

Maddison J Watt (VFA)

From: [REDACTED]
Sent: Sunday, 30 April 2023 9:07 AM
To: Maddison J Watt (VFA)
Subject: RE: Letter: Public consultation on 2023/24 Draft Further Abalone Quota Order and Fisheries Notice for the Central Zone of the Victorian Abalone Fishery

Dear VFA ,

If the science and research is under review , then there should be no changes or recommendations to the current LML's and TACC .

Please leave the TACC and LML's as is .

Kind regards
Anthony Quarrell
[REDACTED]

From: Maddison J Watt (VFA) <maddison.watt@vfa.vic.gov.au>
Sent: Tuesday, April 11, 2023 7:44 PM
Cc: Toby A Jeavons (VFA) <toby.jeavons@vfa.vic.gov.au>
Subject: Letter: Public consultation on 2023/24 Draft Further Abalone Quota Order and Fisheries Notice for the Central Zone of the Victorian Abalone Fishery

Good afternoon

Please see attached a letter from Travis Dowling, inviting you to provide written comment on the proposed 2023/24 management arrangements for the central zone of the commercial Victorian Abalone Fishery.

To support your submission, the following documents are attached for consideration:

- Draft Further Abalone Quota Order;
- Draft Fisheries Notice;
- Central zone stock assessment report;
- Central zone stock assessment summary;
- Central zone harvest strategy report; and
- Central zone workshop summary.

Further information is available on the VFA website under current consultations: <https://vfa.vic.gov.au/operational-policy/fisheries-consultation/current-consultation>

Public consultation and acceptance of written submissions will close on **Sunday, 30 April 2023**.

Please let me know if you have any questions.

Kind regards
Maddie

MADDIE WATT
Abalone Fishery Manager
Victorian Fisheries Authority
1 Spring Street, Melbourne 3000
[REDACTED]

Maddison J Watt (VFA)

From: [REDACTED]
Sent: Wednesday, 26 April 2023 11:38 AM
To: Maddison J Watt (VFA)
Cc: Geoffrey Muldoon; Ian Knuckey; Mike McCarthy; [REDACTED]
Subject: Public consultation on 2023/24 Abalone Quota for the western zone of the Victorian Abalone Fishery
Attachments: Australian-Seafood-Traceability-Workshop-series-final-report.pdf
Follow Up Flag: Follow up
Flag Status: Completed

Hello Maddison

The recent IUCN Red-list of Abalone, it's concerning that viewing Abalone in Melbourne restaurants, I can't tell if the Abalone in the fish tank, is a legitimately harvested Victorian sourced Abalone, or an illegally sourced one

with this in mind, I hope we can improve the identification of commercial live Abalone in the market place, noting that commercial canned processors are unique
I've attached the Traceability report for some reference, the report commission by the WWF with Fishwell

just an idea, that's been floating around in the belfry.
Tagging live Abalone, with a reference to their origin

Red Tag- Western Zone
White Tag - Central Zone
Blue Tag - Eastern Zone

I know there's an issue with Abalone from Tasmania & SA. being outside the VFA control, something to think about

Kind Regards
Craig Starritt [REDACTED]

Maddison J Watt (VFA)

From: [REDACTED]
Sent: Thursday, 20 April 2023 7:43 PM
To: Maddison J Watt (VFA)
Subject: Submission to draft Abalone quota Order (Central Zone)

Hi Maddison

I have commercially dived for abalone for a total of 31 years (Central Zone and Western Zone Victoria) I believe we must have appropriate size limits, and that when a Reef has been worked enough stock should be left behind for it to continually reproduce.

This is the main reasons that so many reefs can no longer produce viable catches -we just didn't leave enough adults to spawn.

The first size limits were introduced around 1974, 120mm West of Lorne, and 110mm East of Lorne to Lakes Entrance

We have over time made some increases in size limits, which has resulted in great improvement in some areas.

The Department has a lot of data from Harry Gorfine and Cameron Dixon outlining the declining biomass over a long period of time, and we must not ignore these findings.

Just changing the TAC does not fix the fishery only.

For example, when we dropped the size limits on Backbeach, Flinders and Phillip Island the biomass decreased and as a result quotas have reduced.

Please help the Fishery by introducing appropriate size limits which will lead to a more sustainable industry and a larger TAC.

I am a second generation diver, my father Clarke Espie helped start the Fishery in 1963 when he was 18 years old. and now my son Jarvis Espie has joined the Industry.

If we continue to ignore the data and not implement adequate size limits, who knows how low the TAC will be? It is not just about the Quota Setting.

I have been attending TAC Workshops since 1987, there was no Marine Parks or Virus back then. We just had a Licence with 20,580 KG, now the Licence is 7,000 KG

I encourage you to listen to those who want a Fishery for the Future, not just tomorrow.

SHIPWRECK COAST

Started at 120mm Now 130mm

This size limit increase is working well, no need for change

OTWAY REGION

Started at 120mm Now 125mm

Needs to be increased to 127mm

I believe the most important area to see an increase

BACK BEACH

Started at 110mm Now 119mm

Needs to be increased to 120mm

FLINDERS

Started at 110mm Now 114mm

Needs to be increased to 115mm

PHILLIP ISLAND

Started at 110mm Now 112mm

Needs to be increased to 115mm

Phillip Island has an average larger sized abalone than Flinders, yet it has a smaller size limit

All other SMU stay the same

Thank you

Regards

Jamie Espie

Dear VFA,

Re: Central Zone TACC

I, Owen Shannessy, attended the TACC meeting held at Queenscliff on the 17th March 2023. In my opinion this meeting should have been postponed to a later date due to the research/data that directly influences the stock assessment for the Central Zone TACC currently being under review. How is the report completed by MRAG when this is under review? It might be worth looking at moving these meetings to every second year. This would allow for sufficient research and data reviewing time to draw legitimate conclusions.

