



Australian Government

Department of the Environment and Heritage

Assessment of the
New South Wales Abalone Fishery

November 2006

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Assistant Secretary
Marine Environment Branch
Department of the Environment and Heritage
GPO Box 787
Canberra ACT 2601

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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 documents to the Department of the Environment and Heritage (DEH) 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 for fisheries. The EIA process for the Abalone Fishery was undertaken in conjunction with the EPBC Act assessment. The *Abalone Fishery: Environmental Impact Statement (EIS) Volumes 1, 2 & 3* (Abalone Fishery EIS), containing the draft Fishery Management Strategy (FMS), was received by DEH in September 2005. The EIS was placed on public exhibition by NSW DPI between 12 September and 24 October 2005. Nine public submissions were received. DEH also provided comments to NSW DPI on the submission.

DEH made short term decisions in November 2005 in relation to export of product from the fishery under Part 13A of the EPBC Act and impacts on protected species under Part 13 of the EPBC Act, pending completion of the NSW EIA process for the fishery.

NSW DPI submitted a final Preferred Strategy Report (PSR) to DEH in September 2006. The PSR provides NSW DPI's responses to the range of issues raised in the public consultation process on the Abalone Fishery EIS. For the purposes of the EPBC Act assessment, the EIS, together with the draft FMS and PSR, constitute the submission from NSW DPI. The Director-General of NSW DPI also made final recommendations in June 2006 to amend the draft FMS to address the allocation of available resources to priority issues such as finer scale spatial management. The DEH assessment also took account of these recommendations.

As required under the NSW EIA legislative process, the NSW Minister for Primary Industries determined the outcomes of the Abalone Fishery EIA process on 27 June 2006. The determination allows the fishery to continue to operate subject to modifications that reduce or eliminate detrimental effects of the fishery's activities on the environment. The determination requires the draft FMS to be further amended to take account of changes required by the PSR and the final recommendations of the Director-General of NSW DPI. The final FMS is yet to be approved and made available by the NSW Minister for Primary Industries. This is expected to occur by the end of April 2007. In lieu of the FMS being finalised, the measures in the draft FMS and the NSW Minister's determination of the fishery are being implemented by NSW DPI.

The DEH assessment against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries* has considered the submission, the determination of the Abalone Fishery by the NSW Minister for Primary Industries and associated documents, public comments and NSW DPI's response to the comments.

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 – overfished in some regions of the fishery.
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 2005/06	~127 tonnes. Total Allowable Commercial Catch (TACC) limit set at 125 tonnes for 2006-07.
Value of commercial harvest 2005/06	~\$AUD 5.45 million.
Recreational harvest	~50 tonnes (from 1997 recreational catch survey). New estimate of 20 tonnes used for 2006-07 stock assessment.
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 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, primarily Japan and Korea.
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 the 2005-06 commercial harvest was estimated at \$AUD 5.45 million 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, 130 t for 2005/06 and 125 t for the 2006-07 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. The draft FMS proposes the potential reopening of a number of the reef sites subject to further survey work to determine stock status.

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 commercial 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. Estimates of the annual take by the recreational and Indigenous sectors vary and have ranged from 18 t to 52 t. The most recent estimate of 20 t used in the 2006-07 resource assessment is based on an expected drop in recreational catch due to the recent change in bag limits from 10 to 2 abalone per individual.

Illegal fishing of abalone is a considerable threat to the economic viability and sustainability of the fishery. Illegal catch 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. Recent estimates of illegal take in NSW were in the order of 40 to 60 t, or between 20 and 30 % of the 2004/05 TACC. The stock assessment process estimates illegal take as 40% of the current legal 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* (FMA) 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. As previously noted, in September 2005 an EIS for the NSW Abalone fishery was released for a period of public exhibition and comment.

Overall assessment

The material submitted by NSW DPI demonstrates that the existing management arrangements for the fishery, in conjunction with the commitments made in the draft FMS and determination of the fishery under the NSW EP&A Act by the NSW Minister for Primary Industries, meet most of the requirements of the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*.

Management arrangements already in place and responses committed to in the draft FMS and NSW Minister's determination of the fishery include limited entry, quota management, size limits, regional stock assessment and TACC determinations, fishery dependent and independent data collection, spatial and temporal closures, development of finer scale spatial management measures and industry code of practice to minimise impacts of abalone harvesting of marine environment.

