NSW Total Allowable Fishing Committee

Report and Determination 2020–21

ROCK LOBSTER FISHERY

June 13 2020

EXECUTIVE SUMMARY

Preamble

The NSW Total Allowable Fishing Committee (the Committee) has responsibility under the NSW Fisheries Act (1994, No. 38) to determine the Total Allowable Commercial Catch (TACC) of rock lobster by NSW commercial fishers. This determination is for the period 1 August 2020 to 31 July 2021. The determination is based on a scientific assessment of the rock lobster stocks, reports from fishery managers and compliance officers, comments from fishers, and input at a public teleconference forum on May 20th 2020.

Determination

The Committee has determined that the Total Allowable Commercial Catch of rock lobster by NSW commercial fishers during the 2020–21 Fishing Period should be **180 tonnes** (t).

This allocation is an increase of 5.9% from that set for the 2018–19 and 2019–20 Fishing Periods. The determination is set given expected catches of rock lobster by non-commercial fishers of around 18.5 t and illegal and unreported commercial catches of about 15.8 t.

Primary Recommendations

The Committee again provides the following recommendations to the NSW Department of Primary Industries (the Department) and the Lobster Industry Working Group in the interests of improving fishery performance. The Committee appreciates the Department's reporting against previous recommendations in its fishery management report this year.

Recommendation 1: The Department and industry prioritise development of a harvest strategy for the rock lobster fishery, with specific fishery objectives linked to target and limit reference points.

Recommendation 2: The Department and Industry develop a strategy for gathering economic information for the fishery, including quota and share transfer prices and fishing operating costs, to facilitate robust economic analyses and development of a bioeconomic model for the fishery.

***Recommendation* 3**: The Department continue development of the rock lobster assessment model, with particular emphasis on development of bio-economic assessment capabilities to inform both biological and economic aspects of TACC-setting.

Recommendation 4: The Department obtains more robust estimates of recreational catch, sufficient to estimate current harvest, identify trends, and assess the potential impact of changes to recreational fishing regulations.

Recommendation 5: The Department undertake any regulatory revisions or procedures necessary to enable multi-year TACCs to be determined for the lobster fishery or other appropriate fisheries.

Stock Status

The rock lobster stock is considered to be robust to current levels of harvest. Management and allowable catch limits since 2004 have been targeted at stock rebuilding. Evidence from scientific assessments, fishery-independent monitoring, and increasing catch rates over that period indicates that rebuilding of spawning stock and stocks of lobster available to the fishery has progressed through most of the period and might be continuing.

Analysis provides good support for a limit reference point of 20% of the unfished spawning biomass and for a target reference point of 30% of the unfished spawning biomass to achieve Maximum Economic Yield (MEY). The stock has now rebuilt to that target reference point and current catches are close to the estimated Maximum Economic Yield. The potential for future increase in allowable catches substantially depends on resolving better the relationship between spawning stock size and recruitment to the fishery, through careful management and monitoring to determine the likely level of maximum recruitment to the fishery.

Uncertainty about historically unreported catch and current recreational catch continue to be important risks in setting TACCs from the common stock. The historically unreported catch might not be resolvable other than by modelling alternative scenarios but current recreational catch can be addressed by implementing a robust monitoring program.

Economic Considerations

Economic performance of the NSW lobster fishery has declined slightly in 2019–20, mostly due to decreases in market prices arising from the impact of COVID-19[1] on the domestic and Chinese export markets. The reliance of NSW rock lobster fishery on the Chinese market has increased in recent years, although substantial quantities are still sold domestically. There are indications that both the Chinese and domestic markets for NSW rock lobster are recovering from the effects of the COVID-19 pandemic, although access to transport, and the high cost of available transport, continues to be problematic. Prices might remain depressed for at least part of the 2020–21 Fishing Period.

Share trading prices also declined slightly in the 2019–20 Fishing Period. Those prices also might have been influenced by recent market conditions but share trading prices usually are indicative of longer-term expectations of profitability in the fishery. The apparent risk premium in the fishery also appears to have increased over the last two fishing periods, however, despite improvements in stock conditions and, until recently, improvements in prices. These changes might reflect a normal fluctuation in risk assessment by fishing business but they should be monitored to assess whether there are some as-yet-unidentified underlying issues affecting confidence in the fishery.

The current stock assessment model suggest that the fishery is likely to be close to the level of biomass that is related to the *proxy* MEY but the appropriateness of that proxy value for the fishery has not been established. Development of a more spatially explicit bio-economic assessment model incorporating economic parameters such as operating costs and market prices would allow more specific economic targets to be set and potential future economic benefits to the industry and broader NSW economy to be evaluated. Such a model also would allow economic costs and benefits of alternative quota settings to be analysed and included in Committee deliberations. Lack of detailed economic data about fishery operations remains a major impediment to development of such a model.

Management Considerations

The NSW lobster TACC in 2019–20 was maintained at 170 t, consistent with the 2018–19 TACC, and, with over 90% of it caught by the end of April 2020, it is likely to be fully harvested. Licensing and management arrangements in the commercial fishery remain stable and effective, and compliance rates remain high. The estimated total catch of rock lobsters in 2018–19, including reported commercial catch and estimates of unreported and recreational catch, was 203.7 t, representing the highest catches since 1991–92. Catch rates remain high and further increases have been detected across the fishery in 2019–20 to date.

The lobster stock is maintaining stable and healthy biomass levels, and industry reports positive catch rates and economic conditions across the fishery. The most recent stock assessment estimated the spawning biomass to be near levels expected to deliver MEY, with a slight increase in the spawning biomass in the past 12 months. Surveys of sub-legal lobsters indicate high abundances of newly recruited lobsters will enter the fishery soon. These positive indicators suggest that the stock is capable of tolerating a small increase in the TACC. The effect that this increase has on the stock and catch rates, however, should be monitored closely to ensure that harvest levels continue to achieve optimal biological and economic outcomes.

Anecdotal reports from industry and logbook data indicate that the high catch rates have contributed to significant amounts of discards in the deep–water fishery in 2019–20. Industry is in the process of adapting to the increased catch rates by decreasing the number of traps set, which should contribute to reduced discarding, but it is important that such operating adjustments are monitored closely and management responses developed if necessary.

[1] COVID-19 is the World Health Organisation authorised acronym for Coronavirus Disease 2019, which was officially declared a pandemic on March 11 2020.

The robust state of the fishery means that the focus of management is now about optimising biological and economic outcomes. The Department has commenced development of a harvest strategy for the rock lobster fishery, but that process has stalled whilst a broader harvest strategy policy for NSW fisheries is being developed. The Committee is of the view that a lobster harvest strategy should be a priority for management so that biological and economic objectives can be defined, and management decisions (including those relating to the TACC) can be taken to enable those outcomes. A harvest strategy also could support a multi-year TACC being determined for this fishery, which would increase industry certainty and decrease administrative burden involved in the current annual TACC reviews.

Useful data and analyses are available for the commercial fishery but uncertainty about the levels of non-commercial (recreational and Aboriginal) harvest of lobster remains a key risk to long term management of the lobster fishery. Representatives of the recreational sector have proposed that the improved condition of the lobster stock should be reflected in increased opportunities for recreational harvest, including through an increase in the recreational bag and possession limits. The information currently available on non-commercial harvest is insufficient to estimate current harvest, track trends, or assess the impact of changes on recreational regulations. Those deficiencies present material risks for management of both the recreational and commercial sectors of the fishery. The Committee recommends that the Department actively pursue cost effective mechanisms to obtain improved regular estimates of non-commercial rock lobster harvest, sufficient to understand the scale and location of recreational catch, changes in those metrics over time, and the potential effects of changing existing limits on recreational lobster fishing.

Conclusions

The NSW eastern rock lobster stock has rebuilt to a robust state clearly capable of supporting current levels of harvest. Some uncertainty remains, however, about the degree to which the stock has stabilised or has further rebuilding ahead, though it appears likely that the stock is near its optimum harvest potential and any further increases in TACC will be moderate.

Improvements in the current assessment model over recent years have provided for more informative forecasts of consequences of alternative harvests and that work is commended by the Committee. Further development of the assessment model, especially toward a fully bio-economic assessment framework, is strongly encouraged.

Continued absence of specific biological or economic targets for the fishery preclude conclusions about whether the stock, and harvest, are at preferred levels. Unavailability of solid economic information about fishery and market operations also continue to hinder such conclusions. The Committee again recommends development of a formal harvest strategy to guide future management of the fishery, including TACC-setting, and evolution to the setting of multi-year TACCs. Persistent robustness of the rock lobster stock and positive industry and regulatory behaviours enable the Committee now to explore further increases in harvest. The Committee therefore has increased the TACC to 180 t for the 2020–21 Fishing Period.

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1. INTRODUCTION

The Total Allowable Fishing Committee (the Committee) is established under Part 2A S40 of the *Fisheries Management Act 1994* No 38. The committee in 2020 was:

- Dr Bruce Mapstone — Chair;
- Dr Rich Little[2] — fisheries science;
- Ms Alice McDonald — fisheries management;
- Dr Sean Pascoe — natural resources economics; and
- Dr Keith Sainsbury — fisheries science.

The Committee is required to determine the Total Allowable Commercial Catch (TACC) for the NSW rock lobster fishery and, in doing so, give effect to the objectives of the *Fisheries Management Act 1994,* as amended where relevant by *Fisheries Management Amendment Acts (1997, 2004, 2006, 2010, 2015, 2018)*. The Committee is not subject to control or direction of the Minister as to the outcomes of Committee considerations. The Act states (Section 40E):

(1) In making a fishing determination, the TAF Committee is to give effect to the objects of this Act and is to have regard to all relevant scientific, industry, community, social and economic factors.

(2) The TAF Committee is also to have regard to —

(a) the need to ensure that the exploitation of fisheries resources is conducted in a manner that will conserve fish stocks in the long term, and

(b) the impact of fishing activities on all species of fish and the aquatic environment, and

(c) the precautionary principle, namely, that if there are threats of serious or irreversible damage to fish stocks, lack of full scientific certainty should not be used as a reason for postponing measures to prevent that damage.

The Committee interprets 'threat' in this context to mean an 'indication of probable harm to come'. The Committee therefore must respond to evidence before it proves future harm to the fishery or the stocks and not postpone action to prevent that harm occurring, even if there is uncertainty surrounding such evidence. Similarly, the Committee should not take pre-emptive decisions on issues such as increasing the TACC when there is insufficient verifiable information on which to base such decisions. The Committee may be consulted out of session on a range of management issues.

The Committee must consider, as far as possible, the full extent of exploitation that might affect resource sustainability to meet its statutory obligations. Total removals from the NSW rock lobster stock are made up of, to varying degrees:

1. The quota allocated to commercial fishers;
2. The total legal catch by recreational and Aboriginal fishers; and
3. Catches by commercial, recreational, or Aboriginal fishers not sanctioned by the Regulations controlling the fishery and not recorded in catch statistics (illegal catches).

