



Australian Government

Department of the Environment and Water Resources

Assessment of the Tasmanian Abalone Fishery

January 2007

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This document is an assessment carried out by the January 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 Water Resources 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 Water Resources or the Australian Government.

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**Assessment of the ecological sustainability of management arrangements for the Tasmanian
Abalone Fishery**

TABLE OF CONTENTS

EXECUTIVE SUMMARY	4
Background.....	4
Conclusion.....	12
PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES. 14	
STOCK STATUS AND RECOVERY	14
<i>Maintain ecologically viable stocks.....</i>	<i>14</i>
Information requirements	14
Assessment	15
Management response.....	16
Conclusion	19
<i>Promote recovery to ecologically viable stock levels.....</i>	<i>19</i>
Conclusion	19
ECOSYSTEM IMPACTS	20
<i>Bycatch protection.....</i>	<i>20</i>
<i>Protected species and threatened ecological community protection.....</i>	<i>20</i>
<i>Minimising ecological impacts of fishing operations</i>	<i>21</i>
Conclusion.....	21
LIST OF ACRONYMS	22

EXECUTIVE SUMMARY

Background

The Tasmanian Abalone Fishery (TAF) was first assessed by the then Australian Government Department of the Environment and Heritage (DEH) in February 2002 under Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in accordance with the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries* (the Guidelines). This assessment was based on the submission provided by the then Tasmanian Department of Primary Industries, Water and Environment in May 2001. The TAF was declared exempt from the export controls of Part 13A of the EPBC Act, which allowed the export of product from the fishery for five years. Interactions with protected species in this fishery were unlikely in the normal course of fishing operations when the fishery was assessed by DEH in 2002 and therefore no accreditation was required for the purposes of Part 13 of the EPBC Act.

As the 2002 accreditation for the TAF expires in February 2007, the Tasmanian Department of Primary Industries and Water (DPIW) has submitted a document for assessment under Parts 13 and 13A of the EPBC Act. The draft document *Reassessment of Ecological Sustainability in the Tasmanian Abalone Fishery* (the submission) was received by the Department of the Environment and Water Resources (DEW) in November 2006. The submission was released for a public comment period that expired on 12 January 2007. No public comments were received. A final submission was received from DPIW in January 2007.

The submission reports on the TAF against the Guidelines. The DEW assessment considers the submission and associated documents.

Table 1: Summary of the TAF

Area	Commonwealth and State waters.
Fishery status	When this fishery was first assessed in 2002, it was considered to be in a stock rebuilding phase. There are indications to suggest that the stocks are rebuilding in some areas of the fishery.
Target Species	Blacklip (<i>Haliotis rubra</i>) and greenlip (<i>Haliotis laevis</i>) abalone.
By-product Species	None.
Gear	Dive fishery (hand collection) using hookah gear.
Season	Unrestricted.
Commercial harvest 2005	2,502.196 tonnes (2379.682 tonnes of blacklip and 122.514 tonnes of greenlip abalone).
Value of commercial harvest 2005	Approximately AU\$40 million (product value).
Recreational harvest	Approximately 56 tonnes (between November 2004 and October 2005).
Commercial licences issued 2005	123 dive licences.
Commercial management arrangements	Input and output controls including: <ul style="list-style-type: none"> • limited entry (a maximum of 125 dive licences); • a total allowable catch (TAC) of 2,502.5 tonnes (allocated across zones); • five management zones (four blacklip zones and one greenlip zone), each with a TAC; • minimum size limits (MSL) for management zones; • mandatory possession of a measuring tool to measure abalone sizes;

	<ul style="list-style-type: none"> • area closures; and • reporting requirements.
Recreational management arrangements	Input and output controls including: <ul style="list-style-type: none"> • daily bag (ten abalone per recreational abalone licence holder) and possession limits; • MSLs; and • area restrictions.
Export	Exported, primarily to Asia.
Bycatch	Bycatch is considered minimal due to the highly selective nature of harvest.
Interaction with Threatened Species	Considered negligible.

The 2002 DEH assessment report of the TAF provided a detailed analysis of the TAF management characteristics. These included fishery area and history, species taken, management structures and harvest control measures, bycatch and protected species interactions and arrangements with other jurisdictions. This 2007 report should be read in conjunction with the 2002 DEH TAF report, which can be found on the DEW website at: <http://www.environment.gov.au/coasts/fisheries/index.html>.

The 2002 DEH assessment of the TAF highlighted certain issues and concerns regarding the fishery and focussed on addressing areas of management where more fundamental changes were required to improve the ecologically sustainable management of the fishery. The key issues DEH considered needed addressing were:

- the development of system-based management objectives and an assessment of the options for associated biological reference, target and limit levels and performance measures;
- continuing the development and maintenance of long-term industry independent monitoring and field sampling of abalone populations;
- the need to strengthen consultative representation to include conservation and broader community interests;
- the need to determine the patterns and scale of local distribution, abundance and productivity within the fishery; and
- the need to undertake periodic reviews of the compliance and enforcement strategy and the levels of take and risk to local sustainability of abalone stocks arising from recreational harvesting.

DEH made 6 recommendations to improve the management of the fishery and address these issues during the period of the fishery's five year export accreditation.

DPIW has made notable progress against several of the key issues raised in the last assessment. These include:

- regular reviews of TAF's management plan, the *Fisheries (Abalone) Rules 2000*, through a consultative process, which includes community and conservation representation;
- reviewing and altering size limits and restrictions on catch (local caps) in order to ensure ecologically sustainable fishing;
- continued monitoring of the take and level of recreational abalone fishing;
- continued monitoring of compliance and enforcement strategies, which involved recent changes to management arrangements including single zone fishing, pre-fishing reporting and overcatch provisions;
- developing and implementing Global Positioning System (GPS) loggers to capture fine-scale data on the activity of abalone divers, to be used in existing length-based models; and
- closure of areas in the fishery as precautionary measures or to facilitate research projects.

