

TAC Committee

Total Allowable Catch Committee Report and Determination for 2011/12

ABALONE FISHERY

17 May 2011

SUMMARY

Conclusions

It is clear that the NSW abalone fishery is experiencing a period of increased productivity (i.e. increased recruitment and/or growth rate), which is now passing through the fishery, as evidenced from another year of increasing catch rates currently being experienced by fishers.

The other significant development is the major advance in data collection by industry using electronic data loggers and the development of industry workshops held to discuss the preliminary analysis of data, as presented by Abalone Council of NSW, supported by funding from the Department. Ongoing efforts by industry, with very limited resources, to implement a finer scale management (FSM) approach that will ultimately result in an alternative and improved system of assessment, management and TAC setting, are commendable. There has been a great increase in the amount of fine scale data collected from the commercial fishing operations in recent years and the TAC Committee has been, and continues to be, very supportive of this approach. However, as yet these data have not been analysed and interpreted to adequately so as inform a sufficient understanding of the status and trends of the stock and the setting of the total allowable commercial catch (TACC) with an appropriate level of confidence.

Industry have expressed frustration at what they perceive as intransigence by the Committee in relation to its precautionary approach towards using industry observations, logger data and submissions, particularly those on the recent substantial increases in CPUE, to underpin Total Allowable Catch (TAC) increases. In response, the Total Allowable Catch and Review Committee (the Committee) reaffirms its obligations to set catches and minimum size recommendations at levels that, in the Committee's view, best secure the future sustainability prospects, both biological and economic, of the NSW abalone fishery. There is a clear divergence of opinion in this regard between the MAC and the TAC Committee.

A key question is the strength and persistence of the 'pulse' of recruitment currently passing through the fishery, as this will determine both the extent of current stock rebuilding and the future scope of sustainable catches. Knowledge of how the stock is responding to previous management measures intended to protect it is also required, as is a better understanding of the relative benefits of the benefits of short term increases in TAC relative to the contribution of uncaught abalone to stock rebuilding efforts.

Due to a discontinuity in research in the fishery, caused by ceasing one system of monitoring and assessment before alternatives were sufficiently well developed, the Committee has very limited information available to it to answer these questions and base its deliberations. There is also ongoing uncertainty about the interpretation of the information which is available.

The Total Allowable Commercial Catch under the Act is clearly defined. However, the Committee has concluded in the past that setting a single TACC number is not a necessary and sufficient action to achieve the role and function of the TAC Committee under the Act. The Committee reiterates its position that the Determination is inextricably linked to selectivity (with size limit and spatial aspects) considerations. The Committee has therefore conditioned its determination in the context of these selectivity considerations, and in particular, minimum legal lengths.

Management issues

The industry presentation to the Committee again confirmed the general effectiveness and capacity of data loggers to collect essential information on catch size, structure and location as part of a structured approach to spatial management. The degree to which this data has been able to be analysed (and linked to assessments under the former monitoring and assessment programme) has reduced its value to the Committee in informing appropriate catch setting.

The management arrangements to set and implement sub-Regional catch caps and limits, intended to spread the catch spatially and avoid localised depletion, were not entirely successful. As a result some areas provided more catch than intended, exceeding the catch target and in several cases also exceeding the catch limit, while other areas provided less catch than intended. An explanation provided for this failure was that the fishing was so easy everywhere that the caps were not necessary. This explanation misses the point of the caps in spreading effort, in preventing the development of sequential depletion (which starts with over-harvesting of accessible and profitable concentrations when the stock is abundant), and in developing, demonstrating and institutionalising a management control (FSM) that is essential in the longer term.

The arrangements for monitoring and assessment arrangements and the regional distribution of effort under FSM, including a draft harvest strategy have been driven by industry. The degree to which the Department, as the representative of whole-of-community interests in NSW fisheries resources, is engaged in, or endorses the new assessment and management process proposed by industry is not clear. It will be necessary for the Department to take an active role in ensuring that FSM is introduced in an effective and timely manner, with the relevant measures to ensure quality assurance and quality control.

There does not yet appear to be any formal arrangement in place on appropriate methodology and protocols as a framework for FSM. The Committee considers that this is an essential part of the process, as are the provision of adequate resources, a responsive and supportive administration, and cohesive and meaningful industry involvement. Expecting industry to achieve consensus on difficult issues within industry workshop situations may be overly optimistic, particularly where advice suggests a cut, real or perceived, to industry revenues.

There appears to be a growing expectation among industry that the workshops will make decisions on the TAC, distribution of catch, and, eventually size limits. This is inconsistent with the Act and general good practice fisheries governance. Workshop derived advice, should, however, be an important element of the information used to inform decision making.

Predictions that the increase of the minimum legal length (MLL) to 117 mm would have severe negative implications for the fishery have proved unfounded. The Committee believes that the same representations made to effectively undermine the Committee recommendation to increase the 'default' size limit to 119mm and 120mm respectively for the last three years are similarly incorrect. An increase in the 'default' size limit is an appropriate action in the current circumstances that will move the fishery to a more sustainable level and continues to be strongly supported by the TAC Committee. The Committee also acknowledges that the aim of the fishery should be to implement more variable size limits to better manage the different growth rates in the fishery. Using the preferred strategy of incrementally raising size limits, carefully monitoring catches, size distributions and shell characteristics, it will be possible to identify faster and slower growing areas and develop FSM-based (variable) size limits. Given the status of the resource and other factors described in further detail in section 5 of this report, the Committee recommends again an increase in the default MLL to 120mm.

The management objectives, performance indicators and triggers contained in the Fisheries Management Strategy (FMS), are problematical, both in terms of their level of precaution and utility. The Department has acknowledged this problem and the Committee looks forward to their review, as part of the review of the Management Plan.

Restructuring in terms of the share transfers that occurred in the rock lobster fishery has not occurred. As the TACC in the abalone fishery has contracted, the number of active divers operating, as distinct from shareholders, has also contracted with increased leasing occurring and divers taking multiple shareholders' quota. This is a form of restructuring,

The reduced bag limit (two per day) and restrictions on access have successfully reduced the recreational catch, and, the Committee considers that the recreational catch now and in the next few years is likely to be in the vicinity of 5-15 tonnes

In previous years, the illegal and unreported catch was assumed to be 40% of the legal and reported catch in 1987, i.e. 102 tonnes. The Committee understands from expert opinion that this figure has reduced to be in the vicinity of 20-40 tonnes per year since 2008. Illegal fishing remains a serious issue, despite considerable success with detections, prosecutions and the introduction of indictable offences. In the present circumstances of stock condition and stock assessment capability it was considered appropriate to have any reduction in illegal catch contribute to stock rebuilding.

The Department is to be again congratulated on its efforts to deal with illegal fishing, and in particular, the ongoing trend in serious, well-organised crime syndicates who are allegedly continuing to steal significant quantities of abalone. The State-wide Operations and Investigations Group (SOIG) has made significant contributions to reducing the serious impact of illegal abalone fishing. Any reduction in capability in this area at a time when it is known that illegal fishing remains of significant concern, and vital stock rebuilding is occurring, would be questionable.

There has been a drastic reduction in the overall value of the fishery due to reductions in beach price and TACC. This reduction has substantially impacted on the capacity of the industry to pay the fees and charges associated with managing the fishery. In response, the Department has been very effective in reducing the management fees payable by Industry, from \$168.40 in 2007/08 to \$30.33 for the 2010/11. This reduction, while welcomed by industry, has left the fishery in a difficult position with respect to management decision making

The reduction in management fees has resulted in fewer funds being available for undertaking management, compliance and research activities, with research suffering the most. This is at a time when there is the greatest need for funds for monitoring and research to inform management action that will and ensure stock rebuilding is effective and ensure that TAC, catch distribution and MLL settings are correct.

An ongoing barrier to more effective cooperation in the past has been the unfortunate expectation by industry that the Minister's Office will engage and intervene in what would normally be considered to be minor operational issues. This avenue of redress appears to be viewed by industry as a better approach to addressing concerns than more appropriate channels of communication between industry, researchers and managers.

Economic issues

The economic analysis possible under this section is restricted by the data and analysis provided to the Committee. While the Committee understands the

competing calls on funding, and the constraints imposed by the economic significance of the fishery, the lack of data and analysis on the structure, conduct and performance of the NSW abalone industry is a serious shortcoming in the monitoring of the fishery. The Committee has recommended that the Department and industry make greater efforts to provide the economic advice needed to equip the Committee to provide advice on the economic situation of the industry. Collection of this information would normally be expected to be driven by Government, possibly via a cost sharing arrangement with industry. Industry have also expressed for some time a desire to improve economic data, and at this year's TAC Forum there was a useful presentation from industry on how this information may be cost-effectively obtained and utilised.

The volume and value of the fishery has been steadily declining since 2000 reflecting depletion of the stock, falling TACCs and deteriorating market conditions. The current GVP of the fishery (3.1 million) is lower, in both real and nominal terms, than at any other time, and down about 86% from its peak in 2000/01. Further deterioration seems likely in 2009/10, with a predicted value of around \$1.9 million. Attention has been drawn to severe competition on export markets for small abalone from aquaculture producers and a general deterioration in price. Evidence that the 117mm size increase has had a negative impact on prices through the overall fishery has not been forthcoming..

Fisher net income has fallen dramatically and considerable financial stress is likely in the industry, particularly among those who entered the industry in 2000, or thereabouts, when share prices were at around \$30,000 per share. Despite these circumstances industry has shown none of the structural change tendencies typical of a primary industry under economic and financial pressure. In fact, since 2005/06 the share market has effectively ceased to exist. Divers have displayed a greater tendency to restructure their operations, with diver numbers falling as fewer individuals catch the quota of increasing numbers of non-diving shareholders.

There are unconfirmed reports that restructuring is occurring off-market. It seems that shareholders, whose numbers have declined only slightly are either committed to the industry or "locked-in" to prevent realising losses. Another key factor is that the fishery is changing in nature to one of a general investment, with indications that only a minority of shareholders (possibly as low as 20%) are owner/divers.

Those operators that gained windfall gains when limited entry and allocation occurred, are at face value at least, still deriving positive returns from their assets. This, of course is little consolation to those who have experienced significant real or paper capital losses; particularly, those who are indebted. It may be concluded that sections of the industry are almost certainly suffering financial stress and that its long term viability, as presently structured and operated, is under threat.

The Committee believes that financial intervention by Government to assist with moving the fishery to a sustainable basis is justified. Any intervention or assistance should be based on the proposition that the likelihood of the fishery recovering under market forces and the current management regime is minimal, as discussed elsewhere in this report. The Committee has suggested that there are likely to be more efficient/cheaper ways to manage the fishery without compromising sustainability objectives, and that these should be pursued, with consideration of public assistance to move to new arrangements.

Biological issues

NSW abalone stocks have historically suffered from significant over-fishing and over-depletion. Recent reductions of the total catch (commercial and recreational) and

recommended increases of the minimum legal size have been a response to that situation.

The stock showed significant evidence of over-depletion in the 1990s and early 2000s. This evidence includes: serial depletion starting in the north of NSW in Region 1 (partly exacerbated by *Perkinsus*) and progressing south; recruitment overfishing in Region 2 which started in the early to mid 1990s; patterns consistent with the onset of recruitment overfishing from the mid-1990s into at least the early 2000s in Regions 3 and 4; an increasingly 'spiky' pattern in catch rates and recruitment, in Regions 2-6; and increasing dependence on abalone that grow over the legal minimum length limit each year.

NSW abalone stocks have shown a pattern of periods of high and low productivity, consistent across all of the well monitored Regions, and is reflected in peaks of the fishery catch rate in about 1988, 1995 and 2001 that are about 6-7 years apart. These peaks, which have been briefer, and in most regions progressively lower, coincide approximately with estimated peaks in recruitment of young abalone. The estimation methods cannot distinguish well between variability in the number of young abalone recruiting to the population, their growth rate or their survival – change of any of these factors could give similar consequences and they may vary together.

After the catch rate peak in 2001 there was a rapid reduction in catch rate and 2005 gave the lowest levels yet seen in the fishery. While the estimates of recruitment indicated that another peak was about to move into the population they also indicated that this most recent peak was extremely weak in the north (Region 2), weak in the central areas (Regions 3&4) and average in the southern areas (Regions 5 & 6). The substantial reductions in the TACC through this time were to both limit the further depletion of the stock and to take advantage of the expected next peak in productivity in the late 2000s to rebuild the stock.

Within this overall context there have been additional specific issues and analyses relating to the status of stocks in the northern part of NSW (i.e. Regions 1 and 2).

Region 1 North (north of Port Stephens, subregions A-E)

There has always been very little stock information from this area. There has never been fishery independent survey coverage, very little commercial fishing since 1987 and the impact of *Perkinsus* is unknown. Special catch allocations have been made in Region 1 North over several years to allow collection of data to determine the extent of *Perkinsus* impacts, to support an initial assessment of the stocks and to estimate a sustainable catch.

Region 1 South (south of Port Stephens, subregions F-L)

This area suffered a severe outbreak of *Perkinsus* in the late 1990s. Some areas were closed to commercial fishing in 1996 and the whole of Region 1 South was closed in 2002. The Fishery Independent Surveys subsequent to total closure showed continued low abundance and no recovery of the small or medium sized abalone, and an accumulation over time of increasingly large abalone, interpreted to be the survivors of the outbreak augmented by low recruitment. Trial fishing in 2004 showed that it was possible to take high catch rates of large abalone from targeted sites, but did not help to assess the status of the stock or the extent of any recovery.

In 2007 a program of trial fishing on pre-identified sites that were historically productive was conducted to understand which of those sites remained productive, and to obtain comparative catch rates. The main conclusions were: about 36% of historically productive sites were still as productive as they previously were; 70-80% of historically productive sites had catch rates that are lower than those recorded there in 1994 or 1987; and for almost all sites the median length of abalone taken

was greater than 120mm (i.e. more than 50% of abalone were larger than 120mm). Data from diver selected sites did not materially change the overall results or conclusions.

Overall these conclusions indicate that Region 1 South supports some pockets of large and dense abalone aggregations, but that many historically productive sites still do not support dense abalone aggregations or significant numbers of small abalone despite many years of protection from fishing. The stock of legal sized abalone in the northern subzones (F, G and H) remained very depleted in 2007, while the stock of legal sized abalone in the more southern subzones (J, K and L) has recovered to 1994 levels at more than half of the sites examined.

Region 2

Region 2 was closed to commercial fishing in 2006 because of evidence of recruitment overfishing. The average recruitment in Region 2 started decreasing in about 1995 and the 1995/96 and 2001/02 pulses of increased productivity and recruitment were estimated to be very much weaker in Region 2 than in the more southern regions in those years, and were considerably weaker than was seen in Region 2 in the 1988/89 pulse. Following the closure of Region 2 special catch allocations have been made each year to allow collection of data that would support an improved assessment of the stocks there, especially in relation to the interpretation of recruitment overfishing.

To address the issues of over-depletion in the fishery the TAC was reduced significantly during the 2000s. The catch reductions between 2005/6 and 2009/10 coincided with the period when, based on previous patterns, a pulse of relatively good recruitment was expected to enter the population and provide a good opportunity for recovery of the stock. The commercial catch rates increased after 2005/6, and by 2009/10 they had recovered significantly with the catch rate approaching historical benchmarks in some Regions and reaching them in others. There remained considerable uncertainty about the robustness of the improved stock condition, particularly concerning: the extent of stock rebuilding and if it was sufficient to allow continued recovery after the expected downturn in recruitment; lack of estimates of the numbers sub-legal sized abalone as an indicator of the strength or weakness of recruitment into the fishery expected during the next few years; and the capability of industry to target known areas of high abalone concentration and thereby bias any assessment based on catch rates.

Despite these uncertainties, there was sufficient optimism to support an increase in the TAC for 2010/11. This TAC was increased further when an in-season review showed that the catch rates had continued to increase, so that by mid-2010/11 they were at or above the historical thresholds in all Regions. These two increments together represent a 25% increase in the TAC for the fishery.

The fishery has a history of a relatively small MLL compared to that used in other fisheries on the same species. It should also be acknowledged that these fisheries allow fishing at smaller size classes, where it has been confirmed that their size at maturity is lower – the main point is that the ‘default MLL’ – i.e. the one that is most appropriate for the fishery (or major region within a fishery) is higher than is the case in NSW.

For several years the Committee recommended that a larger size limit be applied to the overall fishery, within which various cost effective arrangements can be applied access any areas where abalone growth is stunted. The advantage of a higher default MLL which can be selectively reduced as appropriate, is that it protects the stocks in areas where abalone grow quickly and reach reproductive maturity at large size from localised overfishing and sequential depletion. These sites of fast growing

and large abalone are also the most productive in the fishery but are vulnerable to being overfished at a small MLL. Industry claims that NSW has many areas of stunted abalone growth conflict with observations from the NSW fishery as the MLL was increased from 115mm to 117mm, which are consistent with a fast growth rate hypothesis (one of three hypotheses) from early scientific analysis for the NSW fishery. By 2010 it was clear that the observed rapid increase in the individual weight of abalone caught and the very rapid recovery of catch rate following the recent increases in MLL would have been impossible if the population was dominated by stunted stocks. The optimum overall MLL for the recovered fishery that is implied by the fast growth rate hypothesis is in the vicinity of 120mm and is more consistent with that for the same species of abalone elsewhere.

The information available to the Committee to assess the status of the stock has changed and diminished considerably in recent years. Prior to and including the Committee's 2008 determination the fishery assessment was based on fishery independent surveys, catch rate and weight composition from commercial fishing; integrated analysis using a length-based population model to estimate population size and recruitment, and predictions of the expected future trends in the status of the stocks under different possible levels of fishery catch.

Since 2008, through various decisions of the industry and Department, the Fishery Independent Survey has not been conducted, there has been no update of the population model to assess stock status, and there has been no scientific prediction of future trends of the stock. Consequently in 2009, 2010 and again in 2011 there was no formal scientific stock assessment or prediction of future stock condition.

Collection of fine scale data on fishing effort and catch, through the use of GPS-linked data loggers has increased since then as more, and more reliable, data loggers have been provided to divers. Descriptions of the data from the data loggers were again presented to the Committee this year. However, as in previous years, these data were not analysed or interpreted with respect to stock status or trends. In particular there was no analysis that related interpretations of the currently collected data from the data loggers to interpretations of historically collected data. Such analysis is necessary to provide perspective and context of the current interpretation of stock status. Some areas provided no catch, precluding even basic monitoring through the catch rate.