While the final FMS will allow the fishery to be relatively well managed, DEH has identified a number of current risks and uncertainties that must be further managed to ensure that their impacts are minimised:

- significantly depleted stocks in several management regions;
- absence of defined recovery strategies to address depleted stock levels;
- need for finer spatial scale management to address potential localized and serial depletion of available stocks;
- uncertain levels of recreational and illegal catches; and
- continuing significant impacts of illegal harvesting.

The key concern for the fishery is the need to address, through a range of measures in the short term, the substantial stock depletion to ensure abalone stocks are rebuilt to more robust ecologically sustainable levels in the longer term. In light of these concerns, DEH has developed specific conditions to be met as part of the proposed Wildlife Trade Operation (WTO) accreditation to ensure that the commitments to be made in the final FMS are actioned in the short term and supported by associated measures to further minimise the outstanding risks.

In conjunction with these conditions, DEH has also developed a range of recommendations to supplement the measures in the final FMS and ensure that outstanding risks and uncertainties in the fishery are addressed and minimised in the medium to longer term.

The management regime aims to ensure that fishing is conducted in a manner that does not lead to over-fishing and for fishing operations to be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. The indications from recent stock assessments that the biomass of stocks in several regions is significantly depleted will be addressed through stock rebuilding and recovery measures in the FMS and through specific conditions under the WTO to enhance stock recovery. On balance, the fishery is being managed in an ecologically sustainable manner and NSW DPI is currently working to address existing problems and minimise environmental risks in the fishery.

The operation of the fishery is consistent with the objects of Part 13A of the EPBC Act. Given the management arrangements in place and the commitment to introduce in the short term a wide range of additional measures in the final FMS, DEH considers that, on balance, the fishery will not be detrimental to the survival or conservation status of the taxon to which it relates in the short term. Similarly, it is not likely to threaten any relevant ecosystem in the short term. DEH recommends that the existing WTO for the fishery be extended for a further 2 years up to 28 November 2008. This would enable NSW DPI to address the specified conditions of the WTO and also progress the implementation of the recommendations made. The implementation of the conditions and recommendations and other commitments made by NSW DPI will be reviewed at that time and a decision made on whether another WTO declaration is warranted.

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. Following the first assessment of the fishery by DEH in November 2005, the NSW *Abalone Share Management Plan 2000* for the NSW Abalone Fishery was declared an accredited management plan under sections 208A, 222A, 245 and 265 of Part 13 of the EPBC Act. The changes to the fishery under the final

FMS should ensure that impacts on protected species by the fishery's activities remain minimal. Therefore the Part 13 accreditation still stands for the fishery.

Conditions to the WTO

1. Operation of the fishery will be carried out in accordance with the NSW Abalone Share Management Plan 2000 in force under the NSW FMA.
2. NSW DPI to advise DEH of any material change to the Abalone Fishery 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. A report to be produced and presented to DEH annually, and to include:
 - a) information sufficient to allow assessment of the progress of NSW DPI, in conjunction with industry and other stakeholders, in implementing the conditions and recommendations made; and
 - b) the status of the Abalone Fishery performance indicators compared to the trigger points.
4. The FMS for the NSW Abalone Fishery to be finalised and approved by the end of April 2007.
5. NSW DPI, in conjunction with NSW Abalone Fishery stakeholders, to develop and implement within 12 months an agreed recovery strategy for abalone stocks across the fishery that defines the following:
 - precautionary recovery targets and associated timeframes;
 - specific measures to promote the rebuilding of stocks to target levels; and
 - stock and catch monitoring and compliance measures required to evaluate and enforce the recovery of depleted stocks.

Recommendations

1. NSW DPI to work with other abalone stakeholders to ensure that the necessary consultative and co-management arrangements, through AbMAC or other mechanisms, continue to operate to address the management commitments of the fishery.
2. NSW DPI, in conjunction with NSW Abalone Fishery stakeholders, to develop and commence implementing, within 6 months, scientific surveys of the status of stocks in the Region 1 of the fishery.
3. NSW DPI, within 18 months, to develop and implement measures to improve estimates of illegal, recreational and indigenous catches of abalone for incorporation into the fishery resource assessment process.
4. NSW DPI, in conjunction with industry, to develop and progressively implement in the next 18 months a program of finer scale management measures, including catch limits at sub-regional levels, spatially and temporally specific size limits and specific management arrangements for the closure and re-opening of areas of the fishery.
5. NSW DPI, in cooperation with other jurisdictions, to develop more effective strategies and specific measures to quantify and reduce the extent of illegal take of abalone in NSW.