Changes to management arrangements for the TAF since 2002 include:

- the development of a new strategic policy document in 2007 for the TAF, including the introduction of environmental, economic and social objectives and performance measures;
- the implementation of a new *Abalone Deed of Agreement* in 2005 between the Tasmanian Government and quota holders;
- Bass Strait blacklip zone created, with an MSL of 114 mm;
- various changes in size limits in both the commercial and recreational fishery;
- various changes in the TAC and catch caps for the commercial fishery;
- the introduction in 2005 of team diving (sharing catch from one quota unit by two divers) and overcatch measures to cover unintentional underestimation of catch weight;
- the prohibition of high-grading and caufing at sea to reduce the likelihood of mortality on non-retained catch; and
- the introduction of cancellation reports and single (blacklip) zone fishing provisions to manage split size limits in-between zones.

DEW acknowledges the sound progress made towards addressing many of the significant issues raised in the 2002 DEH assessment and commitments made in DPIW's 2001 submission. DEW notes that there are still a number of sustainability concerns with the TAF such as: the recent outbreak of the virus, *Ganglioneuritis* in Victoria and its potential impact on wild abalone stocks; the lack of knowledge and research into abalone biology; declining stock levels in certain areas of the fishery; the potential impact of urchin barrens on the fishery; and the level of fishing effort on inshore abalone stocks. DEW also notes that a small number of recommended actions are outstanding from the 2002 DEH assessment of the TAF and are in need of further attention. This is further discussed later in this report.

Overall assessment

The material submitted by DPIW indicates that the TAF operates in accordance with the Guidelines. DEW considers that the TAF is a well managed fishery that is unlikely to have an unacceptable or unsustainable impact on the environment in the short to mid-term.

Recommendations have been developed to ensure that the risk of impact is minimised in the longer term.

Overall, the management arrangements consisting of limited entry, a TAC (allocated across five management zones), MSLs for management zones, mandatory possession of a measuring tool to measure abalone sizes, area closures and reporting requirements, underpinned by a detailed statutory management plan for the TAF suggests that the fishery is being managed in an ecologically sustainable way.

While progress has been made across a range of issues, a number of commitments made in the initial assessment of the fishery in 2002, including a number of recommendations arising from the assessment, do not appear to have been fully implemented by DPIW. These include: considering broader public notification of the potential to input into the assessment process, continuing concern with abalone stocks levels in certain areas of the fishery, and the need to develop proposed system-based management objectives and assessing options for associated biological reference levels and performance measures. While this will not affect the immediate sustainability of the target species, these issues and recommendations need to be addressed for the longer term sustainability of rock lobster stocks.

In light of a number of these concerns, DPIW have advised that the development of a new strategic policy document for the abalone fishery, including the enunciation of environmental, economic and social objectives and performance measures will commence during 2006/07.

While the fishery is relatively well managed, DEW has identified a number of risks and uncertainties that must be managed to ensure their impacts are minimised:

- continue to monitor the spread of the *Ganglioneuritis* virus and any other diseases that may impact on abalone stocks;
- continue to monitor the impact of sea urchin barrens on the abalone fishery and to consider environmental factors when setting the TAC annually;
- conduct research into abalone biology, particularly in reference to reproductive biology and growth, in order to develop meaningful biological performance measures and indicators;
- the need to develop fine-scale monitoring of the level of fishing effort in the fishery and implement management measures as required to minimise the risk of localised depletion of abalone stocks; and
- the development and implementation of performance measures and indicators and a clear timetable for the implementation of corresponding management responses in the event that a performance measure is breached.

Specific recommendations to address these issues have been developed to ensure that the risk of impact is minimised in the longer term. In conjunction with 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. This will ensure the stocks are fished sustainably.

The assessment finds that the fishery is managed in an ecologically sustainable way and its operation is consistent with the objects of Part 13A of the EPBC Act. DEW recommends that the export of species taken in the fishery should be exempt from the export requirements of Part 13A of the EPBC Act, with that exemption to be reviewed in 5 years. DEW considers that the fishery, as managed in accordance with the *Fisheries (Abalone) Rules 2000* is not likely to cause serious or irreversible ecological damage over this period.

As the official fishery area encompasses Commonwealth as well as State waters, consideration under Part 13 of the EPBC Act is required regarding the impact of the fishery on listed threatened species, listed migratory species, cetaceans and listed marine species. While the fishery management plan was not accredited under Part 13 of the EPBC Act in 2002, DEW considers that Part 13 accreditation is important in the unlikely event of an interaction occurring with a protected species in Commonwealth waters. DEW therefore believes it appropriate to consider the *Tasmanian Fisheries (Abalone) Rules 2000* and the *Tasmanian Living Marine Resources Management Act 1995* under Part 13 of the EPBC Act.

A number of protected wildlife species occur in the fishery area including seals, sharks, cetaceans, and marine turtles, however the fishery has little to no interactions with these species. The TAF is a dive fishery with direct and selective hand collection of the target species and has no identified significant adverse impacts on endangered, threatened or protected species, or threatened ecological communities.