There is now heavy reliance on commercial catch rate as an indicator of stock abundance. This reliance on commercial catch rate has well known problems, particularly in a fishery managed by individually tradable quotas where the management intent is for industry to increase efficiency and catch rate through innovation and changed fishing practices. Commercial catch rate is notoriously 'hyper-stable' for abalone fisheries, because high catch rates can be obtained and maintained for a time by targeting concentrations of abalone in known patches of preferred habitat even if the overall population decreases. Another issue is that commercial catch rate is a 'trailing indicator', reflecting what has happened, rather than a 'leading indicator' that informs about what will happen – it contains no information about the numbers of sub-legal sized abalone that provide the future commercial stock. In principle analysis of the fine scale data now being collected could provide solutions to these problems, but to date this has not been attempted or demonstrated.

Improving annual catch rates seen since 2005 have continued strongly and catch rates in all Regions are now above historical thresholds. In all Regions the monthly catch rate has been 'flat' and fluctuating without trend for the latest about 8 months (i.e. late 2010 to April 2011), having apparently stabilised at the higher level after the

large increases during 2009 and early 2010. Reduced stock productivity is expected from about 2010 if previous patterns of fluctuating productivity are repeated.

The catch rates in all Regions recovered to their previous levels within 4-6 months after the increase of MLL from 115mm to 117mm in July 2008.

The average weight of abalone caught increased substantially in all Regions when the MLL was increased to 117mm. There has been further steadily increase in the average weight since 2008 in Regions 4, 5 and 6. But the average weight has remained approximately constant since 2008 in regions 1, 2 and 3. The average weight in the commercial catch is a coarse and insensitive indicator, and several different interpretations are consistent with the same trend in average weight. Interpretations would be greatly improved by complimentary sampling of the length composition from the commercial catch, by accounting for changes in fishery targeting, and by surveys or structured fishing to directly measure population size composition.

Anecdotal observations from industry are unanimous in reporting that there are numerous undersized abalone in the population, and while all report significant improvement in the stock during the last few years, there are conflicting views about the robustness and stage of the recovery so far.

There is no doubt that there has been substantial improvement in the state of the stock in recent years, starting in about 2006 but particularly since about 2009. The TAC reductions and increased MLL have succeeded in this regard and the population has accumulated stock 'on the bottom' from a period of low TAC and high productivity. There is also no doubt that this accumulated stock could be caught through a higher TAC, though the sustainability of such an increase in TAC is highly uncertain. The central questions relate to the extent of the recovery and the robustness of the recovery so far to a possible downturn in stock productivity that could occur if the past cycle of productivity in the fishery is repeated.

It will be also essential to identify and rectify the past management settings that allowed the overfishing to occur historically so that they are not repeated as TACs are increased during stock recovery. The information and analysis available does not provide convincing examination or confident conclusions in relation to these central questions. In this situation the conclusions drawn must be precautionary and simply increasing the TAC during stock recovery without identifying and addressing these past weaknesses in the management arrangements risks, or perhaps even guarantees, a repeat of history.

An immediate consideration in the Committee reaching a conclusion on the TAC this year is uncertainty about achieving continued stock rebuilding, or at least stabilisation at present levels, during the next few years if natural productivity fluctuates lower. There are also significant concerns about the slow progress in recognising and rectifying features of the historical management settings that allowed past sequential depletion and overfishing of the stock.

The pattern seen in the catch rate over the next 2-3 years should indicate the robustness of the recent stock rebuilding to these natural fluctuations. In the circumstances it is decided that there should be no change in the TAC for 2011/12 and that consequently that the TACC should remain **at 94 tonnes**.

If the overall MLL for the fishery was 120mm, and 123mm in sub-Regions Z1-Z5 and 125mm Regions 1 and 2, there would be grounds to reconsider the TAC. And with these MLLs a TAC of 110t would be expected to provide an acceptable balance of risks in the medium term.

Contents

1. INTRODUCTION	1
2. PROCEDURES.....	2
2.1 PUBLIC CONSULTATION BY TAC COMMITTEE.....	2
2.2 MATTERS CONSIDERED.....	3
2.3 FORMAT OF THE REPORT	3
3 MANAGEMENT CONSIDERATIONS.....	4
3.1 INTRODUCTION	4
3.2 FISHERY BACKGROUND.....	4
3.3 CURRENT ISSUES AND FISHERIES PERFORMANCE	4
3.3.1 <i>Industry structure</i>	4
3.3.2 <i>Fine scale management</i>	5
3.3.3 <i>Harvest strategy</i>	7
3.3.4 <i>Catch rates</i>	8
3.3.5 <i>Minimum sizes</i>	8
3.4 RECREATIONAL FISHING.....	10
3.5 COMPLIANCE ISSUES.....	10
3.6 OTHER FISHING	11
3.7 FISHERY MANAGEMENT COSTS	12
3.8 COMMUNITY CHARGE PAYMENTS	13
3.9 CO-MANAGEMENT APPROACHES	13
3.10 CONCLUSION	14
4. ECONOMIC CONSIDERATIONS	14
4.1 INTRODUCTION	14
4.2 VOLUME AND VALUE OF PRODUCTION	15
4.3 PRICES	16
4.4 CATCH PER UNIT EFFORT AND AVERAGE SIZE	17
4.5 ABALONE MARKETS.....	17
4.6 FISHER NET INCOME.....	18
4.7 SHARES.....	20
4.8 SHARE TRADING, TRANSFERS AND VALUES.....	22
4.9 QUOTA TRANSFERS AND VALUES	23
4.10 IMPACT OF ILLEGAL UNREPORTED REMOVALS	24
4.11 RECREATIONAL AND INDIGENOUS CATCH	24
4.12 ECONOMIC DATA	24
4.13 COMMUNITY CONTRIBUTION CHARGE	25
4.14 PERFORMANCE INDICATORS FOR THE FISHERY.....	25
4.15 STRUCTURAL CHANGE.....	26
4.16 CONCLUSION	27
5. STATE OF THE STOCKS.....	28
5.1 INTRODUCTION	28
5.1.2 <i>Previous conclusions about the status of the stocks</i>	28
5.2 INFORMATION AND ANALYSIS AVAILABLE IN APRIL 2011	33
5.2.1 <i>Catches, catch rates and average weight</i>	33
5.2.2 <i>Illegal, unreported and recreational fishing catches</i>	34
THE DETERMINATION.....	42

**TOTAL ALLOWABLE CATCH COMMITTEE
ABALONE FISHERY
REPORT AND DETERMINATION FOR 20011/12**

1. INTRODUCTION

The Total Allowable Catch Committee is established by Section 26 of the *Fisheries Management Act 1994*. In 2011, it consists of:

- Mr Ian Cartwright – Chairman
- Dr Keith Sainsbury – fisheries scientist
- Dr Jessica Hartman – natural resources economist
- Mr Bill Talbot – fisheries manager

The Committee was provided with limited Secretariat services.

The Committee is required to determine the total allowable catch for the commercial sector (TACC) of the abalone fishery and, in doing so, to give effect to the objectives of the *Fisheries Management Act 1994*, as amended by the *Fisheries Management Amendment Act 1997*. It is not subject to the control or direction of the Minister, but in reaching its decision, the Committee is required to have regard to:

- all relevant scientific, industry, community, social and economic factors;
- the need to ensure that the abalone resources are exploited in a manner that will conserve stocks in the long term;
- the impact of fishing on other species and the environment; and
- the precautionary principle as set out in Section 30(2)(c) of the Act.

The Committee is also consulted out of session concerning a range of management issues.

The TACC under the Act is clearly defined. However, the Committee has concluded in the past that setting a single TACC number is not a necessary and sufficient action to achieve the role and function of the TAC Committee under the Act. The Committee reiterates the position that the determination is inextricably linked to selectivity (size limit and spatial aspects) considerations and that its recommendations in this regard are not discretionary.

The Committee produces a stand-alone report each year as background to, and in support of, the TACC determination. The report includes a number of recommendations for the management of the fishery as they relate to the TACC, based on the experience and background of the Committee members. The Committee finds it helpful when DPI provides views on report, creating a dialogue on a range of issues directly related to the TAC in a whole-of-fisheries context. As stated above, however, the Committee can only make a determination on the TACC, and the degree to which its suggestions and recommendations are accepted is a matter for the NSW Department of Regional Infrastructure and Services (DTIRIS – the Department). To meet its statutory obligations, the Committee must consider the full extent of abalone exploitation. Total removals from the stocks of abalone are made up of:

- the quota allocated to commercial fishers;

- the legal catch of recreational fishers (the sum of the bag limits); and
- other catches (by both commercial and non-commercial fishers) not sanctioned by the Regulations controlling the fishery and not recorded in the statistics.

The Act defines, in Section 30(2)(c), how the Committee should apply the precautionary principle, namely:

'if there are threats of serious irreversible damage to fish stocks, lack of scientific certainty should not be used as a reason for postponing measures to prevent that damage.'

The Committee views the word 'threat' in this context to mean an 'indication of probable harm to come'. Thus it believes that where evidence before it indicates probable future harm to the fishery or the stocks but there is some scientific uncertainty surrounding that evidence, it must not postpone action to prevent that harm occurring. Such uncertainty, and principally the strength of the current and possible future recruitment events into the fishery, continues to surround a number of key aspects of the abalone stock assessment and the Committee must, and does, take this into account when setting TACCs and recommending limits for regional catches.

The determination of the Committee is to be published in the Gazette by the Minister. In the light of the determination, the Minister is required to review the regulations and any other instruments under the Act. The determination is to be implemented in accordance with the Management Plan.

2. PROCEDURES

2.1 Public Consultation by TAC Committee

The Committee called for public submission on the appropriate total allowable catch under the requirements of Section 31 Division 4 of the *Fisheries Management Act 1994*. Abalone fishers, relevant industry bodies, environmental groups and the community generally were encouraged to make submissions on the total allowable commercial catch. The details of this consultative process are set out in Appendix 1.

The Committee interviewed and received reports from:

- NSW Department of Regional Infrastructure and Services Fisheries Research;
- NSW Department of Regional Infrastructure and Services Management;
- NSW Department of Regional Infrastructure and Services Fisheries Compliance;
- representatives and members of the Abalone Management Advisory Committee; and
- industry members.

A summary of submissions and the issues raised is provided in Appendix 2.

As in previous years, submissions to the Committee were provided in an open forum situation, which allows stakeholders an opportunity to hear views on the status and management of the abalone resource. There was also an option for the Committee to call on *in camera* submissions where appropriate. During the forum, the Committee and industry were able to ask questions of clarification, and a number of issues were discussed by all stakeholders present which assisted the Committee in its deliberations.

2.2 Matters considered

Before reaching its determination, the Committee considered:

- the documentation available on the fishery and the submissions it received;
- the management objectives set out in the draft management plan;
- the current state of the fishery;
- advice on the status of management of the fishery provided by the Department;
- advice on the economic status of the fishery as assessed by the Department and by industry representatives;
- an abbreviated stock assessment for abalone provided by the Department;
- data and analysis presented by the NSW Abalone Council,
- a range of technical and other industry comments regarding the status of the abalone stock and other matters regarding aspects of the management of the abalone industry; and
- the compliance situation as assessed by the Department and by industry representatives.

This report covers the three key areas affecting the management of the fishery, including the TACC setting process. These are:

- management considerations;
- economic considerations; and
- the status of the stocks.

The Determination of the Committee for the annual TACC for abalone for the 2010/11 fishing season is provided at the end of the report.

The Committee notes that the Department was unable to deliver the stock assessment and associated supporting documentation in sufficient time to allow the MAC time to comment and meet the deadlines for submissions to the Committee. The Committee also received papers only a few days (on in some cases on the day) before the Open Forum, which did not allow for sufficient consideration. Also, the dates for the meetings were set unusually late and aligning the diaries of busy profession people is very difficult.

*The Committee **recommends** that an action list and timetable be developed well before year end and adhered to. The list should be promulgated to industry and cover dates for the 2012 TACC Open Forum and meetings (including locations), the delivery of associated supporting documentation; and for delivery of the TAC Committee Report and Determination.*

2.3 Format of the Report

As in recent years, the TAC Committee, in addition to the Determination and suggested regional catch limits, has made a number of recommendations for the consideration of the Department. These recommendations are provided to clarify the position of the Committee on a number of issues, as they relate to the TACC. The Committee finds it very helpful where the Department comments on the assumptions and recommendations made in the various sections of the Committee Report. This has not occurred this year.

3 Management Considerations

3.1 Introduction

This section provides a brief historical background to the New South Wales abalone fishery and its management. Current issues and fisheries performance, recreational fishing, compliance and management arrangements are discussed. Recommendations are made concerning management actions that would assist with the recovery of the commercial fishery, in particular the adoption of an appropriate finer scale management regime. The impact of the severe reduction in resources that are provided by the NSW Department of Regional Infrastructure and Services (DTIRIS – the Department) has led to a lack of the scientific information which has traditionally informed the process of setting a Total Allowable Commercial Catch (TACC) for this fishery. This gap has again left the TAC Committee in a most difficult position. Divers continue to see evidence of, and the TAC Committee acknowledges that, a significant recruitment has occurred, CPUE is increasing in many areas of the fishery, and there has been some recovery in abalone stocks. There is, however, restricted ability to understand the extent of this recovery, and, importantly, very limited information to use to look forward in a predictive sense. This is now beginning to be addressed through work by the NSW Abalone Council, which appears to have the general support of the Department. The Committee acknowledges the encouraging progress with FSM approaches and efforts to close this knowledge gap.

3.2 Fishery background

The New South Wales commercial abalone fishery was established in the early 1960s, and in 1973 annual production peaked at approximately 1250 tonnes. Since that time the status of the abalone stock and annual production has steadily declined to the extent that the Total Allowable Commercial Catch (TACC) is less than 10% of peak production.

The fishery extends from Forster in the north to the border with Victoria in the south. Since 2002, the bulk of the commercial catch of abalone has been harvested from the area of the coast that is south of Jervis Bay.

Following the observation of declining catch rates at the end of the 1970s, in 1978 a Parliamentary Select Committee recommended that entry into the fishery should be restricted. From over 100 applications, the number of permits initially issued was 59. In 1979, an economic survey considered that around 29 divers could derive a 'reasonable income' from the fishery at a time when annual production from the fishery was in the order of 600 tonnes. By 1980, 55 divers still remained in the fishery. Under the 2-for-1 transfer arrangements and a buy-back scheme, the number of licences was reduced to 37 by 1992.

These 37 licence holders were then allocated 100 shares in the share management fishery and, notwithstanding court challenges, in February 2000 the final shares became the statutory fishing right under the share management fishery arrangement. Prior to the commencement of the share management plan, the 100 shares were the minimum shareholding to be eligible for an endorsement to take abalone (i.e. as a diver). This minimum was subsequently reduced to 70 on commencement of the plan to enable endorsed divers and crew to make an investment in the fishery.

3.3 Current issues and fisheries performance

3.3.1 Industry structure

There are currently 44 shareholders with shareholdings varying between 10 and 150. Of these, 37 are currently eligible for an endorsement, i.e. are entitled to deploy an active diver.

The Environmental Impact Statement (EIS) identifies diver numbers as a key risk to the long-term sustainability of the fishery and that improvements to the economic efficiency of the fishery should occur with any substantial reduction in actual diver numbers. There are now positive signs in that in the past five years a trend has developed which shows a contraction in the number of active divers that are operating in the fishery. On average in 2008/09, 25 divers reporting fishing per month, which is a decrease of approximately one-third in comparison with the period 2000-2006. While *active* diver numbers have fallen, the number of endorsements in the fishery remains unchanged, representing considerable and undesirable latent effort. This is unlikely to be a problem while the TAC remains low, but when (and if) the rebuilding of stocks becomes substantial the opportunity to increase diver numbers remains. Reasons for the lack of structural adjustment are discussed in the economics section of the report.

During the 2009/10 fishing period, about half of the commercial catch has been taken by 8 divers, with the remaining number of authorised divers reporting very low catches. Increased catch rates resulted in the average number of days fished falling from 69 in 2004/05 (average 57 kg per day) to 21 in 2009/10 (average 152 kg per day).

This change in the trend coincides with an increase in the amount of the TACC that is leased across the fishery (from 5-11% of the TAC in 1998-2001 to 32% in 2009/10) and indicates that some informal restructuring is occurring within industry.

3.3.2 Fine scale management.

Increasingly, and in common with other abalone jurisdictions, NSW is seeking to adopt fine scale, regional management of abalone fisheries with catch caps or regional TACCs and varying minimum sizes, introduced with the support from the industry and supported by the use of electronic loggers.

It is the belief of the Committee that the term 'finer' (rather than fine) scale management would be more a more appropriate term in the NSW context, and that the units for spatial management should be selected in such a way as to balance cost and the difference between the habitat and dynamics of abalone populations. Currently industry is proposing 21 different management areas (i.e. areas with separate TAC allocations). The distribution of catch between these areas will be based on data from the fishery and range of performance indicators (many of which are yet to be developed), informed by industry discussions at workshops.

The industry presentation to the Committee again confirmed the general effectiveness and capacity of data loggers to collect essential information on catch size, structure and location as part of a structured approach to spatial management. The degree to which industry has been able to introduce data logging, with the recent support of the Department, Dr Craig Munday's work and a FRDC TRF project, is a credit to those involved. The contribution by Duncan Worthington and the TAC is particularly noteworthy. The Committee continues to be supportive of such approaches and, given the cost recovery and research framework in NSW, agrees that it provides a very viable way forward subject to resolution of a number of issues.

The arrangements for monitoring and assessment arrangements to inform this new approach have been primarily driven by industry, with minimal input from Departmental researchers. The same applies to the regional distribution of effort, where industry appears to lead discussions and decisions on the distribution of catch, based on voluntary approaches. In this regard, there is little to indicate in the reports provided to the Committee on the degree to which the Department, as the representative of whole-of-community interests in NSW fisheries, is engaged in, or endorses the new assessment and

management process proposed by industry . It will be necessary for the Department to take an active role in ensuring that FSM is introduced in an effective and timely manner, with the relevant measures to ensure quality assurance and quality control. Further substantial and detailed discussion between industry, researchers and managers will be required. Past apparently irreconcilable difficulties with the MAC have significantly hampered progress and created doubt as to the ability of that forum, as currently constituted, to provide a platform for such discussions. However, the Committee is pleased to see that the dysfunctional government/ industry relationship that has plagued the NSW abalone industry is now being addressed. Industry workshops, while slow to get off the ground, appear to have improved prospects for success, as evidenced by the positive result and general support for the outcomes of the Eden workshop held in February 2011.

There does not yet appear to be any formal arrangement in place on appropriate methodology and protocols as a framework for FSM. The Committee considers that this is an essential part of the process.

Ongoing success in this area will be very much conditional on adequate resources, a responsive and supportive administration, and cohesive and meaningful industry involvement. Expecting to achieve consensus on difficult issues within industry workshop situations may be overly optimistic and experience from other fisheries has shown that industry find it difficult to agree on decisions that will have direct negative economic impacts on revenue, particularly where cuts in TAC are required. Some form of formal voting may be necessary to ensure an outcome in terms of the advice to be provided to managers/ TAC Committee.