The Committee produces a stand-alone report each year in support of the TACC Determination. The report also sometimes includes recommendations for management of the fishery related to setting TACCs, based on the experience and background of the Committee members and reports received by the Committee. Constructive dialogue between the Committee and the Department and Industry on a range of issues related to the fishery, including recommendations from the Committee, is an important and valuable part of the Committee's deliberations in reaching each TACC Determination. It is important to note that the Committee makes Determinations on TACCs and, potentially, implementation matters it considers necessary to implement such TACCs effectively, consistent with the provisions of the Act.

The Committee also will make recommendations to the Minister, the Department, or Industry that are intended to assist management of the fishery and support the utility of TACCs. The degree to which those recommendations are accepted is a matter entirely for the Minister, the Department, or Industry as appropriate.

[2] Dr Little did not participate in this Determination.

2. PROCEDURES

2.1 Public Consultation

The Committee, through the Department, called for public submission on the appropriate total allowable commercial catch under the requirements of Section 40F and 284 of the *Fisheries Management Act* 1994 No. 38. Rock lobster fishers, relevant industry and community bodies, and the community generally were invited to make submissions on the Total Allowable Commercial Catch. The details of the consultative process are set out in Appendix 1.

The Committee normally would have obtained input from participants in a Total Allowable Fishing Committee Open Forum meeting in Sydney during May 2020. The occurrence of the COVID-19 pandemic, however, precluded such a public meeting and a teleconference of the Committee, Departmental officers, and interested commercial and recreational fishers was convened instead on May 20th 2020. Reports considered by the Committee and referred to in that teleconference included those from:

- NSW Department Primary Industries (DPI), Fisheries Research;
- NSW Department Primary Industries, Commercial Fisheries Management;
- NSW Department Primary Industries, Fisheries Compliance; and
- Participants in the commercial rock lobster fishery.

Verbal submissions to the Committee also were invited in the teleconference. The Committee was able to call for *in-camera* discussions, where appropriate. No in-camera discussions were requested at the 2020 meeting.

2.2 Matters considered

The Committee considered the following matters before reaching its determination:

- Documentation available on the fishery and submissions received for this year;
- Management objectives set out in the 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 industry representatives;
- Advice about compliance with fishery regulations as assessed by the Department and 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; and
- Submissions and commentary provided at the Open Forum.

2.3 Format of the Report

This report covers the three key areas affecting management of the fishery and TACC setting process:

- Status of the rock lobster stocks;
- Economic considerations; and
- Management considerations.

The key considerations for each of these areas are presented in the following sections 3, 4, and 5, followed by a concluding section 6.

The Committee has made several recommendations with the Determination to clarify the position of the Committee on a number of issues related to the TACC. They are included in the Executive Summary.

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

3. STATE OF THE STOCKS

3.1 Introduction

Data from the fishery and research and monitoring programs were reviewed, including fishery catch and effort, fishery independent surveys and monitoring, and estimates of illegal, unreported, recreational and Aboriginal catches. An assessment of current stock status from a length-based population model based on these data, and stock predictions for various future catches, also were reviewed.

3.2 Reference Points and Harvest Strategy

Long-term yield has been provided in the last few years and the Committee accepts these as providing interim values for the limit[3] and target[4] reference points. The interim limit reference point is a spawning stock depletion to 20% of the unfished level. The target reference point relates to achieving the Maximum Economic Yield (MEY) and is estimated to be a spawning stock depletion of 30% of the unfished level. The target reference point might need future revision as the relationship between spawning stock size and maximum recruitment is better understood. The fishery does not have a Harvest Strategy to formalise the reference points, size limits, assessment, and decision rules for management or TACC-setting. It is recommended that a Harvest Strategy be developed as a key priority.

3.3 Catch and Catch Rates

3.3.1 Unreported Commercial Catch

Estimates of unreported commercial catch prior to 1969 are very uncertain, whereas there is a better basis for estimation post-1969 and particularly post-1994. The current base-case stock assessment uses a credible scenario for unreported commercial catch based on sensitivity tests. The current scenario for under-reporting of commercial catch has a linear decrease from 17% of the total commercial catch in 1994–5 to 8.5% in 2010–11 and each year subsequently. It is considered that the estimates might be too high in recent years but there is no justifiable improvement available.

The level of discards, including from high grading, has increased in recent years as the TACC has become increasingly limiting. This is because of a combination of increased stock abundance, increased over-sized lobsters in some parts of the fishery, and some fishers setting more traps than is necessary to catch their quota allocation. Discards were about 20 t in 2018–19 compared to 4.3 t–10.5 t per year in each of the previous four years. It is assumed that 10% of the lobster discards did not survive, but that assumption is not well-tested or validated. It is necessary to monitor and minimise discards, to encourage reduced discards through appropriate adjustments to trap-sets, and to better estimate discard mortality if discards remain high.

3.3.2 Non-commercial Catch

The level of non-commercial (recreational and Indigenous) catch is very uncertain. There is broad agreement that the non-commercial catch has decreased in recent years and that a catch of 10% of the commercial reported catch is a reasonable maximum estimate. This gives a 15.7 t catch in 2018–19. It is again recommended that more accurate measures of the amount of recreational catch be established. There is a variety of mechanisms being considered by the Department for better measurement of recreational catch, including implementing a system for fishers to indicate their intention to take lobster that facilitates an improved sampling frame for surveys. A robust recreational catch-monitoring program should be implemented as soon an urgent requirement for managing the fishery, especially given recent increases in rock lobster abundances and the associated likelihood of elevated accessibility and attraction to recreational fishers.

3.3.3 Commercial Fishery Data

Figure 3.1 shows the commercial reported catch used in the ‘base-case’ stock assessment, including the estimates of unreported commercial catch and non-commercial catch since 1969.

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[3] A limit reference point (LRP) indicates a stock status that is undesirable and that should be avoided with high probability. The Committee previously has interpreted the legislated management trigger of 25% of unfished biomass to be the *de facto* LRP for the lobster fishery, but now accepts advice based on the current assessment that an appropriate LRP in this fishery is 20% of unfished biomass, pending resolution of a formal harvest strategy.

[4] A Target Reference Point (TRP) stipulates the level of biomass that is considered to produce specific desirable outcomes given allowed fishing practices. TRPs often are set to deliver either Maximum Sustainable Yield or Maximum Economic Yield and fishery management is effected to ensure stocks are maintained close to the TRP and safely above the Limit Reference Point (above).

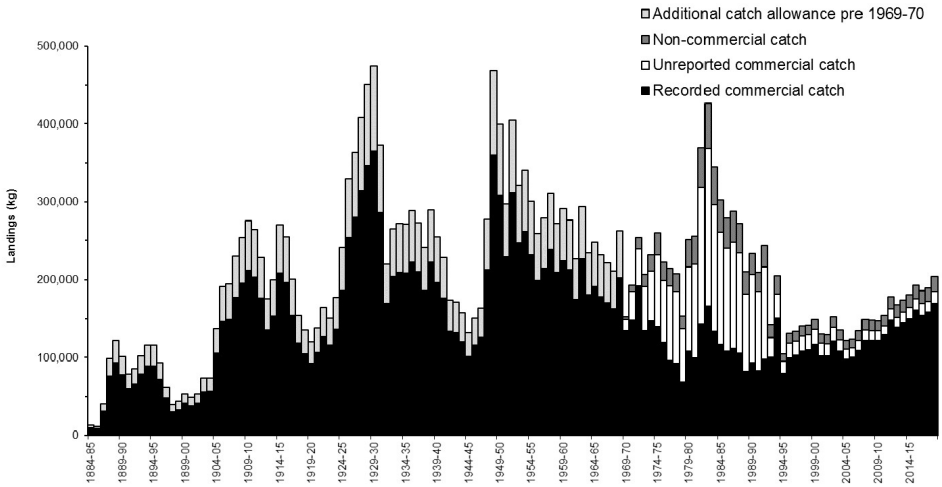


Figure 3.1. The landed catch of rock lobsters since the start of the fishery.

Total catch, effort, and catch per unit effort (CPUE) since 1969–70 are shown in Figure 3.2, including standardised[5] and unstandardised CPUE since 1997. The standardisation accounts for the broad effects of recent shifts in fishing effort from shallower grounds (less than 30 m) to deeper grounds where larger pots are set for longer periods. The standardisation does not account for all the expected effects of these changes, nor for increases in efficiency expected from improved equipment and ability to avoid marginal weather or fishing grounds. The standardised catch rates have been similar for the last 3 years, indicating an approximately constant number of legal sized lobsters in the population. The unstandardised catch rate continues to increase because of fishing operational improvements.

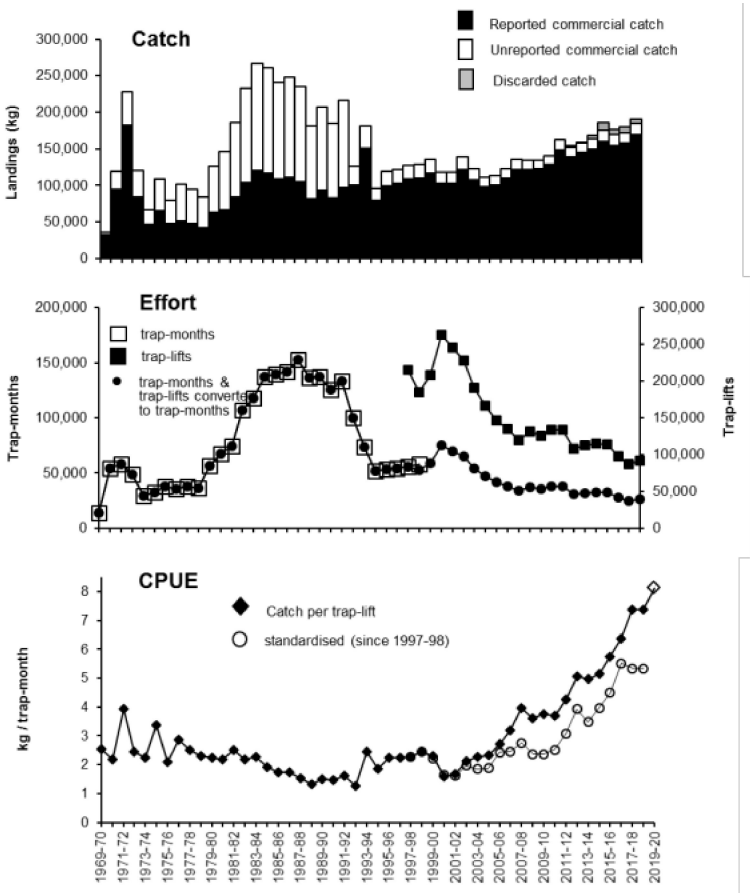


Figure 3.2. Commercial catch, effort, and catch rate since 1969–70 when more reliable effort is available. The 2019–20 data are incomplete but account for approximately 92% of the TACC and so the CPUE is close to the full quota year.

