



Australian Government

Department of the Environment and Heritage

Assessment of the
Queensland Developmental Jellyfish Fishery

May 2006

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This document is an assessment carried out by the Department of the Environment and Heritage of a commercial fishery against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. It forms part of the advice provided to the Minister for the Environment and Heritage on the fishery in relation to decisions under Parts 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999*. The views expressed do not necessarily reflect those of the Minister for the Environment and Heritage or the Australian Government.

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Assessment of the ecological sustainability of management arrangements for the Queensland Developmental Jellyfish Fishery

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EXECUTIVE SUMMARY

Background

The Queensland Department of Primary Industries and Fisheries (DPI&F) has submitted a document for assessment under Parts 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The draft document *Ecological Assessment of the Developmental Jellyfish Fishery in Queensland waters* (the submission) was received by the Department of the Environment and Heritage (DEH) on 17 October 2005. The submission was released for a thirty-day public comment period that expired on 18 November 2005. No public comments were received and accordingly no changes were made to the submission as a result of public comment. A final submission for assessment was received on 14 December 2005.

The submission reports on the Queensland Developmental Jellyfish Fishery (DJF) against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries* (the Guidelines). The DEH assessment considers the submission and associated documents.

Table 1: Summary of the DJF

Area	State waters in the Moreton Bay Marine Park, Tin Can Bay and Great Sandy Strait, and the Gulf of Carpentaria.
Fishery status	Developmental under 3 yr permits ending mid 2008. The target species is under fished.
Target Species	<i>Catostylus mosaicus</i> .
By-product Species	No by-product species permitted.
Gear	Hand held dip-nets with prescribed sizes and mesh size.
Season	Closed season: 1 June – 31 August.
Commercial harvest proposed for 2006	800 tonnes (t) wet whole weight (200 t in Moreton Bay, 200 t in Tin Can Bay and 400 t in Gulf of Carpentaria)
Estimated value of commercial harvest	Fishery is yet to commence.
Recreational and Indigenous harvest	No recreational or Indigenous take of target species.
Permit holders	6 permits to be issued: 2 each for Moreton Bay, Tin Can Bay and Gulf of Carpentaria.
Fleet	It is anticipated that up to 12 boats (2 per permit holder) will be used.
Management arrangements	Input controls: boat and gear restrictions, temporal closures, limited entry, spatial limitations. Output controls: total allowable developmental commercial catch limit (TADCC).

Export	Jellyfish products planned for export to Asia.
Bycatch	Uncertain, possibly other jellyfish and fish species, but thought to be minimal.
Interaction with Threatened Species	Uncertain, thought to be minimal.

The DJF is a developmental fishery for three years (2005 – 2008) and after this time it may be expanded to a commercial fishery if evidence suggests that it is viable and sustainable.

The area of the fishery is restricted to three discrete coastal areas in Queensland State waters. These are:

- Moreton Bay Marine Park waters – excluding the Caboolture River, waters west of the Hornibrook Highway (Pine River), the Logan River, waters south of the southern tip of Russell Island, and all Marine Park Protection Zones and Buffer Zones;
- Tin Can Bay and Great Sandy Strait – with the northern limit being a straight line between Urangan, Hervey Bay and Moon Point, Fraser Island; and
- waters in the Gulf of Carpentaria– excluding waters west of 140°E (east longitude).

No part of the fishery lies within Commonwealth waters and the entire fishery is managed by Queensland. Future stock investigations by DPI&F may lead to the opening of other geographical boundaries after the developmental phase is over.

The fishery is limited to the take of the jellyfish (*C. mosaicus*) commonly know as the jelly blubber, blue jelly, blue mosaic sea jelly or the brown blubber sea jelly. No by-product species is permitted.

C. mosaicus is very common in temperate and tropical waters of Australia, especially along the eastern coastline of Australia, with the species occupying waters from the Torres Strait and Northern Territory to Port Phillip Bay in Victoria. The genus *Catostylus* also occurs in New Zealand and other Indo-Pacific regions, particularly the Philippines. This species is known to congregate in large aggregations in coastal waters and estuaries with stock units restricted to individual bays and estuaries. The jellyfish's large bell is a creamy white or brown colour, but farther north it is usually blue due to a symbiotic relationship with algal plant cells that are kept inside its body.

This species is highly fecund and reproduces both sexually and asexually. The medusa stage is the sexually reproducing, dispersal phase having separate sexes. As this phase is the only sexual stage of the life history it is important for maintaining genetic diversity. The jellyfish's medusa stage, which is subject to harvesting, is believed to have a very limited lifespan of about five months. There appears to be a high level of annual variation in abundance for the species. It is thought that the variation may be a related to changes in water temperature and salinity, however this is not confirmed.

C. mosaicus is prey to turtles (particularly leatherback turtles (*Dermochelys coracea*) but also green turtles (*Chelonia mydas*) and flatback turtles (*Natator depressus*)), some bony fish, crabs, sunfish and some birds.

There has been no estimate of the biomass of the jellyfish in Queensland waters. There are developmental fisheries in New South Wales and Victoria, limited to Port Phillip Bay, and preliminary biomass estimates have been conducted or are scheduled for these fisheries.

The collection apparatus has been restricted to hand held scoop and dip nets with a diameter of no more than 1 meter and mesh size no less than 30 mm. Although seine nets have been permitted for herding and corralling jellyfish in other states, it is thought that this would increase the chance of bycatch and juvenile injuries so the use of seine nets has not been permitted in the DJF. A maximum of 2 boats of less than 7 m in length are licensed to operate on each permit with a total of six permits being issued. Boat restrictions limit effort in the fishery and reduce boating related impacts on marine habitats within the fishery area. A maximum of 4 persons per permit, acting under the direction of the holder, are authorised to harvest *C. mosaicus* during daylight hours only.

