# MSC Audit Reporting for Western Rock Lobster Resource

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25 July 2022

## Background

The West Coast Rock Lobster Fishery was certified under the Marine Stewardship Council (MSC) standard in 2000 and was the first fishery in the world to be MSC certified. Since then, it has successfully been re-accredited in 2006, 2012 and 2017. This document provides an update on changes to the fishery for annual audits by the MSC certification body and the annual stock assessment update for quota setting of the western rock lobster resource. Since the onset of the Covid-19 pandemic, the fishery has adopted extended fishing seasons (18 months) to deal with logistic and marketing issues. For simplicity of reporting, this document has maintained the 12-month fishing season structure (15 January - 14 January following year) for all modelled indices. Empirical derived indices have transitioned to financial year reporting in line with the new proposed season structure. Unless otherwise stated, data contained here represents data up to and including the 2021 season (15 January 2021 - 14 January 2022). The datasets discussed here, and synopsis of more comprehensive data can be found in de Lestang et. al. (2016) and Bellchambers et al. (2017).

## Management Arrangements

The management arrangements for the 2022 season were:

- This current season has been extended from 1 July 2021 to 14 January 2023 due to Covid-19 induced market impacts and was assigned a TACC of 9,000 tonnes (plus 1.5% due to water loss).
- Minimum legal size of 76 mm carapace length.
- Setose lobsters could be taken during whale gear modifications period (May to October inclusive).
- 100% of a pot entitlement may be fished outside of the whale gear modifications period (50% during).

## Stock Assessment

The annual stock assessment for the fishery is conducted in April/May each year, following the completion of the puerulus settlement season. This assessment has been based on the traditional 12-month fishing period for consistency in reporting construction and model design. The assessment entails updating and validation of all current data on puerulus settlement (April 2022), breeding stock surveys (October 2021), commercial monitoring

(January 2022), catch and effort (January 2022) and tag recaptures (January 2022). The stock assessment model is updated and used to assess several future harvesting (TACC) scenarios. The model assumes that the current (2022) season's biological controls (minimum size at 76 mm and no maximum size) are maintained in the assessment for the following five seasons. Projections of stock levels use the last four years of puerulus settlement data, with the fifth year based on the $25^{th}$ percentile of the historical data range (these are used to project the stock out over a five-year time frame as required by the Harvest Strategy, see below). The outputs from these analyses are provided below and to managers, the Western Rock Lobster Council, RecFishWest and industry stakeholders at annual management meetings.

### Summary

The 2022 stock assessment indicates that the rock lobster resource is currently well above threshold reference levels and is being sustainably fished at current harvest rates. Future projections suggest that lobster biomass and levels of egg production will be maintained well above threshold levels over the subsequent five fishing seasons under the modeled range of 12-month TACC (6000-7000 t) and harvest rate levels will remain steady. Outcomes of the stock assessment indicate that a moderate increase (e.g. 500 t) in the TACC would move towards fishing at Maximum Economic Yield (MEY).

The Total Allowable Recreational Catch (TARC) was calculated as 5% of the allowable harvest level (AHL), which is based on a commercial harvest rate of 39% of the available legal biomass for the 2022 season. (39% is chosen as it approximates the MEY level of fishing, Caputi et al. 2015). The resultant TARC for the February 2023 to January 2024 fishing season is 527 t. Details of seasonal AHL, TARC, TACC and recreational catch are provided in Appendix A.

### Harvest Strategy

The Harvest Strategy and Control Rules (HSCR - Fisheries Management Paper #264: (Department of Fisheries 2014) for the Western Rock Lobster Fishery (the Fishery) has been used as the basis for this assessment of the 2023 total allowable commercial catch (TACC) and Total allowable recreational catch (TARC).

This HSCR was used in the assessment of the 2015 - 2021 seasons' TACC and TARC. An internal review of this Harvest Strategy, compatible with the new Aquatic Resources Management Act, commenced in 2017. The department intends to initiate broader consultation of this Harvest Strategy in the latter part of 2022 or into 2023. The objectives of the current HSCR are:

- Sustainability: To ensure that the egg production in each of the four Breeding Stock Management Areas of the Fishery remain above their respective threshold values for the next five years with a probability greater than 75%.
- Harvest: Once the Sustainability Objective has been satisfied, total allowable catch (TACC + TARC) for the Fishery shall use the principle of Maximum Economic Yield to determine a range of TACs that would optimise the economic performance of the

Fishery by achieving the best catch and catch rates combination, and thereby providing high economic returns and greater amenity to the Fishery and the West Australian community.

The allocation principles used within the HSCR are:

- The TAC is split 95:5 between the commercial and recreational sectors.
- The TACC is to be split 50:50 between the northern (Zones A and B) and southern (Zone C) regions of the Fishery. This principle will be applied after the Sustainability and Harvest Objectives have been met.
- The TACC for the northern zone is to be further split 36:64 between A and B zones. This is consistent with the historic 10-year average between the 1998/99 and 2007/08 seasons and has been used as the basis for setting catch allocations since TACCs were introduced for each Zone.

A more detailed description of the stock assessment process including the biological and economic modelling used within the TAC setting processes is provided in Western Rock Lobster Resource Assessment Report (de Lestang et al., 2016). The assessment examines empirical data as well as the outputs from the stock assessment model.

### Empirical Assessment

The empirical assessment examines a range of observed indices derived from Commercial Catch and Effort statistics, Catch Disposal Records (CDR), the Independent Breeding Stock Survey (IBSS) and the Puerulus Settlement monitoring. This assessment indicates that:

- **Standardised catch rates are at very high levels in all fishing zones (Fig. 1):**
  *Data have been shown on a financial year basis as the fishery will soon move to this season structure.*
  Catch rates are standardised to account for the high grading of legal lobsters, which began in the 2010/11 fishing season when the fishery moved to quota management. After moving to quota management, the season was extended to 12 months. Variation in the soak time, location and timing of when catch has been landed are also standardised for, to remove the influence of variable monthly catchability. These biases have been removed by modelling the data with a generalised linear model (GLM) incorporating fishing season, depth, month, soak time and zone as factors or co-variants. The average response for each season in each zone has been produced. In all zones the standardised catch rates are currently at record levels. Causes of high catch rates include the reduced catch (and thus higher biomass) due to Covid-19 (9000 t over 18 months), the large 2016 puerulus recruitment, and the large residual biomass left each season because of the conservative catch quotas.