[5] 'Standardised' catch rates take account of changes in fishing gear and practice to provide improved measures of stock density. Standardised catch rates are considered to be more realistic indicators of stock abundance than are un-standardised catch rates.

Catch rates in the last few years have been broadly stable or increasing across all the depths and regions where there has been significant fishing (Figure 3.3). High catch rates have been recorded in the 10–30 m depth areas in the far-north coast in the last 8–9 years, which implies expansion of the breeding stock. Catch rates in deep water (>30 m) on the central and north coast remain high. These are maturing lobsters recruiting to the spawning stock from southern regions, indicating continued contribution from lobsters surviving the gauntlet of the southern fisheries. Catch rates of small legal-sized lobsters in shallow water (<10 m) also remain high in the central, mid-north, and far-north coasts, indicating that increased numbers of young lobsters continue to enter the fishery.

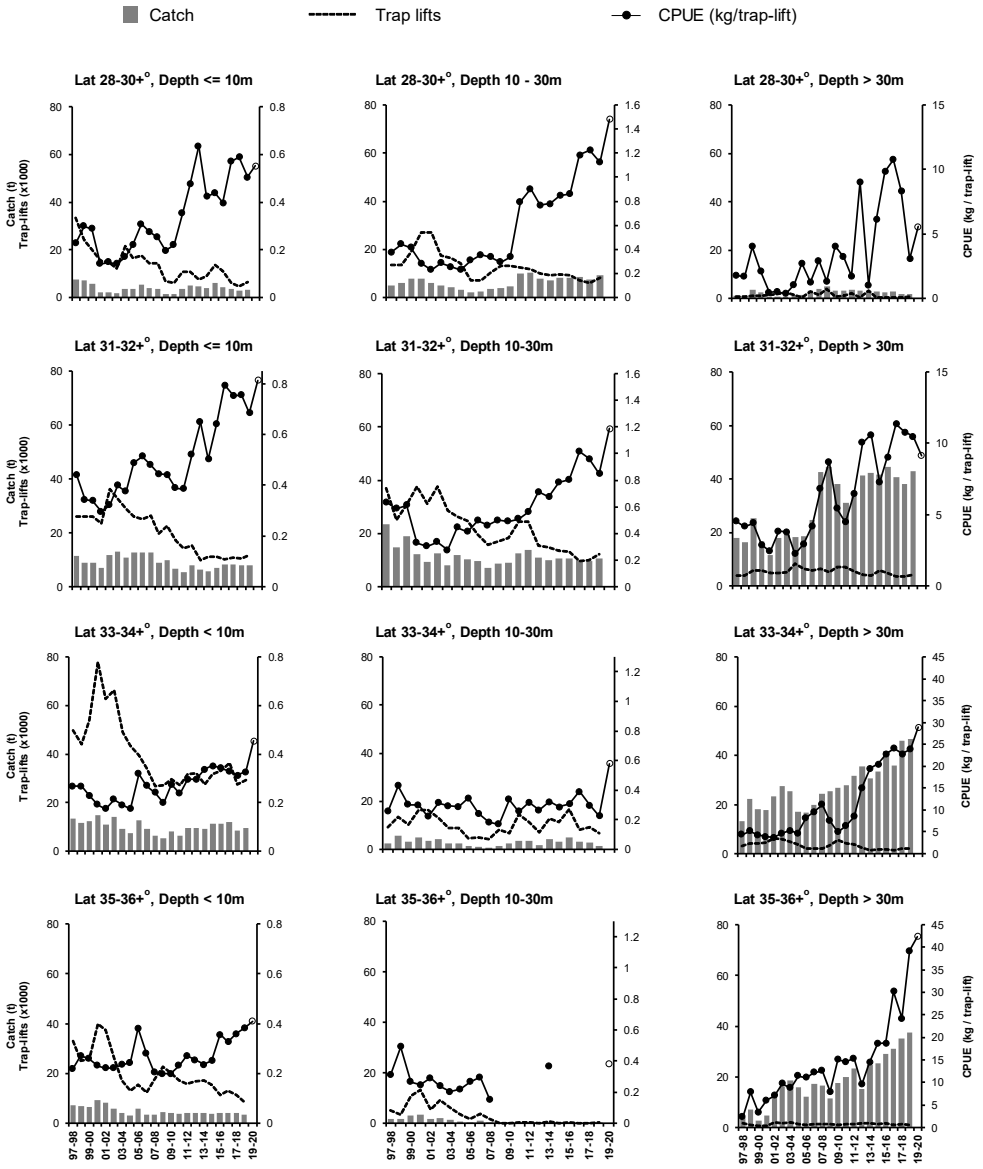


Figure 3.3. Commercial catch, effort, and catch rate by area and depth since 1997–98 when detailed reporting became mandatory. The spawning stock is found mostly in the far-north coast (28–30+°) and mid-north coast (31–32°) at depths beyond 10 m and especially depths 10–30m.

The catch and catch rate data overall strongly indicate substantial increases in the stock during recent years. Unstandardised catch rates have increased substantially since 2000 and have increased rapidly each year since about 2011. Standardised catch rates have also shown this increase but have been broadly stable for the past 3 years. The assessment models have been pessimistic in that they predicted a slight decrease of standardised catch rates during the last about 5 years as TACCs were increased. Catch rates have been stable or increasing across all the depths and regions of the fishery, implying stable or increasing abundance of lobsters of all sizes and maturity groups. There has been substantial increase in catch rates in the far north of the fishery, implying expansion of the breeding stock back into this area after many years of severe depletion. The catch rate of sub-legal lobsters is among the highest on record, indicating strong recruitment to the fishery in the coming year, and high catch rates of migrating lobsters indicate that substantial numbers are surviving to join the breeding stock.

3.3.4 Fishery Independent Data

Independent measures of spawning stock are particularly important in this fishery because a maximum legal size is used to protect lobsters larger than 180 mm, meaning that the status of the spawning stock is not fully reflected in the commercial catch data. Three fishery independent monitoring programs are used, one to monitor the settlement of post-larval lobster (pueruli), a second to monitor sub-legal lobsters, and the third to measure the abundance of spawning lobster. Pueruli grow and recruit to the fishery about 2–3 years after they settle from the plankton to bottom habitat. Pueruli surveys started in 1995–96. Sub-legal lobsters are measured from surveys of commercial catches, before sub-legal lobsters are returned to the water. Spawning stock surveys started in 1998–99, have been done every second year since 2009-10, and use standardised pot-sets in the northern areas of the fishery. The survey data are combined with observer data from the fishery to estimate the relative abundance and size composition of the spawning stock.

Puerulus settlement has been increasing on average since about the mid-2000s, coincident with increases in spawning biomass, and is now about double the initial numbers. Settlement in the last 2–3 years has been high. The number of sub-legal lobsters now is among the highest recorded, indicating a strong recruitment to the fishery next year.

The last survey of size composition of the spawning stock was done in 2018–19, and so has not been updated this year. Last year's survey showed a significant spawning stock that was about six times the numbers seen when the surveys started (Figure 3.4).

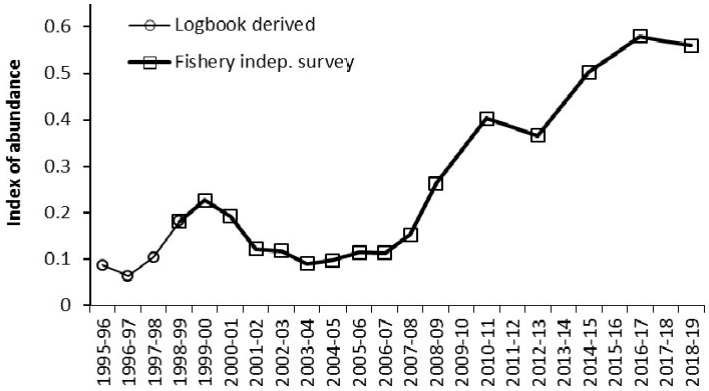


Figure 3.4. Spawning stock index (lobsters per pot-lift) from commercial catches of berried female lobsters and on fishery-independent surveys. Recent surveys have been done biennially, most recently in 2018–19.

The fishery independent monitoring is very encouraging about the strength of stock rebuilding and greatly increases confidence that the stock and fishery has rebuilt under recent management measures. The increased spawning stock has been associated with increased puerulus settlement and recruitment to the fishery, which appear to be continuing.

3.4 Stock Analysis

3.4.1 Stock Assessment Model

The assessment model has been redeveloped and refined in recent years and it is now fitting the available data well. Key population and depletion estimates are provided in Table 3.1. The estimates are reasonable and stable.

Table 3.1. Estimates from the base-case assessment model of total and spawning biomass prior to exploitation and in 2019–20.

Metric	Median	5% limit	95% limit
Unexploited total biomass (K) (t)	7,474	7,410	7,826
2019-20 total biomass (t)	3,149	2,812	4,062
2019-20 total biomass/K	0.422	0.378	0.521
Unexploited spawning biomass (USB) (t)	2,865	2,840	2,999
2019-20 spawning biomass (SB) (t)	997	863	1,383
2019-20 spawning stock depletion SB / USB	0.348	0.303	0.462

The median estimate of spawning stock biomass is 34.8% of the unfished level, with a 95% confidence range being 30.3%–46.2%. The spawning biomass has been above the limit reference point since about 2010. There is a high probability that spawning biomass is at or above the target reference point.

The assessment model confirms recent concern that the spawning stock was more depleted in the mid-1990s than estimated previously. It now is thought that depletion then reached about 4% of the unfished biomass. There was significant recruitment overfishing when the stock was depleted, but recruitment has increased as the spawning stock has rebuilt. The capacity for further increase is unclear. The stock currently is at or near the maximum for the spawning stock to recruitment relationship assumed, but direct observations of recruitment show continued increase. It is not known what has caused this ongoing increase in recruitment, or whether it will persist, so there should be further monitoring of recruitment as the spawning stock continues to grow, with review of the estimated stock-recruitment ratio is warranted.

3.4.2 Future Stock Predictions

Predictions were made of the change in biomass that would occur after 5 years of total catch[6] at various levels, starting from the most recent biomass estimate in 2019–20 (i.e. total catch at various constant levels in years 2020–21 to 2024–25). Projected levels of spawning biomass and exploitable biomass are given in Table 3.2.

Table 3.2. Base-case projections of median spawning biomass and median exploitable biomass in 2024–25 relative to those in 2019–20 after 5 years of different constant future total catches, including prospective TACCs, estimated non-commercial catches, and unreported catches.

