



Ecological Assessment of the Developmental Slipper Lobster Fishery in South-East Queensland Waters

A submission to the Australian Government Department of the Environment and Heritage addressing the Guidelines for the Ecologically Sustainable Management of Fisheries

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April 2004



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ECOLOGICAL ASSESSMENT OF THE

Developmental Trap Fishery for Lobsters in Southern Queensland

This ecological assessment report has been prepared by the Queensland Department of Primary Industries & Fisheries (DPI&F) for assessment against the Guidelines for the Ecologically Sustainable Management of Fisheries, to meet the seafood export requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is intended that this report serve as the first step in the process to have slipper lobsters (*Scyllarides* spp.) taken from Queensland waters placed on the list of native species exempt from export restrictions under Part 13(A) of the EPBC Act 1999, and to satisfy the requirements relating to interactions with protected species under Part 13 of the EPBC Act 1999.

This report comprises 2 parts:

Part 1 - Description of the Fishery providing a detailed description of the developmental lobster trap fishery

Part 2 - Ecological Assessment detailing the assessment for the fishery

DESCRIPTION OF THE FISHERY

Introduction

In 1997 the then Queensland Fisheries Management Authority (QFMA) (now incorporated into the Queensland Fisheries Service, (QFS)) authorised a developmental trap fishery for spiny and slipper lobsters after submissions by industry representative who believed an undeveloped slipper lobster (*Scyllarides* spp.) resource existed in southern Queensland waters. A policy document (See Appendix 1) was formulated and after a selection process two applicants were selected as candidates to operate in the fishery. Recognising the requirement to closely monitor developments, a Management and Scientific Advisory Committee (MSAC) was set up to provide management advice on the fishery. Members included the fishery manager, a resource officer, researcher, compliance officer and each of the permit holders. The MSAC was to report directly to the Manager, Harvest Fisheries, and ultimately to Harvest MAC. See the section 'Current Management Arrangements' for more detail on the MSAC and HarvestMAC processes.

The offshore region of the fishery was the first to be developed (see Figure 1). After only 3 unsuccessful fishing trips in the offshore zone (Saumarez Reef) by one permit holder, and due to the inability to secure permits to operate inside the Great Barrier Reef Marine Park (GBRMP), development of the offshore fishery stalled. A further selection process was initiated and three applicants were chosen to operate in the inshore zone, south of the GBRMP. Development of this fishery officially began in July 1999 under conditions described in Appendix 3. The fishery was to be monitored for an initial three-year period ending 30th June 2002, however permits were extended for a further 12 months to conclude on 30 June 2003. At the time of writing, there are no active permits to harvest Slipper or Spiny lobsters in the Developmental Lobster Trap Fishery. Further development of the fishery is awaiting discussions between stakeholders and fisheries managers.

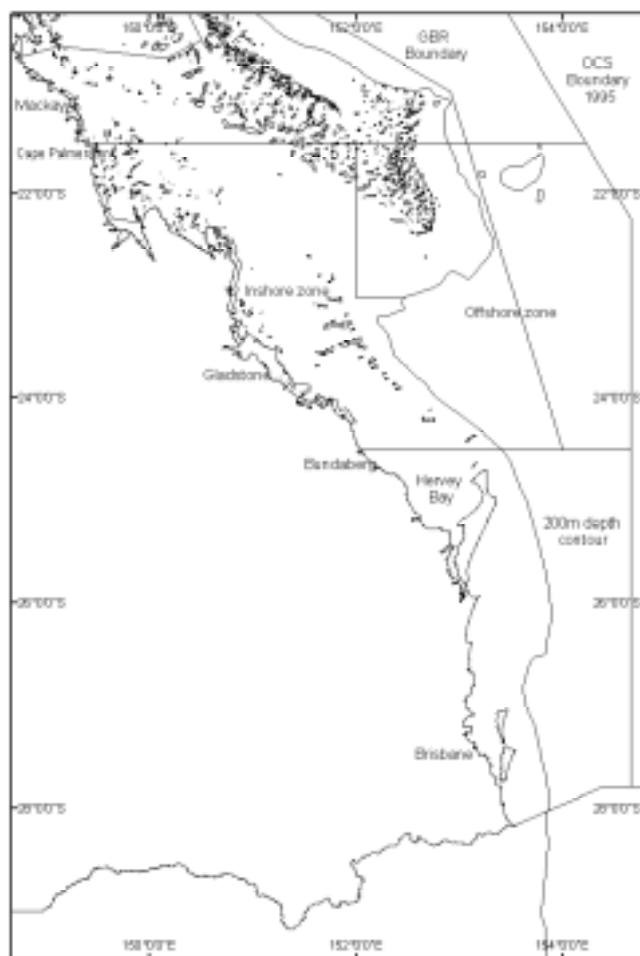


Figure 1. Map of Southern Queensland showing lobster management areas. The current area of management is west of the 200m contour and south of the latitude 24° 30'S.

As part of the developmental fishery it was originally proposed that other lobster species would be able to be taken (See Appendix 4 and 5) but to date only *Scyllarides* spp. and a limited number of *Panulirus* spp. have been caught. To some extent this is a result of the current limitation of the fishery to relatively shallow depths < 200m, which is not the preferred habitat of many of the species capable of entering baited traps.

The trap fishery for slipper lobsters (*Scyllarides squammosus* and *Scyllarides haanii*) has been under development since 1998 but prior to that time both species were landed only as a minor by-product of prawn and scallop trawl fisheries. The trawl take has now ceased with the removal of these species from the “Permitted Trawl Species” able to be retained by trawl fishers.

Distribution of main target species

The fishery predominantly targets two species of slipper lobsters (*Scyllarides squammosus* and *Scyllarides haanii*). *Scyllarides squammosus* is widely distributed in the Indo-West Pacific region and is found from East Africa to Japan through the West Pacific to Melanesia, New Caledonia, Hawaii and Australia. In Australia, *S. squammosus* is found on the west and east coasts from temperate (Sydney) to tropical regions (Torres Straits). It reportedly occurs on reefs and rocky areas at depths ranging from 20 to 50m but has been recorded by fishers to depths of 80m.

Scyllarides haanii is also widely distributed in the Indo-West Pacific region including the Red Sea and Mauritius, the southern coast of Japan, Korea, China, Indonesia, Hawaii and Australia. It is reportedly captured on reefs and rocky bottoms in depths ranging from 10 to 135m. Anecdotal evidence suggests that the species is more abundant in depths greater than 80m. FAO guides (Holthius 1991) list this species as not occurring in coastal waters on the east coast of Australia but information from fishers suggests that its distribution is similar to that of *S. squammosus* (but generally found in slightly deeper water).

Fishery area

The current boundaries for the fishery are shown in Figure 1. The fishery was originally intended to occur in offshore and inshore regions south of Latitude 21° 30', however in practice it has been restricted to the area south of Latitude 24° 30' (the southern boundary of the GBRMP). The change to the fishery area was required following the GBRMPA's refusal to issue permits allowing developmental trap harvesting of lobsters within the GBRMP area. To date the majority of the effort has been in waters in excess of 30m, although no minimum depth restrictions are stipulated under the permitted conditions of operation of the fishery.

Within the area of the fishery, a number of closed waters have been declared under the *Fisheries Regulations 1995*. These are displayed in Appendix 7. As mentioned above, the GBRMP component of the original fishery area has also been effectively closed to fishing.

Biology and Ecology

There is currently very little known about the biology of either of the main target species in this fishery. The ongoing monitoring and research program on the fishery is described in the Research and Monitoring section but there is also data on the biology and ecology of related species that may be relevant to the ecological sustainable management of the two main species of interest in this fishery.

Included in the FAO Species Catalogue (Vol. 13) Marine Lobsters of the World, (Holthius 1991) there are in excess of 70 species of the family Scyllaridae. Of these 8 are of commercial importance, and a further 7 contribute in a minor way to the economy of their region.

Scyllarid species of commercial importance within the developmental lobster trap fishery off SE Queensland are *Scyllarides squammosus* and *Scyllarides haanii*. These species, along with the spiny lobsters also form a significant fishery in Hawaii where comparatively little is known about the longevity, early life history and other aspects of their biology.

From the available scyllarid literature, parallels in the biology and ecology of other scyllarids (particularly *Scyllarides latus*) can be drawn with *Scyllarides squammosus* and *S. haanii* in SE Queensland. The offshore rocky reef habitat of SE Queensland waters is relatively similar to the requirements of *S. latus* in the Mediterranean Sea and of *S. squammosus* and *S. haanii* from Hawaii. Slipper lobsters inhabit the near coastal waters in winter to early spring (when water temperatures are at their lowest), and migrate to deeper waters in summer for breeding requirements.

Slipper lobsters have been noted as moulting in late autumn and early winter and that adults are not likely to moult more than once a year. Observations have shown that moulting is not a requirement for breeding in slipper lobsters as it is for Moreton Bay bugs (*Thenus* spp.). Slipper lobsters may spawn at least twice in a season. Sex ratios in populations of Scyllarid species differ depending on species and region. In Hawaii, *S. squammosus* have been noted as entering the fishery at 3.3 years of age and a minimum tail width size of 56 mm. Studies on the

morphometrics of *S. latus* showed that the mean carapace length and width is larger in females than in males.

Spanier and Lavilli (1998) and Bianchini *et al.* (2001) noted a larger percentage increase in post moult weight gain for smaller individuals of *Scyllarides latus* (24% below 300 g, 6% above 500 g). If we apply the post moult gain of 6% above 500 g to *S. squammosus* and *S. haanii*, coupled with only one moult per year for adults, the fishery may be targeting a relatively old slow growing species. Bianchini *et al.* (2001) suggest that medium-large slipper lobsters are 10-15 years old. However, no definitive growth data has been collected on either of the species in south east Queensland waters.

Research on the ecology of slipper lobsters show they shelter diurnally on the ceilings of caves with small multiple openings, they are gregarious except during moulting, foraging at night-time and showing a preference for rough hard substrate, although *S. nodifer* is documented as burying in mud. Slipper lobsters prey primarily on bivalves and gastropods, and scavenge. Scyllarid species are harvested around the world using pots, scuba and trawls. The habitat of slipper lobsters in SE Queensland waters favours the use of pots, similar to the “Fathoms Plus” pots used in the Hawaiian fishery (NWHI).

The management plan of the NWHI fishery incorporates closed seasons, minimum size limits, no retention of egg bearing females, the incorporation of escape vents in pots, accurate recording of log data and revised yearly quotas. These measures have been modified since the early phase of the fisheries development in Hawaii but the current management regime has seen a sustainable fishery develop. The history of management of the NWHI fishery, and the current management plan they have in place, can serve as a guide to the management of the potential fishery for slipper lobsters in SE Queensland.

Fishing Gear and Methods

The gear used in this fishery is specified in the Permit Conditions held by each operator. (see Appendix 3). The main two types of pot used are the standard “Fathoms Plus” pot, which is extensively used in the USA and Hawaii, and a modified blue swimmer crab pot. These apparatus are shown in Figures 2(a) and 2(b)



Figure 2(a) “Fathoms Plus” pot being hauled aboard vessel



Figure 2(b) Commercial blue swimmer crab trap as used in the slipper lobster pot fishery

Pots can be deployed either individually or in trotline configuration where up to 25 pots can be placed on the one buoyed line depending on the depth of operation. The current QFS policy specifies a maximum of 600 pots (in total) that can be used in this fishery at this stage of its development.

Current Management Arrangements

The Queensland Fisheries Service (QFS), a business group of the Queensland Department of Primary Industries & Fisheries (DPI&F), is responsible for formulating policy and managing the developmental trap fishery for lobsters. The Queensland Boating and Fisheries Patrol (a part of QFS) carry out compliance and enforcement activities for the fishery, with research and monitoring undertaken recently by the Agency for Food and Fibre Sciences (AFFS).

