

# **TAC Committee**

## **Total Allowable Catch Committee**

### **Report and Determination for 2015/16**

#### **ROCK LOBSTER FISHERY**

20 July 2015

## Summary

### ***State of the stocks***

Management decisions in the past several years have been aimed at stock rebuilding. There is now clear measurable evidence that significant rebuilding of the spawning biomass has been achieved since about 2000. There is now little chance that the spawning biomass is depleted below 25% of the unfished level, and the median estimate from the most credible assessment is 39% depletion.

Rebuilding of the spawning stock is predicted to continue at a moderate rate under recent catch levels, but there are several reasons to expect that the model is slightly pessimistic. The recent pattern of increased recruitment is greater than what is included in the population model and the stock predictions assume no further increase in recruitment above that seen in 2011/12. In contrast the current expectation is that average recruitment will continue to increase as the spawning stock increases, up to some presently unknown limit that is higher than that in 2011/12. The patterns of settlement and recruitment will fundamentally drive the outcomes and options for future stock rebuilding and the fishery.

Data from the fishery shows that catch rates have increased during the 12 years 2000/01 to 2012/13 and have fluctuated at about the 2012 level since. However, it is not clear whether the increased catch rates since about 2010 reflect increases in the exploitable biomass, increases in capture efficiency or both. Additional work on standardisation to look at the rates of increase of 'raw' and standardised catch rates has been recommended. (The standardised catch rates, which take account of the gross effects of shifts in recent years from shallow (less than 30m depth) to deeper pot sets, are considered to be more realistic. The method of standardisation is approximate and is unlikely to capture the detailed effects of the significant depth and gear changes occurring in the fishery.)

There has been considerable uncertainty about the level of recreational and unreported catch. The Committee this year has again applied the approach adopted in 2013/14, using lower estimates of unreported catch and non commercial catch. While there was agreement that the recreational catch had decreased in recent years there was also a common view that it could increase again in future because continued stock recovery may attract additional recreational fishing effort. It is again recommended that a means be developed to more accurately measure the amount of recreational catch and to track trends. There are a variety of mechanisms that could be considered for closer measurement and management of the recreational catch including a register of those fishers expressing an intention to take rock lobster, or additional endorsements on the existing recreational licence.

Puerulus settlement and recruitment have both increased on average during the past about 10 years as the spawning stock has increased. Puerulus settlement in the past 2 years, an indicator of recruitment to the fishery in the next 1-2 years, is about average for the levels seen in the last 10 years, but somewhat lower than the levels that gave rise to the lobsters that recruited to the fishery in the past 2-3 years.

The stock has now recovered to the extent that current depletion is approaching the depletion range where common fishery targets (e.g. maximum sustainable yield and maximum economic yield) are expected to be for species such as this. The need to identify the desired target state for this fishery is becoming more urgent, and further consideration of the upper size limit should be an element of this. A key challenge in coming years will be to achieve this target without catches 'overshooting' the desired sustainable level, which would have negative impacts on the stock and require subsequent catch reductions.

This challenge of not 'overshooting' is complicated because the depletion giving maximum sustainable yield or maximum economic yield will only be known accurately when the recruitment can be seen to plateau as spawning biomass continues to increase, and there is a several year delay in when the recruitment from each level of spawning biomass can be observed. Determining and achieving such targets in this fishery will by necessity be empirical and adaptive. This carries with it the risk that catches could be increased above the target level before that level is recognised. As the target is approached the spawning stock is expected to continue to rebuild and the exploitable biomass is expected to be maintained at levels similar to those seen recently - such positive signs could encourage excessive catch increases before the resulting recruitment from those spawning stock levels is understood. It is for this reason that the Committee supports relatively small catch increases as the target is approached, so that during the delay until the effects on recruitment can be determined any 'overshoot' of the target catches will be small and not seriously damaging to the stock or disruptive to the industry.

The fishery data, scientific survey data and stock assessment provide reasonably consistent evidence in support of these interpretations. Consistency between the model and the catch rates has been improved by some standardisation of the catch rate data, revision of the unreported catches and incorporating an ad hoc means of representing the observed increases in recruitment. The Increased Recent Recruitment (IRR) scenario improves the consistency between the model and catch rate data. However this is still not fully correcting the situation, and there is a large discrepancy between the model and fishery catch rates in the last three years (i.e. 2011/12 to 2013/14). If not addressed this discrepancy will undermine confidence in future assessments and projections. Further improvements to both the standardisation and treatment of recruitment should be developed and implemented.

### ***Economic issues***

While the lack of information on the net return from lobster fishing means that only tentative conclusions about the economic status of the industry are possible, the evidence available to the Committee suggests that the lobster industry in NSW is economically viable. Both quota and share prices have increased in recent years indicating a perception by industry that the future outlook for the fishery is positive. The increase in viability is a result of a number of factors including increases in stock abundance and catch per unit effort, the latter believed to have been influenced partly by an improvement in the efficiency and practices of lobster fishers.

The Committee has made a number of recommendations that are aimed at providing improvements in the economic viability of the lobster fishery in the future including that: Industry and the Department continue to explore new marketing initiatives for NSW rock lobster, in particular exploring the potential for an expanding export market for lobster to Vietnam to take stock from NSW; lobster fishers make further efforts to report price information for quota transfers; and Industry and the Department set up a joint working group to develop an approach to undertaking economic analysis in the NSW Lobster Fishery.

Given that industry is still cautious about the need for economic data to be collected, the Committee is of the opinion that a more formal process for discussion of approaches to undertaking economic analysis is needed. The Committee has provided a number of possible approaches that could be taken, however it is still of the view, as outlined in a number of previous determinations, that the best approach to economic analysis is to estimate net returns using data from a survey of costs and earnings of NSW lobster fishing businesses.

There has been significant restructuring in the lobster fishery with fewer fishers landing a higher proportion of the catch. This structural change is desirable in order

to allow for the most efficient fishers to land the majority of the catch, and to ensure the continued viability of lobster fishing businesses.

The Committee is pleased that industry continues to be entrepreneurial in their approach to improving productivity and cutting costs. However, it notes that the heterogeneous nature of the fishery means that these productivity gains and cost cutting measures are not uniform across the fishery. As such the Committee recommends that further investigation of the structure of fishing businesses be undertaken so that both the Department and the Committee can better understand the impact of its decisions on the economic well-being of industry.

The Committee notes that there is a premium paid for larger sized Eastern Rock Lobster on the Sydney Fish Market. The Committee believes that it is worth investigating the factors behind this premium, as well as undertaking analysis of the relationship between length and economic yield.

The Committee is pleased that efforts are being made to collect better recreational and Aboriginal cultural catch data. However, more is needed and, as such, the Committee recommends that the Department continue to invest resources in obtaining more robust time-series estimates of recreational catch

As optimism in the fishery continues to improve the Committee would suggest that fishers remain cautious about overinvestment, and to take into account of the potential impact of future events such as changes in recruitment, market demand or future management arrangements (e.g. increases in cost recovery).

The Committee's determination for an increased TAC in 2015/16 strikes a balance between i) allowing for additional catch based on evidence that significant rebuilding of the spawning biomass has been achieved and ii) using a conservative approach to exploring the biological (and economic) potential of the fishery.

### ***Management issues***

Concerns that have been expressed in the past about the capacity of the commercial sector to take all of the allocated TACC are now largely redundant, with annual landings above 95% of the TACC for the past nine years and projected to reach similar levels in 2014/15.

Considerable rationalisation has occurred in the fishery. Over the past ten years, the total number of shareholders in the fishery has contracted, since 2000 (174 down to 99 in 2014/15) drastically. There has a general trend of share reallocation from small (<55) to large (>100) shareholdings. It is also now apparent that an increasing proportion of the total catch is being taken by this smaller group of operators who fish predominately for lobsters. Preliminary data for the current season indicates that 15 fishers have landed 50% of the catch and 30 fishers have landed 75%. This consolidation is consistent with the management objectives for the fishery. the process of restructuring the fishery is proceeding at a steady rate and with the introduction of web-based trading, further efficiencies should be recognised

Commercial fishers have made comments consistently that recreational fishers appear to be increasing their rock lobster catches in NSW, with the potential to erode intended gains to the commercial sector. Estimating recreational participation rate and catch has been problematic in the past and there is no quantitative evidence to support the varied views on these issues. The 2013-14 survey, which used a similar methodology to the 2000-01 survey, provides an estimate of any changes in the recreational fishery that may have occurred since that time. Since there is no specific information concerning which recreational fishers target rock lobsters, the report that survey (which has yet to be finalised) will, however, be of limited value for this fishery.

Aboriginal cultural fishing has been formally recognised under the *Fisheries Management Act 1994*, the relevant elements of which will provide regulation-making powers that allow limits (including bag and possession limits) and/or other management options to be applied to the special cultural fishing provisions. In 2014/15 only two cultural permits were sought and issued. Fisheries Officers report that the actual take under these permits is less than permitted.

For 2013/14 compliance rates for the fishery were again above the trigger point contained in the management plan, with the overall compliance rate for the fishery being 74%. However, when broken down into commercial and recreational compliance, the rates for 2013/14 differ significantly. The commercial compliance rate is 58% (down by 4% on previous period) and the recreational compliance rate is 91% (up 3% from previous period). Figures so far for 2014/15 period suggest that there will continue to be differences between the two sectors although the commercial compliance rate is expected to increase for 2014/15 once the fishing year is over and complete figures are available.

Data on the number of hours dedicated to rock lobster compliance indicate increasing levels of targeting. In particular there was a spike in 2013/14, which reflected the focus on a small number of high-end offences. This reinforces the relationship between targeted, intelligence-led compliance effort and detection rate – which appears in the outcomes as a decreased compliance rate but actually reflects positively on the compliance regime in the fishery rather than a dramatic shift in behaviour by the fishery. The figures support the conclusion that the majority of the licenced fishery continue to be compliant with regulations and are committed to the rebuilding and strengthening of the lobster stock.

As discussed above, expert judgement is that unreported retained catch has reduced from the 17% previously estimated and has reduced over time to around 8-10% of the reported commercial catch. The model inputs have been structured to reflect this unreported commercial catch.

All five coastal NSW marine parks include sanctuary zones over reef area likely to provide habitat for rock lobsters. These Sanctuary zones make up less than 7% of state waters. Given the small percentage of these zones in depths preferred by adult rock lobsters (generally 10 to 150m), and the migratory nature of rock lobsters, it is unlikely that existing sanctuary zones have a significant influence for the stock assessment and TACC setting process.

The Fisheries Management Strategy (FMS) specifies objectives, performance indicators and trigger points that provide a framework to measure the performance of the fishery against the objectives. No triggers were activated for 2013/14 and the biomass is currently well above the limit reference point of 25% of pre-exploitation levels. As the fishery continues to biologically improve and move away from its trigger limits, industry and government again acknowledged the need to develop targets that maximise the economic yield from the fishery and that the fishery is now at a point where a lack of target reference points materially impacts TACC-setting. The Committee again recommends that the Department and industry work to develop to collect economic data and develop a harvest strategy. The latter should include target reference points relating to maximising economic yield, to provide guidance on TACC decisions in relation to stock rebuilding. Industry now appears to be ready to engage in discussions on these issues and contribute to determining economic/biological targets for the fishery.

The contribution of management charges to total costs has contracted as a share of GVP from the fishery (from around 15% to 5%). The Committee continues to support a transparent system of cost recovery where services received by industry against management and other charges are fully justified and delivered efficiently. In

considering 'management', the totality of fees applying to the fishery should be considered and thought be given to developing an overall, risk-based, management package (including science and compliance) that has costs appropriate to the scale of the fishery.

Industry consultation and cooperation with the Department and the Committee continues to be working very effectively. The Committee is pleased to note that the Lobster Industry Working Group met the day before the public forum, and hopes this body will continue to engage effectively as it has so far. This group will be particularly important as a new management plan and harvest strategy are developed that will enable the fishery to reach full potential. Industry generally continue to support a precautionary approach to the TACC and express a desire to maintain a consistent catch and return that is available from a more stable, robust stock. This year, industry was for the first time vocal in their view on the status of the rebuild of the fishery and that this should be reflected in an increase in TAC of at least 10%. As summarised below, the Committee was able to determine an increase reflecting its view that caution is still necessary while it is uncertain as to the future potential for the fishery.

### **Total Allowable Commercial Catch for 2015/16**

The Committee was presented with a detailed Resource Assessment, based on the available fishery-dependant catch and effort information as well as data from the Fishery-Independent Survey. The assessment presents empirical measures of stock performance as well as model outputs.

Management and compliance reports were also provided and industry views were presented.

A detailed analysis of the Resource Assessment is set out in the stock status section of this report, including recommendations for improving the precision of the stock assessment going forward (particularly relating to recruitment and to catch rate standardisation).

Nevertheless, from a management perspective, the key factors are:

- the spawning biomass is estimated to be significantly above the limit reference point of 25% of pre-exploitation levels and there are high levels of confidence around this estimate;
- all measures of recruitment (peurulus settlement, catch rate of undersize and FIS catch and catch rate of undersize) indicate continuing healthy recruitment to the fishery (noting that the increasing trend has slowed);
- there is unanimous agreement that the estimates for recreational and unreported catch can safely be regarded as 'low' and that the 'low' option has therefore been used as input to the model; and
- there are reasonable levels of consistency between the fishery data, scientific survey and model-based indicators for the fishery.

**On this basis, the Committee supports an increase in the TACC by 10t to 160t for the 2015/16 quota year.**

In making this determination, the Committee is taking into account the positive stock assessment but cautious about the unknowns in relation to the stock, its limits and at what stage of rebuilding is at (discussed at length in the stock status section). The Committee is also very cautious about over-capitalisation in the fishery, which typically occurs at this point in a fishery's development. The Committee is therefore mindful to cautiously and incrementally increase the TACC and encourages fishers, individually and collectively, to also take a measured approach to developing the fishery.



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**TOTAL ALLOWABLE CATCH COMMITTEE  
ROCK LOBSTER FISHERY  
REPORT AND DETERMINATION FOR 2015/16**

## **1. INTRODUCTION**

The Total Allowable Catch Review and Setting Committee (the Committee) is established by Section 26 of the *Fisheries Management Act 1994*. In 2015 it consisted of:

- Mr Ian Cartwright – Chairman
- Dr Keith Sainsbury – fisheries science
- Dr Jessica Hartman – natural resources economics
- Ms Kelly Crosthwaite – fisheries management

The Committee is required to determine the Total Allowable Commercial Catch (TACC) for the commercial sector of the rock lobster 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 regards to:

- all relevant scientific, industry, community, social and economic factors;
- the need to ensure that the rock lobster 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 that the NSW Department Primary Industries (the Department) and industry provide views on the recommendations made by the Committee and their associated logic. This has created a dialogue on a range of issues directly related to the TACC in a whole-of-fisheries context, and enables the Committee to have a better understanding of the views of both the Department and industry. In this respect, the comments on the Committee recommendations contained in the management report this year were again particularly helpful. As stated above, however, the Committee can only make a determination on the Total Allowable Commercial Catch and the degree to which its suggestions and recommendations are accepted is a matter entirely for the Department.

To meet its statutory obligations, the Committee must consider the full extent of rock lobster exploitation. Total removals from the stocks of rock lobster are made up of:

- the quota allocated to commercial fishers;

- the legal catch of non-commercial fishers (recreational and Aboriginal) (the sum of catches taken by individuals within 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 legal and illegal components of the non-commercial fishery are currently estimated as a single figure, and the unreported commercial catches are estimated as a percentage of the actual commercial catch.

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 the 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. The rationale and measures suggested by the Committee concerning the maintenance of an adequate spawning biomass in the north of the fishery is an example of the application of the precautionary principle

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 commercial catch under the requirements of Section 31 Division 4 of the *Fisheries Management Act* 1994. Lobster 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.

In 2015 the Committee interviewed, obtained feedback from the TAC Forum and received written reports from:

- NSW Department Primary Industries, Fisheries Research;
- NSW Department Primary Industries, Commercial Fisheries Management;
- NSW Department Primary Industries, Fisheries Compliance; and
- participants in the commercial rock lobster fishery

Submissions to the Committee were provided in an open forum, with 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. This year, no requests were received to provide submissions in camera.

### **2.2 Matters considered**

Before reaching its determination the Committee considered:

- the documentation available on the fishery and the submissions it received;

- the management objectives set out in the draft management plan;
- the current state of the fishery;
- advice on the status of management of the fishery provided by the Department;
- advice on the economic status of the fishery as assessed by the Department and by industry representatives;
- the stock assessment for rock lobster provided by the Department;
- the spatial nature of the fishery, particularly in relation to the spawning biomass;
- comments and commentary provided at the TACC Open Forum; 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:

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

The Determination of the Committee for the annual TACC for rock lobster for the 2014/15 season is provided at the end of the report.

### **3. STATE OF THE STOCKS**

#### **3.1 Introduction**

In making its determination of a TACC for rock lobster, the Committee is required to consider the current and predicted status of the stock. This section considers the major features of a range of data from fishery operations and fishery independent surveys and monitoring, and estimates of illegal unreported and recreational catches. The population assessment undertaken by DPI using a length-based model is reviewed. Finally, a number of conclusions concerning spawning stock rebuilding are drawn and a TACC for 2014/15 is recommended.

#### **3.2 Data**

##### **3.2.1 Illegal, unreported and recreational catches**

There is considerable uncertainty about the level of non-commercial (primarily recreational) catch and unreported commercial catch.

In previous years the assessments and population projections assumed:

- A 25.8t recreational catch. This was based on estimates from studies and surveys several years ago. Reports from Compliance Operations Branch consistently indicate that the recreational catch has decreased since about 1994/5.
- An unreported commercial catch of 17% of the total commercial catch was assumed to allow for unreported retained catch from the lobster fishery, unreported lobster catch in the trawl and trap fisheries targeting finfish, mortality due to ghost fishing by lost fishing gear, and predation or other mortality of commercially caught lobsters during fishing operations. Reports

from the Compliance Operations Branch and the fishing operators consistently indicate that the unreported catch has considerably decreased since about 1994/5. The decrease is due to a combination of increased targeting of compliance operations, the improved economic circumstances of the fishery and active measures to reduce ghost fishing.

These estimates and judgements were discussed at length in the 2013 assessment and each year since. In the 2013 assessment and subsequently two scenarios were included, one being the previous estimates as above and the other having lower unreported commercial catch and non-commercial catch (UCNC) after 1994/5. The lower UCNC scenario assumes that:

- the recreational catch is 10% of the reported commercial catch each year since 1994/5 (i.e. recreational catches that range from 10-16t); and
- the unreported commercial catch linearly decreased from 17% of the reported commercial catch in 1994/5 to 8.5% of the reported commercial catch in 2010/11, and has been constant at 8.5% since 2010/11 (i.e. non-reported commercial catches that range from 12-19t in recent years, and is 12.75t for a TACC of 150t).

Based on the reports from DPI Fisheries Compliance in recent years the lower UCNC scenario was considered to be the more credible of the two. This was discussed again in the context of the current assessment. During 2014/15 DPI Fisheries Compliance found that recreational compliance was similar to previous recent years, with no reports of major illegal catch. They also found no major compliance breaches among the commercial operators, and specifically there has been no repetition of the large illegal catches by three operators that caused concern in 2013/14. DPI Fisheries Compliance judge that there have been no major changes in the level of UCNC catch in recent years and that the lower UCNC scenario remains reasonable. So this year's assessment was based on the lower UCNC catch scenario only.

Uncertainty in the estimates of recreational catch remains a point of concern, and while the recreational catch has decreased in recent years there is a common view that it could increase again if continued stock recovery attracts greater recreational fishing effort. It is highly desirable that a means be developed to more accurately measure the amount of recreational catch and to track trends. One approach that is used in some other jurisdictions, and that should be considered for NSW, is to require registration of an interest in lobster harvest when applying for a recreational fishing permit. This would provide information to allow surveys to be targeted on those people potentially in the recreational lobster fishery, which would greatly increase the efficiency, accuracy and precision of recreational catch estimates. There are a variety of other mechanisms that could also be considered for closer measurement and management of the recreational catch.