Total Annual Catch (t)	Relative spawning biomass [95% confidence interval]	Relative exploitable biomass [95% confidence interval]
175	1.05 [0.99–1.09]	1.05 [1.06–1.09]
200	0.99 [0.95–1.03]	0.95 [0.93–0.98]
225	0.95 [0.91–0.98]	0.85 [0.83-0.87]

It is predicted that for catches at recent levels (i.e., TACC = 170 t, total catch = 204 t) the spawning biomass would remain at about recent levels and the exploitable biomass would decrease slightly. The 5 year stock projections in recent years have been pessimistic compared to actual outcomes. The model assumes that recruitment should not increase further, but if observed recruitment does continue to increase then the model predictions will continue to be pessimistic compared to observed biomass.

3.5 Conclusions

The rock lobster spawning biomass has been above the adopted limit reference point since about 2010 and there is a high probability that spawning biomass is now at or above the target reference point. All indicators of stock status trends are positive. The model-based and empirical indicators for all aspects of the population, including the spawning stock and recruitment, are consistent with a recovered fishery.

Expectations of increased future catches nevertheless remain uncertain. The current assessment interprets the stock as being close to the estimated MEY, so that increasing the catch is predicted to decrease the harvestable biomass and the commercial catch rate (and, later, also that catch). Further increases in observed recruitment, and estimated MEY as the stock is fished further, however, might result in increased expectations of sustainable catch and an associated higher MEY.

The dual challenges in coming years are to continue steady rebuilding of the spawning stock to secure the target level and to avoid catches ‘overshooting’ the desired sustainable level. The challenge of not ‘overshooting’ is complicated because the stock status giving MEY will be known accurately only when recruitment to the fishery can be seen to plateau as spawning biomass increases but there is a several year delay between a given spawning biomass and observation of the recruitment from that biomass. There is a risk, therefore, that catches could be increased too far before the plateau level is recognised, resulting in a several-year delay before the oversetting of TACC is detected. The Committee therefore supports constant catches for intervals of two or more fishing periods following moderate catch increases whilst the stock response to increased harvest is observed . This strategy is important in the next few years as the predicted maximum sustainable catch is approached. The approach, and the assessment results, indicate that the TACC now could be increased to 180 t, corresponding to a total catch of 225 t including non-commercial and unreported catch.

[6] Conversion between TAC and TACC uses the same method as last year, TACC = 0.832 Total Catch.

4. ECONOMIC CONSIDERATIONS

4.1 Introduction

The Fisheries Management Act (1994) requires that the Committee have regard to economic and social issues in making its determination. Economic information available for considering economic implications of different quota alternatives included estimates of gross value of production from the fishery, market prices from the Sydney fish market (SFM), and share transfer and quota leasing prices from a subset of trades where information was provided voluntarily. Indirect productivity measures were available in the form of average catch rates.

The absence of primary data on fishing costs means that it is not possible to make a complete analysis of the economic performance of the NSW rock lobster fishery, although trends in profitability can be inferred using some simplifying assumptions around profit decomposition. Focussing on gross returns alone means that the economic implications of different quota scenarios cannot be assessed fully. These constraints of limited economic information have been highlighted in previous determination reports.

The absence of any formal economic objective for the fishery also means that performance cannot be assessed relative to any target. Maximum Economic Yield (MEY) cannot be determined for the fishery at the moment with accuracy but the stock assessment model and associated MEY proxy biomass levels suggest that the fishery is currently *likely* to be close to MEY.

4.2 Value of the Fishery

The 2019–20 fishing season was characterised by several challenges. Bushfires in December 2019 and January 2020 resulted in the disruptions in access to markets, particularly for fishers operating in the southern areas of the fishery, due to roads being closed during that period. Seafood imports to China ceased on 26 January 2020 as a result of the COVID-19 epidemic there. Imports into China were not banned but market closures and social restrictions resulted in no demand for product at what normally is a period of peak demand. China historically has not been a key main market for NSW rock lobster but has increased in importance over recent years. Pandemic-related restrictions in Australia also resulted in substantial reduction in domestic demand for rock lobster due to restaurant closures.

4.2.1 NSW Rock Lobster Markets

NSW is a minor contributor to the total production of lobster in Australia, with the bulk of production coming from Western Australia, South Australia, and Tasmania. Total Australian production of rock lobster in the 2017–18 financial year (the latest year for which data are available) was 10,519 t, of which NSW contributed 1.5%[7]. The price received by NSW lobster fishers on both the international and domestic markets therefore is driven largely by total Australian and global supply and demand conditions.

Over 89% of the total 2017–18 production of lobsters in Australia was exported, with over 98% of that by weight and value exported fresh, mostly as live animals[7]. The largest markets for Australian exports of rock lobster by weight in 2017–18 were China (58%), followed by Vietnam (37%). Vietnam previously had been a staging point for re-export to China rather than a consumption market itself and, until 2016–17, was the main export destination for Australian rock lobster. The free trade agreement (FTA) between Australia and China that came into force in December 2015, however, facilitated direct exports to China, which increased from negligible levels to now being the main (direct) destination. Tariffs were reduced under the FTA from 6% in 2017 to 3% in 2018, and were further reduced to zero in January 2019. Ninety-four percent (94%) of Australian rock lobster exports by value were directly to China in 2018–19.[8]

NSW exports of rock lobster have followed a similar pattern, with 93% of exports (by value) going to China in 2018–19, up from less than 3% in 2016–17.[8] Quantities exported from NSW fell to close to negligible levels in February 2020 due to market closures in China as a result of COVID-19, but increased again in March 2020 to pre-Christmas levels[8]. More recent export information is not available at this time. Evidence provided by the Industry at the stakeholder forum suggested that market conditions for lobsters are currently improving in China, although international transport is difficult to access and expensive.

The Sydney Fish Market (SFM) is the major domestic market for NSW rock lobster, with 38% of landings sold through the SFM in the 2018–19 season. Supply to the SFM has decreased over recent years with the increase in exports to China, from 47% of total landings in 2016–17 to 38% in 2018–19. Supplies to SFM to April 2020 also appear to be lower than at similar times in most previous years.

[7] ABARES (2019). Australian fisheries and aquaculture statistics 2018. ABARES, Canberra.

[8] https://www.frdc.com.au/services/seafood-trade-data/rock-lobster-exports

4.2.2 Rock Lobster Prices

Prices on the SFM have fluctuated in real terms (i.e. adjusted for inflation)[9] between roughly $78/kg and $82/kg since 2013–14. Such prices continued for the first half of the 2019–20 Fishing Period, but the effect of COVID-19 on both the domestic and export markets has been to reduce demand since January 2020. Prices on the SFM declined to below $60/kg in March 2020 but appeared to recover slightly to around $65/kg in April. Information provided by Industry suggested that prices recovered further in May, although that increase also likely was the result of reduced supply to the market. Industry submissions to the Committee suggest that current SFM prices sit between $70/kg for small lobsters and $91/kg for large lobsters, comparable with the range before COVID-19 affected the domestic market. Price information for lobster sold through outlets other than the SFM is not available publicly. Anecdotal evidence, however, suggests that prices all along the coast roughly follow the SFM price, although the prices received by fishers will vary due to differences in transport costs.

Data from the SFM suggests that NSW lobster generally attracts higher prices during the first quarter of the financial year (July–September), which may be due to other States either producing fewer lobsters at that time or supplying less to the NSW market. Industry also reports that there is a premium paid for larger sized lobsters at the SFM, in contrast with most other Australian rock lobster markets. The Committee suggests it is worth analysing the relationship between lobster size, market supply, and price as an aid to assessing optimal economic yield.

Export prices for NSW rock lobster peaked in December 2019 at around $100/kg, then fell to a low of $48/kg in February 2020, and recovered slightly to around $55/kg by March 2020. Industry-provided information suggests that export prices also have recovered slightly in May, to around $65/kg.

4.2.3 Rock Lobster Catches

The reported catch at the end of April 2020 was 154.2 t, representing 90.7% of the TACC with three months of the fishing season remaining. Catches in March and April were slightly lower than in those months in the previous year (2018–19 Fishing Period), but similar to or greater than catches over most of the last five fishing periods. It thus is expected that the TACC of 170 t will be landed this fishing season.

4.3.4 Gross Value of Production (GVP)

The estimated gross value of production (GVP) of the fishery in 2019–20 is $12.81 million (m), based on the average Sydney Fish Market (SFM) prices to the end of April of $75.35/kg and assuming the whole quota (170 t) is caught. This is around 6% lower than the estimated GVP in 2018–19 of $13.63 m, reflecting the lower prices received from February to April 2020.

GVP often is used as an indicator of the gross value of the fishery to the community but better information on actual prices is required to derive a more detailed and accurate picture of the fishery's economic performance. Information on how prices change with landings, either as a result of changing market allocations or due to price–quantity relationships on the main domestic markets, also is needed to assess the effects of changes in TACCs, and size composition of catches, on prices, and hence fishery revenue.

4.3 Fishery Economic Performance

Information on the actual economic performance of the fishery is unavailable, but likely changes in performance can be inferred from a range of indicators such as fishing activity, productivity, and share or quota trading prices. Estimates of profitability per unit catch also can be made, based on information provided by Industry at the stakeholder forum.

4.3.1 Fishery Productivity (Catch per Unit Effort)

Catch per unit of effort (CPUE) has increased markedly since 2001–02. Catch per trap lift during 2019–20 to date was the highest for the last 50 years, noting greater uncertainty of the data in earlier years (Figure 4.1). Much of that increase likely was due to changes in stock levels, but fishers also have been able to increase their productivity through changing gear and fishing grounds. 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. The Committee notes that changes in fishing power are rudimentary in the stock assessments, effected through a basic CPUE standardisation. The standardised CPUE also is historically high, even allowing for these productivity changes (Figure 4.1). There may be merit in a

[9] Nominal values are 'raw' transaction values recorded at given times, without adjustment for inflation from other times. Real values are transaction values at each time adjusted for inflation between that time and some reference time. The Consumer Price Index (CPI) often is used for the adjustment since it reflects changes in costs of living, and so inflation. Real values are preferred for temporal comparisons because inflation effects have been removed.

further study of productivity and technical efficiency to assess how different fleet segments (spatially and technologically) have changed over time.

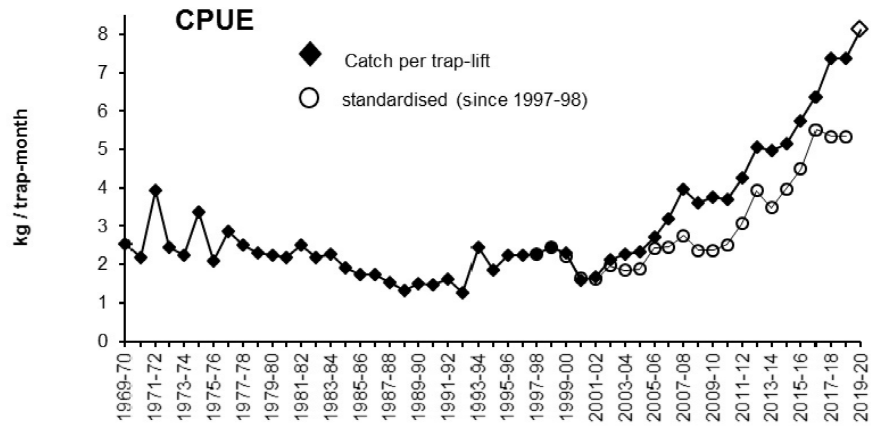


Figure 4.1: Estimated catch per unit effort from 1969–70 to 2019–20.

