

Victorian commercial ocean wrasse fishery harvest strategy

Performance update 2022

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Blue Throat Wrasse (*Notolabrus tetricus*) male and female, and Purple Wrasse (*N. fucicola*) male

Key points

The available information for the Victorian commercial wrasse fishery indicates that –

- For 2021/22 the primary catch per unit effort (CPUE) performance indicator was above the trigger reference point for the West zone, slightly below for the Central zone, and the East zone could not be assessed in 2021/22 as no wrasse were landed in the zone.
- Around 3% of wrasse were taken in rock lobster pots, well below the 10% allocation permitted under the harvest strategy, as has been the case for seven years.
- The proportion of total catch taken by ocean wrasse fishery licences in 2021/22 was 99%, consistently increasing from below 50% prior to 2014/15.
- Discard rates were relatively high overall with about half those caught being discarded. Bluethroat wrasse discards were particularly high in the Central and East zones, averaging 67% across years, whereas in the West zone the average was 16%. Rates of Bluethroat discarding were consistent among years within each assessment zone. Purple wrasse discards were less consistent but much lower than for Bluethroat, being less than 10% in most years but with higher rates approaching 40% in 2020 and 2022 in the West zone, where catches of purple wrasse are higher.
- The total catch for 2021/22 of 21 t was similar to 2020/21 (21.5 t) but down by about one-third from 2018/19 (31.5 t) and 2017/18 (32.6 t) likely due to changed market conditions. This state-wide reduction was driven by a 16% decrease in the Central zone and no landings were reported for the East zone, whereas in the West zone catch increased by 39%.
- In comparison to the relatively stable CPUE trend during the harvest strategy reference period of 2004/05–2014/15, 'hook & line' effort increased to a much greater extent than catch reflecting a decrease CPUE i.e. stock biomass until licence transferability in 2017/18. Following transferability both variables have been relatively stable with moderate increases in CPUE apparent over the past two years in the West zone and an increase in the East zone until 2020/21 (no fishing in 2021/22), whereas there has been a decline in the Central zone.
- Monthly patterns of catch and effort since early 2020 have generally been consistent with presumed effects of public restrictions imposed in response to the COVID-19 outbreak in Victoria, associated market conditions, international market constraints on rock lobster exports, and weather patterns, with the influence of these factors on fishing inseparable.
- Recent patterns in effort among different fishing methods are consistent with the introduction of licence transferability as new operators have become active using 'hook & line' since 2017/18.
- There has been a demographic shift in ownership of ocean wrasse fishery licences reflected in a recent increase in the proportion of catch taken from the West assessment zone.

Introduction

Background

Victorian wrasse populations support mostly local port-based commercial fisheries. The Victorian fishery predominantly uses 'hook & line' to harvest wrasse from in-shore waters (<30m depth) year-round for the live fish restaurant market. There is also a small recreational fishery. This document summarises the performance of the Victorian ocean wrasse (OW) fishery in relation to the "Harvest Strategy for the Victorian Wrasse (Ocean) Fishery" that was established in early 2017 and is available at: <https://vfa.vic.gov.au/commercial-fishing/wrasse>. This annual harvest strategy update considers the key performance indicators of CPUE, commercial wrasse harvest and fishing effort up to and including the 2021/22 fiscal year for the fishery overall as well as the three assessment zones specified in the harvest strategy (Figure 1). The percentage of total harvest that is taken by 'hook & line' is also monitored due to the intent that this fishery remains dominated by a 'hook & line' fishing method.

CPUE for 'hook & line' method, measured as kg/hr of reported fishing time, is used as a proxy performance measure for available biomass, under the assumption that CPUE will fluctuate in proportion to the availability of legal sized wrasse. However, CPUE can also vary for reasons unrelated to available biomass, such as fisher skill, season/month, location of fishing and potentially other reasons. To reduce the influence of these factors on the CPUE biomass signal, the nominal or "raw" CPUE data are standardised using statistical procedures (Generalised Linear Mixed Modelling) to reduce the effects of factors that may influence the CPUE but are not related to the available biomass. Prior to standardisation, data from catch and effort records being used to estimate CPUE are carefully reviewed, and any records considered implausible (e.g. well outside historic ranges) are removed to avoid erroneously skewing the results. Further, because annual CPUE data can vary due to random interannual variation in localised availability or fishery operations, the 3-year average standardised CPUE is used as the primary indicator.

Abrupt changes in catch and/or effort are also flagged by the harvest strategy, whereby a 50% change in effort and/or catch from one year to the next would require discussion and review with industry as the initial management response.

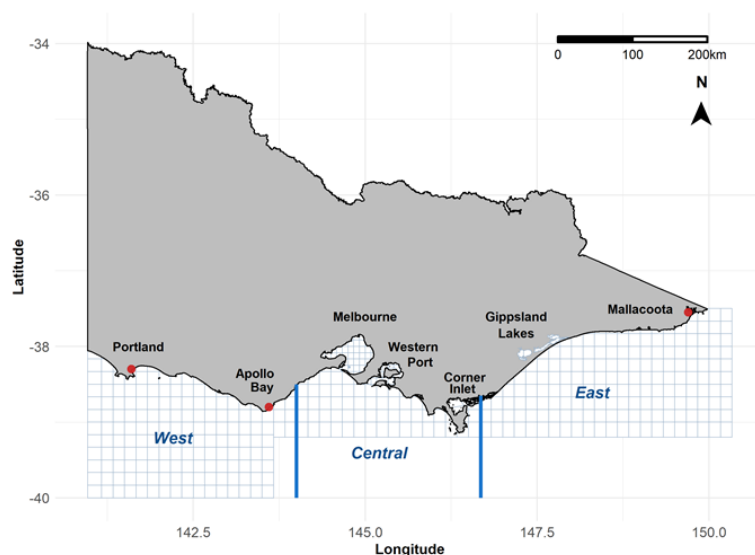


Figure 1. Map showing assessment zones and catch reporting grid cells for the Victorian ocean wrasse fishery.

Biology

Wrasse are reef dwelling species with a single male dominating a “harem” of females. Aside from this aspect of biology where females of some species greatly outnumber males, stock structure of wrasse in Victorian waters is uncertain. Blue throat wrasse live to 23 years and males can grow to over 50 cm total length (TL). Purple wrasse live for up to 24 years and grow to over 45 cm TL. Maturity (50 percent) for blue throat wrasse is reached at four to eight years (20–30 cm TL), and for purple wrasse at three years (18 cm TL). Blue throat wrasse can change sex (female to male) from 5 years of age onward in response to the loss of a dominant male. Purple wrasse do not change sex and males and female reach similar sizes. Wrasse are highly fecund and are fast growers. The main spawning period is spring. Wrasse are territorial inhabiting specific reefs.