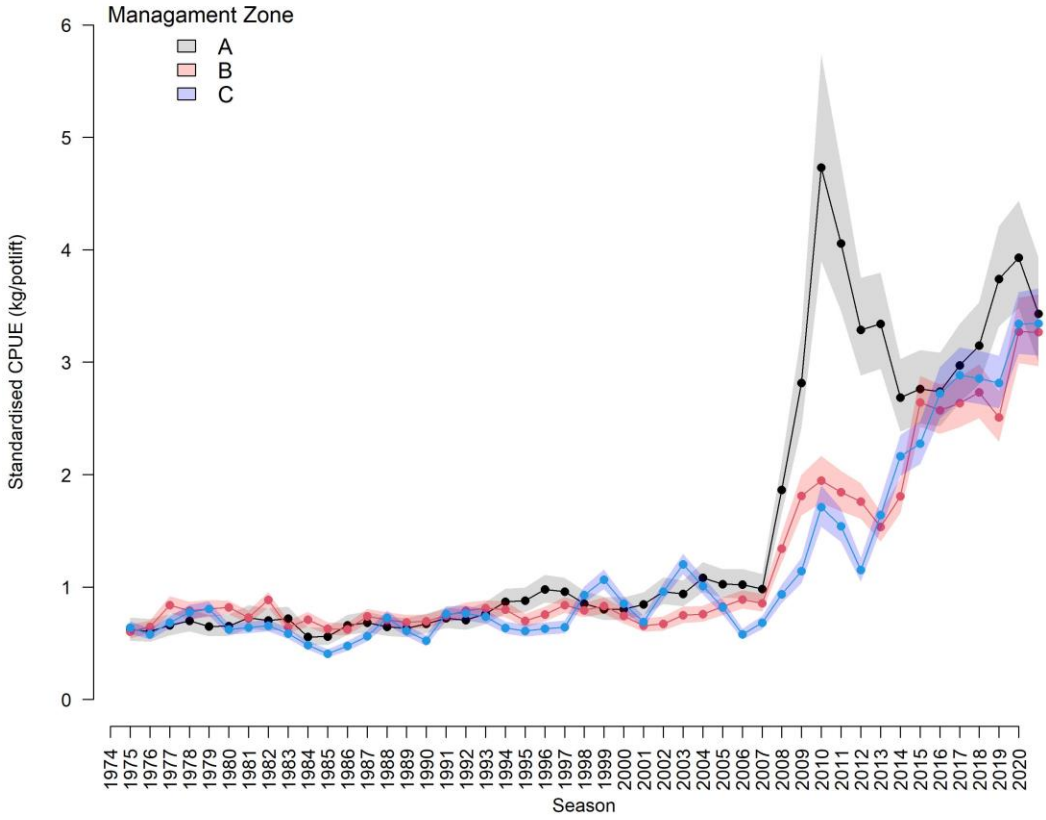


Figure 1. Mean (95% CI) standardised catch rates in the three fishing zones.

- **Egg production is at very high levels throughout fishery (Fig. 2):** The 2021 fishery-independent breeding stock survey (IBSS) sites sampled showed steady or increasing catch rates from their previous year (except in Big Bank). Kalbarri and Fremantle were not sampled in 2021. Although the IBSS egg indices are standardised for swell and water temperature, not all inter-annual variation in catchability is removed. A FRDC funded project (started in 2017) is examining a range of biological / behavioral and environmental factors which may influence catchability. Initial analysis indicates that stock composition (numbers of small and large lobsters), mating/spawning stage and sea floor temperatures during the surveys all have a marked effect on the catchability of the lobsters.
- Lobsters take about six/seven years to grow from puerulus into mature adults. With this time lag, lobsters that settled in 2014 and 2015, would be the dominant age classes that entered the breeding stock in 2022.

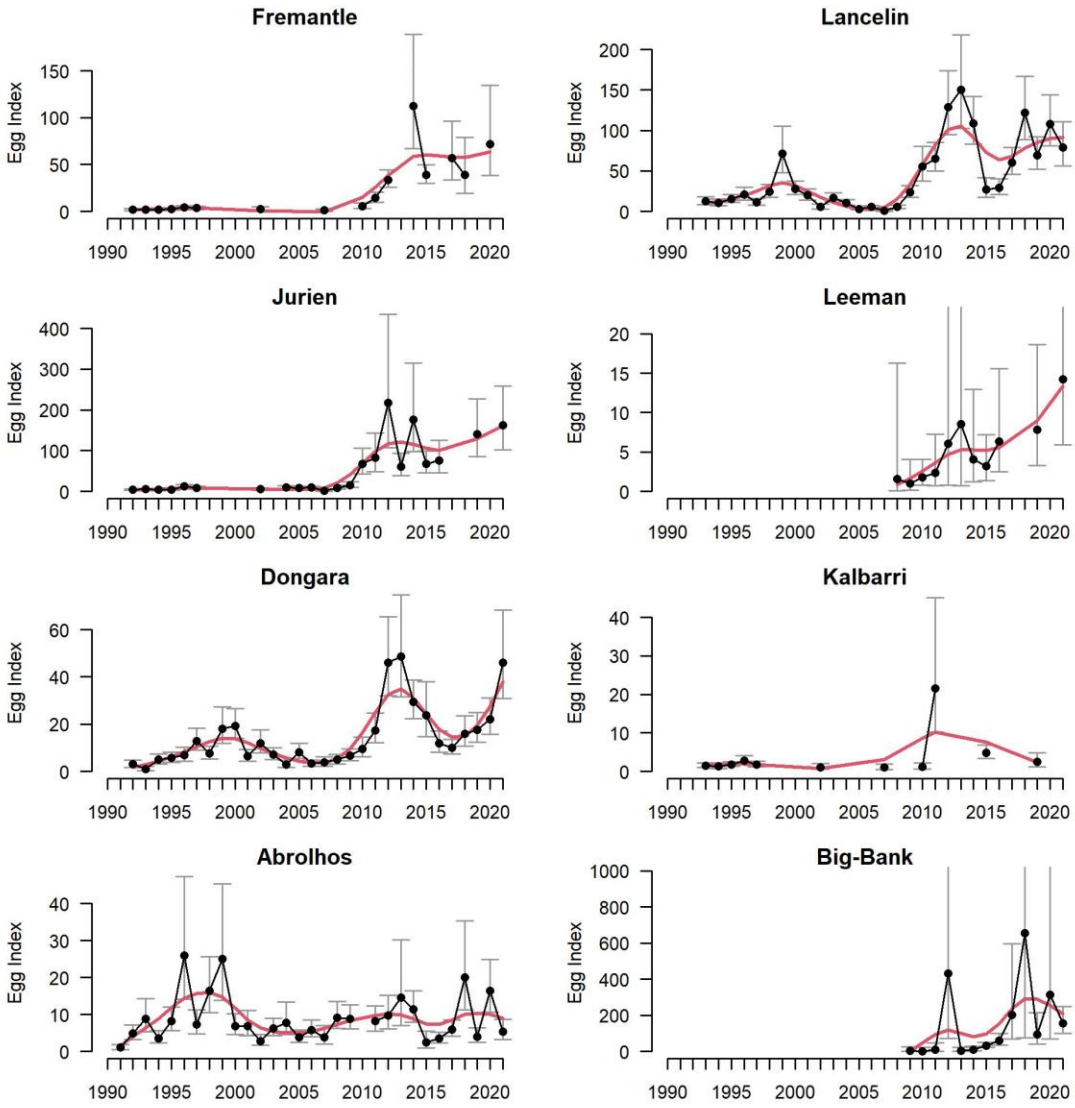


Figure 2. Independent Breeding Stock Survey mean (95% CI) egg production indices at eight locations with a smoother (red line) added to indicate their general pattern.