There appears to be a growing expectation among industry that the workshops will make decisions on the TAC, distribution of catch, and, eventually size limits. This is inconsistent with the Act and general good practice fisheries governance. Workshops will make decisions about the advice to be provided to the Department/ TACC and this advice will be an important element of the information used to inform decision making.

While noting these issues, the Committee strongly endorses the industry view that the fishery must continue to move towards FSM as rapidly as possible, by formalising and expanding the collection of comprehensive data at fine scales using data loggers. More informed decisions as to scales of spatial management and other measures (including TACCs and size limits) can then flow from analysis of that data. The lack of such analysis, which is attributed to a shortage of funding, continues to hamper an understanding of the status of the resource and thus TAC setting.

As soon as possible, the Committee strongly recommends that data logging and provision of data should be a condition of access to the fishery, i.e. industry must fit a working logger to be endorsed to operate. For its part, Government will need to invest in the systems and infrastructure to store and analyse the data for the use and benefit of both industry and government. Tasmania will be mandating the adoption of loggers across the fishery from January 2012.

During the 2009/10 season industry made considerable progress with data collection using GPS/data loggers. A logger audit was also conducted. Issues to be addressed include:

- the ability to link previous fisheries independent surveys and stock assessment outputs to the new FSM approach;
- significant gaps in coverage; and
- a comprehensive analysis that provides sufficient confidence and promotes the setting of TACs and size limits in such a way as to balance stock rebuilding with deriving appropriate short and long term economic returns from the fishery.

These issues are discussed further in the biological section of this report.

*The Committee **recommends** that the framework for an appropriate finer spatial scale management approach, agreed jointly between government and industry (with TACC input where appropriate) should be pursued as a matter of priority. In particular, attention should be given to the roles of industry, researchers, managers and the TAC Committee.*

3.3.3 Harvest strategy

The TAC Committee continues to be of the view that the wording of some of the objectives, and most of the performance indicators in the current plan are significantly obsolete due to changes in monitoring and assessment and knowledge of the resource. As noted elsewhere in this report, new performance measures and reference points should be developed as a priority. Department staff acknowledged that new objectives, performance indicators and triggers will need to be developed and the Committee looks forward to the finalisation of new measures that are more meaningful, and reflect the changes in assessment and monitoring that will occur under fine scale management. The committee notes that the current management plan/fisheries management strategy is to be redeveloped. The Committee supports this as a priority activity to be undertaken in a short a timeframe as is practicable.

*The Committee **recommends** that the current performance indicators and triggers in the FMS/Management plan be reviewed, taking account the move to FSM approaches.*

The Abalone Council of NSW (ACNSW) presented a draft harvest strategy (HS) to the Committee, although this document was not apparently discussed at the industry Forum. This is a step in the right direction and the initiative is strongly supported. The Committee has significant detailed comments to make on this document, but considers that at this stage providing comment on guiding principles would be the most productive way forward. It is assumed that the TACC would be consulted on, and as appropriate, involved in, the development of the details of the final harvest strategy. These principles are that:

- The objectives of the HS are consistent with the Act, including resource sharing etc.
- As the HS will dictate how a community resource will be harvested, it should be driven strongly by the Department as a joint exercise between managers, researchers and industry – the current HS appears to have been developed in isolation by industry.
- Performance indicators should be measurable and appropriate, given the shift to FSM, new monitoring and assessment arrangements and catch planning workshops.
- The role of industry/ACNSW, industry workshops, the TAC Committee and Departmental managers and researchers must be clearly defined, within the requirements of the Act.
- Objective scientific testing of the performance of proposed HS decision rules/strategies against objectives of the Act under various conditions of recruitment/ catastrophic changes in mortality /catching efficiency should be undertaken, prior to its final adoption.
- Adequate quality control/assurance/ audit to be included.
- Consideration to be given to long-term human and financial resourcing requirements to implement and monitor the HS, based on current Government cost recovery principles.
- Use of 'weight of evidence' considerations to avoid overreliance on particular indicators, especially catch rates and individual views.

3.3.4 Catch rates

The decline in catch rates has been addressed, and for regions 3-6 have increased for the 5th successive year.

CPUE is considered to be an index of abundance in fisheries. Since CPUE is fishery dependent, and in the case of abalone, liable to 'hyperstability' (meaning that high catch rates can be achieved from aggregations, even under circumstances of severe depletion of the overall stock) means that, as an index of abundance, CPUE should be used with some caution. Given the recent 'knife-edge' recruitment nature of this fishery and the uncertainty of the most recent recruitment, recent increases should not be seen as an indication that the fishery is in a position of assured sustainability going forward. CPUE is a backward rather than a forward looking tool and can mask fishery failure as was the case in 2001, when CPUE was high, with a TAC of the order of 300 tonnes; this was followed by reduced catches and CPUE, despite severe cuts in the TAC..Consequently,the Committee does not agree with some of the CPUE-based conclusions (with some reference to increasing average size) reached in the Management Report relating to the status of the stock.

As a number of the industry submissions noted, with the current catch settings and effort levels, there is little surprise that catch rates have improved (off an extremely low base) substantially. The extent of the areas capable of maintaining these catch rates, with little data of size distribution, including sub-legal abalone, remains uncertain, as does the overall extent of the recovery. The degree to which there have been recent successful settlement events resulting in strong year classes of juveniles is unclear, as is the ability of the fishery to sustain increased TACs.

3.3.5 Minimum sizes

The minimum legal length (MLL) for abalone in New South Wales was increased to 117 mm from the 1st of July 2008 following a recommendation to the Minister from the SARG. The TAC committee, as a precautionary measure has suggested increasing the 'default' size limit to 119 and 120 respectively for the last three years. These recommendations, while accepted by the Department and many in industry, have not been adopted due to strong opposition by the MAC and some sectors of industry.

Minimum sizes are usually designed to ensure that a reasonable section of the abalone population (50%) will have at least two spawning opportunities before they can be harvested (a length setting known as $L_{50} + 2$). Most abalone fisheries utilise a combination of minimum sizes to comply broadly with this setting, often set on a regional basis and reinforced with voluntary arrangements and supported by industry training. These arrangements recognise that some abalone reach maturity at well below the average (for the fishery) minimum size, i.e. are considered slow growing (stunted), and others do not reach maturity at maximum size, i.e. are fast growing. Having a range of minimum sizes and combined area-based TACCs that reflect the nature of abalone populations, has the potential to provide improved yields and afford greater protection to reefs from serial depletions and the harvesting of immature abalone..It should be noted however, that fisheries where this approach has been successful, generally using workshop-based approaches, enjoy a greater abundance of abalone with a far greater number of year classes and a higher proportion of mature, breeding adults in the fishery than is currently the situation in NSW.

The Fishery Management Strategy (FMS) for the NSW abalone fishery proposes that any upward increase in the minimum size for abalone should only be done on an incremental basis and at a time when catch rates are high. The TAC Committee partially shares this view and continues to recommend that measures increasing the average size of commercially harvested abalone in NSW should be a priority for management and industry.

The commercial fishery in NSW has been historically based predominately on abalone that are just above the minimum size. In this situation, and unless the TAC/caps are set appropriately, abalone can be repeatedly removed from reefs, measured and not retained because they are just undersize. This practice, which is commonly called 'chipping' and leads to some mortality of undersize abalone due to shell damage, should be avoided.

The decision by DPI to again not raise the size limit as recommended in last year's TAC Committee Report to afford greater protection and increase the productivity of the abalone stock was very disappointing. An increase in size limit is an appropriate action in the current circumstances that will move the fishery to a more sustainable level and continues to be strongly supported by the TAC Committee. The Committee also acknowledges that the aim of the fishery should be to implement more variable size limits to better manage the different growth rates in the fishery. By incrementally raising size limits, carefully monitoring catches, size distributions and shell characteristics, it should be possible to indentify faster and slower growing areas and develop FSM-based (variable) size limits.

Some members of Industry, and in particular the MAC, have in the past made strong representations that this action was not appropriate, based on:

- a potential shift of effort towards areas with larger abalone present thereby exacerbating the current problems with the spatial distribution of effort;
- the decision being incompatible with previous undertakings to move towards FSM with variable size limits;
- the potential to restrict the TACC and restrict the productivity of the fishery; and
- the impact on the niche Japanese market, which apparently relies on quantities of small (115-117mm abalone).

Other members of industry showed strong support for the size increase.

At the TACC setting forum following the last size increase, the Committee was advised that the change in the minimum size led to a decline in CPUE for the fishery of less than 1% and in increase in the weight of individual abalone of about 12%. In other words, the disruption to normal fishing expectations has been short-term and minimal but the benefits are considerable, particularly as they resulted directly in less abalone being taken to fill the TACC. The TAC Committee was informed again this year that the Japanese market is under increased pressure from aquaculture product, reducing demand for small abalone. This development is at odds with the argument that widespread size limit increases effectively lock NSW out of a substantial marketing opportunity.

We repeat our view that, ideally, size limit increases should be matched spatially to growth characteristics. However, the nature of NSW abalone industry, the early stage of cooperative management approaches and cost/complexity of administering various size limits means that such an approach will be difficult to fully implement. Given the status of the resource and other factors described in further detail in section 5 of this report, the Committee recommends again an increase in the default MSL to 120mm.

*The 2mm increase in size has had a number of benefits and minimal adverse impacts which were basically short-term. The TAC Committee believes that now is an appropriate time to implement a further increase and strongly **recommends** an increase in minimum size to 120mms, with the provision to increase MSLs south of Womboyn. Carefully monitoring catches, size distributions and shell characteristics, it should be possible to indentify other faster and slower growing areas and develop FSM-based (variable) size limits*

The Committee notes the proposed trial to manage part of catch by regulating proportion of size classes. It believes that this is overly complex, expensive and presents some risk to the resource. The justification offered seems to increase average size at landing; this could be more easily achieved through a 120mm default LML and variations based on scientific evidence

3.4 Recreational Fishing

There is now general acceptance that the decision in July 2005 to reduce the recreational bag limit from ten abalone per person per day to two abalone per person per day has had a profound effect on the recreational harvesting of abalone in NSW. Prior to the introduction of the reduced bag limit four years ago, the Committee set the provisional allowance for the recreational catch of abalone at 50 tonnes. Following the introduction of the reduced limit this allowance was decreased to 20 tonnes, and then for last year further reduced to the current estimated figure of 10 tonnes.

The Committee is confident that the 10 tonnes it allows for as recreational catch in the TACC setting process is a reasonable estimate of what may now be taken by this sector of the fishery. It is intended that this figure will remain in place until there is better and more precise information available on the extent of the recreational catch.

Further comments on the role of industry and government in fine scale management are made in Section 3.3.2 above.

*The Committee **recommends** the development of a research program to determine the extent of the recreational abalone catch in NS.*

3.5 Compliance Issues

The level of illegal, unreported and recreational catch, and trends during the history of the fishery, remain very uncertain.

Since the decision to reduce the recreational bag limit from ten abalone per day to two, there has been both extra focus on compliance and increased penalties for illegal recreational fishing. Reports from industry, management and compliance all agree that this has substantially reduced the illegal recreational catch.

In previous years, the illegal and unreported catch was assumed to be 40% of the legal and reported catch in 1987 – that is 102t from Regions 2-6. The absolute quantity of illegal catch is very unclear. General impressions from compliance officers and industry are that the illegal catch probably was about 100t per year in the past, that it was likely to have been below 100t but above 50t in 2008, and to be in the vicinity of 20-40t per year since then. The introduction of indictable offences for abalone theft, the targeting of poaching syndicates by compliance officers, and the development of improved methods to permit indigenous catch are all thought to have improved the situation. In the present circumstances of stock condition and stock assessment capability it was considered appropriate to have any reduction in illegal catch contribute to stock rebuilding.

Objective 7 of the Management Plan is to minimise the number of offences committed by fishers in relation to abalone. Compliance rates as reported by DPI for the commercial sector for 2009/10 is recorded at 71% and 79% for the recreational and commercial abalone sectors respectively.

The plan provides for a review of the situation when the aggregate compliance rate for the fishery falls below 70% but the combined compliance rate of 75% is still comfortably above this figure.

The Compliance Report for the 2011/12 season contains a refinement of the recording of illegal activities by the recreational (or non-commercial) sector. It is encouraging to see that this issue has been identified and will part of a move to improved reporting of illegal/non licensed commercial fishing. In a fishery such as this which has clearly been under a high degree of stress for a number of years, and which has seen substantial cuts in both the commercial and recreational catch from the fishery, illegal catches must be kept to a minimum if the stock is to recover.

The Committee appreciates the difficulty in accurately defining the illegal catch of abalone from NSW waters. For stock assessment purposes, the Department continues to rely on the original figure for the illegal and recreational catches. As discussed above, it seems clear that the reduction in the recreational bag limit to two abalone per day has significantly impacted on the "small scale" poacher who relied on taking multiple recreational bag limits of 10 (the old daily bag limit) to make his illegal activities viable.

Compliance reported, however that 'illegal abalone activity remains high in NSW'. This activity is fuelled by strong black market demand and is undertaken by highly organised illegal syndicates. Despite considerable success with apprehensions and prosecutions, these activities continue to cause concern.

The Committee continues to be impressed by the efficiency and effectiveness of compliance staff. The State-wide Operations and Investigations Group (SOIG) does the bulk of the compliance activity that is targeted at serial abalone poachers and is supported (albeit with reduced manpower resources) by coastal fisheries officers and members of the police force.

Amendments to the Fisheries Act providing for increased penalties for abalone poaching (indictable offences) to include indictable offences for abalone poaching has placed NSW will be on a similar footing to Tasmania, Victoria and South Australia in having a key tool to address the scourge of abalone poaching.

Finally, the Committee noted comments that budgetary constraints appear to be impacting on compliance staffing arrangements within the abalone sector. It seems questionable to reduce capability in this area at a time when it is known that illegal fishing remains of significant concern and has the capacity to undermine stock rebuilding.

3.6 Other Fishing

Amendments were made to the Fisheries Management Act in 2010 to formally recognise the spiritual, social and customary significance to Aboriginal persons of fisheries resources and to protect and promote Aboriginal cultural fishing.

These new arrangements include the creation of an Aboriginal Ministerial Advisory Council (AFAC) and management changes aimed at improving access for the purpose of cultural fishing. The amendments include special provisions to allow aboriginal people an extension to certain fishing rules including bag and possession limits to accommodate small communal and cultural gatherings. These provisions will be implemented once regulations are developed in consultation with the AFAC.

A written request to the Department outlining species and numbers proposed to be taken is required before aboriginal fishing permits can be issued. Permits for 6,350 abalone were issued from 2008/09 to March 2011. However, the actual amount of abalone taken is unclear as there is limited compliance with reporting requirements. It is likely that the amounts requested are not fully caught and compliance staff estimate that less than 300 fish have been taken so far during the 2010/11 fishing period.

3.7 Fishery Management Costs

Shareholders in the NSW abalone fishery are required to meet all management costs attributable to the commercial fishery in accordance with pricing principles recommended by the independent Pricing and Regulatory Tribunal (IPART).

Industry has experienced declining beach prices for abalone (in 2002 - \$46 per kg, in 2008/09 - \$25.56 per kg) mainly caused by the steady increase in the value of the Australian dollar and progressive drops in TACC from 300 tonnes in 2002 (worth \$12.7 million) to 94 tonnes in 2009/10 (worth around \$1.9 million). These changes have substantially impacted on the capacity of the industry to pay the fees and charges associated with managing the fishery, including those associated with management, compliance and research services in a cost recovery environment.

A number of actions have been taken within the context of the existing cost recovery framework to reduce the costs to industry. For the 2008/09 fishing period, the management charge was \$35.57/share, a decrease from \$168.40 in the 2007/08 fishing period. This represented a 79% reduction in fees. Management fees for 2009/10 were \$40.74 and are \$30.33 for the 2010/11 fishing period.

In 2008, faced with a situation whereby management costs were remaining relatively high in a time of declining returns to shareholders from the fishery, DPI acquiesced to an industry choice of ceasing the then research programme and commencing a structured fishing-based programme. While this did reduce management costs the TAC Committee were advised that the Department went to some lengths, both in the written information provided and in formal and informal discussions at meetings with industry, to make clear what the likely consequences might be flowing from a reduction in industry contributions to the cost of managing the NSW abalone fishery. The consequences of this drastic reduction in funding for the management of the fishery and the flow-on effects to the task of setting a TACC have been discussed extensively in previous reports of the committee. As the fishery recovers the TAC Committee continues to be of the view that expenditure on research needs to be maintained at a sufficient level to ensure that there is an adequate level of information on the status of the resource.

The Committee notes that while the decision to drastically reduce funding for research and monitoring had over-whelming support from share-holders, this has left the fishery in a difficult position with respect to management decision making. The Committee believes that ensuring the appropriate collection and analysis of data in support of management arrangements is a core responsibility of Government. To do this, there is a need for Government to also ensure that appropriate mechanisms for the proper collection and analysis of that data are in place. Given the current circumstances of industry, some assistance, through the provision of resources to further develop such mechanisms, would be appropriate. This is not to infer that Government should be responsible for meeting the ongoing costs of data collection and analysis; this should be dealt with through normal cost recovery processes.

Objective 4 for the current management plan requires the promotion of cost effective management, as determined by independent review. The Committee notes that no such review has occurred since the Plan was established. Given the Committee's concern that management fees are now at such a level as to prejudice the adequate management of the fishery, such a review would be timely.

The Committee is concerned that the necessary resources may not be available to develop and support the initial implementation of a viable alternative industry based assessment and

*management package. It is therefore **recommended** that an independent review of cost – efficiency of current management services should be undertaken.*

The Committee was heartened by the decision by the Department to apply additional resources towards the establishment and implementation of alternative, finer scale spatial assessment and management arrangements.

3.8 Community charge payments

The commercial abalone industry has been granted some relief from the payment of the community charge, which has been levied on the industry at 6% of the annual gross value of the fishery. Details of this are contained in the Report of the Working Group that assessed these charges.

Significant changes have been made to the basis of levy collection with no charge being levied if the beach price for abalone is below a \$43 threshold. For 2009/10 (2009/10) fishing period, abalone shareholders will not be required to make any payment of Community Contribution and, given the status of the fishery, this seems highly appropriate, given current circumstances. However, some thought will need to be given to the possibility of the reinstatement of the Community charge as the fishery recovers.

3.9 Co-management approaches

The lack of a functional MAC or some similar consultative/advisory process has clearly hampered the effective management of the fishery.

An ongoing barrier to cooperation in the past has been the unfortunate expectation by industry that the Minister's Office will engage and intervene in what would normally be considered to be minor operational issues, and that this avenue of redress remains a viable alternative approach to more proper channels of communication between industry, researchers and managers. The improved relationship between managers and industry appear to be reducing these interactions.

