

# **TAC Committee**

---

## **Total Allowable Catch Committee Report and Determination for 2009/10**

### **ABALONE FISHERY**

**27 May 2009**

## SUMMARY

The Total Allowable Catch and Review (TAC) Committee remains concerned about the future sustainability prospects, both biological and economic, of the NSW abalone fishery. This statement is made despite signs from the fishery that some recruitment is occurring and catch rates in the last 2-3 years have shown substantial increases, albeit off a low base. Industry has been vocal in its view that recovery has been substantial and widespread. The Committee's concerns relate to two main areas. These are firstly, the status of the abalone resource and projections for its future rebuilding, and secondly major shortcomings in the processes for the assessment and management of the fishery. A related issue is the continued inability to establish effective communication between and within industry and DPI.

### ***Management issues***

As the TACC has contracted, the number of active divers operating in the fishery, as distinct from shareholders, has also contracted with increased leasing occurring and divers taking multiple shareholders' quota. While half of the commercial catch has been taken by 9 divers, with the remaining number of authorised divers reporting very low catches, the number of nominated divers has not diminished. The restructuring in terms of share transfers that occurred in the rock lobster fishery is not happening in the abalone fishery and means of achieving structural adjustment should be explored.

The management objectives, performance indicators and triggers, while covered by the Fisheries Management Strategy (FMS), remain problematical, both in terms of their level of precaution and utility. This issue should be addressed before the new management plan is finalised.

The concerns and dire consequences for the fishery expressed by the MAC and some other industry stakeholders over the DPI decision to establish a fishery wide minimum size limit of 117mm appear to have been largely unfounded. Catch rates have now been restored at similar or improved levels prior to the size limit increase, and there has been an increase in the size and number of abalone in the population. The very rapid response of the population to this increase indicates that overall the abalone are growing rapidly at the current minimum legal size and that there are likely to be 'per recruit' benefits from further increases in the minimum legal size.

While it is acknowledged that it would be better to utilise a combination of minimum sizes, set on a regional basis and reinforced with voluntary arrangements and supported by industry training, the current circumstances in NSW mitigate against such an approach. The Committee has suggested a further 2mm size increase in an effort to continue the move away from the current 'knife edge' situation reliant on recently recruited abalone. This is a situation that is both undesirable and irresponsible. Wherever possible and appropriate, size limits should be incrementally increased at an appropriate spatial scale, which, when accompanied by appropriate TACCs, will provide a 'buffer' of stock necessary for responsible management of the fishery. Such a strategy is also expected to reduce risk to the stock arising from a limited ability to monitor and assess the status of the stock.

The spatial management of effort and catch within the fishery is not effective. Finer scale, regional approaches to managing abalone fisheries (FSM) with regional catch caps developed with industry and varying minimum sizes is well accepted in other states. Some ad-hoc progress has been made, but FSM should be introduced in a structured manner as a priority if recovery of the fishery as a whole is to be achieved.

The chosen method of FSM will need to reflect current and likely future realities in the fishery, including its size and value, legislative and management complexity and cost. Successful adoption will be conditional on adequate resources, a responsive and supportive administration, and significantly increased and meaningful industry involvement. In the opinion of the Committee, Industry 'going it alone' is not a viable option. FSM should not be seen as solely an industry responsibility, but as a widely acknowledged and necessary approach to managing abalone fisheries.

The Department is to be congratulated on its efforts to deal with the increasing trend in serious, well-organised crime syndicates who are allegedly stealing large quantities of abalone. It is hoped that investment in these efforts will be maintained and increased. Current compliance efforts are seriously disadvantaged, and illegal fishing encouraged, because of the light penalties in NSW for abalone offences. Illegal catches also undermine efforts by legitimate operators to rebuild a viable industry. The long delay in making abalone stealing an indictable offence is understandably frustrating and the Committee welcomes the news that the relevant Bill will be put before Parliament at the earliest possible opportunity.

The Committee was concerned at the option provided to industry by ballot to reduce compliance efforts (and costs) by removing 1.5 officers from the Special Operations Unit. This Unit, as discussed above, has made significant contributions to reducing the serious impact of illegal abalone fishing. It appears questionable to reduce capability in this area at a time when it is known that illegal fishing remains of significant concern.

Fishery management costs have become a major issue for the fishery which has faced falling TACCs, increased harvesting costs, and falling demand and prices. Considerable efforts to reduce management costs have been undertaken by DPI prior to 2008. Notwithstanding these efforts, the costs of management relative to the value of the fishery have remained unacceptably high to industry, the situation which, it is believed, was the driver for offering industry the opportunity to effectively 'opt out' of research and compliance costs through an industry ballot.

The circumstances of the ballot bound DPI to a majority industry decision. It is understood that in the event the outcome of the ballot was not totally binding, since the option to cost recover the package of measures put forward and accepted by a large majority (91%) by industry was not accepted. This now leaves the fishery with a resource which in a critical biological circumstance without adequate monitoring and assessment. The previous fishery independent survey and stock assessment has been suspended with no transition strategy or agreed way forward, including industry-based alternatives. The TAC Committee urges the Minister to instruct DPI to deal with this situation as a matter of urgency to ensure that, as a core responsibility of government, the information flow to enable the sustainable management of abalone is not compromised.

The issue is how to fund research and monitoring and the introduction of FSM under a cost recovery environment, and, in doing so, implement a more appropriate and affordable overall management framework. It is suggested that a management package (including science, compliance and FSM), that has costs appropriate to the scale of the fishery be developed and implemented as a priority, and that the IPART pricing principles as they relate to NSW Commercial fisheries be reviewed. Approval of a FRDC project, to assist in the process will be helpful. This project includes an element of DPI co-funding, which was formerly part of the industry package rejected in the ballot.

Co-management approaches in the fishery appear to remain foundering. The SARG report covers this issue, and how it might be addressed in some detail. What is clear is that work is needed by both industry and DPI to restore respect and trust; it

appears to the Committee that this is not happening, either at the newly appointed MAC or through interactions within and between Government and Industry.

### **Economic issues**

The economic analysis possible under this section is restricted by the data and analysis provided. 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. Further, this lack of economic information seriously hampers the Committee's ability to provide meaningful and useful advice to the Minister, and assess performance against agreed indicators and triggers.

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.

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 is lower, in both real and nominal terms, than at any other time, and down about 80% from its peak in 2000. Further deterioration seems likely in 2009/10. Attention has been drawn to severe competition on export markets for small abalone from aquaculture producers and a general deterioration in price. Processors in NSW are reportedly refusing to buy abalone due to an inability to clear currently full tanks of abalone into a difficult market. This shift in market demand may be structural rather than short-lived and if so, could have profound implications for the future of the industry. Again, improved economic information from the fishery would assist in analysing these impacts.

Despite these circumstances the pattern of shareholdings in the fishery has remained almost static. This is remarkable in that up until 2007, the industry has shown none of the structural change tendencies typical of a primary industry under economic and financial pressure. Since 2005/06, when share prices fell to around one-third of 1996/97 values, the share market has effectively ceased to exist. There are unconfirmed reports that restructuring is occurring off-market, although it is not possible to confirm this. 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 (possibly as low as 20%) are owner/divers. 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.

It is believed that rents are being earned in the industry. Those operators that gained windfall gains when limited entry and allocation occurred, are at face value at least, still deriving positive returns (8%) 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 reiterates its concern about the possible consequences of its determination for the profitability of the industry and the financial well-being of those in it. Accordingly, there is an urgent need for improved information, indicators and triggers for the assessment of the economic status of the industry.

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***

In previous years, the Committee has relied on a range of information on which to base the TACC. These were: fishery independent surveys (FIS), catch rate and weight composition from commercial fishing, integrated analysis of this information using a length-based population model, and model based predictions of the expected future trends in the status of the stocks under different levels of catch. In addition, there has been some limited information from surveys and structured fishing in Regions 1 and 2.

As noted earlier, the information provided to assess the state of the stocks this year, and to judge likely future trends, is extremely limited. The FIS was not conducted, there was no update of the population model or prediction of future trends of the stock, and no analysis of either previously collected or recently collected information from the surveys/structured fishing in Regions 1 and 2.

The information provided to the Committee was limited to the commercial catch rate and average weight of abalone in the commercial catch for Regions 3-6, and to the catch rate and weight of abalone in the catch from structured fishing in Regions 1 and 2. As foreshadowed in previous reports, there are issues with comparing catch rates from structured fishing in Regions 1 and 2 with those derived from earlier commercial fishing. In addition, commercial catch rate is widely recognised in fisheries assessment as a poor index of abundance, but is the only one available for the abalone stock this year. A particular limitation of commercial catch rate is that it is a 'trailing' indicator that reflects what has happened, rather than a 'leading' indicator that can inform about what will happen. The reduced information available is particularly problematic for assessment of the fishery at this time because of concerns about recruitment overfishing in the stock, and the need to understand the impacts of recruitment and size increase effects.

Recruitment overfishing was considered to have occurred in Region 2, leading to closure to commercial fishing in 2006. Last year, the Committee expressed growing concern about the possibility of recruitment overfishing in the more southern regions. Specifically, the concern was that the population model predicted the pulse of relatively strong recruitment currently passing through the fishable population would be weaker than previous pulses, which, if correct, would both indicate the onset of recruitment overfishing in these regions and cause further decline in the mature biomass – further exacerbating the recruitment overfishing believed to be occurring in Region 2. The key question relates to the strength of the current pulse of recruitment relative to previous pulses. If the pulse is weaker, then the indication is that recruitment was decreasing on average through these cycles (i.e. recruitment overfishing). Due to the lack of information provided, these serious issues remain unresolved.

Similarly, the lack of information makes it difficult to detect the changes in the population arising from the 2 mm size limit increase, as distinct from trends in recruitment.

Reflecting these circumstances, the stock assessment and projections provided in last year's (2008) assessment were used as the most recent comprehensive assessment of the state of the stock and likely future trends. This was augmented by interpretation commercial catch rate data and the weight of abalone in the commercial catch. This interpretation focused on attempting to identify the effect of the size limit increase and the strength of the most recent pulse of recruitment that is passing through the population.

Major and increasing fluctuations in catch rates, with a period of about 7 years, are interpreted to be due to a combination of peaks and troughs in recruitment, variation in the number of abalone that grow across the minimum size limit and enter the fishable population each year, and the availability of legal sized abalone to buffer the 'down-phase' of these variations. The increase in catch rates in the most recent 2-3 years in Regions 2-6 indicates that another relatively strong recruitment is entering the fishable populations there, although it is not yet clear how strong this is.

It appears that the level of depletion of the exploitable stock and reliance on new abalone growing across the size limit have both been increasing during the times between stronger recruitment. This is reflected in increasingly large fluctuations in catch rate, and in particular in large and rapid decreases in catch rate during periods of relatively weak recruitment. This is not a usual or desirable situation and makes the fishery vulnerable to relatively minor changes in abalone recruitment and growth, especially during periods of relatively weak recruitment.

Fishery independent surveys (FIS) of the abundance of abalone in each of the regions provide a key source of information for assessment of the stock. Concerns have been raised by industry about the representativeness of the FIS, particularly in Region 2. As suggested by the Committee, the collection of fine scale data from structured commercial fishing might have helped reveal the extent of any bias in the independent surveys. While this did not occur last year, structured fishing to investigate the issue is being developed. In any event, the general pattern seen in the FIS is accepted using the rationale presented in the report.

Overall, the FIS indicates that Region 1 remains significantly depleted, that Region 2 has a declining population that is smaller than desired for all size classes of abalone, that Region 5 continues to have a lower than intended abundance of large abalone, and that abundances in Regions 3, 4 and 6 are generally in or close to the desired range.

Recruitment patterns are apparent in the information available, showing a number of pulses of recruitment, varying through time and region, and occurring in multi-year periods of high and low recruitment. The patterns of recruitment seen in the independent surveys are broadly similar to those seen in the commercial catch rate data.

A length-based stock assessment model incorporating information on the growth, natural mortality and size at maturity of abalone is used to combine all available information and estimate stock abundance and fishing mortality rates. The model cannot match the increasing amplitude of the fluctuations in the commercial catch rate, including rapid decrease in commercial catch rate between 2001 and 2005, and the subsequent increase in 2006 and 2007, while also matching the more stable survey data. The model interpretations are however consistent with the patterns seen in the commercial and survey data, and reported by industry, and the differences between the recent model interpretations and the industry reports are differences of scale rather than trend.

Overall, the interpretations from the model-based analysis are:

- That all regions are below the 1994 benchmark. Region 2 is significantly more depleted than the other regions and is significantly below the benchmark, but is marginally improved in comparison with last year.
- The mature biomass in Regions 3 and 4, and 5 and 6 are both estimated to be below the 1994 benchmark, but they are expected to be less than 10% below. Their status remains almost exactly the same as last year in these regions, indicating that the recent catch reductions may at least be stabilising stock condition
- The stock is below the biomass that gives MSY in all regions and Region 2 is considerably below the level that would provide MSY.

The model also provides an estimate of the history of recruitment in the regions. The changes to recruitment described by the model are broadly similar to the trends seen in the FIS data and consist of increasingly strong fluctuations, with regional variations in terms of the extent and duration of the 'highs and lows'. In general, the periods of good recruitment are shorter and the low recruitment between these peaks is lower overall, this is a pattern that is consistent with recruitment overfishing of the stock having begun in the early 1990s, and having become quite severe in Region 2.

Industry seems of the view that current catches are low enough to allow stock recovery despite the expected downturn in recruitment after the recent pulse, or even to reduce the magnitude of this downturn. However, these alternatives are not expected from any of the model interpretations that are available.

Predictions of future stock levels were generated from the model, based on differing levels of catch by region(s). In setting the TACC, and noting that the Committee considers that a more appropriate benchmark is required, a conservative probability (75%) of achieving legal and mature biomass benchmarks (currently the 1994 level in 5 years) was used. A similar logic was applied to using a 90% chance of being above the minimum benchmark (85% of the 1994 population biomass) after 5 years.

Catches should be limited by maintaining the mature biomass at the target, rather than avoiding the limit. A requirement of a 75% probability of rebuilding to the 1994 level corresponds to a 10t catch from Regions 3 and 4 and a 39t catch from Regions 5 and 6 (i.e. a total catch of 49t).

The number of young abalone growing into the mature and legal stock in the next 5 years (from 2008) is predicted to be low. Under the assumption of autocorrelation the peaks in estimated recruitment to Regions 3 and 4 and 5 and 6 in 2003/04 are expected to be followed by troughs, and correspondingly the recently increasing commercial catch rates are expected to peak and then decrease in the next few years. The estimated increase in recruitment in Region 2 is from a very low base and unless it develops into a major peak in the next few years it is not capable of rebuilding the stock there in the next 5 years, even in the absence of fishing.

The amounts of the recreational and illegal and unreported catches, which make up the other removals allowed for on the stock assessment model and in calculating the TACC, are uncertain. The recreational catch is assumed to have fallen as a result of the reduced bag limit, and an estimate of 10 tonnes has been used this year.

As 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 the compliance officers and industry are that the illegal catch probably was about 100t in the past, and that it is likely to be below 100t but above 50t per year currently. In the present circumstances of stock condition, it was concluded that the historical assumptions

should continue to be applied (i.e. 102t). However the issue should be reviewed and suggestions for issues to be considered in such a review have been provided.

The primary data from fishery operations are the size composition of individuals in the catch, location of the catch, weight of the catch and the fishing effort. The lack of length measurements makes the direct comparison of predicted and actual size composition of the catch difficult, which both complicates and limits what would otherwise be a direct and powerful test of the model's accuracy.

A very large fraction of the commercial catch each year (probably about 70%) is now made up of abalone that grow across the minimum size limit and enter the fishable population in that year, and this fraction is interpreted to have been increasing since the 1990s. The result is that the stock provides a reduced ability to buffer the catch rates from relatively minor variation in recruitment, growth or emergence behaviour. It is significant that in Region 2 the 1995/96 and 2001/02 pulses were very much weaker than those seen in the more southern regions in those years, and were weaker than that seen in Region 2 in 1988/89. This is interpreted to be due to a decrease in average recruitment to Region 2 since about 1995, including a decrease in the strength of recruitment in the 'pulse years'.

A simple (by eye) comparison of trend (gradient) of CPUE between 2005/07 and 2007/09 is interpreted as indicating that the most recent pulse of elevated recruitment passing through the fishery is at or near its peak, and that in Regions 4, 5 and 6 this is at catch rates that are much lower than seen during previous pulses. In these regions, the most recent pulse of recruitment is interpreted to be weaker than previous pulses. In Region 3, the pulse appears to be at its peak and at catch rates similar to those seen at previous peaks. In this region, the most recent recruitment pulse is interpreted to be of similar strength to previous pulses.

Several factors in the fishery are all expected to result in increased catch rate and increased abundance of abalone recruiting to the fishable population at present. These include a recruitment pulse about 2005, reduced TACCs and an increase in size limit. Thus there are several reasons to expect short term improvement in the catch rates and the abundance of abalone 'on the bottom', and these are reflected in current data and reports from industry.

Overall, the catch rate data support the interpretation that recruitment overfishing is occurring in most of the regions open to commercial fishing – that is decreasing average recruitment with lower peaks and deeper troughs through the sequence of recruitment pulses. This is the pattern predicted from modelling provided to the Committee last year. The recent trends in the commercial catch rate increases the credibility of those model predictions.

There may seem to be a contradiction between:

- short term improvements in the number of abalone seen 'on the bottom' by industry and explainable by the factors above that are expected to increase current catch rates; and
- the interpretation that recruitment overfishing is occurring.

The key concern is that while there are short term increases in catch rates in most regions, these increases are mostly not to the levels previously seen during recruitment pulses and are predicted not to be sufficient to rebuild the mature biomass under current catch and size limit settings.

Some structured fishing and survey information from the southern part of Region 1 in 2007 was provided to the Committee last year (2008), and structured fishing was conducted late in 2008 in both the northern and southern parts of Region 1, but the data are not yet available. Some methodology issues arise from the preliminary

analysis of the 2007 information, indicating that there is need for future consideration of acquiring interpretable information about sub-legal sized abalone as a leading indicator of recruitment; and the need to calibrate the past Fishery Independent Surveys with whatever new monitoring approach is used. Both of these issues need to be addressed if information from structured fishing is to provide an efficient and reliable basis for monitoring, assessment and management of the resource.

The northern part of Region 1 is closed to commercial fishing until there is sufficient information available from survey or structured fishing to allow assessment of an appropriate commercial catch limit; there is no indication that the abalone populations are depleted. As previously, a **5t catch limit** is incorporated into the TACC for a survey or structured fishing program in northern Region 1 that is agreed by the Department and responds to previous requests for information to inform the setting of a TACC.

The southern portion of Region 1 (Port Stephens to Jervis Bay) was closed to commercial fishing when the Fishery Independent Survey found the abalone to have suffered severe depletion from *Perkinsus* infection. Small catches have been allowed through survey or structured fishing to monitor the population and determine the degree of recovery. Preliminary analysis in 2008 of structured fishing information from 2007 showed that only about 36% of historically productive sites were still as productive and 70-80% of historically productive sites have catch rates that are still lower than those recorded 13 years or 20 years ago.

While the information base for decision making is considerably weaker than that available in previous years, the information provided indicates that recent improvements in stock condition are likely to be short-term and provides an outlook of deteriorating recruitment and stock condition. On balance the Committee decided not to reduce the Total Allowable Catch to the full extent suggested by the 2008 model predictions because:

- i) the catch rates have slowed their rate of increase or stabilised, but they have not yet decreased and they may stabilise at their current level (indicating a more protracted recruitment pulse than previous pulses);
- ii) the Total Allowable Catch has already been decreased significantly and should be providing some protection;
- iii) about 10-15t of the 105t Total Allowable Catch in 2008/09 is likely not to be taken because of market conditions;
- iv) the increases in the minimum legal size to 117mm last year and to 119mm next year should provide additional protection for recruits and part of the mature biomass; and
- v) there is opportunity for further analysis and interpretation of the stock situation during 2009/10.