In view of the benign method of harvest in the fishery, the very low number of protected species interactions and the management measures in place, DEW considers that the fishery is unlikely to have an unacceptable impact on protected species. DEW recommends that the management regime, operating under the *Fisheries (Abalone) Rules 2000*, be accredited under sections 208A, 222A, 245 and 265 of the EPBC Act. In making this judgement, DEW considers that the fishery to which the regime relates does not, or is not likely to, adversely affect the survival in nature of a listed threatened species or population of that species, or the conservation status of a listed migratory species, cetacean species or listed marine species or a population of any of those species. DEW also considers that the management regime requires that all reasonable steps are taken to avoid the

killing or injuring of protected species, and the level of interaction under current fishing operations is low. On this basis, DEW is satisfied that an action taken by an individual fisher, acting in accordance with the management regime, would not be expected to have a significant impact on a listed threatened species or listed migratory species protected by the EPBC Act.

Based on this assessment, the following recommendations have been made with regards to the management of the fishery, which will be monitored and reviewed as part of the next DEW review of the fishery in five years time.

Recommendations

Recommendation 1: *DPIW to advise DEW of any material change to the TAF management arrangements that could affect the criteria on which EPBC Act decisions are based, within three months of that change being made.*

Recommendation 2:

Reports to be produced and presented to DEW annually, and to include:

- i. information sufficient to allow assessment of the progress of DPIW in implementing the recommendations made in the Assessment of the Tasmanian Abalone Fishery 2007;*
- ii. a description of the status of the fishery and catch and effort information;*
- iii. a statement of the performance of the fishery against objectives, performance indicators and measures once developed; and*
- iv. research undertaken or completed relevant to the fishery.*

Recommendation 3: *Within three years, DPIW, in collaboration with other jurisdictions, to develop and conduct research into abalone biology, particularly in reference to reproductive biology and growth.*

Recommendation 4: *DPIW to continue to develop fine-scale monitoring of the level of fishing effort in the TAF and implement management measures as required to minimise the risk of localised depletion of abalone stocks.*

Recommendation 5: *DPIW to develop and implement performance measures and indicators and a clear timetable for the implementation of corresponding management responses in the event that a performance measure is breached to ensure the ecologically sustainable management of the fishery.*

Recommendation 6: *DPIW to continue to monitor the impact of sea urchin barrens on the abalone fishery. DPIW to consider environmental factors, such as urchin barrens, when setting the TAC annually for the TAF.*

Recommendation 7: *DPIW, in conjunction with Victoria, to continue to actively monitor the spread of the Ganglioneuritis virus and any other diseases that may impact on abalone stocks. Should Ganglioneuritis impact on wild abalone stocks in Tasmania, DPIW to develop further management responses within one year.*

PART I - MANAGEMENT ARRANGEMENTS

The TAF is managed by DPIW under the *Fisheries (Abalone) Rules 2000*, which was made under Part 3 of the *Living Marine Resources Management Act 1995*. The management plan for the fishery is supported by the fishery policy document (The Tasmanian Abalone Fishery Revised Policy Paper, 2000) and subsequent revisions of the TAC, size limits and changes for the 2006 Abalone Quota year. The *Fisheries (Abalone) Rules 2000* continue in force until 31 December 2009.

All of the following documents associated with the management regime of this fishery are publicly available:

- the *Fisheries (Abalone) Rules 2000* (the management plan);
- the Tasmanian Abalone Fishery Revised Policy Paper, 2000;
- the Tasmanian *Living Marine Resources Management Act 1995*; and
- relevant Gazetted notices and licence conditions.

There are a number of other documents, including fishery assessment reports, research reports, scientific literature and discussion papers, which are utilised by DPIW to guide management of the TAF.

Several changes to the management arrangement for the TAF have occurred since the fishery was first assessed by DEH in 2002. These changes are listed in the executive summary of this report. Further amendments to the management arrangements are expected to be determined by DPIW during 2007, as a result of a review of the policy document and fishery-specific objectives for the abalone fishery. Broader ecosystem, social and economic objectives will be considered during this time and performance measures including target reference points will be incorporated into a decision framework, to enhance management of the fishery.

Following recommendations from the Abalone Fishery Advisory Committee meeting in October 2006, there will be no change to the TAC in 2007, with fishery production set at 2502.5 tonnes Statewide. The current catch caps for the fishery were to be reviewed at the end of 2006 with the view of implementing a number of new caps in early 2007.

DEW considers it important that management arrangements remain flexible to ensure timely and appropriate managerial decisions. Because of the importance of the management arrangements and documents referred to above to DEW'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. Therefore, in order to ensure that these decisions remain valid, DEW 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.

DEW is aware that the management plan *Fisheries (Abalone) Rules 2000* will expire in December 2009. It is important for DPIW to notify DEW before the expiration of the current management plan and advise what actions will take place during and after this period. DEW will need to assess the changes to the TAF management arrangements and determine whether the new management regime should be accredited under Parts 13 and 13A of the EPBC Act.

Recommendation 1: *DPIW to advise DEW of any material change to the TAF management arrangements that could affect the criteria on which EPBC Act decisions are based, within three months of that change being made.*

DEW also considers it important that reports be produced and presented to DEW annually in order for the performance of the fishery and progress in implementing the recommendations in this report

and other managerial commitments to be monitored and assessed throughout the life of the declaration (5 years). Annual reports should include a description of the fishery, management arrangements in place, recent catch data for all sectors of the fishery, status of target stock, interactions with protected species, impacts of the fishery on the ecosystem in which it operates, progress in implementing DEW recommendations and research and monitoring outcomes.