Jellyfish are generally stored whole on board vessels in a salt solution and processed at an approved onshore facility, although some operators will separate the tentacles from the bells at sea. It is expected that processed jellyfish will be exported to Asia. A recovery rate of approximately 10 – 14% is reported and the 800 t TADCC will produce in the order of 110 t processed weight. At a price of \$10/ kg this is estimated to be worth in excess of \$1m annually.

Some evidence does exist that jellyfish act as fish attraction devices to juvenile finfish, so there may be some interaction with these species whilst dip netting occurs. It is unclear what impact the removal of *C. mosaicus* would have on the ecosystem within the DJF. Information on bycatch in the fishery is very limited, but given the selectivity of the fishing methods it is expected to be very low.

The only species that may be affected by this fishery currently listed as protected species under the EPBC Act are dugong and marine turtles (particularly the green turtle). Possible protected species interactions in this fishery are limited to possible boat/ gear interaction (boat strikes, etc) with turtles and dugong (and possibly crocodiles and sea snakes in the Gulf of Carpentaria) and competition with marine turtles for jellyfish as a food source. These interactions are assessed under Principle Two of this report.

There is no significant take of *C. mosaicus* by the Indigenous and recreational sectors, however some may be taken as bycatch in other fisheries. This is discussed further in Principle Two of this report.

The fishery is managed under Developmental Fishing Permits issued by DPI&F under authority derived from the Queensland *Fisheries Act 1994*. A range of input and output controls (as permit conditions) are employed to manage the take in the fishery (see Table 3 in Part II of this report).

Overall assessment

The material submitted by DPI&F indicates that the DJF operates in accordance with the Guidelines. DEH considers that the DJF is a well managed developmental fishery that is unlikely to have an unacceptable or unsustainable impact on the environment in the period of the developmental permits issued. Recommendations have been developed to ensure that the risk of impact is minimised in the longer term or when the fishery is considered as a commercial fishery. Overall, noting that the fishery is in a developmental phase and that

DPI&F have approached its development in a precautionary manner, the management regime incorporating a range of input and output controls (such as a conservative TADCC, limited entry, spatial restrictions, gear restrictions, vessel controls, a seasonal closure, as well as a trigger related to juvenile and total catches) indicates that the fishery is being managed in an ecologically sustainable way. DEH notes that these arrangements follow considerable public consultation (through the release of papers about the establishment of developmental jellyfish fisheries in the Gulf of Carpentaria and Moreton Bay and a second paper dealing with Tin Can Bay).

In making its assessment, DEH considers that stocks are not currently overfished and the current arrangements in place for the developmental fishery are sufficient to ensure that the fishery is conducted in a manner that does not lead to over-fishing. Considering the precautionary management arrangements in place and the selective and benign characteristics of the fishery operations, DEH considers that fishing operations are managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. DEH is confident that DPI&F will provide appropriate high quality management to this developing fishery and develop appropriate and effective management arrangements before the fishery becomes fully commercial.

The material submitted by DPI&F demonstrates that the management arrangements for the DJF meet most of the requirements of the Guidelines. While the fishery is well managed, DEH has identified a number of risks that must be managed to ensure that their impacts are minimised. These include the following:

- No formal management plan that includes fishery specific objectives, performance measures or management responses;
- No stock assessment or Total Allowable Commercial Catch (TACC) setting process; and
- No research strategy to ensure key information gaps are investigated that would guarantee any future commercial fishery is sustainably managed.

DEH understand that the DJF has yet to commence as a developmental fishery and the management arrangements proposed are considered sound and appropriate. The management regime aims to ensure that fishing is conducted in a manner that does not lead to over-fishing and for fishing operations to be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. On balance, the fishery will be managed in an ecologically sustainable manner and is working to address existing and potential problems and minimise environmental risks.

The operation of the fishery is consistent with the objects of Part 13A of the EPBC Act. Given the management arrangements specified in the policies and permit conditions relating to the DJF and the development of management arrangements, DEH considers that the fishery will not be detrimental to the survival or conservation status of the taxon to which it relates in the short term. Similarly, it is not likely to threaten any relevant ecosystem in the short term. DEH therefore recommends that the fishery be declared an approved Wildlife Trade Operation (WTO) with the actions specified in the recommendations to be undertaken by DPI&F to contain the environmental risks in the long term. DEH considers that the fishery, as managed in accordance with the management regime is not likely to cause serious or irreversible ecological damage over the period of the export decision. Specifically, the WTO declaration would allow the export of product from the fishery for a period of 3 years, which coincides with the period of the developmental fishery permits issued by Queensland. The WTO declaration will require annual reporting on the progress of implementing the recommendations of this report and other managerial commitments. The implementation of

the recommendations and will be monitored and reviewed as part of the next DEH review of the fishery in 3 years time.

Two sectors of the DJF will take place in or adjacent to Ramsar sites: the Great Sandy Strait which includes Tin Can Bay and Tin Can Inlet (No. 992) and Moreton Bay (No. 631). The impact of the fishery both in the developmental phase or a fully commercial phase on the significance of either of these sites as Ramsar wetlands is not expected to impact on the ecological values of these areas (considered in their listing) and further investigation on the impact of the fishing operation is required. While a recommendation has been made requiring evaluation of any impact the fishery may have on these sites, DEH considers that an action taken by an individual fisher, acting in accordance with the developmental fishing permits issued by DPI&F, would not be expected to have a significant impact on a matter protected by the EPBC Act.

As the fishery area does not encompass Commonwealth waters, consideration was not given under Part 13 of the EPBC Act regarding the impact of the fishery on listed threatened species, listed migratory species, cetaceans and listed marine species.

Recommendations to address these issues have been developed to ensure that the risk of impact is minimised in the longer term. Through the implementation of the recommendations and the continuation of a responsible attitude to the management of the fishery, management arrangements are likely to be sufficiently precautionary and capable of controlling, monitoring and enforcing the level of take from the fishery while ensuring the stocks are fished sustainably and there is minimal impact on the structure, function, productivity and biological diversity of the ecosystem. The implementation of these and other commitments made by DPI&F in the submission will be monitored and reviewed as part of the next DEH review of the fishery in 3 years time.