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:

- NSW FMA;
- NSW *Abalone Share Management Plan 2000*;
- NSW Abalone Fishery EIS;
- the NSW EA&P Act;
- 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.

NSW fisheries are subject to a legislated EIA process which involves the development of a detailed EIS and extensive consultation with stakeholders, leading to the implementation of a final FMS that provides a comprehensive future management framework for the fishery. The EIS (incorporating the draft FMS) is available on the NSW DPI website and in hard copy from NSW DPI, and the final FMS will also be available on that site when approved. The Abalone Fishery EIA process was undertaken in conjunction with the DEH assessment of the Abalone Fishery. The NSW Minister for Primary Industries made a determination on 27 June 2006 on the outcomes of the Abalone Fishery EIA process. The process should be finalised by early 2007 when the FMS for the fishery will be approved by the NSW Minister for Primary Industries.

The Abalone Fishery is included in the NSW FMA as a share management fishery. The primary role of the share management plan for the fishery is to provide the legislative framework for the Abalone Fishery and the rights of its stakeholders. The share management plan also brings into operation a number of aspects of the fishery described in the draft FMS. The share management plan includes objectives and performance indicators that are complementary with the FMS.

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 (to WTO): *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 range of consultative mechanisms and a commitment to effective consultation with a variety of stakeholders. The primary consultative mechanism is through the Abalone Management Advisory Committee (AbMAC) which consists of an independent chair, industry representatives, conservation and Indigenous representatives and

NSW DPI representatives. A Total Allowable Catch Committee (TAC Committee) is established under the FMA to make determinations on the annual TACC. Members are appointed by the Minister for Primary Industries and include an independent chairman, a natural resource economist, a fisheries scientist and a person with fisheries management qualifications. The TAC Committee has statutory obligations to consider the full extent of exploitation on abalone stocks, including quota allocated to commercial fishers, legal catch by recreational fishers and abalone catches from other fisheries. The Committee also invites public submissions on the appropriate annual TACC and publishes a comprehensive report on the NSW DPI website on its deliberations and determinations of the annual TACC.

While the share management plan for the fishery provides for sound consultative mechanisms for stakeholders through AbMAC, the recent TAC Committee report for 2006-07 raises significant concerns with the current effectiveness of AbMAC, including divisions within the membership of AbMAC and industry, that are impacting on the management of the fishery. DEH understands that AbMAC has not formally met in 2006, despite significant changes in the fishery such as dramatic falls in the TACC in recent years and the pending implementation of the new FMS for the fishery. The TAC Committee has recommended further efforts be made to reconvene an effective AbMAC structure to inform key management aspects such as the stock assessment process.

Given the number of priority issues confronting the fishery that require cooperative management approaches, such as rebuilding depleted stocks and reducing illegal catches, along with a range of other commitments made under the new FMS, DEH agrees that effective consultative management arrangements need to be re-established in the fishery as soon as possible.

Recommendation 1: *NSW DPI to work with other abalone stakeholders to ensure that the necessary consultative and co-management arrangements, through AbMAC or other mechanisms, continue to operate to address the management commitments of the fishery.*

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 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. The draft FMS includes a range of management responses to work through the Indigenous Fishery Strategy to minimise the impacts of the fishery on indigenous cultural heritage, promote consultation with the indigenous community and encourage indigenous involvement in the commercial fishery. The PSR also notes that the draft FMS should be amended to reflect indigenous representation on the Seafood Industry Advisory Council and other commercial fishery advisory committees.

The fishery is managed in accordance with the *NSW Abalone Share Management Plan 2000*. The management objectives in the Plan have been adapted in the new FMS that will provide the ongoing management framework for the fishery. 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. The draft FMS also includes a comprehensive set of performance indicators and triggers to measure performance against the respective FMS goals. An assessment of the effectiveness of these measures is included in Part II of this report.

As the basis for the ongoing management framework of the fishery, the FMS includes a wide range of measures to address existing risks in the fishery and improve the ecological sustainability of the fishery in the medium to longer term. While the Minister for Primary Industries determined the outcomes of the EIA process for the Abalone Fishery in June 2006, the draft FMS is still being finalised to incorporate the key outcomes of this process into the ongoing management of the fishery. DEH considers the FMS to be a crucial component for ongoing improvements in the fishery and its finalisation should be given immediate priority.