The industry workshop held in February 2011 appears to have been relatively well supported by industry, with detailed consideration of data and catch planning occurring. This augers well for future FSM approaches, provided the framework for making recommendations and subsequent inclusion in the decision making process (TACs, LMLs and catch distribution) is agreed, in place, and used. Reliance on voluntary approaches has been shown to be manifestly inadequate in most abalone fisheries in other jurisdictions and a balance is required between regulatory and voluntary/co-management approaches.

The Eden workshop held in February avoided explicitly discussing the issue of size limits, which is understandable given the preliminary nature of the process and the contentious nature of the issue.. To be fully effective, future workshops will need to give some consideration to size limits. The way in which catch targets were arrived at appeared somewhat arbitrary (acknowledging the generally responsible approach taken by industry). There was little explicit consideration of trade off between the short term financial benefit of taking a catch now and the contribution to the fishery (and biological and economic benefits) of investing in a faster rate of rebuild by leaving the fish in the water. A good harvest strategy with explicit targets and indicators should address this issue.

*The Committee **recommends** that for the future the MAC be used as a forum to discuss and exchange information on key aspects of the abalone fishery such as the previous year's Determination and TAC Committee report, stock assessment, management and economics, prior to the TAC Committee deliberations. LobMAC provides a useful model for such an approach.*

3.10 Conclusion

Industry representatives are confident that the decline in commercial catches has been arrested and that stock rebuilding is occurring. The move to an increase in minimum size has some support from industry, but a universal and strong rejection by MAC members. Whilst commercial catch rates have improved over the last year measuring the status of resource using the available data remains problematic.

The decision of NSW abalone shareholders to overwhelmingly accept the invitation by DPI to substantially reduce their payment of charges for research without putting in place alternative and complementary activities continues to have a profound effect on the TACC setting process for the 2011/12 quota period. At the time of writing there remains limited data (compared to what has been provided before) on which to base a coherent decision on the quantum of the TACC.

The initial increase in minimum size which followed a recommendation in the report prepared by the SARG has, despite initial criticism from some industry members been generally well received and is in the opinion of the TAC Committee continuing to deliver benefits for the NSW abalone resource and industry, as demonstrated by a considerable number of industry submissions.

Industry support for the efforts made by the Department to improve the effectiveness of its compliance performance continues to be most encouraging. Hopefully the contraction in resources that DPI provides for compliance will not see any decline in compliance effectiveness at this important time for the fishery. The shift to indictable offences is a welcome and significant step forwards.

Improvements in the relationship between industry and the management arms of the Department are now becoming apparent and will be essential to an effective management process for the fishery. There appears to be a substantial disconnect between the research and management sections of the Department.

The prospect of the successful development and implementation of more effective, affordable management arrangements are increasingly apparent. This, coupled with the reversal of stock declines and a longer-term view of what are sustainable catches, will be fundamental for the future. If these are not achieved, then the long-term recovery and future of the fishery will remain in doubt.

4. Economic considerations

4.1 Introduction

In this section of the report, the economic status of the NSW abalone industry is described, as consistent with the requirement that the Committee have regard to economic and social issues the making its determination. Economic considerations focus on gross returns to the industry rather than net returns due to the absence of information on fishing costs. A summary of quota and share market prices is presented as an indicator of both short and long run industry profitability. Analysis of other data affecting the economic performance of the fishery, such as export prices and catch per unit effort, is also presented.

The absence of timely and relevant data on fishing costs means that it is not possible to make a complete analysis of the economic performance of the NSW Abalone industry. Focussing on gross returns only means that changes in costs, and the impact of this on profitability, is not taken into account in determining economic performance.

Social considerations, such as the non-pecuniary lifestyle benefits fishers derive from the activity of fishing itself, influence the return from abalone fishing. Data on the lifestyle factors

associated with fishing, the demographic profile of fishers and the profile of the regions within which fishers live and work were collected through a survey by Roy Morgan Research in 2001 (Roy Morgan, 2001a). However, more up to date information is required.

An understanding of the economic impacts of the fishery at the state and regional level would also be useful in terms of understanding the contribution of the abalone industry to the economy more broadly. Work in this area was undertaken by Roy Morgan Research in 2001 for NSW commercial fisheries, but it requires updating as economic conditions and the structure of the fishery have changed since then (Roy Morgan 2001b).

4.2 Volume and value of production

The volume of reported catch of abalone in 2008/09 was 103.3 tonnes, a fall of 5.6 per cent on the previous year catch of 109 tonnes (Figure 2). This catch accounts for around 98 per cent of the TACC. Since 2005/06, industry has been able to catch virtually the full TACC; and more recently with reportedly less effort. With reported catch in the current year to March 2010 at 47 tonnes, it is likely that actual catch will approach the TACC of 75 tonnes set for the current year.

The TACC has declined by 75 per cent since 2001/02 responding to a substantial depletion in the stock and efforts to rebuild the fishery.

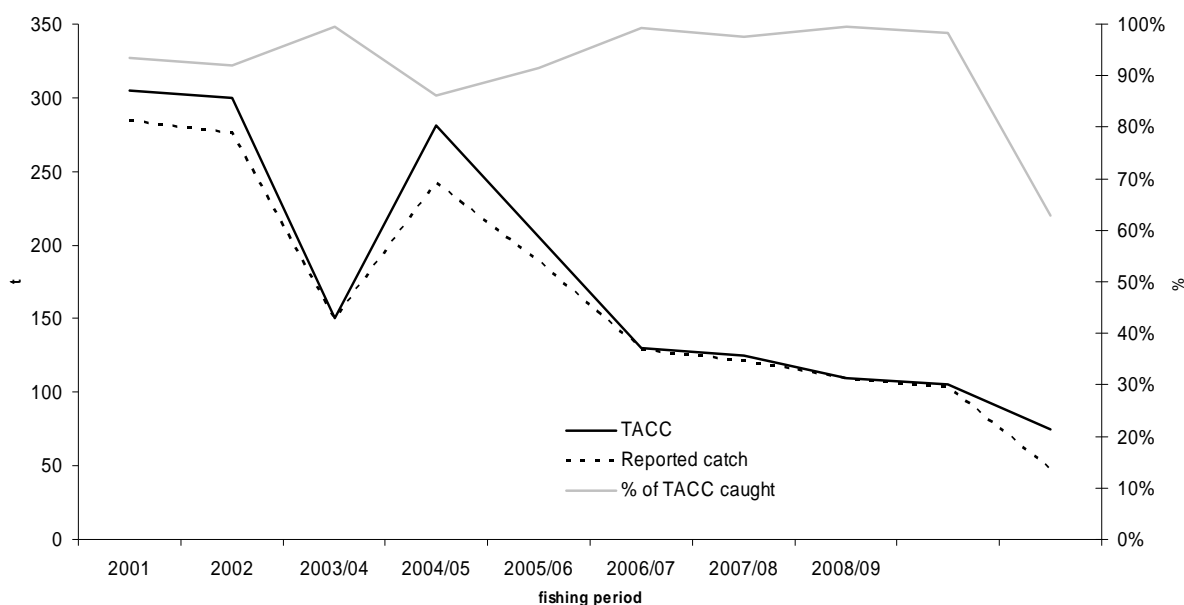


Figure 2*. TACC (t), total reported commercial catch (t) and proportion of TACC caught (%) for each fishing period from 2001 to 2008/09.

*This figure was provided by the Department; it is suggested it be modified prior to next year's report as the x-axis is incorrect. Partial data for the current year also needs to be removed as it is distorting interpretation of the figure.

The value of reported catch of abalone in 2008/09 was \$3.1 million, an 18 per cent fall when compared to the previous year (Figure 3). After reaching a peak of \$21.4 million dollars in real terms in 2000/01, the value of reported catch fell by 85.5 per cent to \$3.1 million in 2008/09. These falls are due both to lower levels of reported catch and lower prices. Production and reported prices for the first eight months of 2009/10 suggests that the value of reported catch for the current year will decline further, to about \$1.9 million.

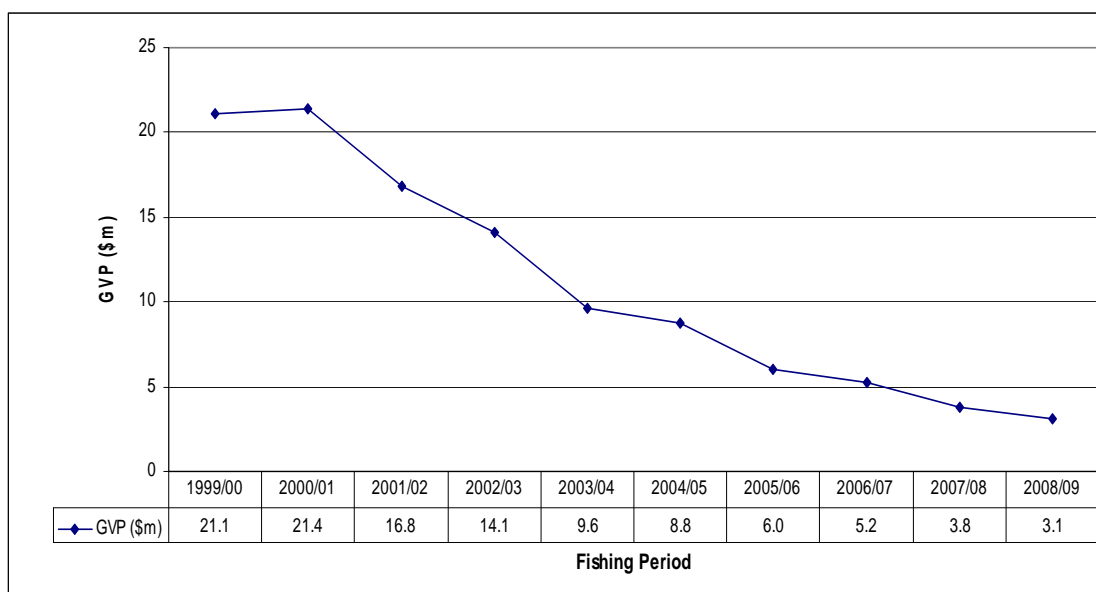


Figure 3: Gross value of production of abalone in NSW, 1999/2000 to 2008/09

NSW abalone production is a very small percentage of Australia's overall production, at around 2 per cent as at 2007/08 (ABARE, 2009). With lower levels of reported catch since this time, this percentage is likely to have fallen even further. The bulk of Australian production of abalone comes from Tasmania, Victoria and South Australia.

4.3 Prices

Prices for abalone are estimated from data abalone processors provide to the Department. In 2008/09, the average real price was \$30/kg, a fall of 13 per cent when compared to 2007/08 (Figure 4).

The peak real price of around \$69/kg in 2000/01 was followed by a steady decline to 2003/04 (during the SARS outbreak which affected Chinese markets in particular) before climbing back to almost \$43/kg or more for three years in a row. Prices have since dropped to an average price of \$26/kg (as of March 2010). In real terms, abalone beach prices have not kept pace with inflation. The peak price of \$69/kg was unusually high for the years of record.

Periods of lower beach prices can be explained partially by the SARS episode and partially by the strength of the Australian dollar against the Japanese Yen and US dollar. An expected depreciation of the Australian dollar over the medium term should result in higher prices for abalone on international markets (ABARE, 2010).

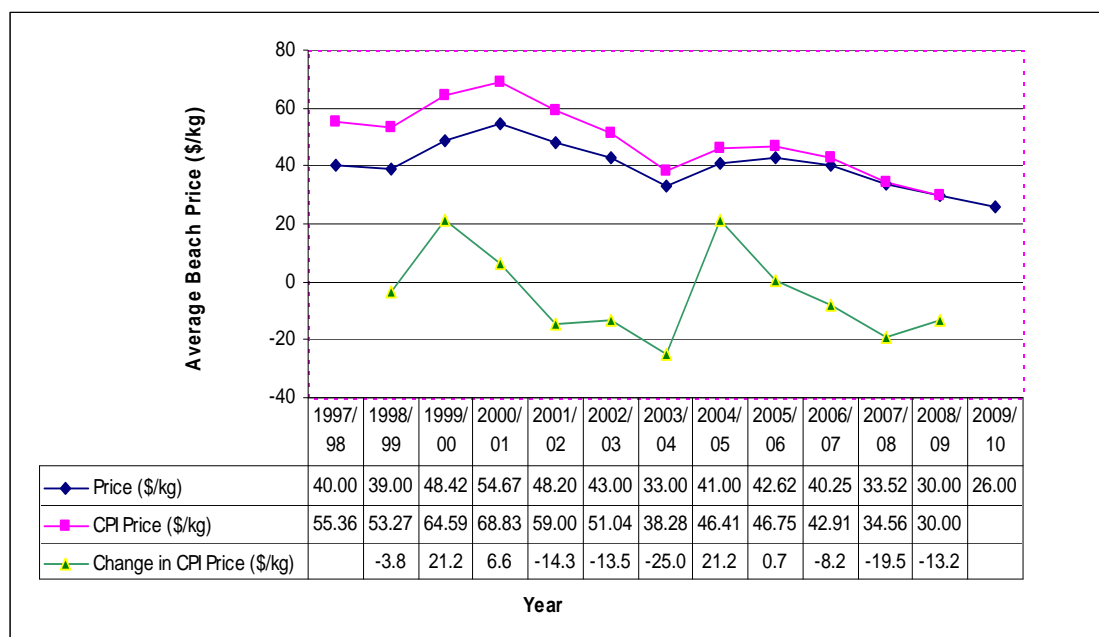


Figure 4: NSW abalone beach prices, 1997/98 to 2009/10

4.4 Catch per unit effort and average size

Catch per unit effort (CPUE) data gives a general indication of overall trends in availability of abalone to the fishery. CPUE in 2008/09 increased by 7 per cent from the previous fishing period to around 20kg/hour. The CPUE for 2009/10 to 10 March has risen significantly to 25.5kg/hr. These increases in CPUE are likely to be as a result of lower TACCs over the past five years and a higher size limit over the last two years. Higher size limits and significantly reduced numbers of fish being taken put the fishery in a much better position to improve and consolidate recruitment events going forward and, subject to the extent of the current and future periods of recruitment, are a positive sign of likely improved returns from fishing in the future.

There is no evidence that the increase in the lower size limit to 117mm has excluded significant areas of the fishery or resulted in effort shift. The average size of abalone in the fishery catch has risen significantly over the past fishing periods from 280g in 2005/06 to 303g in 2008/09, with a continued rise in the current fishing period to 305g. These figures compare to 1999/00 when the approximate average weight of caught fish was 285 g. The increase in average size in 2008/09 is in excess of that anticipated due to the size increase from 115mm to 117mm.

4.5 Abalone markets

Abalone product is sold through registered and registered restricted fish receivers to processors along the NSW coast. Increasingly there has been a tendency for shareholder/divers to become registered and registered restricted fish receivers and sell product directly to processors.

The NSW abalone industry is predominantly export oriented. As a result, prices received for NSW abalone are subject to economic conditions in the main export markets, competition from exports from other abalone exporters, and other factors, the two most significant being aquaculture production and exchange rate fluctuations.

The main export market for abalone is North-East Asia. Total exports of abalone from Australia have declined from 4,910 tonnes in 2003/04 to 3,580 tonnes in 2007/08. Prices received for abalone on export markets have also fallen over the same period driven by an appreciation of the Australian dollar against the Japanese yen and US dollar (ABARE, 2010).

Australian exports of abalone are divided into two categories: 'fresh, chilled or frozen' and 'canned' In 2007/08 the largest export market for fresh, chilled or frozen abalone is Hong Kong followed by Japan and China (exports to mainland China were higher than Japan in 2005/06). The largest export market for canned abalone is Hong Kong, followed by Japan and Singapore.

Wild caught abalone has been subject to increased competition from aquaculture product. Nearly 10 per cent (507 tonnes) of total abalone production in 2006/07 was sourced from aquaculture farms (ABARE, 2010:15). The Department reports that by 2014/15 approximately one-third of total Australian abalone production could be farmed product. As costs associated with producing farmed product fall, prices may fall, undercutting those for wild caught product in the future, particularly for smaller sizes of abalone.

Important long-term structural changes may be occurring as a result of the growth of the aquaculture industry and, perhaps, changes in tastes and preferences for abalone in China and Japan. Industry report that the preference in China is for smaller sized abalone than can currently be produced in NSW and that this market is currently being serviced by farmed product. Industry also report that the niche market that NSW abalone previously held in Japan is shrinking due to aquaculture competition and that the preference in the Chinese market is for larger sized abalone than can currently being produced in NSW. The Chinese market is now being serviced by Tasmanian wild caught product. One processor considers that there is potential to competitively market smaller abalone in China using the fact that it is wild caught rather than cultured as a marketing edge.

As aquaculture operations continue to expand in Tasmania, Victoria and South Australia, new overseas markets and marketing initiatives for wild caught abalone will need being explored. The Committee notes the McKinna Report on the development of a marketing strategy for Australian abalone may offer some suggestions in this regard.

4.6 Fisher net income

Declines in gross revenue of the magnitude that have been experienced in the abalone industry mean that considerable financial stress is likely in the industry, particularly among those who entered the industry in 2000, or thereabouts, when share prices were at around \$30,000 per share. Questions must be asked about the future viability of the industry if prices continue at present levels, stock levels (and hence the TACC) do not recover, and appropriate adjustments do not occur. Precise estimates of the circumstances of individual fishers are, unfortunately, not possible without detailed information on the structure, conduct and performance of the industry, particularly the structure of costs and levels of debt.

The costs of fishing include both fixed and variable costs, with variable costs such as fuel, bait and repairs being the most susceptible to change in response to short term fluctuations in prices and production. Fixed costs such as boat capital and other overheads associated with running a small business are unlikely to be as responsive to short term fluctuations in prices and production. However, when changes in prices and/or production are maintained over the longer term, and such changes are indicative of a longer-term decline in the resource and/or demand for abalone, structural change in the industry may result in lower fixed costs. There may also be a reduction in the number of shareholders and divers,

though this has not occurred in the abalone industry to the extent that would have been expected, as is discussed later, and in Sections 4.7 and 4.8.

The last survey of fishing costs and returns was undertaken by Roy Morgan Research for the 1999/2000 fishing year. As the estimates of fishing costs from this survey are now out of date, they cannot be relied upon to estimate net returns from abalone fishing. Further, the survey is for a single year, and, as such, only provides a snapshot of the net return from abalone fishing. A more accurate representation of the net return from abalone fishing would consider the stream of net returns over time, and, hence, would require cost data over a number of years.

In the absence of up to date information on fishing costs, some observations about likely changes in variable costs can be made. As nominated divers are usually paid on a \$/kg basis, variable costs may have fallen as a result of a reduction in catches across the fishery. Offsetting this will be the impact of higher fuel costs, as reported in ABARE's most recent fishing survey (ABARE, 2010). Anecdotal evidence suggests that fishers' costs per unit of output have, in fact, increased over time.

