



Australian Government

Department of the Environment and Heritage

Assessment of the
New South Wales Abalone Fishery

December 2005

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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 NSW
Abalone Fishery**

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EXECUTIVE SUMMARY

Background

The New South Wales (NSW) Department of Primary Industries (DPI) has submitted a document for assessment under Parts 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). These documents were prepared under the NSW legislated Environmental Impact Assessment (EIA) process. The EIA process for the Abalone Fishery was undertaken in conjunction with the EPBC Act assessment and is yet to be finalised. The NSW DPI draft document *Abalone Fishery: Environmental Impact Statement (EIS) Volumes 1, 2 & 3*, containing a draft Fishery Management Strategy (FMS), was received by the Department of the Environment and Heritage (DEH) in September 2005. The submission was released for a thirty-day public comment period that expired on 14 October 2005. Nine public comments were received. DEH also provided comments to NSW DPI on the submission. NSW DPI submitted a draft Preferred Strategy Report (PSR) to DEH in November 2005. For the purposes of the EPBC Act assessment, the EIS, together with the draft FMS and PSR, constitute the submission from NSW DPI. The final FMS is yet to be determined and made available by the NSW Minister for Primary Industries.

The DEH assessment against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries* has considered the submission, associated documents, public comments and NSW DPI's response to the comments through the draft PSR.

Table 1: Summary of the NSW Abalone Fishery

Area	Coastal rocky reefs within NSW and adjacent Commonwealth waters out to the limit of the Australian Exclusive Economic Zone (EEZ).
Fishery status	Fully fished.
Target Species	Blacklip abalone (<i>Haliotis rubra</i>).
Byproduct Species	No byproduct species permitted.
Gear	Hand collection with the assistance of Self Contained Underwater Breathing Apparatus (SCUBA) or hookah apparatus.
Season	Year round.
Commercial harvest 2003/04	238 tonnes.
Value of commercial harvest 2003/04	~\$AUD 7.854 million.
Recreational harvest	~50 tonnes (from 1997 recreational catch survey).
Commercial licences issued	48 shareholders; 42 hold enough shares to be able to hold an entitlement to fish.
Management arrangements	Input and output controls including: <ul style="list-style-type: none"> • limited entry; • annually reviewed Total Allowable Commercial Catch (TACC); • Minimum Legal Size (MLS) of 115 mm for commercial and recreational harvest; • possession limits for recreational harvesters (2 abalone per person per bag); and • area closures including marine parks, aquatic reserves and closures to taking of abalone due to <i>Perkinsus</i> disease.
Export	Export mainly to Asian markets.

Bycatch	Minimal, restricted to commensal organisms.
Interaction with Threatened Species	No interactions reported.

The NSW Abalone Fishery extends from the NSW coastline into Commonwealth waters out to the outer edge of the EEZ. NSW has management jurisdiction for abalone from the low water mark out to 200 nautical miles from the coast under an Offshore Constitutional Agreement between the NSW and Commonwealth Governments. However, most fishing effort occurs within State waters on coastal rocky reefs from the intertidal zone to depths of 40 metres. The fishery is divided into 6 geographical regions for the purposes of stock assessment.

Blacklip abalone is the sole target species of the NSW Abalone Fishery. There are no byproduct species allowed in the fishery. Blacklip abalone populations are contiguous throughout southern Australian waters from Coffs Harbour in NSW to Rottnest Island in Western Australia and inhabit rock crevices and sheltered rocky reefs generally in shallow waters up to 40 metres in depth. In NSW, abalone are most abundant on the far south coast and become progressively less abundant and patchy in areas north of Sydney. Abalone can attain a size of 200 mm and live for >20 years. Abalone are dioecious and spawn over a prolonged season from early spring to autumn. Eggs are fertilised in the water column and hatch after ~ 24 hours. Larvae settle to coastal reefs after about a week and dispersal from spawning adults appears to be limited (McShane, 1991). Abalone reach 90-100 mm within 4-5 years, where ~50 % are mature. Individuals reach the MLS of 115 mm in a further two years, whereupon they become available to the fishery. Growth rate appears to be related to environmental conditions, such as the availability of food and exposure (Day and Fleming, 1992) and in some areas, individual abalone may not attain the MLS. Movement of abalone is typically limited and there can be considerable differences in rates of growth between abalone aggregations over a range of spatial scales.

Abalone are generally at risk of overexploitation and localised depletion due to their limited dispersal abilities, patchy distribution, high value, ease of collection, slow recovery from overfishing and limited information on biological and spatial distribution available for management. The species therefore requires strict management controls to ensure the sustainability of harvests.

The NSW Abalone Fishery is one of the State's most valuable fisheries, however it contributes only about 5 % of the national abalone exports. The value of the fishery peaked in 2000 at \$AUD 15.2 million, however value of production has declined in subsequent years and was estimated at \$AUD 7.85 million in 2003 due to lower TACCs, declines in the target stock, strengthening Australian dollar and a weakened Asian economy.