4.3.2 Share and Quota Trading Prices

The amount of quota transferred in each fishing period appears to have increased over the last 5 fishing periods, from 29% of the total TACC transferred in 2015–16 to 40% transferred in 2019–20 (to 28 April 2020). The number of shareholders trading quota also has increased over that period, suggesting that the quota market is working efficiently. Supplementary information provided by the Department (Figure 4.2) suggest that around 30% of quota is traded at the start of the fishing year, with generally two thirds of all trades occurring before the end of December in each fishing period and relatively small quantities of trades from April-July. A greater proportion of trades occurred after December in 2019–20 than in previous years, presumably reflecting fishers adjusting their holdings in response to changed market conditions.

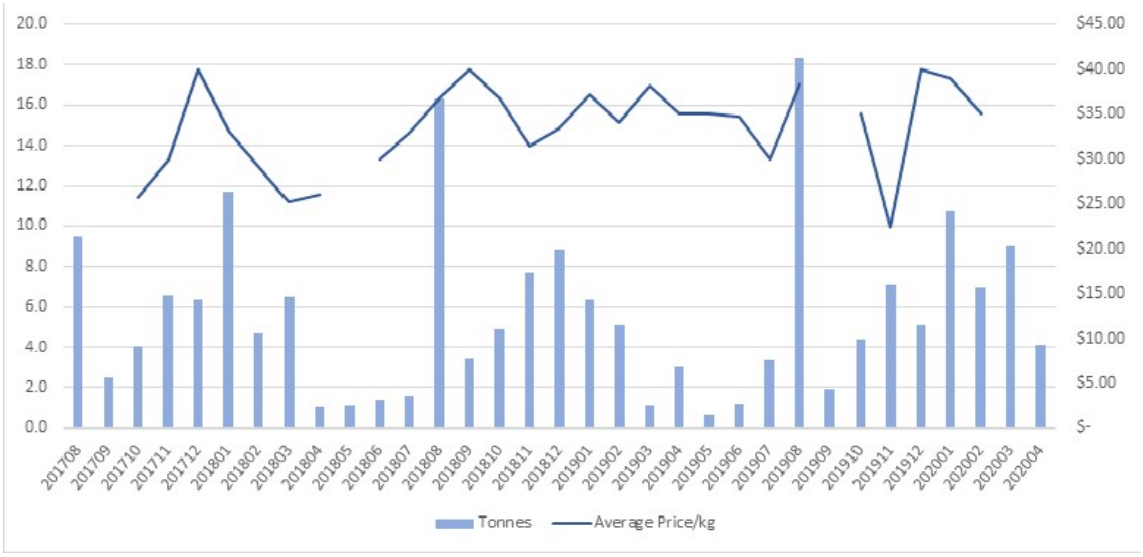


Figure 4.2: Monthly Quota transfers and quota lease price, August 2017 to April 2020.

Quota lease prices reflect the short term economic profit associated with the use of the quota. Quota lease prices have trended upwards since 2009–10, but fell slightly in 2019–20 to an average of $34.74/kg (Fig. 4.2). Much of that slight decrease, however, was due to a fall in average lease prices in November 2019, prior to the adverse market conditions that occurred from January 2020.

Share transfer prices provide an indication of the economic health of the lobster fishery and industry's expectations about the longer-term future of the fishery, given reasonable certainty of title and a competitive market. Share prices generally increased in real terms between 2004–05 and 2018–19 but appear to have declined from $13,170/share in 2018–19 to $10,753/share in 2019–20. The most recent share price is lower than that observed in the previous two fishing seasons but is still substantially higher than real prices prior to 2016–17. The specific timing of share transfers is not known so the impact of the

changed market conditions and the additional uncertainty that might have created is not known, but it is likely that those conditions were the main driver of the lower transfer price.

4.3.3 Combined Economic Indicators

Effects of changes in landings and prices on overall fishery profits remain uncertain without detailed information about fishing costs. Some general trends can be seen regarding key economic indicators based on economic first principles, however, despite economic data for the fishery being unavailable.

First, quota lease prices often reflect the level of profit earned by the least profitable fishers, who can gain more by leasing their quota to more profitable fishers than by catching it themselves. Similarly, more profitable fishers will lease quota provided that the lease price still leaves room for profit after additional costs of fishing are deducted from the additional revenue achieved through the quota lease. Equilibrium in a well-functioning market will be reached where the quota lease price is equal to the lobster sale price less the costs of fishing, and hence is a measure of the marginal economic profit associated with an additional unit of catch. The difference between the price of the catch and the lease price provides an indication of the economic cost of catching the marginal unit of catch. Costs in this case are economic costs, and include a value for owner-operator labour and other input costs (crew, fuel, etc.). These costs also will include management costs (currently $62.55 a share, $3.57/kg) and the community contribution (currently $115 a share, $6.57/kg).

The key drivers of the increase in quota lease price (and hence short-term profitability) can be broken down into the effects of lobster price and fishing costs (using imputed costs). The latter also reflects any change in productivity (for example, due to stock changes), as cost per unit of catch likely decreases as stock size increases. Changes in profits can be decomposed into changes in each of these measures (Table 4.2, see Pascoe et al. 2019[10] for details).

The profit index in Table 4.2 represents the change in economic profit per kg, based on change in lease price from one year to the next. An increase in profit results in the profit index being greater than 1, and a decrease in profit results in the profit index being less than 1. The price and cost indexes measure how changes in these variables have affected profit. A price index value less than 1 indicates that the price decrease has a negative impact on profit, and vice versa. A cost index value greater than 1 indicates that cost decreases had a positive impact on profit, and vice versa. The main driver of profit is determined by the index that had the greatest change (positive or negative). For example, in 2004–05, the decline in costs ($/kg) more than offset the decline in price ($/kg) to result in a net increase in profits.

Table 4.2: Implicit cost and profit decomposition

Fishing period	Lease price ($/kg)	Lobster Price ($/kg)	Implicit Costs ($/kg)	Profit index	Price Index	Cost Index	Key driver
2003–04	$10.48	$56.76	$46.28	1.00	1.00	1.00	
2004–05	$15.53	$54.62	$39.09	1.48	0.84	1.80	Cost decrease
2005–06	$18.23	$57.25	$39.02	1.17	1.17	1.00	Price increase
2006–07	$20.99	$63.69	$42.70	1.15	1.39	0.83	Price increase
2007–08	$23.34	$59.73	$36.39	1.11	0.84	1.33	Cost decrease
2008–09	$20.00	$68.77	$48.77	0.86	1.53	0.56	Cost increase
2009–10	$18.19	$68.39	$50.20	0.91	0.98	0.93	Cost increase
2010–11	$20.39	$66.18	$45.79	1.12	0.89	1.26	Cost decrease
2011–12	$20.59	$66.95	$46.36	1.01	1.04	0.97	Price increase
2012–13	$22.28	$62.68	$40.40	1.08	0.82	1.32	Cost decrease
2013–14	$22.93	$77.64	$54.71	1.03	1.94	0.53	Price increase
2014–15	$23.62	$81.49	$57.87	1.03	1.18	0.87	Price increase
2015–16	$29.68	$81.13	$51.45	1.26	0.99	1.28	Cost decrease
2016–17	$33.05	$77.43	$44.38	1.11	0.89	1.26	Cost decrease
2017–18	$28.36	$77.88	$49.52	0.86	1.01	0.84	Cost increase
2018–19	$35.32	$81.90	$46.58	1.25	1.14	1.10	Price increase
2019–20	$34.74	$75.35	$40.61	0.98	0.83	1.19	Price decrease

[10] Pascoe, S., Giles, N. and Coglan, L. (2019). Extracting fishery economic performance information from quota trading data, *Marine Policy* 102, 61-67.

The key drivers of the lease price since 2014–15 appear to have been equally increases in lobster sale prices and decreases in costs as a result of improved catch rates (Table 4.2). Costs of capture appeared to decline further in 2019–20 but those benefits were more than offset by decline in average sale price.

The relationship between the annual lease price and the share sale price (on a $/kg basis) also provides an indication of the implicit discount rate[11] used by fishers. This generally has declined over the period that the stock has been rebuilding (Figure 4.3), suggesting that fishers generally have confidence in the industry and are prepared to take a longer-term perspective on its management. The trend in implicit discount rate over the last 17 years has been downwards but the implicit discount rate has increased in the last two years. Some fluctuations in this rate are normal, but continued increases in the next couple of years would indicate some unidentified systematic issue that is undermining confidence in the fishery. It is too early to draw conclusions at this stage, but this trend needs to be monitored closely.

The discount rate also reflects the opportunity costs of capital invested in the industry, however, and with generally lower interest rates over recent years (since the global financial crisis in 2007–08) the reduced lease to share price ratio also might reflect a lower opportunity cost. The difference between the implicit discount rate and the risk-free interest rate (represented by the 10 year Treasury Bond rate) provides an indication of the risk premium in the fishery. From Figure 4.3, this risk premium also has tended to decrease until recently. The apparent recent increases in the risk premium may be a normal fluctuation or it may be indicative of some as yet unidentified issue, and further monitoring is required.

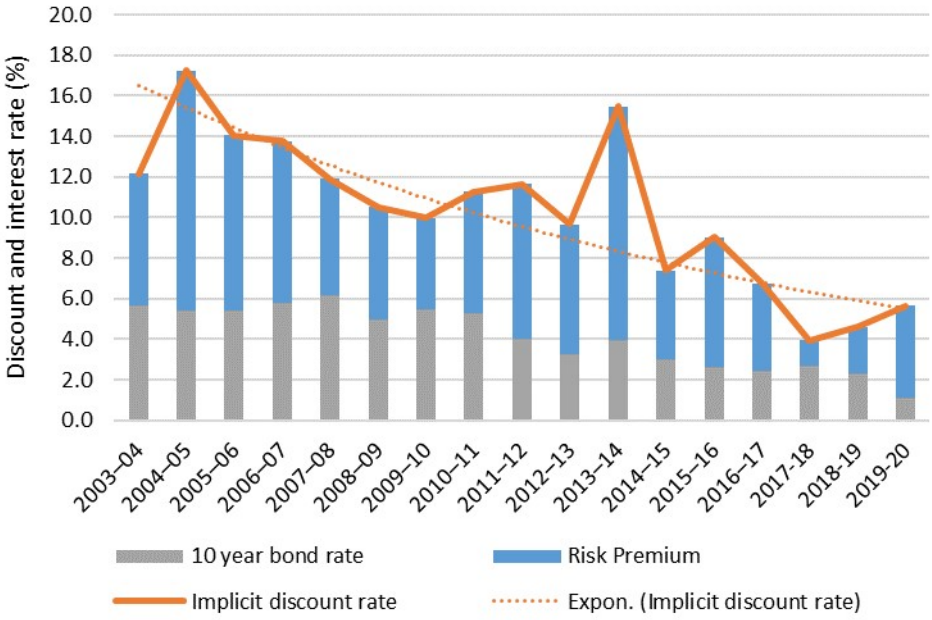


Figure 4.3: Implicit discount rate from 2004–05 to 2017–18.