Consequently the Committee decided that the commercial catch taken from each area should not exceed:

Region 1 North	5t available for surveys or structured fishing to a design acceptable to the Department
Region 1 South	0t
Region 2	0t
Regions 3 and 4	25t
Regions 5 and 6	45t
<b>Total TACC 75t, with all catches to a minimum legal length of 119mm</b>	

These decisions could be reviewed if new information and analyses become available. The TAC report provides some guidance as to new information and analyses required for Regions 1- 6.

Given the overall state of the stock, and the desire for continued commercial fishing, it is imperative that there is a robust and reliable means to monitor, assess and predict the state of the stock. This should include leading indicators that are based on the abundance of sub-legal abalone, which will bring considerable advantages to management and industry from improved planning horizons. The information and analysis available for this year's assessment by the Committee is not adequate to support reliable decision making in an ITQ fishery, and understanding of the status of the stock will rapidly deteriorate if this situation persists. The Committee has previously recommended against dismantling the established methods of monitoring and assessment before any new method is fully developed and calibrated against the previous methods. The Committee repeats that recommendation. In the event of further deterioration in the ability to monitor and assess the stock, highly precautionary and low-cost management measures will be necessary, such as a large size limit, a smaller TACC and large closed areas spread throughout the fishery.

## Contents

<b>1. INTRODUCTION .....</b>	<b>1</b>
<b>2. PROCEDURES.....</b>	<b>2</b>
2.1 PUBLIC CONSULTATION BY TAC COMMITTEE.....	2
2.2 MATTERS CONSIDERED.....	3
2.3 FORMAT OF THE REPORT .....	3
<b>3. MANAGEMENT CONSIDERATIONS.....</b>	<b>4</b>
3.1 INTRODUCTION .....	4
3.2 FISHERY BACKGROUND.....	4
3.3 CURRENT ISSUES AND FISHERIES PERFORMANCE .....	6
3.3.1 <i>Management of effort</i> .....	6
3.3.2 <i>Catch rates</i> .....	7
3.3.3 <i>Minimum sizes</i> .....	8
3.3.4 <i>Spatial Management and the use of data loggers</i> .....	9
3.3.5 <i>Regions 1 and 2</i> .....	10
3.4 RECREATIONAL FISHING.....	11
3.5 COMPLIANCE ISSUES.....	11
3.6 OTHER FISHING .....	13
3.8 FISHERY MANAGEMENT COSTS .....	13
3.9 COMMUNITY CHARGE PAYMENTS .....	14
3.10 CO-MANAGEMENT APPROACHES .....	15
3.11 CONCLUSION .....	15
<b>4. ECONOMIC CONSIDERATIONS .....</b>	<b>16</b>
4.1 INTRODUCTION .....	16
4.2 PRODUCTION AND MARKETS .....	16
4.2.1 <i>Export markets</i> .....	16
4.3 VOLUME OF PRODUCTION .....	19
4.5 GROSS VALUE OF PRODUCTION .....	20
4.6 NUMBER OF SHAREHOLDERS AND RETURN PER SHAREHOLDER.....	21
4.6.1 <i>Number of shareholders and fishing effort</i> .....	21
4.6.2 <i>Net return per shareholder</i> .....	24
4.7 THE QUOTA MARKET.....	26
4.8 ECONOMIC OVERVIEW .....	26
4.9 COSTS OF MANAGEMENT.....	28
4.10 STRUCTURAL CHANGE.....	28
4.11 CONCLUSION.....	30
<b>5. STATE OF THE STOCKS.....</b>	<b>31</b>
5.1 INTRODUCTION .....	31
5.2 STOCK ASSESSMENT MODEL AND PREDICTIONS CONDUCTED IN 2008 .....	33
5.2.1 <i>State of the stock</i> .....	33
5.2.3 <i>Predictions under different catch levels</i> .....	34
5.3 BIOLOGICAL DATA AND ASSUMPTIONS.....	36
5.3.1 <i>Illegal, unreported and recreational fishing catches</i> .....	36
5.3.2 <i>Data from fishery operations</i> .....	36
5.4 CONCLUSION .....	40
<b>THE DETERMINATION.....</b>	<b>48</b>

**TOTAL ALLOWABLE CATCH COMMITTEE  
ABALONE FISHERY  
REPORT AND DETERMINATION FOR 2009/10**

## **1. INTRODUCTION**

The Total Allowable Catch Committee is established by Section 26 of the *Fisheries Management Act 1994*. In 2009, it consists of:

- Mr Ian Cartwright – Chairman
- Dr Keith Sainsbury – fisheries scientist
- Prof Warren Musgrave – natural resources economist
- Mr Steve McCormack – fisheries manager

The Committee was provided with Secretariat services by Ms Jackie Gerard, Executive Officer.

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 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 the recommendations and their associated logic, creating a dialogue on a range of issues directly related to the TACC 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 NSW Department of Primary Industries (DPI).

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 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 Primary Industries Fisheries Research;
- NSW Department of Primary Industries Fisheries Management;
- NSW Department of Primary Industries 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.

MAC members provided a second submission since the stock assessment report was not available until after the date for submissions to the TAC Committee had closed.

## 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 DPI;
- advice on the economic status of the fishery as assessed by DPI and by industry representatives;
- an abbreviated stock assessment for abalone provided by DPI;
- 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 2009/10 fishing season is provided at the end of the report.

The Committee was again grateful for the efficient executive support services provided by Executive Officer, Ms Jackie Gerard.

The Committee notes that DPI 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 **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 2009 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

In 2007, the TAC Committee, in addition to the Determination and suggested regional catch limits, made a number of recommendations for the consideration of the Department. These recommendations were provided to clarify the position of the Committee on a number of issues, as they relate to the TACC. Appendix 3 summarises these recommendations and provides the views of the Committee with respect to actions taken to address them. The Department, and in particularly the fisheries management section, has made detailed comments on a number of the Committee recommendations. The Committee, however, was disappointed that, having taken the time and effort to make explicit recommendations in a number of key areas, many of these were not commented on in the Department reports, despite requests that this occur. The Committee would also find it very helpful if the

Department would comment on the assumptions and recommendations made in the various sections of the Committee Report and in particular, those associated with the stock assessment.

This year, the same approach has been adopted, and further recommendations have been made in the body of the report.

### **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 Primary Industries (partly at the behest of abalone share-holders) 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. That this should happen at a time when the abalone resources in New South Wales are in a particularly precarious position is most unfortunate.

#### **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. There is anecdotal information available which suggests that in the early days of the fishery it was quite productive, and, in the south of the State probably comparable to the adjacent fishery in Victoria.

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. To monitor any potential blowout in diver numbers (potentially to 51) a cap of 42 was set as a trigger. The fishery now sits at that trigger level as it did last year. There are 42 shareholders holding 70 or more shares, the majority of which have nominated divers.

The Environmental Impact Statement (EIS) identifies diver numbers as a key risk to the long-term sustainability of the fishery. Improvements to the economic efficiency of the fishery should occur with any substantial reduction in actual diver numbers. There are now positive signs that in the past three years a trend has developed which shows a contraction in the number of active divers that are operating in the fishery. While *active* diver numbers have fallen, the number of endorsements in the fishery remains unchanged, representing considerable and undesirable latent effort.

With the exception of the Marine Park buy-out, there have been no shares sold during the past three years. This would suggest that quota holders are now more inclined to lease out their quota in preference to selling at what is now a comparatively low price. Recent cuts in quota and ongoing uncertainty over the status and prospects for the abalone resource are exacerbating this situation. Further reasons for the lack of structural adjustment are discussed in the economics section of the report.

There continues to be no agreement on the means of reducing endorsements to fish for abalone. At previous industry forums, some sectors of the industry suggested that an additional 'dive entitlement' be issued as a statutory right to cap diver numbers at the current level and offer a flexible means of reducing endorsements to dive from the fishery.

This approach of creating a separate diver entitlement has not been supported by the Department which continues to be of the view that the current legislative mechanism of adjusting diver numbers through changing minimum shareholding requirements is a better mechanism. In this respect, the freeing up of share trading (minimum one share, no maximum limit) and removing restrictions on the transfer of quota, will in the view of the Committee, assist this process.

During the 2008/09 fishing period, about half of the commercial catch has been taken by 9 divers, with the remaining number of authorised divers reporting very low catches.

This change in the trend coincides with an increase in the amount of the TACC that is leased across the fishery.

The Committee was advised that a number of the divers who take small catches have employment in other sectors of the NSW commercial fishing and oyster industries fisheries which is necessary to supplement their income.

There is now around \$900,000 outstanding in the payment of management fees by industry. It is understood that the regulations provide the Department with the opportunity to not approve the transfer of shares until these payments have been made. This debt has also led to an unwillingness of the Department to use the cost recovery process to fund industry-based research, as requested in a recent industry ballot regarding fisheries management services.

The price paid for shares in the fishery has contracted from a high of \$25,300 in 2002/03 to \$9,250 in 2005/06. There have been no shares transferred during the period 2008/09 so it is not possible to determine what the current value of shares might be. As part of the Marine Park buy-out, 200 shares were bought out at a value of \$14,800 each.

Comments were again made at the industry forum that would suggest that any shareholder who may contemplate selling quota in the current climate would have to accept a price that is substantially less than the last recorded market price for shares. The low price of shares is a major barrier to restructure, with current shareholders unwilling or unable to exit the fishery.

*The Committee **recommends** that further efforts are made by industry and the Department to consider how best to achieve the structural adjustment necessary to help restore viability to the fishery.*

### **3.3 Current issues and fisheries performance**

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 problematical. New objectives, performance indicators and triggers are under development and the Committee looks forward to the finalisation of new measures that are more meaningful.

#### **3.3.1 Management of effort**

The New South Wales commercial and recreational abalone fisheries are based entirely on black-lipped abalone. The abalone fisheries in Tasmania and Victoria that are also based on black-lipped abalone have their own issues and problems, but the difference between the NSW fishery and the other two fisheries continues to be quite pronounced.

Significant differences include:

- (a) an hourly catch rate for commercial divers which in NSW is about one tenth of that found in Victoria, and
- (b) a decline in the annual catch in NSW from a peak of 1250 tonnes in 1972 to the current catch of 105 tonnes. In Victoria, catches peaked at approx 3500 tonnes in 1968 but have averaged approx 1400 tonnes since 1988.
- (c) the use in other states of finer scale, regional management of abalone fisheries with regional TACCs and varying minimum sizes, introduced with strong support from the industry.

The spread of effort in the NSW fishery has traditionally relied on the largely unmanaged movement of divers across the State. Commercial access to Regions 1 and 2 is now subject to permit control and there are caps on the total catch that can be taken from Regions 3-6.

Divers move their fishing operations up and down the coast to seek out the more productive beds of abalone, and are also balancing travel time, costs of fishing and social factors. It is clear from industry submissions that there is a growing interest in, and support for, smaller zonal or area based catch management arrangements, but there continues to be no clear plan of how this might be informed by research/data collection, or managed.

Fine scale management (FSM) approaches are being developed in most Australian abalone fisheries. In Victoria, some assessment and management is at reef scale, based on cooperative industry/government approaches. In other fisheries, data is collected (and in some cases analysed) at relatively fine scales, but management is at a larger scale, reflecting operational and licensing/fishing entitlement constraints. Some ad-hoc progress has been made based on the recommendations of the TAC Committee, but FSM should be introduced in a structured manner as a priority if recovery of the fishery as a whole is to be achieved.

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 moving directly to a Victorian model from the current management arrangements in NSW is both unlikely and unrealistic. The Victorian approach was developed over a number of years in conjunction with a far more cohesive industry and without the currently dysfunctional government/ industry/ researcher relationship now existing in

NSW. Accordingly, and as suggested in the SARG report, NSW DPI should consider the range of options/models used in other states and select a way forward that reflects current and likely future realities in the fishery. Success in this area will be very much conditional on adequate resources, a responsive and supportive administration, and significantly increased and meaningful industry involvement. In the opinion of the Committee, Industry 'going it alone' is not a viable option. It is also difficult to see how FSM will be successfully introduced in NSW without industry being prepared to rigidly support appropriate area based caps/TACCs, which would complement variable minimum sizes across the fishery. These conclusions have been drawn for some years now.

While noting these preconditions, the Committee remains convinced that the fishery must move towards FSM as rapidly as possible, initially by collecting comprehensive data at fine scales using data loggers. Decisions as to scales of spatial management and other measures (including TACCs and size limits) can then flow from analysis of that data. Movement towards this form of management has now been hampered by discontinuation of the current fisheries independent survey and stock assessment processes, and a lack of agreement on a way forward.

*The Committee **recommends** that efforts to develop finer spatial scale management should continue to be pursued as a matter of priority. The Special Abalone Recovery Group (SARG) Report provides a clear direction as to how this may be achieved. The Committee also recommends that the SARG Report should be released for general public consideration.*

The Department took action in 2007 to limit commercial harvesting of abalone in Region 2 of the fishery. A closure to commercial fishing now applies in Regions 1 and 2 and any fishing must now be conducted under the direction of a scientific permit.

An industry-based approach to managing regional or area based TACCs, similar to that used in other states but reflecting the realities of NSW, continues to be supported by the Committee. Given the difficulties in collaboratively agreeing on how to implement this proven and effective practice, it appears that it will be necessary for the Department to take an active role in ensuring that such practices are introduced. In this regard, we note and welcome the suggested approach by the SARG. An effective finer scale management approach will need substantial and detailed discussion between industry, researchers and managers. The recent cancellation of a MAC meeting and general lack of progress at this crucial time in the fishery creates doubt as to the ability of that forum, as currently constituted, to provide a platform for such discussions.

Objective 8 of the share management plan for the fishery stipulates that a review will take place if the number of endorsements in the abalone fishery exceeds 42. The potential number of endorsements for the fishery is 52. The Department has advised that there are currently 38 businesses that are eligible for an endorsement.

As discussed above, the Department and industry agree that the low TACCs that are now being set for the fishery have adverse economic and compliance ramifications for the current number of operators in the fishery (divers in the water), with the average catch per shareholder decreasing from 8 tonnes in 2001/02 to 2.4 tonnes in 2007/08. Under the current and likely projected TACC, it is reasonable to expect that the number of active divers will not increase and this trigger will not be activated.

### 3.3.2 Catch rates

Daily catch rates have increased from 57.2 kilos per day in 2004/05 to 86.2 kilos per day for the 2008/09 period and remain low when compared to those in other States.

However there does appear to be a case for cautious optimism that the decline in catch rates has been addressed and may now be stabilising. Given the 'knife-edge' recruitment nature of this fishery and the uncertainty of the most recent recruitment, this increase should not be seen as an indication that the fishery is in a position of assured sustainability.

### 3.3.3 Minimum sizes

The minimum size for abalone in New South Wales was increased to 117 mms from the 1st of July 2008 following a recommendation to the Minister from the SARG. Minimum sizes are designed to ensure that abalone will have at least one spawning opportunity before they can be harvested. Other abalone fisheries utilise a combination of minimum sizes, 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, set on a voluntary basis and managed in part by the industry, combined with relatively small area-based TACCs, better reflects the nature of abalone populations and protects reefs from serial depletions and the harvesting of immature abalone. It should be noted however, that these fisheries 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 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 continues to be based predominately on abalone that are just above the minimum size. In this situation, 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 raise the size limit to 117mm continues to be strongly supported by the TAC Committee which sees it as an appropriate action that will move the fishery to a more sustainable level. At the time some members of Industry, and in particular the MAC, 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 drive down the current TACC; 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.

The level of protest generated at the 2008 industry forum, and subsequently, for what is basically a marginal size limit increase, appears to be excessive given the benefits forecast for the change in limits. If a single size limit (rather than variable limits) is the sole management tool, then there is a strong argument that subsequent incremental increases are necessary to place the fishery on a more biological and

economically secure footing. By incrementally raising size limits, carefully monitoring catches, size distributions and shell characteristics, it should be possible to identify faster and slower growing areas and develop FSM-based size limits.

At the TACC setting forum for this year, the Committee was advised that the change in the minimum size has led to a decline in CPUE for the fishery of less than 1% and an 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 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.

It is acknowledged that, ideally, size limit increases should be matched spatially to growth characteristics. However, the nature of NSW abalone industry, lack of cooperative management approaches and cost/complexity of administering various size limits means that such an approach will be difficult to implement, until FSM approaches are developed and agreed.

There have been indications in the past that industry would support an increase in the minimum size to 120mms for the area that is located south of the township of Womboyn but for a range of reasons this has not been implemented.

*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 consider further increases and strongly **recommends** an increase in minimum size to 119mms.*

### 3.3.4 Research, spatial Management and the use of data loggers

Data loggers are now used extensively in other States where fine scale management has been adopted by the respective management agencies and industry. They offer one of the most promising (and possibly the only) way forward for ensuring the cost-effective data collection and management in the NSW fishery.

The industry presentation to the Committee 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. Whilst some data is being collected by permit holders under the structured fishing activity in Regions 1 and 2 (and possibly other regions), there does not yet appear to be any formal arrangement in place on appropriate methodology and protocols under current permit arrangements. The Committee considers that this is an essential part of the process if structured fishing is to provide the information necessary to assess the status of the fishery and set a TACC.

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. This will give effect to the stated objective of the Department to move to FSM. 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.

It is of great concern that the structured fishing 'agreement' between DPI and Industry which covers structured fishing has yet to be finalised. The Committee understands that the scientist undertaking this work has now moved and the Committee is concerned that there is a large gap between industry expectations and that of DPI and the Committee in terms of the scientific methodology for undertaking

structured fishing, and the QA/QC aspects of data collection, storage and analysis. If, as stated in the DPI management report, *the abalone industry will be responsible for taking a lead role in the future research for the fishery* clarification of such matters is essential.

### 3.3.5 Regions 1 and 2

The Committee welcomes the fact that after a long delay, structured fishing has recommenced in Region 1 (south of Port Stephens). This is being done under the authority of a scientific permit.

Region 1 South (Port Stephens to Wreck Bay, Jervis Bay) was closed to abalone fishing in November 2002. Region 1 North (Port Stephens to the border with Queensland) and Region 2 were closed to fishing in August 2007.

Ministerial approval was granted in April 2008 for the issue of research permits under the provisions of section 37 of the *Fisheries Management Act* 1994 to harvest abalone in Region 1. In setting the TACC for the 2008/09 period, the Committee made an allowance for the taking of up to five tonnes of abalone from Region 1 (North), five tonnes from Region 1 (South), and five tonnes from Region 2.

In past reports, the TAC Committee has been very explicit concerning the information it was seeking to inform the TACC setting process. A robust and structured industry-based survey would provide verified data on which to base decisions on future commercial harvesting options.

At the time of writing this report, data collected from the survey which was conducted last year has only been partially analysed and does not provide a basis whereby the Committee could in any way support a return to ongoing commercial fishing. Limited information is available on catch rates, but it is difficult to compare this with what has occurred in the past.

The decision, through industry ballot, by the majority of abalone share-holders to severely reduce funding for research now places the TACC Committee in an invidious position. The Department does not have the resources to do any reasonable analysis of the structured fishing program and the plans by the industry to have in place their own monitoring program have not sufficiently progressed that the TAC Committee has any viable information from them on which to make future TACC setting decisions.

Whatever the rights and wrongs may be of the current resourcing arrangements for research and management of the NSW commercial abalone fishery, the basic fact is that there is little information available to the Committee which would justify the allocation of quota to support the permit based system for the next quota period.

To summarise the permit controlled survey was supported in Region 1 (North) to determine an appropriate TACC for the region. This has not been possible.

For Region 1 (South), permits were issued to help determine what the impact has been from the *Perkinsus* outbreak. Based on the limited information that is available from the 2008 survey, the impact of *Perkinsus* still appears to be extensive and there has been very limited recovery, with many of the historically productive sites remaining severely depleted.

In Region 2, the permit system was designed to examine the current state of what is a suspected recruitment decline, compounded by overfishing. Information obtained from the surveys would also assist in supporting or refuting the industry position on the FIS site activity as a reliable input into the process of determining future TACCs.

The Committee has held the view for some time that increased sizes for abalone in the fishery would be of benefit in the longer term, and suggests that when the

research permits are considered for renewal in July this year, that a minimum size of at least 119mm should apply to all harvesting from Region 1.