Abalone fishing in NSW commenced in the 1950's with official records commencing in 1958. The industry grew throughout the 1960's and landings reached 200-400 tonnes. Expansion continued in the 1970's when reported landings briefly exceeded 1000 tonnes. In 1980, the NSW Abalone fishery became a limited entry fishery with 59 operators. Numbers decreased through a '2 for 1' buy-back scheme. The current number of operators entitled to fish in the NSW Abalone Fishery is 42. Some abalone divers hold endorsements to other fisheries (mainly the NSW Sea Urchin and Turban Shell Fishery), but most specialise in collecting abalone.

A MLS was introduced in 1973 and increased several times in subsequent years until set at the current limit of 115 mm in 1987. Quota management was introduced in 1989 to further stabilise catches. There has been a decreasing trend in annual TACCs in recent years, with the TACC set at 281 t for 2003/04, 206 t for 2004/05 and 130 t for the current 2005/06 fishing season.

Perkinsus olseni is a protistan parasite that infects abalone producing abscesses in the flesh or, in severe infections, causing death. NSW DPI first detected abalone heavily infected with *Perkinsus* in

1992 in Region 1 of the fishery. The infection spread, apparently causing mass mortality of stock from Sydney to Newcastle and south to Wollongong and Kiama by 1995. By 2002 the infection had spread to Jervis Bay and Port Stephens with reductions of >90% in some abalone populations. Management responses at the time included a series of fishing closures from The Entrance to Kiama. These closures extended to Port Stephens and Jervis Bay in 2002 resulting in a substantial portion of Region 1 of the fishery being closed to commercial and recreational abalone harvesting. These closures are still in place, however the draft FMS proposes the reopening of a number of the reef sites, despite no indication of clear improvement in the stocks of these areas.

Abalone are collected by hand, with the aid of a tool called an abalone iron, by divers using SCUBA or hookah underwater breathing apparatus. Divers typically operate from small boats less than six metres in length and operate year round, depending on weather.

The NSW Abalone Fishery is managed through input and output controls. The fishery is a limited entry, share managed fishery with 48 shareholders as of February 2005. Of these, 42 hold the minimum 70 shares required to fish for abalone. The remaining shareholders may transfer their quota to another shareholder to enable their quota to be fished. Output controls include a TACC, set annually and allocated to shareholders in proportion to their shareholding. A MLS of 115 mm is in place. The MLS is estimated to protect ~95 % of the abalone population and ~66 % of the mature abalone population from commercial take. It also allows the majority of abalone in the population at least two years of spawning before becoming available to commercial harvest.

Apart from the abovementioned *Perkinsus* driven closures in Region 1 of the fishery, abalone harvesting is precluded from a range of marine parks and aquatic reserves in NSW.

Due to the highly selective hand collection of abalone, bycatch is limited to the commensal species that live on abalone shells, such as limpets, algae and other organisms. Interactions with protected species are infrequently reported and appear to be insignificant in terms of effects. These interactions are assessed under Principle Two of this report.

There is no take of abalone from other NSW fisheries. The take of abalone in NSW by recreational and Indigenous fishers is limited by the MLS of 115 mm and a bag and possession limit of two abalone per individual. In addition, the use of underwater breathing apparatus by recreational fishers to collect abalone is prohibited. Indigenous fishers may take more than the recreational bag limit for traditional cultural purposes through the issue of special permits; two special permits were issued in 2003. Estimates of the annual take by the recreational and Indigenous sectors vary and range from 18 t to 52 t, representing 5.5 % to 16 % of the commercial catch at the time of estimation.

Illegal fishing of abalone is a considerable threat to the economic viability and sustainability of the fishery. Illegal take can take a number of forms, such as commercial divers exceeding their quota, recreational fishers exceeding their bag limit, breaches of the MLS, catches in closed areas and catches taken for sale by those without an endorsement to do so. The biggest problem is thought to come from those persons without quota operating on a commercial scale. The most recent estimate of illegal take in NSW is in the order of 40 to 60 t, or between 20 and 30 % of the 2004/05 TACC.

The NSW Abalone Fishery is managed under the NSW *Abalone Share Management Plan 2000*, which is a statutory plan in force under the NSW *Fisheries Management Act 1994* and NSW *Fisheries Management (General) Regulations 2002*.

In addition the NSW Government requires that all fishing activities are managed in an environmentally sustainable manner. Accordingly, under the NSW *Environmental Assessment and Planning Act 1979* (EA&P Act), an EIS must be prepared for the fishery, comprising a draft FMS and an environmental assessment of the draft strategy and the activities conducted in relation to the Abalone Fishery. In September 2005, an EIS for the NSW Abalone fishery was released for a thirty day public comment period.

Overall assessment

The material submitted by NSW DPI indicates that the management arrangements for the NSW Abalone Fishery meet most of the requirements of the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. While the fishery overall is relatively well managed, DEH has identified a number of risks under existing management arrangements that must be managed to ensure that their impacts are minimised:

- substantial declines in catch and available stocks in recent years;
- uncertainty with stock status across the fishery;
- no definitive stock recovery or rebuilding strategies in place despite evidence of declining stocks;
- significant threat of localised or serial depletion and no specific strategies in place to mitigate these threats;
- no evident risk assessment or other precautionary strategies in place to assess the impacts of proposed restocking programs; and
- absence of appropriate performance indicators and trigger points to monitor abalone catches at a regional scale.