Harvest Strategy

The 2017 harvest strategy has specific benchmarks (reference points) for CPUE that are designed to indicate acceptable, declining and below acceptable biomass. These benchmarks are based on a reference period from 2004/05 – 2014/15. During this period catches were relatively stable compared with the overall catch history. Given the apparent stability of the recent catches, the focus of the harvest strategy is to provide management advice to safeguard the existing biomass from unsustainable depletion rather than to rebuild it.

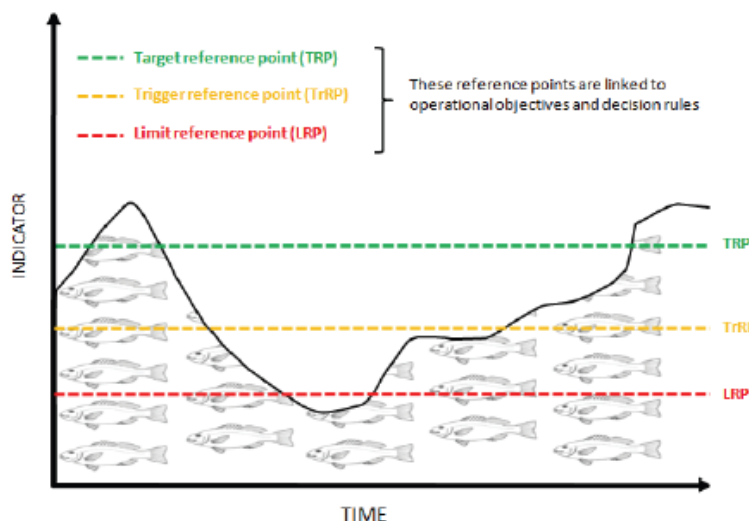


Figure 2. Illustration of the performance of CPUE as a proxy for stock biomass relative to the three references points specified in the harvest strategy for commercial wrasse.

The harvest strategy benchmarks for the 3-year averaged standardised CPUE are:

- *Target reference point*: Average of standardised CPUE for the reference period (biomass is at target level)
- *Trigger reference point*: $0.75 \times$ average of standardised CPUE for the reference period (below which biomass is considered declining)
- *Limit reference point*: $0.50 \times$ average of standardised CPUE for the reference period (below which biomass is considered poor)

In the context of the harvest strategy, when the 3-year averaged standardised CPUE remains above the trigger reference point, management action to protect biomass is unlikely required (Figure 2). However, there are currently no management decision or control rules attached to the CPUE reference points. These require further development in consultation with the industry. Currently, if the 3-year averaged standardised CPUE dropped below the trigger reference point, then this would initiate a formal review with industry to obtain a better understating of

the situation and the need for management changes. Because the fishery is transitioning to the new license arrangements and operators, it is recognised that the initial harvest strategy may need to be adaptive when warranted, and may evolve as the fishery settles, more data and/or additional potential indicators of stock/fishery performance become available.

Additional reporting fields were introduced to the catch and effort reporting forms from 2017, including numbers of lines and hooks used, and discards. Over time, these new data will enhance the information that is available to assess performance of the fishery, so wrasse fishers are encouraged to do their best to complete these fields accurately. Thus far, the industry is commended for improving its reporting of fishing activities. Over the last decade, for example, the catch of wrasse species reported as 'unspecified' among all licence classes and gear types has reduced from an average of 61% of the total reported catch during the 2004/05–2014/15 reference period to 7% in 2015–2022 due to improved reporting by fishers. Indeed, during the past two years it has been < 0.2%.

In relation to the percentage of catch taken by 'hook & line', the harvest strategy document indicates that if it drops below 90% (i.e. >10% of the catch is by pots) management may need to consider approaches to prevent further increases in the catch proportion by pots. This has not occurred to date and the impact of an embargo on importation of rock lobster into China appeared to have reduced the catch of wrasse to zero in during 2020/21, noting that it reached a high of 21% during 2016/17. Around 3% of wrasse were taken in rock lobster pots in 2021/22.

Assessment

Annual assessments are undertaken to gauge the performance of the harvest strategy as more data are progressively acquired. Significant management changes, which alter the way a fishery operates, can strongly influence variables used to monitor trends and spatial patterns in stock by causing short-term shifts unrelated to stock biomass as well as changes in biomass over longer periods. It is in this context that this report addresses the performance of the harvest strategy following the relatively recent implementation of licence transferability that gave rise to a change of operators, with an emphasis on promoting 'hook & line' fishing. There have been only a few years since upon which to measure changes statistically, and most recently since 2020 there has been added disruption from the SARS-CoV-2 coronavirus pandemic and the secondary effect of a trade embargo on China's importation of Australian rock lobster. Again, it will take more years for the impact, if any, on stocks to become apparent, but in this instance, stock biomass will not be adversely affected by a reduction in fishing mortality arising from a period of reduced market demand for wrasse or interruptions to market access. Nevertheless, it can be more difficult to assess stocks under these circumstances when the time series of monitoring data are of short duration.

Performance Assessment

Summary of fishery data

Catch

Annual catch statistics across the entire recorded history of the fishery illustrate its development and increasing sophistication of reporting, consistent with the early development phase transitioning into maturation of the fishery.

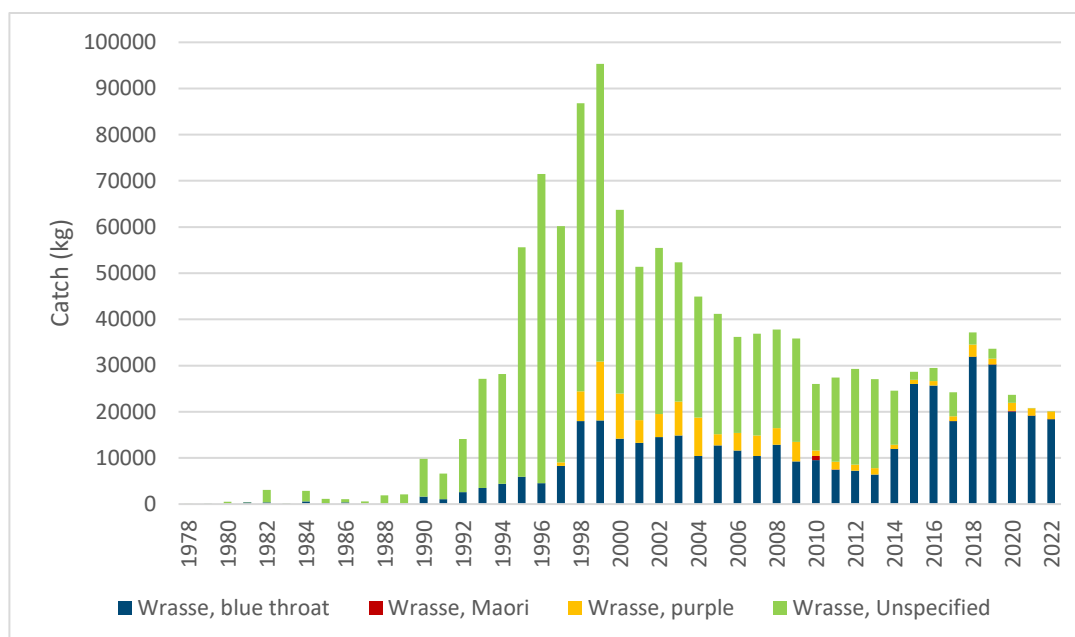


Figure 3. Catches reported for all wrasse species since 1978; note that most of the 'Unspecified' landings are likely to be Bluelthroat wrasse.