The fishery is managed as a developmental fishery under the *Fisheries Act 1994*, the *Fisheries Regulations 1995* and an 'Exploratory and Developmental Fishery Policy' (currently under internal review by QFS). No areas fished are currently subject to marine park zoning under either the Commonwealth *Great Barrier Reef Marine Park Act 1975* or the Queensland *Marine Parks Act 1982*. Participants in the fishery require a permit that is renewed annually (subject to satisfactory performance by the permit holders). The current standard permit conditions are set out in Appendix 3. At the time of writing, no active permits existed to harvest slipper lobsters as the trial phase of the fishery – initially three years then extended for a further year - lapsed on 30 June 2003.

Management advice on general developmental fishery issues is provided to QFS through the management advisory committee for harvest fisheries known as HarvestMAC. QFS' MAC process provides a consultative forum allowing all stakeholders to provide input into the management of particular fisheries. HarvestMAC representatives include a DPI&F appointed chair, manager, researcher, compliance officer, commercial fishers, recreational fishers, seafood marketer, conservation member, indigenous representative and a GBRMPA representative.

QFS has also set up a Management and Scientific Advisory Committee (MSAC) specifically focussed on the developmental lobster trap fishery. The MSAC comprises a manager, researcher, compliance officer and a representative of each of the permit holders. All issues arising from or of relevance to the fishery, including any impacts to target, bycatch or protected species, or to the broader marine environment generally, are discussed by the MSAC. The MSAC then advises

QFS on any management actions required to ensure the fishery continues to operate within sustainable levels.

In the event the fishery progresses beyond the developmental phase a formal process will be undertaken to develop appropriate management arrangements. This process will include extensive public and stakeholder consultation through the public release of a Regulatory Impact Statement (RIS) and Public Benefit Test (PBT).

Environmental Impacts of the Fishery

Should the fishery be allowed to continue at recent levels of effort, utilising the same fishing gear and under exiting monitoring and management arrangements, the QFS considers that the Queensland developmental lobster pot fishery does not pose a significant threat to the sustainability of the target species nor to any bycatch, endangered, threatened or protected (ETP) species. The environmental impacts of the fishery are assessed in greater detail in Principle 2 of this assessment. Bycatch issues are discussed in under Objective 1; impacts to endangered, threatened and protected species under Objective 2; and impacts to the marine environment generally under Objective 3.

The fishery has landed less than 5 tonne of product each year and in the 2002/2003 financial year no product was landed. Nevertheless further documentation of bycatch and examination of the impacts of the fishery on ETP species remain important considerations should the fishery develop further. Since the fishery is only of recent origin, the AFFS reviewed the available literature on bycatch and ghost fishing from related fisheries around the world that provided further support for the QFS position that the fishery is not likely to pose a significant environmental risk (Appendix 5).

Research and Monitoring Program

Due to its current low level of economic importance there has been only a relatively small level of research effort in this fishery with more resources being devoted to an observer program that validated logbooks, monitored catch rates, investigated bycatch and generally reviewed fishing operations of the three permit holders who operated in the fishery. Nevertheless if the fishery develops further QFS has the capacity to be responsive to issues as the fishery develops and as issues arise within the MSAC.

Observers accompanied fishers on 10% of their fishing trips and have provided valuable information on both the biology of the target species as well as the impact of the fishery on bycatch and the ecosystem in general. The high value of the product (\$40+ per kg live) has resulted in few animals being sacrificed for detailed biological study, but previous studies on other lobster species have provided significant information that can be applied to the lobster species categorised here. During observer trips with fishers a range of biological information has been collected utilising methods employed by previous local and overseas studies.

ENVIRONMENTAL ASSESSMENT

PRINCIPLE 1. A fishery must be conducted in a manner that does not lead to overfishing, 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.

Objective 1. Fishery catch levels maintain ecologically viable stock levels within an acceptable level of probability

Information Requirements

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-dependent & fishery-independent research and monitoring.

The Queensland Fisheries Service (QFS) has developed an integrated Queensland Fisheries Information System (QFISH) to gather fisheries-dependent information on the fisheries under its management. Fishery dependent information collected by QFS includes a complete daily census of commercial fishing activities and large-scale biennial state-wide recreational fishing surveys. In addition, a compulsory charter vessel logbook is now in operation throughout that sector. The information collected by these mechanisms provides a longitudinal survey of fishing activities and is one of the most comprehensive fisheries dependent programs in Australia.

Fishery-dependent data from the commercial sector of the fishery is collected via CFISH – the Commercial Fisheries Information System. Since its commencement in 1988, CFISH has collected daily data from commercial fishers about their commercial fishing activity through the use of compulsory logbooks. The daily logbook records must be returned to QFS at the end of each month. All commercial fishers in Queensland have a legal obligation to provide information about their fishing activity via daily logbook reporting. Section 118 of the *Fisheries Act 1994* (the Act) and Section 109(1)(b) of the Fisheries Regulation 1995 (the Regulation) require that all holders of primary commercial fishing boat licences and holders of authorities to take, possess or sell fish must keep detailed statistical records about their fishing activities and provide such records to QFS. Section 118 of the Act clearly outlines that any person who fails to comply with an obligation to keep and provide the logbook or other information about fisheries required by QFS is liable to prosecution for an offence against the Act.

Due to the developmental nature of the fishery only fishery-dependent data has been collected, however that data is of a very high standard. The fact that the fishery is solely a commercial fishery with no significant recreational, charter or indigenous component results in a high degree of certainty in the fishery dependent data, particularly since there has been an active observer program to validate logbook records since the start of the fishery.

A wide range of data has been collected (See Appendix 4 for an example of the compulsory daily logbook filled in by all operators). The logbook data is considered very reliable given that observers have accompanied about 10% of fishing trips.

The fishery operates on a daily or short-term basis (trips less than 3 days duration) with fishers returning directly to port to unload their live product. The industry contributed funds for compliance checks on the fishery, which has been relatively easy to survey given that there were only three permit holders in the fishery and the fishery did not extend over an extensive area.

There have been regular meetings of all permit holders, compliance, management and research officers in which all aspects of the fishery were reviewed, including compliance and enforcement

strategy. As the fishery is only in its infancy, data are too few to enable a formal stock assessment, however the fishery dependent data plays a vital role in monitoring catch rates. The fact that the data is collected at very fine spatial and temporal scales enables considerable scope to detect fine scale changes. The spatial resolution for most of the data is GPS co-ordinates of individual trap lines and the fact the log is a daily log maximises the temporal resolution of the data. As a condition of operation in the fishery all operators must have a VMS system installed and this has been the case since the instigation of the fishery, a condition that has maximised the spatial resolution of the fishery dependent data.

There is currently no fishery independent data available for this fishery. Over the first three years of its development the fishery was highly seasonal with most landings occurring during the winter. While this is partly a reflection of the seasonal availability of lobsters in shallower waters it also reflects the participation of fishers in other fisheries (primarily the blue swimmer crab fisher) during the rest of the year.

It is very important to note that although fishery-dependent data has been collected from the fishery it cannot be presented publicly due to confidentiality agreements between QFS and industry. These agreements limit the publication of catch information when data from fewer than five fishers is available.

Assessment

1.1.2 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.

There is currently no formal stock assessment model of the fishery but there is ongoing review of the catch rate and bycatch data. An observer program has already resulted in decreased levels of bycatch and modifications to gear. The regular meetings between fishers, managers, scientists and compliance officers proactively addressed issues within the fishery as they arose. The information collection system is capable of detecting small-scale changes in catch rates of target and bycatch species as well as incidental interactions with threatened or endangered species such as loggerhead turtles. Biological information such as change in sex ratio and average size of the catch is also available from data collected by observers. The management arrangements in place in this fishery have already been demonstrated to be flexible enough to respond to issues in the fishery. This is demonstrated by the removal of the ability of fishers to retain fish by-product caught in the traps when this was highlighted as a possible issue by observers and fishers.

1.1.3 The distribution and spatial structure of the stock(s) has been researched and established, and is factored into the management arrangements and responses.

The fishery was originally divided into two different management zones but for the last four years there has only been one zone (southern inshore zone) for management purposes. The fishery is only catching two main species of slipper lobster (*Scyllarides haanii* and *Scyllarides squammosus*) and only a small proportion of these stocks are fished as the spatial zoning arrangements restrict fishing to a small component of the species distribution in Australian east coast waters.

Scant information is available in published literature on the distribution of either species within Australia, particularly *S. haanii*, which in some literature is not even described as occurring on the east coast of Australia. *S. squammosus* has been described as occurring on both the east and west coast of Australia. On the east coast it is found from Torres Straits in the north to at least

Sydney in the south. Information collected from the observer program and the fishery dependent logbook so far indicates that *S haanii* is found in deeper habitats (> 80m) than *S. squammosus*. There is no genetic information available on stock status of either species within Australia or elsewhere in either species distribution. However, given information on other offshore crustacean species found along the east coast of Australia, and the effect of the East Australian Current on the distribution of eggs and larvae, it is likely that there is little stock differentiation on the east coast.

QFS will consider further research on the fisheries biology and ecology of the target species should the fishery develop further.

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.

There is no recreational, charter or indigenous fishery for either of the two main species taken by the fishery. In the past a small quantity of slipper lobsters was retained as by-product in the east coast trawl fishery but it is not possible to differentiate between the two species in the trawl log records. As the preferred habitat for both species is reef and rocky bottom it is highly likely that only a small proportion of the stock is in habitats that can be trawled. While there is scope in the east coast trawl logbook to record catches of lobsters, the fact that they are relatively uncommon in trawl catches suggests that their occurrence in catches may also have gone unrecorded. Nevertheless, recent amendments to the east coast trawl fishery management plan now prohibit the take of slipper lobsters by the trawl sector. It is therefore reasonable to assume that the catch estimates recorded in the logs of the current permit holders are reliable estimates of the total landings of these species.

1.1.5 There is a sound estimate of the potential productivity of the fished stock(s). There are estimates of the harvestable proportion.

There are currently no estimates of potential productivity of the Queensland stock but should the fishery develop QFS will undertake work to better assess the productivity of the stock.

Management Responses

1.1.6 There are reference points (target &/or limit), which trigger management actions including a biological bottom line and/or a catch or effort upper limit beyond which the stock should not be taken.

QFS recognises that biological reference points are important triggers for management intervention as they ensure stocks are not harvested beyond sustainable levels. However, accurate and reliable reference points require a sound knowledge of the population dynamics of the species being harvested; and regular updates on the current status of the stock, preferably including both fishery-dependent and –independent information. Given the small-scale, limited value, and very early stage of development of the slipper lobster fishery, such information is not collected for the species harvested and reference points have not yet been established.

In the event the fishery progresses beyond the developmental phase a formal process will be undertaken to prescribe management arrangements, including extensive public and stakeholder

consultation. The development of appropriate reference levels will be discussed as part of that process

1.1.7 *There are management strategies in place capable of controlling the level of take.*

The *Fisheries Act 1994* provides the overarching objectives for the management of the developmental lobster trap fishery (as it does for all Queensland fisheries), specifying that:

- 1) The main purpose of the Act is to provide for the use, conservation and enhancement of the community's fisheries resources and fish habitats in a way that seeks to:
 - (a) apply and balance the principles of ecologically sustainable development; and
 - (b) promote ecologically sustainable development.
- 2) In balancing the principles, each principle is to be given the relative emphasis appropriate in the circumstances.