Agreement on the form and structure for the survey conducted in Region 1 South was difficult to achieve, and has been a source of considerable frustration to the Committee and all stakeholders in the fishery. While the Committee is encouraged that the survey was completed, it is regrettable that the data, including size frequency data and the form of analysis is insufficient to provide rigorous advice on the status of the resource and thereby set a commercial TACC.

*The Committee **recommends** that the use of data loggers to record catch and location details should be a pre-requisite for the issue of all permits to fish in Regions 1 and 2. Subject to the availability of resources, this information should be conveyed directly to the Department for processing and analysis. If industry is to undertake the primary data collection and analysis function, then adequate processes and protocols must be agreed, implemented and monitored.*

### **3.4 Recreational Fishing**

There is now general acceptance that the decision 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 figure of 10 tonnes.

Reported observations by DPI compliance officers consistently show that fewer people are inclined to collect abalone, and that they tend to concentrate on spear fishing or rock lobster harvesting.

The Committee is confident that the 10 tonnes it allows for as recreational catch in the TACC setting process is at the top of the range that 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.

Abalone that are now not taken by the recreational sector as a result of the bag limit reduction will be contributing to the future increase in abalone stocks in NSW which can only be of benefit.

### **3.5 Compliance Issues**

In setting a TACC for the NSW abalone fishery, the Committee makes provision for the illegal catch taken by people who are not licensed as commercial fishers and who operate outside of the prescribed recreational fishery. The illegal catch was initially set at 40% of the legal catch (first introduced in 1987) when the illegal catch was estimated at 102 tonnes.

The 102 tonne figure has been maintained to this day and we now have arrived at a position whereby the estimated illegal catch for 2008/09 will exceed the actual commercial catch.

Objective 7 of the Management Plan is to minimise the number of offences committed by fishers in relation to abalone. General compliance rates as reported by DPI for the commercial sector for 2007/08 is recorded at 93%, which is a slight improvement on last year. For the recreational sector it is at 67%, which is deterioration in the situation as it was reported last year.

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 79% is still comfortably above this figure.

Some further refinement of the recording of illegal activities by the recreational (or non-commercial) sector has been identified by the Department as a priority objective. All non-commercial fishing is lumped together as recreational fishing which leads to disparate groups, such as low-key recreational fishers, who may be involved in smaller scale lower impact activities be included in the same category as serial or professional abalone poachers who are having a significant impact on the resource. 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.

*The Committee **recommends** that the reporting of recreational fishing be progressively refined to reflect the difference in impact on the resource by low key recreational offenders and serial or large scale abalone poachers.*

The Department has identified that organised poaching syndicates that often have interstate connections are the groups that need to be targeted as a priority. It appears that until fairly recently NSW based serial poachers would often work in other states where better catch rates could be obtained. In recent years, a combination of improved compliance practices, interstate cooperation and severe penalties for illegal fishing have had a major impact on poaching in other states, particularly Victoria, and has significantly reduced illegal catches. However, this success has had the effect of forcing NSW based poachers to look to operating in their home state where the penalties that the courts are able to impose are substantially less. This problem is now most pronounced on the south coast where stocks of undersize abalone are targeted.

The Committee is confident that the Department has an effective abalone compliance capacity. 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 for this year) by coastal fisheries officers and members of the police force. The Committee again noted that at this year's Open Forum, those industry representatives that were in attendance were strong in their praise of the efforts that NSW fisheries officers are putting in to detect and catch illegal fishers.

The Committee was advised at the forum that amendments to the Fisheries Act providing for increased penalties for abalone poaching (indictable offences) are listed for consideration by the NSW Parliament in the 2009 Autumn Session. The Committee has frequently stated its support for increased penalties or indictable offences for abalone poaching. Once indictable offences are in place, NSW will be on a similar footing to Tasmania, Victoria and South Australia in having a key tool to addressing the scourge of abalone poaching.

Finally, the Committee was concerned at the option provided to industry by ballot to reduce compliance efforts (and costs) by removing 1.5 officers from the Special Operations Unit. This Unit, as discussed above, has made significant contributions to reducing the serious impact of illegal abalone fishing. It appears very questionable to reduce capability in this area at a time when it is known that illegal fishing remains of significant concern.

### **3.6 Other Fishing**

Consistent with the provisions of the Indigenous Fisheries Strategy, Aboriginal Cultural Events Permits are issued for the collection of abalone for cultural fishing activities. Two permits were issued in 2008 to take a total of 90 abalone. Members of the indigenous community may also have taken some abalone as part of the recreational component of the fishery.

The Committee does not see that at this stage there is a need to make any special allowance in the TACC for the amount of abalone that is taken by the indigenous community.

DPI NSW released a discussion paper in May 2009 outlining the cultural and legal issues that are being reviewed as they relate to the harvesting of abalone for cultural purposes.

### **3.8 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).

At the time of writing this report, the situation regarding the collection of annual management charges for 2008/09 and the provision of funding for research and base-line monitoring of the NSW abalone is in a state of flux.

Since 2002, total management costs to industry have contracted by more nearly 50%. In 2002, the total industry contribution to management costs for the fishery was \$962,000 and for the 2007/08 period was \$581,000. For the past three years, these costs have stabilised at approximately 15% of the GVP of the fishery. This has occurred against a backdrop of declining beach prices for abalone (in 2002 - \$46 per kg, in 2007/08 - \$33 per kg) mainly caused by the steady increase in the value of the Australian dollar, which is likely to have an ongoing negative impact on seafood exports, and a drop in TACC from 300 tonnes in 2002 (worth \$13.8 million) to 110 tonnes in 2007/08 (worth \$3.7 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.

For the period 2007/08, the value of abalone landed in NSW was just under \$3,700,000. Management costs were \$168.40 per share for each of the 3,454 shares in the fishery, or in total, around 15% of the value of GVP. In a processor-based submission to the Committee, it was suggested that the beach price could drop to \$25 next year because of the strong Australian dollar and significant market difficulties. While the concern of fishers over the size of management charges is understandable, the likely reason for this is the relatively small size of the industry compared to those in other jurisdictions. A larger industry might enjoy lower costs per share due to economies of size.

Faced with a situation whereby management costs were remaining relatively high in a time of declining returns to shareholders from the fishery, DPI received sustained

requests from the industry for some relief from the continued high charges it was required to pay for research monitoring and to a lesser extent compliance. In November 2008, DPI wrote to all shareholders offering three options for revised funding of research and compliance in the 2008/09 period. Shareholders were offered three options and advised that DPI would adopt the proposal that they endorsed. 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 options provided were:

- a proposed levy charge of \$348,500 which would be the industry contribution to a total research budget of \$446,000;
- a total levy charge of \$117,000; and
- a levy charge of \$50,000 to cover support and audit of structured fishing and fishery assessment, funding the NSW Abalone Council to provide services required by the structured fishing programme and support for a FRDC Tactical Resource Fund project to develop and extend the structured fishing programme.

By a resounding vote (91%), and as discussed above, the current assessment process and costs were rejected, and the third option was chosen.

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 are discussed extensively in this report. At this crucial time for the recovery of the fishery, 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.

Clearly the option that was flagged in last year's report of setting a highly conservative TACC with associated simple and restrictive management as a result of inadequate information from the fishery is now a reality.

Accumulated debt in the fishery caused by the non-payment of fees and charges has since 2003/04 and is now in the order of \$900,000.

Almost ten years have elapsed since the Independent Price and Regulatory Tribunal (IPART) developed its pricing principles for NSW commercial fisheries, as cited in the FMS. There would be value in a new independent assessment of cost recovery principles in the management of NSW fisheries, including abalone. It is understood that the SARG has made a similar recommendation.

*The Committee notes that the decision to drastically reduce funding for research and monitoring had over-whelming support from share-holders. The appropriate collection and analysis of data in support of management arrangements is a core responsibility of Government and recommends that in the absence of any viable industry based alternative that DPI should provide the resources that are necessary for this and **recommends** that an overall assessment and management package be developed.*

### 3.9 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 2008/09 (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.

### 3.10 Co-management approaches

The failure of the MAC to meet effectively during the current quota period is not encouraging. The lack of an effective Management Advisory Committee (MAC) for abalone, staff changes at DPI, and divisions within the industry has clearly hampered the effective management of the fishery. A number of the issues which would more properly be dealt with at the MAC are coming to the TAC open Forum, which at times, is inappropriate. The TAC Committee notes that despite the best efforts of the Chair, the MAC remains mired in the controversies of the past, It has been unable to give attention to a path forward for the fishery, and in particular the best ways to move from current stock assessment and management arrangements to a different, more affordable (but effective) alternative based on FSM approaches. While not seeking to dismiss or minimise the current grievances, it is essential that they not be allowed to dominate efforts to restore the fishery and its management.

Current feedback from the fishery however, is not encouraging. There are ongoing disputes covering most aspects of the fishery, an expectation by industry that the Minister's Office will engage in what would normally be considered to be minor operational issues, and poor communication between industry, researchers and managers.

*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 stock assessment, management and economics, prior to the TAC Committee deliberations.*

### 3.11 Conclusion

Industry representatives continue to be generally optimistic that the decline in commercial catches has been arrested. The move to an increased minimum size of 117 mms has broader support from the industry than was the case at this time last year. Whilst commercial catch rates have improved over the last year measuring the status of resource using this data has been confounded by the increase in the minimum size.

The decision of NSW abalone shareholders to so overwhelmingly accept the invitation by DPI to substantially reduce their payment of charges for research has a profound effect on the TACC setting process for the 2009/10 quota period. Whilst it was the stated intention of industry representatives at the TACC setting forum that they could in part at least fill this void, the unfortunate fact is that the research and monitoring information that had informed the Committee on a consistent basis over recent years is no longer available. At the time of writing there is extremely limited data (compared to what has been provided before) on which to base a coherent decision on the quantum of the TACC.

The increase in the minimum size of 2mm which follows a recommendation in the report prepared by the SARG has despite initial criticism from some industry members now been well received and is in the opinion of the TAC Committee already showing benefits for the NSW abalone resource.

The market situation for abalone is now at a low ebb, and given that the TACC for 2008/09 is not expected to be fully utilised, now would in the Committee's view, be a good time to increase the minimum size by a further 2 mms.

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.

Improvements in the relationship between industry and the research and management arms of the Department are essential to an effective management process for the fishery in the currently difficult phase that the industry is going through. This is particularly relevant to current efforts to establish FSM.

If this occurs, and differences within and between key players at all levels can be dealt with effectively and transparently, then the prospects for developing more effective, affordable management arrangements are reasonable. This, coupled with a 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 recovery of the fishery will remain in severe doubt.

## **4. Economic considerations**

### **4.1 Introduction**

In making its determination, the Committee is required to pay attention to economic and social issues. That is the purpose of this section of the Report. Unfortunately, the ability of the Committee to address this issue is severely restricted by the limited information available to it. This is despite repeated and reasonable requests by the Committee for submissions to be improved in this respect. While the Committee understands the competing calls on funding, and the constraints imposed by the economic significance of the fishery, the resulting inability to address adequately its statutory requirement to advise on the economic and social status of the industry is greatly regretted by the Committee. This matter is discussed further later in this section.

In this section, the export market is reviewed, the volume and value of production described, and the number of shareholders and their incomes discussed. Following presentation of data on share and quota markets, the overall economic health and performance of the industry is considered, to the extent allowed by the available information.

### **4.2 Production and Markets**

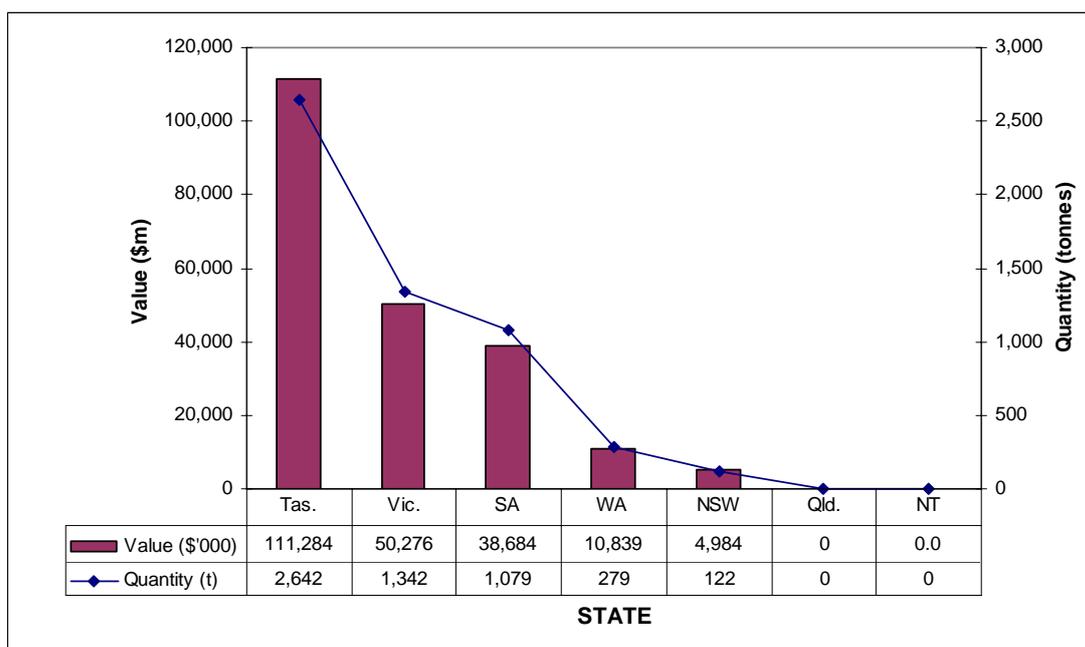
#### **4.2.1 Export markets**

The Australian abalone industry is predominantly export oriented. Its principal markets are in North-East Asia. As Table 1 shows, the bulk of the catch and exports of abalone comes from Tasmania, Victoria and South Australia. New South Wales is a minor and declining contributor to both production and total Australian exports (Figure 1).

**Table 1: A comparison of NSW and Australian production and value of abalone**

FINANCIAL YEAR (FY)	Volume of NSW Production(t)	Value of NSW Production (\$'000)	Volume of Australian Production (t)	Gross Value of Australian Production (\$'000)	NSW production as % of total Australian production	NSW value as % of total Australian value
2003/04	252	\$8,668	5,588	\$197,901	0.05	0.04
2004/05	186	\$7,825	5,592	\$233,030	0.03	0.03
2005/06	129	\$5,424	4,979	\$225,779	0.03	0.02
2006/07	122	\$4,984	5,464	\$216,067	0.02	0.02

Data from ABARE reports



Source: ABARE (2008) Australian Fisheries Statistics 2007

**Figure 1: Abalone exports by state in 2006/07**

Exports account for almost 100 percent of NSW abalone production. As a result, prices received for the NSW product are subject to economic conditions in the main overseas export markets, competition from exports from other abalone exporters, and other factors, one of the most significant being exchange rate fluctuations.

Australian exports of abalone are divided into two categories: 'fresh, chilled or frozen' and 'canned' (Table 2). The information in Table 2 shows that, in 2006/07, the largest export market for fresh, chilled or frozen abalone was Hong Kong - China; followed by Japan, and China. The largest export market for canned abalone is Hong Kong, China, followed by Japan and Singapore.

**Table 2: Australian exports of abalone 2002/03 to 2006/07**

	2002/03 (t)	2002/03 \$'000	2003/04 (t)	2003/04 \$'000	2004/05 (t)	2004/05 \$'000	2005/06 (t)	2005/06 \$'000	2006/07 (t)	2006/07 \$'000
<b>Fresh, Chilled or Frozen</b>										
Canada	-	-	8	986	12	1,583	10	1,341	12	1,588
China	30	3,141	20	1,532	296	16,033	609	34,493	271	14,255
Chinese Taipei	159	8,536	137	6,088	85	4,096	63	3,153	44	2,301
Hong Kong, China	1,129	71,567	1,551	87,086	1,229	76,529	1,019	66,780	1,492	92,240
Japan	351	22,574	377	19,985	394	24,250	404	23,766	391	24,057
Singapore	7	441	14	781	8	599	16	971	15	1,121
United States	7	708	-	-	-	-	-	-		
Other	17	2,310	12	1,264	15	1,848	12	1,028	16	1,479
<b>Total</b>	<b>1,701</b>	<b>109,277</b>	<b>2,119</b>	<b>117,482</b>	<b>2,032</b>	<b>123,856</b>	<b>2,133</b>	<b>131,533</b>	<b>2,241</b>	<b>139,041</b>
<b>Canned</b>										
Chinese Taipei	207	8,403	428	16,366	227	12,806	153	10,553	134	7,836
Hong Kong, China	901	29,309	1,222	53,210	949	70,010	609	46,392	883	54,819
Japan	584	29,629	596	25,309	402	27,462	404	29,876	229	16,546
Singapore	326	20,088	344	16,744	311	22,475	249	18,768	324	20,861
United States	118	3,231	91	3,391	31	2,381	37	3,056	39	3,174
Other	356	16,177	110	5,178	52	4,160	80	5,449	61	3,750
<b>Total</b>	<b>2,493</b>	<b>106,838</b>	<b>2,791</b>	<b>120,198</b>	<b>1,972</b>	<b>139,294</b>	<b>1,532</b>	<b>114,094</b>	<b>1,670</b>	<b>106,987</b>
<b>Total Abalone</b>	<b>4,193</b>	<b>216,115</b>	<b>4,910</b>	<b>237,680</b>	<b>4,004</b>	<b>263,150</b>	<b>3,665</b>	<b>245,627</b>	<b>3,911</b>	<b>246,028</b>

Source: Australian Fisheries Statistics

Since 2006/07, the export market has apparently deteriorated significantly. Anecdotal evidence provided by industry members to the Committee, indicates that, at the time of writing, the market has virtually collapsed with processors refusing to buy fish as they have full stocks which they are unable to clear. In a submission to the Committee, a representative of the sole processor in NSW, Mr. George Chung, described a situation of total market collapse. He attributed the collapse to the world financial crisis and, more significantly, to the increased availability of farmed (small) abalone. He pointed out that the latter was particularly significant for the NSW industry because of the significance of small abalone in its catch. To the extent that his diagnosis is correct, the industry faces a structural change in its market rather than a relatively short lived financial crisis. This could have profound implications for the future of the industry. Mr Chung recommended a number of actions which are listed below, together with comments from the Committee in italics.

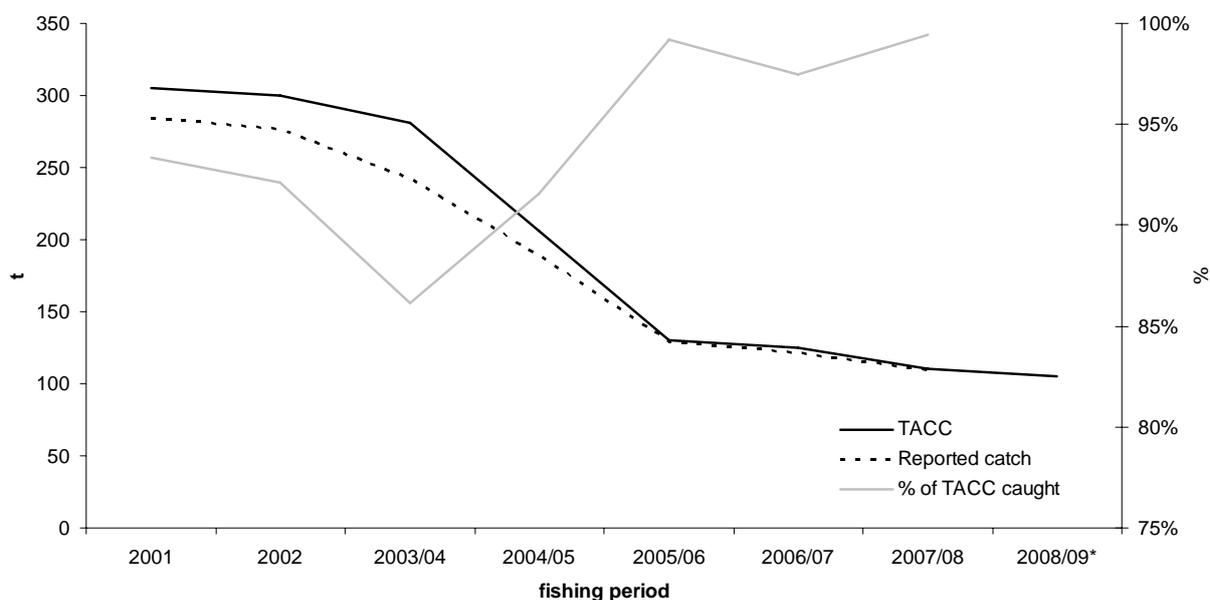
1. Increase production and exports to maintain the viability of the exporters and the industry i.e. quota must be increased urgently. *Based on the information provided to the Committee, this would not be in the best interest of the sustainability of the fishery.*
2. Variation of size limits with at least 115 mm. in as many ports as possible must be introduced to meet with market needs. *Larger, rather than smaller, minimum sizes would be in the best interest of the fishery and, apparently, of the market for NSW abalone.*
3. Management charges must be decreased further to ensure shareholders will not be bankrupted, if not already inevitable. *The Committee has, on several occasions urged a review of the IPART cost recovery principles, as*

has the NSW Treasury. As yet no review has been undertaken. Further, the Committee has urged DPI, industry and researchers to work together to develop a strategy to transition to a new, lower cost fisheries assessment and management framework. While some limited progress has been made, such a strategy has not been developed.