### **3.2.2 Data from fishery operations**

As in previous years two different time-series of data are available from the fishery.

The first series covers the period 1884-1958. The data from the fishery in this period is limited to catch and fishing effort and the data sources are poorly understood, fragmentary and often coarse. These data provide a valuable historical perspective for the fishery and assessment, but they are open to many interpretations. From previous examination of old reports and records it was concluded that the catches were probably reasonably accurate but that fishing effort was unreliable.

The second series of data covers the period 1969 to the present. The data for this period are better understood, are more detailed and monitor more than just catch

and fishing effort. In particular, voluntary logbooks since 1994 record the size of lobsters and the breeding condition of females, and a standardised observer program since 1998 has independently measured the size composition of lobsters caught.

Historically commercial catch rates were not formally standardised for changes in details such as the gear, area, depth or time of fishing operations; unstandardised catch rates are calculated as the total catch divided by the total effort in the area/time of interest. In the last few years catch rates are reported both in the unstandardised form and with a simple standardisation to account for the gross effects of recent shifts in fishing effort from shallow (less than 30m) to deeper pot sets. The deeper sets use much larger pots and longer soak-times, and have greater catch per pot-lift, than shallow sets. The shallow sets tend to be on resident lobsters growing to a size at which they migrate to the spawning areas while the deep sets tend to be on aggregated and migrating lobsters. The standardised catch rates are considered to be a more realistic reflection of lobster abundance than the unstandardised catch rates, and so they are used to calibrate the population assessment model.

The estimated total catches for the selected UCNC catch scenario are shown in Figure 3.1. The total catch, effort and catch rates since 1969/70 are shown in Figure 3.2. The detailed catch, effort and catch rate by area and depth since 1997/8 are shown in Figure 3.3. These figures provide data from the most recent complete catching year (2013/14) and a preliminary estimate of the catch rate in the current incomplete catching year (2014/15). The incomplete 2014/15 data account for almost all of the available TACC (139t of the 150t). The remaining fishing period includes the season when high catch rates are traditionally obtained from depths greater than 30m on the mid-north coast (see Figure 3.3) and so the annual catch and aggregate catch rate for 2014/15 are expected to be slightly higher than the incomplete figures indicate.

Both unstandardised and standardised catch rates (Figure 3.2) show similar trends, though as expected the absolute values are smaller for the standardised catch rate. Catch rates have increased during the 12 years 2000/01 to 2012/13, and have fluctuated at about the 2012 level since. The catch rate rapidly increased in the two years 2010-11 to 2012-13, and this is considered to be related to concentration of fishing in deep water. There continues to be increased concentration of the fishery in deep water.

The population model has predicted either a stabilisation (from the enhanced recruitment scenario) or decrease (from the base case) of the exploitable biomass following the increases in TAC since 2007/08. The standardised catch rate is consistent with stabilisation of the exploitable biomass from 2007/8 to about 2011/12, followed by a significant increase. Standardisation of the catch rate is intended to account for changes in the operation of the fishery. However the method of standardisation is approximate and is unlikely to capture the detailed effects of the significant depth and gear changes occurring in the fishery, so it not clear whether the increased catch rates since about 2010 reflect increases in the exploitable biomass, increases in capture efficiency or both.

The stable or increasing catch rate in the last few years is widespread across depths where significant fishing effort has been expended (Fig 3.3). Some very high catch rates have been recorded in the 10-30m depth areas in the far-north coast in the last 3-4 years. This is particularly encouraging as it implies an expansion of the breeding stock back into this area after many years of depletion. The catch rates in deep water (>30m) on the central and north coast remain high. These are maturing lobsters from southern regions recruiting to the spawning stock.

Overall the catch and catch rate data support interpretations that the stock is broadly increasing in recent years, having increased significantly from the low levels of 2000-2002. Inshore catch rates of small lobsters show an overall increasing trend, with fluctuations that are at least partly in response to patterns of puerulus settlement, and deeper catch rates of maturing lobsters indicating substantial numbers are reaching the size/age at which they join the spawning stock.

Comparison of the unstandardised catch rate (i.e. the catch rate experienced by fishers) and the standardised catch rate (i.e. the index of exploitable stock abundance intended to correct for changes in fishery operations) indicate both that there are significant effects of improved fishing efficiency since about 2005/6 and that the standardisation is not capturing these improvements since about 2010/11. Initially the standardised catch rate increased more slowly than the unstandardized catch rate, as expected if the standardisation was accounting for some of the increases in operational efficiency as intended. However in these 2011/12 and 2012/13 the standardised catch rate increased more rapidly than the unstandardised catch rate, and the 2013/14 showed a relatively large decrease. This all suggests that the current standardisation methodology is not achieving the aim of standardisation and this methodology should be redeveloped.

### 3.2.3 Fishery reference points

While target and limit reference points have not been formally agreed for the fishery the TACC has operated with implicit target and limit reference points for several years. These are:

**Target reference point.** A depletion to 0.5 of the unfished biomass has been used for reporting. Performance against this reference point has been reported for both total biomass and spawning biomass. Because the stock has been well below 0.5 of the unfished biomass since the Share Management arrangements were introduced this reference point has not been highly relevant operationally. But as the stock is recovered an appropriate target reference point should be considered and selected. This is now becoming a more urgent and relevant need. Based on the most credible stock assessment the current spawning stock depletion is approximately 0.39, and this is approaching the depletion levels for common fishery targets (eg Maximum Sustainable Yield and Maximum Economic Yield). For species with medium levels of 'steepness' in the stock recruitment relationship the stock depletion giving these targets is often in the range 0.4-0.5. Questions about the appropriate target reference point (e.g. MSY, MEY or some other level regarded as optimal) and how best to reach and stabilise at the chosen target are now influencing TAC decisions. Clarification and guidance on the appropriate target reference point is now needed.

While there remains uncertainty there is growing evidence that this lobster species does not have a high 'steepness' in its stock-recruitment relationship, as had been assumed previously. Rather it has medium or low 'steepness'. This is evidenced by the continued increase, on average, of puerulus settlement and the number of lobsters recruiting to the fishery as the spawning biomass rebuilt well above 0.1 depletion – the depletion at which recruitment is expected to plateau under the previous 'high steepness' assumption. The implication of this is that this species has medium-low steepness, and consequently recruitment is expected to increase with spawning biomass to a relatively high threshold of spawning biomass. So far this increase has been observed up to the current depletion of 0.39 and it could continue to increase further as the spawning stock increases, though an asymptote is expected. Knowledge of this 'steepness', and the related location of the asymptote beyond which further increase in the spawning biomass does not result in increased average recruitment, is relevant to setting the target reference point.

With the information available currently it can be concluded that this asymptote is at or above the current spawning stock size, implying that the overall productivity of the stock is greater than or equal to the current productivity. Only as the stock recovers more fully will it be possible to determine how much greater the productivity could become and the level of depletion at maximum productivity. In setting target reference points for this fishery the maximum biological productivity, and consequently some aspects of economic productivity, is not yet known and so an adaptive approach is needed. It will be necessary to slightly 'over recover' the stock to know the depletion at which maximum productivity occurs.

An important management challenge at this stage in recovery is to remain aware of the lags between different signals from the fishery, especially the about 4 year lag between the size of the spawning stock in any year and the subsequent recruitment of lobsters from that spawning stock into the exploitable biomass. Without care promising signs of recovery could result in too rapid an increase in the fishery catch, with subsequent 'overshoot' of the fishing mortality compared to the target level.

**Limit reference point.** The 2007 Fishery Management Strategy (SMP) identifies stock depletion to 0.25 of the unfished biomass as a level of depletion that is of biological concern and that would trigger a review of management. The Committee treats this as a limit reference point, to be avoided with high probability. The Committee has used median depletion to 0.3 of the unfished level as the limit reference point. These two different limit reference points are consistent and equivalent when applied with different requirements for the probability that the reference point is avoided. The limit reference point used by the TACC is a median 0.3 depletion, which gives a 50% probability that the actual population is above the 0.3 depletion level. The standard error of estimated depletion in recent assessments is about 0.05. So a median depletion estimate of 0.3 implies (approximately) an 84% probability that the true population is above 0.25 depletion. Put slightly differently, the Committee uses a limit reference point of 0.25 depletion combined with an 84% probability that the true population is above this limit.

Performance against the limit reference point has been reported for both total biomass and spawning biomass, with most importance and priority being given to the spawning biomass.

### **3.2.4 Fishery independent surveys and monitoring**

In this fishery independent measures of spawning stock are particularly important because a maximum legal size is enforced that is intended to reduce fishing on a significant part of the spawning stock. This management measure protects the older mature animals from fishing because they contribute strongly to egg production. But it also has the consequence that commercial catches and catch rates do not fully reflect the spawning stock.

Two fishery independent monitoring programs have been established, one to monitor the spawning stock and the other to monitor settlement of post-larval lobster (puerulus) that grow and recruit to the fishery about 2-3 years later. The spawning stock surveys started in 1998/9 and use standardised pot sets in the northern areas. The puerulus surveys started in 1995/96. The combination of spawning stock, puerulus monitoring and fishery monitoring is beginning to allow direct examination of the relationship between spawning stock, settlement of puerulus and recruitment of lobsters to the exploitable stock. The value and reliability of these interpretations will increase greatly during the next few years because they will help to define the asymptote beyond which further increase in the spawning biomass does not result in increased average recruitment.

Puerulus settlement in the northern areas is typically low on average (about a tenth of the settlement in the south), but it is important in supporting the inshore fishery. In the past low settlement in the north has resulted in undesirable transfer of fishing effort onto the deeper spawning stock. Settlement in the northern areas in the past three years has been variable, but overall strong by historical standards and it continues to show a slight increasing trend.

In the southern areas the puerulus settlement has on average been increasing since about the mid-2000s. Average settlement since 2010 is more than double the settlement in the late 1990s and early 2000s. Settlement in the past 2 years has been relatively weak by recent standards, though still good by historical standards, and this is expected to result in somewhat reduced recruitment into the southern inshore fishery during the next 1-2 years.

The size composition of the catch from standardised trap surveys on the mid-north and far-north coast is shown in Figure 3.4. This is the area occupied by the mature lobsters. The size composition is monitored every second year, and was updated this year (2014/15). These surveys indicate that the mature female population has substantially recovered from the low abundance and truncated size distribution in the early 2000s. The recovery was very slow until about 2007/8, but has been rapid since then and there are now high catch rates for a wide size-range of mature lobsters. The size composition of the spawning sized lobsters continues to build, including of very large lobsters (greater than 210mm carapace length).

A composite index of the spawning biomass from direct observations is shown in Figure 3.5. This shows the slow rebuild through the mid-2000s and the rapid increase since the late 2000s.

Overall this direct monitoring of the spawning stock is very encouraging with respect to the strength of rebuilding. It greatly increases confidence in assessing the status of the stock. It clearly and directly demonstrates that the decreased maximum size limit, decreased fishery targeting of the areas occupied by mature lobsters, the TACC reductions in the mid to late-2000s, and continued restraint in setting more recent TACCs is allowing rebuilding of the spawning biomass. The spawning stock has slowly rebuilt under the management interventions, with rebuilding first occurring in the pre-mature lobsters in the deep-water parts of the fishery in the south, then feeding into the mature and premature lobsters in the deep water parts of the mid-north coast - and now also into the far-north coast. The increase in spawning stock has been particularly strong in the past few years. The increased spawning stock appears to have resulted in a trend of increasing puerulus settlement and recent recruitment to the fishery.

### **3.3 Analysis**

#### **3.3.1 Stock assessment**

The status of the lobster population was assessed using a length-based model. This model explicitly represents the length and associated age structure in the population, as well as the sexual difference in some key parameters such as growth and hence availability to the fishery. It allows calculation of the size of the mature stock, it can represent the effects of strong or weak year-classes as they pass through the population, and it can incorporate changes in size selectivity in the fishery

This model was fitted to the catch data throughout the history of the fishery (corrected by the low UCNC assumptions about unrecorded catch), to the standardised catch rate data since 1969, and to the size composition of 160-200mm lobsters in the years 1999/2000, 2000/01, 2001/02, 2008/09 and 2009/10. This limited size range was used because it is expected to be less subject to changing

fishery practices and the limited period was used because the size composition of the catch in those years were collected by observers. The model also incorporates a great deal of other information. For example it includes detailed biological information (e.g. growth rate, maturity schedule, percentage berried females, natural mortality rate, relationship between mature stock and recruitment) and fishery information (e.g. selectivity of the fishing gear, discarding of lobsters near the legal size limits, and the mortality of discarded lobsters).

Sensitivity of the model was examined for two interpretations of the recent recruitment.

1. The base-case interpretation uses the previously assumed stock-recruitment relationship with a high 'steepness' of 0.9. This implies that recruitment remains relatively high on average for spawning stock biomass down to depletion of 0.1 of the unfished biomass, and then decreases rapidly below this biomass. Conversely, during recovery under this assumed high steepness recruitment is expected to increase rapidly as the spawning biomass increases to about 0.1 of the unfished level and then to increase more slowly and plateau as the spawning biomass rebuilds further. This expectation does not match the empirical observations from the fishery, where continued increase in recruitment has been seen during an about 4-fold increase in the spawning stock index, which is estimated to relate to an increase in spawning stock from a depletion somewhat less than 0.1 depletion to depletion of about 0.3. Recruitments at the higher spawning stock depletion of the past 2-3 years have not yet been directly measured, though the puerulus settlement and pre-recruit survey data indicate that the trend of increasing recruitment has continued at the higher depletion. Consequently the base-case interpretation has low credibility in respect to recruitment patterns, but it is conservative and provides easy direct comparison with assessments in previous years.
2. An alternative 'increased recent recruitment' (IRR) scenario was developed for last year's assessment (i.e. the 2014/15 determination) that better matched the increased recruitment recently observed in the fishery. This scenario has been further developed and applied in this year's assessment. The main difference this year being that the increased recruitment is considered to start earlier (1994/5) and end earlier (2010/11) than was the case in last year's assessment in which the increased recruitment extended from 1997/8 to 2012/13. So in this year's assessment the IRR scenario increases recruitment by 40% over the period 1994/5 to 2010/11 (at a constant 2.5% per year) and maintains the 2010/11 level of recruitment thereafter. effect of the IRR scenario is to lower the 'steepness' assumption in the stock-recruitment relationship during the IRR period. This is a cautious treatment because it does not assume that the increased recruitment will not continue to increase beyond what has been observed during the IRR period, as it would if a lower 'steepness' was simply assumed to apply in the past and future. But conversely this treatment assumes that recruitment will remain at the high levels seen in 2010/11, and will not revert to the earlier lower levels – essentially this an assumption that the increased recruitment is due to increased spawning biomass rather than to a random or episodic change in the environment.

The model fit to the length frequency data is good, including both to the 1999-2002 period of high fishing mortality with a steep gradient in the length frequency distribution and to the later 2012/13 period of lower fishing mortality with a shallow gradient in the length frequency distribution. However, the model fit to the catch rates becomes increasingly poor in the last few years, with the model increasingly underestimating the catch rate. The IRR scenario matches the catch rate slightly better than the base-case, and so this scenario is an improvement. But neither the

base case nor the IRR scenario can match the rapidly increasing catch rate observed in 20011/12, 2012/13 and 2013/14. Two possible reasons for this discrepancy, that are not mutually exclusive, are:

- that increases in recruitment since 2010 are stronger even than the IRR scenario represents, which implies that the model is underestimating recent stock recovery; and
- that operational increases in fishing efficiency since 2010 are greater than the method of catch rate standardisation can correct for, which implies that the catch rate is exaggerating the recent stock recovery.

This conflict gives a growing uncertainty in the stock assessment and in stock projections, and it needs to be addressed. At this time, and based strongly on the fishery independent measures of the spawning stock, an interpretation of some continued stock recovery during the past 2-3 years is regarded as reasonable. The IRR scenario, while somewhat ad hoc in its implementation, has strong empirical support and is accepted here as a feasible representation of the population. In future a more formal modelling structure that can accommodate systematic trends in recruitment should be developed and applied (e.g. a model with estimated annual recruitment deviations and/or a fitted stock-recruitment relationship).

### 3.3.2 Present stock levels

The key population and depletion estimates are provided below for the base-case (i.e. average recruitment according to the high steepness stock-recruitment relationship used in previous assessments) and for the Increasing Recent Recruitment (IRR) scenario (i.e. increased recruitment to match the average trend observed in the field during the 16 year period 1994/5 to 2010/11). The IRR assessment is considered to provide the most credible assessment of the two. For both the base case and the IRR scenario the model was fitted to standardised catch rate and used the low scenario for Unreported Catch and Non-commercial Catch (UCNC)

	<b>Median</b>	<b>5% limit</b>	<b>95% limit</b>
<b>Unexploited total biomass (K)</b>			
Base-case	6,095	5,833	7,417
IRR	6,100	5,833	7,454
<b>2014-15 total biomass</b>			
Base-case	2,459	1,846	3,842
IRR	2,957	2,099	4,338
<b>2014-15 total biomass/K</b>			
Base-case	0.40	0.31	0.52
IRR	0.48	0.36	0.60
<b>Unexploited spawning biomass</b>			
Base-case	2,336	2,235	2,843
IRR	2,338	2,236	2,857
<b>2014-15 spawning biomass</b>			
Base-case	784	547	1,278
IRR	921	616	1,425
<b>2014-15 spawning biomass/unexp. spawning biomass</b>			
Base-case	0.34	0.24	0.46
IRR	0.39	0.27	0.51

Key features of the assessment are:

- the status is very similar to last year, with the main difference this year being increased credibility given to the IRR interpretation over the base-case interpretation;
- the spawning biomass has increased measurably and steadily over the past 5 years; and
- the spawning biomass has rebuilt to well above the limit reference point, and there is now a very low probability that the spawning stock is below 0.25 depletion. The median estimate of spawning stock depletion in the IRR assessment is 0.39 with a 95% confidence interval from 0.27 to 0.51.

This indicates that the management measures of the past several years have had the desired effect of rebuilding the stock.

The Increased Recent Recruitment scenario gives a better fit to the available data than the other model assumptions but it still under-predicts the observed catch rates in the last 2 years. This deviation appears to be growing and if not rectified will cast significant doubt on the overall interpretation of stock status and trends in future assessments.

### 3.3.3 Predictions of future stock levels

Predictions for the base-case assessment and the IRR scenario were made of the change in the biomass that would occur after 5y of total catch at various levels. The changes in spawning biomass and exploitable biomass are calculated by the predicted biomass in 2020/21 divided by current biomass in 2014/15. These are:

<b>Predicted proportionate change in spawning biomass after 5y of various constant future catches</b>		
<b>Total Catch (t)</b>	<b>Catch rate and unreported catch assumptions</b>	<b>Increase in spawning biomass (<math>SB_{2020-21}/SB_{2014-15}</math>); Median and the 95% confidence interval</b>
<b>150</b>	Base-case IRR	1.01 [0.97-1.05] 1.13 [1.06-1.17]
<b>175</b>	Base-case IRR	0.90 [0.85-0.96] 1.08 [1.01-1.12]
<b>200</b>	Base-case IRR	0.88 [0.81-0.97] 1.03 [0.94-1.08]

<b>Predicted proportionate change in exploitable biomass (104-180mm length lobster) after 5y of various constant future catches</b>		
<b>Total Catch (t)</b>	<b>Catch rate and unreported catch assumptions</b>	<b>Increase in exploitable biomass (<math>B_{2020-21}/B_{2014-15}</math>); Median and the 95% confidence interval</b>
150	Base-case IRR	1.04 [1.02-1.07] 1.01 [1.07-1.13]
175	Base-case IRR	0.90 [0.85-0.96] 1.00 [0.96-1.03]
200	Base-case IRR	0.76 [0.64-0.89] 0.90 [0.79-0.96]

The IRR assessment is considered to provide the most credible interpretation. With catches at about the recent level (i.e. TACC of 150t and a total catch of 180t) the spawning biomass is predicted to continue to rebuild, the median depletion of the spawning biomass is predicted to remain above the limit reference point, and the stock available for harvest is predicted to decrease slightly from current levels. The model predictions are very similar to those made last year. They are expected to be slightly pessimistic because the IRR assumes that future recruitment will remain constant at the 2010/11 level, rather than to increase with increasing spawning biomass.