The current management arrangements for the fishery specify the type and quantity of equipment permit holders may use as well as imposing size and sex restrictions on the species harvested. All management controls are listed in the permit conditions provided in Appendix 4, however a summary is provided in Table 1.

Table 1. Summary of management arrangements in the Developmental Lobster Trap Fishery

Management arrangement	Developmental fishery
Size of apparatus	In waters shallower than 100 metres: <ul style="list-style-type: none"> • Beehive – 150 cm (wide) x 120 cm (high) • Other design – 1 cubic metre in overall volume In waters 100 metres and deeper: <ul style="list-style-type: none"> • 195 cm x 120 cm x 120 cm
Float size	Floats to be at least 15cm in diameter
Float colour	Floats for traps set in strings – orange in colour Floats for single traps – any colour except orange
Float marking	Owners boat name and boat marking
No. of apparatus	Not more than 200 traps per operator May have 210 traps in possession but those in excess of 200 must be unassembled.
Configuration of apparatus	In waters less than 20 metres – traps set singly In waters 20 – 100 metres – set in strings of up to 25 In waters over 100 metres – set in strings of up to 50
Taking female lobsters	Prohibited to take berried females or setose females
Minimum size limit	104 mm carapace length (<i>Jasus verreauxi</i>)
Maximum size limit	200 mm carapace length (<i>J. verreauxi</i>)

The input controls, which restrict the number of pots used and specify the type of apparatus able to be used, in conjunction with the allocation of only three permits limit the amount of effort applied in the fishery. In addition, since the numbers of pots has been limited to 200 per permit holder, and the number of operators limited to three, here is little scope for effort creep in the fishery under current permit arrangements. Modifications to gear to reduce bycatch and possibly increase lobster-catching efficiency are possible but the total effort (in terms of numbers of pots) is capped.

A range of output controls also protect the species harvested, namely the prohibition on taking berried and setose females and the minimum and maximum legal size limits. The permit conditions outlined in Appendix 4, with which each operator must comply, list a range of other measures aimed at ensuring the fishery is managed in a sustainable manner. These include the mandatory use of VMS technology to track spatial fishing effort; the requirement to allow observers on any fishing trip; and the requirement to keep a daily logbook of all species harvested. As the fishery is developmental there is considerable scope for QFS to alter the management arrangements at any time should such an action be deemed necessary to ensure sustainability, or for any other reason. In particular, permit condition 31 (a) states that:

“...the Chief Executive will consider the suspension or cancellation permit[s] if it determines...that a deleterious effect on stocks of Slipper and Spiny Lobster or any other fish species (including bycatch and byproduct) has been caused or is imminent or may be reasonably be expected due to activities under this permit.”

There is the scope for illegal take of lobsters by trap fishers who are targeting other species such as blue swimmer crabs (*Portunus pelagicus*) but the possession of lobsters by these fishers places them in breach of the Act and subject to heavy penalties if they are found with lobsters in their possession. In addition, the preferred habitat for slipper lobsters results in little overlap in fine scale distribution of slipper lobsters and blue swimmer crabs.

1.1.8 Fishing is conducted in a manner that does not threaten stocks of by-product species.

Permit conditions originally proposed in 1999 allowed fish and elasmobranch by-product to be taken but this was later removed as a condition. Monitoring the levels of fish bycatch in particular suggested that fish species could be caught in significant numbers in some areas. Under conditions of the permit held by each fisher there is no by-product allowable in this fishery. In addition, the other main lobster fished in Queensland, the tropical rock lobster (*Panulirus ornatus*) is specifically excluded from being taken by holders of the developmental fishery permit. At no stage was the impact of the fishery such that it was likely to adversely effect by-product species but QFS took a precautionary approach to the issue of fish by-product.

1.1.9 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

QFS believes that the arrangements put in place at this stage of the fisheries development are robust and responsive enough to cope with any development in the fishery. An observer program, coupled with the small number of permit holders and the high level of consultation and communication results in arrangements that ensure ecological sustainability. There is currently no fish or elasmobranch by-product allowed in this fishery and by-catch is routinely monitored both in logbooks and by observers. In addition, permit conditions can be altered without legislative change and this has already taken place in response to emerging issues related to byproduct in the fishery.

Objective 2. Where the fished stocks are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated time frames.

Management Responses

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 apply until the stock recovers, and should aim for recovery within a specific time period appropriate to the biology of the stock.

and

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' effort or quota reduction are implemented.

The lobster trap fishery has operated on only a very limited developmental scale, with just three permits allocated, and over a limited time frame of only four years. As such, Slipper and Spiny lobster stocks are not likely to have declined below ecologically viable levels. The current permit conditions provide QFS extensive powers to ensure the sustainable management of the fishery, allowing the suspension or cancellation of permits if a *'deleterious effect on stocks of Slipper and Spiny Lobster or any other fish species (including bycatch and byproduct) has been caused or is imminent or may be reasonably be expected due to activities under the permit'* (Permit Conditions, Appendix 4).

Should the fishery progress beyond the developmental phase, the *Fisheries Act 1994* will provide the overarching objectives for management of the fishery (see criterion 1.1.7). If the stocks were found to be at risk at any stage, it is implicit in the objectives of the Act that QFS is committed to, indeed is legislatively required to, implement appropriate precautionary management actions in a timely manner. The Act provides QFS the power to review or revoke management plans, or to take emergency action necessary to rectify the impacts and causes of any threatening actions.

PRINCIPLE 2 Fishing operations should be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem.

Objective 1. The fishery does not threaten bycatch species

Information requirements

2.1.1 Reliable information, appropriate to the scale of the fishery is collected on the composition and abundance of bycatch.

Bycatch information is routinely recorded in compulsory logbooks and is also collected as a regular part of an ongoing observer program. The logbook specifies quantities by weight and number however observers have also documented size and accurate species identification of all bycatch components. Permit holders have also been trained by the observer and by Queensland Museum staff on the identification of important bycatch taxa. Species Identification Guides of crustacean species likely to be found in traps have been distributed to fishers. Over time, the system of bycatch recording has been further refined to include an assessment of the condition of the bycatch that is returned to the water. However to date only preliminary data have been collected on the condition of bycatch, and these from the observer program. Should the fishery develop additional information on bycatch release condition will be collected.

QFS believes that the scale of the observer program operated previously, coupled with the detail provided in the compulsory logs will provide enough information to detect spatial and temporal changes in the bycatch of this fishery. At this stage there is no strategy to collect information on sex ratio or age structure of any of the teleost bycatch components, however ongoing monitoring and proposed risk assessment of bycatch components will determine if such a strategy is warranted (see the following criterion). As the fishery is currently only in its developmental phase there is limited data available publicly. With only three permit holders operating in the fishery issues of confidentiality limit the public release of much of the fishery-dependent information. Preliminary estimates of bycatch catch rates in are shown in Figure 3. Aggregated abundance estimates for the most common bycatch species are presented in Table 2.

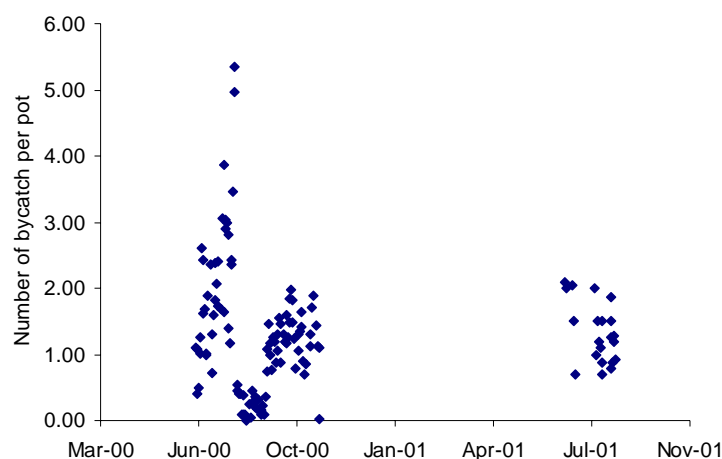


Figure 3. Number of bycatch individuals per pot lift in the lobster developmental fishery during observer trips.

Table 2. The 20 most abundant bycatch species taken in slipper lobster pots in SE Queensland during observer trips between 1999 and 2001.

Common Name	Species name	N	%
Grassy Sweetlip	<i>Lethrinus genivittatus</i>	202	27.01
Venus Tusk Fish	<i>Choerodon venustus</i>	122	16.31
Black Spot Goatfish	<i>Parupeneus spilurus</i>	96	12.83
Rock Crab	<i>Charybdis natator</i>	52	6.95
Hermit Crabs		42	5.61
Pinkies	<i>Nemipterus spp.</i>	18	2.41
Red Emperor	<i>Lutjanus sebae</i>	16	2.14
Yellow Sweetlip	<i>Lethrinus miniatus</i>	12	1.60
Tawny Nurse Shark	<i>Nebrius ferrugineus</i>	12	1.60
Banded Wobblygong	<i>Orectolobus ornatus</i>	12	1.60
Snapper	<i>Pagrus auratus</i>	12	1.60
Gulf Damsel Fish	<i>Pristotis jerdoni</i>	11	1.47
Pearl Perch	<i>Glaucasoma scapulare</i>	10	1.34
Whitetip Shark	<i>Triaenodon obesus</i>	10	1.34
Whiptail	<i>Pentapodus spp.</i>	9	1.20
Brown Triggerfish	<i>Sufflamen fraenatus</i>	9	1.20
Morwong	<i>Cheilodactylus gibbosus</i>	6	0.80
Sea Urchins		6	0.80
Leatherjacket	<i>Meuschenia trachylepis</i>	6	0.80
Spotted Cod	<i>Epinephelus fasciatus</i>	5	0.67

Assessment

2.1.2 There is a risk analysis of bycatch vulnerability to fishing:

A recent report assessing the environmental impact of various fishing gears in the USA (Morgan and Chuenpagdee, 2003) categorized pot fisheries as medium impact fisheries behind the more high impact fisheries of bottom trawling, bottom and midwater gillnetting and dredging.

One of the benefits of pot fisheries is that they generally do not inflict physical damage on bycatch species which can usually be quickly sorted from the target species and returned to the water within minutes of capture.

To date, neither the observer program nor log book records have documented any interaction with marine turtles or seabirds. It is considered unlikely that the fishery will impact on seabirds as the baited pots are set in water at least 20m deep well beyond the diving range of seabirds. It is however recognized that the buoy lines and pots themselves may potentially entangle threatened loggerhead and green turtles. Steps to mitigate against this have included the specification of lead weights to be positioned below the buoy and the allowance of "trot line" configuration of pots which minimizes the amount of rope in the water column that can potentially become tangled with turtles.

At present slipper lobsters are the only product being marketed but there is the provision for other species of lobster to be marketed as by-product. None of the other species that have been listed as possible candidates for pot capture have been recorded to date. Should other species of lobster be encountered then they will be included in the formal assessment process.

Injury to fish bycatch due to barotrauma is an issue which appears to be very much species dependent. To date most of the fishing has taken place in waters of between 30 and 80 m where observers have noted that the majority of the fish bycatch is released alive and swims away apparently unharmed. The issue of barotrauma on fish species and methods of mitigation of barotrauma for line caught fish is currently under investigation by staff from the Agency for Food and Fibre Sciences and CRC Reef (FRDC Project No. 2003/019). This project is due to be completed in 2007 and information collected from that project will be used to better assess the risks of barotrauma damage to released fish bycatch species.

Management Responses

2.1.3 Measures exist to avoid the capture and mortality of bycatch (beyond sustainable levels). If suitable technology is NOT available, steps have/are being taken to develop it.

The size and specifications of gear that can be used are prescribed in the permit conditions (see Appendix 3). These specifications were originally formulated after discussions with lobster industry representatives from Western Australia and South Australia. One of the issues addressed in these discussions was bycatch minimization.