4.4 Economic Targets for the Fishery

The Committee again noted that there is no formal (or informal) economic objective for the fishery, nor an economically-based target level of biomass or catch. Recent good fishing periods have demonstrated to the industry that the fishery has the potential to generate substantial profits, although neither how large is that potential nor what is an economic optimum for the fishery has been established.

Modelling in the stock assessment report suggests that the fishery's current catch levels are close to both Maximum Sustainable Yield (MSY) and also near a proxy estimate of Maximum Economic Yield (MEY) if the assumption of BMEY = 1.2BMSY (i.e. biomass at MEY is assumed to be 20% higher than the biomass at MSY) is accepted. A more fishery specific estimate of MEY (and BMEY) has not been made, so the appropriateness of the proxy assumption cannot be assessed.

It is important that industry, managers, and policy makers determine what they want to achieve in the fishery, especially now that the stock is considered confidently to be well above the limit reference point

[11] The discount rate is the rate at which fishers trade-off future benefits for current benefits. A high discount rate suggests that fishers prefer benefits now (i.e., have a relatively short time perspective) and are less concerned about future benefits, while a low discount rate suggests fishers take a longer-term view about the benefits from fisheries management. Implicit in this also is the level of confidence that longer term benefits will exist.

implicit in the legislated management trigger (25% of pre-exploitation biomass) or adopted in assessment modelling (20% of pre-exploitation biomass). Failure to set specific objectives and targets for the fishery exposes the fishery to risks of not achieving its full potential, operating less efficiently than possible, or returning to stock sizes closer to the limit reference point if future stock increases immediately are consumed through short term increases is allowable catch.

4.5 Community Contribution

The Fisheries Act requires that shareholders in category 1 share management fisheries, which includes rock lobster, make a periodic contribution for the right of access to the fishery (a community contribution) as prescribed in the management plan. The current community contribution charge in the lobster fishery is $115 per shareholder. This value has not increased since 2012, despite the apparent increase in profitability in the fishery.

The community contribution charge in the NSW commercial lobster fishery was based on a decision by the NSW Government to return part of the economic rent being earned by lobster fishers to society. It was designed on the basis that there is potential for economic rent[12] to be earned by fishers in a well-managed fishery with a TACC set with reference to MEY. Economic rent is profit in excess of normal returns on capital, after accounting for all costs, including the full costs of management. Lease prices provide an indication of the short-term economic profits in the fishery, which also will be net of the community charge (which forms part of the cost of fishing). Lease price currently is estimated to be $34.74/kg and the community contribution represents $6.57/kg, suggesting that the total level of resource rent being generated in the fishery is around $41.31/kg.

An estimate of economic rent in the fishery should be made to avoid too much or too little rent being appropriated from the fishery through a community contribution charge, particularly given that much of the resource rent already has been capitalised into share values. Changes in the community charge can have implications for future share trading as well as distributional implications for fishers who have recently purchased quota shares. Such an estimate requires detailed information on fishing costs and earnings. Calculation of implications for future economic rent generation with regard to alternative TACC scenarios requires a bioeconomic model. There is no objective basis from which to review the community contribution without such a model or detailed cost and earnings data and the Committee encourages the Department to develop those capabilities for this fishery.

4.6 Future Economic Information Needs

The outcomes of this year's assessment reaffirm the need for robust economic information to support future deliberations and ensure that TACCs are set that maximise returns from the fishery to both industry and NSW coastal communities. Key economic analyses should include:

- Bioeconomic modelling, building on the current stock assessment model, to estimate Maximum Economic Yield from the fishery and potential generation of economic rent;
- Productivity analysis to estimate effects on performance of heterogeneity in fishing behaviour and operational characteristics;
- Analyses of price dynamics to verify how prices on the SFM change with supply and interactions between supplies to the export and domestic markets, including costs of supply to alternative markets; and
- Fishing cost analysis to document how fishing costs vary among different sectors in the fishery (e.g. inshore vs offshore) and quantify cost-production relationships.

The apparent importance of prices in driving profitability in the fishery means a better understanding of the impact of changes in TACCs on prices will be important for future assessments. Such information also could be incorporated into a bioeconomic model of the fishery to provide greater assistance in assessing TACCs and their effect on fishery profitability, as well as identifying appropriate target

[12] Economic rent is comprised of three types of rent: entrepreneurial rent, quasi-rent, and resource rent. Some operators in any business are more skillful than others and therefore will earn more profit. Rents attributable to the skill of fishers are described as entrepreneurial rents and should be left with fishers. Entrepreneurial rents can be as high as 36 per cent of total economic rent in a fishery. Fishers may earn large surpluses over costs in the short-term, which may provide *prima facie* evidence of substantial resource rents. There are some circumstances, however, where such surpluses can occur but they are not true rents. These are referred to as quasi-rents and might arise, for example, when there is under-investment in a fishery or where short-term but unsustainable price increases flow from exchange rate fluctuations. Some profits will be obtained, however, because the natural resource being used has a value. These profits are resource rents and also are a component of economic rent.

reference points for the fishery. Development of economic objectives for the fishery also are essential to enable strategic analyses of TACCs appropriate to legislative and industry aspirations for the fishery.

Analyses of likely dynamics of recreational fishing demand also will be important for future TACC determinations, especially to estimate how recreational catch might change with changing stock levels and greater ease of capture by recreational fishers.

4.7 Conclusion

The lack of accurate information on the net return from lobster fishing means that only tentative conclusions about the economic status of the industry are possible, but evidence available to the Committee suggests that the lobster industry in NSW is economically viable. The fishery has been adversely affected by recent changes in market conditions due to COVID-19, although those effects seem to be less severe than in some other fisheries.

A basic analysis of the available data also suggests that, until recently, the increase in profits in the industry has been driven by increases in real prices over the last decade. The decline in prices in 2019–20 due to the adverse market conditions have had a negative effect on profitability. Indications are that markets are picking-up, so an improvement in profitability is expected for 2020–21.

Both quota and share prices have tended to increase in recent years, indicating a perception by industry that the future outlook for the fishery generally is positive. The decline in quota trading price in 2019–20 largely was driven by a decline in market prices. Increases in the implicit discount rate over the last two years, driven by an increased risk premium, is potentially worrying, though might be a normal fluctuation. Continued high risk premiums, however, will warrant monitoring and potential further investigation.

The Committee again emphasises that improvements in the economic viability of the lobster fishery, and especially as determined by future TACCs, hinges on robust economic analyses if the industry. Better economic data, such as information on the costs and earnings of lobster fishing businesses, and a robust bioeconomic model will allow future TACCs to be set that maximise economic returns from lobster fishing and facilitate better management decisions by allowing the Department and Industry to understand better the financial implications of alternative management options.

5. MANAGEMENT CONSIDERATIONS

5.1 The Rock Lobster Fishery

The NSW Rock Lobster fishery is a share managed, single species fishery that harvests rock lobster primarily using traps. The fishery extends the length of the NSW coastline and is managed as one unit across the State, meaning fishers can relocate without restriction, though some spatial closures apply as a result of a network of marine protected areas closed to commercial fishing.

Fishers can retain other fish species when fishing for lobsters (excluding prohibited size or protected fish), and the catch of by-product was 6.78 t in 2018–19. Ocean jackets were the most common by-product species retained, with over 2 t harvested in 2018–19. Over 1 t each of grey morwong and maori octopus also were retained.

Access to the fishery is limited to shareholders with a minimum shareholding, which currently is set at 55 shares, though this condition does not apply to fishers who held a lobster endorsement prior to the implementation of the Lobster Share Management Plan. There were 101 shareholders with 73 authorised fishers in the 2019–20 Fishing Period. Around half of the shareholders in the lobster fishery also hold endorsements in other NSW fisheries, with many of those holding endorsements in the Estuary General Fishery (46 shareholders), Ocean Trap and Line Fishery (43 shareholders), and the Ocean Haul fishery (39 shareholders).

5.2 Catch History

Catch in the lobster fishery largely follows the TACC, with over 95% of the TACC caught since 2004–05. The TACC was set at 102 t in 2004–05, following a period of severe decline in stock status. The TACC since then has been increased gradually to 170 t in 2018–19 and 2019–20, as the stock has rebuilt.

The majority of lobsters landed are caught in the middle half of the state, with the area between Forster and Newcastle reporting the highest landings annually. Monthly landings typically are highest in December and January, while the last three months of each fishing period (May–July) generally experience the lowest catches. Eleven fishers landed 50% of the total catch in 2018–19, and 27 fishers landed 75% of the total catch.

5.3 Catch in 2019–20

Catches in 2019–20 have followed a typical pattern through the fishing period, with highest landings in December and January. Catches did decline in February–April but they still were similar to previous years, despite significant declines in export prices and logistical issues associated with COVID-19 restrictions. Over 90% of the TACC had been caught by the end of April and the TACC is expected to be fully caught in 2019–20.

Between 5,030 and 11,598 lobsters (equating to 4.5–10.4 t) annually over the last five years have been reported in logbooks as discarded, in excess of quota. Industry submissions and logbook data show that the quantity of discarded legal size lobsters in the deep water fishery increased in 2019–20, with the Department estimating 20 t of discards are expected in the 2019–20 Fishing Period. Some high-grading is occurring but it is thought that most discards are a result of higher than expected catch rates in the deep water traps. The rate of discarding should decrease as operators adapt to higher catch rates by reducing the numbers of traps they set and soak times, but that response needs to be monitored closely to ensure that mortality from discards does not pose a risk to the stock.

5.4 Current Management Arrangements

5.4.1 Commercial Fishing

Management of the NSW lobster fishery is governed by the *Fisheries Management Act 1994* and arrangements are set out in the *Fisheries Management (Lobster Share Management Plan) Regulations 2000* (SMP) and the *NSW Lobster Fishery Management Strategy* (FMS). The fishery has been assessed against Part 13A of the Commonwealth *Environment protection and Biodiversity Conservation Act 1999* and was found to meet the sustainability requirements, receiving an export approval until 31 March 2028.