DEH understands that the FMS and PSR currently being finalised under NSW's EIA process for the Abalone Fishery may address these issues to further enhance the ecologically sustainable management of the fishery. DEH considers that under existing management arrangements the Abalone Fishery is a relatively well managed fishery and is unlikely to have an unacceptable or unsustainable impact on the environment in the short term. The existing management regime of TACs and other output and input controls, sound stock assessment process, performance criteria prescribed under a statutory management plan and relatively benign mode of fishing operations suggests that the fishery is being managed in an ecologically sustainable way and is working to address existing problems and minimise environmental risks.

DEH's assessment finds that the operation of the fishery is generally consistent with the objects of Part 13A of the EPBC Act. Given the management arrangements already in place and the intent to introduce further measures in the final FMS once the current EIA process for the fishery is completed, 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.

However, given the risks and deficiencies identified above and the pending finalisation of the EIA process for the fishery, DEH recommends that the fishery be declared an approved Wildlife Trade Operation (WTO) for a period of 12 months. Specifically, the WTO declaration would allow the export of product from the fishery for a period of 12 months during which time DEH would expect these deficiencies to be addressed through management actions as required in the WTO conditions outlined below to ensure the ongoing sustainability of the fishery in the medium to long term.

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.

Protected species occurring in the fishery area include grey nurse sharks, marine turtles, seals and seabirds, however the fishery has no recorded interactions with these species groups. The actual and potential impact on Part 13 species under the management arrangements is considered low and adequate protection is provided. There are no listed threatened ecological communities in the fishery area.

DEH recommends that the NSW *Abalone Share Management Plan 2000* for the NSW Abalone Fishery be declared an accredited management plan under sections 208A, 222A, 245 and 265 of the EPBC Act. In making this judgement, DEH considers that the fishery to which the management plan relates does not, or is not likely to, adversely affect the survival in nature of 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. DEH also considers that the management plan 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 very low. On this basis, DEH considers that an action taken by an individual fisher, acting in accordance with the management plan, would not be expected to have a significant impact on a listed threatened species or listed migratory species protected by the EPBC Act.

To further strengthen the effectiveness of the management arrangements for the Abalone Fishery, and to contain the environmental risks in the medium to long term, the following conditions have been developed, which must be addressed and implemented over the next 12 months to ensure the ongoing export approval of the fishery. The implementation of these and other commitments made by NSW DPI in the submission will be monitored and reviewed in 2006 when the EIA process for the fishery is completed, at which time DEH will review the final PSR and FMS for the fishery and re-assess the fishery against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries* and make appropriate decisions concerning export of product from the fishery beyond the 12 month WTO period.

Conditions on the 12 month WTO for the NSW Abalone Fishery:

1. Operation of the fishery will be carried out in accordance with the NSW *Abalone Share Management Plan 2000* in force under the NSW *Fisheries Management Act 1994*.
2. NSW DPI will advise DEH of any material change to the NSW Abalone Fishery's management arrangements that could negatively affect the assessment of the fishery against the EPBC Act criteria, within three months of that change being made.
3. NSW DPI, in conjunction with NSW Abalone Fishery stakeholders, will conduct, within 12 months, reviews of the current abalone stock status across all zones of the fishery, as a sound basis for determining appropriate management measures to maintain stocks across the fishery at ecologically sustainable levels.
4. NSW DPI will ensure a comprehensive risk assessment is prepared and considered prior to the development and implementation of any restocking programs in the fishery. A commitment to a consultation process with all interested stakeholders in the fishery will be included as a part of this process.
5. NSW DPI to ensure the FMS for the NSW Abalone fishery incorporates appropriate performance indicators and trigger points to monitor regional abalone catch.

6. NSW DPI, in conjunction with NSW Abalone Fishery stakeholders, will develop and implement, commencing within the next 12 months, a suite of management measures to address localised and serial depletion of abalone stocks across the fishery.
7. NSW DPI, in conjunction with NSW Abalone Fishery stakeholders, will develop, within 12 months, a recovery strategy for abalone stocks across all zones of the fishery. The recovery strategy will address appropriate monitoring measures and management responses and proposed timelines for recovery of overfished and depleted stocks.

PART I - MANAGEMENT ARRANGEMENTS

The NSW Abalone Fishery is managed by the NSW DPI.

The management regime is described in the following documents, all of which are, or will be publicly available:

- the NSW *Fisheries Management Act 1994*;
- NSW *Abalone Share Management Plan 2000*;
- NSW *Abalone Fishery: Environmental Impact Statement Vol. 1, 2 & 3*;
- the NSW *Environmental Assessment and Planning Act 1979*;
- NSW *National Parks and Wildlife Act 1974*;
- NSW *Marine Parks Act 1997*; and
- relevant Gazetted notices and licence conditions.

A number of other documents, including research reports, scientific literature and discussion papers are integral to the management of the fishery.