4. Government funds must be injected to seek and develop new markets as well as new value-added products. *If the industry was to be subsidised, this, in the form of a terminating grant may be better than most forms of intervention. In the meantime, some self-help may lead to value adding outcomes. The Committee notes the McKinna Report on the development of a marketing strategy for Australian abalone, which offers some suggestions in this regard.*
5. Cooperation between NSW DPI, shareholders, divers and processors to address the many challenges facing the industry. *Absolutely agree. Without this the Committee doubts that the industry has a future.*

### 4.3 Volume of production

Figure 2 shows the production record of the industry since 2001. There has been a dramatic decline in the TACC and in production over this period. Preliminary data for 2008/09 has the reported catch at 56.8 tonnes, which is 54 percent of the TACC. Over the period, the TACC could be viewed as having been binding only since 2005/06. Whether the TACC will be caught in 2008/09 is not clear, mostly because of the state of the market rather than the stock.

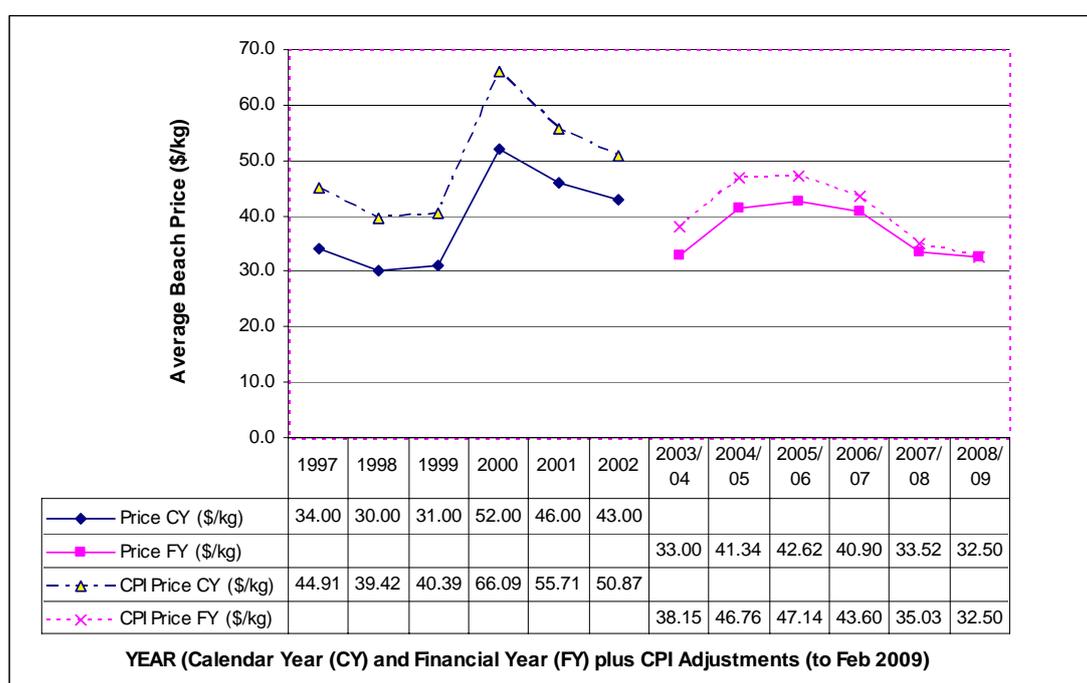


**Figure 2. TACC (t), total reported commercial catch (t) and proportion of TACC caught (%) for each fishing period from 2001 to 2008/09.**

In 2004/05 and 2005/06, the pressure on the resource was brought sharply into focus with the TACC levels declining significantly to 205 and 130 tonnes. In 2004/05, only 92% of the TACC was caught. This was symptomatic of substantial depletion of the stock. The pressure on the resource is indicated by the decline in the TACC by 63 percent between 1993/04 and 2008/09.

#### 4.4 Average Beach Price

Figure 3 shows the average NSW beach price for abalone (\$ per kg in real and nominal terms) between 1997 and 2008/09. The real average beach price has declined over the last three years, which shows that the slight recovery in 2003/04 and 2004/05 has dissipated and the longer time decline, which commenced in 2000, has been resumed. As indicated above, a range of factors influence NSW abalone prices and their net effect over the last nine years has to be to depress prices. Most important of these influences appear to be exchange rate movements, demand in China and Japan and increased competition from other producers, particularly aquaculture. A particularly important short-term influence is the world financial crisis. Untangling this web of influences is no easy task, but important long-term structural changes may be occurring as a result of the growth of the aquaculture industry and, perhaps, changes in taste for abalone in China.



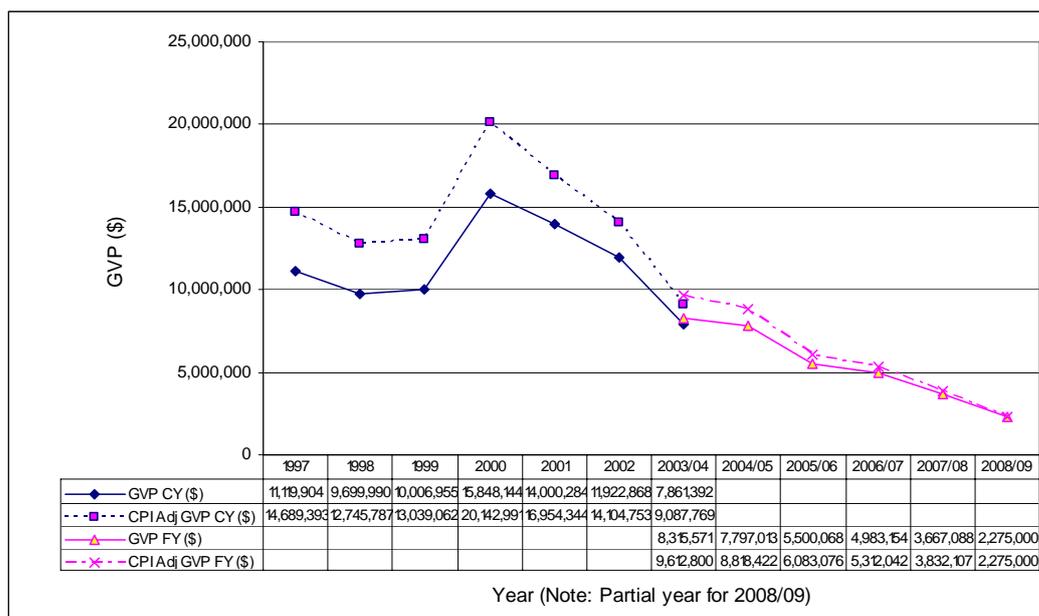
Source: Estimates from processor data

**Fig 3 NSW abalone prices and CPI Adjustments 1997-2008/09**

#### 4.5 Gross Value of Production

As Figure 4 shows, the gross value of production, or gross industry revenue, after peaking at \$20.1 million dollars in real terms in calendar 2000, has declined to \$3.8 million dollars in 2007/08. Industry GVP has declined steadily from its 2000 peak and is now about 80 percent below it. The current GVP of the Abalone Share Management Fishery is lower, in both real and nominal terms, than at any other time and further deterioration seems likely in 2008/09.

Declines in gross revenue of this magnitude mean that considerable financial stress is likely in the industry, particularly among those who entered the industry in 2000 or thereabouts. 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 in the absence of detailed information on the structure, conduct and performance of the industry, particularly the structure of costs and levels of debt. These points are returned to below.



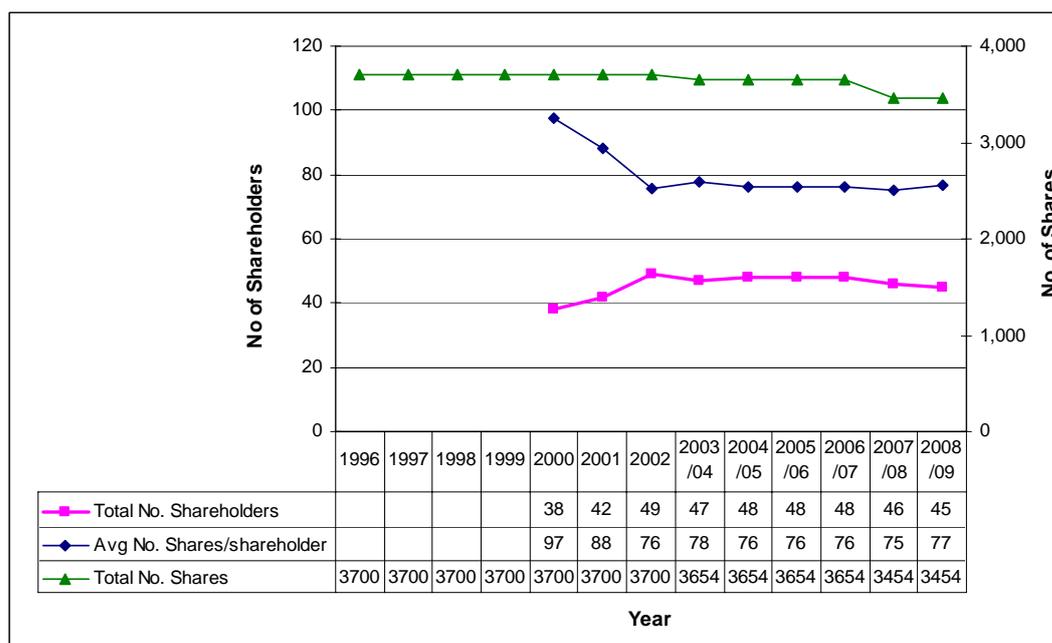
Months of record only for 2007/08 to 6 March 2008

**Figure 4: Gross value of production of abalone in NSW, 1996/97 to 2006/07**

#### 4.6 Number of shareholders and return per shareholder

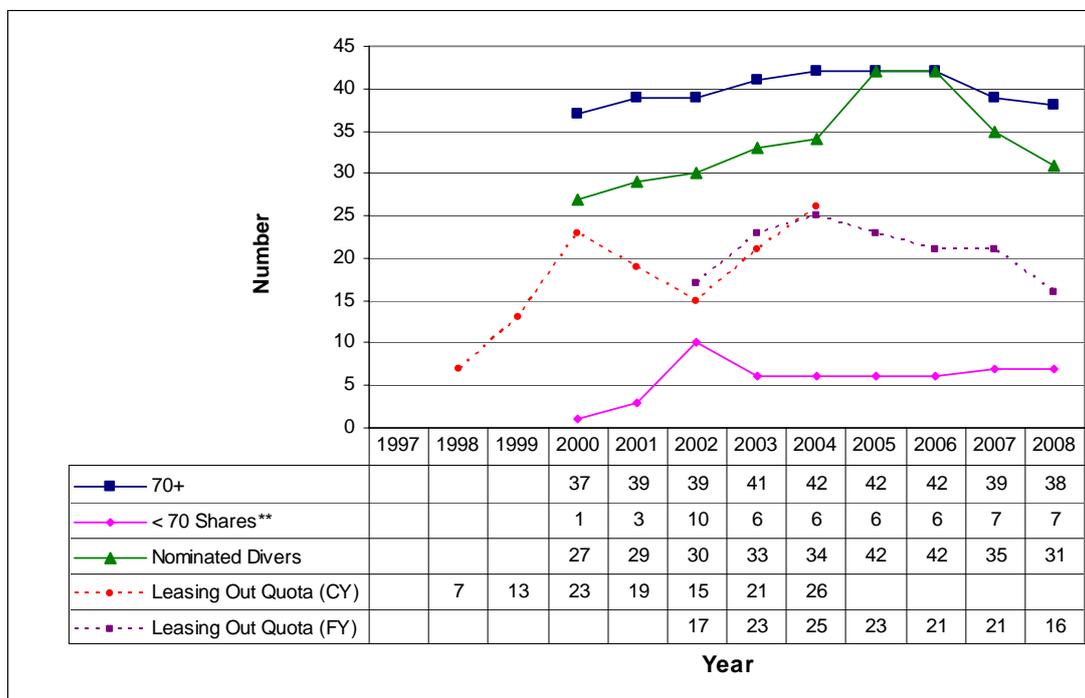
##### 4.6.1 Number of shareholders and fishing effort

Figure 5 shows that the number of shareholders peaked at 49 in 2002. Since then it has fallen to 45. The average number of shares per shareholder has fallen from 3,700 in to 3,454 in 2008/09. 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 relative small fall (less than 10 percent) since then is not consistent with the changes one would expect over a period of significant decline. The fall in the number of shareholders in 2007/08 is due to the Batemans Bay and the Port Stephens Marine Parks buyouts.



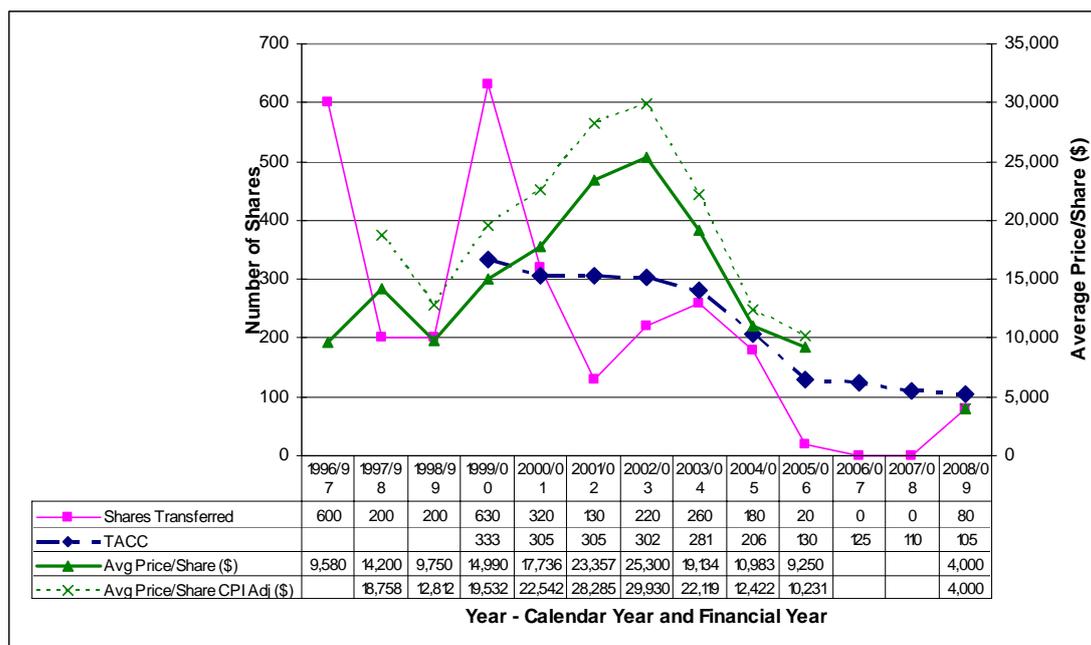
**Fig 5 – Trends in shareholdings, 1996 to 2008/09**

More detail on the structure of the industry is provided in Figure 6. Diver numbers peaked at 42 in 2005 and 2006 but have declined to 31 in 2008 (a fall of about 25 percent). Of the 45 shareholders in 2008, 38 had more than 70 shares and so qualify for endorsement. The remaining 7 do not qualify for endorsement and presumably lease-out quota.



**Fig 6 - Distribution of shareholdings, diver numbers and quota leasing, 1998 to 2008/09**

Interpretation of these changes in the structure of the industry is difficult. In part, this is because of the small size of the industry and what appears to be a degree of integration of activity among shareholders, either through family connections or through companies with common directors. The industry has shown some responsiveness to its changing economic circumstances with rising shareholder and diver numbers representing a response to the good times prior to 2000 and declining since then. Overall, diver numbers appear to be more responsive to the economic circumstances of the industry. Discussion in the open forum last year suggested that the decline in the number of divers was enabling those remaining to avoid a fall in their quota. A further indication from that open forum was that only a minority (perhaps nine) of shareholders were owner/divers. The remainder (perhaps 80 percent) leased their quota to divers. Some implications of this situation are explored below.



**Fig 7 - Share transactions in the abalone fishery, 1996/99 to 2008/09**

The data in Figure 7 shows that since 1996/97, the number of shares traded has fluctuated round a declining trend. The number of transfers reached a peak of 630 in 1999/2000 and fell to zero in 2006/07. No further trades were reported up until 2008/09 when a package of 80 shares was reported to have been sold for \$4,000 per share.

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. Data on entries to and exits from the industry have not been available to the Committee, but the impression is gained of some stability of participation among shareholders compared with the decline in the number of divers, over the recent years of decline. This suggests that shareholders are either committed to the industry and have expectations of a return to better times, or are “locked-in” to prevent realising losses.

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.

**Box 1**

Given the change in minimum shareholdings required for endorsement, from 100 down to 70, shareholders with more than 70 shares could capitalise on their investment subject to share transfer rules. Because an endorsed shareholder with 100 shares would still be endorsed at 70 shares after the 70 minimum came into effect, shareholders had a powerful incentive to capitalise on their 30 “spare” shares when the change took effect in February 2000. There was no comparable incentive to buy shares from less efficient operators and in doing so, contribute to the restructuring of the industry.

For example, by selling shares at an average price of about \$15,000 in 1999/2000 a shareholder could receive \$450,000. For those shareholders with no cost of entry to the fishery (on the basis of prior catch history), this would be a windfall gain. For shareholders who paid the average price of \$9,580 per share in 1996/97, the gain would be about \$162,600. The incentive to sell (and still stay endorsed) was even greater in 2001/02, 2002/03 and 2003/04 given that average share prices for 30 shares would yield \$532,000, \$700,000 and \$759,000, respectively, for those shareholders with no entry costs.

**4.6.2 Net return per shareholder**

Speculation such as the above aside, net returns, i.e. gross returns less costs, will probably have fallen to a greater extent than gross return, especially if there has been no reduction in variable costs, such as those of fuel and of nominated divers. As nominated divers are usually paid on a \$/kg basis, however, some costs will have fallen as a result of a reduction in catches across the fishery.

Fixed costs, such as boat capital and other overheads associated with running a small business, are unlikely to be as responsive to changes in catch and prices as variable costs. Operators may adjust to lower catches and prices in the short run, by reducing variable costs. Where falls in catches and/or prices are maintained over the longer term, structural change in the industry by means of the adoption of new technology and reduction in the number of shareholders and divers may result in lower total and variable costs thereby enabling lower total average costs.

In the absence of such adjustments, costs per unit of catch are likely to stay at their current levels, or, if aggregate catch declines, increase. In such a situation, fisher profits will decline. The rate of decline will depend on a number of factors, including the status of the stock. Anecdotal evidence suggests that fishers’ costs per unit of output have, in fact, increased over time. All told, there is evidence to suggest that the long-term viability of the industry, as currently structured, is under threat if current prices and yields are maintained. As already suggested, some structural adjustment may well be necessary, if the industry is to be viable. Shareholders are said, however, to be reluctant to exit the industry or to undertake other structural adjustments, which may reduce costs. This perception is not inconsistent with shareholder numbers in recent years.