Lead weighted buoy ropes are not currently specified as a condition of operation within this fishery but all permit holders voluntarily adopt a policy of using weighted ropes to minimize interactions with marine turtles and marine mammals. Escape gaps are currently not specified under permit conditions but remain an area for future research investigation. Permit conditions prohibit the retention of any fish or shark and specify that these must be returned to the water as quickly as possible.

As the fishery is only in its developmental phase there have been no reference points set for bycatch due to insufficient data. QFS recognizes this as a priority and is awaiting further development of the fishery before a policy is formulated.

Loss of apparatus and possible ghost fishing may be an issue in this fishery. One of the common pot designs used in Queensland, the 'Fathoms +' pot (see Figure 2a for a picture) is used extensively in the Hawaiian slipper lobster fishery. Parrish and Kazama (1992) found that the majority of Hawaiian spiny lobsters and slipper lobsters were readily able to escape these pots once the bait was exhausted. Western rock lobster are also readily able to enter and exit lobster pots (Randall Owen, GBRMPA, pers. comm.) and are even known to use unbaited pots as temporary shelter. Although not currently specified in permit conditions pots can be fitted with corrodible pins or corrodible panels that rust out reducing the potential for ghost fishing.

The fishery commonly operates in waters 40 –150 m depth, which minimizes any potential impact on nesting marine turtles. Fishers must report all gear loss in their daily logbooks.

2.1.4 There is an indicator group of bycatch species

At present there is insufficient information from the fishery in order to determine an appropriate and reliable set of indicator species. Indeed, given the limited amount of gear set (a maximum of 600 pots) and the low abundance of bycatch, QFS believes that this may not be an appropriate strategy for monitoring changes in bycatch in this fishery. Once again, should the fishery develop beyond the developmental phase, this issue will be included for review.

2.1.5 Decision rules are in place for significant perturbations in the bycatch indicator species

As no indicator species have been identified no decision rules have been determined. At this stage, logbooks coupled with suitable validation are of a sufficient scale to highlight any significant bycatch issues should they arise.

2.1.6 Management arrangements have a high chance of achieving objective 1 (i.e. the fishery doesn't threaten bycatch species)

QFS believes that the current management arrangements (permit conditions which can be quickly modified) coupled with an ongoing observer program are adequate to ensure that any unacceptable risks to bycatch species can be addressed. This view is supported by management intervention to remove the take of finfish early in the development of the fishery when the catch of fish in traps became an issue. The gear is also highly selective for the target species in comparison to other fisheries.

Objective 2 The fishery avoids mortality/injury to endangered, threatened, or protected species. The fishery avoids/minimizes impacts to threatened ecological communities.

Information Requirements

2.2.1 Reliable information is collected on interactions with endangered, threatened, or protected species and threatened ecological communities.

There have been no reported interactions with endangered, threatened or protected (ETP) species either from the observer program or from logbook records in this fishery. Despite this, based on information from other trap fisheries it is recognized that interactions with species of marine turtles or marine mammals may occur in the future, primarily through entanglement in the buoy ropes of traps. Should interactions occur in the future, adequate mechanisms are in place to collect information including compulsory recording in the daily logbook and through an observer program (Appendix 4 includes an example sheet from current logbook).

Across all QFS-managed fisheries, the reporting of interactions with ETP species is currently being enhanced through the development of new Species of Conservation Interest (SOCI) logbooks. QFS anticipates that by the end of 2004, all commercial fishers endorsed to fish in Queensland waters will be issued with the new SOCI logbook (Shane Gaddes, QFS, pers. comm., 2003). Example SOCI logbook, species codes and summarised logbook instructions are provided in Appendix 6. Please note that these examples are taken from the SOCI logbook sent to all commercial operators in the trawl fishery. It is anticipated that a similar logbook will be used across all Queensland fisheries.

Assessment

2.2.2 There is an assessment of impacts to endangered, threatened, or protected species

As no interactions with ETP species have been reported to date either in logbooks or by observers, the incidental risk to wildlife is considered extremely low. It is recognized that pots and lines rising to the sea surface have the ability to interact with passing wildlife, particularly turtles and whales. However, the incidental risk to wildlife is considered extremely low in the context of the small number of pots used in the fishery (600 pots maximum); the practice of using pots in trot-lines; and the fact that no interactions have been recorded to date. Observer

trips have indicated that there is no discarded rubbish such as plastic bait straps or other plastics that can occur in some baited pot fisheries for other species.

Table 3 contains a list of fish, reptile and marine mammal species of conservation interest that possibly occur in the areas in which the lobster developmental fishery operates. The table also includes an assessment of the likelihood of the fishery interacting with the species. The assessment is based on the known distribution and behavioural characteristics of the species, and the type and scale of gear and methods used in the fishery. It is recognised that this provides only a preliminary assessment of the actual and potential impacts to ETP species.

Table 3. Conservation status of marine fish, reptiles and mammals of conservation interest that are likely to occur in the developmental pot fishery for slipper lobsters.

Common name	Species	WCU*		Australia #	Qld	Likelihood of species interaction with fishery ^v
		Listing	Criteria			
Fish						
Grey Nurse Sharks	<i>Carcharias taurus</i> (east coast population)	VU	A1ab+2d	CR	Fish regulated by species ² Under Section 65 of the Fisheries Regulation 1995 the take, possession or sale of regulated fish is prohibited. Section 65 does not apply to shark fishing contractors.	Remote The critical habitat sites are well outside the area of operation of the lobster developmental fishery
Great White Shark	<i>Carcharodon carcharias</i>	VU	A1cd+2cd	VU	Fish regulated by species ² (See above)	Remote
Turtles						
Green	<i>Chelonia mydas</i>	EN	A1bd	VU	VU ³	Possible
Loggerhead	<i>Caretta caretta</i>	EN	A1abd	EN	EN ³	Possible
Flatback	<i>Natator depressus</i>	DD		VU	VU ³	Rare
Hawksbill	<i>Eretmochelys imbricata</i>	CR	A1bd	VU	VU ³	Possible
Olive Ridley or Pacific Ridley	<i>Lepidochelys olivacea</i>	EN	A1bd	EN	EN ³	Remote
Leatherback	<i>Dermochelys coriacea</i>	CR	A1abd	VU	EN ³	Remote
Dugong						
Dugong	<i>Dugong dugon</i>	VU	A1cd	LMS & LOMS	VU ³	Remote
Cetaceans (Whales and Dolphins)						
All species of the order Cetacea					Protected Species ^{4,5}	Remote
Indo-Pacific humpback dolphin	<i>Sousa chinensis</i>	DD		LOMS	Rare ³	Remote
Humpback whale	<i>Megaptera novaeangliae</i>	VU	A1ad	VU & LOMS	VU ³	Remote
Southern Right whale	<i>Eubalaena australis</i>	LR-CD		EN		Remote
Fin whale	<i>Balaenoptera physalus</i>	EN	A1abd	VU	Common ³	Remote
Sei whale	<i>Balaenoptera borealis</i>	EN	A1abd	VU	Common ³	Remote
Blue whale	<i>Balaenoptera musculus</i>	EN	A1abd	LOMS	Common ³	Remote
Bottlenose dolphin	<i>Tursiops truncatus</i>	DD				Possible
Bryde's whale	<i>Balaenoptera edeni</i>	DD				Remote
Cuvier's beaked whale	<i>Ziphius cavirostris</i>	DD				Remote
Dense-beaked whale	<i>Mesoplodon densirostris</i>	DD				Remote
Fraser's dolphin	<i>Lagenodelphis hosei</i>	DD				Remote
Killer whale (orca)	<i>Orcinus orca</i>	LR-CD				Possible
Longman's beaked whale	<i>Mesoplodon pacificus</i>	DD				Remote
Minke whale	<i>Balaenoptera acutorostrata</i>	LR-NT				Remote

Common name	Species	WCU*		Australia #	Qld	Likelihood of species interaction with fishery ^v
		Listing	Criteria			
Pantropical spotted dolphin	<i>Stenella attenuata</i>	LR-CD		LOMS		Remote
Pygmy killer whale	<i>Feresa attenuata</i>	DD				Remote
Risso's dolphin	<i>Grampus griseus</i>	DD				Remote
Rough-toothed dolphin	<i>Steno bredanensis</i>	DD				Remote
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>	LR-CD				Remote
Sperm whale	<i>Physeter macrocephalus</i>	VU	A1bd			Remote
Spinner dolphin	<i>Stenella longirostris</i>	LR-CD		LOMS		Remote
Strap toothed beaked whale	<i>Mesoplodon layardii</i>	DD				Remote
Striped dolphin	<i>Stenella coeruleoalba</i>	LR-CD				Remote

*World Conservation Union (WCU = IUCN) - Listings: VU = vulnerable, EN = endangered, CR = critically endangered, LR-CD = lower risk, conservation dependent, LR-NT = lower risk, near threatened, DD = data deficient
nl = not listed (Refer to WCU for description of conservation listing categories and criteria)

Australia (*Environment Protection and Biodiversity Conservation Act 1999*)
The species listings in Table 3 are current as of May 2003.
Listings: E=extinct, CR=critically endangered, E=endangered, VU=vulnerable
LMS=Listed Marine Species
LOMS= List Of Migratory Species

¹ Draft 2002 Coral Reef Fin Fish Management Plan

² Queensland Fisheries Regulation 1995

³ Queensland Nature Conservation (Wildlife) Regulation 1994

⁴ Queensland Nature Conservation Act 1992

⁵ Queensland Nature Conservation (Whales and Dolphins) Conservation Plan 1997

The classifications used and their definitions are below:

Likely	Interactions are expected to occur regularly
Occasional	Interactions may occur, but not regularly
Possible	Uncommon but has been known to occur
Remote	An interaction may occur in exceptional circumstances

These classifications and definitions are adapted from the definitions provided in the SCFA-FRDC ESD Project -Risk assessment process for Wild Capture Fisheries, 2001. The report for the project (Version 3.2) is available at: http://www.fisheries-esd.com/a/pdf/RiskAssessmentProcessV3_2.pdf

2.2.3 *There is an assessment of impacts to threatened ecological communities*

There is no known threatened ecological community in the depth range and area of operation of this fishery.

Management Responses

2.2.4 *Measures exist to avoid the capture/mortality of endangered, threatened, or protected species*

Permit holders have received training in the identification of endangered, threatened and protected species but to date there have been no reported interactions. Measures to mitigate against interactions include:

- Gear that is to be used is specified in the permit conditions;
- Voluntary adoption of weighted rope as a bycatch minimization protocol. (This reduces the quantity of rope on the surface of the water at times of limited current and reduces the probability of interactions with marine wildlife); and,

(c) The encouragement of the use of trotlines as a preferred fishing method in certain areas.

In the event that the fishery progresses beyond the developmental phase, more formal arrangements to minimize any impacts to ETP species will be discussed and addressed where necessary.

2.2.5 Measures exist to avoid impacts to threatened ecological communities

As outlined in criterion 2.2.3 there are no known threatened ecological communities in the depth range and area of operation of the lobster trap fishery.

2.2.6 Management arrangements have a high chance of achieving objective 2 (i.e. the fishery avoids mortality, injury, or impacts to endangered, threatened, or protected species and to threatened ecological communities)

The small scale of the fishery and the bycatch mitigation measures in place, lead to the conclusion that the fishery is being conducted in a manner that minimizes injury or mortality to ETP species or ecological communities. If the fishery develops further, additional information on ETP species will be collected and used as the basis for future management decisions.

Objective 3 The fishery is conducted in a manner that minimises the impact of fishing operations on the ecosystem generally.