The annual proportions of catch among species shows that the fishery predominantly depends on blue throat wrasse (assuming that the proportion of 'wrasse, unspecified' is relative to when species is reported accurately), with purple wrasse making up most of the complement of the landings (Figure 3). Maori wrasse account for a very small to negligible amount of the reported catch with a maximum of 4% in 2010, and it seems reasonable to surmise that the larger fractions of unspecified species in the catch reported until 2015 were mostly blue throat wrasse (Figure 3). The different species are distinctly recognisable, and it is implausible that the catch of unspecified species represents one of the minor species that has become extremely depleted.

The proportion of total catch by ocean wrasse fishery licence/permit in 2021/22 was >99%, increasing consistently each year from around 10% or less prior to 2007/08. The percentage of catch taken by rock lobster pots has been 8–9% for the past three years with around 90% taken by 'hook & line'. This is consistent with the objective of the harvest strategy to limit the targeted effort by rock lobster fishers who also participate in the ocean wrasse fishery to ensure that the fishery was predominantly 'hook & line'.

The total catch for 2021/22 of 21 t was similar to 2020/21 (21.5 t), but down by almost one-third from 2018/19 (33.5 t) and 2017/18 (37.1 t). This state-wide reduction was driven by a 16% decrease in the Central zone and no landings were reported for the East zone, whereas in the West zone catch increased by 39%.

Although most of the catch during the past decade has been taken in the Central zone, the proportion taken in the West zone has steadily increased over the past three years to now be at 46% of total catch across the State (Figure 4). Historically, in 2004 the landings from the West zone were 57% of the state-wide landings so the current proportional landings are not unprecedented. The East zone produced the least catch averaging 5% of the total during the past six years although it accounted for 23% of the catch in 2010 (Figure 4). It is likely that the increase

in the West zone, clearly illustrated by the positive spike in interannual change in 2017/18 (Figure 5), has arisen from demographic change associated with some of the licence transfers. This may have little to do with the state of the resource at the time but may have consequences for stocks if such transfers result in spatially intensified effort on particular reefs beyond what their wrasse populations can sustain. Nevertheless, the spike rapidly subsided possibly as fishing operations settled down to a more consistent pattern in the wake of the transfers.

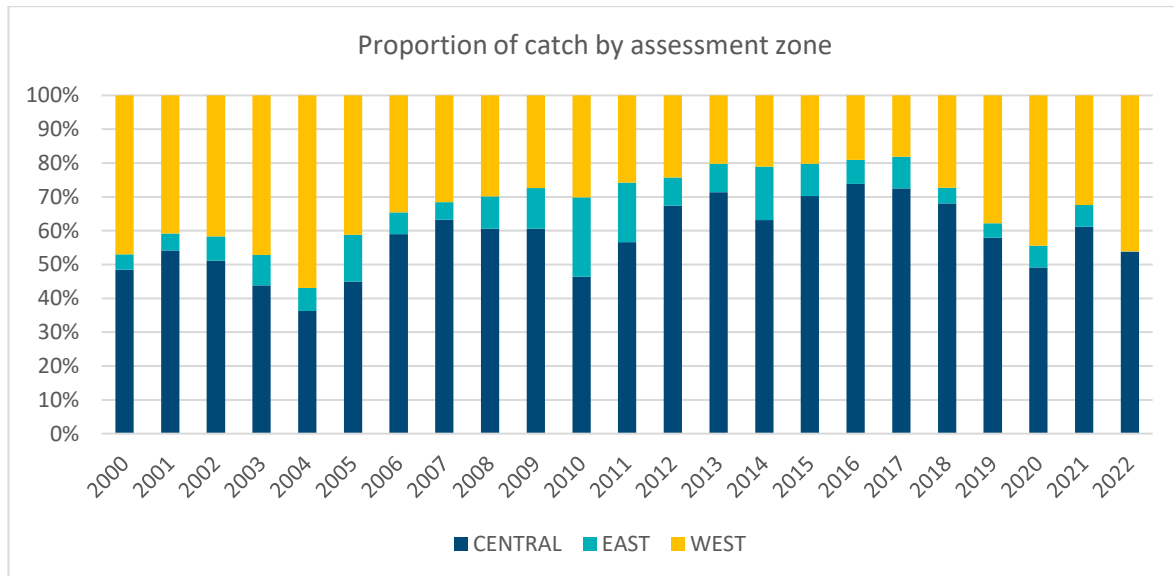


Figure 4. Distribution of annual catch (other than from rock lobster pots) among assessment zones during 2004–2020.

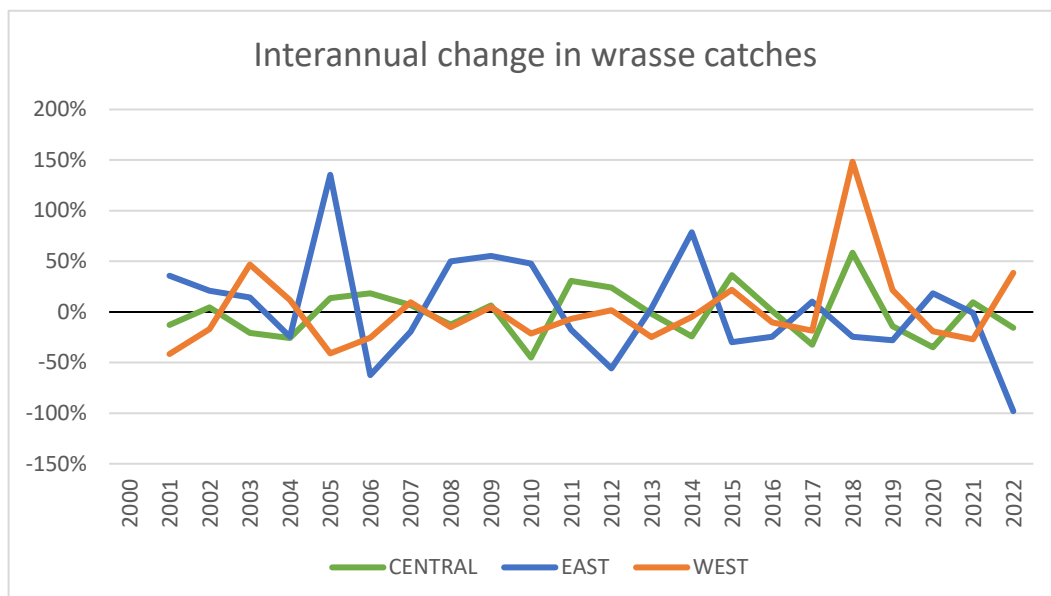


Figure 5. Proportional change in total wrasse catch taken by 'hook & line' from year to year since 2000 for each assessment zone and state-wide (Note: data for 2022 slightly incomplete).