Recommendations

Recommendation 1

DPI&F to inform DEH of any intended amendments to the management arrangements that may affect sustainability of the target species or negatively impact on by-product, bycatch, protected species or the ecosystem.

Recommendation 2

Within 1 year following an Ecological Risk Assessment planned for late 2007, DPI&F to develop fishery specific objectives linked to performance indicators and performance measures for the target species and impacts on the ecosystem.

Recommendation 3

DPI&F to ensure that the observer program is capable of providing the required information at a statistically robust level and provides for the collection of at least the following:

- *validation of commercial catch information for use in stock assessments and management;*
- *observations on damage to jellyfish that escape from the dip netting operation;*
- *data on bycatch;*
- *protected species interactions; and*
- *any ecosystem impacts of fishing operations (to the extent possible noting the nature of the fishing operations).*

Recommendation 4

DPI&F to continue to develop and implement research to address:

- *key gaps in the knowledge of jellyfish biology and ecology of *C. mosaicus* (including annual variation, aggregations and ecosystem role of species);*
- *stock status (including research surrounding establishing a process for setting the TACC based on the stock status);*
- *bycatch levels in other fisheries; and*
- *the effects of harvesting jellyfish on the wider ecological community.*

Within 3 years if there is an indication/ decision that further commercial development is to occur or before any further commercial fishing (exploratory or otherwise) is allowed to be undertaken after this date, DPI&F to develop and implement a research strategy. The research strategy will need to be implemented within the constraints of available resources.

Recommendation 5

From 2007 DPI&F to report publicly on the status of the fishery on an annual basis, including explicit reporting against each performance measure, once developed.

Recommendation 6

DPI&F to monitor the status of the fishery in relation to the performance measures once developed. Within 3 months of becoming aware of a performance measure not being met, DPI&F to finalise a clear timetable for the implementation of appropriate management responses.

Recommendation 7

Within 3 years, DPI&F to evaluate and report on the impact of the fishing operation in the Great Sandy Strait and in Moreton Bay areas on the RAMSAR sites (Site Nos 992 and 631) on the ecological values considered in listing the areas.

Recommendation 8

Within 1 year, to support the implementation of the Species of Conservation Interest logbooks, DPI&F to ensure that an education program for commercial fishers is developed and implemented, to promote the importance of protected species protection and accurate incident reporting.

PART I - MANAGEMENT ARRANGEMENTS

The DJF is managed by DPI&F. The management regime is described in the following documents, all of which are, or will be publicly available:

- the Queensland *Fisheries Act 1994*;
- the Queensland *Fisheries Regulation 1995*; and
- relevant permits (such as those issued under section 35(2) of the *Fisheries Regulation 1995*) and associated conditions.

Management of the DJF is based on the Queensland *Policy relating to the Establishment and Management of Exploratory and Developmental Fisheries*. This Policy is currently under review as the original reportedly had limited public exposure and it is claimed that its development did not allow for public input into its scope nor for the identification of environmental criteria to assess the extent to which it included environmental protection. Exploratory or developing fishing is defined in this Policy as:

- all forms of fishing for a species of fish not presently utilised or considered to be significantly under-utilised; or
- fishing for a presently utilised fish species using apparatus not permitted by the legislation for that purpose; or
- harvesting of a fish species or use of prescribed apparatus (or both) in locations where such activities have not previously occurred; or
- combinations of the above, with an eventual objective of harvesting such fish.

DPI&F state that the objective of the Policy is “to determine whether or not a potential new fishery is commercially viable, socially acceptable and “ecologically sustainable” as defined in section 25(4) of the *Fisheries Act 1994*”.

DEH considers it is important that management arrangements remain flexible to ensure timely and appropriate managerial decisions. Because of the importance of the management regime and documents referred to above to DEH’s assessment of the fishery, an amendment could change the outcomes of the assessment and decisions stemming from it. Decisions resulting from this assessment relate to the arrangements in force at the time of the decision. In order to ensure that these decisions remain valid, DEH needs to be advised of any changes that are made to the management regime and make an assessment that the new arrangements are equivalent or better, in terms of ecological sustainability, than those in place at the time of the original decision.

Recommendation 1

DPI&F to inform DEH of any intended amendments to the management arrangements that may affect sustainability of the target species or negatively impact on by-product, bycatch, protected species or the ecosystem.

DEH notes that Exploratory or Developmental fishing (carried out under permit from DPI&F) does not infer:

- that the fishery will advance to a subsequent stage (Developmental or Managed); or
- that the holder of an Exploratory or Developmental Permit will have a preferential right to an authority in any subsequent stage of the fishery

Management of the fishery incorporates a sound range of consultative mechanisms and a clear commitment to effective consultation with a variety of stakeholders. DEH considers the level

of consultation to be adequate and is confident that the management agency will continue to ensure interested parties are consulted appropriately.

Management advice on general developmental fishery issues is provided to the DPI&F through the management advisory committee (MAC) for Queensland's harvest fisheries (HarvestMAC). The DPI&F's MAC process provides a consultative forum allowing stakeholders to provide input into the management of particular fisheries. HarvestMAC representatives include a DPI&F appointed chair, the fishery manager, a researcher, a compliance officer, commercial fishers, recreational fishers, representatives from the Great Barrier Reef Marine Park Authority (GBRMPA) and a DEH observer. There are no representatives from the Indigenous community effected by the fishery or from conservation based organisations.

In addition to HarvestMAC, the Management and Scientific Advisory Committee (MSAC) provided specific advice relating to the DJF. The MSAC comprises of fishery stakeholders, including researchers and representatives from Queensland Parks and Wildlife Service (QPWS), the Queensland Centre for Food Technology and the Queensland Boating and Fisheries Patrol (QB&FP). It met on a number of occasions, providing significant input into the development of suitable management arrangements for the developmental phase of the fishery and will provide further input should it progress past the developmental stage. 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, were discussed by the MSAC. The MSAC advises DPI&F on any management actions required to ensure the fishery operates within sustainable levels.