- **Recent recruitment (puerulus) into the fishery has been below average (Fig. 3):** The 2021/22 settlement was an improvement on the previous years, especially at Cape Mentelle, the most southern location within the fishery. The effects of this better recruitment will not dramatically affect catch rates as it will be buffered by the high residual biomass currently present in the fishery. This recruitment will enter the fishery in 2025.

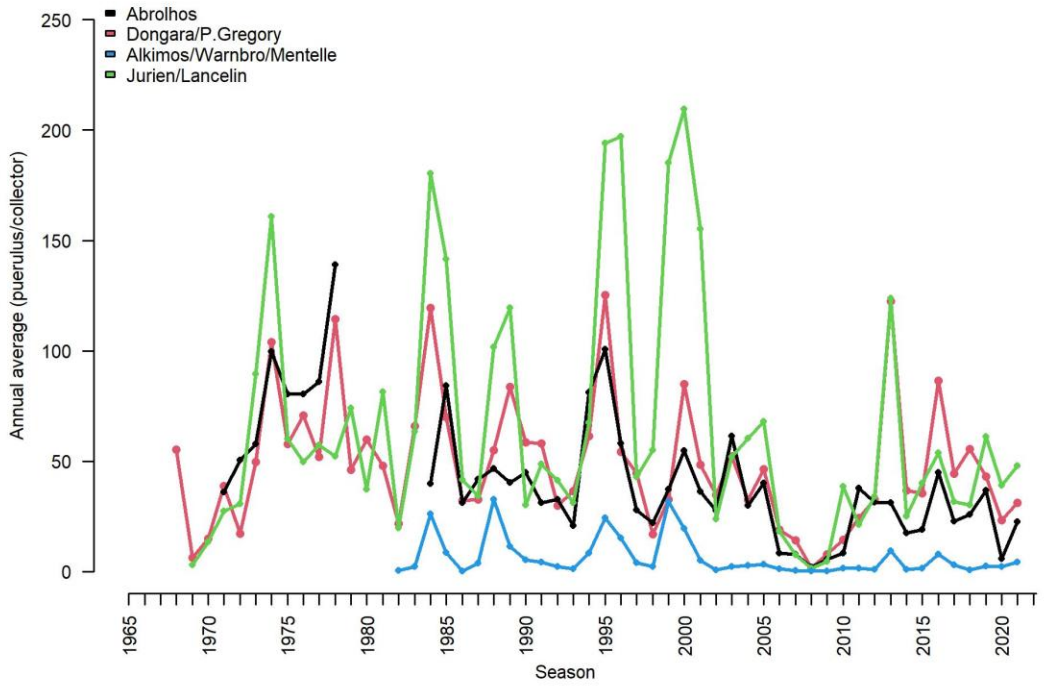


Figure 3. Regional puerulus settlement levels

- **TACC has been achieved while fishing effort and vessel numbers continue to decline (Fig. 4):** The TACC has been achieved each year. Data have been shown on a financial year basis as the fishery will soon move to this season structure. The fleet fishing for lobster decreased slightly in 2021 (vessels having returned at least five CDRs within a season) fishing season. Catches over the past three financial years have not been spread evenly. Relatively small amounts of quotas was landed during the first six months of the January 2020 – June 2021 18 month season, as it was held in the hopes of an increase in beach price. However, in the final 12 months of this season, with no price rise being apparent, fishers needed to land their quota (as to not waste it). In the current 2021/23 18 months season, again we have seen fishers hold off on landing quota in the hope of a price rise.

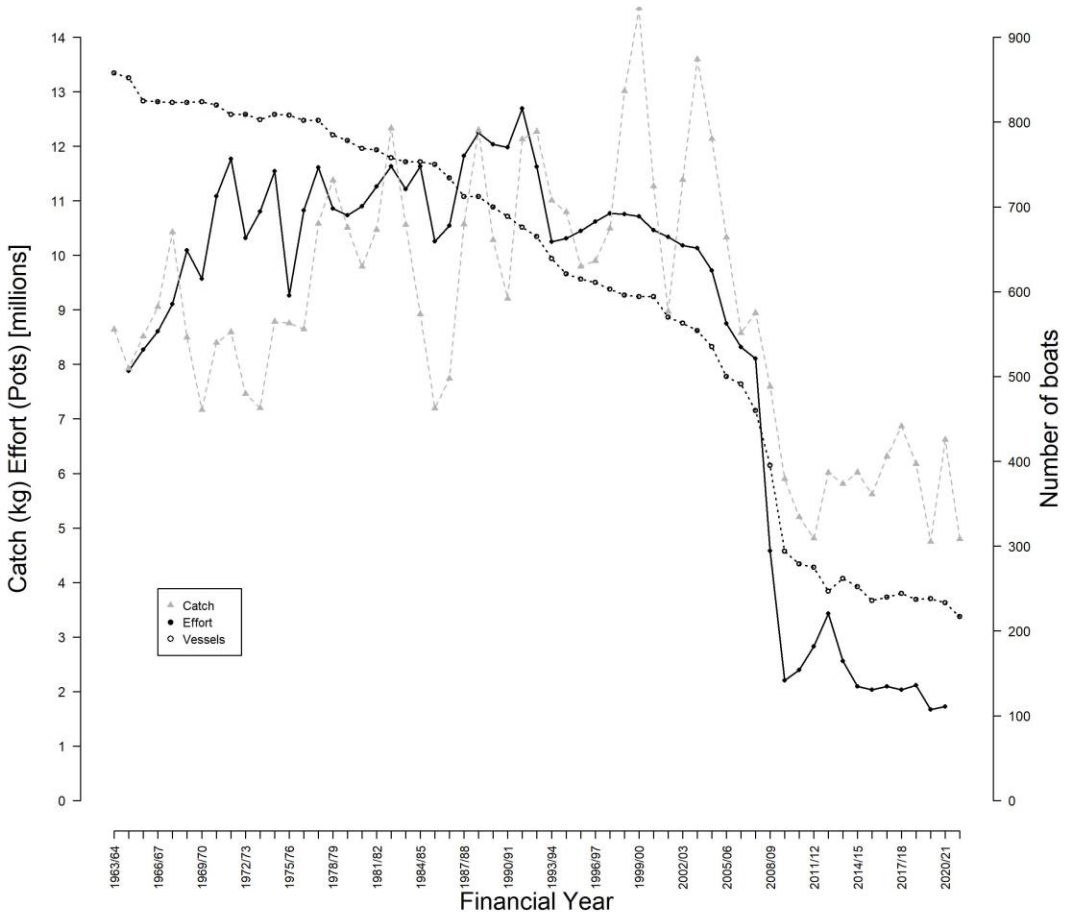


Figure 4. Catch (tonnes), effort (pot lifts) and the number of vessels. Note: variability in catch in the last three years is due to fishers fishing to the market, aiming to achieve the greatest beach price during extended (18-month) fishing seasons.