As indicated previously, both catches and prices and, hence, in the absence of any structural change in the industry, profits, have fallen since 2001/02. The decline in profits must, by now, be such as to seriously threaten the viability of the industry in the long run, and place at least some shareholders, particularly the heavily indebted, in difficult financial circumstances in the short run. The data suggest a greater ability of divers to respond to economic circumstances by either leaving the industry or fishing more quota.

The Committee understands that a reasonable approximation to the cost of catching abalone is \$14/kg. This is also reported to be the return to a diver for each kilogram caught. Although probably an understatement, if this is assumed to cover all costs, including return on non-share capital and depreciation, adding government costs of \$168 per share gives total costs per share of \$275.80. Assuming a beach price of \$32/kg and 19.7kgs per share (with the TACC at 75 tonnes), the resulting net return is \$196.45 per share. A fisher with 100 shares would then have a total net income of \$19,645 as a return to share capital, which, at an interest rate of say, 8 percent, would justify a maximum share price in the region of \$1,600.

More precise and verifiable data on industry costs would permit a more robust assessment of the economic and financial circumstances of the industry, but on the basis of these admittedly rough calculations, positive rents can still be earned in the industry. This would be 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.

### **Box 2**

Declining TACCs, rising harvesting costs and falling beach prices will have resulted in considerable economic stress in the NSW abalone industry. As suggested above, the degree to which that hardship is being felt is proportional to the degree to which quota owners have relied on the value of quota as an investment vehicle to generate above-market returns, or rent. Those operators that gained windfall gains when limited entry and allocation occurred, are at face value at least, still deriving positive returns (8%) from their assets. Given the risk associated with abalone fisheries many would conclude that this is far from an adequate return to capital and would conclude that more attractive investments exist. The principle however, remains. At current beach prices and with the TACC set by this determination, shareholders would appear to be in an unsustainable position unless they have other sources of income such as diving or a diversified portfolio of investments. This may be the case for shareholders who remain invested in the industry in the hope of a stock recovery and improved economic circumstances. The lack of sellers of shares would seem to indicate this circumstance might be common in the fishery.

As raised elsewhere in this report, 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 is justified. However, any intervention/assistance should not be based on providing relief for poor investment (in quota) decisions. 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, including adjustment within the industry to ensure restoration of sustainable levels of the stock.

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. The Committee understood that both parties intended to ensure that these deficiencies would be ameliorated for future determinations and recommended accordingly in its last report. So far, little progress in this direction has been made. At this year's open meeting, however, the Committee was pleased to hear expressions of interest from industry in what form such data might take. The Committee recommends that the Department direct its economists to advise the AbMAC in this respect. In providing this advice, the Department could use the 2007 Econsearch report on South Australian rock lobster

industry as a basis for discussion<sup>1</sup>. This report is perhaps more comprehensive than the Committee is calling for and there is some overlap with material already provided, but it is an excellent example of what the Committee needs if it is to provide the Minister with the advice the Act calls on it to provide.

*The Committee, therefore, **recommends** that the Department direct its economists to guide the industry on the information needed to equip the Committee to provide the advice on the economic situation of the industry expected of it, and that, in doing so, the Econsearch 2007 report on the South Australian rock lobster industry be used as a basis of discussion.*

#### 4.7 The quota market

Unfortunately, information on the price at which quota is transferred is not collected by the Department.

Quota became fully transferable in the late 1990s. Since the commencement of the Management Plan in 2000, the dynamics of the fishery have changed with (a) new investors acquiring shares in the fishery, (b) the minimum shareholding required to be eligible for an endorsement decreasing to 70 shares, and (c) provision for use of nominated divers. Table 7 shows that 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 16 in 2008. All told, the data in Figure 7 indicates that the quota leasing market is becoming less active. Industry has suggested that the reason for this is that more quota is starting to concentrate in the hands of the better divers. Certainly, 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 repeats its **recommendation** that the Department and Industry work together to develop more detailed information on the structure and operation of the quota market.*

Industry members, particularly Mr George Chung, in a written submission to the 2004/05 TACC review, indicate 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. Possibly similar observations could be made about the share market.

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

#### 4.8 Economic overview

In its report accompanying the 2004/05 determination, the Committee described the share market as being by no means indicative of an industry with a poor outlook, and stated that the persistence of strong share prices did not support contentions that the industry was in a parlous economic state. The fall of the share price since then, and the present lack of activity on the share market, along with other indications led the

---

<sup>1</sup> Econsearch (2007), Economic Indicators for the SA Southern Zone Rock Lobster Fishery 2005/06, Report prepared for Primary Industry and Resources South Australia.

Committee to advise last year, that the circumstances of the industry appeared to have deteriorated. This year, the advice is that the situation appears to have deteriorated even further and some participants in the industry may be financially stressed. Claims to this effect were made by industry members at this year's open meeting. The lack of verifiable data, such as that provided to the South Australian lobster industry, make an authoritative, more precise conclusion impossible. If accurate and verifiable data were available to show that returns are not sufficient to cover the costs of the capital, labour and management involved in it, the industry, as structured and operated, must then be seen not to be viable. Such data are not available to the Committee.

What can be said is that crude calculations, such as those above, and observations of the behaviour of the share market, suggest the industry is financially stressed. On the other hand, the structural change that has occurred seems limited and does not seem consistent with an industry in perilous circumstances.

Objective 5 of the abalone share management plan is to ensure that the fishery remains economically viable. The performance indicators for this objective are that:

- standardised commercial catch rates remain relative to 1994;
- there is a buying market for quota; and
- the value of shares in the fishery is maintained or increased.

The trigger points for these indicators are that:

- standardised commercial catch rates fall by more than 15 percent from the 1994 benchmark;
- 20 percent (or more) of quota available for trading cannot be traded;
- 15 percent (or more) of shares available for trading cannot be sold; and
- the value of share packages for the fishery decreases by more than 10 percent (using the 1999 value as a benchmark).

The Department has indicated to the Committee that it sees these as unsatisfactory indicators of the economic health of the industry. Data on the first and last trigger are available but not on the second and third. Standardised commercial catch rates have increased over the last two years. Share values are recorded in financial years (Figure 7) and had not fallen, in nominal terms, below the 1998/99 value up until recorded sales ceased in 2006/07. They fell by more than 10 percent of the 1999/2000 value however, in 2004/05 and 2005/06. In real terms, the value had fallen 10 percent below both the 1998/99 and the 1999/2000 values by 2005/06. The conclusion that this trigger has now been activated for several years is warranted.

The Committee notes that the economic indicators and triggers in the proposed Fishery Management Strategy are lacking in specificity and relevance, and clear management responses. The Committee was encouraged in last year's report, to maintain that declining rents or share values, while indicative of significant capital losses and possibly of economic stress, are not of themselves indicators of loss of viability. This last is indicated when rents and, in a mature, efficient and stable market, share values, are zero and returns in the industry are not sufficient to cover all costs, including depreciation and the opportunity costs of capital, labour and management.

Whatever indicators and triggers for the assessment of the economic status of the industry are selected, 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 therefore, has in the past welcomed advice from the Department and the Industry that the economic content of their future submissions will be improved. The Committee has been helped by the improvements already made in this respect, but stresses that further improvement is necessary if meaningful and useful advice is to be provided to the Minister. A precise recommendation of action to address this problem is made above. If this recommendation is not implemented in time for a constructive response from the Department in time for next year's determination, the Committee's frustration with its inability to meet its statutory obligations will be extreme. This matter is returned to below.

The indicators of economic performance, which are available, give no reason for complacency, however. The conclusion that segments of the industry are financially stressed cannot be avoided. Given the apparent continued decline in the status of the stock, and evidence that fishing effort continues relatively undiminished, the Committee reiterates its concern about the possible consequences of its determination for the profitability of the industry and the financial well-being of those in it, particularly in the absence of sufficient structural change to enable reduced fishing effort and recovery of the stock to economically sustainable levels. The Committee has expressed concerns of this nature for several years.

*The Committee, in seeking to give meaningful and useful advice to the Minister, **recommends** 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.*

#### **4.9 Costs of Management**

See Section 3.9 in Management Considerations.

#### **4.10 Structural Change**

As already noted, there has been a limited tendency for the number of shareholders to decline. The number of divers has fallen to a greater extent. Whether there has been any change in the distribution of shareholdings is not known. Figure 8 provides a snapshot, which shows that there was a distinctly bimodal distribution of shareholdings at the end of June 2006. A majority of shareholders held 70 to 80 shares, while the next largest group held 100 shares. Provision of these data in time series and up-dated form would help in understanding trends in the structure of the industry. Unfortunately, such data have not been provided to the Committee.

It has been suggested to the Committee that shareholders are not prepared to sell at current share prices and many, as is discussed in Section 4.6.1, are supplementing/subsidising their involvement in the fishery by using other sources of income.

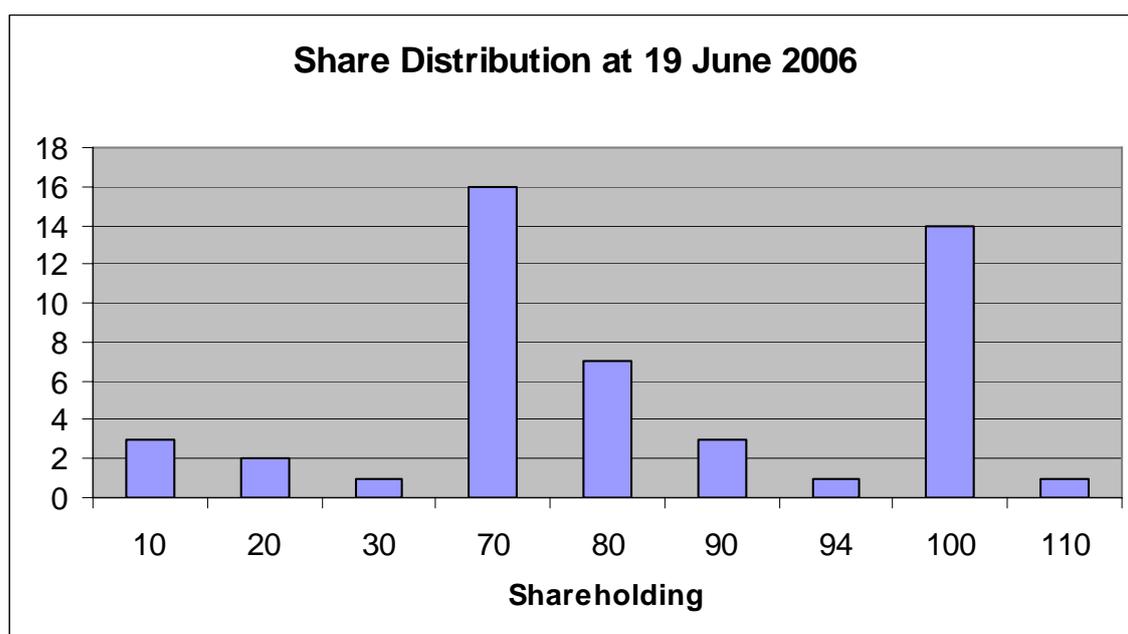
Clearly, the rewards of participation in the industry have so far not been such as to provide an inducement for the number of shareholders to decline at anything other than a slow rate. Industry members claim that they are in difficulty, however. Certainly, many must be facing substantial capital losses, given the decline in share prices in recent years, while those with significant debt could be in financial difficulty. On the other hand, anecdotal estimates of costs provided to the Committee by industry members, indicate that to date surpluses over variable costs have been possible. The Committee has called repeatedly for the provision of the economic and financial data to enable such indications to be tested, without success. Quite apart

from the needs of the Committee, it would be expected that Government would want (and expect) to be able to determine the economic health of its primary industries. The Committee notes that, in its Review, IPART stated that the provision of economic data to inform the development of economic policies related to the health of industry should be funded by Government. This is contrary to the position put forward by members of the Industry Analysis Branch of DPI in discussions with the Committee.

*The Committee **recommends** that the DPI reconsider its current position with respect to contributing to research on the economic status of the abalone fishery, and consider some form of cost sharing arrangement with industry*

The industry is one of two NSW fisheries (the other being lobster) that first moved to fully share managed status. As of February 2007, a total of seven fisheries are now under share management. The rock lobster industry, in contrast with abalone, has benefited from structural change in the face of adverse circumstances. A study of the comparative performance, both in terms of management and economic performance, of the two fisheries would be of interest. 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 rather than impede it. The Committee has now made the recommendation below for several years, without formal response until this year. The Committee's interpretation of this response, which is contained in the Department's management report to the Committee, is that the Department believes that the cost of collection and the accuracy of the data it might collect, is such that the exercise is not warranted. While it cannot comment on the first of these reasons, the Committee rejects the second as it flies in the face of the success and usefulness of such investigations in a range of primary industries. The South Australian study, cited above, is a particularly relevant example of such a study.

*The Committee **recommends** that a study be undertaken to compare the structural adjustment under share management of the rock lobster and abalone fisheries.*



**Figure 8. Share Distribution as at 30 June 2006**

The Department has signalled its intention to remove a number of impediments to the trading of shares and quota to facilitate restructuring. These include:

- reducing the number of abalone shares that can be traded from 10 shares to 1 share; and
- removing the shareholding aggregation limit (210 shares)
- removal of the requirement to transfer quota with shares other than when an entire shareholding is transferred, and
- review of the current restriction on the amount of quota that can be leased by a shareholder (currently 2X the original allotment)

The Committee welcomes these initiatives as actions which would be expected to occur as a matter of course in any output controlled fishery. It is however, not convinced about the likely scale of impact on industry restructuring/ consolidation/ rationalisation. No evidence was provided this year, to indicate that these reforms had been implemented. The Committee was pleased to note that the Department is planning to undertake a productivity and business analysis of the fishery, which will seek to:

- i. assess the potential for the NSW abalone fishery to achieve greater economic productivity;
- ii. explore options to realise such productivity; and
- iii. after review of i) and ii) above, develop a business model with respect to a preferred option.

Again, there was no indication this year that this analysis has been undertaken.

As noted elsewhere, this study combined with one to look at an appropriate management and research/monitoring framework, are urgently required if the abalone industry is to be salvaged and placed on an economically and biologically sound footing. It would be unrealistic, or under some arguments inequitable, to expect industry to fund this work, as well as that required to undertake the necessary actions to move towards FSM approaches and resolve the stock status issues associated with Regions 1 and 2. Further, given the fractionised and dysfunctional nature of the management of the fishery, development of the necessary alternative management arrangements without intervention are highly unlikely to be successful. In this respect, 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 fishery and support the development of alternative, more cost-effective management arrangements and support the necessary improvements in trust and collaboration.

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.

#### **4.11 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 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 the structural change, which is expected to be necessary if the industry is to cover all appropriate costs, including the provision of appropriate government services and the payment of a community contribution 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 that these should be pursued.

Market forces in a single species fishery, such as abalone, with strong individual property rights (quota) should result in trading towards low cost, efficient operators with a resulting drop in the number of divers in the water. This process may now be under way. While the lack of verifiable data prevents authoritative and conclusive evaluation of the economic status of the industry, 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 eventually benefit from it.

## **5. State of the Stocks**

### **5.1 Introduction**

In making its determination of a TACC for abalone, the Committee is required to consider the current and predicted status of the stock. In previous years this has been 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. In addition, there has been information from trials of various designs of surveys and structured fishing in Regions 1 and 2, which are currently closed to commercial fishing. These trials are intended both to investigate methods of monitoring the stock that are more cost effective than Fishery Independent Surveys, and to inform stock assessment and management decision-making for those regions. Preliminary results from survey trials in Region 1 were provided to the Committee during last year's Determination, and some structured fishing was conducted late in the most recent fishing year in both Regions 1 and 2.

The information provided to assess the state of the stocks this year, and to judge likely future trends, is extremely limited. Through decisions variously of the industry and Department the Fishery Independent Survey was not conducted, there was no update of the population model, there was no prediction of future trends of the stock, and there was no analysis of either previously collected or recently collected information from the surveys/structured fishing in Regions 1 and 2. The information provided to the Committee was limited to the commercial catch rate and average weight of abalone in the commercial catch for Regions 3-6, and to the catch rate and weight of abalone in the catch from structured fishing in Regions 1 and 2. The catch rates in Regions 1 and 2 from structured fishing are not directly comparable with the rates from commercial catch in earlier years, and without analysis and calibration these data are not informative of trends.

This is especially likely in individually transferable quota managed fisheries where the management intent is for industry to increase catch rate through innovation and to responsively change fishing practices (e.g. target sizes) according to market and cost circumstances. Also abalone fisheries are expected to show 'hyper-stability' in that

high catch rates can be maintained even if the population decreases, by targeting concentrations of abalone in known high-quality habitat patches. Catch rate may also be open to manipulation by misreporting, particularly in circumstances where it is well known that TACC decisions will be based heavily on such data. The fishery in Region 1 showed the effect of hyper-stability strongly, as reported previously, with steady and high catch rates being maintained since 1986 despite the fishery independent surveys indicating collapse of the abalone populations due to *Perkinsus* infection in all surveyed areas in Region 1 during the mid to late 1990s. A further limitation of commercial catch rate is that it cannot provide an index of the abundance of abalone below the minimum size limit, and so in relation to recruitment, the commercial catch rate is a 'trailing' indicator that reflects what has happened, rather than a 'leading' indicator that can inform about what will happen. This is especially the case in the NSW abalone fishery where the bulk of the catch each year is made up of abalone that have grown through the minimum size limit in the year of their capture and so commercial catch rate retrospectively indicates the recruitment that entered the fishable population that year. Furthermore there were reports this year of some irregularities in the recording of commercial catch rates (e.g. the catch from two days being recorded as from one and misspecification of the location of catches). Although the extent and accuracy of these reported irregularities are not known, they undermine confidence in the integrity of the reporting system for commercial catch rate at a time when this is the only source of information on trends in stock abundance.

The reduced information available is particularly problematic for assessment of the fishery at this time because of concerns about recruitment overfishing in the stock, and separating the effects of this from the effects of the increase in minimum size limit by 2mm to 117mm in July 2008. Briefly examining each of these:

- **Recruitment overfishing:** Region 2 was closed to commercial fishing in 2006 because of the evidence that recruitment overfishing was occurring there, and in last year's Determination, the Committee expressed growing concern about the possibility of recruitment overfishing in the more southern regions. Specifically, the concern was that the population model predicted the pulse of relatively strong recruitment currently passing through the fishable population would be weaker than previous pulses, which, if correct, would both indicate the onset of recruitment overfishing in these regions and cause further decline in the mature biomass – further exacerbating the problem of recruitment overfishing. The key question is whether the pulse of recruitment currently passing through the fishable population is as strong as previous pulses, and if so, an interpretation of fluctuating recruitment could be sustained, or whether it is weaker which would indicate that recruitment was decreasing on average through these cycles (i.e. recruitment overfishing). The model prediction was not acted upon by the Committee last year because the total allowable catch had already been significantly reduced in the previous few years and because close monitoring and assessment of the stock was considered to provide the ability to detect such a weakening of recruitment if it happened, and to trigger appropriate management responses. But the question remains and the information base on which to examine it is greatly reduced.
- **Increased size limit:** The short term transition effect of this is expected to be reduced catch rates, followed by increased catch rates and weight of abalone in the catch (i.e. the same catch from fewer abalone killed) as the abalone grow through the increase in the size limit and are again available for harvest. Once the short-term transition period is over, and this was in just a few months for NSW abalone (see below), the increase in catch rate results from better utilisation of the sub-legal sized already in the population. This expected

increase in the catch rate confounds detection of the trends in recruitment, and in the short-medium term would tend to mask the effects of any decrease in recruitment. This confounding could have been explored through use of the population model, or even through simpler 'per recruit' analyses, but such analysis is not available.