Condition 4 (to WTO): *The FMS for the NSW Abalone Fishery to be finalised and approved by the end of April 2007.*

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 (130 tonnes for 2005/06, 125 tonnes for 2006-07);
- MLS of 115 mm for commercial and recreational harvest; and
- area closures.

The draft FMS and the TAC Committee report for 2006-07 both address the need to apply these measures at a finer spatial scale of management appropriate to the population characteristics of abalone stocks in NSW. Further discussion on the application of finer scale spatial management measures is provided in Part II of this report.

Compliance and enforcement tools in the fishery involve a detailed document trail including daily dockets 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 FMS outlines a range of trigger points relating to each objective, which will result in a review of the performance of the fishery if triggered. The FMS provides for a performance assessment of each performance indicator annually and a report on the performance indicators to be provided biennially to the NSW Minister for Primary Industries. The TACC is also reviewed annually by the independent TAC Committee to ensure the sustainability of harvest and includes analyses of a range of factors including state of the abalone stocks, impacts of other removals such as recreational and illegal harvesting and effectiveness of existing management measures in controlling harvests. DEH considers that a five year review of the entire fishery policy framework would be suitable while critical aspects are reviewed annually through the TAC setting and performance reviews and while NSW DPI continues to act when adverse signals appear in the fishery.

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. The appropriate scale of management in which to apply these controls is currently subject to further review and modifications under the new FMS. 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 a condition and recommendation for improvements in the longer term.

PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

Stock Status and Recovery

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

Maintain ecologically viable stocks

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

Information requirements

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. Size composition of the catch is obtained from fishery records of total weight and number of abalone in every bin caught which is used to calculate average weight per abalone in each bin. Catch weight and fishing effort (diving time) are recorded daily and for each of the 72 sub-zones of the fishery.

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 sound and that compliance and enforcement activities have the capacity to ensure the ongoing reliability of data in the fishery.

Fishery independent surveys have been carried out annually since 1994 to provide stock abundance data which feeds into the stock assessment. These abundance surveys are carried out across the 6 stock assessment regions and currently amount to about 400 survey sites. 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 from 1994 is used to determine the 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.

The 2006-07 TAC Committee report notes that Region 1 of the fishery has been significantly depleted for a number of years and also suffered substantial mortality from *Perkinsus*. The TAC Committee report also notes industry's interests in accessing potentially available stocks in this region to relieve current fishing pressure on other sectors of the fishery. However, public comments on the EIS also raised concern about the possibility of *Perkinsus* closed areas being reopened to fishing.

The TAC Committee has advocated in recent years the need to survey historically fished sites south of Port Stephens to evaluate the impact of *Perkinsus* and gain a better understanding of stock status in the region. The Committee also noted the lack of scientific surveys in the northern portion of Region 1 and similar needs to confirm stock status. The Committee has indicated that surveys would be a key mechanism to ensure government and industry work cooperatively to increase understanding of stock status, particularly in key areas south of Port Stephens.

The 2006-07 TAC Committee report notes that work has been undertaken on survey methodology for the southern areas of Region 1. However, neither the TAC Committee report nor the draft FMS provide a commitment as to when these surveys will take place and the scope and objectives of the surveys. Also, it is unclear what action is being taken to implement surveys for the northern areas of Region 1. DEH considers that surveys in Region 1 are priority components of the recovery strategy to support the rebuilding of stocks in depleted areas of the fishery.

Recommendation 2: *NSW DPI, in conjunction with NSW Abalone Fishery stakeholders, to develop and commence implementing, within 6 months, scientific surveys of the status of stocks in the Region 1 of the fishery.*

The draft FMS includes a comprehensive research plan that links to the goals and objectives of the FMS and comprises four broad categories – stock assessment, habitat and ecosystem, rebuilding biomass and socio-economic. A number of proposed research projects have been determined in the plan as high priorities, including fishery independent surveys, annual abalone resource assessment, developing methods to estimate illegal catch and investigating and managing *Perkinsus*-related mortalities. 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.

The draft FMS includes a performance indicator to review and update the research plan annually and the PSR notes that the draft FMS will be revised to provide further detail on what these reviews will entail.