- **Recreational catches remain with the TARC (Appendix A):** The total recreational and charter catch for the 2020/21 season was estimated to be 542 t, and is the highest catch on record. While the total estimated recreational catch exceeds the 2020/21 TARC (533 t), using the 5 year rolling average (5-YRA) model, the 5-YRA catch was 498 t and the 5-YRA TARC was 503 t. This represents 4.9 per cent of the AHL, just below the five per cent recreational catch allocation. The increasing trend in catches was expected due to the easing of management regulations, and the conservative level of fishing by the commercial sector which has resulted in increased abundance and size of western rock lobster.

## Modelled Assessment

The Western Rock Lobster integrated assessment model is used to derive a number of indices highlighting the performance of the fishery in the three management zones. These indices are also projected five fishing seasons into the future (considering the puerulus settlement) to assess the likely implications of various TACC settings. The indices include catch rates, levels of egg production, legal biomass, and harvest rates. The model also includes an assumption of an annual recreational catch of 520 tonnes. This assessment indicates that:

- **Modelled catch rates are at very high levels in all fishing zones and generally predicted to increase or be maintained over the five-year projection under current harvest levels (Fig. 5):** Catch rates will remain relatively similar over subsequent seasons if the TACC does not increase markedly. A marginal increase in TACCs from the current 6000 t (pro rata 9000 t to 12 months) to 6600 t will have minimal impact on catch rates (Fig. 5).

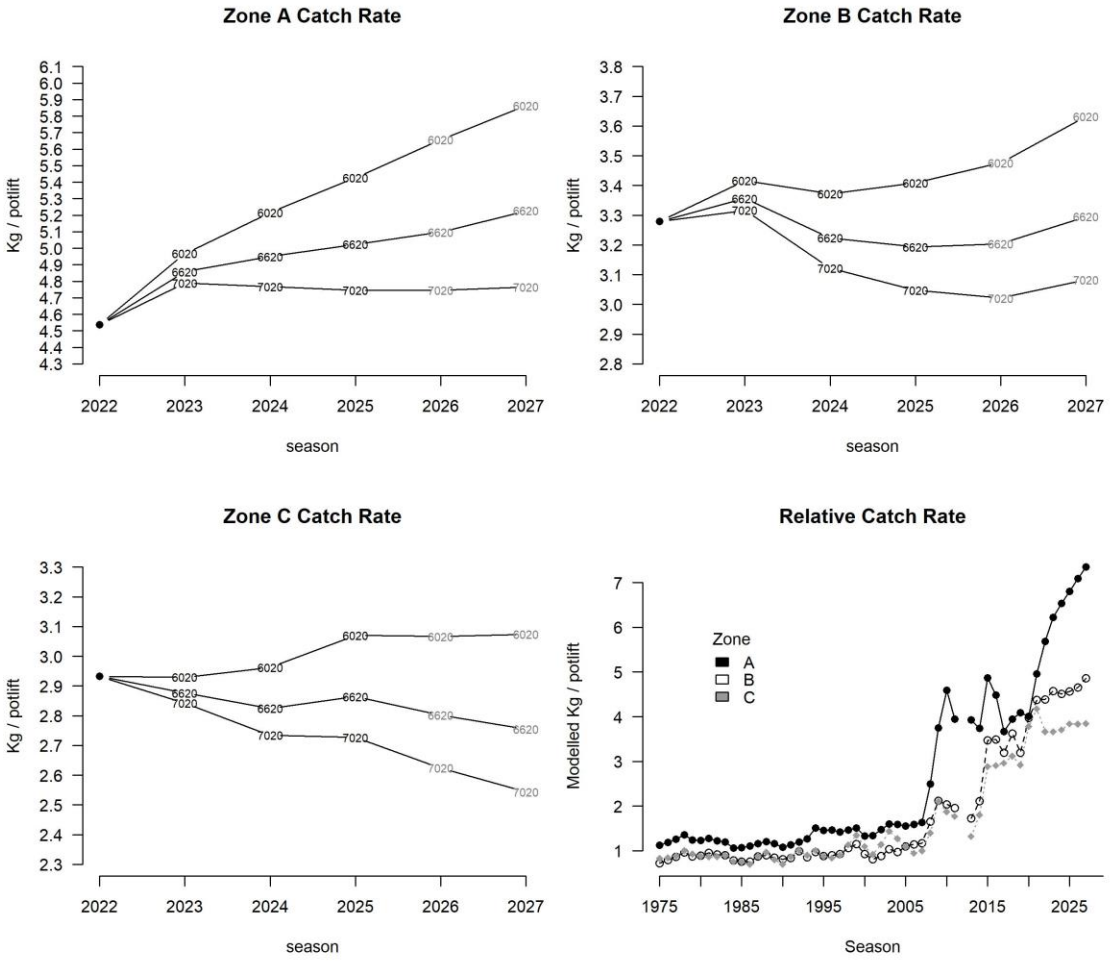

Figure 5. Model projected catch rates for different levels of fixed TACC for the three Management Zones of the fishery and the long-term relative change in catch rates within each zone. The final years are shown in grey as they are based on a conservative estimated level of puerulus settlement.

- **Modelled levels of egg production are at very high levels in all fishing zones and predicted to increase under current harvest levels over the five-year projection (Fig. 6):** Egg production increased following a drop in total landings in 2008 (from ~ 11000 to 5500 t), peaked in ~ 2013 before declining again when the lobsters from the 2008 recruitment failure year attained sexual maturity (i.e. very few grew into the spawning stock). Subsequently egg production again increased as landings have remained around 6000 t. Recent management changes (removal of maximum size and setose) have resulted in an increased targeting of breeding-age lobsters during the autumn/winter period prior to mating occurring when they again become protected. This has slowed the increase in egg production. Under current management measures, egg production is projected to increase over future seasons due to the good puerulus settlement in 2013/14 and 2016/17 starting to mature and enter the breeding stock. An increase in TACC may lead to a slight decline in egg production in the southern breeding stock management area but this will remain well above threshold levels.