The lobster fishery is regulated by annual TACCs, individual transferable quotas, and minimum and maximum size limits, supported by verification and compliance mechanisms including compulsory tagging of all commercially caught lobsters. The minimum and maximum size limits have been adjusted over time to support rebuilding of the stock, and they continue to be reviewed by the Department using robust scientific analysis. Daily limit and possession numbers also apply to the catch and retention of a number

of bycatch and by-product species. Commercial fishers report their catch and effort through daily catch and effort logbooks and real time fishing activity reports through the online FisherMobile tool.

Both the SMP and the FMS specify objectives, performance indicators, and trigger points that provide a framework to measure the performance of the fishery. The performance indicators provide a measure of whether the objectives are being achieved and the trigger points signify a potential problem with the fishery requiring review of management arrangements. Both current CPUE and estimated stock biomass far exceed their triggers in the SMP and FMS respectively. Only one of the triggers legislated in the SMP was exceeded this fishing period, specifically the increase in management charges. The management charge is reviewed and redetermined annually, and although the charge per share increased by 3.5% in 2019–20 due to an increase in the cost of management, the fee was consistent with that in 2018–19 when viewed as a % of the fishery's GVP and remains well below the statutory limit per share.

The Department and Industry are conscious that the existing frameworks are out of date, and that more appropriate performance indicators and targets need to be developed, particularly as the fishery continues to improve biologically and move away from its trigger points. The Department has commenced development of a lobster fishery harvest strategy that will specify limit and target reference points for the lobster fishery, but development has not progressed substantively over the past 12 months. The Department advises that a harvest strategy should be available before the 2021–22 Fishing Period.

The Committee implicitly has been using its own targets and objectives, in the absence of formally specified targets, to guide decisions on appropriate stock levels for a sustainable and profitable fishery. The stock has recovered substantially over the past 16 years as a result of TACC amendments and management actions and is now well above the interim limit reference point of 0.2 of the unfished spawning biomass. The stock assessment presented to the Committee now estimates the spawning biomass depletion level to be at 0.348, which is close to levels that would represent a proxy target reference point of Maximum Economic Yield (MEY), equivalent to 1.2 times the estimated Maximum Sustainable Yield (MSY). The economic conditions in the fishery are largely positive, and fishers have indicated that they broadly are comfortable with the catch rates and economic returns currently being generated in the fishery. All of these indicators suggest that stock levels are providing conditions consistent with (implicit) biological and economic objectives for this fishery, and therefore the stock conditions that likely would be sought as targets in a well-considered harvest strategy.

It is necessary, however, to develop an agreed harvest strategy that formalises the objectives and reference points for the fishery in order to ensure that economic returns are being optimised and strategic long term decisions on harvest can be made appropriately. This will enable more informed and strategic TACC setting and ensure that appropriate and timely management responses can be made to future changes in the stock. The Committee recommends that the Department prioritise development of the lobster harvest strategy, using a considered and consultative process. The Committee supports continuing refinement of the stock assessment model to enhance medium and long-term forecasts, and to develop a bio-economic model to inform strategic decision making and the development of appropriate economic objectives and harvest control rules for future management, including TACC-setting.

5.4.2 Recreational Fishing

A daily and possession limit of two lobster per person, a minimum size limit of 104 mm, and maximum size limit of 180 mm apply to the recreational harvest of lobster in NSW. Recreational harvest generally is undertaken by hand (snorkelling) or trap, with the use of traps limited to 1 per person within the 10 m depth contour. The Department advises that recreational harvest is most likely to occur around high population areas, which overlaps with the location where the highest commercial landings occur.

The most recent estimate of recreational lobster harvest from a survey undertaken in 2017–18 estimated a catch of 4.56 t (+/- 2.56 t). That estimate is an improvement over previous estimates which had significantly higher error bars, but the Department advises that few fishers interviewed during the survey reported landing lobsters, and therefore caution should be taken in using this result.

Estimating recreational participation rate and catch has been problematic, with the result that there is little confidence in the use of estimates made over time for management purposes. The application for a recreational fishing licence now includes the option to declare an intention to fish for rock lobster, which has created a valuable database of recreational lobster fishers for future surveys. The Department advises that an application for funding is being prepared to enable a more targeted survey of recreational lobster fishers to be done later in 2020.

It is reasonable in the meantime to assume recreational fishers will target rock lobster more as lobsters become more abundant and easier to catch, or will be more likely to take lobster while targeting other species. The paucity of data, however, means that harvest levels and any change in the recreational

harvest cannot be inferred with confidence. The Committee therefore continues to assume that any increase in recreational catch as a result of higher abundances reflects the existing share of the sector.

A representative of the recreational sector that attended the TAFC forum in 2020 suggested that an increase to the recreational bag limit could be considered, to match the increased TACC that has been achieved as the fishery has rebuilt. Appropriate access to the lobster resource by all relevant sectors should be an ongoing consideration of management but the Committee cautions against any consideration of increases to recreational limits until there are improved estimates of recreational catch and robust monitoring procedures are in-place.

The Committee used a precautionary estimate of 18.5 t for non-commercial harvest for the 2019–20 Fishing Period, which includes both recreational and Aboriginal fishing. There have been some COVID-19-related restrictions in early 2020 that may have decreased recreational activity, including boat ramp closures in some locations, but anecdotal information suggests that other areas have seen increases in recreational fishing activity. The Department advises that 18.5 t remains a reasonable estimate for use for the purposes of setting the TACC, pending improved estimates of actual non-commercial harvest.

5.4.3 Aboriginal Fishing

Aboriginal cultural fishing is recognised formally in the *Fisheries Management Act 1994,* the relevant elements of which provide regulation-making powers that allow limits (including bag and possession limits) or other management options to be applied to special cultural fishing provisions. These provisions have not been implemented fully yet but an interim policy is in place to implement the intent of the amendments through permits. A number of cultural fishing permits are issued each year, with those in 2018–19 allowing for up to 835 lobsters to be harvested and those in 2019–20 allowing for the harvest of up to 480 lobsters (to date). These permits are issued for a basket of species, not just lobster, and advice from fishery compliance officers is that actual take often is significantly less than the amounts formally permitted. The catch under Aboriginal cultural fishing permits remains unlikely to have a detectable impact on the resource.

5.4.4 Engagement

The Committee continues to appreciate the level of engagement of commercial industry in the TAFC forums and finds the forum contributions to be positive and constructive. The Committee also welcomed the addition of a recreational fishing representative in the forum discussions this year, providing useful context on the interests of recreational fishers in the rock lobster fishery.

The Lobster Industry Working Group is established and is engaged actively in managing the fishery. The Committee strongly supports this group, especially in taking a strategic long-term focus. Developing a harvest strategy should be a core component of clarifying future management objectives for the rock lobster fishery and industry is urged to engage fully in that process.

Industry observations reported to the Committee were largely very positive about the status of the fishery. This was balanced by a measured low-risk approach to the long-term management of the fishery and a desire not to risk the current favourable conditions by significant changes to the current regime without sufficient supporting scientific evidence. Most industry members present at the forum expressed a preference to increase the TACC by a small amount, to enable fishers to benefit from the higher catch rates being experienced.

5.5 Compliance

Fisheries officers in NSW allocate time to compliance patrols in the lobster fishery based on risk and intelligence information. The compliance effort dedicated to the fishery in 2018–19 was lower than in 2017–18, with a total of 2,630 hours dedicated to the lobster fishery, 446 of which was directed toward the commercial sector, 870 to the recreational sector, and 1,314 to the targeted illegal sector. The Department advised that the movement of compliance officers was restricted in places in early 2020 due to catastrophic bushfires experienced on the south coast. Future data on hours and compliance rates may be affected accordingly.

The Department also dedicates a significant amount of time and resources to compliance in the post harvest sector, including fishery cooperatives, seafood markets, and restaurants. The intent of this work is to identify product coming from unlawful sources (unlicensed fishers operating commercially). Those efforts are not captured in compliance reports for any one fishery, but significantly contribute to identifying and penalising illegal harvest and trade.

The overall (recreational and commercial) compliance rate in the lobster fishery for 2018–19 Fishing Period was 82.5%; a slight decrease from the 2017–18 season which had an overall compliance rate of 89%. Compliance rates in the commercial fishery have continued to increase, with the majority of offending being relatively minor in nature and offences largely relating to the timeliness of reporting. A number of strategic compliance operations continue to be conducted targeting high-risk offenders and organised syndicates.

Recreational compliance rates have declined slightly over the last year, which the Department advises might be associated with an increased focus in northern NSW. The most common recreational offence remains the possession of prohibited size rock lobsters. 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. The increased abundance of lobster resulting from the recovery of the stock, combined with the ongoing increase in the domestic price of lobster, however, is likely to contribute to an increase in recreational interest in lobster harvesting. These factors also will contribute to a greater risk of increased illegal activity in the fishery. Retaining a strong compliance presence, and greater informal or formal monitoring of the number of recreational fishers participating in lobster harvesting, is necessary to manage this increasing risk.

Reporting on compliance and infringement detection rates is notoriously difficult as improvements in the targeting of compliance effort can lead to more offences being detected, which then can appear as lower levels of compliance when reported statistically. Use of an intelligence-led approach should lead to a higher rate of detection and therefore seemingly lower rates of compliance, at least initially. The Committee appreciates the improvements in the reporting and accuracy of compliance data made by the Department over time to improve the ability to detect trends and identify key issues. It remains difficult to draw conclusions from the compliance information, however, without supporting qualitative explanations or separation of metrics about intelligence-driven, targeted enforcement from more routine ‘on patrol’ compliance data. The Committee therefore finds the discussions with Fisheries Officers at the annual TAFC public forum very useful.

Regulation of the lobster fishery includes a demerit point and share forfeiture penalty scheme, where demerit points are recorded against shareholders that are convicted of offences under the Plan or Act. A shareholder who accrues 6 or more demerit points can have their shareholding forfeited, and for certain offences a Court may order forfeiture at its discretion. This scheme resulted in forfeiture of 109 shares in July 2019. These provisions, and the use of them, provides a strong disincentive to illegal behaviour, which is an important element of a robust compliance program for high value species. Licence holders expressed to the Committee their continued strong support for the compliance program and for strong penalties, including forfeiture of quota for serious offences.

Compliance with the TACC goes to the integrity of the quota system and uncertainties in the reported catch, which in turn can affect future TACC determinations. The figures, plus the qualitative analysis provided by the Department, support the conclusion that the majority of the licensed fishers continue to be compliant with regulations and are committed to the rebuilding and strengthening of the lobster stock. Strong penalties achieved through successful prosecutions represent important disincentives to more serious offences, including systemic and targeted illegal operations. The types of offences detected demonstrates that the mechanics of the quota system continue to be monitored and breaches continue to be detected at low levels. This is to be expected, especially with the introduction of new reporting systems, and provides confidence that the integrity of the quota system is being actively addressed.