MRAG stated in the meeting that no data was collected from the FIS sites as this was not reviewed during the 2021/2022 season. Therefore, the outcome was drawn from the CPUE for this year's TACC meeting. To my point above, without all the data, how can a proposal be drawn for the 2023/2024 season and a quota reduction be concluded? In any other industry, the proposal would have been postponed until all data was reviewed.

It was also stated by MRAG that the FIS site locations were in deep water due to logistics. I do not understand how valid readings of the Abalone biomass are made in areas that are "logistically easier" for them to collect data, rather than where we as Abalone divers are actually working, which are mostly in areas only accessible when the weather conditions allow. It is very concerning that for the past several years the sites used for collection have not been productive or ever been productive areas for Abalone. It would make sense to only use areas where the Abalone is being fished from every year, otherwise, the data will always point to a quota reduction required. I myself dive in most to all of the zones in the central zone and everywhere I have been this year and last year have been fishing well. I have not noticed a decline in Abalone, if anything I have seen more Abalone on the bottom. The bottom is in fact looking better than previous years.

It is worth noting, over the years there has been so many LML changes all concluded from the word of the divers and not research dictating the size change. There needs to be conclusive research completed to set the correct LML's for the whole state, each zone and sub zone. If the LML were correct, this size limit would naturally protect the zones. Therefore, there would be no need to allocate quota to sub zones. The diver will not keep fishing down to the knife edge measuring each Abalone, therefore the effort would be spread to other areas in the zone.

Additionally, each time the LML is changed, the data starts again. At the moment, we refer back to the early 2000's as the baseline. This is not a fair baseline. If you look at the LML's from 2000 to 2006, the Surf Coast East was 110mm and the Surf Coast West was 120mm. If the LML's were these measurements today we would be recording large catches each day. This is not comparable to today's data and will always show a decline in biomass.

More is required than just cutting quota to help the resource. We are not over fishing areas. There are a lot of areas where we cannot go due to the LML's. Cape Otway East of the Light House needs to be a different LML to the West of the Light House. In my opinion, the LML increase for Cape Otway has led to a mixed result. In the sub zone West of Light House, the

Abalone seem to be growing faster and larger. However, the East of the Light House they are smaller and growing slower. In my opinion, this indicates that there should be a different LML West of the Light House and East of the Light House. The research needs to be conducted to confirm my observation. Looking back in 2018 at Zones 7.03 to 7.06, there were a tonnes fished in these areas. However, due to size increase at present, there is no effort going into these areas and the effort has moved to West of Light House placing more pressure down there. This just reinforces the need to ensure our LML's are correct. All vessels have tracking on them, so there is no reason why we cannot have different sizes in Sub Zones.

I would also like to see some investment into other areas of the Abalone industry, such as reseedling and translocating Abalone to areas that held Abalone in the past. This has been an area of focus in other fisheries. MRAG Cameron Dixon, during the TACC meeting advised that in the early 2000's there was a major spawning event and there has not been an event like this since. It might be an idea to trial a 'closed period' in the season around the Abalone spawning. There have been times where I noticed Abalone gathering (getting ready to spawn) and I have also heard of times when the Abalone have reached the processors or still in the boat and have spawned. If we were to have a 'closed period' within the season, there would be thousands of Abalone left in the water to spawn and in time we would see an increase in biomass. If other fisheries are doing this, I am sure it is achievable for us too.

In summary;

- Due to the lack of data and the research being under review, the quota for the 2023/2024 season should be left the same at 240T/ 354.11KG per Unit
- Look to move the TACC meetings from yearly to every second year
- LML's need review and thorough research
- We need to look into other areas to protect the biomass, such as translocation and reseedling programs
- We need to set a period of time within the season for closure during spawning

Please do reach out if you have any questions.

Kind regards,
Owen Shannessy

SCUBA DIVERS FEDERATION of VICTORIA

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28 April 2023

Maddison watt

Abalone Fisheries Manager,
Victorian Fisheries Authority,
1 Spring St
Melbourne. VIC. 3000

via: maddison.watt@vfa.vic.gov.au

re: 2023/24 Draft Further Quota Order and Fisheries Notice (Central Abalone Zone)

Dear Maddison,

The SCUBA Divers Federation of Victoria (SDFV) represents recreational divers who fish for abalone, and we take a deep interest in the health of the stock and the management of the fishery.

We have considered the stock assessment for Central Zone fishery and our representatives attended the recent Central Zone TACC workshop in Queenscliff.

We note that the Stock Assessment report by MRAG Asia Pacific is very clear in messaging strong concern that status of the stock in the Central Zone continues to decline under the application of the harvest strategy. In particular, the report emphasizes the risk to the fishery arising from the uncertainty in assessing the status of the stock with limited or no Fishery Independent Survey data and an over-reliance on CPUE as a biased proxy of abundance. In this context, we see much similarity and parallel in the MRAG report on the Central Zone and their earlier report on the Eastern Zone. We also note that for both zones, MRAG has concluded the harvest strategy is inadequate and more conservative approaches to setting the TACC must be adopted. We see it as significant that for the Central Zone, MRAG specifically recommends reducing the variations in LMLs and ensuring SMUs are fished closer to their OT to reduce some uncertainty arising from CPUE-driven abundance estimates.

It is therefore with some relief we see that the VFA response to Central Zone stock report has been to propose an overall reduction in total catch, and a catch reduction in most SMUs, a general maintenance of LMLs (no new variations), and a reduction in the upper limit for most SMUs. We also acknowledge the different approach taken by VFA in this TACC workshop by not seeking a room consensus about SMU catch levels and limits for the next fishing year.

cont....