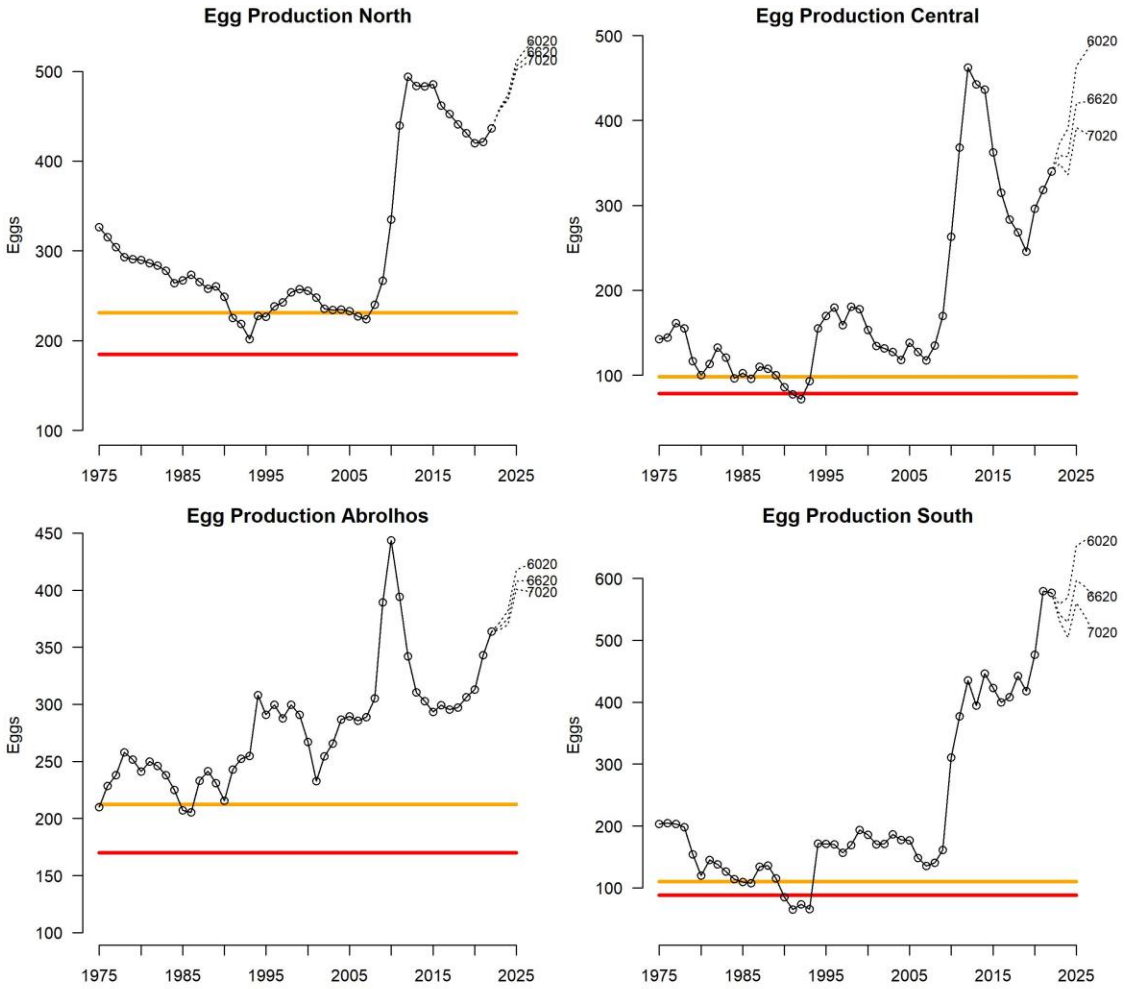


Figure 6. Model projected egg production for four modelled areas for different levels of TACC relative to their threshold (orange) and limit (red) reference levels

- **Modelled legal biomass levels are at record high levels and predicted to increase further under current harvest rates (Fig. 8):** Model-derived estimates of legal biomass available has changed over time due to variation in the classification of a legal lobster (e.g. are setose lobster legal or not) and due to level of harvesting lobsters compared to the abundance which recruit to the fishery each season (Fig. 7).

  In the late 1970s the legal biomass of lobsters in the fishery was between 15,000 and 20,000 t. This biomass varied annually from changes in the levels of puerulus settlement 3-4 years previously as well as through a progressive increase in harvest rate. Historical low levels of legal biomass were reached during the 2000s at about 14,000 t. Catch and effort reductions since 2008 and 2009 and then a change in the classification of legal lobsters (maximum size and setose protection removed from 2014 - 2015) have resulted in a sharp increase in the biomass of legal lobsters.

Currently estimates of the legal biomass are the highest on record and are projected to be maintained at proposed future catch levels.