In the current circumstances, the stock assessment and projections provided in last year's (2008) assessment was used as the most recent comprehensive assessment of the state of the stock and likely future trends. These analyses taken from the 2008 assessment are provided here in italics. This was augmented by interpretation of the data on the commercial catch rate and the weight of abalone in the commercial catch. This interpretation focused on the effect of the size limit increase and the strength of the most recent pulse of recruitment that is passing through the population.

## 5.2 Stock assessment model and predictions conducted in 2008

Details of the data, methodology, results and interpretations are provided in last year's report from the Committee. Here, some key results and interpretations are repeated from last year's TAC report.

### 5.2.1 State of the stock

*The median estimates and 90% confidence intervals of the performance measures for mature biomass (MB) calculated for the base-case assessment model are:*

<b>Region</b>	<b><i>MB<sub>2007</sub>/MB<sub>0</sub></i></b>	<b><i>MB<sub>2007</sub>/MB<sub>1994</sub></i></b>	<b><i>MB<sub>2007</sub>/MB<sub>MSY</sub></i></b>
2	28% (20-36)	75% (66-84)	49% (35-63)
3 and 4	51% (38-68)	96% (85-107)	91% (67-121)
5 and 6	41% (28-56)	94% (84-106)	72% (50-98)

*Overall the interpretations from this are:*

- *Region 2 is significantly more depleted than the other regions and is significantly below the 1994 benchmark.*
- *The mature biomass in Regions 3 and 4 and 5 and 6 are both estimated to be below the 1994 benchmark, but they are expected to be less than 10% below.*
- *Region 2 is estimated to be significantly below the 1994 benchmark, and is expected to be about 25% below.*
- *Region 2 is marginally improved in status compared to last year (2007/08), consistent with the very low catches taken. Regions 3 and 4 and 5 and 6 are estimated to have almost exactly the same status as last year (2007/08). This indicates that the recent catch reductions may be at least stabilising the mature biomass under recent recruitment levels.*

*The model also provides an estimate of the history of recruitment in the regions. These estimates are shown in Figure 9. Key interpretations are:*

- *The good years for recruitment correlate well among all regions, and all recruitment patterns are consistent for both assumptions about autocorrelation of recruitment. This increases confidence in the estimated recruitment patterns.*

- *After about 1990, several changes are apparent:*
  - *The periods of good recruitment are shorter and the low recruitment between these peaks is lower. The increased fluctuation in recruitment estimates matches that in the commercial catch rate data 2-4 years later.*
  - *The two most recent periods of good recruitment were very weakly expressed in Region 2, although there was some expression. This is consistent with the qualitative interpretations made from the independent surveys.*
  - *There is a decreasing trend of recruitment in Region 2 since about 1983, with peaks and troughs superimposed on that trend.*
  - *The average recruitment in Regions 3 and 4 and 5 and 6 since about 1990 is lower than in the earlier period, with an increasingly 'spiky' pattern of recruitment through time. Different regions show different mixtures of lower lows, more persistent lows and briefer highs.*
  - *These interpretations are not sensitive to the alternative assessment models or data weighting.*
  - *Overall, this is a pattern that is consistent with recruitment overfishing of the stock having begun in the early 1990s, and having become quite severe in Region 2.*

*This interpretation of recruitment overfishing is also consistent with the estimates of 'steepness' in the relationship between the abundance of the mature stock and the average recruitment that is produced. 'Steepness' is the proportionate reduction in average recruitment that results from a reduction in the mature biomass to 20% of the unfished level, and 'steepness' can range from 1, (i.e. no reduction in recruitment) to 0.2 (i.e. an approximately linear reduction in recruitment). The estimates of 'steepness' from the model are 0.4-0.5, which implies a significant reduction in average recruitment for the depletion that has occurred in the abalone populations for some regions. The depletion in Region 2 is to 28% of the unfished level, which for a range of steepness values 0.4-0.5 implies that significant recruitment overfishing is occurring (i.e. a reduction in recruitment to perhaps half of the unfished value). Some appreciable but less severe recruitment overfishing would also be expected on this basis in Regions 3 and 4 and Regions 5 and 6.*

*This interpretation suggests that the 1994 abundance benchmark is not an appropriate one to protect against recruitment overfishing. It has previously been noted that it is not an appropriate benchmark to provide the maximum sustainable yield. The present analysis indicates that a more appropriate benchmark would be in the vicinity of the 1984 level of mature biomass, rather than the 1994 level.*

### **5.2.3 Predictions under different catch levels**

*Stock predictions were used to calculate a number of performance measures for the fishery, including those emphasised in the Abalone Share Management Plan. That is, the probability of being above the 1994 benchmark (treated as a target), and of being above 85% of the 1994 benchmark (treated as a lower limit to be avoided with high probability). These performance measures were calculated for both the legal biomass (LB) and the mature biomass (MB), and separately for Regions 2, 3 and 4 and 5 and 6. As in previous years, emphasis is given to ensuring that these criteria are met for the mature biomass. As noted above, there is concern that the 1994 benchmark is not adequate to protect the stock from recruitment overfishing, and that a higher level of mature biomass is required.*

Given the uncertainties in the assessment and concern that the benchmark may be too low to protect against recruitment overfishing, the estimated probability of being above the 1994 benchmark in 5 years should be greater than 50%. Catches giving a 75% probability of achieving the benchmark in 5 years were considered appropriate. There should be a low probability of being below the minimum benchmark (i.e. 85% of the 1994 population abundance) in 5 years, consistent with it being identified as a population level to be avoided. Catches giving a 90% probability of being above the minimum benchmark were considered appropriate.

Estimates of the catch levels that would deliver on these performance measures for mature biomass (MB) are:

Region	Prob[ $MB_{2012} > MB_{1994}$ ]		Prob[ $MB_{2012} > 0.85MB_{1994}$ ]	
	80% prob	75% prob	95% prob	90% prob
2	0	0	0	0
3 and 4	approx 6	10	30	46
5 and 6	approx 27	39	54	74
Total catch	33	49	84	120

As previously, the catch is limited by maintaining the mature biomass at the target, rather than avoiding the limit. The relevant column is italicised in the table above. On the basis of these predictions:

- For Region 2, there is no catch above zero that would achieve any of these performance measures.
- For Regions 3 and 4, a catch of 10t would result in a 75% probability of rebuilding to the 1994 level of mature biomass, and a catch of 46t would give a 90% chance of rebuilding to at least 0.85 of the 1994 level.
- For Regions 4 and 5, a catch of 39t would result in a 75% probability of rebuilding to the 1994 level of mature biomass, and a catch of 74t would give a 90% chance of rebuilding to at least 0.85 of the 1994 level.

A requirement of a 75% probability of rebuilding to the 1994 level corresponds to a 10t catch from Regions 3 and 4 and a 39t catch from Regions 5 and 6 (i.e. a total catch of 49t).

The number of young abalone growing into the mature and legal stock in the next 5 years (from 2008) is predicted to be low. Under the assumption of autocorrelation the peaks in estimated recruitment to Regions 3 and 4 and 5 and 6 in 2003/04 are expected to be followed by troughs, and correspondingly the recently increasing commercial catch rates are expected to peak and then decrease in the next few years. The absolute level of recruitment is estimated to have been low in Regions 3 and 4 for the last several years, so that even though an increase is estimated to have occurred in the last 2 years the absolute levels of predicted recruitment is not large. And low recruitments have been estimated for Regions 5 and 6 in the last 2 years which are predicted to continue for several more years. The estimated increase in recruitment in Region 2 is from a very low base, and unless it develops into a major peak in the next few years, it is not capable of rebuilding the stock there in the next 5 years even in the absence of fishing. These patterns in recruitment are mainly driven by the commercial catch rate data, accentuated in the case of Regions 3 and 4 by the trends in small abalone in the independent survey and in the case of Region 2 by the trends in all size classes of abalone in the independent survey.

### 5.3 Biological data and assumptions

There are no new biological data used in consideration of the state of the stocks this year. The biological data and assumptions used in the 2008 stock assessment model and forward predictions are as described in last year's report.

The regions continue to be examined separately, because the populations there have different catch histories, different recruitment/productivity histories and have different levels of depletion due to fishing. It is recognised that the regions provide a coarse representation of the spatial dynamics of the resource and fishery. Abalone populations are known to show differences in growth, mortality and recruitment at local spatial scales, such as for individual reefs and areas within reefs. The fishery targets and operates at reef and sub-reef scales. But in the NSW fishery, there are insufficient data available to allow assessment and management at this more biologically relevant spatial scale. The coarser scale data and analyses are limited in their ability to fully represent the population and fishery, and in particular analysis and management at this aggregated spatial scale is vulnerable to problems of sequential fishery targeting and depletion that is operating at finer space scales. Accommodating these local biological and fishery differences is one of the motivations for moving to more appropriate (finer) scale management and data collection.

#### 5.3.1 Illegal, unreported and recreational fishing catches

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

Since July 2005, there has been a reduction in the permitted recreational bag limit from 10 to 2 abalone per day, combined with an 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 5-15t, with 10t being accepted here.

As 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 the compliance officers and industry are that the illegal catch probably was about 100t in the past, and that it is likely to be below 100t but above 50t per year currently. In the present circumstances of stock condition, it was concluded that the historical assumptions should continue to be applied (i.e. 102t). However the issue should be reviewed and recommendations should be provided about:

- (i) the most appropriate base-case illegal catch history;
- (ii) some plausible alternatives to this catch history as necessary; and
- (iii) appropriate methods to account for illegal catches in projections of future population status.

#### 5.3.2 Data from fishery operations

The primary data from fishery operations are the size composition of individuals in the catch, location of the catch, weight of the catch and the fishing effort.

Prior to 1993 occasional samples of the catch were taken to determine the length composition of abalone in the catch. Between 1993 and 1999, the length composition of the catch was obtained through a fishery independent catch-sampling program. Since 1999, the size composition of the catch has been measured from fishery records of the total weight and number of abalone in every bin caught – from

which the average weight per abalone in each bin is calculated. The frequency distribution of the average weight of abalone per bin is used to calculate the mean length of the abalone in the catch. In the one year in which the 1993-99 and post-1999 measures were compared, there were differences between them. The causes of these differences, the indirect estimation of length composition of the catch from weight, and the aggregated sampling by bins all provide sources of additional uncertainty in interpretation of the length composition of the catch. In particular, the lack of length measurements makes the direct comparison of predicted and actual size composition of the catch difficult, which both complicates and limits what would otherwise be a direct and powerful test of the model's accuracy. This year the reconstructed length composition of the catch was not calculated because the stock assessment model was not fitted. The weight in catches was estimated this year using the same methods as in previous years.

The catch and catch per unit effort (CPUE) by region and year is given in Figure 10. The catch rate is the 'raw' unstandardised catch rate; total catch divided by total effort.

The catch and effort information from Regions 3-6 came from commercial fishing, as in previous years. The full time series for Regions 3-6 is reflective of commercial fishing and so is directly comparable in that sense. The catch and effort information from Region 1 since 2003 come from a highly localised fishing, surveys or structured fishing, and these data are not directly comparable to the earlier part of the time series. Similarly, the catch and effort information from Region 2 since 2007 are not directly comparable to the earlier part of the time series. No detailed calibration, comparison or interpretation of the different information sources for Regions 1 and 2 are available.

As noted previously, the commercial catch rates in each of the Regions 3, 4, 5 and 6 show substantial and relative rapid fluctuations within a period of about 7 years, which appear to be growing in amplitude since about 1990. These fluctuations are interpreted as being due to a combination of variation in recruitment, variation in the number of abalone that grow across the minimum size limit and enter the fishable population each year, and the availability of legal sized abalone to buffer the 'down-phase' of these variations. The increase in fluctuations since 1990, including the increasingly steep decreases and increasingly lower catch rates in the 'down-phase', are interpreted as being due to increased reliance each year on catching abalone that have grown through the size limit that year. A very large fraction of the commercial catch each year (probably about 70%) is made up of abalone that grow across the minimum size limit and enter the fishable population in that year, and this fraction is interpreted to have been increasing since the 1990s. The result is that the stock provides a reduced ability to buffer the catch rates from relatively minor variation in recruitment, growth or emergence behaviour. This interpretation implies that there were relatively strong year-classes recruiting to the fishable population in about 1988/89, 1995/96 and 2001/02, and that a further pulse began entering the fishable population in 2006/07.

It is significant that in Region 2, the 1995/96 and 2001/02 pulses were very much weaker than those seen in the more southern regions in those years, and were weaker than that seen in Region 2 in 1988/89. This is interpreted to be due to a decrease in average recruitment to Region 2 since about 1995, including a decrease in the strength of recruitment in the 'pulse years'.

Each of Regions 3-6 show a steep decline in catch rate during the 4 year period 2001-2005, with 2005 providing a new low-point in the time series of each region. This is interpreted as reflecting the low abundance of abalone as the 2001/02 pulse of stronger recruitment passed out of the fishery.

Each of Regions 3-6 show a rapid increase in catch rate during the 2 year period 2005-2007, followed by catch rates in 2008 that were broadly similar to those in 2007 and catch rates in the first 3 months of 2009 that were similar to or higher than those in 2007 and 2008. The catch rates in Regions 4, 5 and 6 remain below the reference level (85% of the catch rate in 1994), as they have been since 2003, but the catch rate in Region 3 has rebuilt to above this reference level. The increased catch rate since 2005 is interpreted as reflecting entry of the most recent pulse of stronger recruitment into the fishable population.

A key issue, as raised in previous years, is the strength of this most recent recruitment pulse and its ability to rebuild the stock and catch rates. Interpreting the strength of this recruitment pulse from catch rates is complicated by the increased minimum legal size of abalone from 115mm to 117mm in July 2008, which would be expected to result in a transient decrease in the catch rate followed by an increase. To examine the effect of the size limit change on catch rates the monthly catch rates and short term trends were examined (Figure 11). The response to the increased size limit in all regions except Region 6, is for an about 10% decrease in the catch rate for 3-6months, followed by an increase in the catch rate to at least the level prior to the increase. This is a very fast transition, indicating that the abalone at this size are growing quickly and that they grow through the increased minimum legal size within half of the fishing season. This also indicates that there are likely to be significant 'per recruit' benefits from this increase at the aggregate level of the fishery and Regions. The anomalous response is in Region 6 where the catch rate decreased in a manner similar to the other regions after the increase in the size limit, but then did not increase as strongly as in the other regions. After the increase in size limit the catch rate in Region 6 decreased for about 3 months, and in the following 5 months there were some months with catch rates similar to the pre-increase period and some months with catch rates similar to the immediately post-increase period. Abalone in Region 6 are thought to be relatively fast growing and so a short transition period after the increase in size limit is expected. The most parsimonious interpretation at this time is that for some reason the catch rates for some months in the last 5 months of the time series were somewhat reduced, but that the transient effects of the size limit increase on catch rate passed within 3-6 months as for the other Regions.

Using this interpretation of the transient effects of the minimum legal size increase, the monthly catch rates (Figure 11) were used to test whether the increasing catch rates seen between 2005-2007 were continuing in Regions 3-6, or whether there was evidence of them slowing or reaching a plateau which would indicate that the recruitment pulse passing through the fishery was at or near its peak. The trend (gradient) of monthly catch rate during 2005-2007 was visually compared to the trend during 2007-2009, excluding the months of transient effects after the size limit increase and all of the low catch rate months in Region 6 after the size limit increase.

The results of these comparisons were:

<b>Region</b>	<b>Comparison of trend (gradient) of CPUE between 2005/07 and 20/09</b>
3	2007-09 Gradient much lower than 2005-07 gradient; 2007-09 plateaued
4	2007-09 Gradient slightly lower than 2005-07 gradient; both gradients relatively low; 2007-09 still increasing slowly
5	2007-09 Gradient much lower than 2005-07 gradient; 2007-09 still increasing slowly or plateaued
6	2007-09 Gradient lower than 2005-07 gradient; 2007-09 still increasing slowly or plateaued

This is interpreted as indicating that the most recent pulse of elevated recruitment passing through the fishery is at or near its peak, and that in Regions 4, 5 and 6 this is at catch rates that are much lower than seen during previous pulses. In these regions the most recent pulse of recruitment is interpreted to be weaker than previous pulses. In Region 3, the pulse appears to be at its peak and at catch rates similar to those seen at previous peaks. In this region, the most recent recruitment pulse is interpreted to be of similar strength to previous pulses.

Several factors in the fishery are all expected to result in increased catch rate and increased abundance of abalone recruiting to the fishable population at present:

- entry into the fishery of a pulse of stronger recruitment in about 2005, after the significant decline in abundance following fishing of the previous pulse;
- greatly reduced Total Allowable Catch since 2005 (from 206t in 2004/5 to 105t in 2008/9) which would be expected to increase the survival of the recruits that entered the fishery, increase abalone abundance in the fishable population and hence to increase catch rate; and
- increase in the minimum size limit from 115mm to 117mm in July 2008 which, after a transient decrease in catch rate, is expected in this fishery to give an increase in the abundance and average weight in the fishable population as a result of making greater fishery use of the sub-legal sized abalone already recruited to the population.

So there are several reasons to expect short term improvement in the catch rates and the abundance of abalone 'on the bottom', and these are reflected in current data and reports from industry. However despite these factors, the catch rate in all of the fished regions since 2007 has slowed its increase or plateaued, and in most of the fished regions (i.e. 4, 5 and 6) this is at catch rates well below previous peaks.

Overall the catch rate data support the interpretation that recruitment overfishing is occurring in most of the regions open to commercial fishing – that is decreasing average recruitment with lower peaks and deeper troughs through the sequence of recruitment pulses. This is the pattern predicted from modelling provided to the Committee last year (see Section 5.2). The recent trends in the commercial catch rate increases the credibility of those model predictions.

There may seem to be a contradiction between short term improvements in the number of abalone 'on the bottom' and the interpretation that recruitment overfishing is occurring. This is explainable by the factors above that are expected to increase current catch rates and the number of small abalone entering the fishable population, while at the same time, the increases are mostly not to the levels previously seen during recruitment pulses and are predicted not to be sufficient to rebuild the mature biomass under current catch and size limit settings.

## 5.4 Conclusion

The 2mm increase in the minimum legal size is widely reported by industry and scientists to have improved the size and number of abalone in the population, and to have improved catch rates. The very rapid response of the population to this increase indicates that overall the abalone are growing rapidly at the current minimum legal size and that there are likely to be 'per recruit' benefits from further increases in the minimum legal size. A larger minimum legal size also is expected to reduce risk to the stock arising from limited ability to monitor and assess the status of the stock.

A preliminary analysis of structured fishing and survey information from the southern part of Region 1 in 2007 was provided to the Committee last year (2008) but this was not further analysed or interpreted. Structured fishing was conducted late in 2008 in both the northern and southern parts of Region 1 but the data are not yet available. From the general description provided of the design of the 2008 structured fishing, it appears to be very similar to that in the previous year (2007), except that there was greater use of data loggers for recording information in the field and there were no scientific observers/divers to record the length of abalone in the catch or information about sub-legal sized abalone.

From the preliminary analysis of the 2007 information:

- i) the design of the structured fishing program did not appear able to provide interpretable information about sub-legal sized abalone, but this is necessary to provide a leading indicator of recruitment; and
- ii) it is highly desirable to calibrate the past Fishery Independent Surveys with whatever new monitoring approach is used - this does not appear to be incorporated in the current design of structured fishing.

Both of these issues need to be addressed if information from structured fishing is to provide an efficient and reliable basis for monitoring, assessment and management of the resource.

The northern part of Region 1 is closed to commercial fishing until there is sufficient information available from survey or structured fishing to allow assessment of an appropriate commercial catch limit; there is no indication that the abalone populations are depleted. As previously, a **5t catch limit** is incorporated into the TACC for a survey or structured fishing program in northern Region 1 that is agreed by the Department and responds to previous requests for information to inform the setting of a TACC.

The southern portion of Region 1 (Port Stephens to Jervis Bay), was closed to commercial fishing when the Fishery Independent Survey found the abalone to have suffered severe depletion from *Perkinsus* infection. Small catches have been allowed through survey or structured fishing to monitor the population and determine the degree of recovery. Preliminary analysis in 2008 of structured fishing information from 2007 showed that:

- i) only about 36% of historically productive sites were still as productive;
- ii) 70-80% of historically productive sites have catch rates that are still lower than those recorded 13 years or 20 years ago; and
- iii) that quantification of the sub-legal sized abalone was not possible from the data available.