Management of the fishery is based on a mixture of input and output controls. Such controls include:

- a TADCC that is considered by QDPI&F to be conservative (set at a total of 800 t with 200 t in Moreton Bay, 200 t in Great Sandy Strait and 400 t in the gulf of Carpentaria);
- limited entry (restricted to 6 permits, two in each of three locations);
- spatial restrictions (fishery limited to Moreton Bay, Great Sandy Strait and the Gulf of Carpentaria);
- gear restrictions (limited to hand held dip nets with diameter < 1 m and with mesh < 30 mm);
- vessel controls (limited to two vessels per permit, each < 7 m in length);
- effort limits (crew limit of 4 per vessel);
- a seasonal closure (fishery closed between 1 June and 31 August each year); and
- pre-determined management responses which is triggered by either specific changes in :
 - total catch of juveniles (consideration given to closing fishery when catch of juvenile jellyfish (< 5 cm bell size) exceeds 25% of catch); or
 - total catches (permits holders advised when catches approach 75% and also at 90% of allocation).

Commercial fishing activity has not yet commenced, therefore no compliance history is available from QB&FP. It is claimed the small number of permits issued, the stringent conditions and notification procedures that apply to permit holders are expected to ensure a high level of compliance in the fishery.

Fishery-dependent data relating to the target species will be collected on a regular basis in the fishery. Some fishery independent information will also be collected. It is conditional for permit holders to inform the QB&FP and the observer, of impending fishing activities prior to commencement. In addition DPI&F require each permit holder to complete a logbook for

input into Queensland's Commercial Fisheries Information System (CFISH) database to allow for analysis of catch and effort in the fishery. DPI&F have instigated an observer program for the DJF. These information collection and compliance support systems are further discussed in Part II of this report. Discussion of the information collection system can also be found in Part II of this report.

The DJF is subject to annual stock surveys in each of the fishery areas. However these are to be conducted by the permit holders using methodologies approved by DPI&F. The annual reviews are discussed more fully in Part II of this report.

The DJF is scheduled to be reviewed by DPI&F in mid 2008 at the end of the duration of the developmental permits. DEH considers that a review at the end of the developmental phase and before the fishery is fully commercial and while DPI&F commits to act when adverse signals appear in the fishery is suitable. DPI&F state that a formal and comprehensive management regime is to be developed if and when the fishery becomes fully commercial. DEH acknowledges that because of the developmental nature of the fishery, management arrangements are under development and that they must remain flexible to ensure timely and appropriate managerial decisions can be made. If there is an indication that the fishery may become fully commercial then there is a priority need to proactively develop a management regime that includes fishery specific performance indicators or trigger limits to ensure that the performance of the fishery can be measured and management action taken as required. DEH considers that the development of fishery specific objectives, linked to performance indicators and performance measures is a priority for the fishery.

In addition, should new fishery dependent or independent information lead to a conclusion that fishing activities are unsustainable, or are having harmful effects on non-target species or on the wider ecological community, DPI&F should implement management responses to address these issues.

Recommendation 2

Within 1 year following an Ecological Risk Assessment planned for late 2007, DPI&F to develop fishery specific objectives linked to performance indicators and performance measures for the target species and impacts on the ecosystem.

An analysis of the fishery's capacity for assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species lives and the fishery operates is contained under Principle Two of this report.

The distribution of *C. mosaicus* is widespread along the east coast of Australia and several developmental fisheries targeting the species are underway or are under consideration, including the DJF which has yet to commence. There has not been any reported collaboration between fishery management agencies on management or research related to the take of the jellyfish, and while this is acceptable to DEH while the fishery is in a developmental and exploratory phase, collaboration with other jurisdictions will probably need to be considered in the future. The issue is further discussed under Principle Two.

DEH considers that the current management arrangements comply with all relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy. DEH expects that DPI&F will also ensure compliance with any future plans or policies as they are developed.

No regional or international management regimes, to which Australia is a party, are of direct relevance to the fishery. The primary international regime affecting the fishery is the United Nations Convention on the Law of the Sea (UNCLOS). The management regime essentially complies with this. Other international regimes are applicable to fisheries management but do not explicitly involve this fishery, for example the 1992 Convention on Biological Diversity and in particular the 1995 Jakarta Mandate requiring that, in relation to the sustainable use of marine and coastal biological diversity, the precautionary principle should apply in efforts to address threats to biodiversity. While these agreements are not specifically addressed in the Submission, the fishery's compliance with their requirements can be assessed by examination of Part II of this report. The application of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/ 78) to vessels operating in the fishery is explicitly discussed under Principle 2, Objective 3.

DEH considers it is incumbent on all authorities to develop a thorough understanding of the framework of national, regional and international agreements and their applicability to export-based fisheries for which they are responsible.

The DJF fishery will be conducted within two Ramsar sites namely the Great Sandy Strait which includes Great Sandy Strait, Tin Can Bay, and Tin Can Inlet (Ramsar Site No. 992), and Moreton Bay (Ramsar Site No. 631). This has been discussed under Part II of this report and a recommendation drafted to address the need to ensure the ecological character of these wetlands are not significantly impacted by the fishing operation.

Conclusion

The DJF is a developmental fishery and DEH believes the management arrangements in the fishery are reasonably precautionary. DPI&F has demonstrated its commitment to the ecologically sustainable management of the fishery by establishing a suitable precautionary regime. In the event that the fishery is to expand as either a fully commercial fishery (or if there is an extension of the developmental phase), a formal management plan is required that is developed with wide stakeholder input and that is based on fishery specific objectives linked to performance indicators and performance measures for the target stock, protected species and impacts on the ecosystem.