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The SDFV has consistently been critical of the past process whereby the accepted productivity of a SMU is greatly influenced by estimates of the commercial abalone divers who are the direct beneficiaries of their own estimates. It has always been difficult to accept this as sufficiently objective. We welcome and applaud the approach taken this year.

Overall, we concur and support the draft Further Quota Order and Fisheries Notice for the Central Abalone Zone of the 2023/24 fishing year. In the specific terms of the Phillip Island SMU we support setting the LML at the most stock conservative level to discourage concentrated fishing effort that is consistent with scientific advice.

We do acknowledge that the TACC workshop is focused on commercial fishery, and we respect the courtesy extended to allow us to attend and be informed.

Thank you for the opportunity to comment.

(signed)

Mike McCarthy,
Chair, SDFV.

Rebuilding the Central Victorian Abalone Zone

A Total Allowable Commercial Catch Submission by Darvin Hansen BScEE,
Tasmanian Seafoods Group – Managing Director

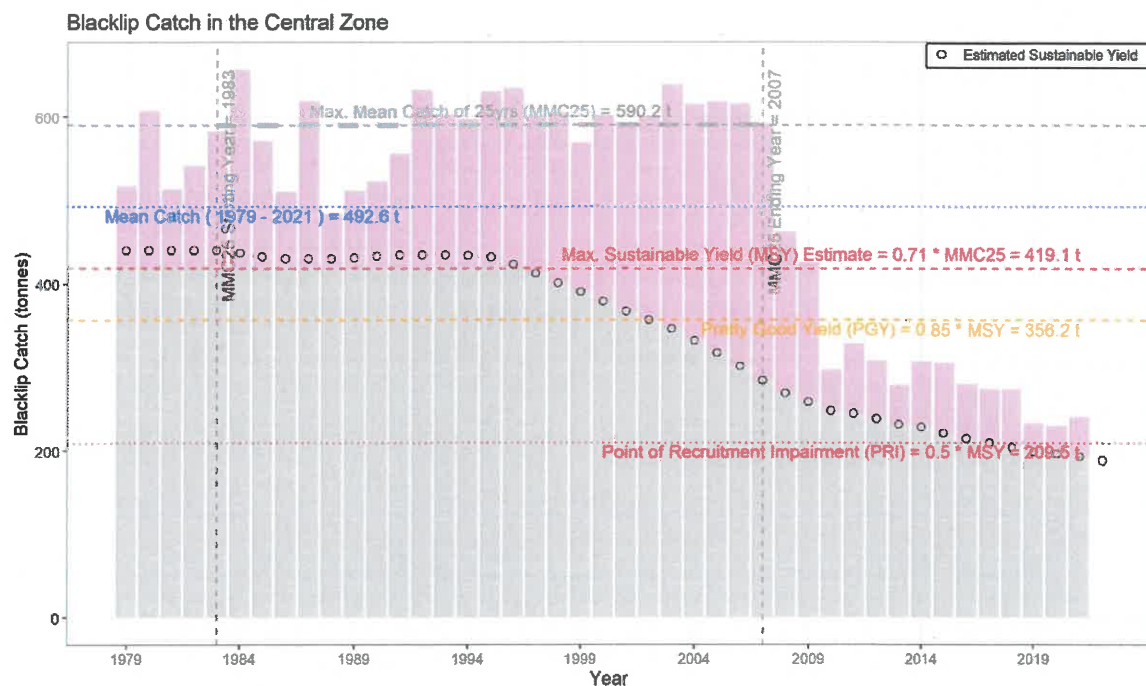


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Executive Summary

The author expresses concern over the sustainability of the Victorian abalone fishery given the increasingly depleted state of the fishery and the international scrutiny the overall situation is bringing, through IUCN Red List. This has potential and severe CITES implications over the medium term.

To respond, the author recommends targeted catch reductions to a level of ideally 141t, representing a 43% reduction in the current TACC, which would likely allow a rebuilding of the fishery's biomass to commence. At least less than 185t is advisable in the first year to prevent further overfishing, approximately a 26% catch reduction. The current catch targets set by the Victorian Fisheries Authority (VFA) are deemed unsustainable by both Tasmanian Seafoods and the science provider for VFA, MRAG. MRAG indicated that 25-50% reductions have worked for other abalone fisheries in similar situations.

The author uses a model-based approach to estimate the sustainable yield for each SMU and proposes catch limits that consider the precautionary principle, aiming for values below the estimated sustainable yield. Most of the VFA's catch targets appear to be unsustainable and could lead to overfishing.

The author emphasizes the importance of taking action now to prevent further depletion of the fishery, and the need to align stakeholder expectations with the reality of the situation. By adopting a precautionary and methodical approach, the fishery can recover and provide long-term benefits for all stakeholders.

Forward

As you read this submission and feel tempted to criticize the analysis or heed its critics, please first note that it's clear that the current approach isn't working.

We are at the lowest biomass in the history of the fishery, with the lowest TACC, with the TACC about to go lower, with all the risks of depletion, facing ongoing depletion. The status-quo TACC setting they advocate for will result in a declining biomass trajectory bringing about eventual export restriction and fishery closure, before outright local extinction.

Over the last decade, the industry has gone from a period of beach prices in the \$20s, to beach prices in the mid \$40s prior to COVID, down to beach prices in the \$20s again. Irrespective of finances or past windfalls, the attitude was always "more money now", and higher rather than lower TACCs.

Introduction

Tasmanian Seafoods Group is the largest single quota holder in the Central Abalone Zone, Victoria. My thoughts are as Managing Director on behalf of Tasmanian Seafoods Pty Ltd, not as a Director of Abalone Victoria (Central Zone) Limited.

