each zone of the fishery and by each vessel in the fishery. 4. There are prohibitions on the taking of berried, setose, tar-spot, oversize females (temporarily relaxed for the 2001/02 season) and animals smaller than < 76mm 5. A zone-based management system reduces the risk of local concentrated fishing effort depleting key elements of the breeding stock (eg. Abrolhos Islands). 6. Compliance policing focuses on checks of the legality of lobsters consigned to processors. 7. Policing that the pot use by individuals does not exceed that allowed on the licence. 8. Escape gaps that decrease the opportunity for undersize lobster to remain entrapped in pots. 9. Limits on the size and structure of pots used to trap lobster are designed to maintain the current level of fishing efficiency. 10. Limits on the use of new technology that may increase fishing efficiency. <p>Explicit decision rules to improve the management of the breeding stock levels in a more predictable manner are currently being developed (i.e. determination of maximum as well as the minimum trigger points).</p> | <p>Estimates (indices) of the level of breeding stock and the associated level of egg production are obtained from two programs conducted by the Department of Fisheries (monitoring spawning index and independent breeding stock survey index)</p> | <p>If the best estimate of the current level of egg production should be below the agreed limit reference point (the estimated level egg production that was present of during the late 1970s, currently estimated to be approximately 22% of the unfished level)</p> <p><u>Management responses if the trigger is exceeded</u> are not specified. Options include</p> <ul style="list-style-type: none"> • further reductions in pot numbers; • reduced fishing season length; • within season closures; • changes to minimum and maximum sizes; • area closures |
| <p>2. Minimise the risk of overfishing by limiting catches of octopus in the western rock lobster (WRL) fishery to historical, sustainable levels.</p> | <p>11. The number of required escape gaps and pot reductions introduced over the past 20 years</p> <p>In the future, under the developing fisheries policy a number of commercial octopus fishermen will be licensed. Their records of catch and effort should allow a more informed measurement of stock abundance and more refined management may be developed if necessary.</p> | <p>Recorded catch rate information for octopus by lobster fishing by independent observers.</p> | <p>A decline in the calculated rate per pot lift more than 25% outside the range of recorded variation.</p> <p><u>Management response if the trigger is exceeded</u> is to conduct a review, and introduce measures to reduce the catch of octopus is the review gave evidence of stock collapse. Options</p> |

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| | | | <p>include</p> <ul style="list-style-type: none"> prohibiting the take of octopus by western rock lobster fishers annual limits on octopus take by western rock lobster fishers |
| <p>3. To minimise capture and direct interactions with sea lions and therefore the impact of fishing on the sea lion population</p> | <p>12. monitoring efforts to avoid capture of sea lions in western rock lobster and other potting fisheries around the world</p> <p>13. data collection to obtain the level of interaction between lobster gear and sea-lion pups, whales, turtles, seabirds, etc (logbook and survey), to be reviewed at the end of the year.</p> <p>14. Increase awareness of the issue with fishers.</p> | <p>The relative number of sea lions found in traps or related fishing gear (per pot lift) and other fishery interactions recorded</p> <ul style="list-style-type: none"> by observers and in fishers logbooks. | <p>Any increase in the relative number of observations, or interactions causing sea lion deaths exceeding an average of one per year within the observer program</p> <p>Any increase in the relative level of recorded interactions with seals leading to their death.</p> <p><u>Management responses if the trigger is exceeded</u> are predicated on evidence of significant adverse interactions. Options include</p> <ul style="list-style-type: none"> measures to limit fishing adjacent to favoured sea lion habitat trial of techniques to discourage sea lion pups from entering traps or otherwise interacting with fishing |
| <p>4. Minimise direct and indirect interactions and therefore the impacts of the WRL fishery on leatherback turtles.</p> | <p>15. monitoring efforts in other pot-based fisheries to develop techniques to discourage and minimise the interaction between commercial lobster fishermen and turtles.</p> <p>16. General practice of pulling pots daily (increases potential for live release).</p> <p>17. Reduced pot numbers since '93/94 (less chance of interactions).</p> <p>18. data collection to obtain the level of interaction between lobster gear and sea-lion pups, whales, turtles, seabirds, etc (logbook and survey), to be reviewed at the end of the year.</p> <p>In the future, WADF may generate interest in the area of commercial and recreational fishers providing information about the sighting of all turtles, including requesting information about all sightings and possibly photographs of the turtles.</p> | <p>The number of recorded deaths and captures of leatherback turtles, assessed annually.</p> | <p>Any increase in the number of logged observations, media reports or other recorded interactions with leatherback turtles.</p> <p><u>Management responses if the trigger is exceeded</u> is to conduct a review on potential methods to reduce the level of interactions</p> |