Some preliminary and deterministic predictions were provided this year to examine the likely Maximum Sustainable Yield (MSY) and the effects of increasing the maximum size limit from the current 180mm carapace length to 200mm. While preliminary these predictions are a useful start in considering the catch and size limits that may be appropriate for the recovered stock, and also in illustrating some of the challenges to be confronted in stabilising the fishery and stock at the chosen target. For the IRR scenario and the current 180mm upper size limit the MSY is about 205t. The total catch in recent years was 180t, so under this scenario and size limit the fishery is close to MSY already. For the IRR scenario with the higher minimum size limit of 200mm the MSY is about 240t.

Both of these IRR predictions of MSY include the observed increase in recruitment from 1994/5 to 2010/11 but then assumes no further increase. So to the extent that there may be further increase in recruitment as the spawning stock further rebuilds these MSY estimates will be conservative. But this extent will only become apparent as the spawning stock and resulting recruitment to the fishery (3-4 years later) is monitored. The predictions also indicate that relatively small catches above the MSY (e.g. 10-20t too high) could ultimately cause significant decline in the stock again by restricting the survival of lobsters from the exploitable biomass into the spawning biomass, but this process is relatively slow and should be detectable with targeted monitoring.

This preliminary examination of MSY and the effect of changing the maximum size limit has several implications:

- There is a strong interaction between the MSY and the upper size limit, with scope to increase both as the stock recovers to the approximate MSY biomass level and if general management arrangements can confidently protect the spawning stock.
- The exact MSY level and conditions to achieve it will not be known until there have been observations of plateaued recruitment for continued increase in the spawning stock. The at least 3-4 years delay in recognising that point poses a risk that the MSY could be exceeded before it is characterised. This mitigates for slow increases in TAC, with adequate time following TAC increases to recognise the effects on spawning stock and subsequent recruitment, as the MSY is approached.
- There is need for leading indicators of the likely first signs of problems if the TAC has been increased too quickly during this adaptive management phase. Current monitoring addresses the spawning stock, puerulus settlement and recruitment to the fishery, but waiting to detect problems in these indicators risks an overly slow management response. The most likely immediate problem to arise is reduction or cessation of the number of lobsters surviving the fishery to join the spawning stock, because of one or more of (i) inappropriately high TAC for that stage in the recovery, (ii) changed selectivity patterns, and particularly excessive concentration of the TAC on a small size

range of lobsters in deep water on their migration north, and (iii) reduced recruitment compared to recent levels.

The results available are too preliminary to justify recommendations for a change in the maximum size limit or to confidently identify the MSY. However they are very helpful in starting to consider both of these management issues, and in indicating the benefits and risks of different approaches to the necessarily adaptive management of the fishery towards targets. There is great value in continuing to develop these approaches.

### **3.4 Conclusions**

Management decisions in the past several years have been aimed at stock rebuilding. There is now clear measurable evidence that significant rebuilding of the spawning biomass has been achieved since about 2000. There is now little chance that the spawning biomass is depleted below 0.25 of the unfished level, and the median estimate from the most credible assessment is 0.39 depletion. Puerulus settlement and recruitment have both increased on average during the past about 10 years as the spawning stock has increased. Puerulus settlement in the past 2 years, an indicator of recruitment to the fishery in the next 1-2 years, is about average for the levels seen in the last 10 years, but somewhat lower than the levels that gave rise to the lobsters that recruited to the fishery in the past 2-3 years. Rebuilding of the spawning stock is predicted to continue at a moderate rate under recent catch levels, but there are several reasons to expect that the model is slightly pessimistic. The recent pattern of increased recruitment is greater than what is included in the population model and the stock predictions assume no further increase in recruitment above that seen in 2011/12. In contrast the current expectation is that average recruitment will continue to increase as the spawning stock increases, up to some presently unknown limit that is higher than that in 2011/12. The patterns of settlement and recruitment will fundamentally drive the outcomes and options for future stock rebuilding and the fishery.

The stock has now recovered to the extent that current depletion is approaching the depletion range where common fishery targets (e.g. maximum sustainable yield and maximum economic yield) are expected to be for species such as this. There is a need to identify the desired target state for this fishery is becoming more urgent, and further consideration of the upper size limit should be an element of this.

A key challenge in coming years will be to achieve this target without catches 'overshooting' the desired sustainable level, which would have negative impacts on the stock and require subsequent catch reductions. This challenge is complicated because the depletion giving maximum sustainable yield or maximum economic yield will only be known accurately when the recruitment can be seen to plateau as spawning biomass continues to increase, and there is a several year delay in when the recruitment from each level of spawning biomass can be observed. Determining and achieving such targets in this fishery will by necessity be empirical and adaptive.

This process carries with it the risk that catches could be increased above the target level before that level is recognised. As the target is approached the spawning stock is expected to continue to rebuild and the exploitable biomass is expected to be maintained at levels similar to those seen recently - such positive signs could encourage excessive catch increases before the resulting recruitment from those spawning stock levels is understood. This is why relatively small catch increases are appropriate as the target is approached, so that during the delay until the effects on recruitment can be determined any 'overshoot' of the target catches will be small and not seriously damaging to the stock or disruptive to the industry.

The fishery data, scientific survey data and stock assessment provide reasonably consistent evidence in support of these interpretations. Consistency between the model and the catch rates has been improved by some standardisation of the catch rate data, revision of the unreported catches and incorporating an ad hoc means of representing the observed increases in recruitment. The Increased Recent Recruitment (IRR) scenario improves the consistency between the model and catch rate data. However this is still not fully correcting the situation, and there is a large discrepancy between the model and fishery catch rates in the last three years (i.e. 2011/12 to 2013/14). If not addressed this discrepancy will undermine confidence in future assessments and projections. Further improvements to both the standardisation and treatment of recruitment should be developed and implemented.

At this time it is considered appropriate to increase the Total Allowable Commercial Catch (TACC) to 160t, which corresponds to a Total Allowable Catch (TAC) of 192.3t. This is expected to allow for some further rebuilding of the spawning stock towards maximum stock productivity, while allowing reasonable opportunity to detect and understand the effects of the recent spawning stock levels on recruitment. Future TACC decisions would benefit from greater clarity about target reference points and the desired pathway to reach them, both of which include strong economic as well as biological considerations.

The conversion between TAC and TACC uses the same method and unreported catch assumptions as applied last year. The TACC is equal to the reported commercial catch (RCC) and the TAC is equal to the reported commercial catch plus the unreported commercial catch plus the recreational catch. In keeping with the low unreported catch scenario used in the base case stock assessment and projections the recreational catch (RC) is assumed to be 0.1 of the total (reported and unreported) commercial catch and the unreported commercial catch (UCC) from 2010/11 is assumed to be 0.085 of the total commercial catch (RCC+UCC). That is

$$UCC=0.085 (RCC + UCC) =0.085 RCC/(1-0.085)$$

and

$$\begin{aligned} TAC &= RCC + UCC + RC \\ &= RCC + UCC + 0.1 (RCC+UCC) \\ &= RCC + 0.085 RCC/(1-0.085) + 0.1 [RCC + 0.085 RCC/(1-0.085)] \\ &= 1.202 RCC \end{aligned}$$

so that  $TACC = RCC = TAC/1.202$

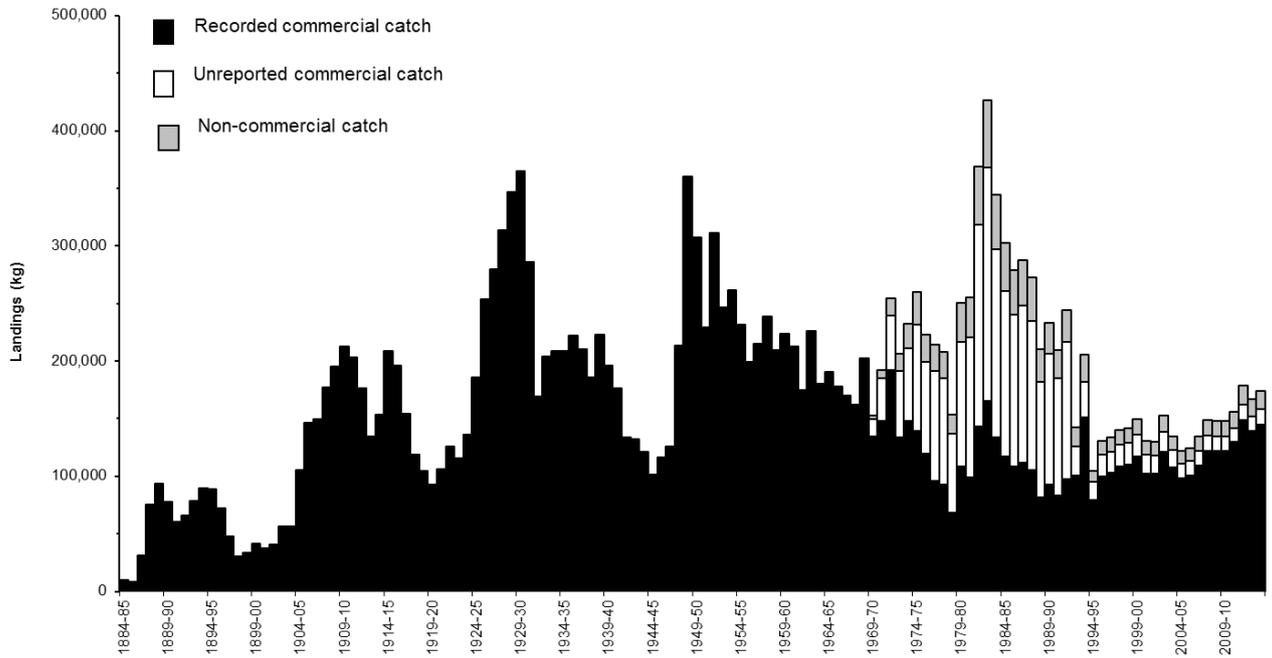
(ie  $TACC=0.832 TAC$  and the non-commercial catch= 0.168 TAC)

There are several issues that would benefit from focused attention by the Department and industry. In particular:

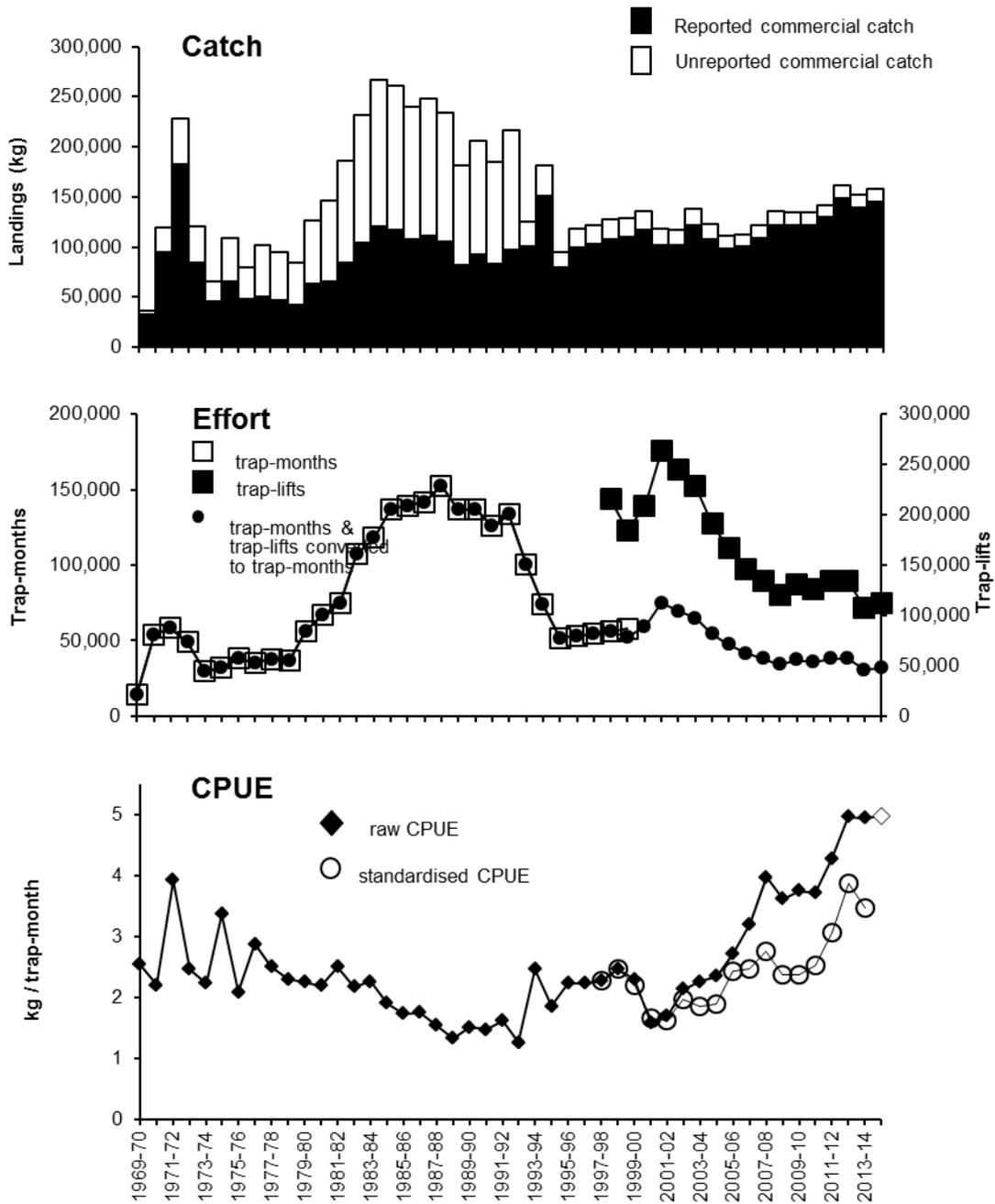
- Redevelop the methods to standardise the catch rate for past and on-going changes in the operational details of the fishery. The current standardisation approach is ad hoc. It increasingly cannot match the effects of recent changes in the fishery, including the increasing shift of effort from small traps on resident lobsters inshore to much larger traps on migrating lobsters offshore. This situation increases uncertainty in the assessment of stock status. It also limits the ability to examine future options for the fishery (e.g. different mixes of fishing strategy) and to predict future stock status. It is recommended that a formal statistical standardisation be developed and applied.

- Modification of the population assessment model to better account for recruitment dynamics. The current approach (i.e. the IRR scenario) is ad hoc. While it is a reasonable and justifiable initial examination it has several problems. It does not include the most recent increases in recruitment (i.e. those since 2011/12 and, more importantly, it does not allow alternative assumptions about recruitment dynamics to be consistently followed through both the assessment model and the stock projections. The current approach assumes high steepness through to 1994/5, then lower steepness between 1994/5 and 2011/12, then constant recruitment at the 2011/12 level after that in both the assessment and predictions. It is recommended that two or three alternative steepness models be identified and those models are applied consistently through both the stock assessment model and the projections. The current IRR scenario should be repeated for at least one year for comparison.
- Develop indicators of the recruitment of lobsters to the spawning biomass each year. If the intended stock rebuild, and later maintenance at the target stock level, fails a leading indicator under most failure scenarios is the annual recruitment of lobsters to the spawning biomass. This would provide early detection of failure caused by excessively large catches from the exploitable biomass, from change in fishery selectivity that resulted in few lobsters surviving the gauntlet of the legal size range, from reduced recruitment to the exploitable biomass, and to pressure on the spawning stock if the maximum size limit was ever increased. It is recommended that two types of indicator be considered. (1) Empirical indicators based on the fishery independent spawning stock survey, perhaps augmented by industry information. The fishery independent survey is currently conducted every second year and consideration should be given to whether or not this should be annual while the fishery achieves its target status. (2) Model-based indicators, perhaps related to survival through the exploitable size range or the absolute or relative number of recruits to the spawning biomass.
- It is recommended that the longer-term target for the stock and fishery be developed. The profitability of the fishery and cost-effectiveness of fishery assessment and management should be factors in these considerations. There should also be explicit consideration of how best to adaptively explore the productive potential of the stock, given that maximum productivity appears occur at higher biomass than was previously expected and the lags between TAC setting and the consequent effects on spawning biomass and recruitment.

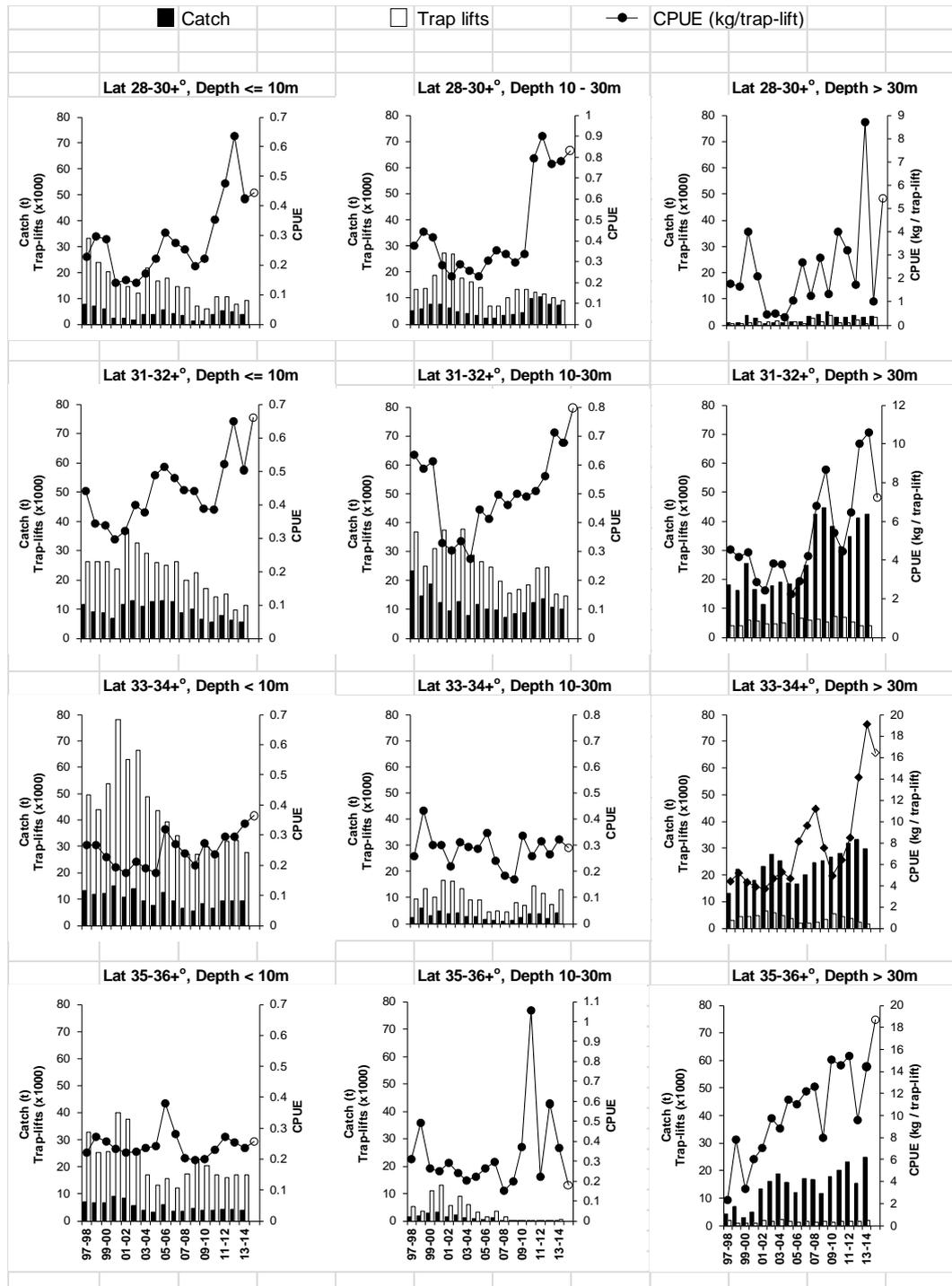
**Figure 3.1.** The landed catch since the start of the fishery. The reconstructed catch assuming a relatively low Unreported Catch and Non-commercial Catch (UCNC) since 1994/5.