Effort

Examination of days of effort among different gear types throughout the entire reported history of the fishery shows that the diversity of fishing methods employed to take wrasse has generally decreased through time but over variable time periods. Examples of this include beach seine being reported for 75%, 25%, and 3% for 1978, 1979 and 1980 landings respectively, but fish trap use mostly ranged between 20–30% from 1981–1993 after which it reduced to levels below 5% from 2003 onwards and has not been reported for more than ten years. Since 2000, around 93% or greater of days of fishing effort where wrasse were landed was reported as 'hook & line' and lobster pot, with 'hook & line' use more than doubling to represent 93% of the total days of fishing effort in 2021/22 and rock lobster pot usage targeting wrasse reducing to 0.5% of the total. This recent pattern in these methods is consistent with the introduction of licence transferability as new operators have become active since 2017/18.

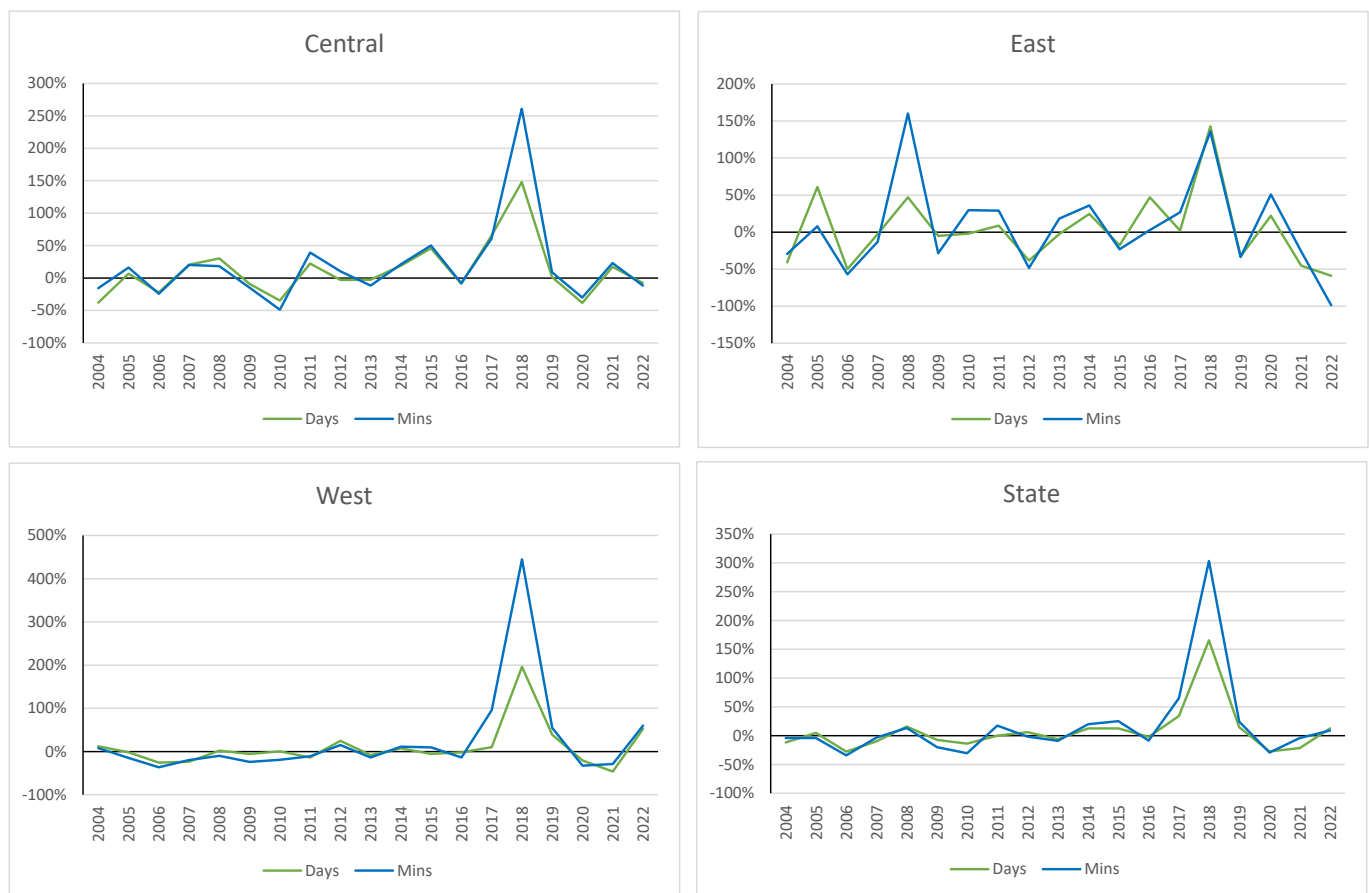


Figure 6. Interannual percentage change of effort in days and minutes for each zone and state-wide during 2004–2022.

A distinct spike of increased effort is clearly visible in all zones, and hence state-wide, in 2018/19 (Figure 6), dropping afterwards, most likely in response to changes arising from an initial transient effect of licence transferability and new entrants to the fishery, and then the effects of the pandemic and market during the past three years.

Catch-per-unit effort

‘Hook & line’ data

The harvest strategy uses ‘hook & line’ data only to provide a consistent basis upon which to gauge the performance of the fishery. The ‘hook & line’ method has accounted for 80–90% of the catch throughout the reference period of 2004–2015 (Figure 7). In contrast, ‘hook & line’ was as low as 55% of total days of effort during this period (Figure 7), reflecting that other methods used to be more prevalent than they have been during the past five years but were less effective; bearing in mind that catches in normal rock lobster pots, as opposed to traps, are generally incidental. Since 2018, 85% or more of the reported days of effort are for catches taken by ‘hook & line’ (Figure 7).