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, and that the appropriate scale of these information collection systems will be further addressed and refined through measures under the new FMS.

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 along with the results of the fishery independent abundance survey data, size at maturity and natural mortality data in a length-structure model, used to inform TACC decisions.

The EIS classifies the fishery as fully fished. However, despite the fairly comprehensive monitoring and stock assessment processes in place, there has been continuing uncertainty with the status of abalone stocks across the various regions of the fishery. Significant concern was raised in public comments on the EIS over the decline in abalone stock abundance. At the last DEH assessment of the fishery in 2005, DEH included a condition for NSW DPI to have a review conducted on the current status of abalone stocks across all zones of the fishery as a basis for determining appropriate management measures to manage stocks at ecologically sustainable levels. The 2006-07 TAC Committee report, published in August 2006, provided a detailed stock assessment on a regional basis. The Committee's reports note the outcomes of recent fishery surveys that indicate Region 1 remains significantly depleted due to past infections of *Perkinsus* and Region 2 has experienced a substantial decline in abalone population due to recent recruitment failures.

The trend in recent years of declining biomass to relatively low levels has resulted in the overall TACC decreasing from 450 t in 2002-03 to 125 t in 2006-07. The 2006-07 TAC Committee report noted that the four year decline in catch rates for Regions 3 - 6 appears to have stabilised and that abalone abundance in these regions may be on the increase, although this is still uncertain under the various stock assessment scenarios and will need close monitoring. The Committee's report also notes that stock is below the biomass that gives Maximum Sustainable Yield (MSY) in all regions, which indicates that substantial stock rebuilding is required across the fishery to return stocks to more robust ecologically sustainable levels.

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 and contraction of viable fishing areas is apparent. The EIS states that over 50% of the harvest in 2002-03 was taken south of Eden. NSW DPI recognises 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. The draft FMS includes a range of measures that can potentially address the concentration of fishing effort in particular areas and the consequent impacts of serial depletion of abalone stocks. These issues are addressed further later in this report.

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 EIS strongly opposed reseeded 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 and does not support restocking as a response to poor management and overexploitation of a fishery resource. In its previous assessment of the fishery in November 2005, DEH included a condition that a comprehensive risk assessment was to be prepared and considered prior to the development and implementation of any restocking programs in the fishery, and that consultation with all interested stakeholders in the fishery was to be included as a part of this process. DEH notes that the draft FMS and PSR for the fishery include the requirements that abalone reseeded and translocation proposals will need to be undertaken through permits approved under the NSW FMA and will be subject to a comprehensive risk assessment process, including stakeholder consultation, before approval.

Potential removals from the NSW Abalone fishery include direct harvest by the commercial fishery, recreational and Indigenous harvest and a likely 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.

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 has considered the earlier estimate of 50 tonnes to be more robust for stock assessment purposes in recent years.

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.

Illegal take is poorly understood and estimates used by NSW DPI, while precautionary, are uncertain. As with other jurisdictions, the level of illegal abalone harvest in NSW is difficult to quantify. The EIS notes a range of variable illegal catch estimates, including NSW DPI Compliance's estimates that range from 120 tonnes annually to a more likely level in the order of 20-30% of the 2004/05 TACC (40 – 60 tonnes annually). In 2003 there were approximately 46 abalone related prosecution briefs produced and a total of \$18,700 in fines were issued in 2003.

For stock modelling purposes the TAC Committee has taken a precautionary approach and used a value of 40% of the TACC for illegal catch estimates. Further research may improve these estimates, however NSW DPI advise that surveys of illegal catch rates have been unsuccessful to date. DEH notes the concerns in the 2006-07 TAC Committee report on the uncertainty with the levels of illegal and recreational catch and the Committee's recommendation that further efforts be made to more accurately estimate the levels of these catches. The estimates used in recent years are substantial but based on old data sources and are unlikely to reflect more recent harvesting trends.

The 2006-07 TAC Committee report notes the concerns by some industry members of AbMAC that illegal harvest may be more significant than accounted for. The Committee report also notes that the estimate for recreational catch has been reduced to 20 tonnes in this year's stock assessment on the basis of the recent reduction in daily recreational bag limit from 10 to 2 abalone.

DEH also notes that, while likely to be minor in relation to illegal and recreational harvest, a reliable current estimate of indigenous abalone harvest is not available.