DEH expects that the NSW Abalone Fishery will be carried out in accordance with the NSW *Abalone Share Management Plan 2000* in force under relevant NSW fisheries legislation. This condition will be reviewed in the reassessment of the fishery in 2006 once the FMS is finalised.

Condition 1: *Operation of the fishery will be carried out in accordance with the NSW Abalone Share Management Plan 2000 in force under the NSW Fisheries Management Act 1994.*

DEH considers it important that management arrangements remain flexible to ensure timely and appropriate managerial decisions. Because of the importance of the management plan 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.

Condition 2: *NSW DPI will advise DEH of any material change to the NSW Abalone Fishery's management arrangements that could negatively affect the assessment of the fishery against the EPBC Act criteria, within three months of that change being made.*

Current 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 NSW DPI will continue to ensure interested parties are consulted appropriately.

The submission states that the Abalone Management Advisory Committee (ABMAC) consists of an independent chair, industry representatives, conservation and Indigenous representatives and NSW DPI representatives.

Proposed management arrangements for the draft NSW Abalone Fishery FMS were developed in a consultative process between shareholders in the fishery and NSW DPI. Consultation was facilitated through the Joint Abalone Working Group (JAWG) which comprised two representatives from industry and representatives from NSW DPI. Input was also sought from ABMAC, shareholders in the fishery, the NSW Ministerial Advisory Councils on the Seafood Industry and

Recreational Fishing, the Total Allowable Catch Setting and Review Committee (TAC Committee), the NSW Conservation Council, the FMS Working Group and the Indigenous Fisheries Working Group. Further public comment on the EIS (including the draft FMS) was sought in September 2005.

Public comment on the draft FMS raised significant concern in relation to consultation with Indigenous communities involved in the fishery. A number of interested stakeholders recommended that NSW DPI identify and adopt a number of communication strategies raised in the report "Assessment of Impacts on Heritage and Indigenous Issues" (Umwelt 2004), provided as part of the the EIS. DEH strongly encourages NSW DPI to incorporate these suggestions in the finalisation of the FMS for the NSW Abalone Fishery.

The fishery is managed in accordance with the NSW *Abalone Share Management Plan 2000* and in accordance with the policy regime described in the draft NSW Abalone Fishery EIS and associated draft FMS. The draft FMS for the NSW Abalone Fishery sets out a range of eight Goals, which aim to:

1. Manage commercial harvesting of abalone to promote the conservation of biological diversity in the coastal environment;
2. Maintain or rebuild the biomass of abalone to ensure stock sustainability;
3. Facilitate effective management arrangements and provision of an efficient fisheries management service;
4. Promote the economic viability of the fishery;
5. Appropriately share the resource and harvest abalone in a manner that minimises negative social and economic impacts;
6. Facilitate appropriate research and monitoring of the abalone fishery;
7. Achieve a high level of compliance within the abalone fishery; and
8. Ensure adequate stakeholder involvement and community consultation.

Each Goal is accompanied by objectives and management responses. 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. These controls include:

- limited entry (47 shareholders with 42 currently holding sufficient shares to harvest);
- TACC determined each year by the independent TAC Committee (206 tonnes for 2004/05, 130 tonnes for 2005/05);
- MLS of 115 mm for commercial and recreational harvest; and
- closed areas.

Compliance and enforcement tools in the fishery involve a detailed document trail including daily docket cross which are referenced by monthly reconciliation sheets, along with periodic patrols, implementation of the National Docketing System and inspections carried out by NSW DPI Compliance Services. Additionally, abalone divers are required to sell their product through a registered processor, which must be registered by the Australian Quarantine and Inspection Service. Currently five processors are registered in NSW. A Strategic Plan for Abalone Compliance is also in place for the fishery and aims to minimise the number of offences committed by divers and abalone processors and improve the biomass of mature and legal size abalone.

DEH is satisfied that these compliance measures contain the means of enforcing critical aspects of the management arrangements for the commercial fishery in the short term. Further discussion of the illegal harvesting and measures to address it is contained in Part II of this report.

The draft objectives contained in the EIS report are currently being reviewed through a documented and transparent process. The document outlines a range of trigger limits relating to each objective, which will result in a review of the performance of the fishery if triggered. The TACC is reviewed annually to ensure the sustainability of harvest. DEH considers that this review is suitable while critical aspects of the fishery are reviewed more regularly if triggered.

Fishery dependent data relating to the target species is collected on a regular basis in the fishery. 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 any adverse impacts on the wider marine ecosystem in which the target species lives and the fishery operates is contained in Part II, Principle Two of this report.

Given the highly localised self-recruiting characteristics of abalone populations, there is limited requirement for managing shared abalone stocks across jurisdictional boundaries. Arrangements regarding cooperative research and management between Australian abalone fisheries are discussed further in Part II of this report.

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 NSW DPI 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 prime 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) to vessels operating in the fishery is also relevant.

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.

Conclusion

DEH considers that the current NSW Abalone Fishery management regime 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 by which the effectiveness of the management arrangements can be measured, enforced and reviewed.