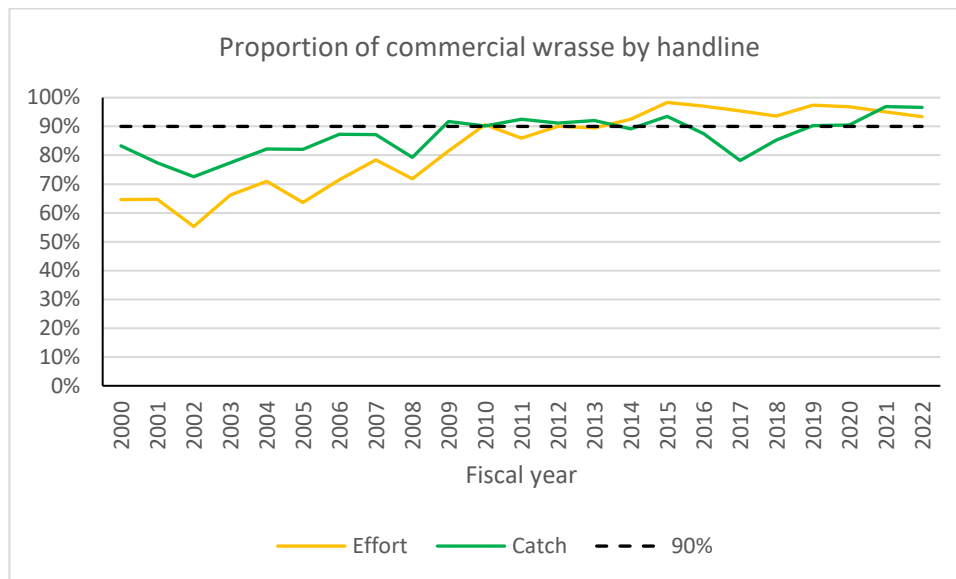


Figure 7. State-wide interannual change in total effort and catch during 2004–2022.

Patterns among licence classes

Distribution of catch among licence classes clearly shows the transition from ocean access to specific wrasse licensing (Figure 8). Absences of catches in the Southern Rock Lobster fishery during the past two years (Figure 8) likely reflects market disruption in the fishery. During the three years prior the percentage of catch taken by rock lobster fishers was below the 10% limit specified in the harvest strategy. The shift in catch from ocean fishery to ocean wrasse during 2014–15 reflects the transition to the new licence class in that period. Catches by commercial permit have been negligible during the past two decades (Figure 8).

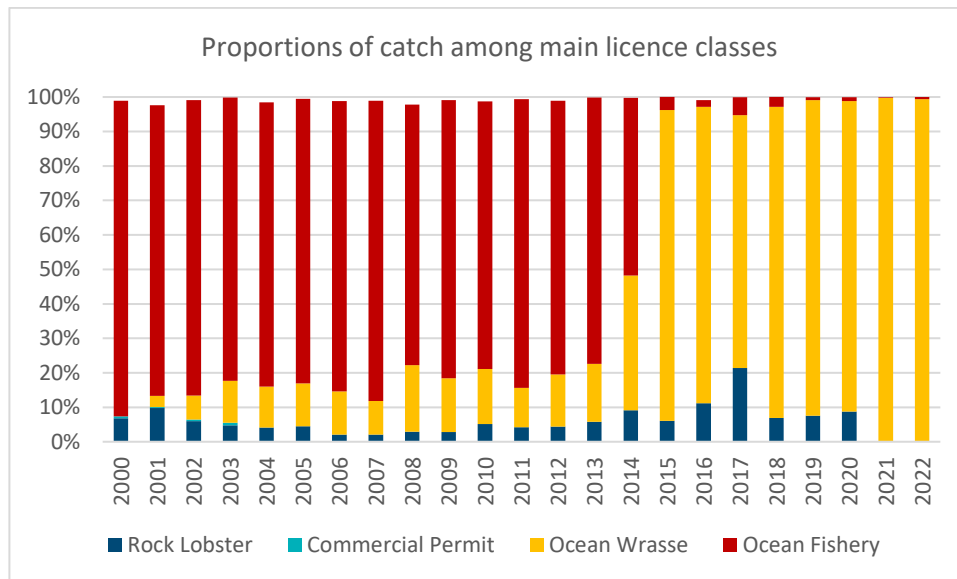


Figure 8. Distribution of catch among the main licence classes targeting wrasse during fiscal years 2000 – 2022.

Filtering and standardisation

It is always important to remember that CPUE is not a direct measure of a biological stock, it is a measure of one aspect of how a fishery is operating and therefore is at best a proxy measure of the rate of change in a stock. In this sense it is a relative indicator, not an absolute measure, so only the trend is meaningful in a biological sense. Its magnitude has more to do with profitability given the landed value of each unit of catch and the cost of each unit of effort. This may seem obvious to experienced fishers, but it can seemingly be forgotten in the context of assessing stock status.

CPUE trends are inherently noisy due to a variety of biological (e.g. migratory behaviour, recruitment variation), environmental (e.g. weather, river flow) and fishery related (e.g. changes in targeting or retaining species) factors. Relying on average values without: 1) exploring the raw data to remove outliers; 2) filtering the data to remove unrealistic observations or those likely to create a systematic bias, and 3) accounting for factors that affect CPUE so that it is less reliable as a proxy measure of biomass; can potentially give rise to an observed trend in CPUE that differs substantially from the actual trend in stock biomass. Three filters were applied to the raw data comprising an i) Operator filter: removes all fishers with less than 10 days reported hand line effort since April 1998, ii) Catch filter: removes records where the daily reported wrasse catch is ≤ 5 kg, and iii) Effort filter: removes records where daily report effort is < 2 hours or > 10 hours.

Estimating the trend

Smoothing CPUE trends by using three-year moving averages, that is, the average value of the current and two preceding years, whilst generally successful, has the disadvantage of creating a lag in the time series, which may result in a failure to respond to changes in stock biomass in a timely fashion. Nevertheless, this was specified in the harvest strategy and adhered to in this assessment. A generalised linear mixed model (GLMM) was applied to the filtered raw data. Mixed refers to specifying fixed and random effects with Year treated as a fixed effect and the others as randomly influencing CPUE. The GLMM was based on a gamma data distribution and employed a log-link function to connect the dependent CPUE with the explanatory variables of Fixed[Year] & Random[Area + License + Month + (Area:Year) + (Month:Year)]. The GLMM was applied interactively using Akaike's Information Criterion (AIC), to select the combination of the specified explanatory variables that produced the 'best fit' to the data, as indicated by the lowest AIC. This year, omitting the interaction between License and Year, and fitting License as a singular random effect, improved the model fit, otherwise the model remains as used in previous years.

Discarding

Reported discard rates for wrasse were relatively high overall with about half those caught being discarded. Bluethroat wrasse discards were particularly high in the Central and East zones, averaging 67% across years, whereas in the West zone the average was 16%. Rates of Bluethroat discarding were consistent among years within each assessment zone (Figure 9).