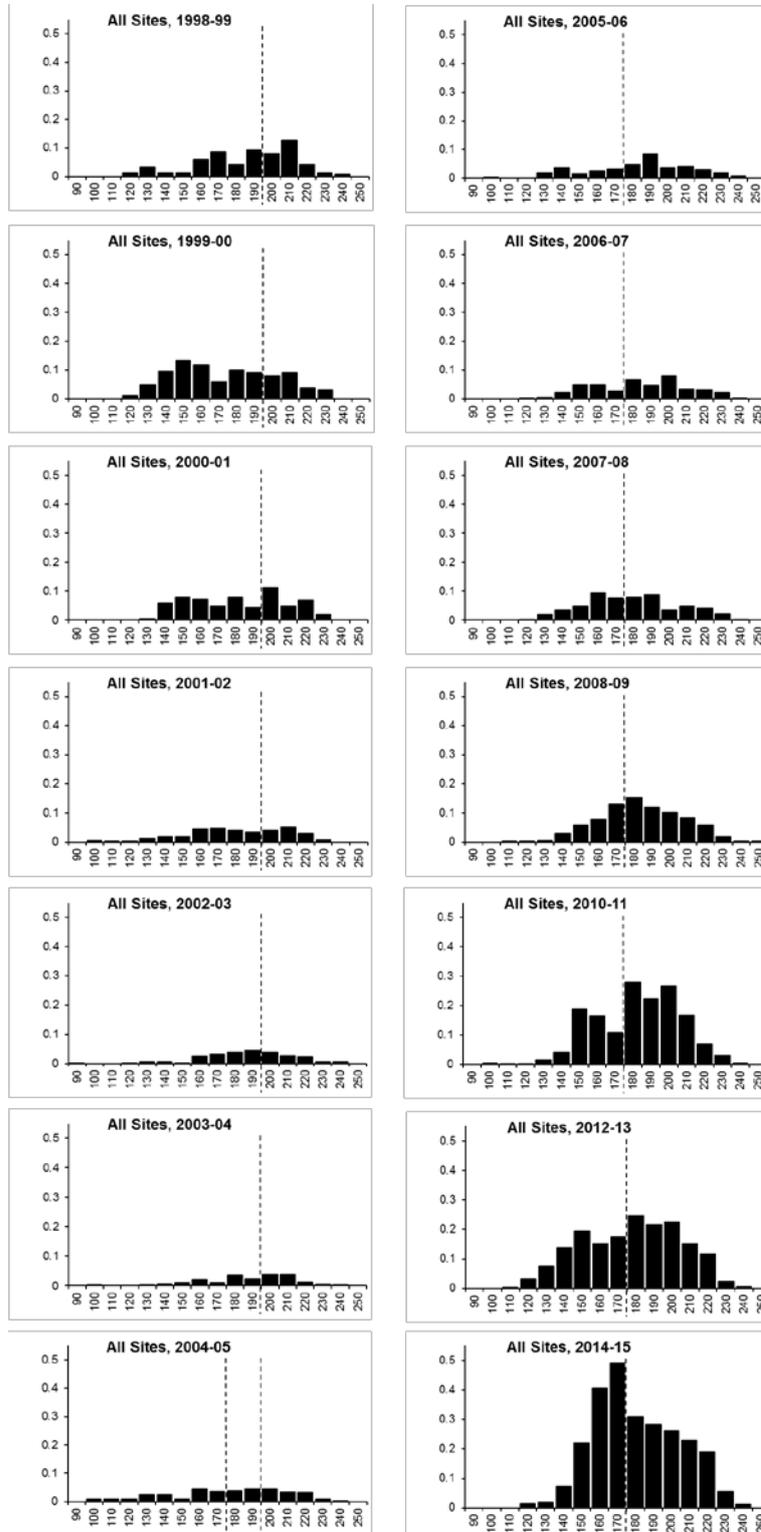
**Figure 3.2.** Commercial catch, effort and catch rate since 1969/70 when reliable effort is available. The open square shows the incomplete 2014/15 year.



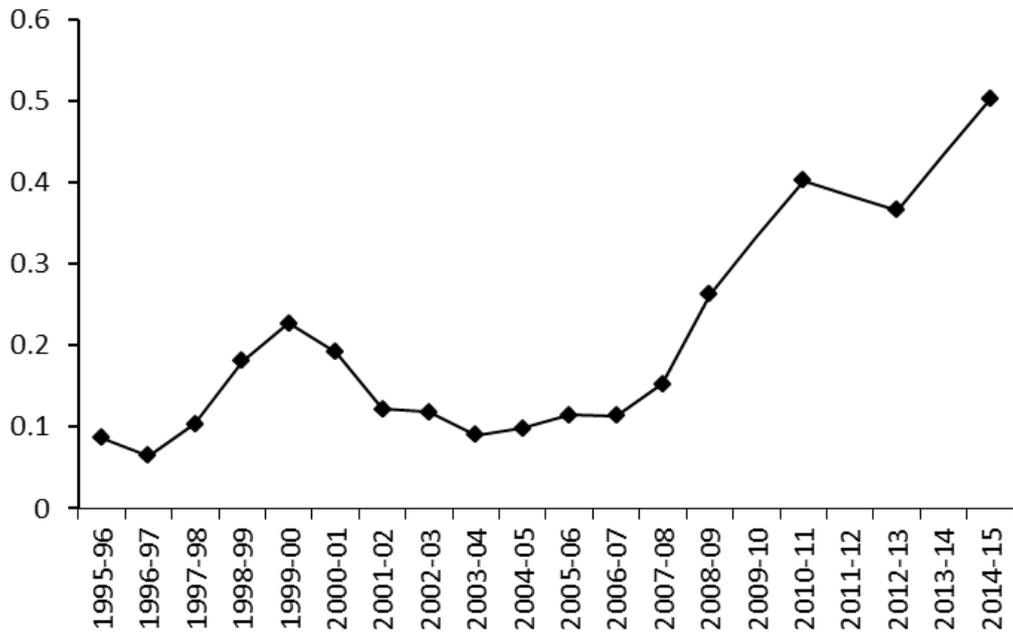
**Figure 3.3.** Commercial catch, effort and catch rate by area and depth since 1997/8 when detailed reporting became mandatory. The spawning stock is mostly found in the far north coast (28-30+) and mid-north coast (31-32) at depths greater than 10m and especially depths 10-30m. Open circles are for the incomplete 2014/15 year.



**Figure 3.4.** Size composition of lobsters in the commercial catch of the combined mid and far-northern areas combined, from data provided by logbooks and augmented by observers. The dashed line is the maximum legal size. These data are updated every second year and have been updated this year.



**Figure 3.5.** Index of abundance of spawning stock from direct observations. The index is based on commercial catches of berried female lobsters for the period up to 1997-98 and on fishery-independent surveys since 1998. These data are updated every second year and have been updated this year.



## **4. ECONOMIC CONSIDERATIONS**

### **4.1 Introduction**

In this section of the report, the economic status of the NSW rock lobster industry is described; consistent with the requirement under the Fisheries Management Act that the Committee have regard to economic and social issues in making its determination.

Economic considerations focus on gross returns to the industry rather than net returns due to the absence of information on fishing costs. Further, this analysis is undertaken for the rock lobster fishery only and does not consider returns from other types of fishing to individual enterprises (fishing businesses), which can be quite significant, especially in the far north of the fishery. A summary of quota and share market prices is presented as an indicator of both short and long run industry profitability. Analysis of other data affecting the economic performance of the fishery, such as export prices and catch per unit effort, is also presented.

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

### **4.2 Volume and value of production**

The volume of reported catch of rock lobster in 2013/14 was 144.7 tonnes, an increase of 4 per cent from 2012/13 where 138.8 tonnes was caught (Figure 4.1). Catch in 2013/14 accounted for 96.5 per cent of the TACC. The ability of industry to catch virtually the full TACC over a number of consecutive years, with less effort, suggests that recovery of the stock continues, as is suggested elsewhere in this report.

The value of reported catch increased significantly, by 29 per cent, between 2012/13 and 2013/14, from \$8.0 million to \$10.3 million in real terms. Based on catch data to 28 April 2015, and price data to 31 March 2015, it is expected that the value of production will increase again in 2014/15 due mainly to higher catches (owing to a higher proportion of the TACC expected to be taken) and expected slightly higher beach prices (Figure 4.2).

#### **CPI adjusted values**

CPI adjusted values are calculated using RBA “all groups” CPI data up to December 2014. Fiscal year adjustments are taken from the December quarter of the appropriate year. CPI adjusted data is identified as “real” price or value figures on graphs.

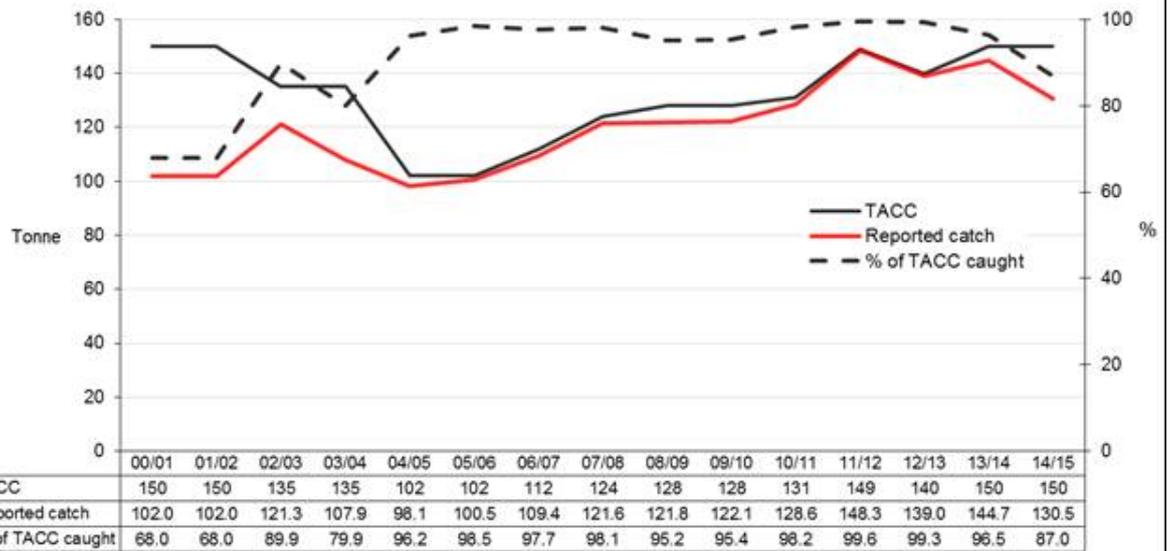


Figure 4.1: Catch, TACC and per cent of TACC caught, 2000/01 to 28 April 2015

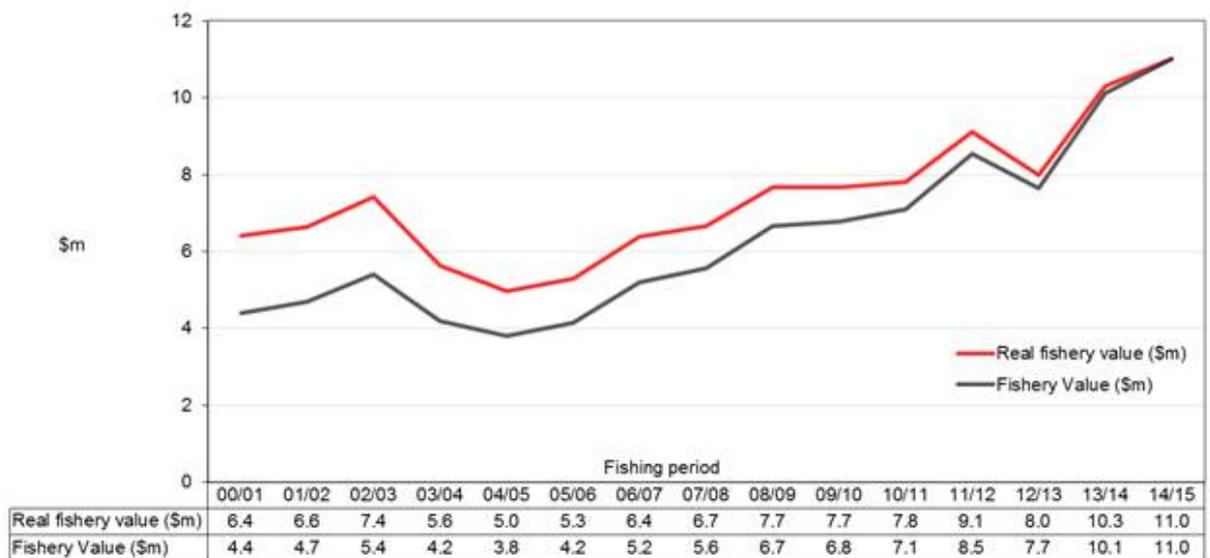


Figure 4.2: Value of production, 2000/01 to 2014/15 (# volume of production to 28 April 2015 and beach prices to 31 March 2015)

### 4.3 Prices

Beach prices have continued to trend upwards, increasing in real terms by 24 per cent to 31 July 2014, and 3 per cent to 31 March 2015 (Figure 4.3). Prices are based on daily average prices of lobster landed at the Sydney Fish Market. These prices provide only a guide as to price movements for lobster in NSW as a significant quantity of lobster (around 40 per cent) is sold through other registered fish receivers in Sydney and along the NSW coast. Fishers estimate that around 27 per cent (roughly 40 tonnes) of this will be sold directly to exporters in 2014/15. However, the final figure exported is likely to be even higher as some product sold to registered fish receivers in Sydney and along the NSW coast will also be exported.

Price information for lobster sold through other outlets is not publicly available. However, anecdotal evidence suggests that prices all along the coast follow the Sydney Fish Market Price. Fishers report that prices for product that is exported is slightly higher than that received on the Sydney Fish Markets in the early calendar year (January/February/March). Hence, exporting lobster provides a more profitable avenue for selling lobsters for fisher's landing catch at this time of the year. However, prices are low, around \$68/kg in 2014/15, when compared to the average price of lobster throughout the year. Given the differences between prices received for lobster on different markets, the Committee would encourage the Department to collect information on export prices and include these in next year's price figures.

Strong prices for lobster landed at the Sydney Fish Market is a result of both less Southern Rock Lobsters coming onto the NSW market, and a weaker Australian dollar increasing demand for Australian product on overseas markets.

Some fishers also attribute higher prices to improvements in the quality of lobster as a result of better product handling. The ability of fishers to increase handling practices is made easier by the use of more efficient boats.

While only a small percentage of NSW rock lobster is exported overseas, the value of the Australian dollar can have a significant impact on prices received for rock lobster. This is discussed further in Section 4.5, below.

NSW product attracts higher prices during the first quarter of the financial year, as other states are not producing lobster at this time. Industry also reports that there is a premium paid for larger sized lobsters at the Sydney Fish Markets, in contrast with most other Australian rock lobster markets. Further analysis of prices received for different size classes on the Sydney Fish Markets reveals that this is indeed the case (Table 4. 1). The Committee believes that it is worth investigating the factors behind this premium further, as well as undertaking analysis of the relationship between length and economic yield.

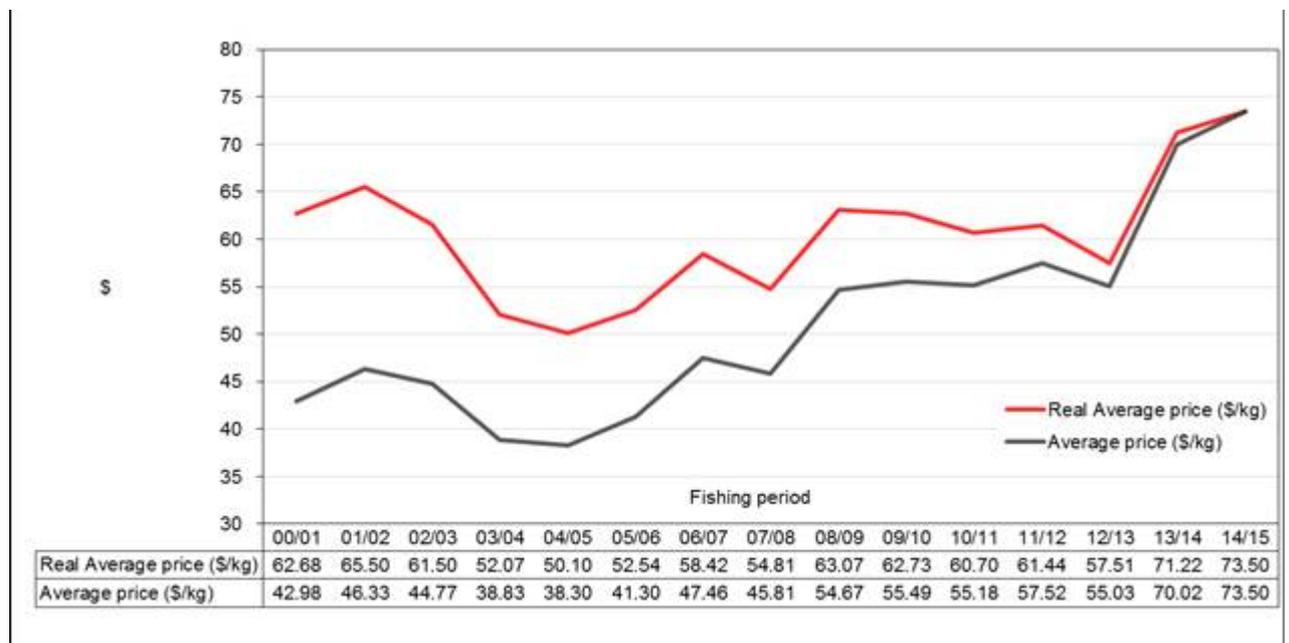


Figure 4.3: Beach prices in real and nominal terms, 2000/01 to 31 March 2015

**Table 4.1: Eastern Rock Lobster Weight and Average Price (Sydney Fish Markets) by Grade for the 2013/14 fishing period**

SFM Grade	Weight	Carapace length	Period nominal average price (\$/kg)
Extra Large	1.7 kg – 2.46 kg	158 – 179 mm	75.85
Large	1.2 – 1.7 kg	140 – 158 mm	73.91
Medium	0.7 – 1.2kg	117 – 140 mm	70.43
Small	<0.7 kg	104 – 117 mm	65.20

#### 4.4 Catch per unit effort and productivity

Catch per unit of effort (CPUE) has increased markedly over the period since 2001/02. Catch rates achieved during 2012/13 and 2013/14 were higher than in 2011/12, and are at the highest level for the last 44 years (noting the uncertain quality of the data in the early years of the fishery). CPUE in 2014/15 is likely to be similar to that in the preceding two years.