Information Requirements

2.3.1 Information is collected and collated on impacts to the environment/ecosystem generally.

There is minimal information available on the ecosystem inhabited by slipper lobsters. It is acknowledged that more scientific knowledge is needed in the area of habitat requirements of both juvenile and adult slipper lobsters as well as the ecological relationships between slipper lobsters, other species and the ecosystem in general.

Information is collected on pot loss via the compulsory logbook system and observer program. At present pot loss is relatively high compared to standards set elsewhere from around the world but it needs to be noted that the fishers are currently fishing grounds that have not previously been fished using pots. All fishers have noted that loss of gear to trawlers, strong current conditions and snagging have been much higher than anticipated, and all have commented that with increased experience pot loss should be considerably reduced to levels less than currently experienced in the blue swimmer crab and mud crab fisheries.

Assessment

2.3.2 A risk analysis is conducted into the susceptibility to fishing operations of ecological communities, food chains, and the physical environment

Limited information is available or is being collected on the ecosystem impacts arising from the developmental lobster trap fishery. At this stage, no substantial impacts are considered to have occurred as the fishery has operated for only four years, with just three permits allocated and a maximum of 600 pots able to be used.

The impact of the pot itself on the seafloor and benthic organisms is believed to be minimal. Pots are commonly positioned in trotlines and set at a distance so that only one pot is hauled at a

time, minimizing movements of pots over the sea floor. The percentage of the sea floor impacted by the pots used by lobster fishers is negligible, particularly since only 600 pots are currently allowed in the fishery. Each pot has a bottom surface area of less than 1 m², therefore at any given time less than 600 m² of sea floor is impacted by the fishery. Impacts from the loss or discarding of litter and vessel discharges are unknown but are likely to be small. Impacts from the loss or discarding of litter and vessel discharges are unknown but are likely to be small. Again it should be noted that a considerable component of the original fishery area is closed to fishing following GBRMPA's decision not to issue permits allowing operation in waters of the marine park.

Since the fishery impacts such a small area of the available habitat no indicators of ecological integrity have been developed for deep-water rocky reef/ rubble communities inhabited by slipper lobsters. Many areas of unfished habitat do exist, which could be used as reference areas for comparative assessment of ecosystem impacts in the future, should the fishery develop.

Management Responses

2.3.3 Management actions are in place to ensure significant damage to the ecosystem does not occur.

and

2.3.4 What specific management actions have been developed to address ecosystem impacts?

QFS has taken a very conservative approach to investigating the feasibility of a sustainable lobster trap fishery in southern Queensland waters. This is evidenced by:

Permitting only three operators entry to the developmental fishery;

Restricting the type and number of pots able to be used (600 pots maximum);

Limiting the developmental period before review to four years; and,

Requiring extension information from operators regarding target, bycatch and ETP species.

These measures have ensured that the scale of the fishery has remained very small, and that there have been minimal impacts to the broader marine ecosystem.

Should information become available suggesting that damage to the ecosystem is occurring as a result of this fishery, the capacity exists under the *Fisheries Act* and permit conditions to adjust the management of the fishery.

2.3.5 Decision rules exist, which trigger management responses when monitoring detects impacts on selected ecosystem indicators exceed a pre-determined level, or where action is indicated by application of the precautionary approach.

It is considered that there is a negligible impact to the marine ecosystem from this fishery using current gear and at current levels of effort. As such no decision rules have been developed and no pre-determined management actions implemented in relation to impacts of the lobster pot fishery on the broader marine ecosystem.

If actual or potential threats to the ecosystem are highlighted in the future, QFS will develop appropriate management responses as part of the permit conditions, or within the formal management regime if the fishery progresses beyond the developmental phase.

2.3.6 Management arrangements have a high chance of achieving objective 3 (i.e. the fishery is conducted to minimise the impact of fishing operations on the ecosystem generally).

Under the current management arrangements, and taking into account the scale of the fishery, the impacts on the ecosystem generally are considered to be minimal. Precautionary measures are in place (primarily monitoring through an observer program and the provision to cancel or suspend permits) that will ensure minimal ecosystem impacts result from this fishery. In addition, over the past 18 months very little activity has occurred in this fishery and since its original development in 1998 the amount of fishing effort has fallen well short of that allowed by current management arrangements.

APPENDICES

Appendix 1. QFMA policy on developmental lobster fishery.

POLICY STATEMENT FOR THE DEVELOPMENT TRAP FISHERY FOR SPINY AND SLIPPER OBSTER OFF SOUTH EAST QUEENSLAND (October 1997)

The Queensland Fisheries Management Authority (QFMA) at its meeting of 15 – 16 October 1997 has determined a Policy for a Developmental Trap fishery for Spiny and Slipper Lobster (including Bugs) off South East Queensland.

This Policy has been determined following receipt of applications in 1996 and a call for expressions of interest from Industry in November 1996. An Information Paper providing details of this Developmental proposal and of the applications received was circulated for public consideration and comment in June 1997. All of the information available and comments received were considered by QFMA in arriving at its Policy for this developmental fishery. Issues relating to other applications to undertake this developmental fishing, which were received by QFMA after the commencement of this consideration process in November 1996, were also a part of this decision.

The QFMA Policy for a Developmental Trap fishery for spiny and slipper lobster (including Bugs) in waters off South east Queensland is as follows:

- 1.0 that a Developmental Trap Fishery for Spiny and Slipper Lobster (including Bugs) be established in waters off South east Queensland as defined;**
- 2.0 that the area of the Fishery be in Queensland waters south of 21 degrees 30' south latitude;
- 3.0 that two fishing zones be defined separately as an Inshore Zone and an Offshore zone delineated by a line which coincides with the line South along longitude 152 degrees, East to the intersection with 23 degrees south latitude, then East along that line to its intersection with the 200 metre depth contour, thence South along that contour to its intersection with the Queensland – N.S.W border
- 4.0 that trapping with approved apparatus be the only approved method of capture;
- 5.0 that with respect to the Inshore fishery, no activity be approved pending further assessment of the impact of the trapping method on the proposed capture species and existing fisheries and where relevant, resolution of authorisation concerns with the Great Barrier Reef Marine Park Authority;
- 6.0 that with respect to the Offshore fishery the following arrangements are proposed:

Tenure

- 6.1 Authorisation be by Permit which will be granted for a period of up to three years, subject to annual assessment of fishing performance and the impact of fishing on the eco-system.

Number of permits issued

6.2 Authorisations to operate in the fishery be provided to up to three applicants.

Selection group

6.3 The selection of successful applicants be made from those who applied in November 1996 and applications received subsequent to November 1996 be considered on the basis of their merits but with primary focus on the management arrangements for the fishery, particularly the reference to the closing date for applications outlined above.

Gear limitation

6.4 The number of traps permitted for use in the fishery in the first instance to be 300 and no one Permit holder to hold more than 100 of such traps. The number of traps which may be used at any one time in the fishery may be amended from time to time by QFMA.

Assessment and management of the developmental fishery

6.5 A fishery management and assessment group be formed to:

- Provide advice on equipment to be approved for use in the fishery;
- Assist in the development of data requirements; and
- Undertake assessments of the status of stocks and impacts on the eco-system by the developmental fishery.

Fishing plan

6.6 Applicants to be required to demonstrate their commitment to the fishery in terms of adequate operation time and submit a detailed fishing plan of their intended operations within the fishery for the first twelve months which will form part of the application for a fishing Permit. For subsequent years an up-dated plan to be provided at the commencement of the fishing year.

Permit conditions

6.7 Permit conditions require among other things that:

- the traps permitted for use in the fishery conform to approved size specifications and be marked and attached to a buoy which is also marked as approved;
- fishing operations are monitored by an electronic Vessel Monitoring System (VMS) and provision of and successful operation of on-board equipment to be the responsibility of the Permit holder;
- size and species constraints be observed;
- seasonal and area closures and trap number limitations be observed;
- vessels approved for operation are covered by marine survey and manned in accordance with current practice;
- permit holders lodge log returns which report catch, effort, bycatch composition including discards and environmental parameters.
Such log returns to be recorded daily while in the fishery and submitted to QFMA at the end of each month;
- landings be reported to a nominated fisheries officer at least two hours prior to such landing occurring;

- monthly landing reports of all product derived from the fishery be submitted to QFMA;
- breach of Permit conditions be a basis for suspension or cancellation of the Permit;
- continuity of the Permit be subject to the payment of fees or charges quarterly in instalments over the three year term with non-payment leading to immediate cancellation of the Permit; and
- the payment of attributable costs be distributed on the basis of each Permit holder's allocation of traps.

Selection criteria

6.8 that applicants be advised of the following criteria for selection of approved applicants:

- the applicant must nominate the boat or boats (maximum of two boats per applicant) to be used in the developmental fishery;
- the applicant must indicate a preparedness to meet their share of the attributable costs of management of the developmental fishery. (The indicative total cost is \$92,500);
- the applicant must be prepared to support an Observer program, log-book program and VMS program for the developmental fishery and participate in the assessment group established with respect to the fishery;
- the applicant must demonstrate a thorough understanding of relevant Queensland legislation and of QFMA Policy as it relates to this fishery;
- the applicant must have and provide details of experience in the fishing industry in south east Queensland and in trapping and handling of spiny lobster;
- the applicant must demonstrate an understanding of trap fishing and of fisheries adjacent to or in the area of the developmental fishery;
- the applicant must have and provide details of access to suitable processing facilities;
- the applicant must demonstrate a commitment to the developmental fishery in terms of adequate operating time including the lodgement of a fishing plan for the first twelve months of operation in the fishery and for subsequent years an updated plan is to be provided at that time; and
- the determination of full or part time status of activities applied for and the determination of allocation of annual allowable catch to a successful applicant will be based on the fishing plan submitted and on all the preceding criteria and in particular on criteria 5, 6, 7 and 8 above.

7.0 that the above management arrangements will be reviewed following the first full year of fishing and the Authority reserves the right to amend any of the above Policy items to meet the requirements of the Fisheries Act 1994.

Details of Some Permit Conditions

The above Policy statement provides the basis on which this developmental fishery will be managed. That Policy provides for specific management detail to be defined and varied as required by Fishery Managers within QFMA. The following are some of the areas in which this detail has already been defined and these will form items of the listing of Permit Conditions to which each successful applicant will be required to adhere. Further detail will be developed following advice from the fishery assessment and management group established under the above policy.

Equipment

1. Traps/Pots to be used in the fishery can be of any design. However the following minimum specifications will be required to be observed:

Maximum size will no exceed:

- If of beehive shape – not more than 150cm at widest part and not more than 120cm high;
- If of other design – not more than 0.4cubic metres in overall volume.
- Unless covered with mesh of not less than 5 cm diameter or with rectangular mesh not less than 5cm in width and 7.5cm in length, each trap/pot will have an escape port or ports incorporated in its construction. Such ports will be of not less than 55mm width and will cover not less than 900mm in length with no single port less than 150mm in length. The highest point of any port will be not more than 110mm from the base.
- Floats will be of at least 15cm diameter and have a weight of at least 50gm suspended not less than 1.5m below the float so that no rope is floating on the surface of the water. Each float will carry an identification mark allocated by QFMA at the time the Permit is issued.

Species

2. The taking of lobster of the species *P.ornatus* is specifically prohibited and any lobster of this species which is taken shall be returned to the water immediately on capture.

Size constraints

3. The following minimum capture sizes will apply until further notice:
Eastern Rock Lobster (*Jasus verreauxi*)
Carapace length of 104mm.

Other lobster
Carapace length of 77mm.