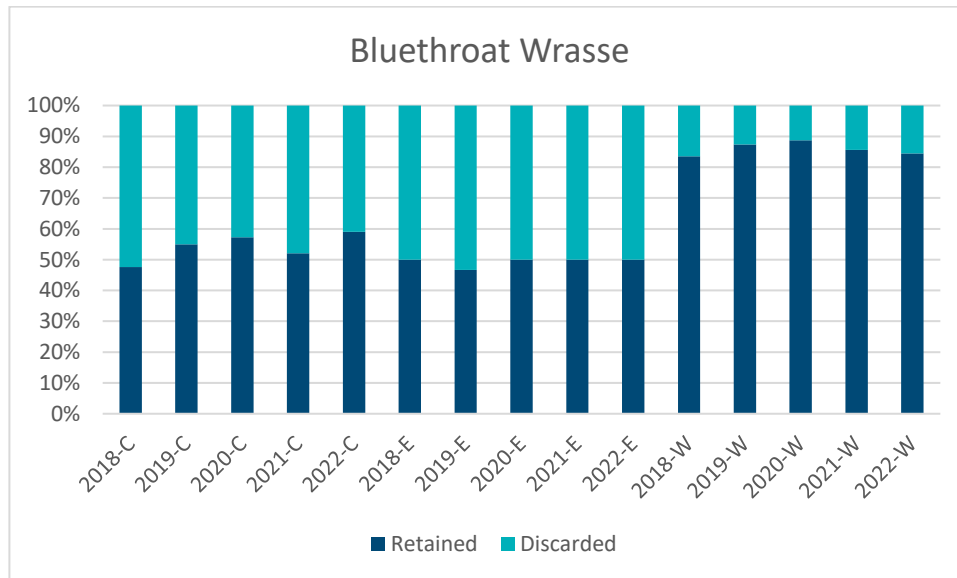


Figure 9. Proportions of retained and discarded Bluethroat Wrasse by assessment zone during 2018–2022.

Purple wrasse discards were much lower than for Bluethroat, being less than 10% in most years but with higher rates in 2020 and 2022 in the West zone (Figure 10). The pattern with zones was less consistent than for Bluethroat.

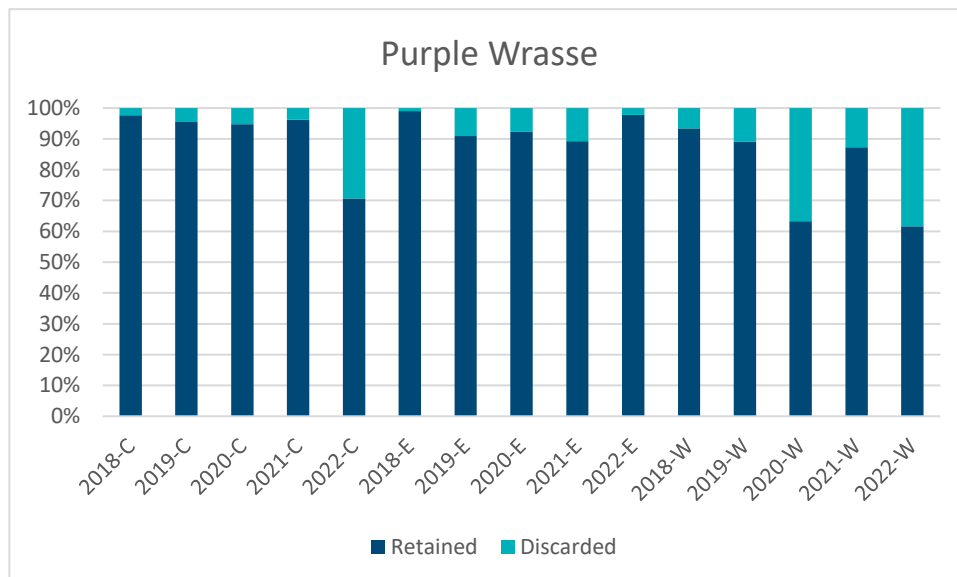


Figure 10. Proportions of retained and discarded Purple Wrasse by assessment zone during 2018–2022.

Patterns during pandemic

In early 2020 an outbreak of the novel human pathogen SARS-COV-2 coronavirus in China, that like the SARS outbreak in 2003, caused a sharp drop in demand and importation of seafood into China. The current SARS-COV-2 has not only had a similar impact to 2003, it has increased in severity as the disease became pandemic and disrupted markets more globally. Enforced closures of Australian restaurants and cafes has also weakened the demand for seafood and the ability of local producers to trade. A combination of these factors associated with the pandemic will have affected patterns in the catch and effort for wrasse as various market closures and trading restrictions were imposed or relaxed.

The pattern of catch for the first four months of 2020 shows a progressive decrease relative to the oscillating pattern in the 5-year average during preceding years. In April, the catch taken was only 17% of both the multi-year averages for that month. The situation then rebounded during May having 27% more than the respective 5-y average. In May the 5-year average was 13% less than for 2020 indicative, perhaps because easing of restrictions in response to the end of the first wave of the pandemic caused a rebound effect with more catch being taken than usual. In May and June, the 2020 catch was approximately 2.5 t and 2.3 t respectively, compared with 0.5 t in April. In July the catch reverted to being lower than the 5-year average with 38–47% less taken in 2020–2021 than expected (Figure 11).

There is likely a variety of explanations ranging from market conditions in terms of price, demand, and ability to supply being restricted by interstate border transit restrictions as well as adverse sea conditions precluding fishing. These are effects that in the absence of an economic assessment can be difficult if not impossible to quantify with any certainty and will be confounded with weather patterns.

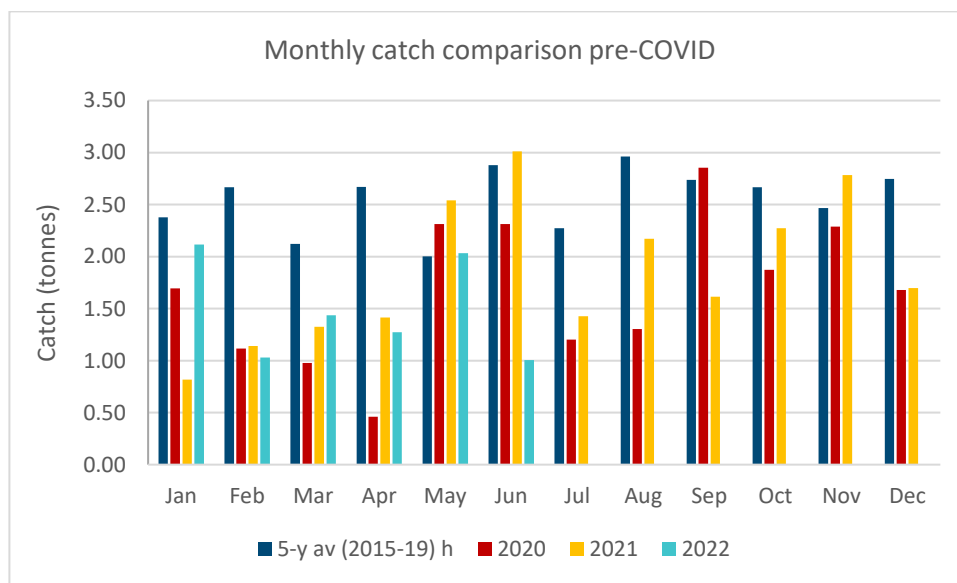


Figure 11. Comparison of monthly wrasse catch totals (kg) for 2020 with the average monthly totals (kg) during the preceding 5 years.