The management arrangements currently in place are capable of controlling the harvest through a combination of input and output controls, set as permit conditions, appropriate to the size of the fishery. A review of the fishery is provided for at the conclusion of the developmental phase, as are the means of enforcing critical aspects of the management arrangements throughout the developmental phase. DEH considers it important that, because of the developmental nature of the fishery, management arrangements remain flexible to ensure timely and appropriate managerial decisions. Thus DEH supports an adaptive management arrangement but must be kept informed of any changes, which may alter the basis of this assessment. DEH therefore recommends that DPI&F inform DEH of any changes to the management regime.

DEH considers that the management regime for the DJF is documented, publicly available and transparent, and is developed through a consultative process. The management arrangements are adaptable and underpinned by appropriate objectives and performance criteria.

The management regime takes into account arrangements in other jurisdictions, and adheres to arrangements established under Australian laws and international agreements.

Impacts of the fishery on the two Ramsar sites in which the fishery will operate needs to be established to ensure the ecological character of these internationally significant wetlands are not significantly impacted.

DEH considers that there is scope to further refine the management arrangements and has made a recommendation for improvements in the management regime in the longer term.

PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

Stock Status and Recovery

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

Maintain ecologically viable stocks

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

Information requirements

The DPI&F maintains a range of data collection systems for providing up to date information on fish stocks, species taken, as well as the level and distribution of fishing effort and fish catches. This information is used by fisheries managers to aid decisions relating to sustainable harvests, by researchers in making assessments about the status of stock, and by analysts monitoring and interpreting spatial and temporal changes in fishing activity and catch levels.

A comprehensive compulsory daily logbook is a requirement for permit holders operating in the fishery and will be the principal means of data collection. The draft logbook for this fishery is currently being designed to collate information from each permit on effort - including hours of collection and number of collectors; location- using 30 minute grid locations; and catch - including bin size, number and product form for example: whole wet weight or bell weight and tentacles. This information will be entered into the CFISH database system, allowing for the analysis of catch and effort in the fishery to help evaluate the effectiveness of management arrangements. Valid logbook entries are to be recorded daily and reported to DPI&F logbook section after every fishing week. DEH believes that data reliability for target species will be reasonable and that compliance and enforcement activities have the capacity to ensure the ongoing reliability of data in the fishery.

Fishery independent data collection in the DJF is and will be limited due in part to the developmental and small scale nature of the fishery. With the introduction of the developmental fishery DPI&F will implement a limited observer program, involving a fisheries observer attending a minimum of 10 fishing trips for each permit holder annually to monitor the harvest and processing operations of the fishery. The observer program will provide data on jellyfish distribution and abundance, population structure and environmental variables, supplying the DPI&F with greater understanding of the operation of the fishery and ultimately allowing more effective management. The observer program will also provide an independent record of fishing, enabling DPI&F to validate the detailed fishery dependent data collected in the CFISH logbook program. The observer program is considered important for the collection of verified information on which a fully commercial fishery could be based.

The design of this observer program needs to be considered carefully, particularly important elements such as the level of coverage that ensures statistically robust information is collected, the range of information collected is comprehensive (eg regarding serial and/ or localised depletion, protected species interaction, removal of tentacles, and gear effectiveness, particularly damage to escapees, suitability of mesh size to allow for escape of juveniles) and logbook data is validated.

Recommendation 3

DPI&F to ensure that the observer program is capable of providing the required information at a statistically robust level and provides for the collection of at least the following:

- *validation of commercial catch information for use in stock assessments and management;*
- *observations on damage to jellyfish that escape from the dip netting operation;*
- *data on bycatch;*
- *protected species interactions; and*
- *any ecosystem impacts of fishing operations (to the extent possible noting the nature of the fishing operations).*

In an effort to address the lack of fishery independent data, DPI&F will collect data on the fishing operation in addition to logbook returns and observers' reports through compliance checks conducted by QB&FP. DEH considers this a useful approach given the developmental nature and small size of the fishery but stresses that a basic understanding of the fishery is required before there is any expansion in the future, either within the areas in which permits have been granted or elsewhere. DEH also notes that data on bycatch is needed to confirm the expected low level of take or interaction with bycatch.

DPI&F will collect data on the stock from the stock assessments which will be designed and directed by QDPI&F but conducted by each permit holder. This is discussed further in the following section.

Overall, given the developmental nature of the fishery and range of fishery dependent and independent data gathered by DPI&F, DEH considers that there is a reliable information collection system in place appropriate to the scale of the fishery. Expansion of existing data collections and research programs if the fishery becomes fully commercial, combined with any necessary extension or refinement of such activities will be important for the future management of the DJF.

Assessment

DPI&F reports that to date there has been no fully commercial fishery for *C. mosaicus* conducted in Australia and little fishery related research exists and consequently little information is available on populations of this species of jellyfish specific to Queensland waters. There is currently no formal stock assessment or model for this fishery. DPI&F has set as a permit condition that each permit holder is to conduct an annual survey of *C. mosaicus* stocks in their fishery area. Written approval for survey methodology, aims and objectives is required from the DPI&F prior to commencement. The surveys are to be conducted annually between 1 November and 31 March with results being provided no later than 1 July each year. The data collected from these stock assessments will be validated against logbook information and data gained from the observer program.

The primary management tool for the fishery is an annual TADCC. QPI&F have set a TADCC of 800 t for the DJF. This is divided amongst the three fishing areas as shown in Table 2. DPI&F maintain that the TADCC has been set well below reference TACCs set for both the NSW and Victorian jellyfish fisheries, which are 1,500 t (bell weight) and 1,000 t (whole wet weight) respectively. The biological sustainability basis for setting the TADCC at

this level has not been established and DEH has ongoing concerns that, while considered precautionary and conservative in nature (compared to TACs set in other jellyfish fisheries), it is not necessarily set at a level which ensures sustainable harvest of the Queensland jellyfish stocks. Should the fishery continue as either a developmental fishery or as a fully commercial fishery, DEH believes a comprehensive stock assessment needs to be conducted that covers the full distribution of the stock(s). If necessary, this may need to be conducted in collaboration with adjacent jurisdictions in which the species occurs.