Recommendation 2:

Reports to be produced and presented to DEW annually, and to include:

- i. information sufficient to allow assessment of the progress of DPIW in implementing the recommendations made in the DEW Assessment of the Tasmanian Abalone Fishery 2007;*
- ii. a description of the status of the fishery and catch and effort information;*
- iii. a statement of the performance of the fishery against objectives, performance indicators and measures; and*
- iv. research undertaken or completed relevant to the fishery.*

The *Living Marine Resources Management Act 1995* prescribes a consultative process for both the development and review of a management plan. Management and the review process of the fishery incorporates a sound range of consultative mechanisms and a clear commitment to effectively consult with a variety of stakeholders, including community and conservation interests. The process used includes:

- consulting with the relevant Ministerial Fishery Advisory Committees;
- consulting with any appointed fishing body, in this case the Tasmanian Abalone Council;
- a public comment period of at least 30 days;
- providing divers, quota holders and processors with the draft rule amendments;
- publicising to the wider community the release of a draft plan;
- a report submitted to the Minister on issues raised during the public comment period; and
- once approved the management plan is considered by the Standing Committee on Subordinate Legislation, which may disallow all or part of the rules.

Industry participation in the development and management of the fishery continues to be a cornerstone in developing long-term management strategies to ensure the sustainability of the fishery. Industry continues to play an integral role in determining the strategic direction of the fishery in particular the implementation of catch reductions, size limit changes and the ongoing refinement of spatial management measures.

Ongoing stakeholder involvement in the management of the TAF is reliant upon a number of advisory groups, each including industry and conservation/community representatives. In the case of the TAF, the formally constituted fishing body is the Tasmanian Abalone Council.

The Abalone Fishery Advisory Committee (AbFAC) provides advice to the Minister about the management of the fishery. The committee includes representatives from the industry, conservation/community groups, processors, marine police, research scientists, the Department's fishery managers and an independent Chairman. The Abalone Research Advisory Group provides strategic research planning advice to the Tasmanian Aquaculture and Fisheries Institute (TAFI) and the Tasmanian Fisheries Research Advisory Board. This group includes research scientists from TAFI, the Commonwealth Scientific and Industrial Research Organisation, fishery managers, industry and community representatives.

The Recreational Fishery Advisory Committee is the peak recreational fishery advisory body. This Council advises the Minister on all issues related to recreational fishing, including recreational abalone diving.

The Stock Assessment Group is an informal group under the support of TAFI to assist the research scientists in completing the yearly stock assessment for the fishery. This group meets to discuss the data collected and provide their assistance in interpreting relevant data.

DEW considers the level of consultation to be adequate and is confident that DPIW will continue to ensure interested parties are consulted appropriately.

The fishery is currently managed according to the policy document described in the Tasmanian Abalone Fishery Revised Policy Paper, 2000. The objectives and strategies are complementary to the stated resource management and planning objectives described in Schedule 1 of the *Living Marine Resource Management Act 1995*. The objectives of fisheries management for the TAF include:

- maintaining biomass and recruitment;
- sustaining yield and economic return;
- separating the activities of abalone divers from other commercial fisheries;
- access to fish-stocks by non-commercial fishers (recreational and indigenous fishers);
- marine farming interactions;
- environmental interactions;
- enforcement (preventing unauthorised persons from taking, possessing or selling abalone);
- cost recovery and return to the community; and
- maintaining a high level of quality assurance for abalone.

The document also outlines a series of performance indicators relating to catch per unit effort (CPUE), egg production and size composition. While specific trigger points have not been established, catch cap triggers are present within the fishery. An assessment of the effectiveness of these measures is included in Part II of this report.

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

- limited entry (125 dive licences);
- a TAC of 2,502.5 tonnes (allocated across zones);
- five management zones (four blacklip zones and one greenlip zone), each with a TAC;
- MSLs for management zones (seven for blacklip abalone and three for greenlip abalone):
 - Northern blacklip zone – 127 mm and 132 mm;
 - Bass Strait blacklip zone – 114 mm;
 - Bass Strait blacklip zone (north coast) – 110 mm;
 - East blacklip zone – 138 mm;
 - West blacklip zone – 140 mm;
 - West blacklip zone (between the Wild Wave and Arthur Rivers) – 136 mm;
 - State waters (including Furneaux and the north-west) for greenlip – 145 mm;
 - King Island for greenlip – 150 mm; and
 - Perkin's Bay for greenlip – 132 mm.
- mandatory possession of a measuring tool to measure abalone sizes;
- area closures; and
- rigorous reporting requirements.

The catch management and reporting system in place for commercial fishers and processors is comprehensive and provides an auditable documentation system of key steps in the landing, transportation and receipt of fish. This system is designed to ensure the integrity of the quota system, adherence to size limit regulations and the provision of accurate and representative catch and effort data. This is further discussed in Part II of this report.

Compliance with the fisheries rules is managed by the fisheries monitoring and quota audit sections within DPIW and the Tasmania police. Recent changes to facilitate overcatch and dive teams involved an extensive assessment of the compliance and enforcement implications of the proposed amendments. Representation of the marine police on the AbFAC provides an opportunity to table and discuss issues with industry in a constructive forum. Recent changes to the management plan such as single zone fishing and prior fishing zone and size reporting have been introduced to address certain compliance concerns. Penalties associated with breaches of the reporting requirements, provide a significant deterrent to non-compliance with the management system. In addition, management arrangements require that vessels participating in certain areas of the fishery need to have a Vessel Monitoring System fitted and operational during the season.

The TAF is assessed annually through the preparation of a fishery assessment report. The assessment is conducted by TAFI and is based on the fishery-dependent and fishery-independent data collected. The fishery is evaluated against the objectives and performance indicators specified in the Tasmanian Abalone Fishery Revised Policy Paper, 2000 and catch cap triggers set by DPIW. The assessment also provides other analyses including ecosystem impacts and interactions, spatial distribution of catch and effort and structure of catches including undersize abalone and discards. In addition, the management plan for the fishery is reviewed every five years, while the objectives, performance measures and reference points contained in the policy document are to be reviewed during 2007.