More thorough analysis of the 2007 structured fishing data has not been provided, and there has been no analysis of the 2008 structured fishing data. No further allocation of catch is made for structured fishing in the southern portion of Region 1.

It is recommended that the existing data are analysed and used to assess the status of the stock, examine the adequacy of the resource to sustain commercial fishing and (as appropriate) to develop improved monitoring methods.

The stock assessment model and predictions from 2008 have not been updated with the most recent information on catch, catch rate and the size of abalone in the catch, and the predictions incorporate a 115mm size limit rather than the 117mm size limit now in place. Nonetheless, they provide the most recent quantitative assessments available and are used as the basis for assessment here, augmented by consideration of the data that were available from commercial fishery operations in 2008 and part of 2009. These data relate to Regions 3-6.

The assessment model and predictions from 2008 indicated that significant recruitment overfishing has occurred in Region 2. Region 2 was closed to commercial fishing but a catch allocation was made to allow structured fishing so as to further assess and monitor the stock. The information from structured fishing has not yet been analysed, but from general description of the methodology, it may suffer from the same problems described in the preliminary analysis of the 2007 data from southern Region 1. No further allocation of catch is made for structured fishing in Region 2. It is recommended that the existing data are analysed and used to assess the status of the stock, examine the adequacy of the resource to sustain commercial fishing and (as appropriate) to develop improved monitoring methods.

The assessment model and predictions from 2008 provide for Regions 3-6 some evidence of recruitment overfishing, and predict that the pulse of recruitment currently entering the fishery is likely to be weaker than previous pulses. They predict that if the pulse is weaker than previous pulses, then a very low catch is necessary to maintain the mature biomass above the 1994 benchmarks (i.e. 10t from Regions 3 and 4 and 39t from Regions 5 and 6 for a total catch of 49t), and that the 1994 benchmark is likely to be inadequate to fully protect the stock against recruitment overfishing. The data from the commercial fishery shows that the recent increases in catch rate as the recruitment pulse passes into the fishery have now slowed for all Regions. In Regions 3, 5 and 6 the catch rates appear to be at or near a plateau, while in Region 4 the increase in catch rate is very slow. Only in Region 3 has the catch rate reached levels comparable with the peak of previous recruitment pulses. This is interpreted as supporting the assessment model predictions that the current recruitment pulse is weaker than previous pulses, and is further evidence that recruitment overfishing is occurring in these regions.

The information base for decision making is considerably weaker than that available in previous years, but the information provided indicates that recent improvements in stock condition are likely to be short-term and provide an outlook of deteriorating recruitment and stock condition. On balance, the Committee decided not to reduce the Total Allowable Catch to the full extent suggested by the 2008 model predictions because:

- i. the catch rates have slowed their rate of increase or stabilised but they have not yet decreased and they may stabilise at their current level (indicating a more protracted recruitment pulse than previous pulses);
- ii. the Total Allowable Catch has already been decreased significantly and should be providing some protection;
- iii. about 10-15t of the 105t Total Allowable Catch in 2008/09 is likely not to be taken because of market conditions;
- iv. the increases in the minimum legal size to 117mm last year, and to 119mm next year, should provide additional protection for recruits and part of the mature biomass; and

- v. there is opportunity for further analysis and interpretation of the stock situation during 2009/10.

On balance the Committee decided that the commercial catch taken from each area should not exceed:

Region 1 North	5t available for surveys or structured fishing to a design acceptable to the Department
Region 1 South	0t
Region 2	0t
Regions 3 and 4	25t
Regions 5 and 6	45t
<b>Total TACC 75t, with all catches to a minimum legal length of 119mm</b>	

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

Specifically, the Committee **recommends** the new information and analyses needed are:

#### **Region 1 North**

- Analyse the existing structured fishing data from 2008/9 to assess the status of the stocks, the areas and size of commercial stocks, the relative abundance of sub-legal abalone, and the appropriate size limit for commercial fishing.
- Identify the information required and the design of future surveys or structured fishing to provide ongoing information to support management of the fishery. This should include data access and sharing between the industry and department. The limitations identified in the preliminary analysis of structured fishing data from 2007/08, and any limitations that emerge from analysis of the 2008/09 data, should be addressed.

#### **Region 1 South**

- Complete the preliminary analysis of the 2007/08 structured fishing and survey data and analyse the 2008/09 structured fishing data. This should address the extent of stock depletion (including prior to the *Perkinsus* infection), the relative abundance of sub-legal abalone, and calibration between any new monitoring method and the Fishery Independent Surveys.

#### **Region 2**

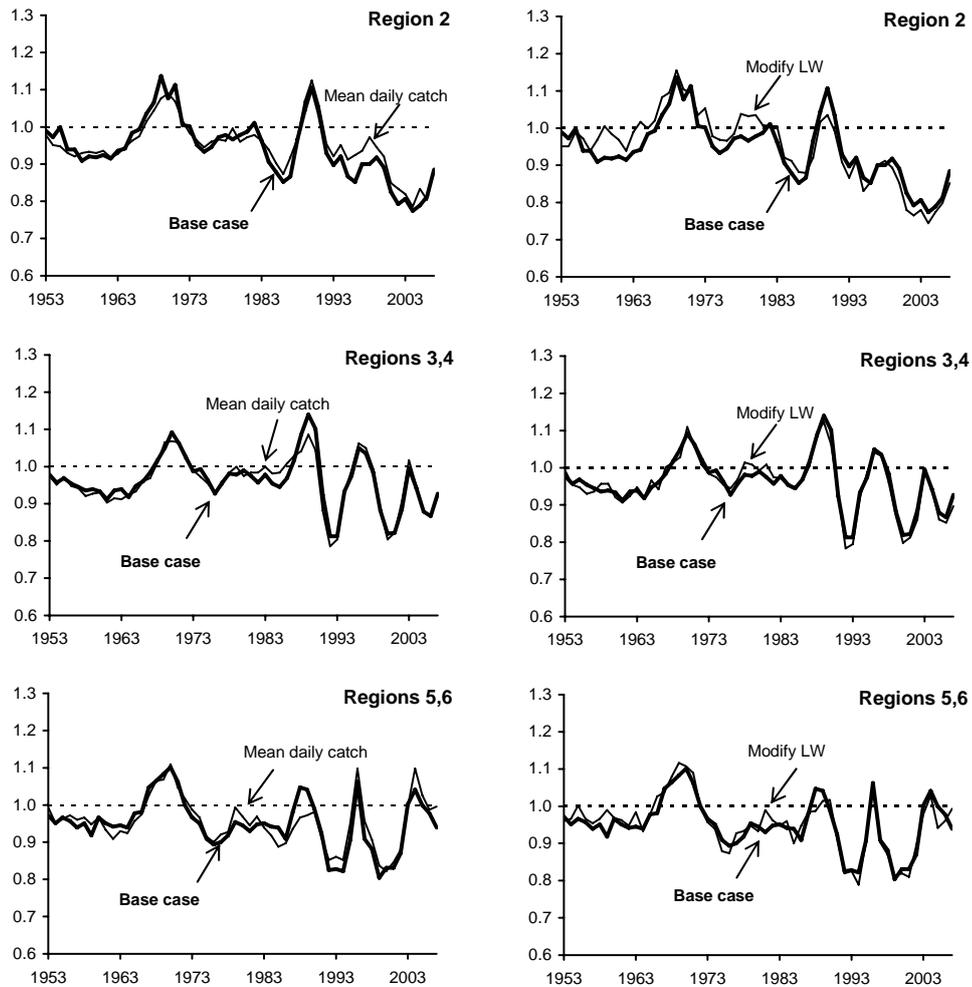
- Analyse the 2008/09 structured fishing data. This should address the extent of stock depletion, the relative abundance of sub-legal abalone, and calibration between any new monitoring method, the Fishery Independent Surveys and historical commercial CPUE.

#### **Regions 3-6**

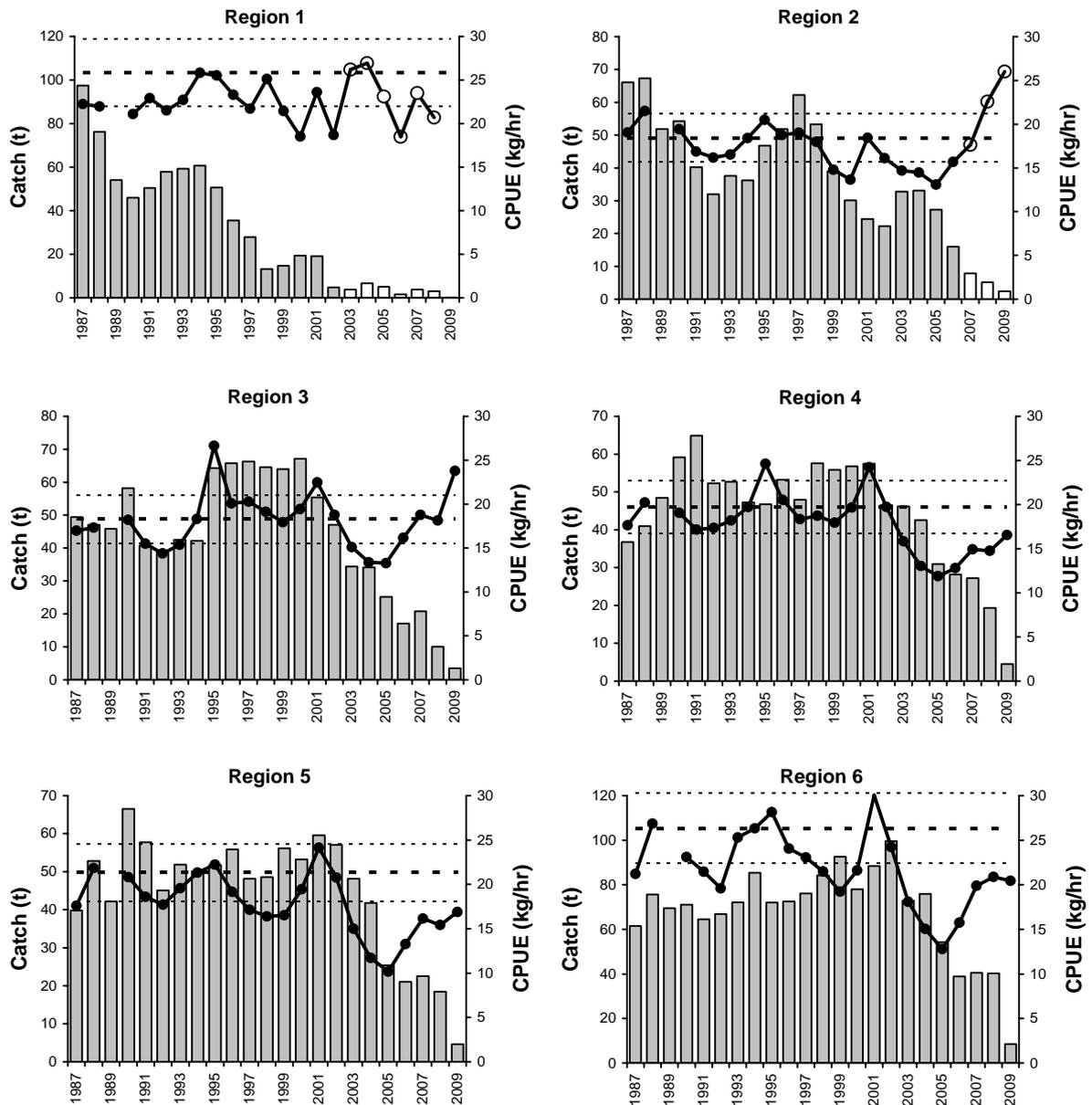
- Update the stock assessment model and stock predictions using the new minimum legal lengths and the additional data on commercial catch rates and the size composition of the abalone in the catch. If the commercial CPUE and structured fishing CPUE can be calibrated for Region 2, then the assessment model and predictions should also be updated for Region 2.
- Provide 'per recruit' tables, on a regional basis, if that is necessary to reflect course spatial differences in population parameters. These should provide yield per recruit, egg production per recruit and mean individual weight in the catch per recruit.

Given the overall state of the stock, and the desire for continued commercial fishing, it is imperative that there is a robust and reliable means to monitor, assess and predict the state of the stock. This should include leading indicators that are based on the abundance of sub-legal abalone, which will bring considerable advantages to management and industry from improved planning horizons. The information and analysis available for this year's assessment by the Committee is not adequate to support reliable decision making in an ITQ fishery, and understanding of the status of the stock will rapidly deteriorate if this situation persists. The Committee has previously recommended against dismantling the established methods of monitoring and assessment before any new method is fully developed and calibrated against the previous methods. The Committee repeats that recommendation. In the event of further deterioration in the ability to monitor and assess the stock, highly precautionary and low-cost management measures will be necessary, such as a large size limit, a smaller TACC and large closed areas spread throughout the fishery.

**Figure 9** The pattern of recruitment estimated from the fitted model 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 10.** 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  $\pm 15\%$ . 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 surveys or structured fishing. Data for 2009 represents 3 months, January – March, only.



**Figure 11.** Mean monthly CPUE (kg/hr, relative to 1994) for each region of the fishery since 1998. Vertical dashed line indicates the increase in minimum legal length from 115 to 117 mm in July 2008. Bold horizontal lines show mean CPUE (kg/hr) during the 6m periods between January 2006 and December 2008 and the 3m period between January and March 2009.

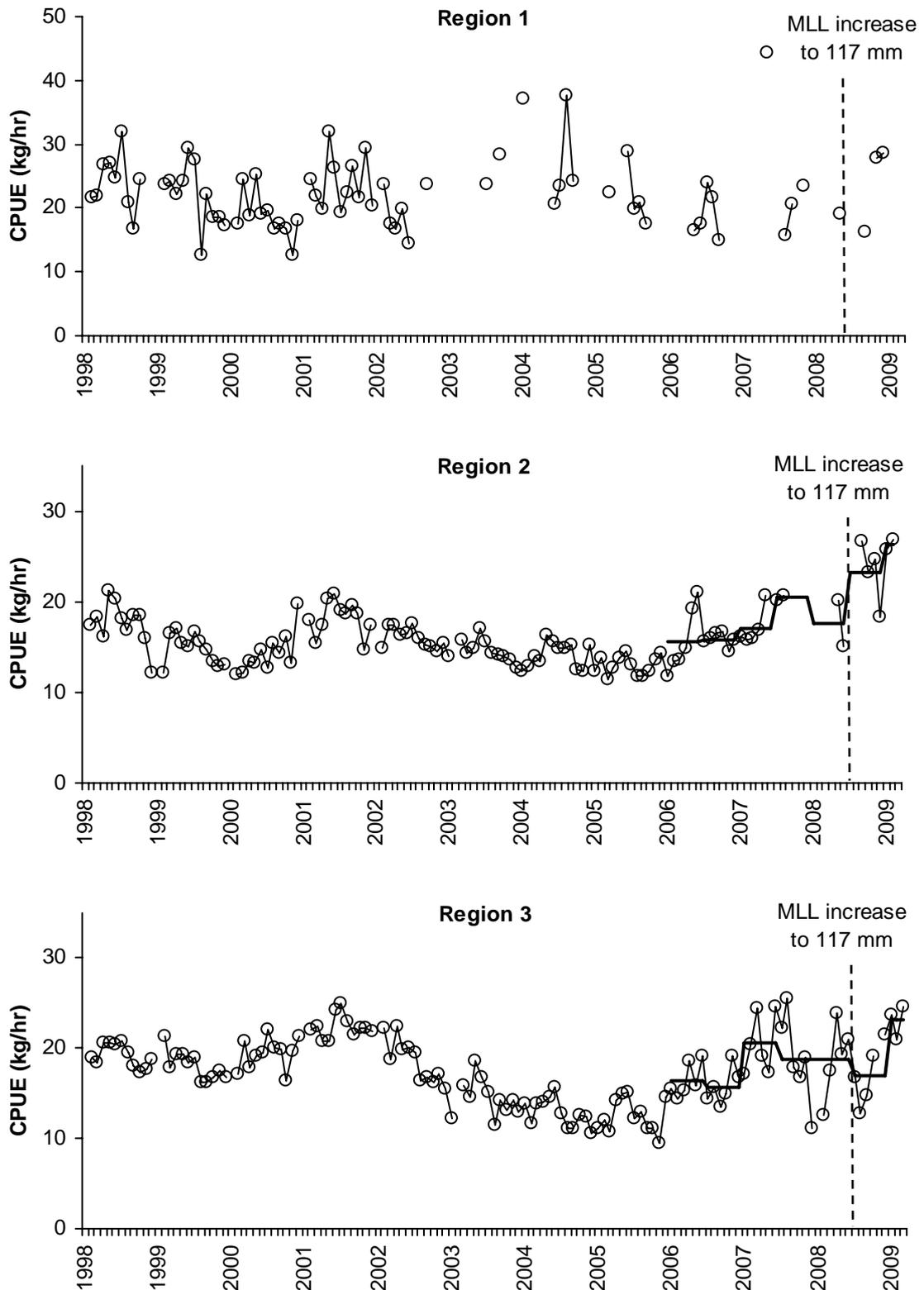
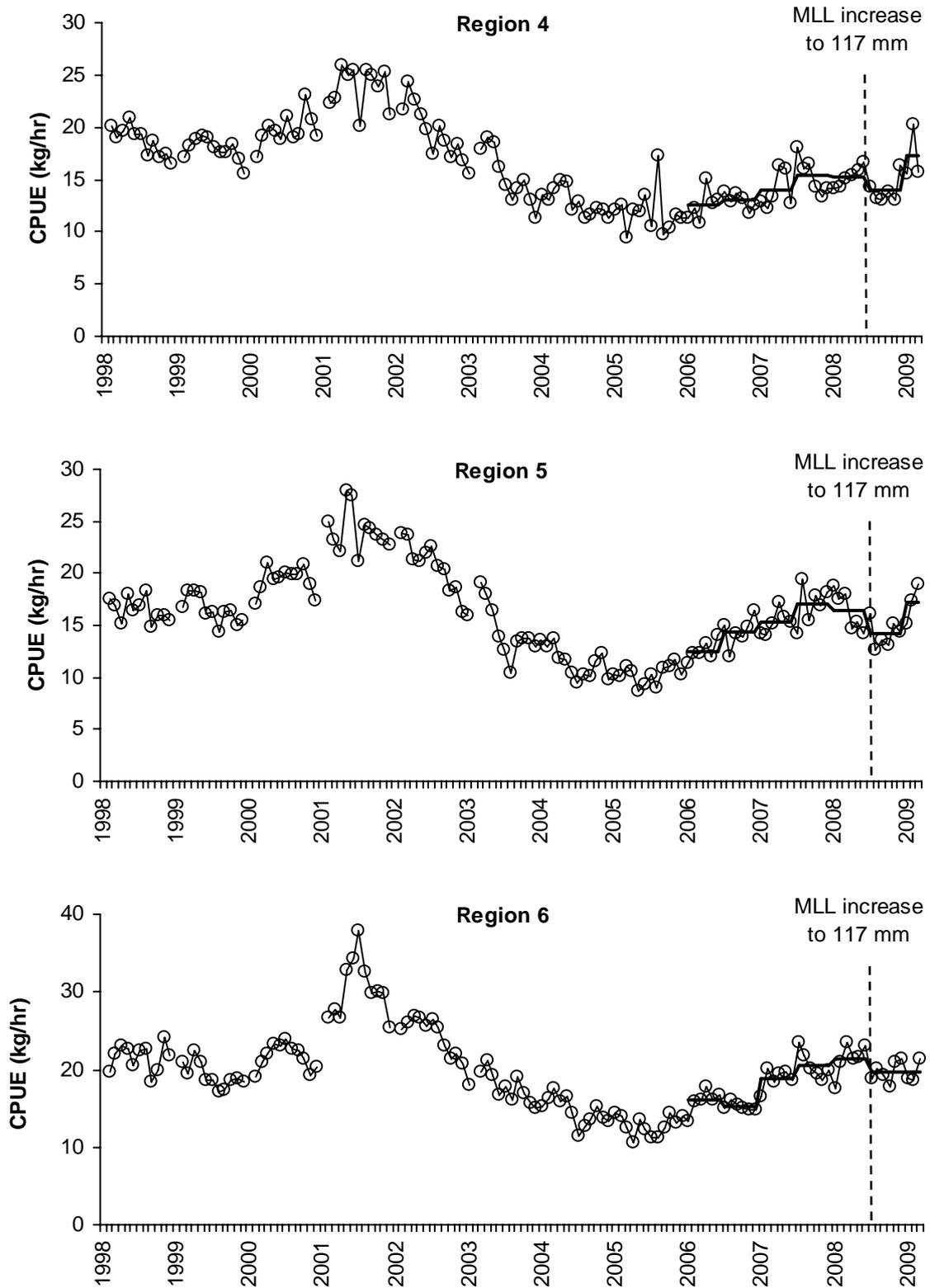


Figure 11 continued



## 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 2009 to 30 June 2010 should be **75 tonnes**. In making this determination, the Committee strongly recommends that:

- a catch of **5 tonnes** be made available for surveys or structured fishing to a design acceptable to the Department from Region 1 north of Port Stephens;
- none is taken from Region 1 south of Port Stephens;
- none is taken from Region 2;
- the catch from Regions 3 and 4 be not more than **25 tonnes**; and
- the catch from Regions 5 and 6 be not more than **45 tonnes**.