Lobster fishers have been able to invest in larger traps and larger more efficient boats as a result of improvements in the profitability of lobster fishing.

#### 4.5 Rock lobster markets

NSW is a minor contributor to the total output of lobster in Australia, with the bulk of production coming from Western Australia, South Australia and Tasmania. In 2013/14 total Australian production of rock lobster was 10,300 tonnes, a fall of 2 per cent from 2012/13 (ABARES 2014). This is much lower than the 2003/04 peak of 19,000 tonnes. In more recent times production has declined as a result of large reductions in catches in Western Australia and South Australia in response to falling stock levels and the introduction of Individual Transferable Quotas (ITQ's). Production is forecast to fall again slightly in 2013/14 and 2014/15, and then increase slightly in 2015/16 (ABARES 2014).

NSW product competes to some extent with Western Australian and South Australian product at the Sydney Fish Markets. The Committee notes that product differentiation will be improved in the 2015/16 fishing period by using the NSW waratah logo on lobster tags. The Committee again urges industry to investigate further marketing approaches, including exploring the benefits to NSW lobster product from gaining third party sustainability accreditation, such as that offered by the Marine Stewardship Council.

Rock lobster is the most valuable Australian seafood export. The export volume of Australian rock lobster increased by 13 per cent between 2011/12 and 2012/13 and by 3 per cent between 2012/13 and 2013/14, after having fallen in consecutive years between 2008/09 and 2010/11. The value of rock lobster exports increased by 16 per cent and 32 per cent over the same time period.

Only a small proportion of rock lobster from NSW is exported (30 per cent in 2012-13 (ABARES 2014)). The largest markets for Australian exports of rock lobster by volume in 2012/13 were Vietnam (this market accounted for 55 per cent of the total volume from Australian rock lobster exports in 2012/13), followed by Hong Kong (ABARES 2014). Australian exports of rock lobster to Hong Kong almost halved between 2011/12 and 2012-13 to 2695 tonnes; while exports to Vietnam went from zero in 2010/11 to 4304 tonnes in 2012/13. Unfrozen rock lobster exports are the most important export product to Vietnam, accounting for 87 per cent of the total export value of Australian seafood exports to Vietnam in 2012/13. The volume of lobster being exported to Japan and China continues to decline. Given the increasing importance of Vietnam as a market for Australian rock lobster, the

Committee suggests that industry investigate tastes and preferences for lobster on this market, as well as opportunities to directly market NSW product to Vietnam (as has been done on the Chinese market in recent times).

Southern rock lobster is usually the preferred product choice in China, Hong Kong and other parts of Asia owing to its highly uniform size and bright red colour when cooked. As production of southern rock lobster has fallen, these markets have had to turn to other sources of supply, resulting in strong demand for NSW product.

The value of the Australian dollar influences the price and demand for Australian exports overseas, including rock lobster. For example, if all other things are equal, a fall in the value of the Australian dollar against currencies in rock lobster export markets would have the effect of decreasing the price of Australian (including NSW) rock lobster on these markets, increasing demand and the prices received by Australian (including NSW) producers.

Econsearch investigated the relationship between exchange rates and prices received for NSW Abalone in a report prepared for the Seafood CRC. It was found that when the Australian dollar appreciates, as it did between 2010/11 and 2011/12, there is, generally, a corresponding decline in the average price of NSW Abalone (Econsearch 2013). The Committee considers that it would be worthwhile for the Department to undertake similar analysis to underpin economic analysis of the rock lobster fishery.

A depreciating Australian dollar against both the US dollar and Japanese Yen in 2014/15 has helped to increase demand for Australian rock lobster on major export markets and has resulted in higher export prices received in Australian dollar terms by Australian rock lobster producers. ABARES have forecast that the Australian dollar will continue to depreciate slightly over the short term, resulting in expected higher prices for rock lobster over this period. Future prices for Australian rock lobster exports will also depend on the extent to which suppliers from other countries are able to substitute product to compensate for an expected continued shortfall in the volume of rock lobster exports from Australia.

Those fishers who currently don't export much, or any, of their production may be able to take advantage of any higher prices on international markets by exporting a greater proportion of their catch. An understanding of the size preference / price relationship on Vietnamese, Chinese and Hong Kong markets would be useful in the context of understanding the opportunity for exported product from NSW to satisfy increased demand on these markets.

The Japan – Australia Economic partnership agreement and China – Australia Free Trade agreement is expected to further improve the competitiveness of Australian rock lobster on key Asian markets.

#### **4.6 Management charges**

Management charges in the lobster fishery increased only slightly in real terms, by 0.7 per cent, in 2014/15 to \$52.81 per share (Figure 4.4). A significant decrease in management charges between 2009/10 and 2010/11 was due, in part, to no dedicated lobster compliance salaries being recovered in 2010/11; which has also been the case in subsequent years.

The costs incurred by the NSW Department of Primary Industries in managing the NSW lobster fishery are currently not fully recovered from industry. The intention is for a policy to be developed on cost recovery for all NSW commercial fisheries in the future. This will impact on the proportion of costs that are recovered in the NSW Rock Lobster Fishery, and the profitability of this fishery. As such, the Committee

recommends that industry take into account the possible implications of the introduction of a new cost recovery regime when making investment decisions.

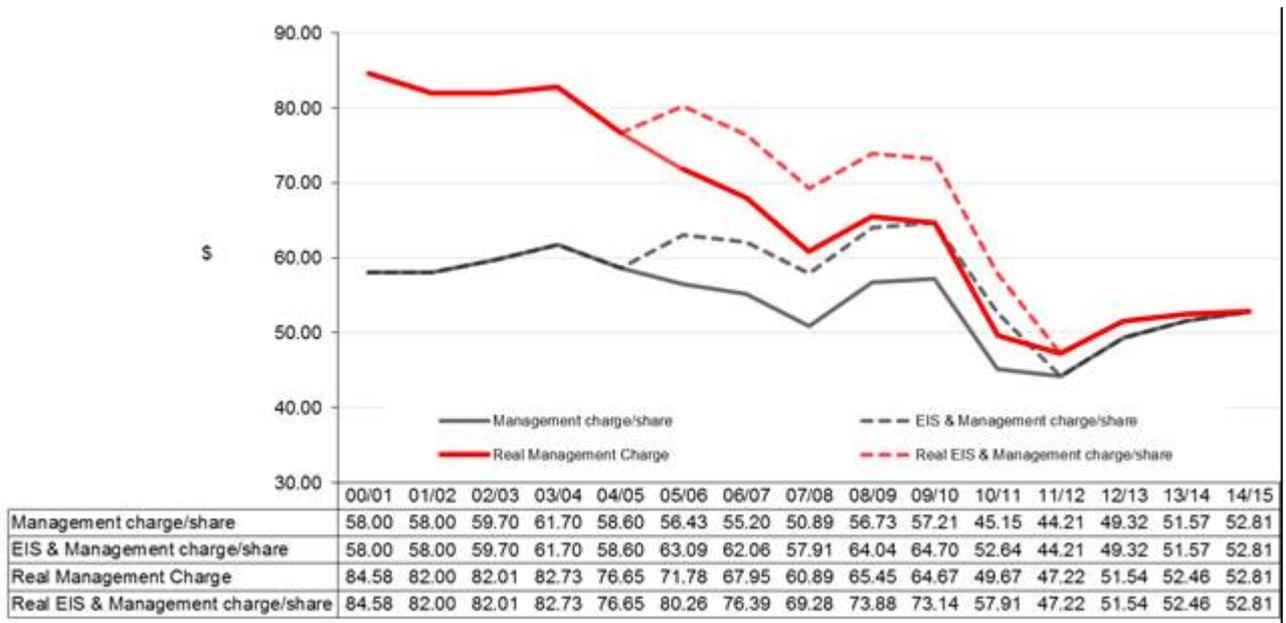


Figure 4.4: Management charge/share, nominal and CPI adjusted value (real price) for each fishing period from 2000/01 to 2013/14.

#### 4.7 Lobster business structures

The structures of fishing businesses that hold a lobster endorsement is not uniform and varies widely according to size of shareholdings; location of business operations and historical / personal fishing preferences. These differences affect the number and types of endorsements held by a fishing business and the size / type of vessels and traps used. For example, lobster fishers located in the far south deep water fishery typically use larger traps and larger vessels and are specialised lobster fishers. Lobster fishers located in the far north inshore fishery are likely to have smaller boats and traps and actively fish other endorsements in a less specialised business structure.

Traditionally, nearly all lobster fishers have held endorsements in several different fisheries, though the extent to which they have gained income from each of them has varied. According to reports from the lobster industry, which are borne out by landings data, there is a trend towards specialisation in the lobster fishery, particularly among larger shareholders.

Currently around half of all fishing businesses with rock lobster entitlements hold endorsements in other fisheries. A breakdown of the types of endorsements held is provided in Table 4.2

**Table 4.2: Endorsements held by lobster fishing businesses in 2014/15 (@ 7 July 2015)**

Fishery	Number of Fishing Businesses
Lobster	99
Ocean Trawl	4
Ocean Trap and Line	42
Ocean Haul	27
Estuary General	31
Estuary Prawn Trawl	2

The most common endorsement to be held in conjunction with a lobster endorsement is Ocean Trap and Line, which is used for the purpose of fish trapping. Other endorsements which support lobster fishing operations (e.g. Ocean Hauling or Estuary General endorsements for obtaining bait) may also be part of a specialised lobster fishing business structure.

For many fishers, a diversified business structure is a way to: counter environmental variability; provide income during times when they have caught their lobster quota; and/or provide income should returns from lobster fishing fall. There are some endorsements held by fishing businesses in fisheries other than rock lobster that are not actively fished. The extent to which fishers will continue to hold endorsements in other fisheries without actively fishing them is likely to change as a result of the current structural review of the NSW fishing industry, and the planned introduction of cost recovery. Preliminary recommendations from the Ministerial Fisheries Advisory Committee are that a fixed charge for each holding of a particular share class should apply irrespective of the size of the shareholding.

Along with the changes outlined above, high returns from lobster fishing and increased abundance of lobster in most parts of the fishery are likely to bring about the impetus for continued increased specialisation in lobster.

The Committee considers that it would be pertinent for the Department to undertake economic analysis of the structure of fishing businesses holding lobster endorsements to better understand the potential impacts of past and future management decisions on these businesses. Economic analysis would also help the TAC Committee to better understand the impact of its determinations on the economic viability of lobster fishing businesses. The Committee's recommendations on the types of analysis that could be undertaken are discussed further in Section 4.15, below.

#### **4.8 Fisher net income**

Without an understanding of the changes in fishing costs over the last few years, it is difficult to ascertain the extent to which increases in gross revenue from lobster fishing have resulted in higher net incomes. It is reasonable to assume that net incomes have risen over the past few years, as a result of both higher gross incomes and lower costs. This is also borne out by the recent large jump in share prices, discussed in more detail in Section 4.10, which indicates that a positive outlook for future profitability of the fishery, and an increase in current net returns from fishing.

In most areas of the fishery costs have fallen in response to substantial improvements in catch per unit effort, and reportedly also as a result of the efficiencies associated with several fishers upgrading to larger boats and larger, more efficient traps.

Costs have also fallen as a result of fishers becoming more entrepreneurial in their fishing and marketing practices. For example a group of lobster fishers have formed a grouping 'Jade Lobster' to market lobsters directly to China. This will result in a saving of around 7 – 8 per cent of gross returns which fishers would normally pay to sell product through a cooperative. Some fishers also cut costs by using their ocean haul endorsement to fish for bait, rather than having to incur travel costs and pay a mark up to purchase bait elsewhere.

In order to better understand the impact of changes in the types of costs reported above on the economic performance of the NSW lobster fishery, it would be helpful to have information on the costs of fishing. As is discussed in more detail in Section 4.15, below, a survey should be conducted to collect cost data, similar to that which has been run by EconSearch in the South Australian Rock Lobster Fishery.

#### **4.9 Shares**

In 2013/14 there were 103 shareholders in the lobster fishery who were eligible for a lobster fishing endorsement. Of the 103 shareholders, 80 reported fishing. In the current fishing period, 2014/15, the number of shareholders reduced to 99; 80 of these reported fishing. The number of shareholders in the fishery has fallen over time from 174 shareholders at the commencement of the Share Management Plan in 2000.

Between 2006/07 and 2008/09 the number of shareholders in the fishery, and the total number of shares, declined significantly from 142 shareholders and 10,051 shares to 106 shareholders and 9,727 shares. The reduction is mainly due to shares surrendered through the Batemans Bay and Port Stephens-Great Lakes Marine Parks buy out programs.

The number of shares per fisher ranges between 10 and 350 shares. The average number of shares per shareholder has increased from 89 in 2010/11 to 98 in 2014/15. This has increased from 54 in 1996/97. There has been an increase in the number of shareholders who hold large shareholdings and a reduction in the number of shareholders who hold small shareholdings (Figure 4.5). There has also been a redistribution of shares from small to large shareholders. In the two most recent fishing periods, 2013/14 and 2014/15, there has been an increase in the number of shareholders who hold >200 shares, suggesting a continuing consolidation towards larger shareholdings.

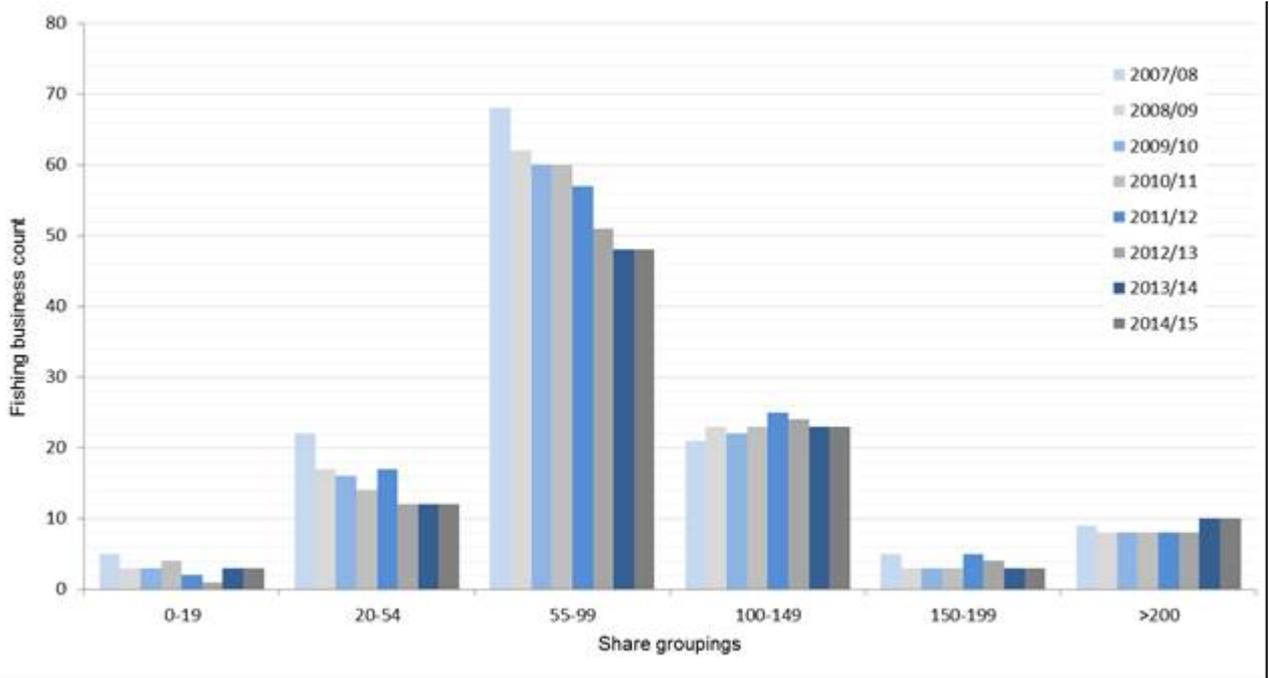
Changes in the structure of the fishery have resulted in fewer fishers landing a higher proportion of the total reported catch (Figure 4.6). In 2012/13, 50 per cent of reported catch was landed by 14 fishing businesses, while 75 per cent of catch was landed by 30 fishing businesses. Preliminary data for the current season indicates that 15 fishing businesses have landed 50 per cent of the catch, and 31 fishing businesses have landed 75 per cent of the catch.

The transferability (leasing) of quota is helping to facilitate the change towards fewer fishers landing a higher proportion of the catch; however there are high transaction costs associated with transferring small parcels of quota which could be resulting in some quota remaining unfished at the end of the season. The Department reports that this is unlikely to be the case; with accessibility to quota being more of an issue than any price point relating to the transfer fee. Nonetheless, the proposed implementation of an on-line quota transfer system should assist in lowering the transaction costs associated with quota transfers. It will also assist with connecting those who wish to transfer quota and those who require additional quota.

Under current management arrangements for the lobster fishery, individual fishers are prevented from owning more than 350 shares in the fishery. This limits the further restructuring and economies of scale that can be achieved in the fishery.

However, the Department has reported that the current maximum shareholding does not prevent additional shares being held in corporate entities or associated structures. As such, and as fishers report, this allows individuals to derive benefits from greater shareholdings than the maximum. That said, the Committee supports the proposal to amend the maximum shareholding to 40 per cent of the total number of shares in the fishery, which would be consistent with other NSW share managed fisheries.

There is the greatest abundance of shareholders and shares in the Port Stephens Fisheries District (Figures 4.7 and 4.8). There are also a large number of shares and shareholdings in the Illawarra Fisheries District. Taken together, Figures 4.7 and 4.8 suggest that the shareholders with the largest shareholdings are concentrated in the south of the fishery.