Speculation such as the above aside, net returns, i.e. gross returns less costs, will probably have fallen to a greater extent than gross returns. Recent downward trends in share prices support this finding, as is discussed in Section 4.8. Given that the number of shareholders in the industry has not reduced in response to the reduction in net returns, net return per shareholder will have also fallen, and is likely to be so low as to seriously threaten the viability of the industry in the long run. Some shareholders, particularly the heavily indebted, must be in particularly difficult financial circumstances at present.

Some shareholders may be able to survive in the industry by covering their operating costs while disinvesting in their plant and equipment. Some may have been able to invest surplus income from the 'good times' elsewhere in the economy, while others may have been able to draw on capital gains from trading in shares. Still others, while holding shares, may be actively employed in or have investment elsewhere in the economy. Some of the non-diving shareholders may be retired and relying on their income from leasing of quota. Divers are also increasing efficiency by taking the quota of an increased number of shareholders. However, as the fishery recovers, and some shareholders choose to become active divers again rather than lease quota, these efficiency gains may be eroded.

BOX 1 A crude estimate of net returns from abalone fishing

The Committee understands that a reasonable approximation to the cost of catching abalone remains around \$14/kg, or \$275.80 per share. Although probably an understatement, if this is assumed to cover all costs, including return on non-share capital and depreciation, adding current management charges of \$35.57 per share gives total costs per share of \$311.37. Assuming a beach price of \$26/kg and 19.7kgs per share (at the current TACC at 75 tonnes) the gross return per share is \$512.20. Deducting costs from gross returns, net return in 2009/10 is likely to be in the order of \$200.83 per share. A fisher with 100 shares would then have a total net return of \$20,083.

At an interest rate of say, 8 per cent, a total net return of \$20,083 would justify a maximum share price in the region of \$1,600. This is of little consolation, however, to those who have experienced significant real or paper capital losses, are carrying high levels of debt, or rely on the return on their shares for the bulk of their income.

Those operators that gained windfall gains when limited entry and allocation occurred, are at face value at least, still deriving positive returns from their investment in the abalone fishery. However, given the risk associated with abalone fisheries, many would conclude that this is far from an adequate return to capital and that more attractive investments exist.

4.7 Shares

There are currently 45 shareholders in the fishery (Figure 5). Of these shareholders, 38 had more than 70 shares and so qualify for endorsement. The remaining 7 do not qualify for an endorsement and presumably lease-out quota.

The number of shareholders increased from 39 to 49 in the 'boom' years from 2000 to 2002. While that is consistent with the expansionary outlook one would expect in such years, the relatively small fall (less than 10 per cent) since then is not consistent with the changes one would expect over a period of significant decline. Further, the decline in the number of shareholders over this period is mainly due to the Batemans Bay and Port Stephens Marine Parks buyouts in 2007/08, rather than to voluntary restructuring. There appears to be a degree of integration of activity among shareholders, either through family connections or through companies with common directors.

The average number of shares per shareholder has fallen from 97 in 2000 to 77 in 2008/09 (Figure 5). This is the opposite of what has occurred in the lobster fishery, where the average number of shares per shareholder has increased. Shareholders owning 70 or more shares increased from 37 to 39 between 2000 and 2001, to 41 in 2003, and to 42 in 2004 (Figure 6). The number of shareholders with less than 70 shares was 1 in 2000, 3 in 2001 and 10 in 2002. The number has been stable at 7 since 2006/07.

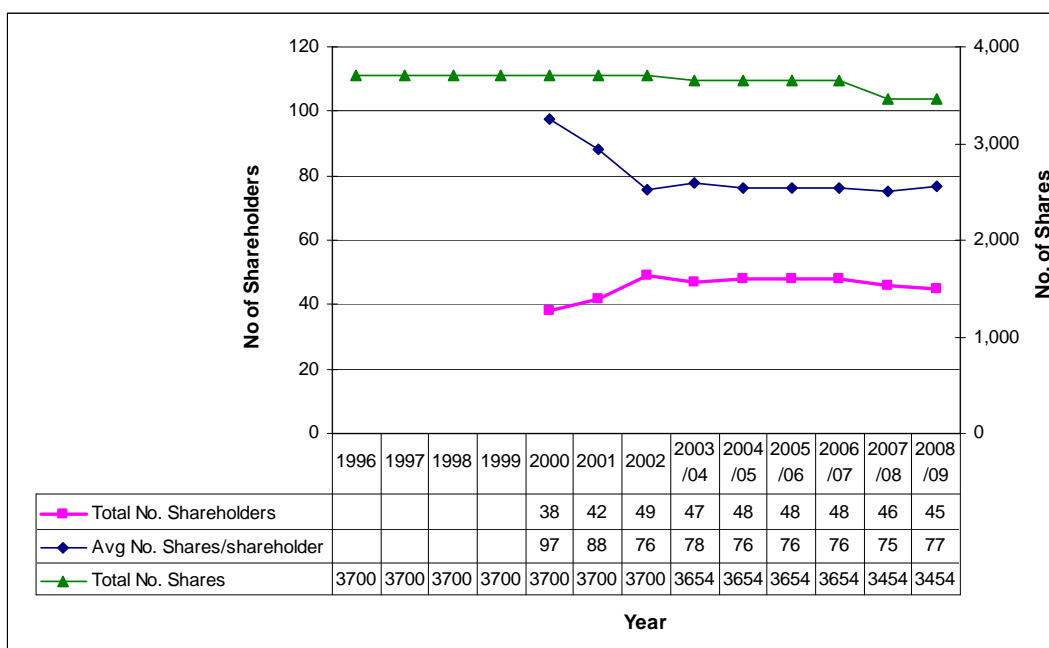


Figure 5: Number of shareholdings, 1996 to 2008/09

Diver numbers appear to have been more responsive to the economic circumstances of the industry than the number of shareholders. Diver numbers peaked at 42 in 2005 and 2006 but have declined to 31 in 2008/09 (a fall of about 25 per cent) (Figure 6).

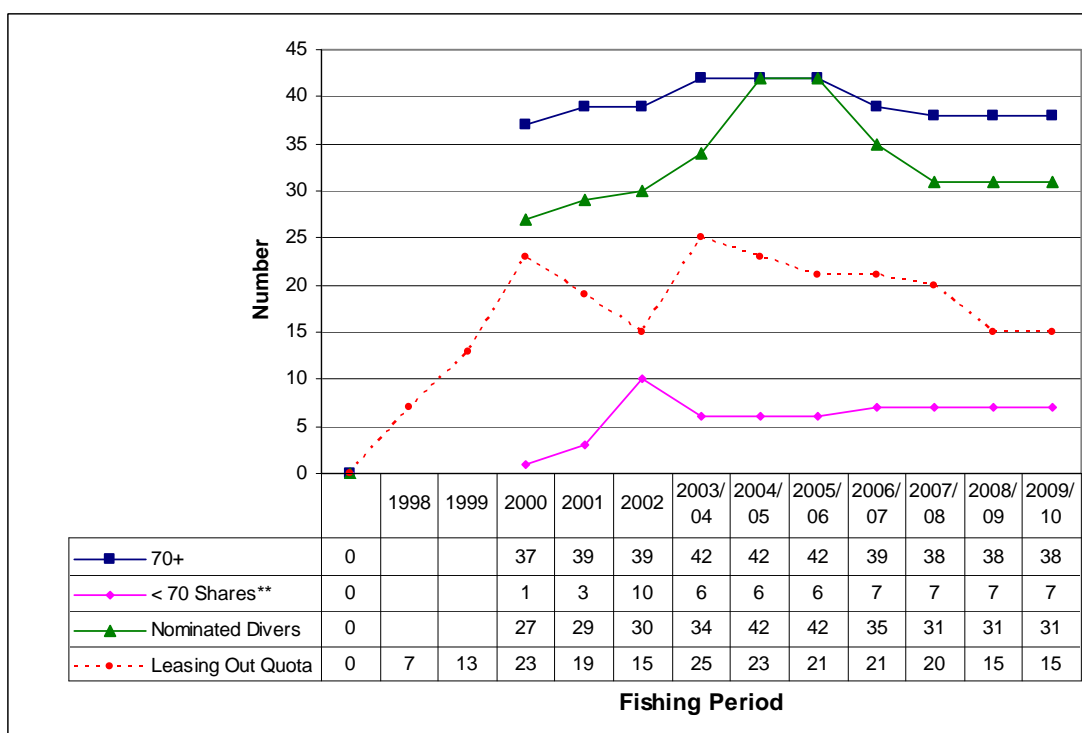


Figure 6: Distribution of shareholdings, diver numbers and quota leasing, 1998 to 2009/10

4.8 Share trading, transfers and values

Share trading activity is reported in Figure 7. No shares were traded in 2006/07, 2008/09, or the current year to-date. In 2007/08, 80 shares were traded at an average price of \$4,124 (CPI adjusted); a trade that the shareholder made public as a 'book' value transaction between two fisheries businesses.

The average price per share climbed from \$9,580 in 1996/97 to \$29,930, in real terms, in 2002/03, and then fell to \$10,231 in 2005/06. Since then, the share market could not be said to have existed, apart from the one sale mentioned above. The cessation in share trading is most likely due to the fact that many shareholders would have to accept a loss in real income if they wanted to exit the industry at this time.

Share transfer prices provide an indication of the economic health of the abalone fishery and of expectations of industry participants on the future outlook of the fishery. In this sense, falls in share prices since 2002/03 can be interpreted as reflecting a poor economic outlook for the fishery.

The volume of share trading increased after the Share Management Plan commenced at the start of the 1999/00 financial year. This trading was triggered by the change in minimum shareholding required for endorsement from 100 to 70 shares in February 2000.

In the five years following the change in minimum shareholdings the TACC declined by 15.6 per cent from 333 tonnes in 1999/00 to 281 tonnes in 2003/04. During this period some shareholders sold "excess" shareholdings – given the financial incentive to do so – noting that decisions to sell or buy were largely based on continuing confidence in the future outlook for the industry.

In accordance with the Fisheries Management (Abalone Share Management Plan) Regulation 2000, shares can be traded in packages of 10. The ability to trade shares allows existing shareholders to structure their operations based on performance during the year and, to some extent, the availability of lobsters. The reason for the minimum size of package is unclear, however it may be impeding potential improvements efficiency that may have otherwise arisen as a result of the transfer of smaller numbers of shares. The Committee notes the Department's intention to remove this impediment

Another trading rule is the cap of 210 on the maximum shareholdings in the abalone fishery. This cap could be considered unnecessarily restrictive as it falls well short of a monopoly situation. The Committee notes the Department's intention to remove this impediment and well as the removal of the requirement to transfer quota with shares other than when an entire shareholding is transferred.

The comparatively high unit price per share (i.e. the lumpiness of the price of shares) could also be an issue in impeding share trading.

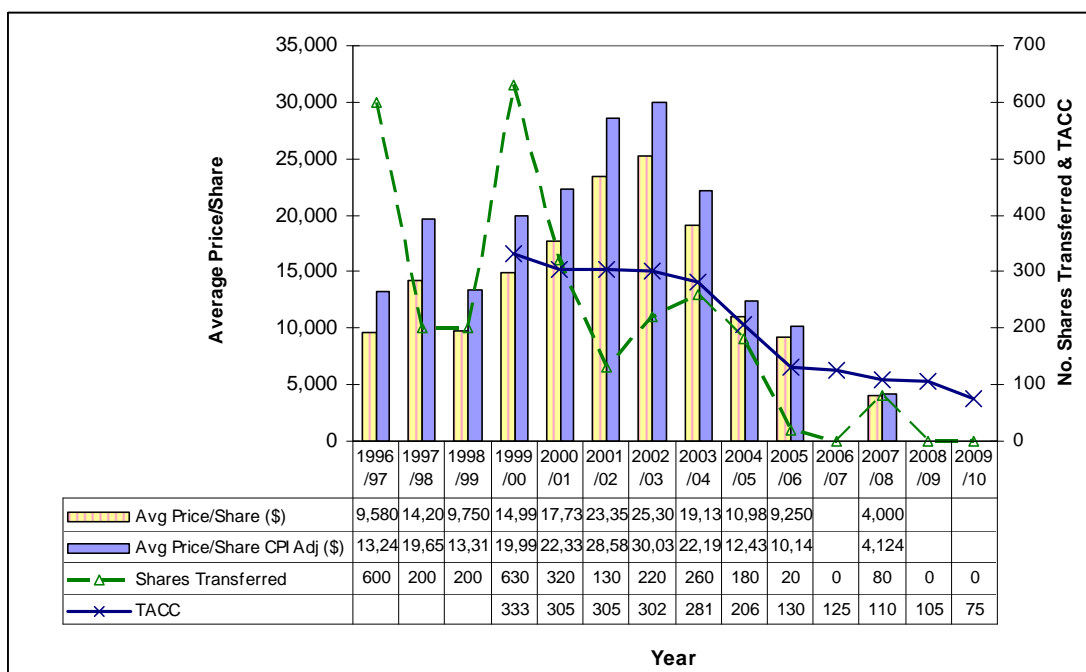


Figure 7: Share transactions in the abalone fishery, 1996/99 to 2008/09

4.9 Quota transfers and values

Quota became fully transferable in the late 1990s. The number of shareholders leasing out quota has ranged from 7 in calendar year 1998 to a peak of 26 in 2004. Since then there has been a decline to 15 in 2008. In 2008/09 47 quota transactions were completed, which comprised a total of approximately 32.8 tonnes of quota (31.2 per cent of the TACC) (Figure 8). To date in 2009/10 18 quota transactions have been completed comprised of approximately 20.5 tonnes of quota (27.3 per cent of the TACC).

The ability to trade-out quota is vital to those shareholders who do not dive, while the ability to buy-in quota would be important to the declining number of divers in the industry. More research into the operation of the quota market would be useful in assessing the resilience of the industry.

The Committee invites more detailed discussion of the quota market and its role in the restructuring of the industry.

Unfortunately, information on the price at which quota is transferred is not collected by the Department. A price of \$18/kg from one quota transfer was voluntarily reported in 2008/09.

Industry members, particularly Mr George Chung, have indicated that many transfers are not commercial, in that they are un-priced transfers between shareholders, on a quid pro quo basis. If this is the case, then a potentially thin market is made even thinner, and potentially less efficient in revealing the value of abalone.

A number of administrative rules regulate quota trade. For example, quota may be transferred only in lots of 100 kilograms or as otherwise approved by the Director. Also, a shareholder may not acquire by any such transfer more than twice the amount of the shareholder's initial quota for the fishing period. These rules may impede a shareholder's ability to take advantage of market signals, that is, to operate more efficiently in the market. First, they may prevent requests for the transfer of smaller lots of quota. Second, they prevent a shareholder from acquiring substantial amounts of relatively risk free quota. The

Committee notes the Department’s intention to review the current restriction on the amount of quota that can be leased by shareholders.

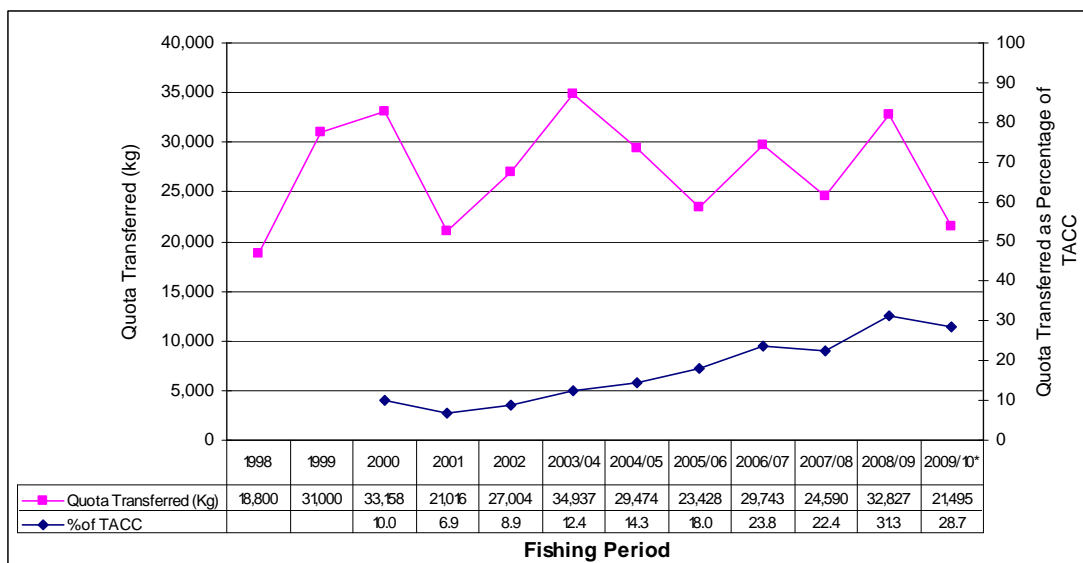


Figure 8: Quota transferred as a percentage of TACC

The Committee repeats its recommendation that the Department and Industry work together to develop more detailed information on the structure and operation of the quota market.

4.10 Impact of illegal unreported removals

Previous reports by the Committee have discussed the loss of economic value from the fishery due to high levels of illegal catch. It has been suggested, in those reports, that the returns on investment to either reduce the level of these catches, or to determine the real extent of illegal catch (which may or may not result in an increase in TACC) would be high.

4.11 Recreational and indigenous catch

As with illegal catch, there is the possibility of loss of economic value from the fishery due to high levels of recreational and indigenous catch. Current estimates of recreational and indigenous catch are unreliable. More reliable estimates of recreational and indigenous catch are needed.

4.12 Economic data

In past verbal presentations and discussions with the Committee, both the Department and the industry have shown appreciation of the need to improve the quality and quantity of the economic data they present. However, the economic data available to the Committee on which to base its recommendation is still lacking and the Committee is still unable to meet its statutory obligations regarding provision of economic advice to underpin setting of the TACC. In the absence of economic data, the Committee remains concerned about the possible consequences of its determination for the profitability of the industry and the financial well being of those in it.

As indicated earlier in this report, authoritative comment on the economic performance of the abalone fishery is restricted to interpretation of changes in share prices and some crude calculations of net returns. As also discussed earlier, better information on the costs of

fishing would allow for the net return from abalone fishing to be calculated more accurately. It would also place industry in a much more informed position regarding setting of the TACC in order to maximise profits, and setting of the community contribution charge such that it does not extract less, or more, economic rent¹ than is present in the fishery.

In order to collect better information on the costs of fishing, a survey, such as that undertaken by EconSearch for the South Australian rock lobster fishery, could be undertaken (EconSearch, 2008). Ideally, this survey would commence as soon as possible and would be conducted every three years, with annual updates, to ensure that fishers are able to maximise economic returns from fishing over time.