The management arrangements are capable of controlling the harvest through a combination of input and output controls appropriate to the size of the fishery for the next 12 months while the draft FMS is finalised. Periodic review of the fishery is provided for, as are the means of enforcing critical aspects of the management arrangements.

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

DEH considers that there is scope to further refine the management arrangements and has provided conditions for improvement over the 12 month period of the WTO.

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 are obtained through daily docket, which record catch and effort information including zones fished, dive time, total catch taken from each zone and information on the crew, boat used and the consignee. Divers are required to record their catch before moving more than 50 metres from the boat ramp. A copy of the daily docket must be sent to NSW DPI within 24 hours of the catch being recorded. Divers are also required to complete a monthly reconciliation sheet within 7 days of each new month. The reconciliation sheet is a cross reference for the daily docket and allows divers to maintain accurate records of their catch. Data on average length of abalone from catch returns are also used to provide estimates of size frequency distribution to use in stock assessments.

DEH considers that data reliability for target species is reasonable and that compliance and enforcement activities have the capacity to ensure the ongoing reliability of data in the fishery.

Fishery independent surveys are carried out annually to provide stock information which feeds into the stock assessment. These abundance surveys are carried out at approximately 40 sites each year across 6 stock assessment regions. The numbers of small (less than 60 mm), medium (60-115 mm) and large (greater than 115 mm) abalone located at each site are surveyed. The first year survey data (1998) is used as a baseline for desired performance under the management plan and as a trigger for review.

Fishery independent research and data collection has primarily been conducted by NSW DPI and industry. As discussed in further detail below, an ongoing stock assessment program was initiated by NSW DPI and industry through a Fisheries Research and Development Corporation (FRDC) project (fully funded by industry since 1996).

FRDC funded projects have also addressed the sea urchin fisheries and potential implications for abalone harvesting and enhancing abalone populations through hatchery-produced seed while a

current FRDC funded project is examining the implications of the recent Perkinsus-related abalone mortalities in NSW.

Under the draft FMS for the fishery, the major objectives for research in the fishery are to collect information necessary to complete an annual assessment of abalone stocks in NSW and to investigate techniques for increasing the productivity of the abalone stocks in NSW. The draft Strategic Plan for Abalone Research (the strategic plan) has been developed to meet these objectives and a number of the projects highlighted in the plan have since been completed (discussed in more detail below).

A revision of research priorities was conducted in 2002 and outlined a range of additional research priorities for the fishery. These included:

- ecological processes;
- impacts of management and manipulation;
- reporting, managerial and policy methodologies;
- disease and pollution;
- post harvest and value adding; and
- socio-economics, education and communication.

DEH notes that abalone fishery management agencies across the various State jurisdictions have been involved in some cooperative research projects and management consultation to address the need for more appropriate biological parameters and reference points for abalone harvesting. Given the biological characteristics of abalone aggregating to form self-recruiting metapopulations within scales of less than one square kilometre, practical requirements for jurisdictions to jointly manage abalone from the same recruiting stock are limited. However, DEH considers that further cooperative research and management consultation is needed to enhance stock assessment outcomes and develop more standardised reference points with a sound biological basis. This issue will be revisited when the fishery is reassessed in 12 months.

A detailed draft strategic plan for research has been developed, and covers the full range of research priorities highlighted above. Funding has not yet been committed for a range of projects, including the high priority requirement to develop methods for estimating the illegal catch of abalone. DEH encourages NSW DPI to determine timeframes for high priority projects as soon as possible.

Overall, given the range of validated fishery dependent and independent data gathered by NSW DPI and the commitment to further research, DEH considers that there is a reliable information collection system in place appropriate to the scale of the fishery. Continuation of existing data collection and research programs, combined with proposed extension and refinement of such activities, will be further reviewed after the FMS is finalised.

Assessment

A sound stock assessment process is in place for the fishery, based on fishery dependent and available independent data.

An annual stock assessment program is undertaken and presented to the TAC Committee to form the basis of the TACC determination for each subsequent fishing period. The stock assessment process draws on basic catch information for the fishery (obtained through logbooks) and available biological survey data. Other fishery dependent data, including size composition of commercial catch and catch and effort data, are utilised with the results of the fishery independent abundance survey data in a length-structure model, used to inform TACC decisions.

The distribution and spatial structure of NSW Abalone stocks is well known. The stocks are found on coastal rocky reefs throughout NSW and are most abundant on the far south coast of NSW. Evidence of a decline in the stock of abalone is apparent, particularly in areas around Eden. The submission states that over 50% of the harvest in 2002-03 was taken south of Eden. NSW DPI recognise that the heavy harvest in these areas is likely to lead to a change in the distribution and spatial structure of abalone in NSW, if a change has not yet occurred. Significant concern was raised over this issue in public comments on the EIS.

DEH notes the significant decrease in the TACC for the fishery over the past three fishing seasons in response to a decline in the availability of abalone. Recent fishery surveys have revealed significant declines in the availability of abalone stock particularly in areas of heavy harvest. Consequently, the TACC for the fishery decreased from 450 t in 2002-03 to 281 t in 2003-04. Significant concern was raised in public comments on the EIS over the decline in stock abundance, evident in a further decrease of the TACC to 130 t for the current fishing season and the lack of regional controls on the level of take in the fishery. DEH considers that high priority should be given to determining the causes of this decline and in forming a more accurate picture of the current stock status of abalone across the entire fishery, rather than just the sampling sites used for the current annual review.