It is known that the species has the capacity to aggregate, although the triggers and mechanisms for this are not understood. Once an aggregation is located large numbers can be harvested with reduced effort, even if the overall abundance is low. This is of concern as such activity has the potential to result in localised depletion.

While acknowledging the developmental nature and the small scale of the fishery it is important, due to the characteristics of the species (i.e. probable localised recruitment and unknown metapopulation structure), that a research program is developed and initiated to obtain relevant information on which to base a fully commercial fishery. A key aspect is the estimation of the 'virgin' biomass throughout the waters in which the species occur (or an alternative measure of biomass) and the sustainable harvesting levels need to be established. Research may also be needed prior to the commencement of full commercial fishing to determine the adequacy of management arrangements based on limiting fishery to discrete bays/ estuaries (ostensibly to provide for refuge areas).

The uncertainty associated with the recruitment of the species, its role in ecosystem functioning and the wide range of the annual variation in abundance, demand a precautionary approach to the management of the fishery (and the approach DPI&F have taken is acknowledged) hence the need for a research, including that required for the conduct of a comprehensive stock assessment.

Areas of future research identified by the DPI&F as necessary to accurately assess the jellyfish resources in Queensland include:

- Estimating the biomass of jellyfish stocks;
- Determining sustainable annual harvest levels of jellyfish;
- Determining biological and ecological aspects of *C. mosaicus*, in particular:
 - population dynamics- such as the timing and duration of reproduction;
 - population growth; and
 - factors influencing jellyfish survival and fecundity.

Recommendation 4

DPI&F to continue to develop and implement research to address:

- *key gaps in the knowledge of jellyfish biology and ecology of *C. mosaicus* (including annual variation, aggregations and ecosystem role of species),*
- *stock status (including research surrounding establishing a process for setting the TACC based on the stock status)*
- *bycatch levels in other fisheries, and*
- *the effects of harvesting jellyfish on the wider ecological community.*

Within 3 years if there is an indication/ decision that further commercial development is to occur or before any further commercial fishing (exploratory or otherwise) is allowed to be undertaken after this date, DPI&F to develop and implement a research strategy. The research strategy will need to be implemented within the constraints of available resources.

Table 2: Regional Quota (whole wet weight) for *C.mosaicus* in Queensland waters

Fishing Area	Permits Issued	Quota per permit (t)	Regional Quota (t)
Tin Can Bay	2	100	200
Moreton Bay	2	100	200
Gulf of Carpentaria	2	200	400
TADCC			800

DEH is unclear as to whether an annual performance assessment of the fishery will be conducted and how this would occur. DEH believes an annual review is necessary particularly as the fishery is developmental in nature. Reviews should be conducted based on the annual surveys conducted by the permit holders, data collected through the logbook, compliance reports and the observer program and any other appropriate research conducted. The review should be conducted against established performance measures that establishes the ecological sustainability of the fishery operations. The outcomes of the assessment should then be used to determine the most appropriate TADCC for the fishery for the coming year.

Recommendation 5

From 2007 DPI&F to report publicly on the status of the fishery on an annual basis, including explicit reporting against each performance measure once developed.

DEH understands that, according to DPI&F, *C. mosaicus* has an extensive inshore distribution along the east coast of Australia and is known to occur in large aggregates during summer months. The species is reported by DPI&F to inhabit the water column from the surface to a depth range of approximately 25 m, and are known to display vertical migration depending on weather conditions.

DPI&F report that up to 10% of the population occurs in mid-deep water levels and they have the ability to maintain position within a relatively sheltered area. The fishing gear and collection methods permitted are highly selective and only individuals at the surface of the water column can be readily fished, which DPI&F maintains ensures a certain level of stock protection. Further protection to the stock is provided through the limitation of the permitted fishing areas to nominated estuaries and embayments and that these are to be treated as separate fishing zones. DPI&F also acknowledges that further research into the spatial structure of jellyfish stock in Queensland waters may lead to more area specific management arrangements in the future.

Should research into jellyfish stock indicate that *C. mosaicus* represents a single stock, DEH believes it would be beneficial for DPI&F to be involved in cross-jurisdictional actions to address shared stock concerns. Furthermore, removals of the species in other jurisdictions would ideally be factored into stock assessments in the Queensland fishery and include mortality from damage attributable to other fishing operations, for example by inshore trawling, crab potting and netting operations.

There is no or only minimal recreational or Indigenous harvest.

The fishery operates under a quota system allocated to individual permit holders and with an annual TADCC. Fishers are required to record all jellyfish caught and retained, which are then decremented against the TADCC. It is understood logbook data will be validated against processor returns. While the retained catch of jellyfish will be known there is some concern about the level of discarding which may occur in the fishery, and the degree to which discards

are factored into stock assessment and management. Such information is important for stock assessment purposes and to measure the overall impact the fishery may be having on not only the target species, but other components of the marine environment. DEH considers the ongoing collection of data and monitoring for discards is an important component in providing confidence in the TADCC and to enable changes in catch size and fisher behaviour to be detected overtime. DEH also believes DPI&F should monitor the post release mortality attributable to the fishing operation, possibly as part of the observer program.

Management response

The DJF management regime reflects the developmental nature of the fishery and aims to maintain ecologically viable stock levels through a range of input and output controls. These measures are addressed in Part I of this report and summarised below, in Table 3.

Table 3: Summary of the Input and Output controls in the DJF

Input	<i>Limited entry:</i>	Number of permits issued is limited to 6 (2 permit holders harvesting in each of the three fishery areas).
	<i>Seasonal closure:</i>	Fishery closed between 1 June and 31 August.
	<i>Vessel restriction:</i>	Each permit holder is limited to 2 vessels, each <7 m in length. Crewing levels limited to 4 per vessel.
	<i>Gear restriction:</i>	Collection is limited to hand collection using dip nets (1m in diameter and minimum mesh size of 30 mm).
	<i>Restricted areas:</i>	Fishing restricted to specific areas in Moreton Bay, Tin Can Bay and Great Sandy Strait and the Gulf of Carpentaria.
Output	<i>TADCC</i>	800 tonne TADCC set (with 200 t in Moreton Bay, 200 t in Tin Can Bay and Great Sandy Strait and 400 t in the Gulf of Carpentaria).
	<i>Juvenile Trigger</i>	If >25% of catch is juvenile animals (5 cm bell diameter) possible closure of the fishery.
	<i>Catch triggers</i>	When 75% and 90% of quota taken permit holders are advised of quota remaining.