Industry, in a helpful presentation to the Committee suggested a similar way forward by using simple indicators including:

- GVP, TACC x beach price;
- agreed fixed costs; and
- indexed variable costs e.g fuel, deckhand days etc

Industry suggests that the survey undertaken by Roy Morgan Research in 2001 could be used as a guide as to the types of fixed and variable cost data that need to be collected. The Committee notes that a similar set of cost variables are used in the Econsearch study.

Such information would be combined with a set of more meaningful economic performance indicators than those currently in the EIS.

The Committee recommends that the Department and industry work together to devise a cost-effective and collaborative means of collecting economic data on the performance of the abalone fishery

4.13 Community Contribution Charge

The community contribution charge is calculated annually and considers CPI, abalone beach price and TACC. It is payable by each shareholder following each fishing period. The community contribution charge has been set at \$0 since 2005/06, following a decline in TACC and average estimated beach price.

The formula for calculating the community contribution charge was developed by a Government Working Group with representatives from the then NSW Department of Primary Industries and NSW Treasury. In developing its formula, the group used data on fishing costs collected for the 1999/2000 fishing year by Roy Morgan Research. As the estimates of fishing costs from this survey are now out of date, they can no longer be relied upon to estimate the appropriate level at which the community contribution charge should be set. Better information on the costs of fishing is required in order to ensure that the community contribution charge does not extract less, or more, economic rent than is present in the fishery.

4.14 Performance indicators for the fishery

The Committee notes that the economic indicators and triggers in the proposed Fishery Management Strategy for abalone are lacking in specificity and relevance, and clear management responses. These indicators and triggers need to be revised as a matter of urgency to make them more relevant to measuring the economic status of the industry.

¹ Economic rent is profit in excess of normal returns on capital. Estimates of normal returns on capital in commercial fisheries vary, but can be as high as 10 per cent.

However, whatever the indicators and triggers for the assessment of the economic status of the industry are, the Committee believes the currently available data on the structure, conduct and performance of the industry will not be sufficient to make them operable.

The Committee recommends that performance indicators and triggers are revised to make them more relevant to measuring the economic status of the industry.

The Committee repeats its recommendation (see 4.12) that data and analysis on the structure, conduct and performance of the industry be improved, at least to a point where performance against agreed indicators and triggers is possible.

4.15 Structural Change

Given the current perilous economic circumstances in the abalone industry, structural adjustment is necessary if the industry is to remain viable. Looking at this in a slightly different way, the limited structural change that has occurred in the abalone industry does not seem consistent with an industry in perilous economic circumstances.

As stated above shareholders appear reluctant to exit the industry, or to undertake other structural adjustments which may reduce costs. The returns, however poor, appear to be adequate for the moment (at least for some shareholders) and indebted shareholders are not prepared to realise a loss on their initial capital investment by selling at current share prices. Further, many shareholders, as is discussed in Section 4.6, may be supplementing/subsidising their involvement in the fishery by using other sources of income. It is also possible that there are significant non-financial benefits (e.g., unpriced lifestyle values) that make up for low returns to capital and labour.

In 2005, the Keniry Report (2005:4) raised concerns about the number of divers and the value of shares in the abalone fishery:

The declining ecological state of abalone has had a seriously adverse impact on the financial state of the commercial fishery. There are too many endorsed divers, whose average annual revenue is now insufficient to meet their costs and provide even a modest living. In many cases, divers have been forced to adjust by taking employment in other fields to supplement their income from abalone. There are many shareholders in the industry whose shares are now worth a fraction of their initial cost and whose income falls well short of meeting their operational and financing costs.

A better understanding of the reasons behind the reluctance of industry to restructure in the face of such difficult economic circumstances would be useful, along with detailed information on the structure, conduct and performance of the industry, particularly the structure of shareholdings, costs and levels of debt. The Department has provided some time-series information on the distribution of shareholdings to the Committee for this determination, but as the data is in aggregate form it is difficult to fully assess whether structural change has occurred.

If, as appears to be the case, the abalone industry is now facing pressure to adjust, there is reason to believe on *a priori* grounds, and on the basis of the experience of the rock lobster industry, that present share management arrangements should facilitate adjustment rather than impede it. In Sections 4.8 and 4.9 of this report, management arrangements relating trading of shares and quota that may be impeding restructuring were discussed. However, it was also noted that the Department intends to remove many of these impediments.

The Committee believes that financial intervention by Government to assist with moving the fishery, including the abalone resource and its management, to a sustainable footing through assistance with the development of alternative assessment/management arrangements, is justified. The basis for intervention should be the proposition that the likelihood without intervention of the fishery as a whole, recovering to sustainable levels under market forces and the current management regime is minimal, as discussed elsewhere in this report. The purpose of such intervention should be to facilitate the necessary steps to ensure restoration of sustainable levels of the stock.

The Committee believes this view is consistent with the views of SARG, application of the precautionary approach, and with the view of IPART. In the case of the last-mentioned, previous IPART rulings have supported the principle that the development of public policy is a matter of public good and should therefore be paid for by government.

4.16 Conclusion

While the available data makes an authoritative assessment of the economic status of the industry and the potential economic impact of this determination difficult, it is sufficient to conclude that sections of the industry are almost certainly suffering financial stress and that its long term viability, as presently structured and operated, is under threat. Measures such as the reduction or removal of management fees and charges, and the reduction of research effort, while perhaps welcome in the short run, are at least only palliative and at worst, destructive. Continued support of this nature will, in fact, impede structural change, which is necessary if the abalone industry is to cover all appropriate costs, including the provision of appropriate government services and the payment of a community contribution when and if economic rents are being earned. The Committee has suggested that there are likely to be more efficient/cheaper ways to manage the fishery without compromising sustainability objectives, and we note that these are now being pursued.

The Committee reiterates its strong position that it would be appropriate, and indeed a good use of public funds, to use Government funds to intervene in the abalone fishery and support the development of alternative, more cost-effective management arrangements.

The Committee notes that NSW abalone product is up against strong competition from wild caught product in the significantly larger producing states of Tasmania, Victoria and South Australia, and aquaculture product. As aquaculture operations continue to expand new overseas markets and marketing initiatives for wild caught NSW abalone will need being explored. The Committee cannot, however, support any initiatives that place market considerations over the long-term sustainability of the resource.

There has not been the degree of structural change in the abalone fishery that one would expect in light of the perilous economic circumstances. In this report, a number of suggestions are provided as to why this may be the case. Better information on the structure, conduct and performance of the industry, would improve the prospects of understanding the reasons behind the reluctance of industry to restructure in the face of such difficult economic circumstances.

The Committee is reassured that restructuring seems to be occurring amongst divers in the fishery, with fewer divers taking a greater proportion of the catch. Quota is trading, potentially towards low cost more efficient operators, and the number of divers in the water is falling. The Committee believes that this pattern of change is likely to be sustained. It also believes that both the fishery and the remaining industry participants will benefit from it.

The Committee has made a number of recommendations in this report that are aimed at improving the economic information available on which to base management decisions. The

Committee also recommends that the performance indicators and triggers against which the economic status of the industry is measured should be revised.

The Committee notes that while the volume of illegal catch appears to be falling, this is still significant and undermines the economic value from the fishery.

The Committee's continued conservative determination for the TAC in 2010/11 is based on the need to provide strong prospects for biological recovery of the fishery over the long term. By leaving stock in the water, this TAC strategy also offers improved prospects for economic recovery of the fishery, again over the longer term. As reflected elsewhere in this report, there is an important trade off to be made between short-term economic gain from increased TACs and the longer-term biological and economic recovery of the fishery. As with the lobster fishery, it is also expected that as stock increases and the fishery is seen as more robust against short term fluctuations, asset (share) values will increase.

5. State of the Stocks

5.1 Introduction

In making its determination the Committee considers the current and likely future status of the stock. There are two main features that provide a background and context for this year's consideration – previous conclusions about the status of the stocks and changes in the information available for assessment.

5.1.2 Previous conclusions about the status of the stocks

NSW abalone stocks have historically suffered from significant over-fishing and over-depletion. Recent reductions of the total catch (commercial and recreational) and recommended increases of the minimum legal size have been a response to that situation. The stock showed significant evidence of over-depletion in the 1990s and early 2000s. This included:

- i) serial depletion starting in the north of NSW in Region 1 (exacerbated by mortality from a severe outbreak of *Perkinsus* in at least the southern part of this region in the late 1990s) and progressing south;
- ii) recruitment overfishing (i.e. breeding stocks reduced to the extent that this results in a reduced number of young produced) in Region 2 which started in the early to mid 1990s;
- iii) Regions 3 and 4 showed patterns consistent with the onset of recruitment overfishing from the mid-1990s into at least the early 2000s;
- iv) all of the well monitored Regions (i.e. 2-6) showed an increasingly 'spiky' pattern in catch rates and recruitment, including progressively lower lows between the spikes with briefer and (in most Regions) progressively lower highs; and
- v) the fishery becoming highly dependent on the abalone that grow over the legal minimum length each year, with the population having substantially lost the buffering effect of multiple and well represented year-classes.

The estimated historical recruitment to 2007 is shown in Fig 7, the results of fishery independent surveys for medium sized abalone (the most reliably surveyed size class) to 2007 is shown in Fig 8, and the historical patterns in catch rate can be seen in the updated information given in Fig 9.

The abalone stocks have shown a pattern with periods of high and low productivity, and this is an important context for the current dynamics of the fishery. This pattern of episodic productivity is consistent across all of the well monitored Regions, and is reflected in peaks of the fishery catch rate in about 1988, 1995 and 2001 (Fig 9). That is peaks in fishery productivity that are about 6-7y apart. These peaks coincide approximately with estimated peaks in recruitment of young abalone (Fig 7), although the estimation methods cannot distinguish well between variability in the number of young abalone recruiting to the population, their growth rate or their survival – change of any of these factors could give similar consequences and they may vary together.

After the catch rate peak in 2001 there was a rapid reduction in catch rate and 2005 gave the lowest levels yet seen in the fishery. While the estimates of recruitment indicated that another peak was about to move into the population they also indicated that this most recent peak was extremely weak in the north (Region 2), weak in the central areas (Regions 3&4) and average in the southern areas (Regions 5 & 6). The substantial reductions in the TACC through this time were to both limit the further depletion of the stock and to take advantage of the expected next peak in productivity in the late 2000s to rebuild the stock.

Within this overall context there have been additional specific issues and analyses relating to the status of stocks in the northern part of NSW (i.e. Regions 1 and 2).

Region 1 North (north of Port Stephens, subregions A-E)

There has always been very little information available to assess the status of stocks in Region 1 north of Port Stephens. There was no Fishery Independent Survey coverage in this area and there has been very little commercial fishing at any time since 1987 (i.e. even when there were no regulated restrictions on fishing there). It is not known whether, or to what extent, the stocks there were affected by the disease *Perkinsus* that significantly reduced stocks in the southern portion of Region 1. Special catch allocations have been made in Region 1 North over several years to allow collection of data to determine the extent of *Perkinsus* impacts, to support an initial assessment of the stocks and to estimate a sustainable catch.

Region 1 South (south of Port Stephens, subregions F-L)

This area suffered a severe outbreak of *Perkinsus* in the late 1990s. There were relatively few Fishery Independent Survey sites in the southern portion of Region 1 but they all showed the death of 50-75% of abalone of all sizes. Some areas were closed to commercial fishing in 1996 and the whole of Region 1 South was closed in 2002. The Fishery Independent Surveys subsequent to total closure showed continued low abundance and no recovery of the small or medium sized abalone, and an accumulation over time of increasingly large abalone interpreted to be the survivors of the outbreak augmented by low recruitment. The Fishery Independent Survey sites were clustered in three areas - Port Stephens, Sydney and Kiama (subregions F, J and K) – so there has been concern about how representative these sites were of the whole region.

Trial fishing in 2004 showed that it was possible to take high catch rates of large abalone from targeted sites, as was expected from the Fishery Independent Survey data, but did not help to assess the status of the stock or the extent of any recovery.

In 2007 a program of trial fishing on pre-identified sites that were historically productive was conducted to test the change in status of the stock at those sites. This program allowed comparison of the proportion of previously productive sites that remained productive, of the change in catch rate at those sites compared to catch rates in 1994, 1987 and 1982-85, and of the current catch rates at historically

productive sites compared to sites chosen by divers as being productive in 2007. The general conclusions were:

- i) about 36% of historically productive sites were still as productive as they previously were;
- ii) 70-80% of historically productive sites have catch rates that are lower than those recorded there in 1994 or 1987;
- iii) the northern subzones, between Pt Stephens and Sydney (subzones F, G and H), had very low abalone abundance and a major loss of historically productive sites;
- iv) the southern subzones, between Sydney and Wreck Bay (subzones J, K and L), had considerably higher abalone abundance and had lost fewer historically productive sites than the northern subzones, and slightly more than half of all sites fished in these southern subzones had catch rates greater than was recorded there in 1994;
- v) for almost all sites the median length of abalone taken was greater than 120mm (i.e. more than 50% of abalone were larger than 120mm length);
- vi) the diver selected sites provided slightly higher catch rates than the pre-identified historically productive sites but data from diver selected sites did not materially change the overall results or conclusions.

Overall these conclusions are consistent with the Fishery Independent Survey data in indicating that Region 1 South supports some pockets of large and dense abalone aggregations, but that many historically productive sites still do not support dense abalone aggregations or significant numbers of small abalone despite many years of protection from fishing. The stock of legal sized abalone in the northern subzones (F, G and H) remained very depleted in 2007, while the stock of legal sized abalone in the more southern subzones (J, K and L) has recovered to 1994 levels at more than half of the sites examined.

Region 2

Region 2 was closed to commercial fishing in 2006 because of evidence of recruitment overfishing there (see Fig 7). The average recruitment in Region 2 started decreasing in about 1995, including a decrease in the strength of recruitment in the 'pulse years'. The 1995/96 and 2001/02 pulses of increased productivity and recruitment were estimated to be very much weaker in Region 2 than in the more southern regions in those years, and were considerably weaker than was seen in Region 2 in the 1988/89 pulse. Following the closure of Region 2 special catch allocations have been made each year to allow collection of data that would support an improved assessment of the stocks there, especially in relation to the interpretation of recruitment overfishing.

To address these issues of over-depletion the TAC was reduced significantly during the 2000s. The catch reductions between 2005/6 and 2009/10 coincided with the period when, based on previous patterns, a pulse of relatively good recruitment was expected to enter the population and provide a good opportunity for recovery of the stock. The commercial catch rates increased after 2005/6, and by 2009/10 they had recovered significantly with the catch rate approaching historical benchmarks in some Regions and reaching them in others. There remained considerable uncertainty about the robustness of the improved stock condition, particularly concerning:

- whether the rebuilding that had occurred to the stock of commercial sized abalone was sufficient to allow continued recovery, and prevent return to decline, after the current pulse of good recruitment passed (expected in about 2010);
- lack of a measure of the abundance of sub-legal sized abalone that could indicate the strength or weakness of recruitment expected into the commercial sized stock during the next few years; and
- the representativeness of the catch rate in reflecting the abundance of the commercial sized stock given that the low TAC could be targeted on known areas of high abalone concentration.

However there was sufficient optimism to support an increase in the TAC for 2010/11, and this TAC was increased further when an in-season review showed that the catch rates had continued to increase so that by mid-2010/11 they were at or above the historical thresholds in all Regions. These two increments together represent a 25% increase in the TAC for the fishery.

A key question for management of the fishery to recovery, and preventing a return to depletion when it is recovered, is: what was wrong with the historical management settings that allowed the serial and excessive stock depletion to occur? In addition to the appropriate catch level three other important issues in relation to this are:

i) Finer spatial scale management

The Committee and others have for many years recognised the importance of effective monitoring, assessment and management at a finer space scale than was applied previously. There are ongoing discussions and efforts to improve finer scale data gathering from the fishery (e.g. GPS-linked data loggers), data analysis for stock assessment, and management measures (e.g. local catch caps). While these developments are promising and welcome they have been very slow to deliver outcomes. There has been increasing fishery coverage and data collection from the data loggers in recent years, but no interpretation or analysis of these data in relation to stock condition or trends. Also the measures for setting and adhering to finer scale catch caps, so as to avoid overly concentrated fishing and serial depletion, have been effective in some years but not in others.

ii) Minimum Legal length (MLL)

The Committee and some in industry have questioned the appropriateness of the current Minimum Legal Length (MLL). The fishery has a history of a relatively small MLL compared to that used in other fisheries on the same species. In NSW the MLL was 100mm in the 1970s, was increased to 108mm for most of the 1980s, was further increased to 115mm for the 1990s and most of the 2000s, was then increased fishery-wide to 117mm from 2008, and in the most southern areas of Region 6 was increased to 120mm from 2010 (some in industry have voluntarily and successfully fished to a 119mm size limit in more northern areas also). The MLL for the same species in Victoria is 120mm in open coastal habitats east of Lakes Entrance (with voluntary industry size limits of 125mm and 130mm in some areas), in Tasmania is 127-138mm across the various harvesting regions, and in South Australia is 125-130mm across the various harvesting regions. It should also be acknowledged that these fisheries allow fishing at smaller size limits where it has been confirmed that the size at maturity or growth is lower. The main point is that the 'default MLL' (i.e. the one that is most appropriate for the fishery or major region within a fishery) is higher in these other jurisdictions than it is in NSW.

For several years the Committee recommended that a larger size limit be applied to the overall fishery, within which various arrangements can be applied as is cost-effective to access any areas where abalone growth is stunted. The advantage of a higher default MLL

which can be selectively reduced as appropriate, rather than low MLL everywhere, is that it protects the stocks in areas where abalone grow quickly and reach reproductive maturity at large size from localised overfishing and sequential depletion. These sites of fast growing and large abalone are also the most productive in the fishery but are vulnerable to overfished at a small MLL. While this approach to the MLL has been supported by a significant number of industry submissions to the TACC over the years, the MAC appears implacably opposed, and this view has been supported by the Department for the last two years.

A major element in the argument against increase in the overall MML has been the view that NSW has many areas of stunted abalone growth. Early scientific analysis for the NSW fishery was based on three hypotheses about the average growth rate of abalone, but of these only the fast growth rate hypothesis is consistent with the observations from the NSW fishery as the MLL was increased from 115mm to 117mm. So by 2010 it was clear from the response of the fishery to the recent changes in the size limit that the population is not dominated by stunted stocks and that the earlier research results suggesting this were not representative of the overall stock or the current situation. The observed rapid increase in the individual weight of abalone caught and the very rapid recovery of catch rate following the recent increases in MLL simply would have been impossible if the population was dominated by stunted stocks. The optimum overall MLL for the recovered fishery that is implied by the fast growth rate hypothesis is in the vicinity of 120mm. This MLL implied from this fast growth hypothesis is also more consistent with that for the same species of abalone elsewhere.

iii) Benchmarks and reference levels

The Committee has for several years commented that the benchmarks and reference levels used in the Share Management Plan and the Fishery Management Strategy were set at levels that did not adequately protect the sustainability and productivity of the stock, and that revision of these benchmarks and reference levels needs to be explicitly grounded in the biological productivity of the stock.