Condition 3: *NSW DPI, in conjunction with NSW Abalone Fishery stakeholders, will conduct, within 12 months, reviews of the current abalone stock status across all zones of the fishery, as a sound basis for determining appropriate management measures to maintain stocks across the fishery at ecologically sustainable levels.*

DEH is aware that the FRDC funded project on enhancing abalone populations through hatchery-produced seed has been completed and that restocking of abalone populations is being considered to enhance stock abundance. The project's aims were to produce seed from wild blacklip abalone at a range of sizes and ages throughout the year, develop techniques to enable the successful deployment of seed to coastal reefs in NSW, develop techniques to maximise the settlement, survival and growth of seed on coastal reefs in NSW and to complete large-scale deployment of fluorochrome-marked seed to depleted coastal reefs in NSW.

A number of public comments received on the fishery FMS strongly opposed reseedling as a recovery mechanisms for depleted abalone stocks. In particular, the lack of research on genetic impacts and disease was raised as an issue. DEH considers that a number of issues raised in public comments should be addressed by NSW DPI. DEH does not support restocking as a response to poor management and overexploitation of a fishery resource. DEH expects that NSW DPI will ensure a full risk assessment is conducted in relation to the reseedling proposal, which specifically addresses concerns over genetic and disease impacts on the stocks. DEH expects that all interested stakeholders will be fully consulted with in the development of the risk assessment.

Condition 4: *NSW DPI will ensure a comprehensive risk assessment is prepared and considered prior to the development and implementation of any restocking programs in the fishery. A commitment to a consultation process with all interested stakeholders in the fishery will be included as a part of this process.*

Potential removals from the NSW Abalone fishery include direct harvest by the commercial fishery, recreational and Indigenous harvest and a high level of illegal take.

Commercial catch is validated using a complex system of catch records, dockets and processor reports. Commercial catch is factored into the stock assessment and this aspect of the assessment is considered reliable.

NSW DPI state that the recreational fishery for abalone is one of the largest external impacts to the commercial fishery, particularly near urbanised areas or popular coastal holiday destinations. Recreational divers who take abalone must hold a recreational fishing licence and can take abalone only at or above a size of 115 mm and are restricted to a daily bag and possession limit of 2 abalone. No control of the total recreational take is in place.

In 1997, a survey estimated the total recreational take of abalone in NSW to be 52 +/- 26 tonnes (Andrew *et al.*, 1998). The National Recreational and Indigenous Fishing Survey conducted in 2001/02 estimated the recreational take to be approximately 12 tonnes (Henry & Lyle, 2003). NSW DPI state that the discrepancy between the two studies is due to inadequacies with the more recent survey size and targeting methodology and therefore consider the earlier estimate of 50 t to be more robust.

The submission states that in most circumstances, Indigenous harvest must occur under the general regulations in place for recreational harvest. Exemptions exist where individuals harvest within the borders of their own Land Council. Special permits may also be issued for harvest in excess of the recreational take, for traditional purposes. No estimate of Indigenous harvest has been given in the submission.

Public comment on the EIS raised concerns about the level of consultation with Indigenous communities and the process involved in obtaining permits for harvest in excess of the recreational limits, for traditional purposes. It was suggested that a more simple process for the Indigenous communities be implemented or a separate Indigenous fishery for the resource be established. The public submission stated that identifying Indigenous take as distinct from recreational take would build Indigenous involvement in the fishery and could be linked to the provision of training community members to enter the commercial industry. DEH strongly encourages NSW DPI to work closely with Indigenous communities with interests in the fishery.

The level of illegal abalone harvest in NSW is difficult to quantify. DPI Compliance estimated the total illegal catch to be in the order of 60-120 tonnes. The most recent estimate is that illegal take of abalone is likely to be 20-30% of the 2004/05 TACC. In 2003 there were approximately 46 abalone related prosecution briefs produced and a total of \$18,700 in fines were issued in 2003.

The size of illegal take factored into the stock assessment process is estimated at a precautionary value of 40 % of the 2004 TACC (145 tonnes). Further research may improve these estimates, however NSW DPI advise that surveys of illegal catch rates have been unsuccessful to date.

DEH notes that while recreational and illegal harvest is taken into account in the stock assessment process, indigenous harvest by permit is not accounted for in the stock assessment however fewer than 100 abalone are harvested under these permits. Illegal take is poorly understood and estimates, while precautionary, are uncertain. Given the uncertainty surrounding the level of this take, DEH considers that priority should be given to developing more reliable estimates of recreational, indigenous and illegal take of abalone across the fishery. This issue will be further reviewed in the reassessment of the fishery in 2006 after the FMS is finalised.

Management response

The management regime for the fishery includes a suite of output and input controls to regulate abalone harvests from the fishery. This includes limited entry of licence holders, an annually reviewed TACC, MLS, possession and size limits for recreational catch, and a range of area closures in place and management of *Perkinsus* disease.