In this submission, I will lay out the overall Australian context with which Victorian wild abalone, and particularly Central Zone, finds itself in. Specifically, the acknowledged assessments of a depleting trend in Victoria, and the IUCN Red Listing of Blacklip abalone and associated risks including CITES.

Given this new environment we find ourselves in, I discuss ways in which we can productively respond to meet these risks in time, including the MSC framework, the CITES Checklist, and VFA's responsibilities towards sustainability.

I discuss the potential rewards of taking the catch cuts required to rebuild the fishery, as acknowledged by VFA's science provider, MRAG. And also – the opportunity given that stakeholders have adjusted to low income for a number of years, that combining a TACC reduction with an increase in beach price might be a helpful opportunity to bridge the an otherwise foreseen short-term income reduction.

I then go through how I developed my framework for setting catch targets and TACC in the fishery, including some perhaps novel modelling work I've done in order to estimate Sustainable Yields for each SMU. This leads into the graphs for the Zone and each SMU, along with my recommendations contrasted with those of VFA, which appear to be insufficient to address depletion.

This has taken a lot of work to get to this point, a lot of coding, drawing on my background of electrical engineering, concepts from control theory classes, computer science classes. It has drawn on many years in the abalone business paying great attention to what works, what doesn't, and the various approaches. It is a big problem, and the risks of CITES if unaddressed in a timely fashion mean very large sums – to us, and others in this industry. I've done the best I can under the circumstances, given the scale and difficulty of the problem.

I believe this plan will work better than any other alternative on the table.

Wild Australian Abalone in 2023

Victorian Blacklip in the Australian Context – Maximum Sustainable Yield estimates

It is notable that by far most abalone present in Victoria, both historically and today, is Blacklip abalone (*Haliotis rubra*), far outnumbering Greenlip (*Haliotis laevis*) abalone. Also, any CITES-related export risk will be determined on a species-by-species basis. It is true that the CITES look-alike provision may impact Blacklip through Greenlip. However, while we can encourage Greenlip to be harvested on a firmly sustainable footing to decrease that risk, it is one of a number of species, including outside of Australia to factor into that risk. Thus, this submission will be solely focused on Blacklip abalone.

To prepare the figures for the following table and graph, I have examined the individual States by their component Zones, looking through past Stock Assessments to determine what the average has been during the 25 years of greatest production (Maximum Mean Catch of 25 years), and hence an estimate of Maximum Sustainable Yield (MSY).

State	Zone	MMC25(t)	MSY est (t)
Tas		2770	1962
Vic	CZ	590	418
	EZ	464	329
	WZ	270	191
SA	WZ	267	189
	CZ	35	25
	SZ	130	92
NSW		180	128
Total		4705	3334

Figure 1: Table of State Zonal MSY Contributions

Australian Blacklip MSY Contribution by State
(tonnes)

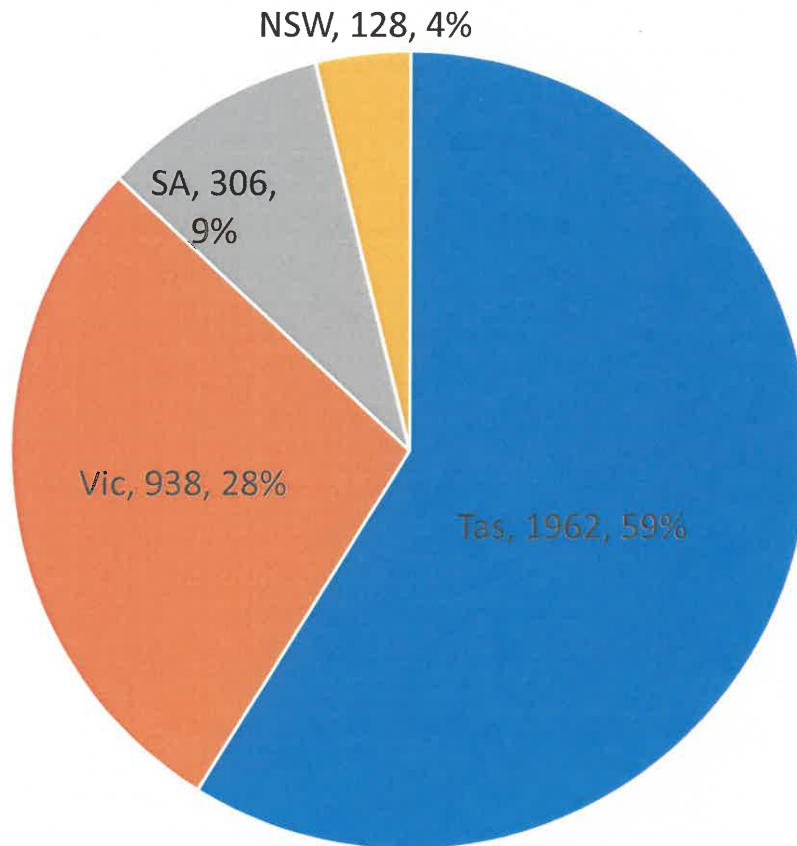


Figure 2: Australian Blacklip Abalone Estimated Maximum Sustainable Yield (MSY) Contribution by State

I draw the following conclusions from this analysis.

- 1) Tasmania's contribution to an overall Blacklip sustainability assessment is dominant. A favourable Tasmanian situation is a necessary, but probably not sufficient contribution to a sustainability assessment of the Blacklip species.
- 2) Victoria provides the second largest contribution, and as such may also form a determining component of an overall Australian outlook to the extent an assessment of Victorian yields a result other than sustainable.
- 3) If viewed on a state-by-state basis, the Victorian Central and Eastern Zones would be critical to yielding an assessment result of "sustainable" for Victoria. At 20% of the historical contribution, with the impact from the AVG virus in 2006 and 2021, a case could be made to ignore Western Zone with a clearly sustainable situation in Central and Eastern zones.
- 4) It is hard to say whether South Australia contributes enough historically to be concerned about. Certainly, a Sustainable result there would be helpful, and the Western Zone there should form an easy majority of the SA assessment.