5.1.2 The information available for recent assessments

The information available to the Committee to assess the status of the stock has changed and diminished considerably in recent years.

- Up until and including the Committee's 2008 determination the fishery assessment was based on (i) Fishery Independent Surveys of the relative abundance of different size categories of abalone (including abalone smaller than the minimum legal size in the fishery so as to provide a 'leading indicator' of recruitment to the fishery), (ii) catch rate and weight composition from commercial fishing, (iii) integrated analysis of this information by fitting a length-based population model to estimate population size and recruitment, and (iv) prediction of the expected future trends in the status of the stocks under different possible levels of fishery catch.
- Since 2008, through various decisions of the industry and Department, the Fishery Independent Survey has not been conducted, there has been no update of the population model to assess stock status and there has been no scientific prediction of future trends of the stock. Consequently in 2009, 2010 and again in 2011 there was no formal scientific stock assessment or prediction of future stock condition. The primary reason for this was to reduce costs, although there were also some industry concerns

about the representativeness of the Fishery Independent Survey sites and hence the indices of relative abundance based on them.

- Collection of fine scale data on fishing effort and catch, through the use of GPS-linked data loggers, started in 2008. Coverage of the fishery has increased since then as more, and more reliable, data loggers have been provided to divers. Descriptions of the data from the data loggers were presented to the Committee again this year. However, as in previous years, these data were not analysed or interpreted with respect to stock status or trends. In particular there was no analysis that related interpretations of the currently collected data from the data loggers to interpretations of historically collected data. Such analysis is necessary to provide perspective and context of the current interpretation of stock status. Issues of special significance in this are comparisons of the fine scale information with the historical Fishery Independent Surveys, with trends from previous data on commercial catch rates, and for estimation of key fishery properties (e.g. thresholds for recruitment overfishing and maximum stock productivity).

The information available to assess the status of stocks is in a transition from the previous methods based on Fishery Independent Surveys, coarse scale data from commercial fishing and population modelling to future methods that are hoped to be better and cheaper based on fine scale data reporting. But the previous methods have been stopped before the new methods have been fully established or shown to be adequate, leaving the current period in which there is increased uncertainty about interpretation of information from the fishery and consequently about the state of the stock. Also there is now heavy reliance on commercial catch rate as an indicator of stock abundance. This reliance on commercial catch rate has well known problems, particularly in a fishery managed by individually tradable quotas where the management intent is for industry to increase efficiency and catch rate through innovation and changed fishing practices. Commercial catch rate is notoriously 'hyper-stable' for abalone fisheries, because high catch rates can be obtained and maintained for a time by targeting concentrations of abalone in known patches of preferred habitat even if the overall population decreases. Such hyper-stability of catch rates has been seen in the history of the NSW abalone fishery at both the Region and Sub-Region scales. Furthermore, commercial catch rate is a 'trailing indicator' that reflects what has happened, rather than a 'leading indicator' that informs about what will happen – it contains no information about the numbers of sub-legal sized abalone that will provide the future commercial stock. In principle analysis of the fine scale data now being collected could provide solutions to these problems, but to date this has not been attempted or demonstrated.

These are a particularly serious weakness in the current management situation where key questions relate to the robustness of the recent stock improvements to an expected natural downturn in productivity and the ability to detect any lack of robustness before the stock condition deteriorates. With the limited information and analysis that is currently available it is not appropriate or possible for management measures to be based on detection and tracking of the detailed nuances of population change in response to natural variability or the effects of previous management interventions – rather management measures must be simple, robust and precautionary.

5.2 Information and analysis available in April 2011

5.2.1 Catches, catch rates and average weight

The annual commercial catch rate for each Region is shown in Fig 5.3. The data for 2010 confirm the interim information provided to the Committee for the in-season review of the 2010/11 TAC. That is the improving annual catch rates seen since 2005 have continued

strongly and catch rates in all Regions are now above historical thresholds. In all Regions the monthly catch rate has been 'flat' and fluctuating without trend for the latest about 8 months (i.e. late 2010 to April 2011), having apparently stabilised at the higher level after the large increases during 2009 and early 2010 (Fig 5.4). Reduced stock productivity is expected from about 2010 if previous patterns of fluctuating productivity are repeated. This recent 'flattening' of the catch rates could be an early indication of this reduced productivity, although with the current low TAC and recently accumulated stock in the population it is hoped and expected that the commercial catch rate will not to be a particularly sensitive indicator of any decrease in stock productivity.

The arrangements to set and implement sub-Regional catch caps and limits, intended to spread the catch spatially and avoid localised depletion, were not entirely successful. As a result some areas provided more catch than intended, exceeding the catch target and in several cases also exceeding the catch limit, while other areas provided less catch than intended. Some areas provided no catch, precluding even basic monitoring through the catch rate. An explanation provided for this failure was that the fishing was so easy everywhere that the caps were not necessary. But this misses the point of the caps in spreading effort, in preventing the development of sequential depletion (which starts with over-harvesting of accessible and profitable concentrations when the stock is abundant), and in developing, demonstrating and institutionalising a finer scale management control that is essential in the longer term.

The catch rates in all Regions recovered to their previous levels within 4-6 months after the increase of MLL from 115mm to 117mm in July 2008.

The average weight of abalone caught increased substantially in all Regions when the MLL was increased to 117mm. There have been further steady increases in the average weight since 2008 in Regions 4, 5 and 6. But the average weight has remained approximately constant since 2008 in regions 1, 2 and 3. The average weight in the commercial catch is a coarse and insensitive indicator, and several different interpretations are consistent with the same trend in average weight. The simplest interpretation is that there is no significant size selectivity by the fishery in any Region - implying that the size composition of the populations in Regions 4, 5 and 6 is rebuilding, whereas there has been very limited or no such rebuilding of the population size composition in Regions 1, 2 and 3. But interpretations could change with different assumptions about fishery targeting practices. Also industry has suggested that a different method of recording weights historically in the northern Regions (i.e. Regions 1, 2 and parts or 3) might further complicate interpretation. Interpretations would be greatly improved by complimentary sampling of the length composition from the commercial catch, by accounting for changes in fishery targeting, and by surveys or structured fishing to directly measure population size composition.

Anecdotal observations from industry are unanimous in reporting that there are numerous undersized abalone in the population, and while all report significant improvement in the stock during the last few years there are conflicting views about the robustness and stage of the recovery so far.

5.2.2. Illegal, unreported and recreational fishing catches

The level of illegal, unreported and recreational catch, and trends during the history of the fishery, remain very uncertain.

Since July 2005 the permitted recreational bag limit has been reduced from ten abalone per day to two, and there has been both extra focus on compliance and increased penalties for illegal recreational fishing. Reports from industry, management and compliance all agree that this has substantially reduced the recreational catch. The Committee considered that

the recreational catch now and in the next few years is likely to be in the vicinity of 5-15 tonnes.

In previous years, the illegal and unreported catch was assumed to be 40% of the legal and reported catch in 1987 – that is 102 tonnes from Regions 2-6. The absolute quantity of illegal catch is very unclear. General impressions from compliance officers and industry are that the illegal catch probably was about 100 tonnes per year in the past, that it was likely to have been below 100 tonnes but above 50 tonnes in 2008, and to be in the vicinity of 20-40 tonnes per year since then. The introduction of indictable offences for abalone theft, the targeting of poaching syndicates by compliance officers, and the development of improved methods to permit indigenous catch are all thought to have improved the situation. In the present circumstances of stock condition and stock assessment capability it was considered appropriate to have any reduction in illegal catch contribute to stock rebuilding.

5.3 Conclusions

There is no doubt that there has been substantial improvement in the state of the stock in recent years, starting in about 2006 but particularly since about 2009. The TAC reductions and increased MLL have succeeded in this regard and the population has accumulated stock 'on the bottom' from a period of low TAC and high productivity. There is also no doubt that this accumulated stock could be caught through a higher TAC, though the sustainability of such an increase in TAC is highly uncertain. The central questions are:

- i) the extent of the recovery in relation to the key fishery properties (e.g. thresholds for recruitment overfishing and maximum stock productivity);
- ii) the robustness of the recovery so far to a downturn in stock productivity that is expected to start in about 2010 if previous patterns of productivity fluctuation are repeated; and
- iii) identification and rectification of the past management settings that allowed the overfishing to occur historically so that they are not repeated as TACs are increased during stock recovery.

The information and analysis available does not provide convincing examination or confident conclusions in relation to these central questions. In this situation the conclusions drawn must be precautionary.

The updated 2010/11 data confirms the information that gave rise to the mid-season increase in the 2010/11 TAC. There is little new information available to modify those previous conclusions about stock status and trends. The relatively flat catch rates in the past about 8 months could be an early sign of the expected decrease in stock productivity, recognising that the Regional catch rate is not expected to be a highly sensitive indicator of stock abundance, and that other interpretations are possible. However the pattern seen in the catch rate over the next 2-3 years should indicate the robustness of the recent stock rebuilding to these natural fluctuations. In the present circumstances it is decided that there should be no change in the TAC for 2011/12 and consequently that the TACC should remain at 94t. As in the previous year the Committee decided that the commercial catch taken from each area should not exceed:

Region 1 North (subregions A-H)	3t available for Fishing Surveys or Structured Fishing to a design acceptable to the Department to inform future TAC setting
Region 1 South (subregions F-H)	0t
Region 1 South (subregions J, K & L)	4t available for Fishing Surveys or

	Structured Fishing to a design acceptable to the Department to monitor stock condition and recovery.
Region 2	5t available for Fishing Surveys or Structured Fishing to a design acceptable to the Department to monitor stock condition and inform future TAC setting
Regions 3 and 4	31t
Regions 5 and 6	51t
Total TACC 94t	

An immediate consideration in the Committee reaching this conclusion is uncertainty about achieving continued stock rebuilding, or at least stabilisation at present levels, during the next few years if natural productivity fluctuates lower. But there are also significant concerns about the slow progress in recognising and rectifying features of the historical management settings that allowed past sequential depletion and overfishing of the stock. Simply increasing the TAC during stock recovery without identifying and addressing these past weaknesses in the management arrangements risks or perhaps even guarantees a repeat of history.

One widely accepted improvement that is needed is to finer scale monitoring, assessment and management. There has been a great increase in the amount of fine scale data collected from the commercial fishing operations in recent years and these efforts are commendable. However, as yet these data have not been analysed and interpreted to inform understanding of the status and trends of the stock. Also the management arrangements for setting and accurately implementing finer scale catch caps have had variable success among years, and were not successful in the most recent year. Another area of recommended management improvement is in the MLL for the fishery. An increased MLL to 120mm throughout the fishery, with options to use a lower MLL where this was shown to be appropriate and cost-effective, would give both biological and economic benefits. It would provide additional protection to the spawning stock in the event that the natural productivity of the stock fluctuates lower in the next few years. While there is uncertainty about exactly what growth rates characterise the overall NSW abalone population, and there will be spatial variability in growth, the fast growth rate hypothesis and its implied optimum MLL of 120mm is the interpretation most consistent with the available information. Further, it is widely recognised that in the most southern areas (sub-Regions Z1-Z5) abalone grow fast and reach a large maximum length, and that abalone in the north (Regions 1 and 2) are currently characterised by large size. Consequently a larger MLL is indicated for these areas. If the overall MLL for the fishery was 120mm, and 123mm in sub-Regions Z1-Z5 and 125mm Regions 1 and 2, there would be grounds to reconsider the TAC. And with these MLLs a TAC of 110t would be expected to provide an acceptable balance of risks in the medium term.

Figure 7. The pattern of recruitment estimated from the fitted population model in 2008 (the last year of its application) for the base case interpretation and various alternatives to test sensitivity of the analysis. The recruitment pattern is not sensitive to these alternatives. In Region 2, there has been a decreasing trend in recruitment since about 1990. The average recruitment in Regions 3, 4 and 5 and 6 since about 1990 is lower than in the earlier period, with an increasingly ‘spiky’ pattern or recruitment through time showing with different Regions showing different mixtures of lower lows, more persistent lows and briefer highs.

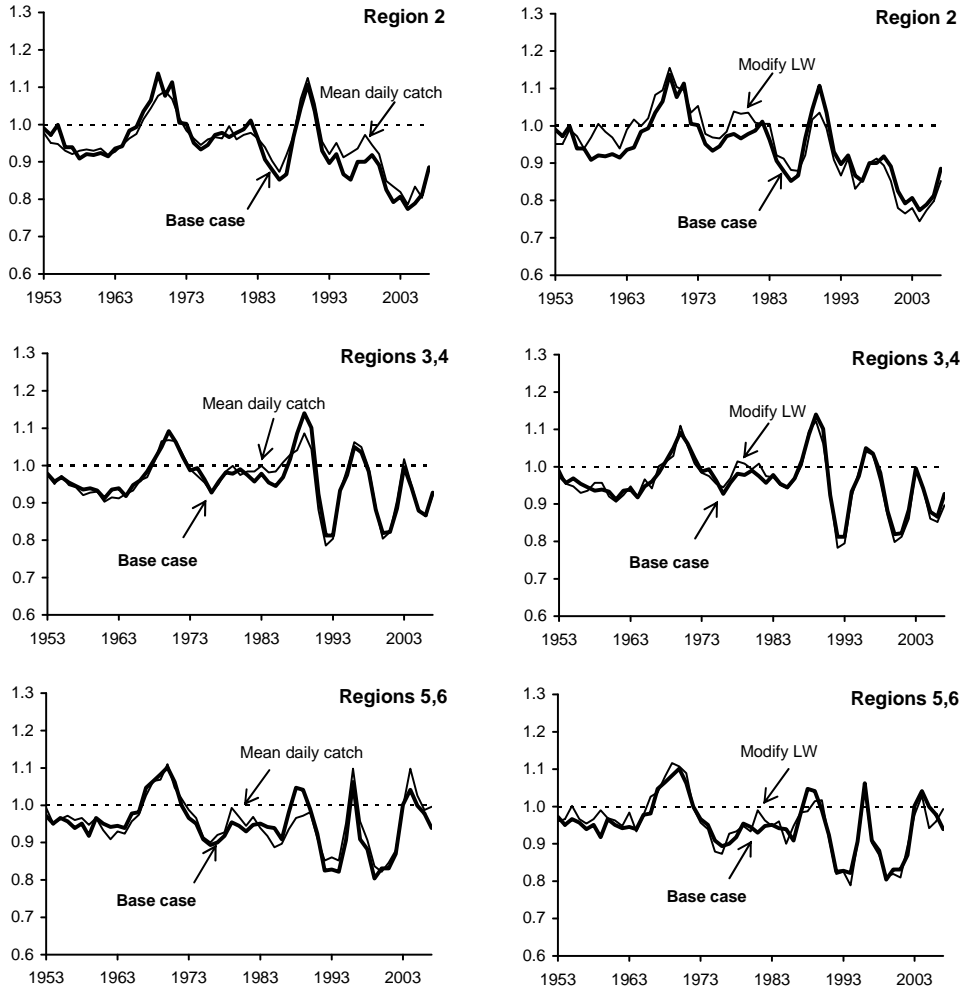


Figure 8. The abundance of medium sized abalone (60-115mm) from fishery independent surveys of about 400 sites between 1994 and 2007. The horizontal lines are the 1994 reference year level +/- 15%. Independent survey sites were located only in the southern portion of Region 1 where there was a major outbreak of the disease *Perkinsus* in the late 1990s.

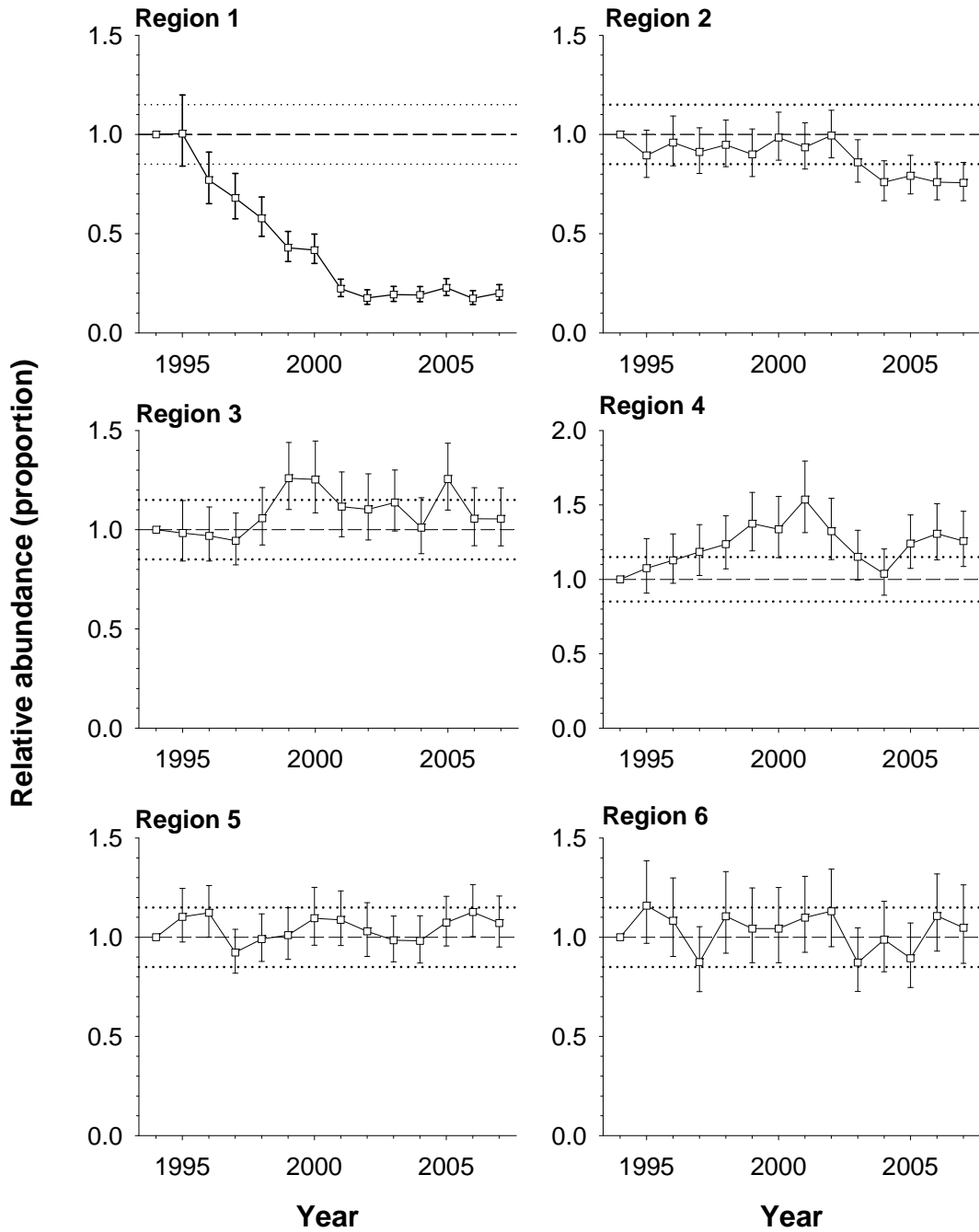


Figure 9. Annual catch (histograms) and CPUE relative to 1994 (lines) for each region of the fishery since 1987. Dashed lines represent the value of mean CPUE in 1994, and dotted lines are +/- 15%. The white histogram bars and open circles for recent years in regions 1 and 2 indicate the years in which substantial components of these regions were closed to routine commercial fishing and the data came from Fishing Surveys or Structured Fishing and so are not necessarily directly comparable.