These measures are underpinned by a range of trigger points, including:

- declines in the state-wide biomass of mature or legal sized abalone of more than 15% of the 1994 benchmark or if there is a risk (>50%) that the biomass would fall below this level within 5 years;
- declines in total catch below 85% of the TACC; and
- shifts in catch between sectors of more than 25% between year 1 and year 5 values following the commencement of the FMS and then every 5 year period after.

Additional performance indicators and trigger points are also in place, in relation to compliance, monitoring, stakeholder involvement and community consultation.

DEH notes that in the event of a trigger point being breached, a review is to be undertaken into the likely causes for the breach, in consultation with ABMAC. A review report outlining the remedial actions recommended in response to the trigger point breach is to be provided to the NSW Minister for Primary Industries within six months of the trigger point being breached.

DEH notes that no performance indicators or trigger points are currently in place to monitor the effects of abalone harvesting on associated habitats and ecosystems (Goal 1 of the draft FMS). Additionally, no performance indicators or trigger points are in place for monitoring regional catch (Goal 2 of the draft FMS). The submission states that these performance indicators and trigger points are to be developed pending further consideration of projects by the NSW Minister for Primary Industries. While DEH accepts that actions for Goal 1 are in relation to lower risk factors, the monitoring of regional catch under Goal 2 relates to higher priority issues, such as localised depletion of abalone stocks, and ongoing measurement of its effectiveness need to be incorporated into the final FMS.

Condition 5: *NSW DPI to ensure the FMS for the NSW Abalone fishery incorporates appropriate performance indicators and trigger points to monitor regional abalone catch.*

DEH notes that there are currently no management actions in place to address the risk of localised depletion to abalone stocks, despite the submission noting that the commercial fishery may contribute to growth and recruitment overfishing in high demand areas. DEH also notes that the availability of harvestable areas has been progressively decreasing over recent years and that most fishing activity is currently focused on the remaining productive areas in the far south of the fishery. The draft FMS for the fishery notes that “a management response to manage the spatial distribution of fishing effort is to be inserted into the final FMS in accordance with the determination in response to the associated EIS for this designated fishing activity”. No timeframe for this decision has been outlined. Given the characteristics of abalone in forming densely aggregated local populations and the pattern of fishing focusing on these local areas of high productivity, fine scale management control of catch and effort is crucial to the continuing effective overall management of the fishery and should be implemented as a priority. Management controls could include regional TACCs and regional size limits reflective of differences in populations of the target stock between locations.

Condition 6: *NSW DPI, in conjunction with NSW Abalone Fishery stakeholders, will develop and implement, commencing within the next 12 months, a suite of management measures to address localised and serial depletion of abalone stocks across the fishery.*

Illegal abalone catch is the most significant issue contributing to the uncertainty in the longer term ecological sustainable abalone yields from the fishery. The recent FRDC project “Assessment of Illegal Catches of Australian Abalone”, noted that, in the absence of targeted research and quantifiable data derived from sound scientific methods, estimates of Australian abalone theft varied widely from around 10% of the commercial TACC to greater than the national total catch.

DEH notes that a range of management measures, including performance indicators, trigger points and targeted enforcement programs are in place. Estimates of illegal take, although uncertain, are factored into the stock assessment process.

DEH acknowledges that illegal harvesting is a key issue for NSW DPI’s compliance and enforcement activities. DEH notes that illegal harvest of abalone is a significant national issue, with the potential for significant adverse impacts on the overall sustainability of abalone fisheries across Australia. DEH also notes that considerable work is being done in other jurisdictions, including NSW, to address the problem of abalone poaching. DEH considers that NSW DPI should cooperate with other jurisdictions, to ensure that a continuing priority is given to the accurate reporting of illegal harvesting and the development of appropriate management responses to reduce poaching. This issue will be further reviewed in the reassessment of the fishery in 2006 once the FMS is finalised.

Due to the selective nature of harvest in the fishery and the management regulations that restrict landing of species apart from the target abalone species, no byproduct species are taken in the NSW Abalone fishery.

Conclusion

DEH considers that the management regime in the NSW Abalone Fishery is appropriately precautionary and, through the implementation of conditions noted above, will provide for the fishery to be conducted in a manner that does not lead to over-fishing in the short to medium term. 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 conditions for improvements in the medium to 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’*

The draft FMS for the fishery contains an extensive set of performance indicators and trigger points which aims to ensure that the target stock is not overfished. As outlined above, if any of these

trigger points are breached, a report, outlining mitigation strategies, must be provided to the NSW Minister for Primary Industries within six months.

DEH notes, however, that no commitment has been made to the development of recovery strategies with timeframes linked to management responses, in the event that abalone stocks fall below sustainable levels.