The draft FMS includes as a management response the continued refinement of estimates of recreational, indigenous and illegal catches for use in stock assessments and the draft research plan in the FMS also includes as priorities the development of methods to more accurately estimate these catches. However the draft FMS does not provide a commitment as to how and when these actions will be undertaken. Given the substantial proportion of depletion that can be attributed to non-commercial harvesting of already significantly depleted abalone stocks, immediate attention needs to be given to implementing measures to more accurately estimate the extent of illegal, recreational and indigenous catches to more reliably inform the stock assessment and TACC setting process.

Recommendation 3: *NSW DPI, within 18 months, to develop and implement measures to improve estimates of illegal, recreational and indigenous catches of abalone for incorporation into the fishery resource assessment process.*

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.

These measures are underpinned by a range of trigger points in the draft FMS, 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. The TAC Committee uses the 1994 stock biomass benchmark as a key parameter for determining stock abundance trends in each region in the annual TACC setting process, noting that 85% of the 1994 biomass level as the limit reference point which if triggered requires urgent review and appropriate corrective management action. The TAC Committee recommended a zero catch for Region 2 for 2006-07 on the basis of stocks in the region being below this reference point in the latest stock assessment. The TAC Committee also notes that the biomass at MSY is the long term benchmark for the fishery.

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.

In its previous assessment of the fishery in November 2005, DEH noted that no performance indicators or trigger points were in place to monitor the effects of harvesting abalone on associated habitats and ecosystems nor for monitoring regional abalone catch. A condition was made to include these in the final FMS. The draft FMS notes that a performance indicator to assess the effects of the fishery on biological diversity is under development and will be included in the final FMS following further refinement of an existing program to increase the knowledge of the effects of abalone harvesting on bycatch species and associated habitats and ecosystems. The PSR includes a commitment to include performance indicators and triggers in the final FMS to monitor the effectiveness of finer spatial scale management measures.

The characteristics of abalone in forming densely aggregated local populations and the pattern of fishing focusing on these local areas of high productivity makes abalone stocks particularly susceptible to serial and localised depletion. DEH notes that the availability of harvestable areas has been progressively decreasing over recent years and, as mentioned earlier in this report, most fishing activity is currently focused on the remaining productive areas in the far south of the fishery. 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 2006-07 TAC Committee report notes that the effective management of abalone stocks requires that the scale of management, including minimum size limits, should match the scale of stocks, and that alternative management approaches for the fishery should be actively explored and evaluated.

DEH notes that a global TACC applying across the 6 regions of the fishery is the primary mechanism to control the legal harvesting of abalone stocks in the fishery. While the TAC Committee conducts an assessment of stocks on a regional basis and recommends a catch limit for each region, these catch limits are not formally applied as regional TACCs. The 2006-07 TAC Committee report notes that concerns have been expressed about the use of a single TACC for the whole fishery, the vulnerability of this management approach to sequential depletion at smaller spatial scales and the need to establish binding regional catch limits in the fishery.

The TAC Committee report also notes that the different productivity and state of stocks in different regions of the fishery makes it inappropriate to manage stocks as a single unit with an aggregated catch limit. The report states that having a range of minimum size limits, combined with relatively small area-based TACCs, better reflects the nature of abalone populations and protects reefs from serial depletions and the harvesting of recently recruited abalone.

In its previous assessment of the fishery in November 2005, DEH noted the lack of management actions in place in the fishery to address the risk of localised depletion to abalone stocks and included a condition for NSW DPI to develop a suite of management measures to address localised and serial depletion of abalone stocks across the fishery. The draft FMS has subsequently been revised to include proposed actions to manage the fishery on a more appropriate spatial and temporal scale, including:

- development of a plan to investigate different abalone size limits across the fishery;
- more flexible management arrangements that provide for industry taking a leading role in establishing voluntary spatial measures, such as catch limits and area closures, at finer spatial scales commensurate with abalone populations; and
- the development of a framework for closing and re-opening areas to commercial abalone harvesting, with priority given to applying this framework to the currently closed Region 1.

The draft FMS also includes new performance measures to monitor the effectiveness of spatial measures such as adherence to recommended catch levels. The NSW DPI Director-General's recommendations on the determination of the fishery include a requirement in the FMS to implement binding regional catch limits from the 2008-09 fishing period if the TAC Committee's recommended regional limits are breached by proposed voluntary industry arrangements starting from the 2006-07 fishing season.