Fishery-dependent data relating to target species is collected on a regular basis in the fishery. No byproduct species are permitted to be taken in the TAF and impacts of the fishery on bycatch and protected species are considered negligible due to the benign method of harvest (hand collection). Some fishery independent information is also collected. Discussion of the information collection system can be found in Part II of this report.

An analysis of the fishery's capacity for assessing, monitoring and avoiding, remedying or mitigating and 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.

DEW is satisfied that the current management arrangements are consistent with all relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch and bycatch action strategies developed under that policy. The *Living Marine Resources Management Act 1995* contains mechanisms that allow for amendments to management practices so that they comply with any future plans of these types.

Conclusion

The management regime for the TAF is developed through a transparent and consultative process. The management arrangements are strategic, underpinned by objectives and performance criteria by which the level of harvest in the fishery can be controlled and which allows the effectiveness of the management arrangements to be measured, enforced and reviewed.

DEW is satisfied with the measures in place for periodic review of the fishery, provided a review of the Tasmanian Abalone Fishery Revised Policy Paper, 2000 (including objectives, performance measures and reference points) is undertaken during 2007, as committed to by DPIW in their

submission. This will allow new information provided by fishery-dependent data and numerous research and associated Fisheries Research and Development Corporation (FRDC) projects to be incorporated into management arrangements, to enhance the ecologically sustainable management of this fishery.

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

Fishery dependent data in the TAF is obtained through a rigorous set of reporting requirements to protect the integrity of the quota system, which applies to both fishers and processors and includes a range of telephone reports and log returns. This compliments a time series of catch and effort data that extends back unbroken to the commencement of the fishery.

The increasing complexity of the spatial management strategies adopted in the fishery has been reflected in the compliance and monitoring systems. The catch management and reporting system is designed to ensure the integrity of the quota system, adherence to size limit regulations and the provision of accurate and representative catch and effort data. Divers and processors must comply with reporting requirements as well as restrictions on vessel movements and fishing activities in parts of the fishery. This system allows the tracking of abalone and verification of data by cross-referencing reports at different stages in the system.

Divers collect data on fishing effort as part of the logbook system. The current system has a separate logbook for each fishery zone. Two additional logbooks were introduced in 2005 as a result of the review of the management plan to record team diving and transfer of excess catch between divers. DPIW indicate that the changes in the management plan that legitimised the practice of share or team diving has enhanced the integrity of catch and effort data.

The relatively small number of buyers/processors (32 in 2006) has also assisted monitoring the fishery post harvest. Processors must provide monthly reports on the form, origin and amount of abalone processed, providing additional capacity to cross-reference catch and production figures.

As no byproduct species are taken in the TAF and impacts to bycatch and protected species are considered negligible due to the benign method of harvest, abalone fishers are not required to record or report on byproduct, bycatch and protected species in their logbooks.

Fishery independent data collection in the TAF is mainly limited to research, including several FRDC projects and monitoring. These FRDC projects have recently been completed or are currently underway. A quantity of commercial catch sampling size-composition data is also collected by TAFI research staff.

Fishery-independent sampling of abalone density and size structure has been undertaken by an FRDC project (project 2001/074), linking fishery dependent and fishery independent assessments. The project identified several weaknesses in fishery independent abalone density surveys, including the cost involved and the highly unpredictable temporal variation in fishing effort at certain sample sites. As a result, a plan has been developed to undertake fishery independent length frequency

sampling within the eastern blacklip zone, however this will be expanded to other regions of the fishery as resources become available. Surveys of selected sites occurred in 2005 and 2006 and will be ongoing. Data from these surveys will provide a time-series to identify changes in stock structure, particularly the proportion of new recruits available to the fishery and provide a basis for validation for length-based modelling of abalone dynamics.

Assessment

A formal assessment of the fishery occurs annually through the preparation of a fishery assessment report by TAFI. The assessment uses all the data described in the previous section to provide an assessment of the fishery evaluated against the objectives, performance indicators and trigger points specified in the Tasmanian Abalone Fishery Revised Policy Paper, 2000. The performance measures and trigger limits against which the fishery is assessed relate to CPUE, egg production and size composition.

At the end of 2005, annual landings comprised 2379.682 tonnes of blacklip and 122.514 tonnes of greenlip, from a TAC of 2502.5 tonnes. While there were two zones (greenlip and western blacklip) in which the landings were over the area TAC, the whole TAC for the fishery was not caught. DPIW indicated that the amount of run-over was not considered to pose a concern overall, as the benefit is in retaining all fish above the size limit and no loss through discarding. This was anticipated due to the new overcatch provisions introduced into the fishery.

When the fishery was first assessed by DEH in 2002, a recommendation was developed for DPIW to assess options for biological reference, target and limit levels and performance measures associated with proposed system-based management objectives to ensure effective management of the TAF.

The development of biological reference points has been limited by the paucity of knowledge of specific components of abalone biology, specifically reproductive biology and growth. While substantial research effort has been applied to describing growth over the past 20 years, relatively few attempts have been made to understand the reproductive biology of abalone in a wild fisheries context, with much of the research and knowledge gained directed towards optimising aquaculture practices.

DEW considers that research into abalone biology should be conducted in collaboration with other jurisdictions for effective management of the stock, particularly as there are concerns with stock levels in certain zones of the fishery. Once information becomes available, DPIW should use it to develop biological performance measures and indicators as required under **Recommendation 5** to ensure the ecologically sustainable management of the fishery.