DEH considers that the input controls should ensure adequate protection of the target stocks, but notes that this is contingent upon the TADCC being set at a sustainable level.

DPI&F recognise that both target and limit reference points are important triggers in fisheries management to ensure the long-term viability of stock is not compromised but notes that there is currently no information on the population dynamics of *C. mosaicus* in Queensland waters and consequently, robust reference points have not been developed. DEH notes the developmental nature of the fishery but maintains that reference points (target and/ or limit) that trigger management actions are important elements of a management regime that manages the resource at an ecologically sustainable level. DEH notes the triggers relating to juvenile catches and total catches also provides the opportunity for DPI&F to respond to any sustainability concerns identified for the fishery.

While the TADCC set for this fishery is a conservative estimate (compared to other fisheries), DEH concurs with DPI&F that it can serve as a proxy reference point until fisheries information, both dependant and independent, collected during the initial developmental period, both, serves to enable for the establishment of reliable reference points. The annual survey of the fishery, required under the permit conditions, should also provide an indication of the suitability of the TADCC.

DPI&F advise that should the fishery progress beyond the developmental phase, a formal process within the framework of the DPI&F developmental fishery policy will be undertaken

to prescribe management arrangements, which will include consideration the development of appropriate reference points.

The submission reports that there will be a closure of the fishery during the winter months (between 1 June and 31 September) as there is a known reduction in numbers and size of jellyfish in this period and the majority of adults have reproduced by this time. It is understood that timing of reproduction and recruitment varies with latitude. DEH is unsure if this closure will provide adequate protection of spawning adults as a general approach and in all areas of the fishery (ie the Gulf of Carpentaria as well as Moreton Bay) as suggests that DPI&F monitor the effectiveness of the closure.

DEH believes that the DJF should be regularly monitored in relation to established objectives, indicators (reference points and triggers) and performance measures. A clear process for responding to a performance measure not being met is also required to ensure that where such an event is determined to be the result of fishery impact prompt management action is taken to address any threats to sustainability.

Recommendation 6

DPI&F to monitor the status of the fishery in relation to the performance measures once developed. Within 3 months of becoming aware of a performance measure not being met, DPI&F to finalise a clear timetable for the implementation of appropriate management responses.

DPI&F notes that some small pelagic fish species use the jellyfish medusae as shelter and may therefore be taken inadvertently during the fishing operation. DEH concurs with DPI&F that the nature of the gear permitted and its permitted use (i.e. hand held dip nets with a maximum 1 m diameter and with mesh size not less than 30 mm) will mean that the level of such take will be very low and is unlikely to be retained as by-product.

Conclusion

DEH considers that the management regime in the DJF is appropriately precautionary and provides for the fishery to be conducted in a manner that does not lead to over-fishing. DEH considers that the information collection system and stock assessment and management arrangements generally are sufficient to ensure that the fishery is conducted at catch levels that maintain ecologically viable stock levels with acceptable levels of probability.

DEH considers that there is scope to further refine some of the existing information collection, assessment and management responses and has provided a number of recommendations for improvements in the longer term.

Promote recovery to ecologically viable stock levels

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

DEH is aware that definitive information on the status of the stock is not available to DPI&F but acknowledges that the stocks of jellyfish can be considered a virgin biomass that has never had any significant fishing pressure applied to it. Accordingly DEH concurs with

DPI&F that this objective is not applicable to the DJF at present given its developmental nature and that it is operating on a virgin biomass.

Conclusion

DEH considers that the jellyfish stock is not below a defined reference point but should that occur in the future, the DJF will be conducted and managed such that there is a high degree of probability the stock would recover to ecologically viable stock levels within nominated timeframes.

Ecosystem impacts

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

Bycatch protection

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

Information requirements

DEH agrees with DPI&F that it is unlikely that there will a significant amount of bycatch in this jellyfish fishery due to the large mesh size of the gear and highly selective methods used, generally enabling bycatch to be avoided.

It is believed that the observer program will provide reliable assessment of this assumption, providing the appropriate information for DPI&F to assess the risk the fishery exerts on any bycatch species. DEH believes that should the observer program identify any bycatch issue, the permits conditions should be amended to include a requirement to record all bycatch taken.

Assessment

As there has been no fishing of jellyfish to date, there is no substantive information on the nature or quantity of bycatch likely to be taken in the fishery. DPI&F have advised that should any species other than the target species be found to be taken during the developmental phase of the fishery, it will, in an appropriate time-scale, assess the risk to these species from the fishery. DEH believes that this will also provide for DPI&F to develop and implement any mitigation measures necessary.

Management response

No specific management response exists to manage bycatch in the fishery given that the fishery has not commenced and because of the fishing gear permitted by DPI&F. DEH agrees that the mesh size allowed for the hand held dip nets will allow for juvenile target species and juvenile finfish to escape before being landed. DPI&F have also indicated that any fish taken unintentionally must be returned to the water as quickly as possible to reduce potential harm or injury.

Given the extremely low likelihood of bycatch being taken in the fishery, and the restricted developmental nature of the fishery, DEH concurs with DPI&F that there is no need to monitor an indicator group of bycatch species. DEH notes the commitment by DPI&F that should any bycatch issues be identified that warrant a need for indicator species this will be included in the decision rules for the fishery.

Conclusion

DEH considers that there is a high likelihood the fishery is conducted in a manner that does not threaten bycatch species. Should this situation change, or a risk assessment process indicate otherwise, DEH expects that DPI&F would undertake appropriate actions to ensure that bycatch species are not threatened by this fishery.