While these developments are encouraging and consistent with the management approaches being developed by other Australian commercial abalone fisheries, DEH notes that the FMS, apart from recommended action on regional catch limits, is unclear on what specific actions will be undertaken to implement catch limits at progressively finer scales than regional level and how and when variable size limits and the framework for spatial closures and re-openings will be introduced.

Given the pressing need for stock rebuilding across the fishery, these should be priority measures to improve the overall management of declining stocks and provide greater certainty in the longer term sustainability of the fishery. NSW DPI, in conjunction with industry, need to give urgent consideration to developing and implementing specific measures that provide a more comprehensive and appropriate system of finer scale spatial management across the fishery.

Recommendation 4: *NSW DPI, in conjunction with industry, to develop and progressively implement in the next 18 months a program of finer scale management measures, including catch limits at sub-regional levels, spatially and temporally specific size limits and specific management arrangements for the closure and re-opening of areas of the fishery.*

Continuing illegal abalone catch is a major factor contributing to the uncertainty in maintaining 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.

The draft FMS and the 2006-07 TAC Committee report both emphasise the significant threat that illegal take of abalone presents to the already depleted abalone stocks in the fishery, particularly given the estimated high level of undersize abalone taken by illegal harvesters. DEH has recommended earlier in this report that priority be given to obtaining more accurate estimates of illegal catches for inclusion in the stock assessment and TACC setting process.

DEH notes that a range of management measures, including performance indicators, trigger points and targeted enforcement programs are in place or will be implemented through the draft FMS. The 2006-07 TAC Committee report recommends further efforts to deal with illegal harvesting, and notes that the Palmer and Keniry reports include a number of appropriate recommendations to address illegal harvesting such as appropriate resourcing and increased penalties. The draft FMS includes an objective to minimise illegal catch of abalone. However, the FMS is unclear on what and when specific actions will be taken to mitigate illegal harvesting.

Apart from participation in the National Docketing system, it is also unclear how NSW will work with other jurisdictions with similar illegal harvesting problems to verify the extent of abalone poaching and take coordinated action to minimise and prevent it. The 2006-07 TAC Committee report raises concerns by industry that the current high profile approach with a patrol vessel may not be effective and is inconsistent with illegal harvesting experiences in other jurisdictions. DEH notes that considerable work is being done in other jurisdictions to address problems with abalone poaching and considers that, in consultation and cooperation with other jurisdictions, NSW DPI should give further priority to developing measures to specifically address and reduce the levels of illegal abalone harvesting in NSW.

Recommendation 5: *NSW DPI, in cooperation with other jurisdictions, to develop more effective strategies and specific measures to quantify and reduce the extent of illegal take of abalone in NSW.*

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 required under the FMS is appropriately precautionary and provides for the fishery to be conducted in a manner that does not lead to over-fishing. DEH considers that the information collection system and stock assessment and management arrangements, as revised under the FMS, are generally 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 the measures in the FMS will assist in the short to medium term in reducing the current uncertainty with the status of stocks.

DEH has some concerns with the declining stock levels in some regions, risks of serial and localised depletion of available stocks and continuing impacts on stocks by other forms of abalone removal such as illegal harvesting. DEH considers there is scope to address these concerns through greater commitment to monitoring arrangements, finer scale spatial management and further efforts to control illegal harvesting and has provided a number of recommendations 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'*

While the EIS classifies the fishery as fully fished, there is evidence from recent TAC Committee reports that several of the fishery regions are seriously depleted and below stock limit reference points. In its previous assessment of the fishery in November 2005, DEH noted the concerns in the

Abalone Fishery EIS on the high likelihood that recruitment overfishing has occurred at localised scales in a number of areas of the fishery, due to a combination of commercial and recreational fishing, illegal catch and *Perkinsus*. DEH included as a condition of the assessment the need for NSW DPI to develop a recovery strategy for abalone stocks across all zones of the fishery.

The 2006-07 TAC Committee report notes that the recent history of the fishery is one of reducing TACCs and deteriorating stock condition and that there is a very high need to protect the stocks from further depletion. The Committee report also emphasised the number of uncertainties in the current stock assessment that presents difficulties in accurately determining the current and projected stock status across the regions and the need to rebuild stocks to provide greater resilience for the fishery in the future.