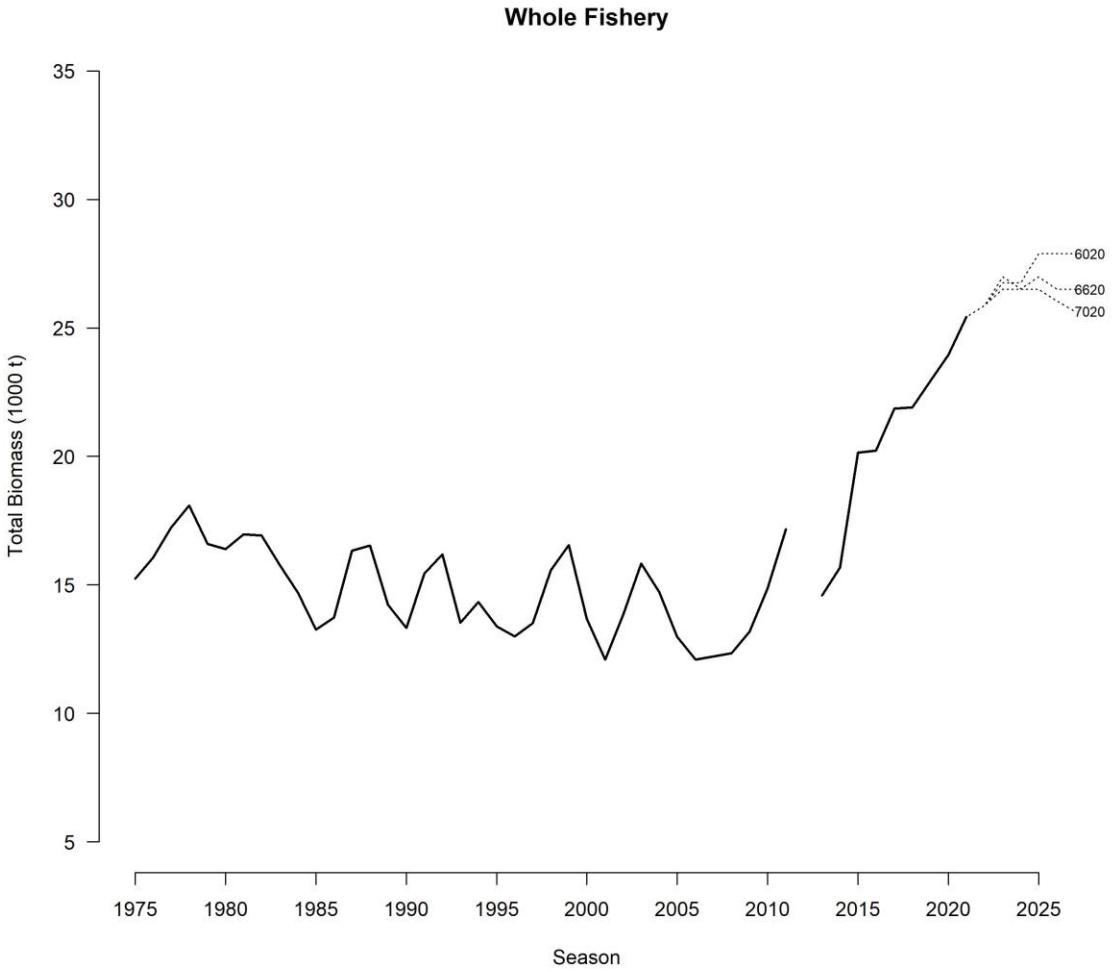


Figure 7. Model-estimated legal biomass and projected levels for different TACC with the break occurring due to the extended 2011/13 season (2012 season did not occur and so a value has not been recorded).

- **Modelled harvest rates are at very low levels and predicted to remain steady or decline further under current harvest levels (Fig. 8):** Model-derived estimates of harvest rate are shown for each fishing season (Fig. 8). The harvest rate is the proportion of the legal biomass taken each season. Therefore a high value indicates that a greater proportion of legal lobsters are being captured, and less "residual" lobsters are being left. The break in the series is caused by the extended 2011/13 fishing season when the season start date changed to 15 January. This extension resulted in the following season being considered the 2013 season. Historically the fishery caught 60-80% of all legal lobsters each season, which did not include the majority of the breeding stock as mature females had additional

levels of protection (e.g. setose and maximum size). In recent years the harvest rate has declined markedly to below 30%. Under the TACCs modelled, these low levels of exploitation are projected to be maintained as large amounts of biomass are allowed to remain in the water each season.

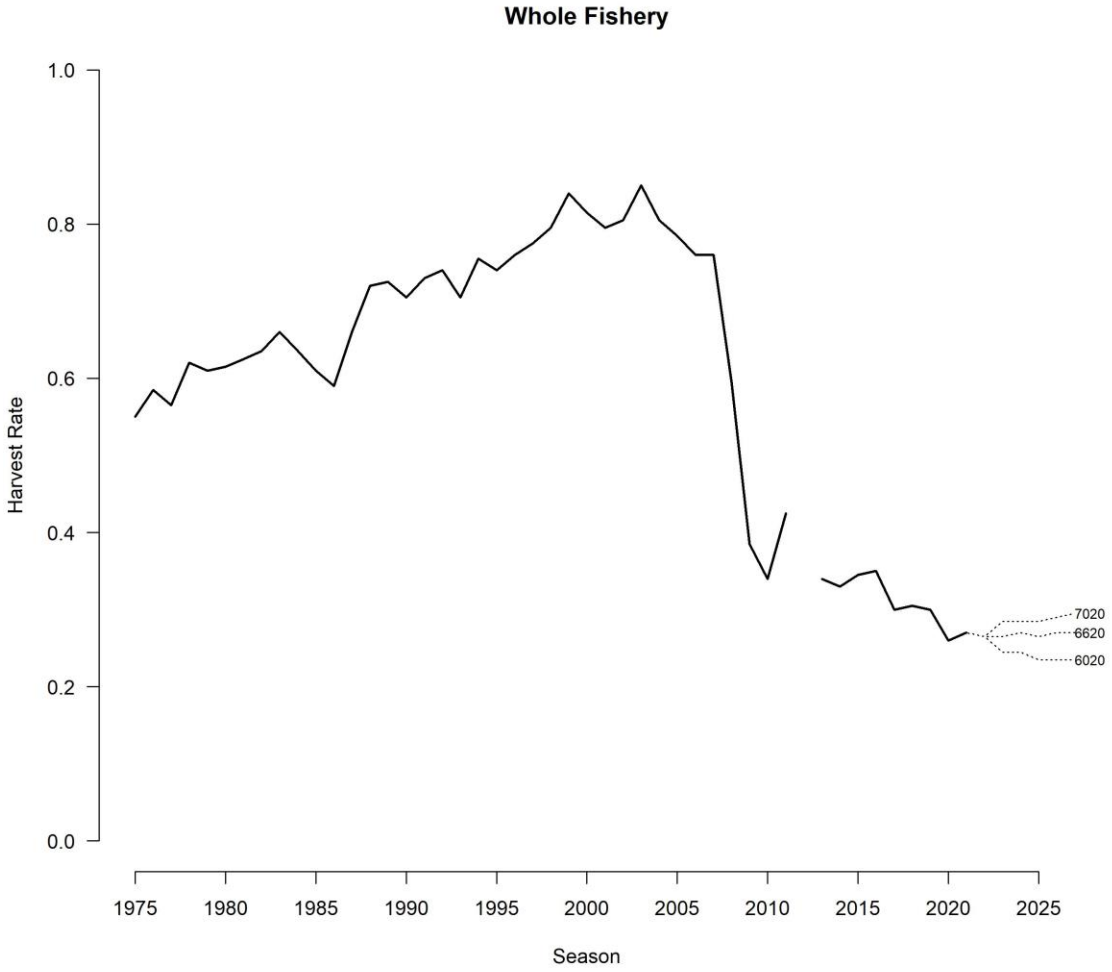


Figure 8. Model-estimated harvest rates and projected levels for different TACC.

## Weight of evidence summary

**The key indicators of the assessment show that:**

- The TACC was achieved in 2021 (within 1%).
- Recreational catches were within the TARC in 2020/21, using the 5-YRA model.
- Current standardised commercial catch rates are at very high levels in all fishing zones (close to record levels) (Fig. 1).
- Current egg production is well above threshold levels and close to historical highs throughout fishery (Fig. 2).
- Recent recruitment into the fishery has been average/just above average, and the 2021/22 settlement is close to average (Fig. 3).

- Commercial fishing effort has stabilised (declined slightly) and harvest rates are at very low levels (Figs 4 and 8).
- TACC projections based on 6000 - 7000 t indicate that catch rates will remain high (only decline slightly) (Fig. 5), high egg production and legal biomass levels will continue under all TACC scenarios modelled (Figs 6 and 7) and harvest rates will remain low (Fig. 8).

Based on the above it is likely that increasing the TACC in 2022 would still result in economical catch rates and move towards the MEY level of fishing based on previous assessments of MEY (i.e. harvest rate currently < 0.3 and MEY ~0.39).