Other constraints

4. The taking of “berried” females or setose (tar spot / sperm pack attached) females is specifically prohibited.

Appendix 2. Summary of Confidential Final Report submitted to the Queensland Fisheries Service on the Developmental Fishery for Slipper Lobsters – Offshore Region

During two fishing trips to the Saumarez reefs and one to the Swain reefs, one hundred “Fathoms plus” traps were used daily, set on four strings of 25 each. However, on occasion individually set traps were used. Strings were set in depths ranging from 20m to 150m, with some individually set pots trialed adjacent to coral outcrops in waters less than 20m. However, the fishers generally targeted the 30-60m depth range. The traps are dome shaped and constructed of black polyethylene with dimensions 104 x 81 x 46 cm. (Clarke and Yoshimoto 1990). Two 30cm (outside diameter) tapered entrance cones are located on each side with 45 x 45mm (inside dimension) mesh. The capture of sub-legal or sub-marketable lobsters was prevented by circular escape gaps of 67mm diameter fitted to the side of each trap. The bait was held in the centre of the traps by two canisters of approximately 15cm diameter, with approximately one kilogram of bait used per pot. Bait used in the traps varied widely and included; Maray, Slimy Mackerel, Tailor, Tuna, Iodine Bream and Red Bass. Baits were originally refreshed every set, however this method was seen to be inadequate and was changed so that the bait was completely replaced every set.

To date the Queensland Offshore developmental lobster fishery has set a total of 1245 traps. Of these 1245 traps, 34 traps were not recovered. The relatively high percentage of loss can be attributed to the relative inexperience of lobster fishers in Queensland and will almost definitely be reduced as fishers gain experience in the fishery. Two traps were damaged by sharks with large bites taken from the sides of the traps.

The fishers predominantly targeted *Scyllarides squammosus* as this species was thought to be the most abundant and most likely to enter traps. Traps were however set in deeper water targeting *Scyllarides haanii* and in shallower water around reef fringes targeting *Panulirus fermoristriga* and the other Panulirids. During none of the trips were commercially exploitable stocks of lobsters caught.

A total of 582 trap lifts at Saumarez Reef (Table 4), and 415 pot lifts at Swains Reef (Table 5) incidentally captured a range of fish, elasmobranch and other taxa.

Table 4. Bycatch composition from 582 traps at Saumarez Reefs.

Common Name	Species Name	Number Caught
Hexagon Rockcod	<i>Epinephelus hexagonatus</i>	1
Iodine Bream	<i>Gymnocranius bitorquatus</i>	1
Black spotted moray	<i>Gymnothorax melanospilus</i>	3
Unspecified crab	Infraorder BRACHYURA	13
Spotcheek Emperor	<i>Lethrinus rubrioperculatus</i>	3
Tawny Nurse Shark	<i>Nebrius ferrugineus</i>	10
Banded Wobbegong	<i>Orectolobus ornatus</i>	2
Samurai Squirrelfish	<i>Sargocentron ittodai</i>	2
Slipper Lobster	<i>Scyllarides squammosus</i>	86
Whitetip Shark	<i>Triaenodon obesus</i>	11

Hermit Crab	Family DIOGENIDAE	106
Unspecified Octopus	Order OCTOPODA	2
Unspecified gastropods	Order NEOGASTROPODA	270

Table 5. Bycatch composition from 415 pot lifts conducted at the Swain Reefs.

Common Name	Species Name	Number Caught
Black tipped Cod	<i>Epinephalus fasciatus</i>	4
Chinaman Rockcod	<i>Epinephalus rivulatus</i>	1
Maori groper	<i>Epinephalus undulatostratus</i>	2
Hexagon Rockcod	<i>Epinephelus hexagonatus</i>	2
Longfinned Rockcod	<i>Epinephalus quoyanus</i>	1
Tassled wobbegong	<i>Euchrossorhinus dasyopogon</i>	2
Red throat emperor	<i>Lethrinus miniatus</i>	12
Tawny Nurse Shark	<i>Nebrius ferrugineus</i>	5
Banded Wobbegong	<i>Orectolobus ornatus</i>	3
Spotted golden goatfish	<i>Parupeneus heptacanthus</i>	2
Red Bigeye	<i>Priocanthus macrocanthus</i>	1
Gulf Damsel	<i>Pristotis jerdoni</i>	11
Slipper Lobster	<i>Scyllarides squammosus</i>	12
Reef Bug	<i>Thenus orientalis</i>	1
Whitetip Shark	<i>Triaenodon obesus</i>	2
Starfishes	Subclass Stellaroidea	4
Sea Urchin	Class Echinoidea	2
Unspecified crab	Infraorder BRACHYURA	28
Brittle star	Order Ophiurida	8
Unspecified gastropods	Order Neogastropoda	54

Appendix 3. Original conditions of operation for Permit Holders to fish in the developmental Trap fishery for lobsters

AUTHORISED ACTIVITIES

The holder may take Spiny and Slipper Lobster (excluding *Ibacus peronii*, *Thenus orientalis*, *Thenus indicus*, *Ibacus brucei* and *Panulirus ornatus*) in the area of Queensland waters south of 23 degrees south latitude, and west of the 200m depth contour.

CONDITIONS

1. The holder must only use the boat XXXX with the boat mark XXXX for developmental fishing under this permit.
2. The holder must only use traps that do not exceed the following size specifications:
 - a. In waters shallower than 100 metres:
 - if of a beehive shape: - 150cm at the widest part and 120cm in height;
 - if of other design: - 1 cubic metre in overall volume.
 - b. In waters 100 metres and deeper:
 - 195 cm x 120 cm x 120cm.
3. The holder must ensure that floats attached to all apparatus will be at least 15cm in diameter. The floats buoying traps set in strings will be of orange colour (as in Polyform floats). The float buoying single set traps may be of any colour except that used with strings.
4. The holder may only use 200 traps at any time. The permit holder may have in possession within the fishery a maximum of 210 traps, of which those in excess of 200 must be unassembled.
5. The holder may only set traps in the following configurations:
 - a. where traps are set in waters of less than 20 metres each trap must be set singly;
 - b. where traps are set in waters between 20 and 100 metres in depth traps may be set in strings of up to 25 traps; and
 - c. where traps are set in waters deeper than 100 metres traps may be set in strings of up to 50.
6. The holder must ensure that:
 - a. all buoys and floats are marked with the name of the boat XXXX and boat mark XXXX; and
 - b. the buoy or float at each end of a string is marked with the number of traps attached to that string.
7. For the purpose of these conditions, by-catch means any fish or other living marine organism that is landed and discarded, while by-product means any fish or other living marine organism that is landed and retained for sale- with the authorised apparatus being used to fish for target species.
8. By-product may include any species other than finfish and sharks (including rays and skates). The holder may not retain finfish and sharks as by-product, and they must be returned to the water as soon as possible after capture.
9. The holder must install, maintain and use electronic Vessel Monitoring Systems (VMS) equipment on the boat mentioned in condition 1 at all times the boat is participating in the

- fishery.
10. The holder must have VMS equipment, which has been approved by the Chief Executive of the Department (the Chief Executive), installed by a person approved by the Chief Executive on the boat identified in condition 1 of this authority.
 11. If the VMS equipment has a malfunction, the holder must stop all fishing activity under this permit immediately upon becoming aware of the malfunction. ("Malfunction" means a failure to work at all and a failure to work in a way so as to perform the functions of VMS equipment).
 12. The holder must, unless the holder has a reasonable excuse -
 - a. notify the Chief Executive of a VMS malfunction; and
 - b. if the boat is not in port -
 - i. notify the Chief Executive that the boat will return to the nearest port or to another stated port; and
 - ii. cause the boat to travel to the port immediately.
 13. The holder does not have to comply with conditions 9 to 12 during a period if:
 - a. before the period began the holder gave notice to the Chief Executive that, for a stated reason, the boat would not be used for fishing during the period; and
 - b. the boat is not used for fishing during that period; or
 - c. the holder is granted an exemption from the Chief Executive for the period, to continue fishing after they have reported a VMS malfunction.
 14. For conditions 11 and 12, the holder is taken to be aware of the malfunction if the holder receives notice from the Chief Executive that the equipment is not working.
 15. A notice under condition 14 may be given by radio, telephone or another form of instantaneous electronic communication.
 16. The holder must not take fish under or over the following minimum and maximum sizes, where size constraints are measured by carapace length (Carapace length is defined as the length of the carapace of the rock lobster measured long a straight line from the point of union of the second antennae to the centre of the posterior margin of the carapace ignoring any hairs attached to the carapace): *Jasus verreauxi* - a minimum size of 104mm and a maximum of 200mm.
 17. The holder must not take berried females or setose (tar spot/sperm pack attached) females, or manually remove eggs from females.
 18. The holder must not retain a berried female for sale. The holder must deal with a berried female by either:
 - a. Discarding it immediately; or
 - b. retaining it on board the vessel for return to the fishing ground at the next available opportunity.
 19. The holder must lodge statistical returns in the format advised by the Chief Executive. Log sheets must be recorded daily and submitted to the Chief Executive at the end of each calendar month.
 20. The holder must keep and give to the Chief Executive the records, documents and other information agreed to by the

- Management/Scientific Advisory Committee from time to time.
21. With respect to all trips on which an Observer has not been present, the holder must notify the Chief Executive of the intention to land fish from the boat XXXX and the Port at which the fish will be landed at least two (2) hours prior to the landing of such fish and if not advised otherwise may proceed with the landing of the fish as proposed. This notification will be made on telephone number 0409870972 or on such other telephone number formally notified to the holder by the Chief Executive.
 22. The holder must notify the Chief Executive of all transfers of fish from the boat XXXX at sea at least two hours in advance of the landing of such product.
 23. The holder must carry on board the boat XXXX such persons as the Chief Executive may nominate from time to time to observe the operations of the boat under this permit, including for the scientific assessment and any fisheries management purposes that the Chief Executive determines. For this purpose, the holder must advise the Chief Executive within a reasonable period of any intended fishing trip for activities under this permit.
 24. The holder must provide, at the holders cost, for any observer on board the boat XXXX -
 - a. accommodation, food, facilities, etc;
 - b. reasonable access to all areas and facilities of the boat necessary for collection of data, samples and other information and observing or assessing the fishing operations of the boat; and
 - c. reasonable access to the boat's radio and other communications equipment.
 25. The holder must cooperate with any reasonable request made by an authorised Officer to enable that Officer to adequately assist in the assessment of the sustainability or viability of the fishery.
 26. The holder is responsible for the operations of the boat XXXX at all times that activities are carried out under the permit.
 27. This permit must be carried on board the boat XXXX at all times while in the fishery.
 28. This permit is not transferable.
 29. The holder may sell fish taken in accordance with this permit. However, fish sold in Queensland may only be sold to the holder of a Buyer Licence (Class A).
 30. The holder must pay the allocated share of costs of management of the fishery to the Chief Executive as requested by written notice of the Chief Executive and by the date specified in that notice.
 31. Without limiting its powers under the Fisheries Act 1994, and the Fisheries Regulation 1995 and any other relevant fisheries legislation (particularly 67 of the Act), the Chief Executive will consider the suspension or cancellation of this permit if-
 - a. it determines, in accordance with its powers under section 67 of the Act, that a deleterious effect on stocks of Slipper and Spiny Lobster or any other fish species (including

- by-catch and by-product) has been caused or is imminent or may reasonably be expected due to activities under this permit; or
- b. the holder fails to comply with any conditions of this permit.
32. The establishment of a successful Native Title Claim over any of the proposed operating area of this fishery may lead to variation or discontinuation of this permit.
 33. The holder must not utilise the boat XXXX in any other commercial fishery whilst the boat is engaged in developmental fishing under this permit.