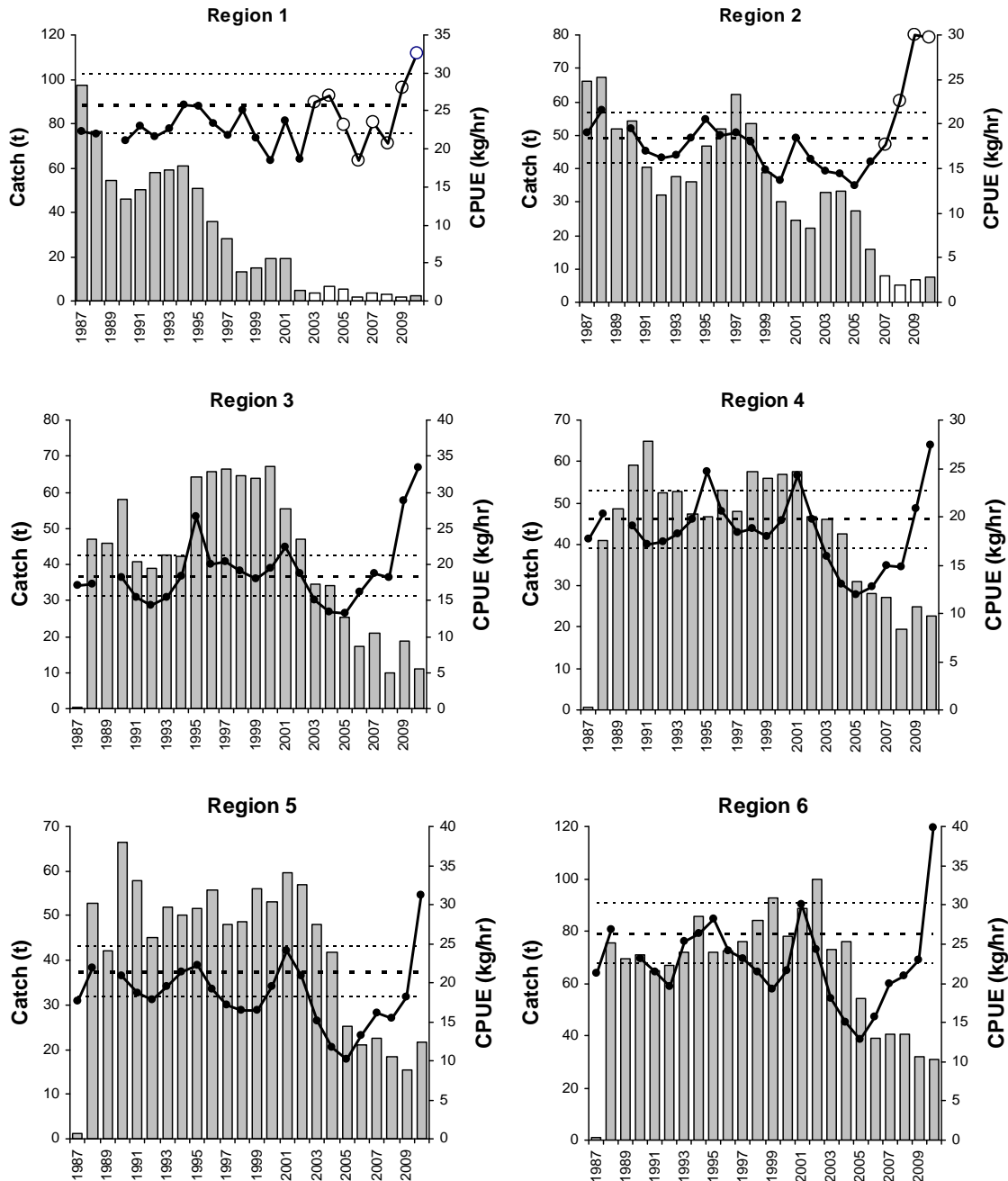


Figure 9. Mean monthly CPUE (kg/hr) for each region of the fishery since 1998. Vertical dashed line indicates the increase in MLL from 115 to 117 mm in July 2008.

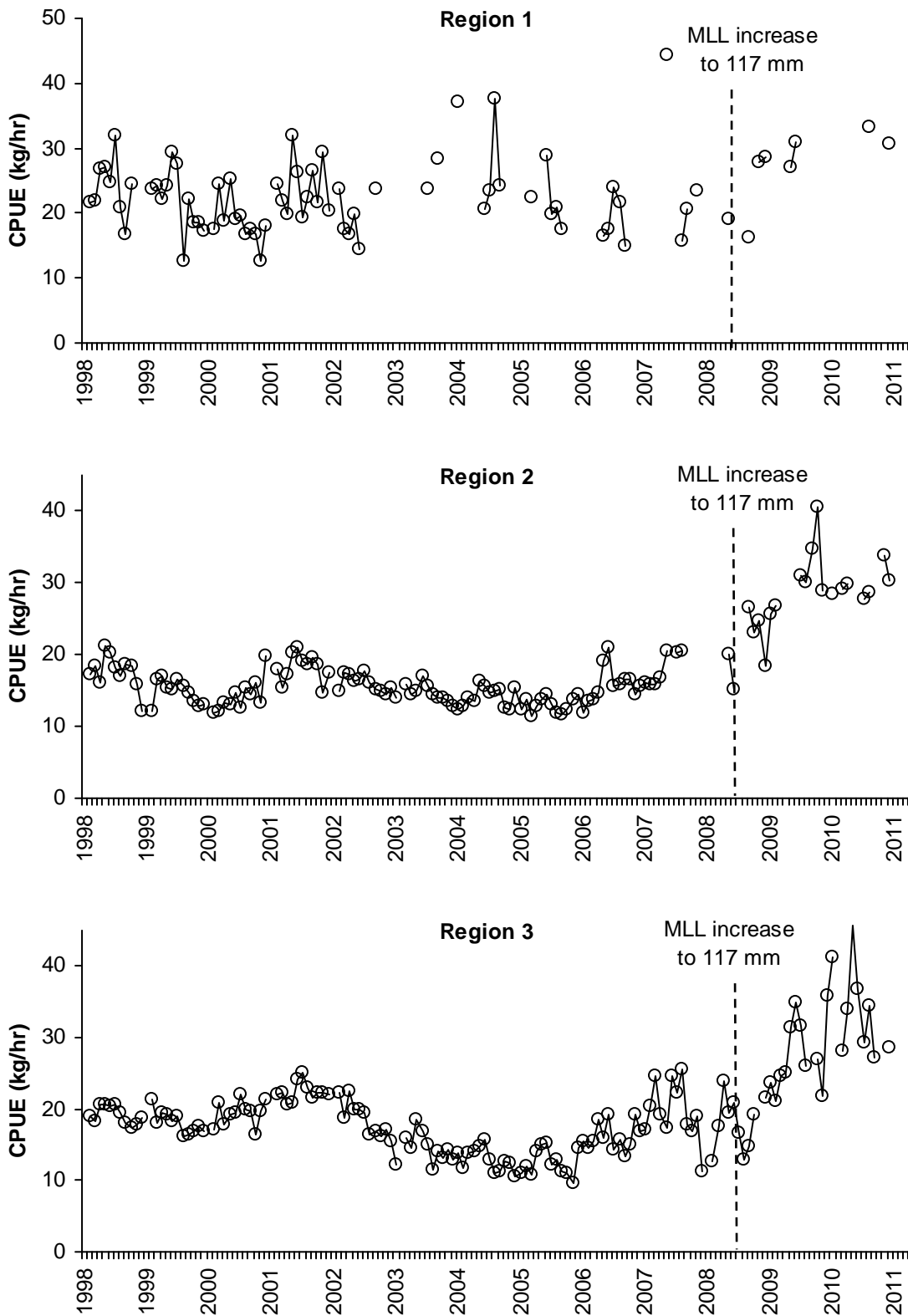
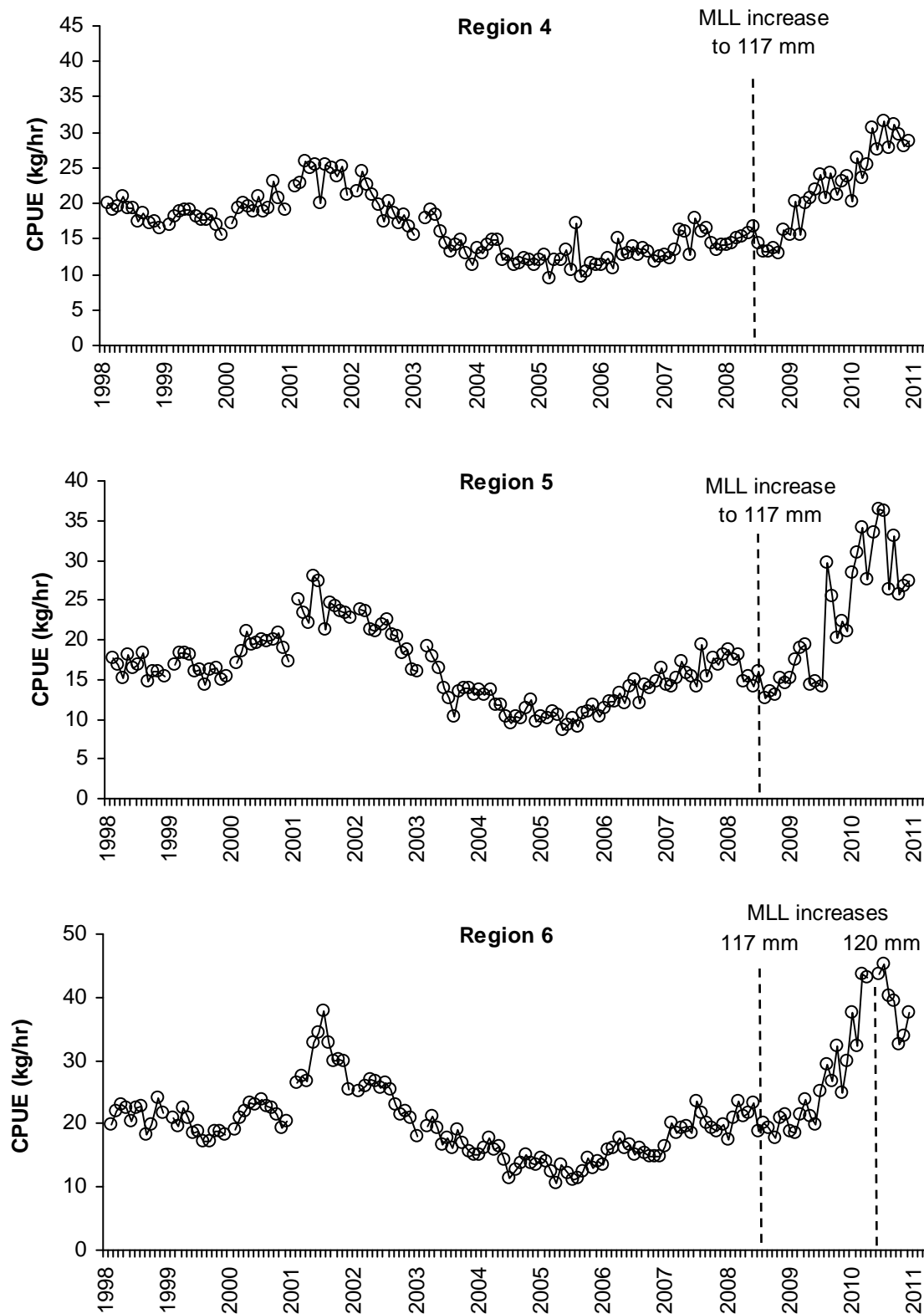


Figure 9 continued. Mean monthly CPUE (kg/hr) for each region of the fishery since 1998. Vertical dashed line indicates the increase in MLL from 115 to 117 mm in July 2008 and an increase in MLL from 117 mm to 120 mm in Zones Z1-Z5 (region 6) in May 2010.



The Determination

The Total Allowable Catch Setting and Review Committee, pursuant to Division 4 of Part 2 of the Fisheries Management Act 1994, determines that the total allowable commercial catch of abalone that may be taken in the Abalone Fishery during the period 1 July 2011 to 30 June 2012 should be **94 tonnes**. In making this determination, the Committee strongly recommends that the following distribution of catches be adhered to, at an increased 'default' minimum size limit:

Region 1 North (subregions A-H)	3t available for Fishing Surveys or Structured Fishing to a design acceptable to the Department to inform future TAC setting
Region 1 South (subregions F-H)	0t
Region 1 South (subregions J, K & L)	4t available for Fishing Surveys or Structured Fishing to a design acceptable to the Department to monitor stock condition and recovery.
Region 2	5t available for Fishing Surveys or Structured Fishing to a design acceptable to the Department to monitor stock condition and inform future TAC setting
Regions 3 and 4	31t
Regions 5 and 6	51t
The Committee recommends that all catches are taken at a minimum legal length of 120mm	

These decisions could be reviewed if new information and analyses become available.

If the overall MLL for the fishery was 120mm, and 123mm in sub-Regions Z1-Z5 and 125mm Regions 1 and 2, there would be grounds to reconsider the TAC. With these MMLs a TAC of 110t would be expected to provide an acceptable balance of risks in the medium term.



Ian Cartwright
Chairperson



Keith Sainsbury
fisheries scientist



Jessica Hartman
fisheries management



Bill Talbot
natural resource economist

Appendix 1. Details of public consultation

The TAC Committee undertook a comprehensive program of public consultation with stakeholders and the community. The details of this process are summarised in the table below, which chronologically records the stages of consultation undertaken by the TAC Committee and gives effect to the procedural requirements with reference to relevant sections from the *Fisheries Management Act 1994*.

Date	Fisheries Management Act	Consultation Stages
10.2.10	Section 31(1)	TAC Committee called for public submissions on the appropriate level of the annual TACC for Abalone.
10.2.10	Section 284 (1b)	The advertisement was placed in the Sydney Morning Herald, the Daily Telegraph and made available at NSW DPI Head Office and Fisheries Offices.
4.2.09	Section 284 (1b)	<p>Individual calls for submissions were also sent to particular interest groups who the Committee considered would be interested in providing a collective standpoint, either due to their direct involvement in the abalone industry or due to their interest in conservation issues. These groups included the following:</p> <ul style="list-style-type: none"> ■ All NSW Abalone Shareholders ■ All Members of the Abalone Management Advisory Committee ■ NSW Regional Industry Convenor ■ NSW Fishermen's Co-operatives ■ Nature Council NSW Conservation ■ I & I NSW Fisheries Offices
1.4.10	Section 284 (1b)	The TAC Committee allowed a period of 55 days for public consultation.
9.4.10	Section 31 (2)	<p>The submissions were collated and analysed, and the TAC Committee heard formal presentations regarding views and opinions at the meeting held on 22.4.10. The following made presentations, or provided information to the Committee:</p> <ul style="list-style-type: none"> ■ NSW DPI – Commercial Fisheries Management, Research, Compliance and Industry Analysis ■ Abalone Shareholders ■ Members Abalone Management Advisory Committee
4.5.10		<p>The submissions were collated and analysed, and the TAC Committee heard formal presentations regarding views and opinions at the meeting held on 22.4.10. The following made presentations, or provided information to the Committee:</p> <ul style="list-style-type: none"> ■ Peter Turnell – I & I NSW ■ Dr Geoff Liggins – Manager Scientific Services ■ Nick Schroder – Investigator, Statewide Operations and Investigations Group ■ Cameron Westaway – Senior Fisheries Manager ■ Robert Gale – Principal Policy Economist, I & I NSW ■ Carly Goddard – Fisheries Management Officer, I & I NSW ■ Nick Schroder – Investigator, Abalone, I & I NSW ■ Duncan Worthington – Abalone Council of NSW ■ Jim Miller – AbMAC ■ Dennis Loubikis – AbMAC ■ Steve Hunter – AbMAC ■ George Chung – AbMAC ■ Tony Fry – AbMAC ■ John Smythe – Shareholder ■ Peter Plunkett – AbMAC (Recreational Representative) ■ Warren Martin – Abalone Chairman

Appendix 2. Summary of submissions and the issues²

Submission provided by ^{*3}	Issue(s)/Recommendations
Abalone Council of NSW (1)	Summary of assessment information about the abalone fishery up to February 2011. A summary of total subzone logbook information by month, regional catch recommendations and actual catch, and subzone catch planning and catch. Factors influencing catch distribution, including high CPUE being maintained where catch is concentrated are discussed. Outline details of research programmes, including GPS and measuring loggers, the development of structured fishing and a draft harvest strategy were also provided.
Abalone Council of NSW (2)	Summary of fishery catch information relevant to stock assessment, including 2010 by area and subzone. A series data compiled by Dr Worthington comprising catch, catch rate and average weight and relative abalone size for the 21 areas that form the basis of industry-driven voluntary catch distribution. This information was used to inform the Eden industry workshop (see below).
Abalone Council of NSW (3)	Summary of outcomes from abalone industry workshop. The proceedings, outcomes and recommendations of a workshop held in Eden on the 24 February 2011. Industry agreed voluntary catch allocations by area are presented, including annual review points and comments for each of the 21 areas of the NSW coast. A TAC of 110 tonnes is recommended.
Abalone Council of NSW (4)	Draft framework for a fine scale harvest strategy in the NSW abalone fishery. A presentation of options for a new harvest strategy for NSW abalone, Provides a discussion of the need to reconsider the broad objectives for the fishery, given the 'strong recovery' of stock, including consideration of catch and catch rate targets. Harvest strategy components are discussed, along with possible performance indicators and a new risk-based TAC setting process, incorporating interpretive assessment of data and performance indicators during a structured industry workshop.
Abalone Council of NSW (5)	Draft framework for fine scale management of minimum size limits in the NSW abalone fishery. Describes an approach for the development of LMLs. The approach seeks to address the need for variable size limits at an appropriate scale.

Note Some submissions were submitted in confidence and have been removed from this version

² Some submissions were lengthy and detailed. The table above seeks to summarise main points for information. The Committee did not use the table to inform their deliberations, but referred to full submissions.