An MEY modelling project, in conjunction with the Western Rock Lobster Council, is currently underway and aims to produce a contemporary MEY assessment for the fishery on annual basis.

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## Retained (non-target) species

### By-product

Commercial lobster fishers can retain and sell southern rock lobster, octopus and champagne crabs that are caught as by-product of lobster fishing. All catch of these species must be detailed on their catch disposal record. These data are included in the stock assessments for the West Coast Deep Sea Crustacean Managed Fishery (champagne crab) and Interim Octopus Managed Fishery (octopus). The catches by the West Coast Rock Lobster Managed Fishery for the 2020/2021 (18 month) season are detailed in (Table 1).

*Table 1. Species and quantity of by-product (kg) retained during the 18- month* 2020/2021 *fishing season.*

| Species | Catch (kg) |
|---|---|
| Octopus | 12,763.6 |
| Champagne crab | 2,181.7 |
| Southern Rock Lobster | 30.0 |
| Tropical Rock Lobster | 4.5 |

### Bait usage

The fishery used approximately 2496 tonnes of bait in the 2020 12-month “season” (15 Jan 2020 – 14 Jan 2021). The majority of bait used (72.1%) was bait of terrestrial origin (e.g. pig fat), or fish processing waste products such as heads or frames which would otherwise be discarded. (Table 2).

*Table 2. Identity, origin, type and amount of bait (kg) used during the 2020 12-month “season”.*

| Bait | Origin | Type | Amount |
|---|---|---|---|
| Blue Mackerel | New Zealand | Whole | 633,915 |
| Salmon | Western Australia | Cutlets | 49,868 |
| Kahawai | New Zealand | Whole | 12,400 |
| Hoki | New Zealand | Heads | 1,017,556 |
| Orange Roughy | New Zealand | Heads | 521,065 |
| Pork Flare | Western Australia | | 117,625 |
| Alfonsino | New Zealand | Heads | 93,700 |
| Orange Roughy | Australia | Heads | 13,440 |
| Blue Mackerel | New Zealand | Tails | 12,000 |
| Salmon | Western Australia | Heads | 11,420 |
| Pork Fat | Western Australia | | 7,500 |
| Silver Warehou | New Zealand | Heads | 5,020 |
| Blue Mackerel | New Zealand | Heads | 40 |

The proportion of Blue Mackerel from New Zealand was 0.26 of the total bait used in the fishery for the 2020 12-month "season" (Figure 9).

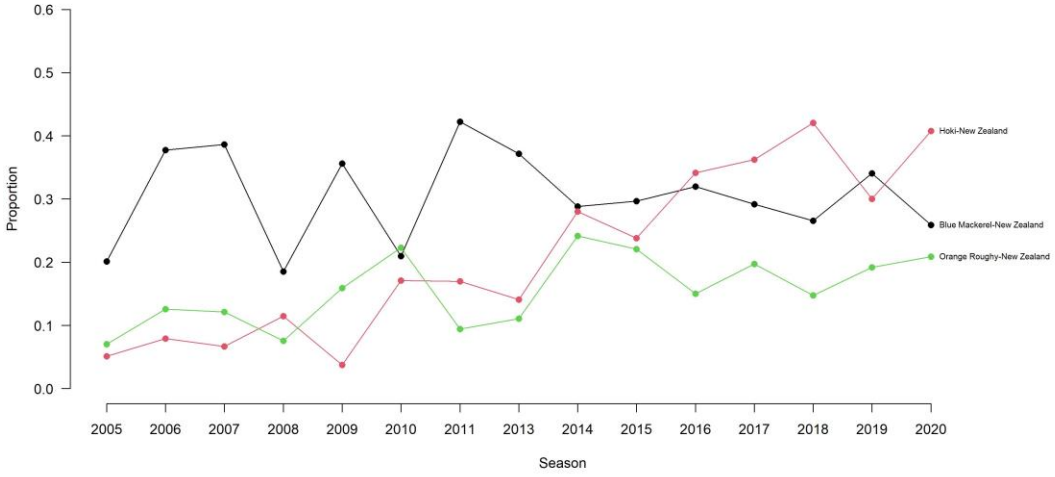


*Figure 9. Proportional bait usage by season for the three most commonly used bait species.*

## By-catch (non-ETP) species

All by-catch (can be retained but not sold) reported during the 2020/2021 (18 month) fishing season in catch disposal records has been summarised to combine, where possible,

the same species under a common name. For example, “Bluebone”, “Baldys” and “Groper” have all been pooled under the common name of “Baldchin Groper”.

The greatest biomass of by-catch was the Baldchin Groper, which contributed 60.4% of all by-catch (3130.4 kg). The second greatest biomass of by-catch was the Pink Snapper, which contributed 17.8% of all by-catch (920.5 kg). It should be noted that not all by-catch caught is retained, with much of it being returned alive (Table 3).

*Table 3. Common name, quantity (kg) and its respective proportion of the total by-catch caught during the 18-month 2020/21 fishing season.*

| Common.Name | Total (kg) | Proportion |
|---|---|---|
| Baldchin Groper | 3,130.4 | 60.44 |
| Pink Snapper | 920.5 | 17.77 |
| Cuttlefish | 405.0 | 7.82 |
| Redthroat Emperor | 285.8 | 5.52 |
| Breaksea Cod | 182.8 | 3.53 |
| Wobbegong Shark | 83.0 | 1.60 |
| West Australian Dhufish | 58.5 | 1.13 |
| Leatherjacket | 56.5 | 1.09 |
| Squid | 36.5 | 0.70 |
| Rockcods | 9.0 | 0.17 |
| Crabs | 5.0 | 0.10 |
| Goldspotted Rockcod | 3.0 | 0.06 |
| Flatheads | 1.0 | 0.02 |
| Foxfish | 1.0 | 0.02 |
| Port Jackson Shark | 1.0 | 0.02 |
| Scorpionfishes | 0.5 | 0.01 |

## Endangered, threatened and protected (ETP) species

### Sea Lions

Drowning of Australian sea lion pups in western rock lobster pots instigated the implementation of sea lion exclusion devices (SLED) in areas where these interactions were occurring. Historical levels were just over three sea lions per season. In 2020/21 there were 0 interactions recorded. The performance measure for the fishery is that there is no increase in the rate of capture of sea lions. Therefore, **the fishery met this performance measure**.

Compliance checks are undertaken on the adherence of fishers to SLED regulations. In the 2021 12-month “season” there were 36 checks of gear for SLED compliance. This resulted in two infringements and 6 warnings issued to recreational fishers.

### Dusky Shark

To address concerns over the impact of entanglement of the Dusky shark (*Carcharhinus obscurus*) population from discarded bait bands, a state-wide ban on bait bands on fishing vessels was implemented on the 15 November 2011. An ecological risk assessment (ERA) re-assessed this issue after the implementation of the state-wide ban as a negligible risk (Stoklosa 2013).