| <p>5. Minimise direct and indirect interactions with dolphins and whales.</p> | <p>19. Monitoring efforts in other pot based fisheries to develop techniques to discourage and minimise the interaction between commercial lobster fishermen and whales and dolphins.</p> | <p>The annual number of recorded and press reported whale and dolphin interactions with the WRL fishery.</p> | <p>Any increase in the number of logged observations, media reports or other recorded interactions with whales and dolphins.</p> <p><u>Management responses if the trigger is exceeded</u> is to conduct a review on potential</p> |

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| <p>6. To minimise adverse effects of human activities on the islands.</p> | <p>20. Restriction on the number and size of camps. 21. Approval requirements for new buildings and major changes and vehicles 22. Walkways and paths are established on the islands. 23. A cat and rat eradication program 24. Regulations over the introduction of domestic pets (prohibited) and flora or fauna 25. Resident control rodents, cockroaches, mosquitoes and flies are controlled using preventive and control mechanisms 26. Regulations specifying how fishers must dispose of various wastes (food, paper, plastics, cardboard, bait bags; large and non-combustible items; and oils, filters, fuel and batteries are returned to the mainland 27. Regulations specifying how sewage may be disposed 28. Installation of composting or hybrid anaerobic toilets at the Beacon Island school, the research camp and at East Wallaby airstrip.</p> <p>In future, the following strategies will be introduced:</p> <ul style="list-style-type: none"> • development of a land-use plan which takes into account the natural and heritage values of the Abrolhos Islands. • development of a habitat map of the terrestrial environment of the Abrolhos Islands to determine which flora and fauna are present and which species, if any are at potential risk. • survey exotic species of plants and animals on the islands with a view to development of a plan for their removal or management. • prepare and implement a management plan for preventing the arrival of exotic species of flora and fauna, and managing or eradicating such species which already may be present. • prepare and implement a fire management plan for the Abrolhos Islands • develop a waste management strategy that produces the most environmentally acceptable waste management procedure of the islands. • prepare policies, standards and guidelines for all marine structures. | <p>No formally monitored performance indicators. Potential indicators include:</p> <ul style="list-style-type: none"> • disturbance and clearing of vegetation • disturbance of fauna • presence of exotic flora and fauna (i.e. pests) • level of rubbish both on the islands and in the surrounding waters • indicators of nutrient enrichment from toilets, sinks, and shower waters | <p>methods to reduce the level of interactions.</p> <p>Potential triggers include</p> <ul style="list-style-type: none"> • reduction in the abundance and diversity of flora and fauna. • presence of vermin and weeds. • increases in the accumulation of rubbish. • significant levels of nutrient enrichment of surrounding waters. <p><u>Management responses if the trigger is exceeded</u> is unspecified.</p> |
| <p>7. The commercial catch of lobsters is maintained within an acceptable range as predicted on an annual basis using the known relationships with recruitment levels and Leeuwin Current strength.</p> | <p>29. The management measures imposed to achieve the objective for the spawning stock (see objective 1 above).</p> <p>In the future, WADF will continue to use input controls to adjust for variations in fishing efficiency and continue to develop the predictive models to improve the reliability of the</p> | <p>The level of commercial catch and total catch compared to historical levels and the predicted level of catch for the season.</p> | <p>The extent to which the annual catch is outside 10% of the predicted total catch value (taking into account changes in the management arrangements for the year).</p> <p><u>Management responses if the trigger is</u></p> |

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| | predictions. | | <u>exceeded</u> is to conduct a review to the causes (eg environmental conditions, changes in fishing operations, whether measurements of recruitment levels were accurate) |