Recommendation 3: *Within three years, DPIW, in collaboration with other jurisdictions, to develop and conduct research into abalone biology, particularly in reference to reproductive biology and growth.*

While the total production in the fishery appears to be stable, there are concerns over parts of the fishery where catch rates have remained historically high for several years and catch rates are showing some signs of decline. In particular, there are concerns for stock levels in the Western zone, which are believed to be declining since being fished at historically high levels of catch since 2000.

While DPIW have suggested that the 2006 catch from this region (particularly the south west) be capped to prevent greater rates of depletion than previous catch rates, commercial fishers who fish in the western zone have expressed varying degrees of concern at the level of stock depletion there. In addition, there have been reports of selective fishing in the western zone, where divers were

selectively fishing for smaller abalone, and therefore taking the TAC from a fraction of the fishable biomass.

The risk that current levels of fishing in the western zone are becoming unsustainable is increasing. The irregular nature of fishing in the western zone invalidates the assumptions upon which the validity of catch rates as an indicator of abundance is predicated and stock levels are likely to be declining at faster rates than trends indicate. DPIW has therefore recommended that a committee be set the task of developing performance measures and a harvest strategy that will initiate management action. DEW supports this approach and considers that research, which has predominantly concentrated on the eastern zone, be expanded to other zones, where appropriate, in order to inform decision-making processes.

While the western zone contains sustainability concerns, other areas of the fishery are also displaying declining stock levels. Most of the Bass Strait zone stocks are reportedly depleted and it seems likely that the level of fishing in this area is unsustainable. Stocks are also reported depleted on the central north coast and the Furneaux Group. While the proposed reduction of the size limit to 110 mm on the central north coast should increase the productivity of this part of the fishery, the extent of the smaller populations and their likely yield are unknown. In addition, the current TAC for the Bass Strait zone was estimated based on catch rates from the then stunted fishery operating in the Bass Strait between 1989 and 1995, where fishery operations only occurred a few weeks every two years. Therefore, the stunted fisheries in this zone, on which the TAC is now based on, were probably not good indicators of potential yield for a fishery that is now operating year-round. Consequently, stock levels in this zone have fallen very quickly since 2003, when the Bass Strait blacklip abalone zone was established, with an initial MSL of 114mm.

The northern zone has been primarily dependent on the north-west and King Island for most of its catch, and there were significant problems with stock levels in both regions. King Island blacklip populations on shallower reefs have been extensively depleted, while deeper water populations that were reported abundant are difficult to access with standard air supplies. Current levels of catch are not high in a historical context, and while serial depletion has occurred, a transfer of effort to the deeper reef/water populations may enable recovery in shallower water while maintaining catch levels. However, the majority of the blacklip catch has been taken by visiting mothership-based divers who have used standard air supplies and any future redistribution of effort and catch to deeper waters will be dependent upon the willingness and ability of these divers to work in deeper water.

As there is current evidence to determine that management measures are required to increase abalone stock levels in certain areas of the fishery, DEW recommends that DPIW implement appropriate management measures in order to ensure the ecologically sustainable management of the fishery. This is particularly important in the western and Bass Strait zones and inshore areas.

Recommendation 4: *DPIW to continue to develop fine-scale monitoring of the level of fishing effort in the TAF and implement management measures as required to minimise the risk of localised depletion of abalone stocks.*

Management response

The current TAF management regime aims to maintain ecologically viable stock levels through a range of input and output controls. These measures were outlined in Table 1 and Part I of this report.

A TAFI based project funded by FRDC (2006/029) to develop electronic data capture techniques for obtaining fishery dependent data will test spatial performance indices being developed by TAFI.

A key issue with CPUE data is not that it is a poor estimate of stock abundance, but that in the initial stages of decline or recovery, CPUE does not capture changes in diver behaviour. Such changes usually involve local shifts in the area fished, the amount of reef covered per hour, with only small or negligible changes in the catch taken per unit time. Spatial performance indices generated from geographic information system tools using GPS data should enable detection of diver behaviour prior to changes becoming apparent in the CPUE data. This project will run from 2006 to 2009.

DEW highlights the importance for DPIW to develop and implement performance measures and indicators, as proposed through the development of the new strategic policy document for the abalone fishery.

Recommendation 5: *DPIW to develop and implement performance measures and indicators and a clear timetable for the implementation of corresponding management responses in the event that a performance measure is breached to ensure the ecologically sustainable management of the fishery.*

Potential threats to the abalone and rock lobster fisheries through the formation of urchin barrens of the long spined sea urchin (*Centrostephanus rodgersii*) in eastern Tasmania have been reported in a recent FRDC project (FRDC 2001/044). The urchin is able to overgraze and form 'barren' habitats that are unable to support commercial abalone, rock lobster and scalefish fisheries. The species has spread along the full extent of the east coast where barrens are steadily increasing and now occurs on the south and west coasts.

It is clear that extensive *C. rodgersii* barren habitat in Tasmania is unable to support abalone at levels suitable for recreational or commercial harvesting. The ultimate impact of the incursion of *C. rodgersii* into Tasmania on the abalone fishery will depend on the extent to which associated barren habitats develop, and on the spatial overlap of barren habitats with preferred areas of fishing. At this stage it is not possible to predict the expansion of barren habitats, although the extent of incipient barrens that was observed, particularly on boulder substratum, suggests that further expansion of extensive barrens is likely. Given these considerations, the project investigators suggested that management measures to limit the spread of *C. rodgersii* barrens in Tasmania are warranted. DEW considers that environmental factors, such as the threat from urchin barrens, should be considered when setting the TAC each year.