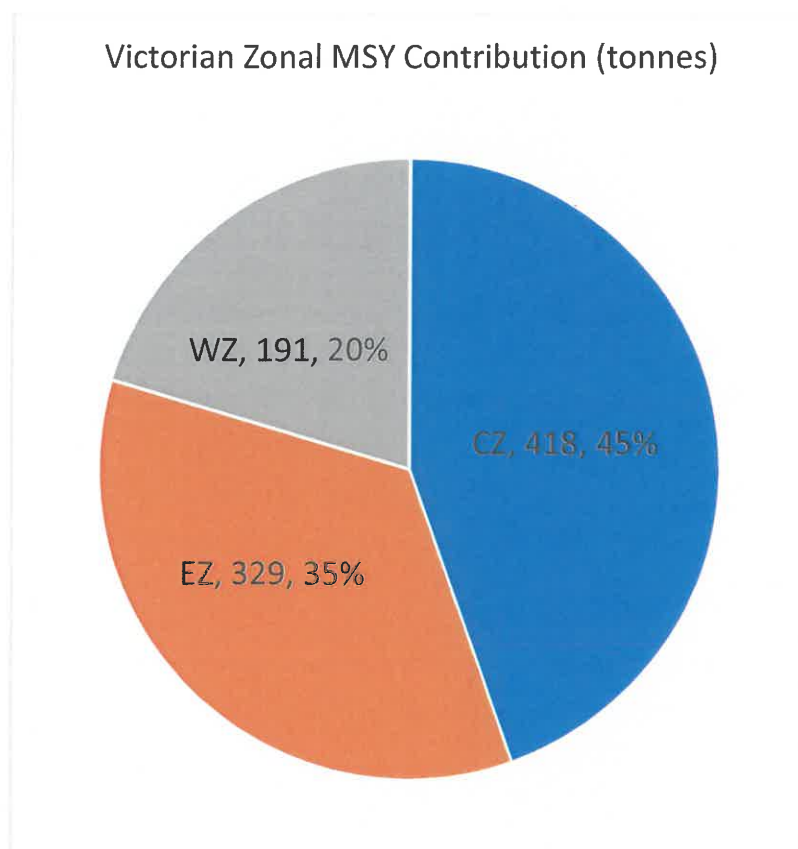


Figure 3: Victorian Estimated MSY contributions by Zone

Sustainability Outlook

Status of Australia's Fish Stocks (SAFS)

Fishing Research and Development Corporation (FRDC)'s Status of Australia's Fish Stocks assesses sustainability of Australia's fish stocks every 2 years. There are 4 main classifications – Sustainable, Recovering, Depleting and Depleted.

Unfortunately, Central and Eastern zone Victoria have been assessed as “Depleting” since 2014, except for 2014 where Central Zone was marked as “Depleted”.

Interestingly, Western Zone Victoria has been classed as Sustainable except for 2014, where it was classed as “Depleted”.

Strangely, Victoria has the only abalone fishery where an official abalone scientist has not put their name to the SAFS assessment, where instead “Victorian Fisheries Authority” appears to have made this [determination](#).

In any case, it is concerning that 80% of Victoria's Blacklip fishery comprising Central and Eastern Zone is noted as depleting and has been since 2014. According to my analysis of MSY estimation and Sustainable Yield estimation, it appears likely that that quotas have unintentionally been set at a level that in aggregate, overharvests the stock, since 1979. While there have been incremental catch cuts, and quite possibly some to below levels of recruitment at various times to give a temporary CPUE increase, they have unfortunately never been set to below Sustainable Yield.

It seems likely that when the reports are revised for the 2022 period (last was 2020), at least Central and Eastern Zone will remain “Depleting”.

Stock Assessment Report (MRAG) 2023

I will quote the concluding paragraph from the MRAG Central Zone Abalone Stock Assessment Report for 2023:

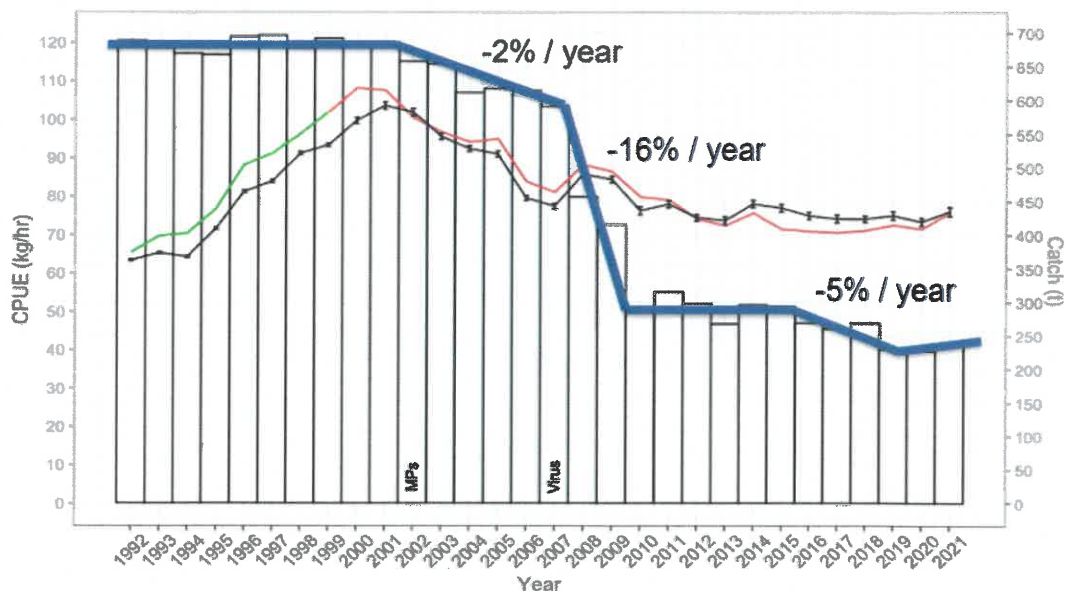
“Given the uncertainty in the current CPUE/FIS-based assessment process, together with available evidence suggesting stock declines, immediate reductions in catch beyond the levels of the current harvest strategy outputs are likely to be required to achieve the management objective of “maintaining biomass”. An objective of stock recovery would require an even more conservative approach.”