Protected species and threatened ecological community protection

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

Information requirements

DPI&F advise that along with completing compulsory daily catch and effort logbooks all permit holders are to keep and submit logbook returns related to interactions with species of conservation interest, in the Species of Conservation Interest (SOI) logbooks. DEH concurs with DPI&F that an interaction with endangered, threatened or protected species is extremely unlikely to occur, however should this happen, the interaction will be detailed in the SOI logbook as well as noted in the general fishery logbook.

Collection of this information will be validated by regular observer trips and any interactions reported will be brought to the attention of the HarvestMAC to provide advice for an appropriate management response.

DPI&F are also aware of the obligations under the EPBC Act of fishers for fishers to notify of instances where species protected under the EPBC Act are killed or injured.

Assessment

Data arising from the protected species logbook or observers are unavailable. Actual capture of protected species occurring in the areas of the fishery in the fishing gear appears extremely unlikely. The relatively benign fishing method namely the small size of the dip nets and the fact that they are to be hand held provides every expectation that no protected species will be taken. It is anticipated that the most likely negative interactions would be boat strikes with dugong and marine turtles.

There are no listed ecological communities in the fishery area although two of the permitted areas include declared Ramsar sites. The DJF fishery will be conducted within two Ramsar sites namely the Great Sandy Strait which includes Great Sandy Strait, Tin Can Bay, and Tin Can Inlet (Ramsar Site No. 992) and Moreton Bay (Ramsar Site No. 631). Under the EPBC Act, a person may not take an action that results or will result in a significant impact on the ecological character of a declared Ramsar wetland. Information on the impact of the fishery

in its developmental phase and possible impacts in a fully commercial phase on the significance of the site as Ramsar wetlands is required. DEH considers that fishing activities as currently practiced in this fishery are unlikely to have a significant impact on the ecological character of these Ramsar sites in the next three years. Any significant change to existing practices, which is likely to significantly impact on ecological character of these Ramsar sites, may require approval by the Commonwealth Minister for the Environment and Heritage.

Recommendation 7

Within 3 years, DPI&F to evaluate and report on the impact of the fishing operation in the Great Sandy Strait and in Moreton Bay areas on the RAMSAR sites (Site Nos 992 and 631) on the ecological values considered in listing the areas.

Management response

Interactions with protected species are to be directly managed by controls over the gear permitted to be used and the methods to be employed. While the fishery is to be conducted in areas in which protected species are known to occur, DEH concurs with DPI&F that the combination of the small number of permit holders, the vast geographic area over which the fishery is to be conducted and the benign fishing methods will effectively ensure there are no impacts on protected species.

DEH also believes that irrespective of the low likelihood of significant impacts on protected species there is an ongoing need to ensure all fishers (commercial and recreational) are aware of the potential for adverse impacts on protected species and the need to mitigate against these. A recommendation has been developed to ensure that the risk of impact on protected species is minimised in the longer term.

Recommendation 8

Within 1 year, to support the implementation of the Species of Conservation Interest logbooks, DPI&F to ensure that an education program for commercial fishers, is developed and implemented, to promote the importance of protected species protection and accurate incident reporting.

Conclusion

DEH notes that interactions with protected species in this fishery are likely to be minimal and considers that the fishery is to be conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities. Should this situation change, or a risk assessment process indicate otherwise, DEH expects that appropriate actions will be undertaken to ensure the fishery avoids mortality or injury to these species and avoids or minimises impacts on threatened ecological communities.

In addition, any identified fishery practice that will, or is likely to, significantly impact on ecological character of these Ramsar sites, may require approval by the Commonwealth Minister for the Environment and Heritage.

Minimising ecological impacts of fishing operations

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

Information requirements

No data has been collected in the DJF although there has been a range of work undertaken on the distribution of target species, there is little information on its specific biology and its role in the ecosystem.

DEH is concerned at the lack of information collection and research covering the fisheries impact on the ecosystem and environment generally. However, DEH understands that this lack of information is the case across a range of Australian and International fisheries and until appropriate research techniques and programs are developed and implemented this will continue to be the case. DEH strongly supports research in this area.

Assessment

As in most fisheries using hand held gear such as the dip nets, the potential of the DJF to impact unacceptably and unsustainably on the physical environment generally is considered to be low. The fishing gear generally is not regarded as posing a significant risk to the physical environment.

As a consequence, DPI&F has not conducted a risk assessment of these issues in this fishery.

The level of take in this developmental phase of the fishery is not considered to pose any significant threat to the biological components of the ecosystem (particularly any associated ecological communities or food chains) in which the fishery is to be conducted.

Management response

DPI&F has implemented a range of management measures that will deliberately or co-incidentally minimise the risk of any significant impact of fishing on ecosystems and their components. While management measures were established to protect target species and their habitats, some actions are specifically designed to protect the broader environment.

Impacts on water quality through the discharge of plastic wastes and pollution from vessels are controlled under MARPOL legislation. Operators are required to comply with the legislation and must retain any plastic waste and dispose of it only when the vessel returns to port.

Conclusion

DEH considers that the fishery is conducted in a sufficiently precautionary manner to minimise the impact of fishing operations on the ecosystem generally.

LIST OF ACRONYMS

CFISH	Commercial Fisheries Information System
DEH	Department of the Environment and Heritage
DJF	Queensland Developmental Jellyfish Fishery
DPI&F	Queensland Department of Primary Industries and Fisheries
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
GBRMPA	Great Barrier Reef Marine Park Authority
HarvestMAC	Harvest Fisheries Management Advisory Committee
MAC	Management Advisory Committee
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships
MSAC	Management and Scientific Advisory Committee
QB&FP	Queensland Boating and Fisheries Patrol
QPWS	Queensland Parks and Wildlife Service
SOCI	Species of Conservation Interest
TACC	Total Allowable Commercial Catch
TADCC	Total Allowable Developmental Commercial Catch
WTO	Wildlife Trade Operation
UNCLOS	United Nations Convention on the Law of the Sea