Appendix 4. Compulsory developmental lobster fishery daily catch log book

Permit Number : Vessel Name :

Location Grid _____	Site _____
Lat _____	Long _____

Sea Surface Temperature (°C) _____	Average Depth (m) _____
Bait Type _____	Bait Quantity Per Pot (kg) _____
Pot Type (Circle) Fathoms + WA Slat NSW Lobster Bee Hive Crab OTHER _____	

Date Pots Set ___/___/___	Time Set _____	No. Pots Set _____
Date Pots Hauled ___/___/___	Time Hauled _____	No. Pots Hauled _____
No. of Pots Lost _____ Reason for Loss _____		

Target Species	Kept			Discarded
Record number of dead and live lobsters <i>in pots on retrieval & estimate total</i>	No. Live	No. Dead	Weight (kg)	Number
Slipper Lobster				

Note: Please ensure correct identification of Target species.

By-Catch Species	Number	Weight (kg)

Comments:

Name _____ Signature _____ Date ___/___/___

INSTRUCTIONS FOR COMPLETING LOBSTER DEVELOPMENTAL LOG SHEET

1. PERMIT NUMBER will be printed on each sheet
2. VESSEL NAME: Enter name of vessel
3. LOCATION of each set of pots should be recorded with the minimum accuracy required as CFISH Grid and Site. Lats and Longs are optional. If you are using two or more types of pot in the same area use a separate sheet for each type of pot.
4. SEA SURFACE TEMPERATURE: Record sea surface temperature at time of setting pots.
5. AVERAGE DEPTH: Average depth (metres) where pots were set.
6. BAIT TYPE and BAIT QUANTITY: Record the type of bait (eg. mullet frames) and the approximate quantity in kilograms used in each trap.
7. POT TYPE DESCRIPTION: Circle the type of pot used if it is of standard design, otherwise specify the type of pot used and describe any modifications.
8. POT SETTING AND HAULING: Enter the date the pots were set and hauled (eg. 30/8/98). Times should be recorded using the 24 hour clock (eg. 1700 = 5.00 pm). Record the number of pots set and hauled, record any pot losses and the reasons (if known) for those losses.
9. TARGET SPECIES CATCH: Enter the total number of live and dead animals as well as the estimated total weight in kilograms for that particular set of traps. Record the number of animals of each species which were discarded. If possible indicate the numbers of berried and small undersized animals with a "B" and an "S" respectively in the discard column.
10. BY-PRODUCT SPECIES: Record the number and estimated weight of each by-product species (That is non lobster species which will be marketed).
11. BY-CATCH SPECIES: Enter the number of individuals of each by-catch species that were returned to the water.
12. COMMENTS: Describe anything that you consider worth commenting on. This may include such things as suspected reasons for good or poor catches etc. Interactions with any threatened or endangered species (whales, dolphins, dugong, turtles or seabirds) should also be recorded in the comments section.
13. NAME, SIGNATURE AND DATE: Enter name of person completing the log, sign and date.

LOBSTER SPECIES IDENTIFICATION

(Refer to Identification Drawings)

Red and white lobsterette	<i>Nephropsis suhmi</i>
Siboga lobster	<i>Metanephrops sibogae</i>

Spiny Lobsters

White whiskered rock lobster (Striped legs, 2 prominent teeth on antennal plate, purple colour)	<i>Panulirus longipes femoristriga</i>
Double spined rock lobster (Striped legs 4 prominent teeth on antennal plate)	<i>Panulirus penicillatus</i>
Painted rock lobster (Striped legs and abdomen)	<i>Panulirus. versicolor</i>
Long whiskered rock lobster (Ornate legs without ornate colouring on abdomen, white stripes on abdomen)	<i>Panulirus polyphagus</i>
Ornate rock lobster (Ornate legs and abdomen, white blotches down sides of abdomen)	<i>Panulirus ornatus</i>
Scalloped rock lobster (Plain coloured legs {not ornate or striped})	<i>Panulirus homarus</i>

Other Lobsters

Champagne lobster (Antennae straight and inflexible)	<i>Linuparus trigonus</i>
Green rock lobster (Sculptured abdomen, green coloured)	<i>Jasus verreauxi</i>
Banded whip lobster (Antennal spines wide apart)	<i>Puerulus angulatus</i>
Furry lobster (Furry carapace)	<i>Palibythus magnificus</i>
Gibbon furrow lobster (Scale like sculpturing on shell, males with large claws)	<i>Justitia mauritiana</i>
Slipper lobster (Drab brown - green colouration without ridges down back)	<i>Scyllarides squammosus</i>
Humped back slipper lobster (Maroon and purple flecked colouration, Large ridges down abdomen)	<i>Scyllarides haanii</i>
Caledonian mitten lobster (Teeth unequal on first frontal horn)	<i>Parribacus caledonicus</i>
Sculptured mitten lobster (Teeth equal on first frontal horn)	<i>Parribacus antarcticus</i>

Bugs

Balmain bug (Convex ridge on carpace)	<i>Ibacus peronii</i>
Fan bug (Ridge on carapace not convex)	<i>Ibacus brucei</i>
Reef bug (Speckled legs)	<i>Thennus orientalis</i>
Mud bug	<i>Thennus indicus</i> (Striped legs)

Appendix 5. Bycatch in Lobster Pot Fisheries: Summaries of Available Literature

Literature dealing with bycatch in lobster pot fisheries concentrate on two main categories: sub-legal lobsters and non-target species. The majority of literature is focused on the American lobster (*Homarus* spp.) and spiny lobsters (*Panulirus* spp.), with two papers by Everson et al. (1996) and Polovina et al. (1991) incorporating slipper lobsters (*Scyllarides* spp.).

Sub-legal Lobsters: Research into reducing the incidence of capture of sub-legal lobsters generally concentrates on the size and shape of escape vents incorporated into pots. Papers by Everson et al. (1992), Fogarty (1996), Fogarty et al. (1980) and Polovina et al. (1991) directly deal with the use of escape vents for sub-legal lobsters while papers by Miller (1996) and Weber et al. (1983) incorporate this issue.

Non-target Species: Research into the reduction of bycatch concentrates on the types of pots used and the incorporation of escape vents and the handling of bycatch on deck.

Another related topic to the reduction of bycatch is ghost fishing and developments of reducing the incidence. Three papers by Bullimore et al. (2001), Parrish et al. (1992) and Pecci et al. (1978) have been included in this literature review

Correa Ivo, C. T., Santiago, M.E. and Monteiro-Neto, C. (1996). By-catch in the fishery for lobsters *Panulirus argus* and *Panulirus laevicauda*, in Ceara State, Brazil. *Arquivos de ciencias do mar. Fortaleza* **30**(1-2): 41-47.

By-catch diversity in the lobster fishery of Ceara State, Brazil has been found to be high with little seasonal variation. The target species in this trap and gillnet lobster fishery are *Panulirus argus* and *Panulirus laevicauda*. The most important families identified were Lutjanidae, Pomadasyidae, Chaetodontidae, Acanthuridae and Sciliaridae with a total of 54 species and 39 families identified.

Everson, A. R., Skillman, R.A. and Polovina, J.J. (1992). Evaluation of rectangular and circular escape vents in the northwestern Hawaiian islands lobster fishery. *North American Journal of Fisheries Management* **12**(1): 161-171.

Traps equipped with circular escape vents were found to reduce the capture of sub legal spiny (83%) and slipper lobsters (93%) without significantly reducing catch of legal lobsters. Traps containing two panels with four 67mm diameter vents were found to give best results when compared to non vented traps and traps with rectangular vents. The lobster fishery in the north-western Hawaiian Islands required the use of these traps as of the 1st January 1988.

Fogarty, M. J. (1996). The lobster fishery: Escape vents and bycatch issues. *Proceedings Of The East Coast Bycatch Conference, Rhode Island Sea Grant, Dec 1996 Riu-w-95-001.*

The use of escape vents and escape panels with degradable time release links have contributed to reduced mortality of sublegal sized lobsters, reduced bycatch of crabs and reduced the effects of ghost fishing.

Fogarty, M. J. and Borden, D.V.D. (1980). Effects of trap venting on gear selectivity in the inshore Rhode Island American lobster, *Homarus americanus*, fishery. *Fish. Bull.* **77**(4): 925-933.

Two different size rectangular escape vents were trialed and found to decrease the catch of sublegal lobster (*H. americanus*). The larger vent size was more effective at reducing the catch of undersize lobster. Vented traps caught more lobster of a significantly larger size than

non-vented traps. The two vent sizes trialled were 42 x 152mm and 44.5 x 152mm. Orientation of the escape panels made no significant difference.

Hadden, G. (1994). Watching the pot. Industry efforts keep New England lobster population healthy. *Win-win bycatch solutions. a handbook for collaboration.*, Natl. Fish. Conserv. Cent., Seattle, WA (USA).

Lessons can be learnt from the lobster fisherman of New England where historical overfishing has caused the lobster fisherman to recognise the need to protect juvenile lobster. *Abstract doesn't say what this is.*

Laist, D. W. (1996). Marine debris entanglement and ghost fishing: A cryptic and significant type of bycatch. Proceedings of the solving bycatch workshop, September 25-27, 1995, Seattle, Washington., Alaska Sea Grant College Program, Fairbanks, AK (USA), Ak-sg-96-03.

Mortality from ghost fishing is usually associated with a particular fishery and it's gear. However actual mortality could be much greater if the effects of other types of lost gear such as trawl and gill nets are taken into account. Important areas that should be investigated are, gear loss rates and causes, the use of time sensitive gear disabling mechanisms, definitive removal of old fishing gear and catch rates of lost gear.

Matthews, T. R. and Donahue, S. (1997). Bycatch Abundance, Mortality and Escape Rates in Wire and Wooden Spiny Lobster Traps. Proceedings of the Gulf and Caribbean Fisheries Institute (49): 280-298.

Wire traps catch significantly more fish and invertebrates than wooden traps. Most fish were observed to escape the traps within 24 hours and overall the impact on bycatch from this fishery is minimal.

Miller, R. J. (1996). Options for reducing bycatch in lobster and crab pots. Proceedings of the solving bycatch workshop, September 25-27, 1995, Seattle, Washington, Alaska Sea Grant College Program, Fairbanks, AK (USA), Ak-sg-96-03.

By utilising a range of techniques bycatch can be reduced in pot fisheries. These include, bait selection, pot design, the use of escape openings and prompt return of bycatch to the water.

Polovina, J. J., Everson, A.R. and Kazama, T.K. (1991). Evaluation of circular and rectangular escape vents in a multispecies lobster fishery in Hawaii. Proceedings of the Gulf and Caribbean Fisheries Institute. Vol. 40.

Circular escape vents were found to be more effective than rectangular escape vents in the Hawaiian lobster (*P. marginatus* and *S. squammonus*) fishery. They reduced the catch of sublegal lobsters of both species without significantly reducing catch of legal size animals.

Smith, B. (1996). Industry-generated success in the lobster fishery. Proceedings Of The East Coast Bycatch Conference, Rhode Island Sea Grant, Dec 1996 Riu-w-95-001.

Historical management of the lobster fishery can be traced back over 100 years where a minimum size was introduced at the instigation of fisherman and biologists. While the measurement has changed from total length to carapace length a number of times today's measurement is based on carapace length.

Smolowitz, R. (1997). Bottom tending gear used in New England. Effects Of Fishing Gear On The Sea Floor Of New England., p. 5 Mitsg-97-15.

In comparison with different types of fishing that involve contact with the sea floor (i.e. trawling, scallop dredging, gill nets) lobster trapping has little problems with bycatch. The major concern with this gear type is entanglement in buoy and string lines by whales.

Weber, A. M. and Briggs, P.T. (1983). Retention of black sea bass in vented and unvented lobster traps. *New York Fish and Game Journal* **30**(1): 67-77.