MRAG Presentation 2023

The following are key slides from Cam Dixon’s presentation at the TACC Setting workshop. The indication is that the 11.5% catch reduction drafted by VFA is unlikely to leave us with a sustainable fishery, and that a 25-50% catch cut is indicated.

Cam also mentions getting “ahead of the curve”. That is worth considering, and in this submission, I attempt to analyse that quantitatively through the concept of “Sustainable Yield”. This is a theoretical level of catch that one must set to, over the long-run, neither increase nor decrease biomass. To get “ahead of the curve”, we must set catches below this level with a reasonable degree of margin. If we have done that successfully, we will not need further cuts, all else equal.

Central Zone



Why has this occurred and what can you do?

- Abalone fisheries around Australia are suffering large declines in catch, reflective of large declines in biomass.
- General agreement that this has resulted from lower than average long-term recruitment, caused or exacerbated by environmental changes such as climate change and habitat loss (reduced kelp cover, urchin incursion etc).
- In almost all cases, TACC reductions have not been sufficient to stop the declines.
- So how much do you have to cut? Some fisheries have recently taken large cuts of 25-50% to get “ahead of the curve” to stop declines.
- Current harvest strategy only suggests 10% reductions maximum (but allows 25% increase). These reductions are unlikely sufficient to get ahead of the curve.
- Also, TACC setting is very difficult because the data is time lagged.



Figure 4: Slides from MRAG Presentation at TACC Setting Meeting

A Sustainable Yield Approach

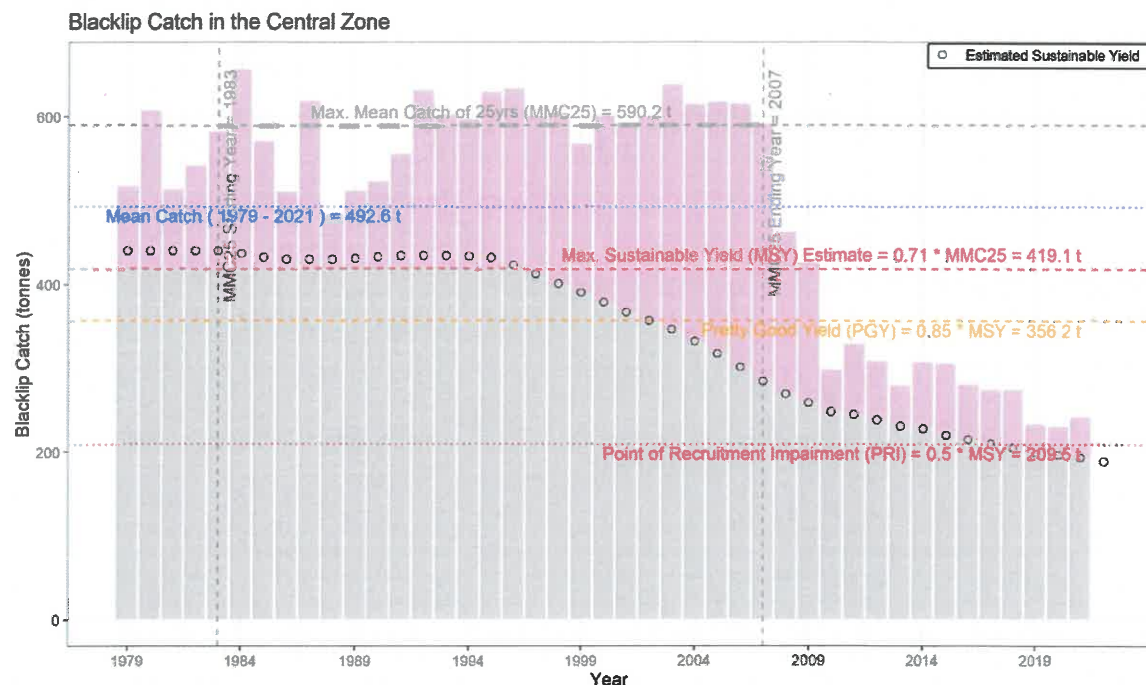


Figure 5: Central Zone Estimated Sustainable Yield Graph

Another way to come at the problem is from a Sustainable Yield perspective, which I have attempted to provide using a Delay Difference model. Using this approach, we can get an indication of where the catch needs to be below to rebuild the stocks, and some indication of what a future rebuild looks like. It can be applied at the SMU level, and even at the Reef Code level. More will be explained in a later technical section.

If we look at the graph, we can see catch is depicted, along with a calculated Maximum Sustainable Yield. Although we could calculate 5-10% higher MSY than the red dashed line indicated at 419t based on summing the SMU or Reef Code level estimates, this would also increase the Point of Recruitment Impairment value. We can see the black circles begin at this sum-of-SMU MSY level.

A potted history of the Central Zone through Sustainable Yield

Essentially, the overharvesting (indicated by the catches in the pink regions above the Sustainable Yield circles) has occurred from the beginning of the fishery until now. First, whatever surplus above B_{MSY} had been steadily eroded until the stocks were below B_{MSY} around 1995. At that point the recruitment pipeline began to output less than MSY level of stock, and this showed up in the modelled Sustainable Yield, which began to drop and further pick up speed as there was no change in the overall catch until 2008.