Compliance checks are undertaken on the adherence of fishers to bait band regulations. In the 2021 12-month "season" there were 361 vessels checked for bait band compliance. This resulted in 1 infringement and 1warning issued to a commercial and recreational fisher respectively.

### Whales

The largest population of humpback whales (*Megaptera novaeangliae*) in the southern hemisphere (Leaper et al. 2008) migrates along the West Australian coast annually. Traditionally this population has had a small interaction with the western rock lobster fishery. Entanglements between 1990 and 2010 ranged from 0 to 6, averaging just over 1 entanglement annually. As a result of increased fishing during the whale migration period as the season extended to 12 months from 2011 – 2013 there was a corresponding increase in whale entanglements which peaked at 17 in 2013.

In July 2014 a series of gear modifications were introduced to mitigate entanglements between humpback whales and western rock lobster gear. These modifications are implemented during the whale migration period (May-October) each year since. The performance measure for this fishery is that entanglements in western rock lobster gear is within historic range. During the 2021 migration there was one entanglement recorded, with the sharp reduction in entanglements related to a fall in winter fishing activity due to the season ending on 30 June 2021. T**he fishery met this performance measure** (Figure 10).

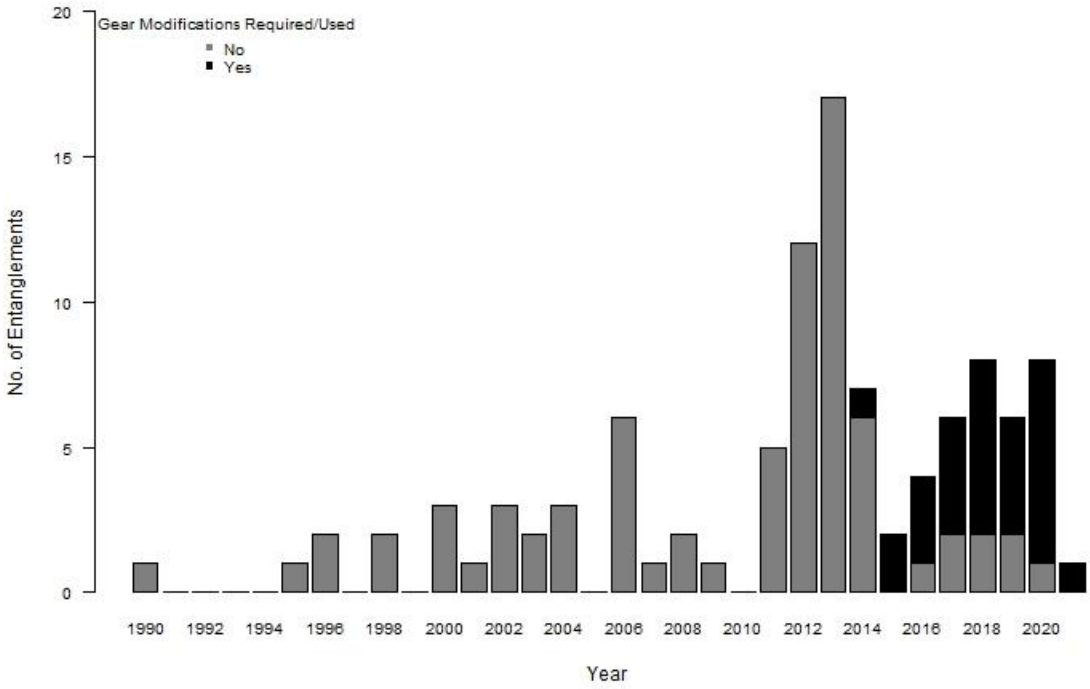


*Figure 10. Annual number of entanglements of whales in western rock lobster gear when gear modifications were not (grey) or were (black) required. Gear modifications were introduced in June 2014, midway through the migration season.*

Compliance checks are undertaken on the adherence of fishers to whale gear mitigation regulations. In the 2021 12-month "season" there were 74 checks of vessels for whale gear modification compliance. This resulted in two warnings to commercial and 1 warning to recreational fishers.

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## Ecosystem Effects of Fishing

A number of components of the ecosystem are monitored to assess any potential impact on the removal of lobsters on ecosystem function. These include target species abundance and demography, invertebrate communities, habitat structure and fish communities and occur throughout the re-certification period (5-year cycle), such that each component of the ecosystem is assessed at least once during this period. This assessment is undertaken through monitoring these components inside an area closed to fishing (Leeman closed area) and adjacent fished areas.

A review of the ecosystem effects of fishing within and around the Leeman closed area is currently underway, examining data from the last 10 years since the closure. It is expected that this report will be available by the end of the 2022/23 financial year.

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## Appendix A

*Table A1. Annual Harvest Level (AHL), Total Allowable Catch (TAC), Total Allowable Commercial Catch (TACC, pro rata from extended seasons), Total Allowable Recreational Catch (TARC), commercial and recreational catch for commercial (15 January to 14 January) and recreational (15 November to 30 June) seasons. Note: during 2018 the recreational fishing season was extended year-round. The recreational catch listed for 2017/18 encompasses the old season structure (15 November to 30 June) and that listed for 2018/19 encompasses the new season structure (1 February to 30 January). This better aligns the commercial and recreational seasons. To ensure both season structures are comparable, the recreational catch landed in February 2018 – June 2018 has been recorded twice in the table below. Work is being conducted to align the commercial and recreational seasons for comparable reporting and to collect year-round recreational catch estimates. All commercial seasons are shown on January 15 to January 14 basis, as such landings will not match the pro rata TACCs.*

| Commercial "season" | AHL | TACC | Commercial catch | Recreational season | TARC | Recreational catch |
|---|---|---|---|---|---|---|
| | | | | Nov 2013/ | | |
| Jan 2014/Jan 15 | 7760 | 5859 | 5946 | Jun2014 | 388 | 243 |
| 2015/16 | 8080 | 6000 | 6086 | 2014/15 | 404 | 330 |
| 2016/17 | 8440 | 6000 | 6087 | 2015/16 | 422 | 393 |
| 2017/18 | 9600 | 6300 | 6394 | 2016/17 | 480 | 461 |
| 2018/19 | 10120 | 6300 | 6392 | 2017/18 | 507 | 489 |
| 2018/19 | 10120 | 6300 | 6392 | 2018/19 | 506 | 464 |
| 2019/20 | 9800 | 6300 | 6392 | 2019/20 | 490 | 535 |
| 2020/21 | 10650 | 6000 | 6615 | 2020/21 | 533 | 542 |
| 2021/22 | 11250 | 6615 | 5696 | 2021/22 | 562 | |
| 2022/23 | 11690 | 6615 | | 2022/23 | 585 | |
| 2023/24 | 10550 | | | 2023/24 | 527.5 | |