While it is recognised that traps with circular escape vents catch less undersize lobster the same comparison cannot be made for the bycatch of black sea bass. There was no significant difference in size or numbers of black sea bass taken in vented over unvented lobster traps.

Wahle, R. A. (1997). Consequences of fishing, with regard to lobster fisheries: report from a workshop. *Marine & Freshwater Research* **48**(8): 1115-1119.

There are little effects from lobster fishing in relation to bycatch and benthic ecosystems. However more research is needed with respect to the effects of pots in reef and seagrass ecosystems.

References on Ghost Fishing :

Bullimore, B. A., Newman, P.B., Kaiser, M.J., Gilbert, S.E. and Lock, K.M. (2001). A study of catches in a fleet of "ghost-fishing" pots. *Fishery Bulletin* **99**(2): 247-253.

Ghost fishing was found to extend past a period of 12 months. While the initial catch rates were not maintained the pots continued to trap crabs and bycatch such as lobsters and fish. Due to the extended time the pots continue to fish the use of biodegradable escape panels is recommended.

Parrish, F. A. and Kazama, T.K. (1992). Evaluation of ghost fishing in the Hawaiian lobster fishery. *Fishery Bulletin* **90**(4): 720-725.

In an investigation into the effects of ghost fishing on the lobsters *P.marginatus* and *S. Squammosus* it was found that all lobsters were able to exit the traps within 56 days with the majority exiting much sooner. Because of this ghost fishing is not seen as a problem in this fishery

Pecci, K. J., Cooper, R.A., Newell, C.D., Clifford, R.A. and Smolowitz, R.J. (1978). Ghost fishing of vented and unvented lobster, *Homarus americanus*, traps. *Mar. Fish. Rev.* **40**(5-6): 9-43.

In a comparison between normal surface hauled pots and ghost pots a mortality of 25% was observed for the lobsters in the ghost pots.

Appendix 6. Species of Conservation Interest (SOCI) Logbook and supplementary Information.

Species of Conservation Interest (SOCI 01)

Boat Mark	Skipper's / License Holders Name			Master Fishers Number		Logbook No	Page No	
FXXK	Reg Bean			QMM00333H				
Date and time of capture	Location of interaction		Fishing Gear Trawl Pot Net Line	Species Codes (see instruction pages)	Release Condition			Tag or band details
	Latitude (or grid)	Longitude (or site)			Number Dead	Number Alive	Number Injured	
1/2/03 10.00	AB9	12	Net	Du		1		
12/5/03 08.00	AB9	1	Pot	Cor	1			
Comments								
I certify that the information I have provided on this form is a true and accurate record of the interactions with the species of conservation interest listed in this logbook.						Signature <i>R Bean</i>		

EXAMPLE

Species of Conservation Interest CODES

The following table includes a list of species of conservation interest and their associated logbook reporting codes

	SOCI code		SOCI code
Turtles / Tortoises		Dolphin (unidentified)	D
Leatherback Turtle	LBT	Irrawaddy Dolphin	ID
Hawksbill Turtle	HT	Spinner Dolphin	SD
Loggerhead Turtle	LGT	Bottlenose Dolphin	BD
Pacific Ridley Turtle	PRT	Striped Dolphin	STD
Flatback Turtle	FT	Common Dolphin	CD
Green Turtle	GT	Indo-Pacific	
Freshwater Tortoises	FWT	Humpback Dolphin	IPHD
Whale		Sea birds (unidentified)	SB
False Killer Whale	FKW	Terns	TER
Pygmy Sperm Whale	PSW	Skuas	SKU
Humpback Whale	HW	Gulls	GUL
Killer Whale	KW	Storm Petrels	STO
Sperm Whale	SW	Prions	PRI
Minke Whale	MW	Diving Petrels	DPET
Melon Headed Whale	MHW	Petrels	PET
Strap Toothed Whale	STW	Albatrosses	ALB
Pilot Whale	PW	Shearwaters	SHE
Blue Whale	BW	Gadfly Petrels	GAD
Pygmy Killer Whale	PKW	Gannets and Boobies	GAN
Brydes Whale	BRW	Frigate birds	FRI
		Tropicbirds	TRO
		Darters	DAR
		Cormorants	COR
		Pelicans	PEL
Crocodiles		Dugong	DU
Saltwater Crocodile	SCR	Seahorse	SEA
Freshwater Crocodile	FWC	Seadragons	DRAG
		Pipefish (excluding Pallid and Duncckers Pipehorse)	PIPE
Seasnake	SS	Water Rats	WR
Sharks		Platypus	PLAT
Whale Shark	WS		
Great White Shark	GWS		
Grey Nurse Shark	GNS		
Narrow Sawfish	NSS		
Green Sawfish	GSS		
Freshwater Sawfish	FSS		
Wide Sawfish	WSS		
Dwarf Sawfish	DSS		

DIRECTION TO KEEP AND GIVE LOGBOOK RETURNS

Legislative requirements

All Queensland fisheries are managed under the *Fisheries Act 1994* (the Act) and the *Fisheries Regulation 1995* (the Regulation). Under other State and Commonwealth legislation, there is an obligation to report interactions with a range of species to the relevant Government Department. The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) requires that a person whose action results in the death or injury of any animal listed as threatened, migratory, marine or a cetacean under the EPBC Act in a Commonwealth Area to report to the Secretary, Department of Environment and Heritage.

The Queensland *Nature Conservation Act 1992* and subordinate legislation require that a person report the accidental taking of a whale, dolphin or dugong to a conservation officer, Environmental Protection Agency.

In addition to these obligations, the 'species of conservation interest' logbook has been designed to report any interactions with species of conservation interest (SOCI). Reporting on this logbook does not fulfil obligations under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) or the *Queensland Nature Conservation Act 1992*. DPI Queensland Fisheries Service is collecting information regarding these interactions in order to report to The Department of Environment and Heritage and other organisations on the sustainability of fishing practices in Queensland. For this purpose, sustainability relates to the effect of fishing practices on all species, not just those targeted by the fishery.

Direction

1. Use the logbook if you are the licenced commercial fisher operating the boat, or make the logbook available to the licenced commercial fisher in charge of the boat;
2. Keep the logbook (or ensure that the logbook is kept) in accordance with the instructions contained in the logbook and any written instructions the Chief Executive may, from time to time provide; and
3. Give the completed logbook (or ensure that the completed logbook is given) to the Chief Executive in accordance with the instructions contained in the logbook. This instruction requires that the completed logbook returns be forwarded to the Chief Executive within a specified time period after the fishing to which they relate has occurred. I further direct all holders of an authority to take, possess or sell fish (commercial fisher licence holders) in charge of a boat to:
 1. Ensure that a logbook specific to the fishing activity to be undertaken under the relevant primary commercial fishing boat licence is available to be completed before commencing fishing activities. If the owner of the boat is unable to make a logbook available, it is advised that you contact the Department directly to obtain a logbook before commencing fishing activities. Any logbook obtained from the Department must remain on the boat that it was issued to. Please note that under Section 118 of the Act, a person who fails to comply with an obligation to keep and give the logbook or other information about fisheries required by the Chief Executive is liable to prosecution for an offence against the Act (maximum penalty 500penalty units).

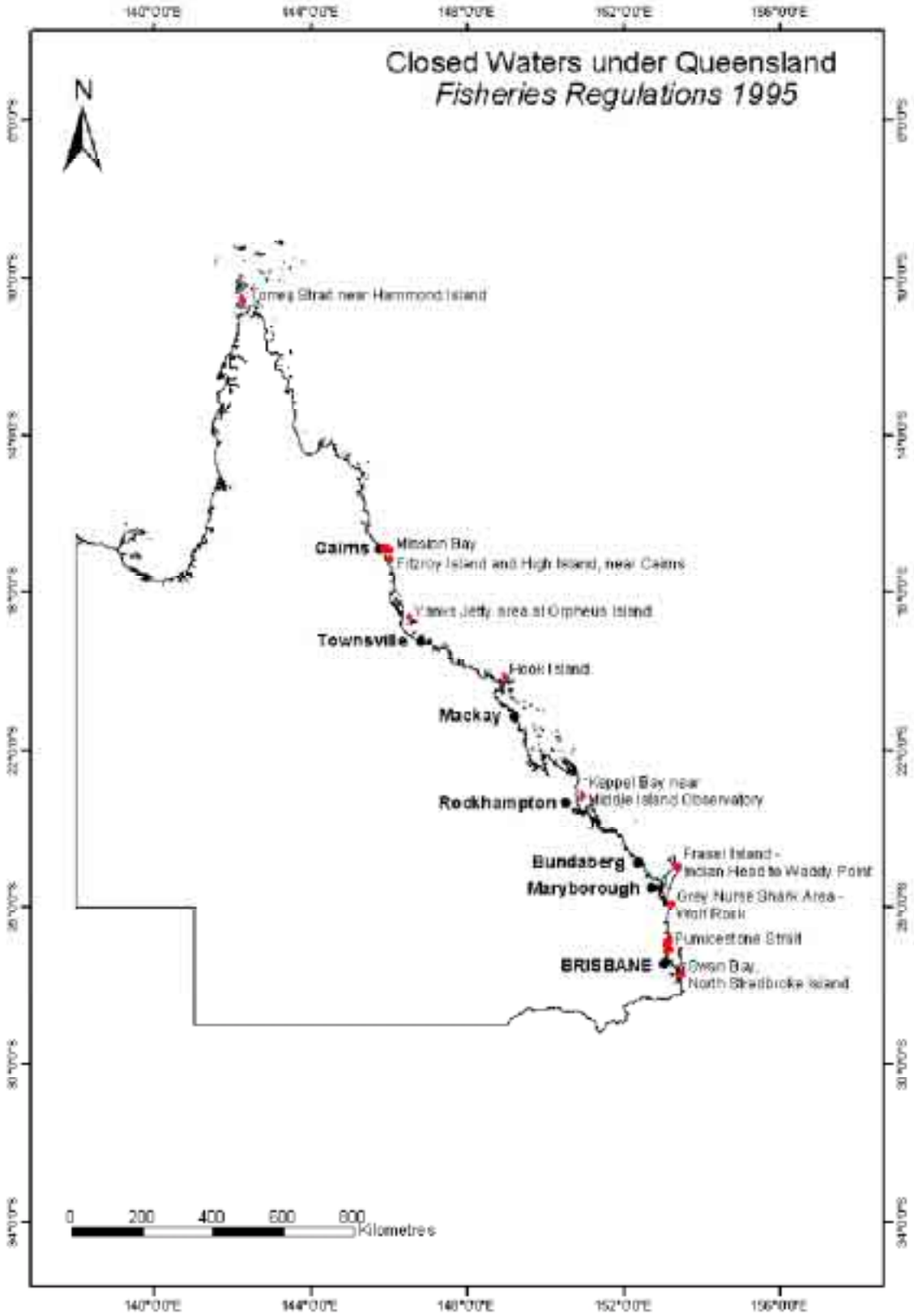
FILLING IN THE LOG FORM

This logbook is to be used to report interactions you have with species of conservation interest during any fishing operations you undertake. It is not used to record any commercial catch, just interactions with species of conservation interest. Please record the fishing gear used and the number and species of all species of conservation interest you interacted with each day. The release condition must be recorded for each species.

POSITION REPORTING

Please provide the position where you interacted with the species of conservation interest. This is to be given either as: 1.30 minute GRID and 6 minute SITE (using the charts in the front of QFS logbooks) or as 2.latitude and longitude. (Please advise if your readout is in decimal minutes).

Appendix 7. Areas closed to fishing under the Queensland *Fisheries Regulations 1995*.



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