5.6 Recommendations for Review of Management Arrangements

The stock assessment indicates that the spawning biomass is consistent with a proxy target reference level of MEY and is significantly higher than the trigger point in the FMS. Standardised CPUE has been stable for the last 3 years and catch per pot-lift appears to be increasing across the fishery in 2019–20. The stock assessment continues to be refined and some uncertainties remain, but the Committee is of the view that the science and data available provide a sound basis for TACC-setting. The primary gap at present, however, is the poor information available to estimate harvest by recreational and Aboriginal fishers. Better understanding that component of harvest, and in particular any increases in non-legal ‘commercial’ harvest, is central to further minimising management risks in this fishery.

5.6.1 Estimates of Recreational Harvest of Lobster

It is essential that robust estimates of the recreational harvest of lobster are obtained, and regular monitoring is established, to inform management of the total harvest from the lobster stock. Such estimates will benefit assessments of the stock, inform TACC setting, and ensure appropriate management of the recreational fishery.

The regular state-wide surveys of recreational fishing in NSW provide valuable data on the catch of recreational species and general trends in recreational fishing activity, but the methodology is not sufficient to obtain robust estimates of niche recreational species such as lobster. Targeted surveys to estimate recreational lobster catch and effort are required to provide robust estimates of total recreational harvest and the distribution of recreational fishing.

It is understood that targeted surveys are being considered by the Department and funding is being sought to support that work. The Committee strongly supports those endeavours and reiterates the recommendation that the Department obtain more robust estimates of recreational catch of lobster, sufficient to estimate current harvest, identify trends, and assess potential effects of changes to recreational regulations.

5.6.2 Harvest strategy

The Committee reiterates the view that a robust harvest strategy is needed to support the management of the lobster fishery, with clear objectives and explicit references points. This will ensure the TACC, and other management decisions, are tailored to achieve both biological and economic objectives. It also will support more streamlined management and administration of the fishery, including for example through the setting of a multi-year TACC.

The Committee recommends that the Department prioritise the development of the harvest strategy, in collaboration with Industry, noting the useful analyses already available from the scientific assessments to support the development of appropriate performance indicators and reference points

5.6.3 Multi-year TACC

The fishery is in a period of stability, suggesting that the introduction of a multi-year TACC may be appropriate. The primary benefit of setting a TACC for multiple years is that it provides greater certainty to industry, and a longer-term outlook for investment decisions. A secondary benefit is that it reduces the administrative burden of undertaking an annual TACC determination and implementation process.

Multi-year TACCs ideally are supported by a harvest strategy or, at a minimum, specified indicators that trigger a mid-term review if conditions in the fishery change. Industry attending the TAFC forum in 2020 generally expressed support for multi-year TACCs on the condition that a harvest strategy is in place. The Department also has advised that the necessary regulatory mechanisms to enable the setting of a multi-year TACC are not yet available.

The Committee recommends that the Department implement any regulatory revisions or procedures necessary to enable multi-year TACCs to be set in future for the lobster fishery, and other fisheries.

5.6.4 Discards

The lobster fishery has been subject to discards of around 5–10 t per year over the past 5 years. Industry submissions and logbook data indicate, however, that discards have increased significantly in the 2019–20 Fishing Period, with the Department estimating that 20 t of lobster will be discarded in this fishing period. It appears that the increase in discards is a result of higher than expected catch rates in the deep water fishery, in which case the rate of discarding should decrease as industry adapts to the changed catch rates through setting of fewer traps for shorter soak times. These adjustments must be monitored closely, however, and appropriate management responses developed if high rates of discards persist.

5.6.5 Size limits

Analyses provided by the Department found that small increases in the maximum size limit for rock lobster would provide substantial gains in MSY and MEY without significantly affecting depletion of the exploitable biomass. Most industry participants were not supportive of increasing the maximum size limit, however, without further considering the potential change in the distribution of fishing mortality across different size classes that might occur if an increase in the maximum size limit was introduced. Some industry participants did suggest, however, that the harvest of a larger size class of lobsters (e.g., > 220 mm) could be considered if there was evidence of reproductive senility in very large individuals. The Department has undertaken some preliminary analyses of the implications of changing size limits but the potential effect of targeting specific size classes on the biomass more broadly is not yet clear. The Committee encourages the Department to continue to refine their analyses, and do relevant research, to enable robust assessment of the potential effects of changes to size restrictions.

6. CONCLUSION

6.1 Summary

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 consideration and feedback provided on its recommendations.

The Committee notes industry's advice that shareholders favour a cautious approach to stock rebuilding but are very confident in their observations that the stock is in a very strong position.

Significant uncertainty remains about the amount of recreational catch of rock lobster. Accounting for recreational catch is important for the management of the fishery as TACCs are set at levels close to those thought to be near maximum sustainable levels and so any changes in recreational harvest become more influential on future stock status. We understand that measures are being proposed (for funding) to monitor more rigorously recreational harvest and strongly support those initiatives.

We again note that our TACC considerations would be assisted greatly by regular collection and analysis of basic economic data about the fishery. We also again emphasise the need for a formal harvest strategy to facilitate identification of clear, relevant objectives for the contemporary fishery, indicators and reference points against which future TACC adjustments would be assessed. A harvest strategy also would streamline management and assessment processes, and increase security for fishers about the medium-long term development of this fishery. The rock lobster fishery is in a very good place at the moment and there is no better time to resolve Departmental and Industry aspirations for its future.

6.2 Total Allowable Commercial Catch for 2020–21

The key factors in arriving at the Total Allowable Commercial Catch for 2020–21 were:

- The spawning biomass is estimated with considerable confidence to be significantly above the management trigger point of 25% of pre-exploitation levels;
- All measures of recruitment (puerulus settlement, catch rate of undersize lobster, and fishery-independent catch data) indicate continuing healthy recruitment to the fishery;
- There are reasonable levels of consistency among the fishery data, scientific survey, and model-based indicators for the fishery;
- There is agreement that current recreational and unreported catch can be regarded as 'low' for current assessments;
- The rock lobster stock is considered to be close to the level at which Maximum Economic Yield is likely and in a robust state from which to explore where that optimum lies;
- Compliance rates for the fishery are stable in the long term;
- Catch rates of lobsters across the legal size range and discard rates of lobsters above the maximum legal size have continued to increase, indicating sustained rebuilding of the harvestable and spawning stock;
- Industry has been adjusting fishing behaviours in response to enhanced catch rates to reduce the amount of discards whilst landing the TACC efficiently; and
- Industry opinion favours a cautious approach whilst the lobster stock continues to rebuild, whilst also favouring a small increase in TACC.

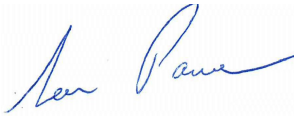
The Committee has resolved to increase the TACC for the 2020–21 quota year by 10 t (5.9%). We have reached this conclusion after taking into account the consistently positive stock and fishery indicators and very informative model prognoses about stock performance under alternative harvest regimes. It will not be possible to resolve some remaining uncertainties about the stock without some controlled testing of the stock's capacity for increased harvest. The rock lobster stock now is sufficiently robust and stable to tackle that testing to verify its limits, and assess whether the inferred relationship between spawning stock and recruitment on which assessments rest is correct. The Committee recognises that this increase in TACC might be 'over-shooting' the sustainable harvest level and, if so, will require future reduction, but we consider the stock and fishery now to be sufficiently robust to accept that short-term risk in the interests of better establishing the optimum, sustainable settings for the long-term future. The Committee's determination for 200–21 therefore again is made in the interests of balancing further rebuilding of the spawning biomass and exploring the sustainable biological and economic potential of the fishery under slightly increased harvest.

6.3 The Determination

The Total Allowable Fishing Committee, pursuant to Part 2A S40 of the Fisheries Management Act 1994 Nº 38, determines that the overall Total Allowable Commercial Catch of rock lobster that may be taken in the NSW Rock Lobster Fishery during the period 1 August 2020 to 30 July 2021 should be **180 tonnes.**

Bruce Mapstone, Chair

Alice McDonald, Fisheries Management



Sean Pascoe, Natural Resource Economist

Keith Sainsbury, Fisheries Scientist

Acknowledgements

The Committee thanks the authors of submissions for consideration in this determination and those fishers who attended and provided valuable discussion in the open forum on May 20th, 2020. We also thank the Departmental officers who prepared comprehensive reports on management, compliance, and the stock assessment on which we drew heavily in preparing this report. The figures and tables in this report are taken from those Departmental reports.

APPENDIX 1. PUBLIC CONSULTATION

Public consultation steps taken by the Committee, with support from the Department, are summarised in the table below. These steps effected the consultation requirements stipulated, *inter alia*, in the *Fisheries Management Act 1994 (FMA)*.

Date	FMA Reference	Consultation Stages
16.04.2020	Section 40F(1)	Call for public submissions on the appropriate level of the annual TACC for Eastern Rock Lobster for 2020–21.
16.04.2020	Section 284 (1b)	Advertisement inviting submissions placed under 'Open for Comment' on the DPI website.
16.04.2020	Section 284-2(c)	Individual calls for submissions sent to particular interest groups who the Committee considered might wish to provide collective submissions either due to their direct involvement in the lobster fishery or their interest in related issues. These groups included: ■ All NSW Lobster Fishery Shareholders and nominated fishers; ■ The NSW Lobster Fishery Working Group; ■ NSW DPI Fisheries Offices; ■ NSW DPI Head Office.
20.05.2020	Section 284-2(b)	Public consultation closing date, after at least 30 days.
	Section 40F (2)	The Committee received the following collated submissions: ■ NSW DPI Commercial Fisheries Management Report; ■ NSW DPI Research and Resource Assessment Report; ■ NSW DPI Fishery Compliance Report; ■ 4 shareholder submissions.*
20.05.2020	Section 40F (2)	The Committee considered submissions and heard formal presentations and opinions at the Total Allowable Catch Committee Open Forum video-conference meeting on 20 May 2020. The following attended the meeting: ■ Allan Blake , commercial fisher; ■ Robert Bryant , commercial fisher; ■ Mark Cranstone, commercial fisher; ■ Daniel Gogerly, commercial fisher; ■ Noel Gogerly, Rock Lobster Working Group; ■ Mark Horne, Rock Lobster Working Group; ■ Lee Monin, Rock Lobster Working Group; ■ Ryan Morris, seafood wholesaler; ■ Peter Offner, Rock Lobster Working Group; ■ Daniel Stewart, Rock Lobster Working Group; ■ Scott Westley, commercial fisher; ■ Malcolm Poole, recreational fishing representative; ■ Nicholas Giles, Commercial Management, DPI; ■ Joseph Wright, Compliance, DPI; ■ Geoff Liggins, Scientific Services, DPI; ***Apologies*** were received from Steve Burt, Michael Firkin, and Rich Little.

**** These submissions were either marked 'Confidential' or contained commercial information that was considered confidential. Identification of the authors has been withheld from the Report and Determination.***