The TAC Committee report highlights a number of concerning issues in the fishery. These include:

- relatively low current biomass levels and hence vulnerability to periods of low recruitment, non fishing mortality such as disease and external removals such as illegal harvesting;
- uncertainty with current stock levels and reliability of future stock projections;
- uncertainty with impacts of *Perkinsus* infections that has resulted in the closing of Region 1 for a number of years;
- need for close monitoring of the fishery to verify stock status and recovery from *Perkinsus* and overfishing;
- heavy reliance on recently recruited legal size abalone;
- low recruitment and depleted stock levels in Regions 1 and 2 with stock estimates below the respective limit reference points and consequently Region 1 remains closed and a zero catch has been recommended for Region 2 for 2006-07; and
- stock estimates for other regions are below 1994 benchmark levels and substantially below MSY targets.

Given the number of concerns and uncertainties with the stock status, the TAC Committee has recommended a continuing low TACC as the primary means of rebuilding the stocks and providing greater resilience to recruitment fluctuations. However the Committee report also indicated concerns with past breaches in the recommended regional catch levels, particularly for the heavily depleted Regions 1 and 2, and noted that effective management measures should be implemented to avoid exceeding the recommended catch caps for each region.

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 noted previously in this report, 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.

The revised draft FMS has also addressed to some extent the above concerns in the TAC Committee report by committing to implement a definitive recovery strategy for the fishery. However, its unclear what this recovery strategy entails and when it will be implemented. The draft FMS includes objectives and associated measures to support stock recovery and rebuild abalone populations such as implementing different size limits on various spatial and temporal scales, proposed arrangements for regional and sub-regional catch limits, area and temporal closures initiated by industry at appropriate spatial scales, framework for better management of area closures and re-openings and reseeded experiments for depleted reefs.

While these measures should contribute to stock recovery, there needs to be a more explicit and consolidated approach to stock recovery that defines ongoing stock control, monitoring, research

and compliance actions and associated timeframes for evaluating stock status and targets for recovery. In particular, the short term target stock rebuilding benchmark of 1994 stock levels stated in the draft FMS has been shown in the 2006-07 TAC Committee report to be below MSY stock levels. A more robust and precautionary stock target level in excess of MSY may be needed to provide greater certainty for longer term harvesting arrangements in the fishery. There is also a need to take a more structured approach to specific impacts such as *Perkinsus* infection. The draft FMS notes the need to develop a response strategy to marine pest and disease incursions and notes that an FRDC funded project is examining strategies to manage stocks that are or might be affected by *Perkinsus*.

Given the range of measures proposed in the draft FMS for voluntary industry action such as finer spatial scale harvesting and management of available stocks, there particularly needs to be explicit support for the range of measures within any recovery strategy from industry and other stakeholders in the fishery. This is not evident from the information in the draft FMS or the TAC Committee report.

DEH considers an explicit recovery strategy to be an immediate priority to provide impetus for the rebuilding of stocks across the fishery to more robust long term sustainable levels and to address the above concerns raised in the TAC Committee report.

Condition 5 (to WTO): *NSW DPI, within 12 months, in consultation with NSW Abalone Fishery stakeholders, to develop and implement an agreed recovery strategy for abalone stocks across the fishery that defines the following:*

- *precautionary recovery targets and associated timeframes;*
- *specific measures to promote the rebuilding of stocks to target levels; and*
- *stock and catch monitoring and compliance measures required to evaluate and enforce the recovery of depleted stocks.*

Conclusion

The assessment that stocks in some regions are overfished is being addressed through a range of measures under the FMS. DEH considers that the measures contained in the draft FMS and those to be incorporated in the final FMS should provide for the rebuilding and eventual recovery of these stocks in the longer term. DEH considers that other recommendations in this report will also assist with rebuilding the status of stocks at risk of overfishing.

DEH has some concerns with the range of current risks to stock levels that requires a more immediate and comprehensive response than provided under the draft FMS framework. DEH has therefore provided a specific condition for more structured stock recovery strategies to be implemented in the short term to increase the probability that stocks would recover in the medium to longer term.

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 include ecological research and a performance indicator is being developed 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 and recommendations have been developed to further enhance the measures in the draft FMS 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	NSW <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
FMA	NSW <i>Fisheries Management Act 1994</i>
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
MSY	Maximum Sustainable Yield
NSW	New South Wales
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