Recommendation 6: *DPIW to continue to monitor the impact of sea urchin barrens on the abalone fishery. DPIW to consider environmental factors, such as urchin barrens, when setting the TAC annually for the TAF.*

Diseases and viruses have recently been reported as a potential threat to abalone stocks in the TAF. Following an outbreak in Victoria of the herpes like virus, *Ganglioneuritis*, DPIW developed a contingency plan in response to the Victorian situation. A decision trigger in this contingency plan was the appearance of wild abalone infected with *Ganglioneuritis* outside of the current Victorian control area. While this disease has not been presently found in any Tasmanian abalone, as a precautionary measure, the part of the Tasmanian fishery closest to Victoria has been closed to fishing to allow for analysis of further testing in Victoria to determine the extent of the disease.

After consultation with the Tasmanian Abalone Council, DPIW approved a three-month closure to commercial and recreational abalone fishing in the vicinity of the northern Bass Strait Islands from 16 August 2006 until 16 November 2006. This closure has now been extended until 28 February 2007. In addition to closing this part of the fishery, an Emergency Order has been issued that will prohibit any vessel that has been used to take abalone in Victoria during 2006 from being used to take abalone in the Tasmanian fishery for the same period as the closure. DPIW will seek to

conduct sampling of abalone in those Tasmanian waters closed to fishing. It should be noted that the above measures represent only a partial closure of the Bass Strait zone, it is considered that sufficient areas remain open for the remainder of the Bass Strait zone TAC to be caught this year.

DEW commends DPIW's efforts in managing this potential threat, but considers that ongoing monitoring is required to ensure that Tasmanian abalone stocks are not impacted by the spread of this virus. Should reports highlight that the virus is affecting wild Tasmanian abalone stocks, DPIW must have management responses in place to reduce further spread of the disease.

Recommendation 7: *DPIW, in conjunction with Victoria, to continue to actively monitor the spread of the Ganglioneuritis virus and any other diseases that may impact on abalone stocks. Should Ganglioneuritis impact on wild abalone stocks in Tasmania, DPIW to develop further management responses within one year.*

Potential removals for the TAF include direct harvest by this fishery, recreational and indigenous harvest and mortality from discarding. No byproduct species are permitted to be taken in the TAF. In addition, no other fishers are permitted to harvest abalone unless they have an abalone dive licence or quota.

Currently there is no formal resource sharing arrangements between the commercial and recreational sectors. A joint commercial and recreational working group was established in 2005 to progress issues between sectors such as size limit changes and resource sharing.

The numbers of recreational abalone licences issued has increased steadily since the introduction of the present recreational licensing system in 1995, with 10,100 persons licensed for abalone during 2004/05. This represents increases of over 140% for abalone since 1995. Results of a survey of recreational fishing activities between November 2004 and October 2005 determined the total catch of recreational abalone was estimated to be 56 tonnes.

When the fishery was first assessed by DEH in 2002, there were concerns that effort was not evenly distributed and there was a potential for localised adverse impacts on areas that were particularly accessible. Consequently, a recommendation was developed by DEH to undertake periodic reviews of the extent of the take and level of recreational abalone fishing and refine management measures if considered necessary.

There is an ongoing commitment by DPIW to conduct bi-annual assessment of the recreational fishery. In addition to this review, Government, industry and the recreational sector have supported the principle of formal resource sharing arrangements for the fishery. Currently the catch from the recreational and indigenous sectors is estimated to be less than 3% of the commercial TAC.

Compared with the commercial catch, the recreational catch may seem insignificant, yet because it is taken mostly from the more accessible parts of the coast, and often from areas of the eastern zone which have been heavily fished by the commercial fishery, it may cause localised depletion in those areas. In light of the increasing level of recreational fishing and pressure on inshore stocks, DEW considers that a resource sharing framework allocating explicit shares between the commercial and recreational sectors be developed and implemented as proposed in the DPIW submission. The framework should ease pressure on exploited areas and reduce competition between the two sectors. The development of a formal resource sharing arrangement may also provide an opportunity to broaden the representation to include conservation and community groups, as well as ecotourism and charter operators.

Conclusion

DEW is satisfied that the information collection system and management arrangements are generally sufficient to ensure that the fishery is conducted at catch levels that maintain ecologically viable stock levels with acceptable levels of probability provided a review of the Tasmanian Abalone Fishery Revised Policy Paper, 2000 (including objectives, performance measures and reference points) is undertaken during 2007.

The major concern with the fishery is the uncertainty with abalone stock levels in certain parts of the fishery. In light of this, DEW has made a specific recommendation (**Recommendation 4**) for DPIW to develop fine-scale monitoring of the level of fishing effort and implement management measures to minimise the risk of localised depletion of abalone stocks.

DEW considers there is scope to further refine some of the existing information collection, assessment and management responses and in addition to **Recommendation 4**, 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’*

At the time of the last assessment in 2002, there were some indications that abalone stock levels were rebuilding slightly after previous years of high fishing pressure in certain areas, particularly the eastern zone. While there has currently been three years of stable total production in the fishery, concern remains over parts of the fishery where catch had remained historically high for a number of years and is now showing some signs of decline. In response to these concerns a number of revised and new catch caps will be imposed to either restrict the capacity for catch to increase or facilitate a reduction.

The current policy document includes assessment of CPUE changes, estimates of egg production, a relative measure based on size/age distributions and maturity and size composition in assessment of stock status. The primary recovery mechanism is catch limits, with size limits varied according to localised conditions and growth rates.