**Figure 4.5: Distribution of shareholders by share grouping for the 2007/08 to 2014/15 fishing periods. # 2014/15 data as at 28 April 2015.**

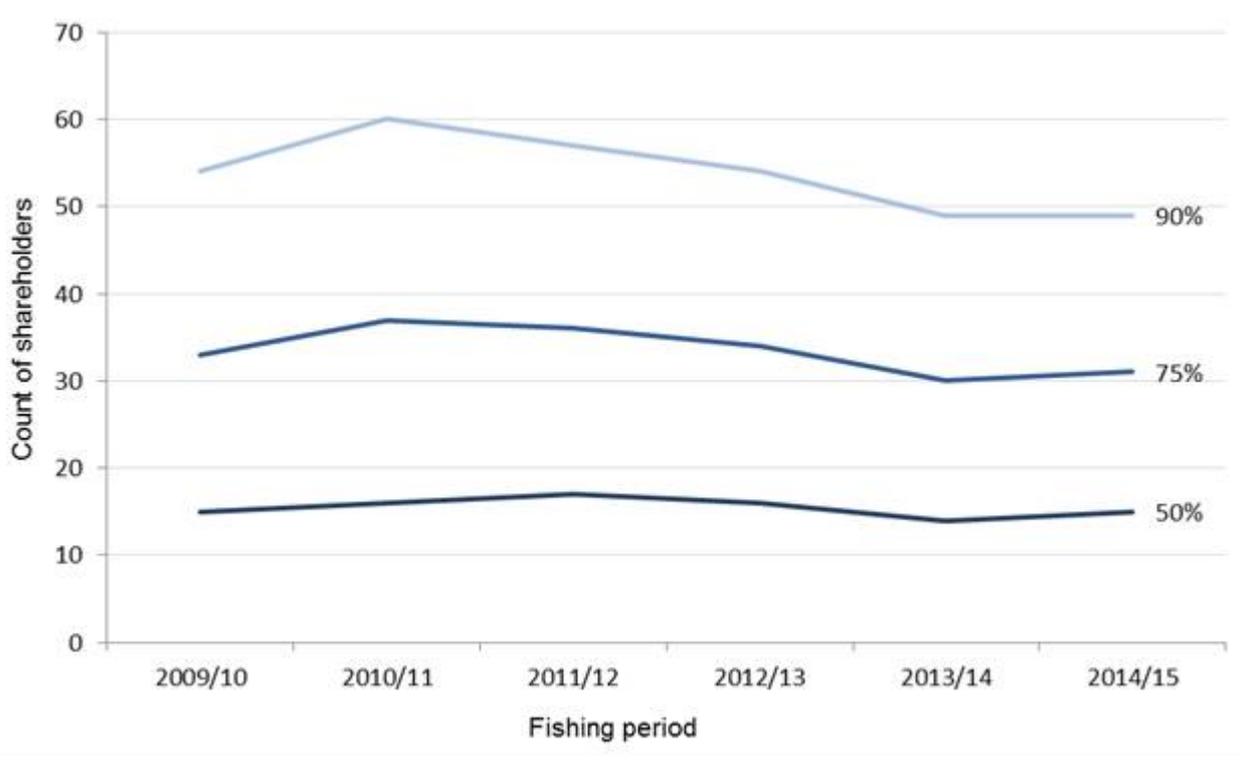


Figure 4.6: Number of shareholders catching % of TACC # 2014/15 data as at 28 April 2015

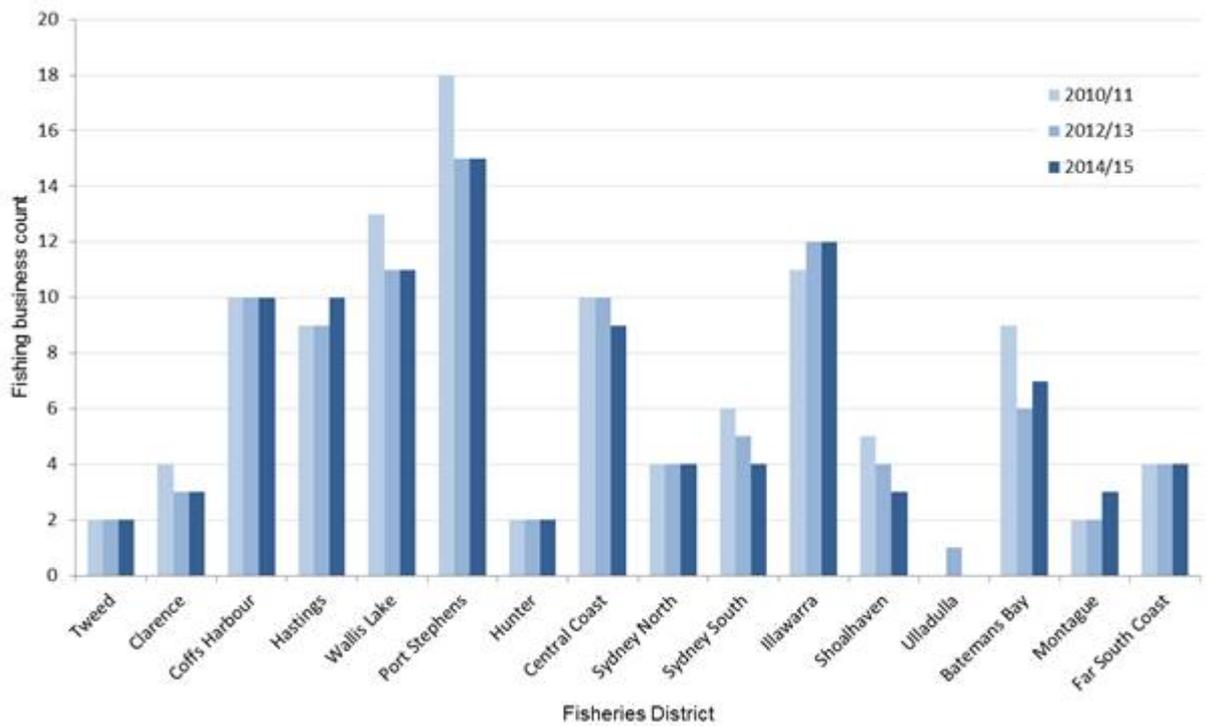
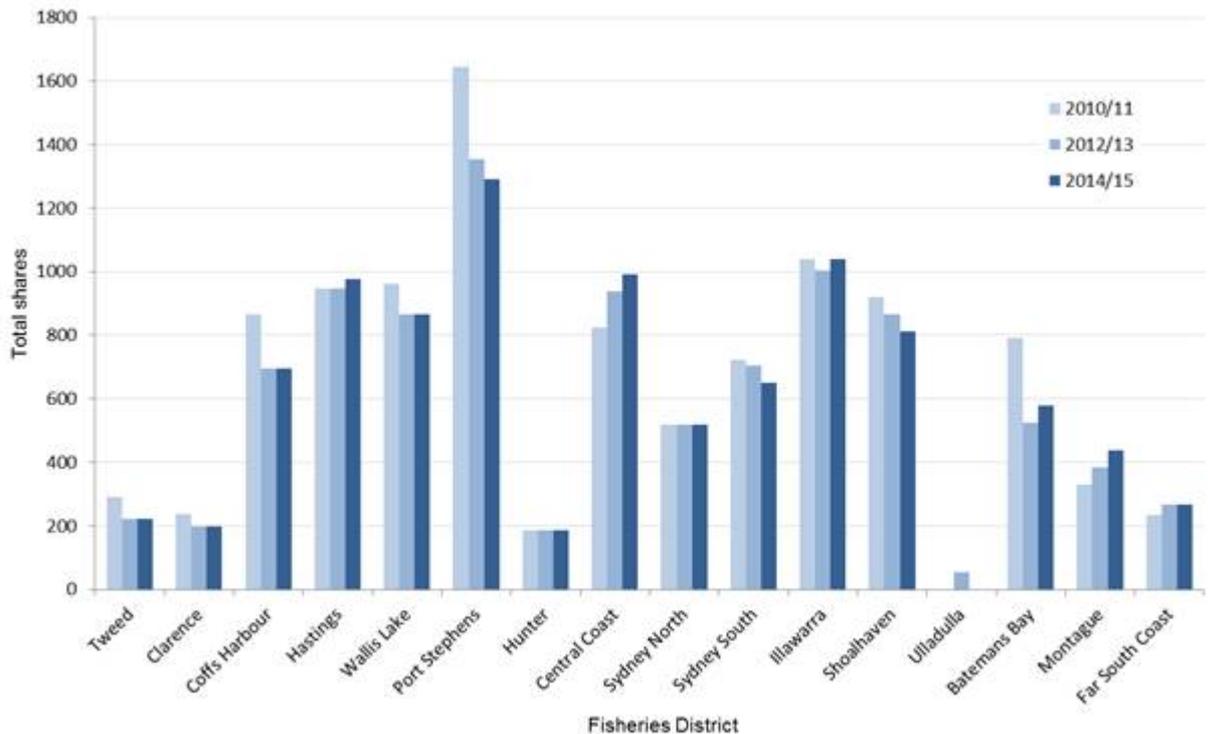


Figure 4.7: Number of shareholders per Fisheries District in 2010/11; 2012/13 and 2014/15 fishing periods. # 2014/15 data as at 28 April 2015.



**Figure 4.8: Number of Shares held in each Fisheries District for each fishing period from 2010/11; 2012/13 and 2014/15. # 2014/15 data as at 28 April 2015.**

The Department has indicated, and the Committee agrees, that structural change in operations promotes stewardship and allows for greater efficiency in both fishing effort and the administration of the fishery. The ultimate result of restructuring is to improve the long-term economic sustainability of the fishery. The Committee remains of the opinion that market forces, particularly through the market for shares, rather than regulatory intervention, offer the best way to achieve the benefits of restructuring. In this regard, care must be taken that regulation of the share market does not impede desirable structural change.

#### **4.10 Share trading, transfers and values**

In accordance with the *Fisheries Management (Lobster Share Management Plan) Regulation 2000*, shares can be traded in packages of 10, or other sizes as approved. The ability to trade shares allows existing shareholders to structure their operations based on performance during the year and, to some extent, the availability of lobsters.

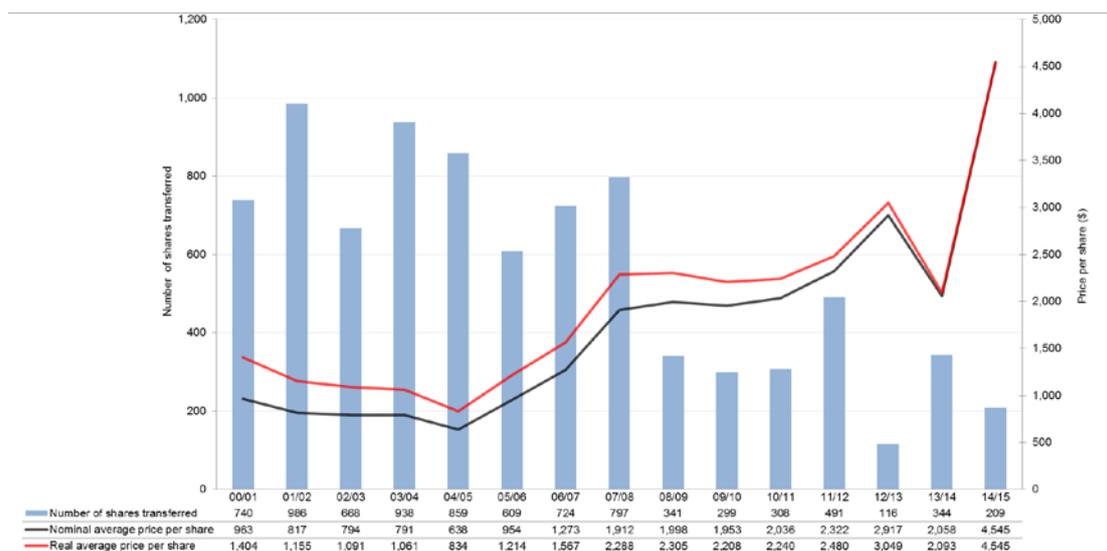
In 2013/14 there were eight share transfers processed, and a total of 344 shares transferred. This is more than double the number for 2012/13 (116 shares). The total value of the eight transfers was \$719,992 with an average price of \$2,093 per share in real terms. This was a 31 per cent fall from the previous period when they were \$3,049 in real terms (Figure 4.9). In the current fishing period there have been 2 share transactions processed for a total of 209 shares (as of 9 June 2015). No value was attributed to one of these transfers. However, for the other a price of \$4,545 per share was recorded.

Share transfer prices provide an indication of the economic health of the lobster fishery, and of expectations of industry participants on the future outlook of the fishery. In this sense, price rises between 2004/05 and 2008/09 can be interpreted as reflecting improved economic conditions and rising expectations concerning the future economic and biological health of the industry. During this time share prices

almost tripled in real terms (Figure 4.9). The recent large increase in share prices also provides an indication that economic conditions in the fishery are continuing to improve as would be expected in response to greater stock abundance, rising prices, and lower harvesting costs. However, the Committee would caution that high catch rates and stock rebuild may be leading to overoptimistic valuations, particularly if expectations of future TAC growth are unrealistic.

The drop in share prices in 2013/14 is puzzling. However, given the structure of the industry (e.g. family and other links between shareholders), and the relatively small number of shares traded, the extent to which average share prices reflect 'true' market values is not clear.

Share prices reflect the present value of all future expected net returns from the fishery given reasonable certainty of title and a competitive market. As such, share prices can be used as a proxy for net income in the absence of cost data. The use of share prices as a tool to estimate economic returns is discussed in more detail in Section 4.15 below.



**Figure 4.9: Number of shares transferred, estimated share price and CPI adjusted (real share price) by fishing period from 2000/01 to 9 June 2015.**

#### 4.11 Quota

Quota is allocated to shareholders in proportion to their shareholding. The Department reports that there is no longer a minimum quota transfer volume. Quota can only be transferred within the current fishing period and cannot be transferred between fishing periods. Under the Share Management Plan, shareholders may not acquire, by any such transfer, more than twice the amount of the shareholder's initial quota for the fishing period. According to the Department, this clause was included in the Plan to encourage shareholders to buy shares, in order to promote restructuring of the industry, rather than allowing small shareholders to buy large quantities of quota without a longer-term commitment to the fishery. The benefits of this policy must be set against the cost of the loss of flexibility it imposes on the industry. The Committee recommends that industry maintain a watching brief on the extent to which this limit becomes binding, thereby restricting the ability of fishers to take advantage of favourable catching conditions / stock abundance by leasing in quota.

#### 4.12 Quota transfers and values

The amount of quota transferred in 2013/14, 44.8 tonnes, was slightly lower than in 2012/13, 48.9 tonnes (Table 4.3). Fishers indicate that the ability to lease quota

helps improve efficiency by providing them with greater flexibility in handling fluctuations in catches. As stated above, the restrictions on the amount of quota that can be transferred could, however, impede full attainment of these efficiency gains. Further, industry reports that the high fee paid on quota transfers is inhibiting trade in small parcels of quota. The Committee notes that the on-line system, which was scheduled to start in June 2012, but has now been delayed, will assist in reducing transactions costs associated with quota transfer and should, therefore, increase the efficiency of these transfers.

**Table 4.3:** Total quota transferred (t), number of quota transferors and transferees, amount of TACC transferred (%) and the average price paid for quota (\$/kg) in each fishing period from 2000/01 to 28 April 2015.

Fishing period	Quota transferred (t)	Quota transferors (out)	Quota transferees (in)	TACC transferred (%)	Nominal Average Price (\$/kg)	Real Average Price (\$/kg)
2000/01	17	31	29	11%		
2001/02	30.6	40	24	20%		
2002/03	44	77	60	33%		
2003/04	29.3	56	41	22%	\$7.17	\$9.61
2004/05	34.5	68	47	34%	\$10.89	\$14.24
2005/06	30.1	64	45	30%	\$13.15	\$16.73
2006/07	35.6	59	23	32%	\$15.64	\$19.25
2007/08	42.3	60	32	34%	\$17.90	\$21.42
2008/09	42.2	48	36	33%	\$15.90	\$18.34
2009/10	39.3	52	43	31%	\$14.76	\$16.69
2010/11	36.3	48	41	28%	\$17.00	\$18.70
2011/12	48	51	45	32%	\$17.69	\$18.90
2012/13	48.9	49	36	35%	\$19.56	\$20.44
2013/14	44.8	55	34	30%	\$20.68	\$21.04
2014/15	43	44	37	29%	\$21.06	\$21.06

The largest businesses, in term of numbers of shares held, were most likely to transfer quota into the business, and the smallest shareholders were more likely to transfer quota out of the business.

In past reports, the Committee suggested that the trend (between 2000/01 and 2007/08) in the number of quota transferors significantly exceeding the number of transferees indicated progressive reallocation of quota from smaller to larger operators. However, since this time, with the exception of 2013/14, the margin with which quota transferors has exceeded transferees has declined, suggesting a slowing in reallocation of quota from smaller to larger operators.

There is a relationship between the percentage of TACC caught and the percentage of quota transferred, albeit an imperfect one. License holders are likely to be more willing to lease (invest) in additional quota where there is a strong expectation that the additional quota will be caught under a constraining TAC. For example, in 2000/01 when the percentage of TACC caught was around 68 per cent, the percentage of quota transferred was only 11 per cent. Conversely, since 2004/05 when the percentage of TACC caught has been close to 100 per cent, the proportion has been around 30 per cent.

In the current fishing period to 28 April 2015, only 14 (19 per cent of quota transferees) provided data on the price of quota transfers. The available information indicates that quota transfer prices in 2014/15 were roughly the same as in 2013/14 at \$20.06/kg (Table 4.3). Quota transfer prices have been gradually increasing since 2009/10 after having fallen for several years. The fact that quota prices have remained relatively flat in the past two years is surprising given that quota prices are an indicator of the short run profitability of the fishery, which has improved in the past two years. Further, in the past the Committee has observed that as beach prices increase, as occurred in 2014/15, and as catch rates and beach prices increase, as occurred in 2013/14, quota transfer prices also increase. The most likely reason that an increase has not been observed is the low level of reporting of quota transfer prices by fishers, resulting in a sample that is not representative of the true price. The Department is of the opinion that reported quota prices provide a reasonably accurate picture of true market values, albeit tracking slightly lower. Further, the Department reports that the reason that quota prices have remained low is that fishers are unwilling to pay higher prices to lease in quota.

Given the advantage of having access to the price of quota transfers, the Committee continues to recommend that the Department and the Lobster Industry Working Group encourage fishers to make further efforts to report price information for quota transfers.

The Committee notes the Department's response to its recommendation that once legislative amendments have been completed, an on-line system for transferring quota will be operational which will facilitate better reporting of quota transfer prices. However, even with the on-line system, reporting of prices for quota transfers is optional. As such, the Committee is still of the opinion that fishers should continue to be encouraged to provide information on the price of quota transfers.

**The Committee repeats its recommendation that the Department and the Lobster Industry Working Group encourage fishers to make further efforts to report price information for quota transfers.**

#### **4.13 Impact of illegal and unreported removals**

Earlier in this report the Committee noted that industry had decided not to fund a dedicated compliance officer. As discussed in previous reports by the Committee, illegal activity results in lost economic value to the fishery that could be reduced through the use of a dedicated compliance officer. The Departmental scientist estimates that illegal take is around 8.5 per cent of total take in the fishery, which in 2013/14 represents around 14 tonnes. At prices prevailing in 2013/14 illegal take in the fishery is estimated to be worth \$997,080 in real terms.

The Committee is pleased that the Department is attempting to make a more accurate estimate of the extent of illegal take. However, estimates of illegal take provided to the committee by the Department still vary. Given that illegal take is factored into TACC decisions, a more accurate estimate of illegal take should be pursued. In previous reports the Committee suggested that the return on investment to determine the real extent of illegal catch (which may or may not result in an increase in TACC) would be high.

In previous determinations the Committee recommended that Industry consider investing more heavily in compliance activities to assist in reducing illegal catch in the fishery. The Committee notes the Department's response to this recommendation, i.e. that at a LobMAC meeting held in 2010, industry representatives advised that they would only pay operating costs for compliance in the budget and would no longer pay for a salary, to bring them in line with other NSW quota managed fisheries.

#### **4.14 Recreational and Aboriginal cultural catch**

As with illegal catch, there is the possibility of lost economic value from the commercial fishery due to the recreational catch. Current figures provided by the Departmental scientist estimate recreational catch at around 10 per cent of total take in the fishery, which in 2012/13 represents around 16 tonnes. At prices prevailing in 2012/13, 16 tonnes of catch is worth \$1,139,520.

It appears unlikely that the Aboriginal cultural catch is significant, based on reports by Departmental officers that the number of requests for permits has decreased and the actual catch is only a fraction of the total permitted.

As the lobster stock continues to increase in abundance, there is a risk that a great number of animals could be taken by the recreational and, to a much lesser extent, Aboriginal cultural sectors and through illegal take.

Current efforts to more accurately record recreational catch and Committee commentary on how these efforts could be made more effective are discussed in sections 3.2.1 and 5.2.

The Committee is also pleased that a lobster tag system has been used as a tool for compliance, for use with Section 37 permits issued for Aboriginal cultural and ceremonial fishing.

**The Committee recommends that the Department continue to invest resources in obtaining more robust time-series estimates of recreational catch.**

In previous determinations, the Committee recommended that the Department direct funding towards developing a resource-sharing model for the lobster fishery, as is currently occurring in the WA lobster fishery. The Committee is pleased that a draft policy for resource sharing in NSW Fisheries will be developed by the recently established Ministerial Fisheries Advisory Council.

#### **4.15 Economic data**

As noted in several of the preceding sections of this report, economic analysis would help the TAC Committee to better understand the impact of its determinations on the economic viability of lobster fishing businesses. It would also assist the Department in making more informed management decisions.