The Committee recommends an increase of 2mm in the minimum size, from 117 to 119mm.



Ian Cartwright  
Chairperson



Keith Sainsbury  
fisheries scientist



Steve McCormack  
fisheries management



Warren Musgrave  
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
4.2.09	Section 31(1)	TAC Committee called for public submissions on the appropriate level of the annual TACC for Abalone.
4.2.09	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"> <li>■ All NSW Abalone Shareholders</li> <li>■ All Members of the Abalone Management Advisory Committee</li> <li>■ NSW Regional Industry Convenor</li> <li>■ NSW Fishermen's Co-operatives</li> <li>■ Nature Conservation Council NSW</li> </ul>
28.3.09	Section 284 (1b)	The TAC Committee allowed a period of 55 days for public consultation.
9.4.09	Section 31 (2)	<p>TAC Committee gave regard to eight submissions. The respondents included the following:</p> <ul style="list-style-type: none"> <li>■ NSW DPI – Commercial Fisheries Management, Research, Compliance and Industry Analysis</li> <li>■ Abalone Shareholders</li> <li>■ Members Abalone Management Advisory Committee</li> </ul>
4.5.09		<p>The Submissions were collated and analysed, and the TAC Committee heard formal presentations regarding their views and opinions at the meeting held 4.5.09. The following made presentations to the Committee:</p> <ul style="list-style-type: none"> <li>■ Dr Geoff Liggins – Manager Scientific Services</li> <li>■ Nick Schroder –Investigator, Statewide Operations and Investigations Group</li> <li>■ Cameron Westaway – Senior Fisheries Manager</li> <li>■ Duncan Worthington – Industry representative</li> <li>■ John Smythe – Shareholder</li> </ul>

**Appendix 2. Summary of submissions and the issues<sup>2</sup>**

Submission provided by <sup>3</sup>	Issue(s)/Recommendations
Bob Lewis	Has seen some improvements on recent years, sees potential to increase biomass, especially with a larger size limit.
NSW Department of Primary Industries	Research, compliance and management updates.
George Chung* (late submission presented to TAC Committee at Public Forum)	Marketing issues relating to loss of Japanese, Chinese and Taiwanese markets for smaller abalone and falling prices (suggested \$25.00 by year end). Remarks on severity of crisis facing NSW abalone industry and some possible 'factors' to improve the situation, namely: increased TACC, restoration of 115mm minimum size in as many areas as possible, reduced management charges, government funding to develop new markets and value-adding and collaboration between NSW DPI, shareholders, divers and processors to find a way forwards. Suggests the economic issues facing the industry be given higher priority.
NSW Department of Primary Industries	Additional catch data to 25.5.09

<sup>2</sup> 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.

<sup>3</sup> This report is provided to the Minister as background to the Determination. The Committee is aware that after submission, this report is also circulated to industry and other stakeholders. Submissions made by fishers who explicitly requested that their responses remain confidential have been deleted.

## Comments on Recommendations made in the 2008 Abalone TAC Committee Report

## Appendix 3

Committee Recommendation	Assessed Progress/Feedback from DPI	Comment
<p><i>The Committee <b>recommends</b> 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 2009 TACC Open Forum and meetings (including locations), the delivery of associated supporting documentation; and for delivery of the TAC Committee Report and Determination.</i></p>	<p><b>Some progress.</b> A meeting timetable was agreed to by the TAC Committee and DPI.</p> <p>Reports were available to the Committee 10 working days before the first TACC meeting.</p> <p>The date of delivery of assessment/reports provided some difficulties for the abalone industry, which again indicated that insufficient time was available to consult with stakeholders and prepare a submission within the due date.</p>	<p>It would be useful if available data and an initial stock assessment report is available in sufficient time for industry to liaise with DPI to discuss concerns and provide input, preferably at the MAC or some other suitable industry forum, prior to the TAC meeting.</p>
<p><i>The Committee <b>recommends</b> that further efforts are made to achieve the structural adjustment necessary to help restore viability to the fishery. As the current share management framework does not provide for the allocation of a dive entitlement and is based on adjustment through the current statutory right of shares, industry and government are urged to work together using the available tools to promote efficiency and sustainability into the future.</i></p>	<p><b>Limited progress.</b> Some regulatory amendments are being progressed to 'facilitate adjustment and investment...'. These include changing the minimum numbers of shares that can be traded and removing the current maximum shareholding. The fishing business card is also considered to have assisted adjustment within fishing seasons.</p> <p>Fewer divers are in the water, indicating that some operational rationalisation is occurring, however, the market for shares is non-existent.</p>	<p>Economic factors, including low catch rates and high operating/management costs, have forced amalgamation of operations, and created some efficiencies. However, the number of shareholdings in the fishery, and the size of the quota holdings under each holding has not changed. There is a negative longer term implication for the fishery in terms of latent effort, particularly if and when the resource recovers. It is noted that a range of regulatory amendments are now being progressed to facilitate adjustment and investment in the fishery – these changes have been in the pipeline for some time now.</p>

<p><i>The Committee <b>recommends</b> that efforts to develop finer spatial scale management be pursued as a priority, as discussed in the SARG Report.</i></p>	<p><b>Little progress</b> The Department has expressed support for approaches that focus on developing and applying catch and size limits tailored to regional or local conditions. Region 1(S) and planned R1 (N) and R2 surveys have not assisted in developing methodologies to the extent hoped. DPI have expressed concern that lack of cohesiveness between industry and relatively small size will restrict FSM approaches.</p>	<p>There remains a disappointing lack of progress in this area. The hope that realistic FSM approaches would be agreed up front and pursued has not been realised, with industry claiming that the fault lies with the Department, while the Department has been unable to engage industry in meaningful discussion, obtain access to the SARG report, and faces inadequate funding and minimal stock assessment advice. Initial attempts to agree a rigorous structural fishing framework to obtain the data necessary to inform stock assessment appear to have been left unfinished as staff have been withdrawn due to redeployment and lack of funding. There is some doubt that current industry efforts at data collection will be adequate to inform the sustainable management of the fishery</p>
<p><i>The Committee <b>recommends</b> that it should be a pre-requisite for the issue a permit to fish in Regions 1 and 2 that all catch and location details are recorded on data loggers and that this information is conveyed directly to the Department for processing and analysis.</i></p>	<p><b>Some progress.</b> Understood that some (all?) data from structured fishing in Regions 1 and 2 are being recorded on loggers. Understood that data collection and storage is being handled by industry.</p>	<p>The conditions under which data from Regions 1 and 2 are to be collected remains unclear with little or no input/ oversight by DPI and uncertain QA/QC protocols. This is a matter of some concern to the TAC Committee. The analysis of data is to be carried out by industry; the TACC is yet to see any evidence of such analysis.</p>
<p><i>The Committee <b>recommends</b> that the relevant legislation is urgently amended so that penalties for stealing abalone are strengthened to bring them into line with other states, particularly in light of the potential for illegal catches to undermine efforts by legitimate operators to rebuild a viable industry. This should include the classification of abalone stealing as an indictable offence, as has been recommended by industry and this Committee for some years.</i></p>	<p><b>Some progress.</b> The TAC Committee have been advised that there are some timing issues with respect to the Bill that will deal with the indictable offenses issue. However, the Minister has advised that the Bill will be introduced into Parliament at the first available opportunity.</p>	<p>The Committee hopes that one of the few elements in this fishery with which everybody agrees would be a significant contribution to improved management (compliance) outcomes will now be introduced.</p>

<p>The Committee <b>recommends</b> that an overall management package (including science, compliance and FSM) that has costs appropriate to the scale of the fishery be developed and implemented as a priority, and that the IPART pricing principles as they relate to NSW commercial fisheries be reviewed.</p>	<p><b>Some progress (in reducing costs).</b> Costs of research have been drastically reduced by virtually halting stock assessment processes and discontinuing the fisheries independent surveys. SARG report recommendations concerning options for moving the fishery towards an alternative, FSM-based management package have not been released.</p>	<p>The action to effectively halt research was not the 'package' envisaged by the TAC Committee.</p>
<p>The Committee notes that meetings have been held with AbMAC, and <b>recommends</b> 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 stock assessment, management and economics, prior to the TAC Committee deliberations.</p>	<p><b>No progress.</b> The MAC has not met in the last 12 months and a meeting scheduled for April 2, 2009 was cancelled. In withdrawing support for the meeting, industry stated that: "we find it very disappointing to find so little progress, or intent to progress, on the issues we, and others including the Minister's SARG, have repeatedly raised with DPI, and that we have been led to believe would be addressed. We find the agenda papers unacceptable in not addressing the specifics we have raised, and the confrontational approach of DPI comments, and as a result, we believe we have little option but to request the meeting be cancelled."</p>	<p>It is understood that the MAC continues to focus on past issues and concerns, and has yet to function at a level where it can discuss forward looking, strategic issues and develop an effective dialogue with the DPI. The degree to which the MAC, or some other representative body, will be able to provide good industry input and negotiate compromises will directly influence the management and recovery of the fishery.</p>
<p>The Committee <b>recommends</b> that the Department and industry make greater efforts to provide the economic advice needed to equip the Committee to provide the advice on the economic situation of the industry expected of it.</p>	<p><b>No progress.</b></p>	<p>Unlike most other fisheries jurisdictions, DPI is of the view that industry should fund economic assessments. Industry has suggested in the past that it would be possible for the development of an agreed set of costs for operators in the industry, and the monitoring of quota trading and other economic performance indicators. The Committee supports this initiative. While the Committee understands the competing calls on funding, and the constraints imposed by the economic significance of the fishery, the resulting inability to address adequately its statutory requirement to advise on the economic and social status of the industry remains of great concern.</p>

<p>The Committee <b>recommends</b> that the Department and Industry work together to develop more detailed information on the structure and operation of the quota market.</p>	<p><b>No progress.</b></p>	<p>See above.</p>
<p>The Committee, in seeking to give meaningful and useful advice to the Minister, <b>recommends</b> 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.</p>	<p><b>No progress.</b> There has been no explicit response to this recommendation, following discussions held with officers of the Industry Analysis Branch of the Department in 2008.</p>	<p>See above.</p>
<p>The Committee <b>recommends</b> that the DPI reconsider its current position with respect to contributing to research on the economic status of the abalone fishery, and consider some form of cost sharing arrangement with industry</p>	<p><b>No progress</b></p>	<p>See above.</p>
<p>The Committee <b>recommends</b> that the management action trigger proposed in the approved FMS<sup>4</sup> be reviewed, and that the Management Plan use a more precautionary trigger based on achieving the MSY and protecting against recruitment overfishing. A more appropriate trigger may be the level of mature biomass in the mid 1980s.</p>	<p><b>No progress.</b></p>	<p>This is a very important issue strategically, as it is the fundamental basis of managing the fishery to a sustainable outcome. It also directly affects the administrative and scientific activities in relation to assessments, rebuilding strategies and performance reporting. Currently the possible inadequacy of the reference points are being addressed by ad hoc and expert judgements within the TAC setting process, but this is not a desirable approach. Transparency and objectivity would be better served by review of the reference point.</p>

---

<sup>4</sup> i.e. management action is to be triggered when the biomass of mature or legal size abalone a) falls below the 1994 benchmark by more than 15% or b) there is a >50% chance of a) occurring in the next 5 years if the TACC is unchanged)

<p><i>The Committee <b>recommends</b> that a study be undertaken to compare the structural adjustment under share management of the rock lobster and abalone fisheries.</i></p>	<p><b>Limited progress</b> Some brief feedback on this recommendation received. The comments received gave the impression that the point of the recommendation had not been fully comprehended. The purpose of the recommended study would be to compare and contrast the experiences of the two industries with ITQs and to make some suggestions, based on the evidence, for the differences in adjustment performances between them. Such a study, if well done would provide the author with material at least for an article in a learned journal.</p>	
<p><i>The Committee <b>recommends</b> that a full retrospective analysis be completed to examine any bias in the current assessment methodology in estimating stock status and predicting the catch that would lead to achieving the intended stock targets.</i></p>	<p><b>Some progress</b> Some analysis was provided in 2008. That analysis was limited but adequate to address the immediate questions in relation to use of the unstandardised catch rate, especially in combination with other analysis provided for different approaches to standardisation.</p> <p>There has been no further progress to 2009.</p>	
<p><i>The Committee <b>recommends</b> that new technologies and industry based monitoring, on appropriate space scales, be explored and developed as a priority. The Committee also <b>recommends</b> that data loggers be used throughout the Region 1 and 2 surveys/structured fishing as a pilot study. The Committee further <b>recommends</b> that the Region 1 and 2 surveys measure the abundance of undersize abalone and the length composition of the catch.</i></p>	<p><b>Some progress</b> Data loggers are apparently in use, and have been recording data for some time. The TAC Committee is yet to view analysis of this data.</p>	<p>It is of great concern that the structured fishing ‘agreement’ between DPI and Industry has yet to be finalised. The Scientist undertaking this work has now moved and the Committee is concerned that there is a large gap between industry expectations and that of DPI and the Committee in terms of the scientific methodology for undertaking structured fishing, and the QA/QC aspects of data collection, storage and analysis. If, as stated in the DPI management report, <i>the abalone industry will be responsible for taking a lead role in the future research for the fishery</i> clarification of such matters is essential.</p>

<p><i>The Committee <b>recommends</b> that the use of structured fishing to monitor the abalone population be continued and improved.</i></p>	<p><b>Some progress.</b> Structured fishing has occurred in Region 1(N), Region 1(S) and Region 2 in 2007, 2008, 2009. This has not yet been used to derive an index of abalone abundance.</p>	<p>See above</p>
<p><i>The Committee <b>recommends</b> that the results of the 2007 and 2008 structured fishing operations be fully analysed and available for next year's assessment.</i></p>	<p><b>No progress.</b> The TAC Committee was not presented with any additional analysis from the 2007 and 2008 structured fishing operations.</p>	<p>Industry has been assigned this role; the Committee advises DPI and industry to take the comments of the Committee into account when setting up structured fishing, and the subsequent data collection, storage and analysis.</p>

<i>The Committee <b>recommends</b> that the following research activities be undertaken to improve the stock assessment:</i>		
<i>Continue the fishery independent surveys using the recent survey coverage and design. The Committee explicitly recommends against diminution of the independent surveys until a credible alternative is demonstrated.</i>	<b>No progress, and recommendation specifically acted against.</b> The advice of the Committee was disregarded and the FIS discontinued. A credible alternative is yet to be demonstrated.	
<i>Review the recreational catch and illegal/unreported catch and provide (i) the most appropriate base-case catch history, (ii) some plausible alternatives to this catch history as necessary and (iii) appropriate methods to account for illegal catches in projections of future population status.</i>	<b>No progress</b>	
<i>Re-examine the adequacy of the growth model in the assessment model.</i>	<b>No progress</b>	
<i>Sample the length composition of the catch for the forthcoming fishing year, and test the accuracy of the length composition of the catch that is predicted by the population assessment model.</i>	<b>No progress</b>	
<i>In future stock assessments, calculate and report the fraction of the catch in each year that has grown across the size limit and recruited to the fishable population in that year. These estimates should be provided for each historical year that the stock assessment model represents and for the future predictions.</i>	<b>No progress.</b>	This remains a potentially powerful way to track an issue of serious concern in the status of the fishery and to test the accuracy of the model. The model-based estimates are of value in themselves for tracking. But the utility would be greatly enhanced if there were direct measurements from the fishery of the same quantity. The lack of direct measurement of the length frequency of the catch is a major limitation to this.

<p><i>Apply a 'retrospective analysis' using the present assessment and projection models to determine any systematic bias between the predicted and realized outcomes of stock condition. This should examine whether past predictions would have been less biased if the assessment model was calibrated to the raw commercial catch rate rather than the Historical Standardisation.</i></p>	<p><b>Some progress.</b> Some partial retrospective analyses were provided in 2008 to examine some specific elements of the stock assessment and prediction methodology.</p> <p>No further analyses provided in 2009.</p>	<p>The retrospective analyses that have been provided have been useful in relation to the elements examined. But there has not been a full retrospective analysis to examine the overall accuracy of the assessments and predictions of the current methodology had it been applied consistently through the past to the data and catches from each successive year. This is a critical test of whether all of the main sources of bias in the methodology have been identified and corrected, and if not the likely scale and direction of bias that remains.</p>
<p><i>Develop an approach to using small commercial catches and fine-scale data recording to give scientifically valid measures the status of the resources in Regions 1 and 2.</i></p>	<p><b>No progress.</b></p>	
<p><i>Develop and apply methods to incorporate the effects of MPAs in the fishery, including (i) the consequences of the reduced area of fishery access on sustainable catches and (ii) accounting for the accumulating biomass in the closed areas in stock assessments and projections.</i></p>	<p><b>No progress</b></p>	

Other recommendations relating to the stock assessment		
<p>Continue the fishery independent surveys using the recent survey coverage and design. This should be supported by a re-examination of the way that past changes in the coverage and design were incorporated into the survey indices of abundance, and development of new methods of incorporation, as necessary, to ensure that no bias has been introduced.</p>	<p><b>Partially completed.</b> The analysis provided in 2008 indicates that there has been no large or systematic bias introduced into the independent surveys through the past changes in the number (i.e. adding and subtracting sites) and location of survey sites.</p> <p>The surveys were discontinued in 2008/09.</p>	<p>The analysis of the effects of past change in the FIS provided a very useful result that increases confidence in the consistency of the independent surveys through time. Confidence in this consistency is critical for use of the survey data as a relative index of abundance in the population modelling and assessment. This analysis cannot of course address the question of the representativeness of the sites, but under many assumptions about stock dynamics the survey data would provide a valid relative index of abundance even if the sites were not representative but were consistent through time.</p> <p>The independent surveys should continue until an adequate replacement is developed and demonstrated. The 2007 structured fishing design did not deliver an adequate alternative to the independent survey.</p>

<p>Monitor change in the recreational catch and illegal/unreported catch.</p>	<p><b>Limited progress.</b> There continues to be improved effort into compliance and with that some improvement in the qualitative judgements about the level and trends in recreational and illegal/unreported catch. But there are no quantitative estimates.</p>	<p>This remains a significant issue, especially because there are quite large allowances made in the stock assessment for recreational and illegal/unreported catches. In the absence of quantitative estimates the issues are presently being addressed by ad hoc and expert judgements within the TAC setting process, but this is not a desirable approach. Transparency and objectivity would be better served by more direct monitoring.</p> <p>This recommendation has been extended in this year's report to include reconsideration of the past pattern of recreational and illegal/unreported catch, specifically to provide a most likely history and a small number of plausible alternatives that could be used for sensitivity analysis.</p>
---	--	---