The halving of the catch from 2007 to 2010 was welcome, but seemingly not enough, even if it would have been done earlier (e.g. at 2008 instead). Instead of the ~300t it was reduced to, it would have needed to drop below 268t – and have appropriate catch targets in each SMU.

(This is very typical of abalone fisheries; if I can paraphrase Adam Smith, “There is a great deal of ruin in an abalone fishery” – however, that ruin is not infinite. Most industry participants entering in the

heyday get lulled into a false sense of security by the presence of a virgin biomass of which half can be harvested before MSY is even dented. Then it takes a further 7 years for the last of the MSY-level recruitment to work its way through the recruitment pipeline.

And so, the typical industry participant's natural idea for what an abalone fishery should be able to be harvested at, does not hold up over the long term. It's understandable that overfishing occurs, because without accurate surveys, the only way we can really gauge the productive capacity is to overfish it. However, now that we do have a better understanding we must find a way to avert tragedy.)

The reductions taken in 2008 and 2010 were better than nothing and resulted in a somewhat flatter depletion trajectory. The minor additional catch reductions since then have been welcome but not sufficient to stop the depletion.

The indication using this model is that we would have to set a catch target at 185t in 2022 just to stop the depletion, without any hope of rebuilding. To rebuild, we have to "get under" the Sustainable Yield, i.e. set a catch below 185t with a good deal of margin. Not only that, this has to be done carefully with appropriate Optimal Targets on an SMU by SMU basis.

Unfortunately, the Sustainable Yield is dropping by 4t a year and that will increase if TACC is held constant and depletion accelerates. VFA's recommended 221.9t, or a 10.7% reduction, is insufficient to achieve sustainability. What is needed is a 26% reduction to stop the depletion. However, I have advocated for a 43% reduction with good reason – there must be an error margin to get it right, and to allow for mass mortality events such as marine heat waves, urchin infestation, storm events, harmful algal blooms, bad recruitments, etc.

An alternate approach – "eyeballing" Sustainable Yield

Prior to using my method of estimating Sustainable Yield, I looked at the graphs to "eyeball" estimate where I thought Sustainable Yield ought to be. This basically involves looking back to find recent periods of stable CPUE in the catch history, seeing what the catch was at those points, and what level of catch has been applied since then and where the CPUE has been trending. I also look at the Fishery Independent Survey (FIS) where available for an SMU, and take that into account. Generally speaking, there is depletion, and if that is the case, we can say that the current Sustainable Yield is likely somewhat lower than the catch at the recent period of stable CPUE.

That "eyeball" estimate came to 186t, which is within 2t of what the model result was. Of course, it is wise to set the TACC under that level by a significant margin, to be sure that a net increase in biomass is occurring. Getting it right is important; if we had taken the appropriate level of catch cut in 2008, we likely would have stabilized the fishery at the level of our current catch, and be now looking to have catch increases now on the back of improved biomass. The feeling would be optimism, instead of pessimism.

Risks of Depletion

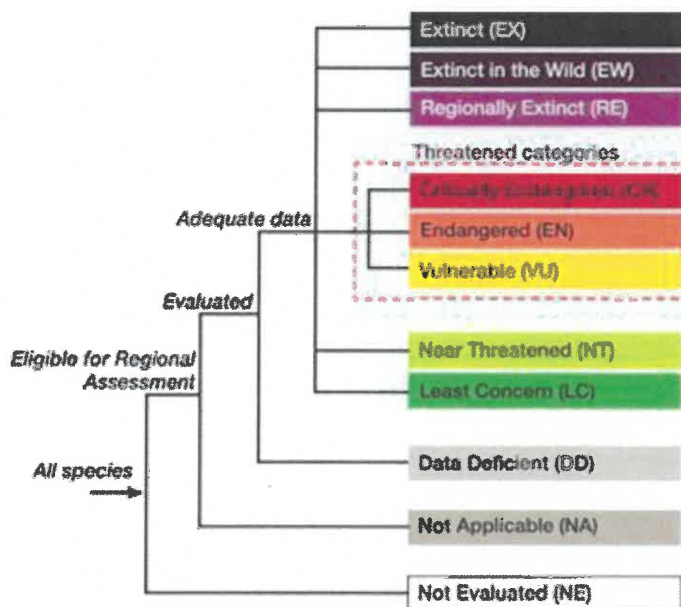
There are several risks that come with depletion that industry and VFA should be made aware of. The landscape has changed. Foremost among that is the long overdue inclusion of many abalone species on the IUCN Red List. As this includes Blacklip abalone, this will have several ramifications, increased scrutiny, potential for CITES, and how abalone may be treated according to Australia's own EPBC Act – both CITES-related components, the standard export approval which has potential not to be granted or if granted, revoked; the EPBC's own [list](#) of threatened Fauna.

Other depletion-related risks include fishery closure and *Centrostephanus* incursion as has been seen in Eastern Zone, Upper East of Tasmania, and NSW, etc. Inability for third-party certification is another problem, and inability to trigger a rebuild as biomass depletes and non-commercial catch approaches the level of Sustainable Yield is another problem.

The successful granting of permits to abalone ranching on reef argued to be depleted is another looming threat of depletion. After I have been arguing since 2019 to fix the depletion with appropriate Optimal Catch Targets and TACCs, it seems a perverse outcome that permits might be granted based on a depletion that has been overseen by the government granting the permit, a depletion objected to by half of the industry.