The Committee is pleased that the Department has started discussions with industry about the importance of collecting economic data to underpin economic analysis of the fishery. The Committee notes that industry is still cautious about the need for economic data to be collected and is, instead, focussed on building biomass and ensuring ongoing security of the resource. However, either way, the question as to the level to which the stock should be rebuilt to still remains.

There are a number of ways in which economic analysis of the fishery could be undertaken, ranging from simple analysis of the value of shares to a more detailed analysis of net returns from fishing using costs and earnings data collected through a survey of lobster fishing businesses. The different options, which are not necessarily mutually exclusive, are presented in more detail in Box 1.

The Committee is of the view that calculation of net return through collection of data on the costs and earnings of lobster fishing businesses would be the best place to start in undertaking economic analysis of the lobster fishery. This would allow for the heterogeneous nature of lobster business operations to be taken into account in economic analysis of the fishery (see Section 4.7, above).

The Committee recommends that a working group is set up to progress development of an approach to undertaking economic analysis in the lobster fishery.

**The Committee recommends that the Department and Industry set up a joint working group to develop an approach to undertaking economic analysis in the NSW Lobster Fishery.**

**Box 1: Options for Economic Analysis of the NSW Lobster Fishery (adapted from ABARE, 2007)**

*net economic returns*

Using survey data on the costs and earnings of different lobster fishing businesses, net economic returns can be calculated for different types of business structures, and for the fishery as a whole. An example of the collection of economic data on the South Australian Southern and Northern Zone Rock Lobster Fisheries (and other fisheries) by EconSearch can be downloaded from the Econsearch website ([www.econsearch.com.au](http://www.econsearch.com.au)).

*productivity indexes*

A productivity index can be calculated by combining changes in total output (lobster) to changes in total inputs, such as fuel, labour and capital. This index shows whether more or less output is being produced over time with a unit of input. An example of the calculation of productivity indexes for the Torres Strait prawn fishery can be found in Hanna et al. (2006).

*share and quota prices*

The price of share transactions can be used to estimate the economic value of a fishery managed by output controls. Given reasonable certainty of title and a competitive market, the price at which shares are traded will reflect the present value of all future expected net returns from the fishery. However, and as mentioned earlier in this report, given the structure of the lobster industry (e.g. family and other links between shareholders), the extent to which average share prices reflect 'true' market values in the lobster fishery is not clear.

Quota lease prices can also be used as an indicator of fishery profits. However, as with share prices, quota lease prices are not routinely reported, with as little as 20 per cent of lobster fishers reporting price information. As such, they cannot be relied upon to provide an accurate reflection of economic value.

An example of the use of quota sale and lease prices to estimate the economic value of New Zealand's ITQ fisheries can be found in Newell et al. 2007.

*technical efficiency analysis*

Technical efficiency analysis is used to estimate vessel level efficiency and is particularly useful in comparing efficiencies before and after a change in management arrangements. An example of the use of technical efficiency analysis in the northern prawn fishery can be found in Kompas et al. 2004).

Collection of information on the costs and earnings of lobster fishing businesses would place industry in a much more informed position regarding setting of the TACC in order to maximise profits. The level of the TACC at which profits (net returns) from lobster fishing are maximised for the fishery as a whole is known as maximum economic yield (MEY). At MEY the TACC is lower than it would be if it was set with reference to stock abundance only, i.e. at maximum sustainable yield (MSY). A profitable fishery is also more resilient to changes in key variables that affect all industries, such as exchange rates and fuel prices. The TACC is currently set with reference to MSY.

If data were to be collected on costs and earnings of lobster fishing businesses it could be incorporated into the current biological model used to estimate the status of

the stock, and set the biological MSY. Using the model, net returns could be estimated for different rates of stock recovery.

The collection of costs and earnings data would also make it possible to undertake technical efficiency analysis of lobster fishing businesses (as outlined in Box 1) which would help inform the optimum size and structure of lobster fishing business in order to maximise returns from fishing.

In the Committee's previous determination the process, and cost, of conducting a survey, similar to that run by EconSearch for the NSW Abalone Fishery, was provided. The Committee is still of the opinion that this type of survey should be conducted for the NSW Lobster Fishery. The survey should commence as soon as possible and be repeated every three years (with annual updates). As recommended by the Committee in past determinations, the issue of funding for the survey (government, industry or some combination), should also be resolved.

#### **4.16 Community Contribution**

The Fisheries Act requires that shareholders in category 1 share management fisheries, which include rock lobster, make a periodic contribution for the right of access to the fishery (a community contribution) as prescribed in the management plan.

The community contribution charge in the NSW commercial lobster fishery was based on a decision by the NSW Government to return economic rent being earned by lobster fishers to society. It was designed on the basis that in a well-managed fishery with TAC set with reference to MEY, there is potential for economic rent to be earned by fishers.

Economic rent is profit (after accounting for all costs, including the full costs of management) in excess of normal returns on capital<sup>1</sup>. Estimates of normal returns on capital in commercial fisheries vary, but can be as high as 10 per cent. An estimate of economic rent in the fishery should be made to avoid too much rent, or too little rent, being appropriated from the fishery through a community contribution charge. As part of the economic rent in the fishery is attributable to the skill of the fisher, there is a strong argument for not appropriating all of the economic rent in the fishery.

The current community contribution charge in the lobster fishery is \$115 per shareholder. At some point in the future, the community contribution charge may change and be based on net returns and economic rent in the lobster fishery (this was due to happen in 2012). Given the recent improvements in economic returns in the lobster fishery, this may not be too far off. Without any reliable estimate of economic returns, estimates of net returns and economic rent will be based on a study by Hassall and Associates in 1999. Undoubtedly, net returns in the fishery have changed since this study was undertaken. It is imperative that more up to date information on net returns from fishing is collected prior to commencement of any new community contribution charge.

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<sup>1</sup> Economic rent is comprised of three types of rent: entrepreneurial rent, quasi-rent and resource rent. As in any business some operators are more skilful than others and will therefore earn more profit. Rents attributable to the skill of fishers are described as entrepreneurial rents. Entrepreneurial rents should be left with fishers. Entrepreneurial rents can be as high as 36 per cent of total economic rent in the fishery (ABARE, 1990). In the short-term fishers may earn large surpluses over costs, which may provide prima facie evidence of substantial resource rents. However, there are some circumstances where such surpluses can occur but they are not true rents. These are referred to as quasi-rents. One example is where a fishery is developing or recovering and there may be under-investment in the fishery. Another example is where there is a short-term but unsustainable increase in price due to, for example, exchange rate fluctuations. However, some profits will be obtained because the natural resource being used (i.e. the fishery) has a value. These profits are described as resource rents and are also a component of economic rent.

#### 4.17 Conclusion

While the lack of information on the net return from lobster fishing means that only tentative conclusions about the economic status of the industry are possible, the evidence available to the Committee suggests that the lobster industry in NSW is economically viable. Both quota and share prices have increased in recent years indicating a perception by industry that the future outlook for the fishery is positive. The increase in viability is a result of a number of factors including increases in stock abundance and catch per unit effort, the latter believed to have been influenced partly by an improvement in the efficiency and practices of lobster fishers.

As optimism in the fishery continues to improve the Committee would suggest that fishers remain cautious about overinvestment, and to take into account of the potential impact of future events such as changes in recruitment, market demand or future management arrangements (e.g. increases in cost recovery).

There has been significant restructuring in the lobster fishery with fewer fishers landing a higher proportion of the catch. This structural change is desirable in order to allow for the most efficient fishers to land the majority of the catch, and to ensure the continued viability of lobster fishing businesses.

Industry and the Department should continue to explore new marketing initiatives for NSW rock lobster. The opening up of new export markets is worthy of further investigation, especially the expanding Vietnamese market which may have the capacity to take stock from NSW.

The Committee notes that there is a premium paid for larger sized Eastern Rock Lobster on the Sydney Fish Market. The Committee believes that it is worth investigating the factors behind this premium, as well as undertaking analysis of the relationship between length and economic yield.

The Committee is pleased that industry continues to be entrepreneurial in their approach to improving productivity and cutting costs. However, it notes that the heterogeneous nature of the fishery means that these productivity gains and cost cutting measures are not uniform across the fishery. As such the Committee recommends that further investigation of the structure of fishing businesses be undertaken so that both the Department and the Committee can better understand the impact of its decisions on the economic well-being of industry.

The Committee has made a number of other recommendations in this report that are aimed at providing improvements in the economic viability of the lobster fishery in the future. Among these is the recommendation that lobster fishers make further efforts to report price information for quota transfers.

The Committee has also recommended that the Department and Industry set up a joint working group to develop an approach to undertaking economic analysis in the NSW Lobster Fishery. Given that industry is still cautious about the need for economic data to be collected, the Committee is of the opinion that a more formal process for discussion of approaches to undertaking economic analysis is needed. The Committee has provided a number of possible approaches that could be taken, however it is still of the view, as outlined in a number of previous determinations, that the best approach to economic analysis is to estimate net returns using data from a survey of costs and earnings of NSW lobster fishing businesses.

Better economic data, such as information on the costs and earnings of lobster fishing businesses, will allow for a TACC to be set that maximises economic returns from lobster fishing. It will also facilitate better management decisions by allowing the department to better understand the impacts of alternative management options on the financial wellbeing of industry.

The Committee is pleased that more robust time-series estimates of recreational and Aboriginal cultural lobster catch are necessary, and that efforts are being made to collect better recreational and Aboriginal cultural catch data. However, more is needed and, as such, the Committee recommends that the Department continue to invest resources in obtaining more robust time-series estimates of recreational catch

As outlined in Section 3.4 above, the Committee's determination for an increased TAC in 2015/16 strikes a balance between i) allowing for additional catch based on evidence that significant rebuilding of the spawning biomass has been achieved and ii) using a conservative approach to exploring the biological (and economic) potential of the fishery.

## **5. MANAGEMENT CONSIDERATIONS**

### **5.1 Introduction**

This section of the report provides background information on the New South Wales rock lobster fishery, focusing on the commercial component. The Department has been the key information source for data on the fishery, through its submission to the Committee. In the context of TACC setting, the status and effectiveness of the current management regime and areas where improvements could be made are considered. Some overall conclusions are drawn.

### **5.2 Components of the fishery**

#### **5.2.2 Commercial**

Rock lobsters have been commercially harvested in New South Wales since the 1800s. The fishery is based almost exclusively on the Eastern rock lobster (*Jasus verreauxi*). Occasional landings of southern rock lobster and painted rock lobster occur, but these amount to less than 1% of the catch.

Sustainable management of the commercial fishery for Eastern rock lobster has its own challenges compared to other Australian lobster fisheries because the larger, mature lobsters that make up the breeding stock of the fishery are found in the north of the state. In southern waters, smaller immature lobsters that have yet to breed are harvested.

The NSW commercial fishery for rock lobster is very small by comparison to similar fisheries in other States. While other lobster fisheries are strongly dependent on export markets, the NSW fishery has an established market within the State and in the past only small quantities have been exported, although this is changing with approximately 30% being exported, with the main market being Vietnam. (The easing value of the Australian dollar is relevant to this change and, as discussed in the economics section, reporting of this and other economic factors would be useful.)

Despite the growing export market, the domestic market remains the predominant market. Eastern rock lobsters are clearly sought after by consumers (particularly by the Chinese community) and attract and maintain relatively high prices and strong demand domestically. The relative lack of volatility enjoyed by domestic fisheries (compared to mainly export fisheries) are strengths for the fishery into the future and a factor likely to temper the growth of the export component of the fishery in proportion to the domestic component.

Since 1994, the setting of an annual Total Allowable Commercial Catch (TACC) and the allocation of transferable, individual fishery catch quota (shares) to licence holders have been the most important management measures for the fishery. The total commercial catch in the fishery is effectively constrained by the annual TACC. Concerns that have been expressed in the past about the capacity of the commercial sector to take all of the allocated TACC are now redundant, with annual landings above 95% of the TACC for more than ten years. Industry representatives were confident that, as in recent years, nearly all of the TACC would be taken before the end of the season in July 2015.

The quota system is augmented by minimum and maximum size limits, a prohibition on taking berried females and gear restrictions. The 2004 decision to reduce the maximum size for lobsters from 200 to 180 mm continues to yield dividends in terms of adult spawning stock and protection, which is a priority management objective for the fishery. The minimum size limit was reviewed in 2005 and maintained at 104mm.

Minimum quota holdings also apply. 55 shares must be held before a shareholder is eligible for an endorsement to fish, although shareholders who held less than 55

shares at the time that the quota system was introduced are also eligible. Over the past ten years, the total number of shareholders in the fishery has contracted, leaving 43% less shareholders in the fishery since 2000 (174 down to 99 in 2014/15).

Similarly, the proportion of shareholders that hold less than the minimum shareholding (55) has reduced drastically since the introduction of quota reflecting a general trend of share reallocation from small (<55) to large (>100) shareholdings and is consistent with the increasing specialisation of lobster fishers (in comparison to the traditional business structure of most fishers operating in more than one commercial fishery). It is also now apparent that an increasing proportion of the total catch is being taken by this smaller group of operators who fish predominately for lobsters. In 2011/12, 50% of the reported catch was landed by 16 fishing businesses while 75% of the catch was landed by 36 fishing businesses. Preliminary data for the current season indicates that 15 fishers have landed 50% of the catch and 30 fishers have landed 75%. This consolidation is consistent with the management objectives for the fishery.

Transfers in shareholdings seem to have stabilised over recent years. Access to quota to buy and to lease is reportedly an issue for some in the fishery. The proposed implementation of an on-line quota transfer system should assist in lowering the transaction costs associated with quota transfers.

Overall, the process of restructuring the fishery is proceeding at a steady rate and with the introduction of web-based trading, further efficiencies should be recognised

### **5.2.2 Recreational**

There are about one million people in New South Wales who partake in some form of recreational fishing. A licence is required, although there are exemptions to that requirement. In total the recreational sector pay approximately \$12,000,000 in licence fees. Recreational fishing for rock lobster is restricted to the use of a single pot (which may be used in waters less than ten metres) or to take by hand (i.e. diving) without any assistance from scuba or hookah equipment. A daily bag and total possession limit of two applies, and recreational fishers are subject to the same minimum and maximum size restrictions as the commercial sector.

Estimating the number of people who target rock lobsters and what they catch is the subject of regular and ongoing discussion at the TACC setting forum. Anecdotal information suggests that the use of recreational pots is contracting in popularity, with recreational diving for lobsters becoming more popular. The Committee have noted comments made in the recent past by commercial fishers that recreational fishers appear to be enjoying improved rock lobster catches in NSW and that tight restrictions on commercial harvest may not result in the intended gains to the rock lobster stock due to increasing recreational fishing harvest. There is no quantitative evidence available which would support or refute either contention. Currently, the 2000-01 National Recreational and Indigenous Fishing Survey (NRIFS) data are the only reliable state-wide estimates of recreational effort and catch for both freshwater and saltwater fisheries in NSW. Updated measures are required.

In response to this need, DPI commenced a statewide recreational fishing survey in March 2013. Last year's TACC report details the design on the survey. The final report of the survey has not been finalised yet. It is noted that due to design limitations it will provide only coarse catch information and not any detailed information on rock lobster fishing that will be sufficient to inform specific lobster fishery management decisions.

In the meantime, the stock assessment for the fishery continues to make assumptions about the recreational catch for input into the model. Currently the

estimate used in the model is 10% of the reported commercial catch, which translates to between 10 and 16t over time. Discussions with the Committee suggest that this is a reasonable assumption in the absence of reliable data, but highlight the need for a renewed focus on getting reliable data. This is particularly relevant as catches and catch rates increase, and lobsters are more easily available to recreational fishers. This is likely to result in more people fishing, and more targeting of lobsters. As discussed in the stock assessment section, there are means of improving the recreational fishery data and these should be explored. The recreational sector should be engaged early in these discussions.

### **5.2.3 Aboriginal**

In 2010, Aboriginal peoples' connection to the fisheries resource was formally recognised in fisheries legislation through the introduction of a new object to the *Fisheries Management Act 1994* (the Act). Aboriginal cultural fishing is also now articulated in the Act as distinct from recreational and commercial fishing.

At the same time, section 21AA was inserted into the Act but has not commenced. That section provides regulation making powers that allow limits (including bag and possession limits) and/or other management options to be applied to the special cultural fishing provisions. The regulations that may be made under section 21AA cannot be made without first consulting the Aboriginal Fishing Advisory Council (AFAC). That consultation has commenced with AFAC and a broader cross sector working group to develop proposals which seek to balance sustainability with the needs of Aboriginal people, recreational fishers and the commercial industry.

In the meantime, an interim compliance policy is in place to capture the spirit of this yet to be commenced provision of the Act. The current interim compliance policy allows an Aboriginal person to take double that of the prescribed recreational bag / possession limit (other than for abalone, for which the extended limit is 10) to provide for cultural needs where elders, the incapacitated, or other community members are unable to fish for themselves. The arrangements apply by increasing an individual fisher's limit – it is not an accumulated limit related to the number of people that the fish are being provided for. Under the interim arrangements, the shucking of abalone, rock lobster and turban shell is also permitted within 100 metres of the high water mark but only if the fish are consumed in this area.

The policy applies to cultural fishing in State waters, including appropriate zones of the NSW marine parks. All other fishing activity and possession of fish and/or fishing gear must comply with the current fisheries legislation.

If Aboriginal people wish to access the fisheries resource for larger cultural events that exceed the amended daily bag and possession limits provided for under the policy, an application for an Aboriginal cultural fishing authority under section 37(1)(c1) of the Act can be made. Section 37 permits provide defences against some aspects of the fisheries laws, subject to conditions. In 2012/13 only three cultural permits were sought and issued. In 2013/14, four permits were issued and in 2014/15 there were two. Fisheries Officers report that the actual take under these permits is less than the maximum permitted.

### **5.2.4 Illegal take**

A key objective of the Share Management Plan for the fishery is to minimise the number of offences that occur in the fishery. The FMS specifies a trigger of 70% compliance rate. For 2013/14 the overall compliance rate for the fishery was 74%, sitting above the trigger point. However, when broken down into commercial and recreational compliance, the rates for 2013/14 differ significantly. The commercial compliance rate is 58% (down by 4% on previous period) and the recreational compliance rate is 91% (up 3% from previous period).

The figures from the incomplete 2014/15 period suggests that overall compliance rate will remain steady at around 72% and there will continue to differences between the two sectors although the commercial compliance rate is expected to increase for 2014/15 once the fishing year is over and complete figures are available.

Reporting on compliance rates and/or detection rates is notoriously difficult as improvements in the targeting of compliance effort can lead to more offences being detected, which can appear as higher levels of non-compliance when reported statistically. In fact, the use of an intelligence-led approach should lead to a higher rate of detections. Therefore, crude 'compliance rate' information is difficult to draw conclusions from without also being supported by further analysis and qualitative explanations.

Data on the number of hours dedicated to rock lobster compliance indicate increasing levels of targeting. In particular there was a spike in 2013/14 which reflected the focus on a small number of high-end offences. This reinforces the relationship between targeted, intelligence-led compliance effort and detection rate – which appears in the outcomes as a decreased compliance rate but actually reflects well on the compliance regime in the fishery.

**Table 5.1: Breakdown of compliance effort for the commercial and recreational sectors**

Year	Patrol hours commercial	Patrol hours rec	Total patrol hours	% targeted
2012/13	1722	2959	4681	~30%
2013/14	2269	3160	5429	57%
2014/15 incomplete (7 months)	967	1468	2436	35%

Next year, it would be informative for the level of targeted effort to be reported by sector so that the impact of the intelligence-led planning process can be assessed for the commercial and recreational sectors separately.