The EIS notes the high likelihood that recruitment overfishing has occurred at localised scales in a number of areas, due to a combination of commercial and recreational fishing, illegal catch and *Perkinsus*. The EIS also notes the potential for growth overfishing in areas of the fishery, such as the far south of NSW, where abalone growth rates are more rapid. The EIS classifies the fishery as fully fished, however NSW DPI state that increases in catch should be possible through a reduction in illegal catch and the recovery of heavily depleted local populations. Public comments raised concern about the possibility of *Perkinsus* closed areas being reopened to fishing. DEH considers that these concerns should be taken into account before any closed areas are reopened to harvest. DEH considers that the implementation of **Conditions 3, 5 and 6** outlined earlier in this report should assist in addressing the problems associated with localised growth and recruitment overfishing.

While these conditions should provide for a more precautionary management approach to declining abalone stocks, DEH notes that despite the recent substantial reductions in catch limits and uncertainty with the status of stocks and reasons for biomass declines across the fishery, there is no evident stock recovery strategy in place across the fishery. While NSW DPI intends to implement a range of additional performance indicators and trigger limits to manage current harvest of abalone through the draft FMS, DEH considers that a more definitive recovery strategy should be developed that includes appropriate management actions within set timeframes.

Condition 7: *NSW DPI, in conjunction with NSW Abalone Fishery stakeholders, will develop, within 12 months, a recovery strategy for abalone stocks across all zones of the fishery. The recovery strategy will address appropriate monitoring measures and management responses and proposed timelines for recovery of overfished and depleted stocks.*

Conclusion

DEH considers that, overall, the abalone stocks are not currently overfished, however there is some uncertainty on the status of abalone populations in localised areas.

DEH has provided a range of conditions for stock recovery strategies and improved spatial management and is satisfied that there is a high probability that the stocks would recover under the stock recovery process, once developed.

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 hand harvest of abalone, no significant bycatch is taken in the fishery, other than the unavoidable removal of commensal organisms such as algae. Disturbance to

the substrate by harvesters or boat activities is minimal. Management responses for bycatch species are therefore not required, nor is it necessary for the management of the fishery to monitor an indicator group of bycatch species.

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 NSW DPI 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’*

Due to the highly selective nature of harvest in the fishery, the risk of disturbance to substrate or interactions with listed species is minimal. Protected, endangered or threatened species occurring in the fishery area include cetaceans, syngnathids and sharks, including the critically endangered grey nurse sharks. Abalone divers are permitted to operate in any of the 10 protected areas in NSW that have been identified as critical habitat for grey nurse sharks and are subject to general diving rules. All abalone fishing operations are required to remain clear of cetaceans according to general regulations for vessels and divers.

Although interactions with protected, endangered or threatened species are unlikely, until recently there has been no requirement to report such interactions in the fishery. Public concern was also raised in relation to the potential for protected species interactions, particularly in the case of grey nurse sharks. DEH notes that a threatened species interaction reporting form has been recently introduced in all NSW commercial fisheries to report on protected species interactions.

No threatened ecological communities have been identified in the fishery area.

Conclusion

DEH notes that no interactions with protected species in this fishery have been detected to date and considers that the fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened, or protected species and that no threatened ecological communities have been identified. Should this situation change, or a risk assessment process indicate otherwise, DEH expects that appropriate actions be undertaken to ensure the fishery avoids mortality of, 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’*

The NSW Abalone Fishery is a highly selective, hand collection fishery. Direct disturbance to benthic environments through the anchoring of licensed boats is low.

The submission states that the preferred food of mature blacklip abalone is drift macro-algae, though some part of their diet may include attached macroalgae. It is therefore unlikely that harvest

from the fishery would have a major impact on other grazing herbivores or on the assemblages of algae in the area.

Some evidence exists to suggest that the removal of abalone may lead to increased abundance of sea urchins (Lowry & Pearse, 1973, reviewed by Jenkins, 2004). A recent study (Andrews *et al.*, 1998b) however, indicated no evidence of this effect.

NSW DPI acknowledge that further research is needed to determine the full scale of ecosystem impacts arising from abalone harvest. Research priorities established in the draft FMS for the fishery highlights ecological research as a low priority and a performance indicator has been established to measure the impact of harvest on ecosystems and habitat.

Conclusion

DEH considers that the fishery is conducted in a manner that minimises the impact of fishing operations on the ecosystem generally. Conditions have been developed to ensure that management strategies are developed to protect target stocks which should in turn ensure that the risk of significant impact by the fishery on the marine environment generally is minimised in the longer term.

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LIST OF ACRONYMS

ABMAC	Abalone Management Advisory Committee
DEH	Department of Environment and Heritage
EA&P Act	<i>Environmental Assessment and Planning Act 1979</i>
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPBC Act	Environmental Protection and Biodiversity Conservation Act, 1999
FMS	Fishery Management Strategy
FRDC	Fisheries Research and Development Corporation
JAWG	Joint Abalone Working Group
MARPOL	International Convention for the Prevention of Pollution from Ships
MLS	Minimum Legal Size
NSW DPI	New South Wales Department of Primary Industries
PSR	Preferred Strategy Report
SCUBA	Self Contained Underwater Breathing Apparatus
TACC	Total Allowable Commercial Catch
TAC Committee	Total Allowable Catch Setting and Review Committee
UNCLOS	United Nations Convention on the Law of the Sea
WTO	Wildlife Trade Operation