Effort (days) roughly shows the anticipated pattern that would accompany a reduction in catch solely due to external variables such as market and weather patterns, although there was almost no difference between the number of days fished in February and in March 2020 (Figure 12). The very low value of 10 kg/day in April 2020, which was 75% less than during January, was the main influence on the pattern. Compared with the 5-year average effort in 2020 was lower for the first quarter of the year, then as with catch it increased about five-fold to be above both multi-year series during May and June (almost 20% higher than in May) before falling to 63% of the 5-year average during July and then further to 38% in August (Figure 12).

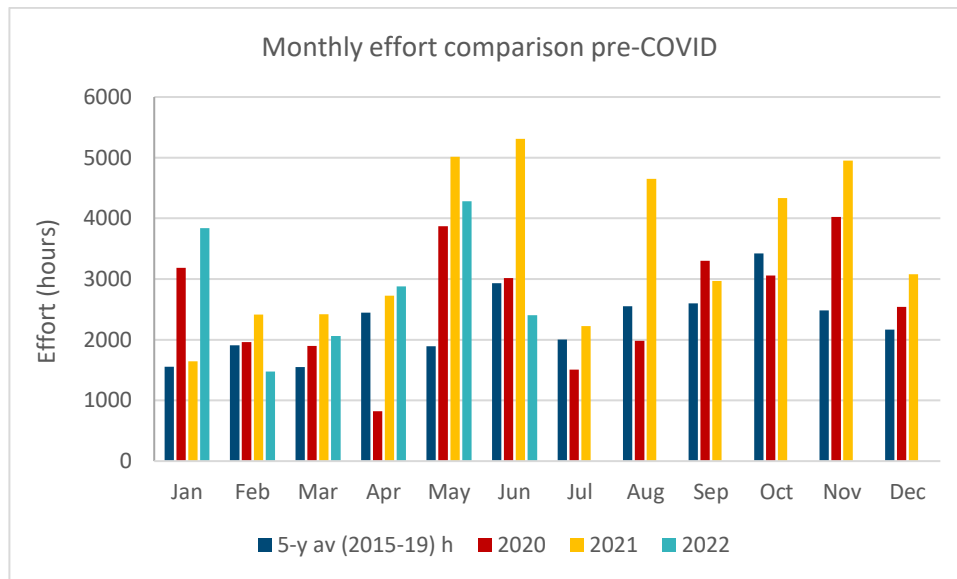


Figure 12. Comparison of monthly wrasse effort totals for 2020 with the average monthly totals during the preceding 5 years.

Harvest Strategy Performance assessment

In the context of the performance of the harvest strategy to 2021/22 the standardised CPUE estimates expressed as kg/h in the East and West assessment zones were above the trigger, noting that no fishing took place in the East zone so performance could not be assessed in the most recent year.

In the Central zone the biomass proxy of standardised CPUE had decreased from being above the target value in 2015/16 to now starting to breach the trigger in 2021/22 (Figure 13). In the East and West there has been an improvement with values trending towards the respective targets (Figure 14 and Figure 15).

The reason for the reduction in CPUE during the most recent year in the Central zone is difficult to determine, but there has been a reduction in both catch and effort in the Central zone and also one of the most active fishers has ceased operation in this zone, all of which could be affecting CPUE beyond the ability of the standardisation to account for given the relatively low number of operators and fishing activity. Given the dynamic nature of fisheries, and the fact that there have been some operational changes in the Central zone, which translates into volatility in performance measures, it is reasonable to expect some fluctuations around a target if the harvest strategy is performing optimally. Thus, while it will be important to carefully monitor the performance of the Central zone in coming years, it is perhaps too early to be concerned about the status of the stock at the zone scale.

Notwithstanding this conclusion, in all three assessment zones the stock biomass has, over the last twelve years or so, reduced compared to the preceding five years (2005–2010).

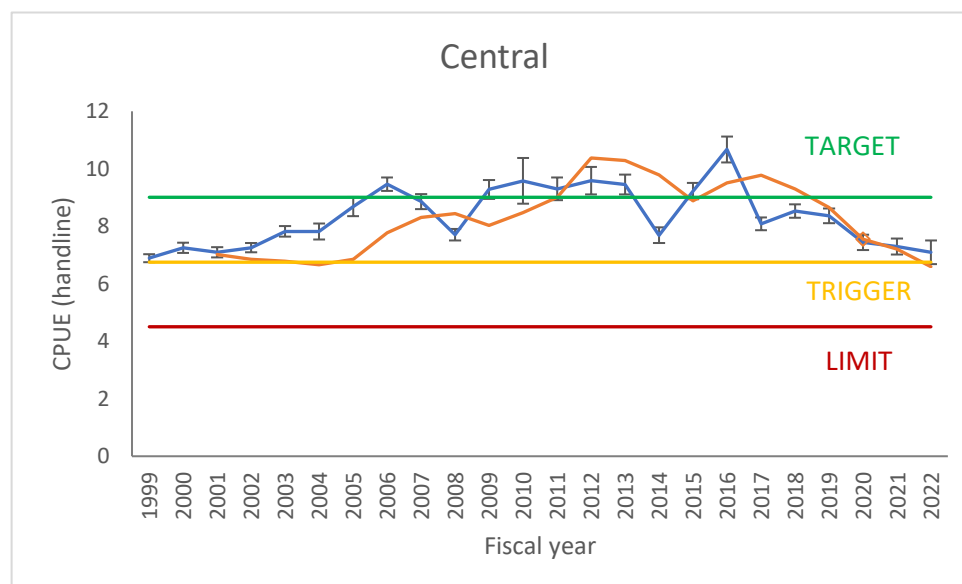


Figure 13. Performance of the Central assessment zone in accordance with the target, trigger and limit reference point specifications of the commercial wrasse harvest strategy for. Blue line is nominal CPUE (mean kg/h $\pm$ SE) and orange line is 3 year moving average of standardised CPUE.