*Commercial sector*

The Compliance Report provided the main reasons for the spike in commercial offences in 2013/14:

- 108 offences detected in the Shoalhaven / Illwarra zone, all of which arise from one matter involving both fishers and processors; and
- 37 offences detected in the Metropolitan and Central Coast zone, 28 of which arise from one matter involving both fishers and receivers; and
- Some lower-end offences related to logbook reporting etc.

From the information provided to the Committee and the discussion at the public forum, the Committee is satisfied that the level of offending detected in the commercial sector over the previous two complete seasons reflects well on the compliance regime and does not represent a breakdown of compliance in the sector. Certainly the majority of industry represented at the public forum, and particularly through the Industry Working Group, have a position that the strongest penalties possible should be applied in these cases. Loss of demerit points and forfeiture of quota represent the biggest deterrent for commercial operators.

The current 2014/15 season has not seen the same level of offending in the commercial sector, with the non-compliance detected being in the form of cautions and for relatively minor offences. The Committee supports the continued focus on ensuring compliance with the quota monitoring system which can seem minor and

administrative but that nonetheless have the potential for significant cumulative impact if left unaddressed over time. These include timely logbook returns, and proper use of tags in sequential order, among others. These things are also important to running an efficient and cost-effective quota monitoring system.

#### *Recreational sector*

The recreational fishery generally displays a high level of compliance, which is ascribed in part to the fact that lobster fishing is highly specialised and those that do it do it well. As with other recreational fisheries, a high percentage of the catch is taken by a small percentage of fishers.

The 2013/14 season saw 98 offences dealt with in the recreational sector, with nearly 60% being considered relatively minor and dealt with by way of written caution, 55 in total. A further 35 infringement notices were issued for more serious offences, most commonly for bag and size limit matters and taking lobsters other than by hand. A further four offences were dealt with by prosecution for a recreational fisher who was found to have 11 lobsters concealed on his boat, the information being that these were most likely taken from commercial traps.

The current incomplete season for 2014/15 is on track for similar outcomes.

It is important to note that there is a category of person that engages in illegal fishing that is undertaken by unlicensed fishers but is commercial in nature. Sometimes this activity gets picked up in recreational figures because the activity is conducted under the guise of legitimate recreational fishing but is better described as illegal commercial fishing. For any fishery of a high-value species this is a risk, particularly when stocks are healthy and available inshore. The Department confirms that their information is that there continue to be isolated by serious cases of this. Again, this reinforces the value of an intelligence-led and risk-based approach to fisheries compliance. The Committee fully supports the Department's continued use and development of this approach.

#### *Estimates of illegal take for stock assessment*

The Committee discussed in the public forum whether it was possible to ascertain if the type of illegal commercial activity that has been detected in recent large operations is ongoing, and whether any quantities of unreported catch could be ascribed to this type of activity. It was considered that there is no way of quantifying the impact of illegal activity beyond the detected offences, but that the Department still consider that the overall level of unreported catch is 'low'. The Committee therefore supports the continued use of the 'low' estimates in the resource assessment model.

### **5.3 Marine Parks**

All five coastal NSW marine parks include sanctuary zones over reef area likely to provide habitat for rock lobsters. In four of these parks lobster shares were purchased in amounts estimated to be proportional to catch from grounds lost to the fishery (507 shares in total). In response the TACC and management charges were adjusted accordingly.

The existence of sanctuary zones raises two primary considerations for the rock lobster stock and fishery management: 1) the extent to which these areas reduce fishing mortality by an amount that allows juveniles to make an appreciable contribution to the adult spawning stock, and 2) the degree to which the spawning biomass protected from fishing mortality within sanctuary zones makes a significant contribution to recruitment.

Sanctuary zones make up less than 7% of state waters and cover a range of estuarine and marine habitats including those with mud, sand and rocky substrates. Well under half the area of sanctuary zone would include habitat suitable for rock lobsters and these areas would cover a range of depths from the intertidal to around 80 metres.

Evidence from a range of published studies indicates that there would be an increase in the number and size of lobsters in sanctuary zones; however these increases may decline over time due to the effects of intraspecific competition and foraging and migration into fished areas. It is expected that juvenile rock lobsters settling in sanctuary zones may benefit from protection for a period, but would then enter the fishery as they reach sexual maturity, forage more widely and move into deeper waters.

The Committee considers that given the relatively small size of sanctuary zones in NSW, the small percentage of these zones in depths preferred by adult rock lobsters (generally 10 to 150m), and the migratory nature of rock lobsters it is unlikely that the presence of existing sanctuary zones has a significant influence for the stock assessment and TACC setting process.

## **5.4 Management framework**

### **5.4.1 Fishery Management Strategy**

The *Fisheries Management (Lobster Share Management Plan) Regulations 2000* set out the arrangements that are in place for the day-to-day operation of the commercial fishery. The fishery Management Strategy (FMS) for the NSW Lobster fishery provides detailed information on management arrangements for the fishery.

The FMS specifies objectives, performance indicators and trigger points that provide a framework to measure the performance of the fishery against the objectives. The performance indicators provide a measure of whether the objectives are being achieved and the trigger points signify a potential problem with the fishery and a review of the FMS is required. No triggers were activated for 2013/14.

A core objective in terms of TACC setting is that biomass is maintained above 25% of pre-exploitation levels. As discussed in detail in the Resource Assessment and the stock status section of this report, exploitation rates are estimated to be comfortably above this limit reference point.

As the fishery continues to biologically improve and move away from its trigger limits, industry and government acknowledge the need to develop targets that maximise the economic yield from the fishery. The Committee is strongly of the view that a modern harvest strategy should be incorporated into the FMS and that in particular, target reference levels should be specified (in addition to the existing limit reference levels). There is a wide range of international, national and State instruments and policies that establish the use of limits *and targets* as standard practice in harvest strategy design. The Committee and industry members had a good discussion about the benefits of specifying economic objectives and building a framework for meeting those objectives within an agreed timeframe, as this can materially impact how TACCs are set. Up until now, the industry has, understandably, focussed on building biomass. The Committee last year stated that it is strongly of the opinion that the secure biological status of the fishery provides the opportunity to now consider more specific economic objectives. This year's consideration of the TACC has affirmed that the fishery is now well and truly at the point of needing a more sophisticated harvest strategy to guide TACC-setting in line with specific objectives and targets

**The Committee again recommends that the Department and industry work to develop a harvest strategy, including target reference points relating to maximising economic yield, to provide guidance on TACC decisions.**

In this context, more detailed economic data is considered a worthwhile investment to inform the development of, and measurement of, economic objectives, as discussed in the economics section of this report.

#### **5.4.2 Quota trading**

As discussed in previous years, the Committee supports the full implementation of the web-based FishOnline/Fisher Direct program, which will assist by having all quota for lease or sale in one place, providing an open and transparent market for leasing and transferring quota. This initiative is very much in line with previous Committee recommendations and should prove very useful for increasing industry returns since online transfers will not incur a transaction charge.

The Department reports that full implementation of the FishOnline self-service system (Fisher Direct component) is still dependent on legislative amendment which is being progressed through the Fisheries Management Amendment Bill 2014. The Department continues to build industry capacity in use of external components of the FishOnline system as circumstances allow. The initial pilot group that has been using the system has been expanded.

Services provided through the online system include:

- Submitting non-quota catch and effort records (eg when using trap & line fishery endorsements)
- Catch and effort history inquiries
- Quota balance inquiries
- Nominated fisher history inquiries
- Fishing business inquiries
- Boat Licence details

**The Committee recommends that the Department continue to implement the FishOnline system through to completion.**

#### **5.4.3 Management Costs**

Category 1 share management fisheries are subject to cost recovery of government services. Charges for management services provided by the Department are payable in proportion to the shareholding. Implementation of full cost recovery in the fishery was staged over three fishing periods from the 1998/1999 fishing period, as indicated in Table 1.

**Table 1. Management charge and fishery value by fishing period (data @ 28 April 2015)**

Fishing period	TACC (t)	Reported catch (t)	Price (\$/kg)	Value (\$m)	Mgt charge (Incl. EIS) / share	Mgt charge (incl. EIS) / GVP (%)
1998/99	125	110.0	34.76	3.8	38.00	10.0
1999/00	140	117.0	39.16	4.6	48.00	10.4
2000/01**	150	102.0	42.98	4.4	58.00	13.2
2001/02	150	102.0	46.33	4.7	58.00	12.3
2002/03	135	121.3	44.77	5.4	59.70	11.1
2003/04	135	107.9	38.83	4.2	61.70	14.7
2004/05	102	98.1	38.30	3.8	58.60	15.4
2005/06	102	100.5	41.30	4.1	63.09	15.2
2006/07	112	109.4	47.46	5.2	62.06	12.0
2007/08	124	121.6	45.81	5.6	57.91	10.4
2008/09	128	121.8	54.67	6.7	64.04	9.4
2009/10	128	122.1	55.49	6.8	64.70	9.3
2010/11	131	129	55.18	7.1	52.64	6.2
2011/12	149	148.3	57.52	8.5	44.21	5.0
2012/13	140	139.0	55.03	7.65	49.32	6.3
2013/14	150	144.7	70.02	10.13	51.57	5.0
2014/15	150	130.5	73.50	11.03*	52.81	4.7*

\* Estimated values assuming that the 150t TACC is taken at the average price to date

\*\*\* Commencement of full cost recovery

The contribution of management charges to total costs has contracted as a share of GVP from the fishery (from around 15% to currently 5%). The Committee continues to support a transparent system of cost recovery where services received by industry against management and other charges are fully justified and delivered efficiently. In considering 'management', the totality of fees applying to the fishery should be considered. There remain significant costs in running this fishery, particularly in the areas of research and compliance. It is noted that the lobster fishery is not fully cost recovered and benefits from discounts for various legitimate reasons. However, in moving through the cost recovery process industry should prepare invest in the fishery appropriately. It would be appropriate to review costs and look at ways of developing an overall management package (including science and compliance) that has costs appropriate to the scale of the fishery. This review could be usefully done in conjunction with the design of a harvest strategy for the fishery, as previously discussed.

#### **5.4.4 Industry Consultation**

Section 2.1 and Appendix 1 of this report detail the industry consultation processes that are in place for the fishery and lists the details of submissions that were made by the commercial sector to the Committee.

The Committee continues to be confident that the open forum process that has now been in place for several years is working effectively and appears to have the ongoing support of commercial fishers. The Committee finds the level of discussions at the open forum to be very positive and constructive. It was encouraging to have some new faces in the room this year. It would be of benefit to the fishery if the other fishing sectors became more engaged with this process.

The Committee understands that the Lobster Industry Working Group is established and is pleased to note that the working group is actively engaged in managing the fishery. The fact that industry generally continues to support a precautionary approach to the TACC reflects well on the maturity of the group and the process. However, it is noted that this is still an evolving process and that the fishery management arrangements are still developing. There are therefore challenges ahead for the industry if the fishery is to reach its full potential and a cohesive and planned approach will be important. The fishery still requires investment in the management of the fishery (research, management, compliance) and would benefit greatly from a framework for assessing how and when to invest in these elements of management. The management plan and harvest strategy are core components of this framework and industry is urged to drive those processes.

### **5.5 EPBC Act Assessment of the NSW Rock Lobster fishery**

In January 2012, the NSW Department of Primary Industries provided an application to the Department of Sustainability, Environment, Water, Population and Communities for assessment, seeking continued export approval for the NSW Lobster fishery

The application was assessed for the purposes of the protected species provisions of Part 13 and the wildlife trade provisions of Part 13A of the EPBC Act and approved until 30 March 2017. Important factors taken into consideration were management arrangements and precautionary measures currently in place for the fishery including annually reviewed total allowable catch limits, limited entry, mandatory tagging of commercially harvested lobsters, recreational bag limits, minimum and maximum size limits, prohibition on the take of berried females, area closures and gear restrictions.

### **5.6 Total Allowable Commercial Catch for 2014/15**

The Committee was presented with a detailed Resource Assessment, based on the available fishery-dependant catch and effort information as well as data from previous Fishery-Independent Surveys. The assessment presents empirical measures of stock performance as well as model outputs.

Management and compliance reports were also provided.

A detailed analysis of the Resource Assessment is set out in the stock status section of this report, including recommendations for improving the precision of the stock assessment going forward (particularly relating to recruitment and to catch rate standardisation).

The key factors in arriving at the Determination are:

- the spawning biomass is estimated to be significantly above the limit reference point of 25% of pre-exploitation levels and there are high levels of confidence around this estimate;
- all measures of recruitment (peurulus settlement, catch rate of undersize and FIS catch and catch rate of undersize) indicate continuing health recruitment to the fishery (noting that the increasing trend has slowed);

- there is unanimous agreement that the estimates for recreational and unreported catch can safely be regarded as 'low' and that the 'low' option has therefore been used as input to the model; and
- there are reasonable levels of consistency between the fishery data, scientific survey and model-based indicators for the fishery.

On this basis, the Committee supports an increase in the TACC by 10t to 160t for the 2015/16 quota year.

In making this determination, the Committee is taking into account the positive stock assessment but cautious about the unknowns in relation to the stock, its limits and at what stage of rebuilding is at (discussed at length in the stock status section). The Committee is also very cautious about over-capitalisation in the fishery, which typically occurs at this point in a fishery's development. The Committee is therefore mindful to cautiously and incrementally increase the TACC and encourages fishers, individually and collectively, to also take a measured approach to developing the fishery.

A revised management plan with newly-defined fishery objectives and a harvest strategy are core components of a fishery management framework that is needed to facilitate the development of the fishery. Fishery managers, with the fishing sectors, need to address some fundamental issues about what is most highly valued in fishery, such as stability of catches, maximising catches or maximising profits. Having clearly defined objectives will assist in designing a harvest strategy and an investment framework for the fishery. As discussed in the economics section, there is basic economic data that should be collected to inform this process. The Committee has been highlighting this for several years and it is time now to collect this information.

## **5.7 Conclusion**

The Committee continues to be impressed by the high level of co-operation between the Department and the commercial sector for both the research and compliance programs.. The Committee acknowledges the way in which its recommendations are considered and feedback provided.

The Committee notes the industry's advice to the Committee which, in summary, provided that shareholders take a cautious approach to stock rebuilding but are very confident in their observations that the stock is in a very strong position. Industry therefore support an increase in the TACC.

Recreational lobster fishing continues to be popular and the Committee looks forward to receiving better quality information on the status of this activity.

To conclude, the Committee would again like to emphasise that a change in the management approach to the fishery should be seriously considered. Such an approach should recognise the need to consider targets for the fishery that incorporate economic, rather than solely biological considerations. This framework, or lack of, will materially impact TACC decisions in the near future.

## THE DETERMINATION

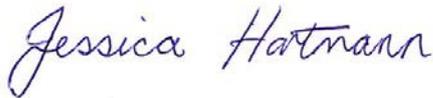
The Total Allowable Catch Setting and Review Committee, pursuant to Division 4 of Part 2 of the Fisheries Management Act 1994, determines that the Total Allowable Commercial Catch of rock lobster that may be taken in the Rock Lobster Fishery during the period 1 August 2015 to 31 July 2016, should be **160 tonnes**.



Ian Cartwright  
Chair



Keith Sainsbury  
fisheries scientist



Jessica Hartman  
fisheries management



Kelly Crosthwaite  
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
29.4.2015	Section 31(1)	TAC Committee called for public submissions on the appropriate level of the annual TACC for Lobster for 2015/16.
29.4.2015	Section 284 (1b)	The advertisement was placed in the Sydney Morning Herald and the Daily Telegraph.
5.5.2015	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 lobster industry or due to their interest in conservation issues. These groups included the following:</p> <ul style="list-style-type: none"> <li>■ All NSW Lobster Shareholders</li> <li>■ All Members of the NSW Lobster Fishery Working Group</li> <li>■ NSW DPI Fisheries Offices</li> </ul>
29.4.2015	Section 284 (1b)	The TAC Committee allowed a period of at least 30 days for public consultation.
	Section 31 (2)	<p>The TAC Committee gave regard to the following submissions.</p> <ul style="list-style-type: none"> <li>■ NSW DPI – Commercial Fisheries Management, Research and Compliance Reports.</li> <li>■ Shareholders, Nth Coast*</li> <li>■ Shareholder, North Coast*</li> <li>■ C W Dunn, Shareholder, South Coast</li> <li>■ Thomas and Nellie Richardson, Shareholders, Mid North Coast</li> </ul>
10.6.2015		<p>The submissions were collated and analysed, and the TAC Committee heard formal presentations regarding views and opinions at the TACC Open Forum meeting held on 10.6.15. The following made presentations, or provided information to the Committee:</p> <ul style="list-style-type: none"> <li>■ Nicholas Giles: Fisheries Manager, DPI</li> <li>■ Andrew Field: District Fisheries Investigator, DPI</li> <li>■ Geoff Liggins: Manager, Scientific Services, DPI</li> <li>■ Peter Offner: NSW Lobster Fishery Working Group</li> <li>■ Noel Gogerly: NSW Lobster Fishery Working Group</li> <li>■ Scott Westley: NSW Lobster Fishery Working Group</li> <li>■ Lee Monin: NSW Lobster Fishery Working Group</li> <li>■ Daniel Stewart: NSW Lobster Fishery Working Group</li> </ul>

\*NB This submission was labelled confidential. Identification of author should be withheld from the copy of the Report and Determination when posted on the DPI website

## Appendix 2\* Summary of submissions and the issues raised

Submission provided by	Issue(s)
C.W. Dunn	Positive comments on resource status as evidenced by ease of taking quota and comments from recreational fishers. Observations on depth and seasonal changes in availability/catch rates. Suggests that quota could be doubled without damage to the fishery, but suggests it should be raised 'significantly'.
Shareholder North Coast	Expressed difficulty in obtaining quota, and related high lease prices. Some problems with poor condition lobsters achieving poor prices – reasons unclear. Catch rates 'fantastic' and restricted only by availability of quota to lease. Lobsters abundant throughout all grounds worked, even inshore and mid-shelf, creating optimism for future of fishery. Breeding stock looking 'great' with plenty of oversized and berried lobsters. Concerned at illegal activity and notes frequency of IUU likely to increase as value of fishery increases. Suggests share forfeiture arrangements should apply in case of serious breaches. Concerned that as stock rebuilds benefits are being eroded by recreational, unlicensed commercial fishers, etc, Suggests a 10% increase could be supported, but does not want to place too much pressure on stocks.
Shareholders North Coast	Several photos of catches of large lobsters and large numbers of lobsters in traps as an indication of stock condition.. Expressed excitement concerning the good condition of the lobster stock and notes that lobsters are now widespread on all fishing grounds., including deep and shallow water. High discard rates (up to 40% by weight) in shallow water trap-sets in the peak of the breeding season due to being oversized or berried. Low recapture rates when fishing around DPI research gear where tagged lobsters released, indicating high stock levels. Working only 2-3 days per week and exhausted quota before the peak of the season. Fishing so good in shallow water that some fishers did not venture to the shelf. Suggests need for more accurate recording of log sheet data, particularly where working multiple sets of gear over a wide area. Concerned this will impact assessments and other activities, such as the location of seismic surveys. Suggests there is a strong case for the TACC to be increased quite substantially and suggests that it be no less than a 10% increase on the current years tonnage.
Tom and Mavis Richardson	Observes that the lobster stocks have improved over the past years and that there should be a 20 per cent increase in the TAC. Would like to see the fisheries make available more shares, for example 10 shares for every share holder in the lobster fishery. The rationale for such a change being the low availability of shares on the market, which have almost dried up. Alternative suggestion is for the Department to sell more shares every five years, based on the belief that it takes approximately five or six years for a share to pay for its self. Only current shareholders should be eligible to buy the 10-share package to allow fisherman to keep up with ever-increasing costs and expand their businesses
Industry and Investment New South Wales	Research, compliance and management reports.

\*NB This submission was confidential. Identification of author should be withheld from the copy of the Report and Determination when posted on the DPI website