| 8. In consultation with the RLIAC and other stakeholders, periodically review the management plan, related legislation, regulations and arrangements to ensure it remains relevant and aligned with the fishery's management objectives and that collectively they cover the 10 main principles. | 30. Administration an, as necessary, amendment of the management plan and related legislation to achieve and pursue the stated objectives.. | The extent to which the management plan and supporting documentation addresses each of the issues and has appropriate objectives, indicators and performance measures, along with the planned management responses | Not specified <u>Management responses if the trigger is exceeded</u> is unspecified. |
| 9. To have sufficiently high levels of compliance with the Fisheries Resources Management Act (FRMA), Fisheries Resources Management Regulations (FRMR) and the managed fishery management plan. | 31. Continue to gather intelligence on suspected and known illegal activity within the fishery using state of the art technology and sound procedures. | The levels of compliance with the legislation, including the estimated level of illegal landings Degree of understanding of rules governing operation of the fishery by licensees and the broader fishing community. | not specified - under development as part of the Fisheries Research and Development Corporation (FRDC) project on Rock Lobster Compliance Risk Assessment. <u>Management responses if the trigger is exceeded</u> is unspecified. |
| 10. To ensure that adequate management processes are in place that allow for the inclusive management of the western rock lobster fishery as a means of facilitating debate on management arrangements that will achieve an equitable allocation of the resource amongst the various extractive and non-extractive stakeholders. | 32. Support the Resource Sharing Sub-Committee established by the RLIAC and processes such as "Issues Identification" workshops 33. Maintain consultative processes involved in managing both sectors of the fishery to ensure that the rights of commercial and recreational fishers are considered. 34. Support the Recreational Fishing Advisory Committee that advises the Minister for Fisheries | The percentage of catch taken by each sector (recreational and commercial) The level of resource sharing conflict amongst user groups. The level of participation of interested groups / parties in any focused resource sharing process. The willingness of the various interest groups to participate in the resource sharing process. | not specified – may be developed post Toohy inquiry <u>Management responses if the trigger is exceeded</u> is unspecified. |
| 11. To uphold the existing jurisdictional arrangements for the management of this fishery. | 35. Retain the jurisdictional arrangements that currently exist as they relate to western rock lobster. | Approaches from the Commonwealth Government to alter the existing Offshore Constitutional Settlement (OCS). | not specified <u>Management responses if the trigger is exceeded</u> is unspecified. |
| 12. To administer a consultation process that is in accordance with the requirements of the FRMA and allows for the best possible advice from all relevant stakeholders to be provided to the decision maker in a timely manner. | 36. Administering a formal statutory process that includes the Rock Lobster Industry Advisory Committee (RLIAC) and the provision of independent advice to the Minister on the implications of any proposal from RLIAC, or other body. 37. Communication by RLIAC to industry (eg the RLIAC newsletter, industry meetings, management papers, individual correspondence, attendance at association meetings, surveys, and discussions with their peers). | Confirmation to the consultation requirements of the FRMA, including <ul style="list-style-type: none"> • advice provided to the Minister following each RLIAC meeting • production and circulation of Chairman's reports to all stakeholders • adherence to annual planning cycle • adherence to proper consultation procedures in any amendment of the management plan. • annual coastal tour held The level to which licensees consider that they are | not specified <u>Management responses if the trigger is exceeded</u> is unspecified. |

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| | | adequately and appropriately consulted. | |
| 13. To report annually to the Parliament and community on the status of the fishery and, in the future, to develop an independent audit process for the fishery at appropriate intervals. | <p>38. production of substantial documents (the Annual Report and the State of the Fisheries) that report on the operation of WADF and the status of its fisheries</p> <p>39. external review on the status of the fishery in terms of its ecological sustainability (MSC requirement).</p> <p>WADF is in the process of developing a tri-partite memorandum with the Western Australian Environmental Protection Authority and the Office of the Auditor General to conduct a regular audit of the fishery</p> | <p>General acceptance of the management system by the community</p> <p>The extent to which external bodies with knowledge on the management of fisheries resources have access to relevant material.</p> <p>Level of acceptance within the community</p> | <p>not specified</p> <p><u>Management responses if the trigger is exceeded</u> is unspecified.</p> |