With the exception of the most recent year in the East and West zones, the standardised curves mostly follow the patterns exhibited in the raw data, which have relatively small standard errors as a proportion of their mean values. Using a retrospective 3-year moving average effectively removes the interannual volatility of the raw data by averaging over adjacent years to dampen fluctuations. This can be viewed as less conservative because it can either delay management responses or reduce the strength of response by a couple of years if the raw data point is an accurate representation of stock biomass. Nevertheless, it is reasonable in the context of wrasse population biology where the risk is mostly localised depletion and the standardisation is producing a less optimistic recent trend than the raw data in the Central zone where the standardised 3-year moving average is currently starting to breach the trigger, with a similar trend in the East zone, and more optimistic trend of three years of successive increase in the West zone.

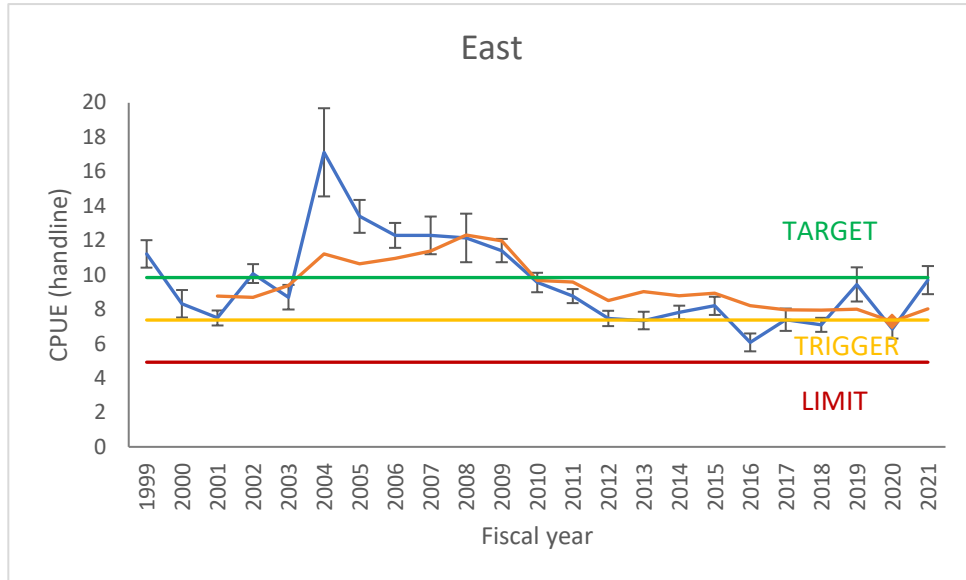


Figure 14. Performance of the East assessment zone in accordance with the target, trigger and limit reference point specifications of the commercial wrasse harvest strategy. Blue line is nominal CPUE (mean kg/h $\pm$ SE) and orange line is 3 year moving average of standardised CPUE.

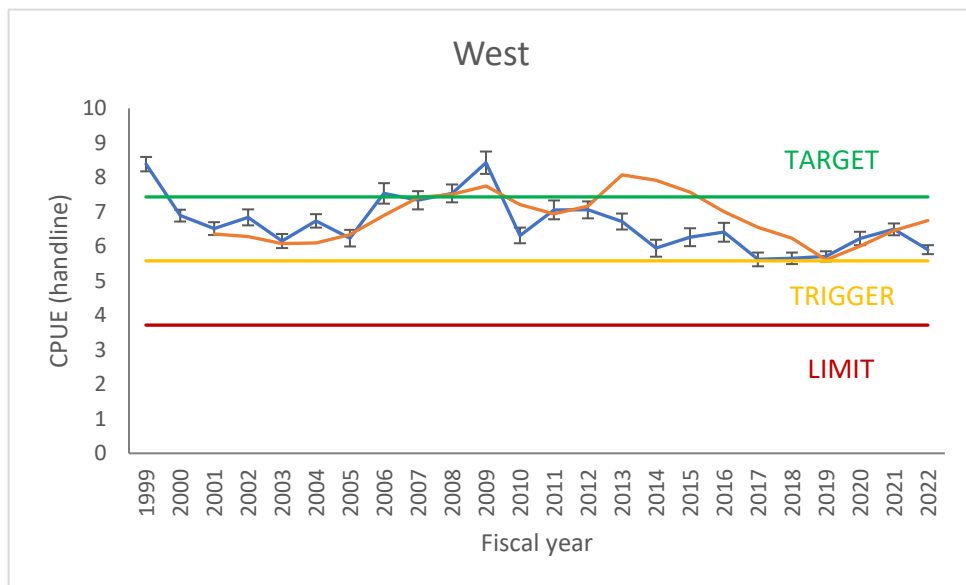


Figure 15. Performance of the West assessment zone in accordance with the target, trigger and limit reference point specifications of the commercial wrasse harvest strategy. Blue line is nominal CPUE (mean kg/h $\pm$ SE) and orange line is 3 year moving average of standardised CPUE.

Summary

All three zones had stock biomass estimates (standardised CPUE) around or above the trigger reference point values specified in the harvest strategy, with East and West zones showing recent upturns and Central zone a recent downturn, which has breached the harvest strategy trigger. In the West zone the standardised CPUE is at the target reference point value. This indicates that stock biomass is at an acceptable level across the breadth of the fishery. With no fishing taking place in the East zone in 2021/22 the performance of the fishery cannot be assessed in the most recent year; however, it was improving in 2020/21 and there is no reason to believe this won't continue given a reduction in fishing in 2021/22. In 2021/22 the Central zone breached the trigger limit and therefore warrants close monitoring.

Patterns prior to licence transferability were consistent with stable to decreasing stock biomass, with decreases in CPUE between the reference period (2014/15) and transferability (2017/18), so the current situation in the West and East zones is an improvement since licences became transferable. The main concerns since transferability are the relatively high discarding rate for blue throat wrasse, particularly in the Central zone, and spatial intensification of effort in Port Fairy, which, if it were to persist may cause localised depletion, notwithstanding that the West zone is currently at its performance target.

The proportion of wrasse caught in lobster pots across all licence classes has remained well below the 10 per cent allocation permitted under the harvest strategy. Ocean Wrasse licences now predominate taking >90% of the catch. The total catch taken in 2021/22 was similar to 2020/21, but down by about one third of 2019/20, with the biggest decrease in the Central zone. It appears from monthly catch patterns during 2020 that the COVID-19 pandemic has led to reductions in catch that are aligned with public health safeguards which restricted public movement, disrupted interstate transport operations, and closed cafes and restaurants during the two waves of disease outbreak, primarily in Victoria but also in NSW. Although the pandemic will be negatively impacting the fishery and associated business enterprises economically, it will not have adversely affected the wrasse stocks.



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