The scale of effective action for localised populations is critical and is addressed through **Recommendation 4**. Current mechanisms allow catch-capping, seasonal limits or closure at block and sub-block level, and are capable of refinement as management requirements are developed.

Conclusion

While there are some concerns with stock levels in certain parts of the fishery, DPIW is committed to addressing this issue and is already taking proactive steps in some areas. In addition, DEW has developed a recommendation for DPIW to develop fine-scale monitoring of the level of fishing effort and implement management measures to minimise the risk of localised depletion of abalone stocks.

The development of a strategic policy document in 2007 for the abalone fishery, including the enunciation of environmental, economic and social objectives and performance measures, should assist in ensuring the fishery is managed in an ecologically sustainable way.

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'*

Due to the highly selective nature of harvesting in the TAF, there is no significant bycatch reported in this fishery, other than the unavoidable removal of encrusting and boring organisms and commensal species with harvested animals. The fishery is exclusively based on direct and selective hand collection of target species, with no retained catch other than abalone reported. There is minimal direct disturbance to the substrate.

A formal bycatch risk assessment for the TAF is not warranted at this stage due to the highly selective fishing techniques employed by fishers. For these reasons, there are no threat abatement plans, recovery plans or bycatch reduction strategies relevant to the fishery. DEW does not consider that specific bycatch minimisation measures are necessary for the fishery at this stage.

Conclusion

DEW considers that there is a high likelihood the fishery is conducted in a manner which clearly meets this objective and does not threaten bycatch species. Should this situation change, DEW expects DPIW would undertake appropriate actions to ensure that bycatch species are not threatened by the 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'*

No interactions with endangered, threatened or protected species have been reported in the TAF. Certain protected species could however occur in the area of the fishery, either temporarily or permanently. These may include: cetaceans, sharks, syngnathids, sea snakes and possibly marine turtles.

When the fishery was first assessed by DEH in 2002 no accreditation was required for the purposes of Part 13 of the EPBC Act as interactions with protected species in the TAF were highly unlikely in the normal course of fishing operations. However, DEW considers that the TAF should be accredited under Part 13 of the EPBC Act in the unlikely event that an interaction does occur (refer to the overall assessment section of this report for further details).

The TAF is a dive fishery with direct and selective hand collection of the target species. There is no retained catch other than abalone reported and there is minimal direct disturbance to substrate. The fishery is considered to be one in which there are no identified significant adverse impacts on endangered, threatened or protected species or threatened ecological communities. The management framework is such that if developing impacts were identified, it should be possible to address them in a timely manner.

The method of fishing in the TAF has meant that interaction with protected species is most unlikely and has not warranted a compulsory reporting forum. No listed ecological communities are found in the fishery area.

Conclusion

DEW notes that interactions with protected species in the TAF are negligible and considers that 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. Should this situation change, or a risk assessment process indicate otherwise, DEW 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.

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'*

There still remains little information on the ecosystem effects of abalone fishing. A current post-doctoral study at TAFI is looking at the role of abalone in the algal community of rock reefs in Tasmania. As stated previously, the fishing method used in this fishery (highly selective hand collection) results in minimal physical damage to the reef. There is the possibility of impacts from anchoring and vessel operation, but other impacts, including discharges and transposition of hull organisms are unlikely, on current information, to pose threats. The management system is considered to be capable of dealing with issues as they are identified.

As previously mentioned in this report, potential threats to certain Tasmanian fisheries through the formation of urchin barrens of the *C. rodgersii* in eastern Tasmania have been reported in a recent FRDC project (FRDC 2001/044). The project shows that the density of abalone is significantly lower on barren habitats than in adjacent macroalgal beds at the same depth and on the same substratum type. It is concluded that abalone and rock lobster are unlikely to occur in commercial quantity on *C. rodgersii* barrens.

A workshop involving DPIW was convened in December 2005 to consider knowledge, research and management of *C. rodgersii*. Recommendations from the workshop have been progressed and a research proposal has recently been submitted to FRDC for funding consideration. The planned outcomes of the project are to provide solid scientific evaluation of management options to assist managers in the development of policy and cost effective measures to mitigate the effect of sea urchins overgrazing in Tasmania. In addition, an FRDC project (FRDC 2030/050) on linking habitat mapping with fishery assessments in key commercial fishery grounds has been completed. One of the outcomes was the information on the distribution and extent of urchin barrens providing an assessment of the reduction (loss) of productive abalone habitat and a reference point in which to monitor future patterns of extent and distribution in north-east Tasmania.

Given these considerations, the project investigators suggested that management measures to limit the spread of *C. rodgersii* barrens in Tasmania are warranted. DEW has developed a specific recommendation (**Recommendation 6**) to address the threat of urchin barren habitats on the TAF.

Conclusion

DEW is satisfied that the fishery is conducted in a manner that minimises the impact of fishing operations on the ecosystem generally. Should this situation change, or a risk assessment process indicate otherwise, DEW expects that appropriate actions will be undertaken to ensure the fishery minimises its impact on the ecosystem. A recommendation has been developed to ensure that the spread of urchin barrens on the marine environment generally is minimised in the longer term.

LIST OF ACRONYMS

AbFAC	Abalone Fishery Advisory Committee
CPUE	Catch per Unit Effort
DEH	Department of the Environment and Heritage
DEW	Department of the Environment and Water Resources
DPIW	Tasmanian Department of Primary Industries and Water
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FRDC	Fisheries Research and Development Corporation
GPS	Global Positioning System
MSL	Minimum Size Limit
TAC	Total Allowable Catch
TAF	Tasmanian Abalone Fishery
TAFI	Tasmanian Aquaculture and Fisheries Institute