IUCN Red List of Threatened Species – Blacklip Abalone “Vulnerable”

At the United Nations Biodiversity Conference in Canada, 9 December 2022, the International Union for Conservation of Nature (IUCN) Red List was [updated](#) to [include](#) 20 of the world's 54 abalone species with a “threatened with extinction” category. This is the first “Red List” assessment of abalone. Most concerningly, the “threatened with extinction” category now includes *Haliotis rubra* – [Blacklip](#), and [laevigata - Greenlip](#) as “Vulnerable”.



IUCN assesses the status of the natural world at a species level, and publishes Red List assessments to highlight need to safeguard nature from extinction (<https://www.iucnredlist.org/about>). IUCN comprises both governments and civil society in driving its strategic direction and its decision making (IUCN has Members that are states, international nongovernmental organizations, national nongovernmental organizations and indigenous peoples' organisations — IUCN has more than 1400 members). IUCN links with the Convention on International Trade in Endangered Species of Wild

Fauna and Flora (CITES) is an international treaty between governments, where IUCN is an observer within CITES, and is widely viewed within the treaty as a provider of credible and unbiased scientific and technical advice on vulnerable species.

CITES

The IUCN Red Listing of abalone as “threatened” should be seen as the first steps for environmental ministries to consider proposing listing abalone for inclusion in CITES Appendices (it is currently not included). If abalone were to be proposed for listing in CITES Appendix II (as a focus species or one that was argued to be a “look-alike” of another that was proposed), the current IUCN Red List “threatened” characterisation would likely encourage the CITES “Conference of the Parties” to adopt abalone into CITES controls.

It is notable that there is a direct linkage between IUCN Red List and CITES, in that the CITES Checklist to Assist in Making Non-Detriment Findings for Appendix II Exports includes an explicit reference to the “IUCN Global Status”.

The next CITES “Conference of the Parties”, COP20 will be held in 2024-5. The last one (COP19) was recently held in November 2022.

The Australian wild harvest abalone industry lacks a Strategic Plan regarding the fact that aquatic species are being proposed for CITES - under less stringent and more precautionary criteria.

The CITES is an international agreement between governments that aims to ensure that the international trade in wildlife does not threaten wild populations.

In Australia, Department of Climate Change, Energy, the Environment and Water (DCCEEW) has a primary responsibility for the implementation of Australia’s requirements for international movement of species listed under the CITES. These requirements are given effect through the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

CITES works by putting in controls on international trade of species lodged on its Appendices. All import, export and re-export species covered by the Convention must be authorized through a licensing system that controls for legality and sustainability, typically through agencies distant from fisheries authorities. In Australia, DCCEEW will oversee administering that licensing system and one or more Scientific Authorities to advise them on the effects of trade on the status of the species.

CITES is an international treaty to which countries have agreed to be bound by the Conventions international trade rules for species on its appendices. Countries within the convention are known as Parties. CITES is legally binding on the Parties – in other words they must implement the Convention. CITES does not have the laws centrally controlled, rather it provides a framework to be respected by each Party within their own legislations, and each Party must adopt its own domestic legislation matching CITES needs to ensure that CITES is implemented at the national level.

If a species such as abalone is CITES listed, then an export permit by DCCEEW may be issued only if the export will not be detrimental to the survival of the species and the trade can be shown to be legal. Once a species is CITES listed, all fisheries in each state must obtain a positive Non-Detriment Finding (NDF) to be able to continue to export. This decision is not up to the state-based Fisheries Management or their Fisheries Scientists, it becomes a Federal decision by DCCEEW.

Scientific reviews are required to determine whether or not trade endangers a species so as to the Management Authority in the country to issue a positive NDF. The basis for assessment includes population status, distribution, population trend, harvest, other biological and ecological factors, and

trade information. Therefore, if Australia's abalone industry does not follow best practice and is not science led it will become difficult to obtain a positive NDF and obtain an export permit.

Complete and reliable data on all relevant fields, as needed for assessment of NDF, are rarely available. NDFs are therefore often a type of risk analysis for a species assessing whether sustainable utilization exists. Ultimately, the question is in terms of how serious is the threat of complete over-exploitation of a population. As CITES requires concrete decisions, it is also a weighing up between the level of risk and the availability of information.

A review of a CITES listed species can lead to a positive non-detriment finding only if "there is only a well-regulated management and the impacts, and the scale of the harvest can be readily quantified".

Risk Assessment

A CITES listing without positive NDF is likely to be severe to catastrophic for industry, as export revocation means in all likelihood a very significant diminishment of beach prices, and an export market that will learn that supply is unreliable and seek substitute product. If the threat is ignored until Blacklip or Greenlip need a positive NDF, then the time to rectify that situation will likely be measured in years, and it will come at a time when industry funds are greatly diminished (due to denied access to export).

Worth noting, the potential for unilaterally-imposed import bans of CITES-listed species (irrespective of positive NDF) should not be discounted.

It is difficult to rate the likelihood of CITES listing in 3 years, or 6 years... but with abalone now being on the IUCN red list, 44% of species marked as "threatened with extinction", including 7 marked as "Critically Endangered", there is a significantly increased likelihood of an abalone species being proposed and accepted on CITES Appendices. Once listed, there will be steadily increasing scrutiny of the entire genus *haliotis*. Once listed, it is practically impossible to be taken off the CITES list. There is also a risk of "look-alike" provisions forcing Blacklip and Greenlip into requiring a positive NDF, even if not CITES listed because of sustainability concerns.

Under many risk assessment matrices, even if a likelihood of only "possible" is combined with a "catastrophic" consequence, it would yield a "critical" risk. If only judged as "unlikely" and "severe", the risk category is still "high". We should act accordingly.

There are two components that maximize the confidence that abalone stocks in a jurisdiction will not be overexploited, and so help satisfy DCCEEW and lead to the issuing of a positive NDF. The first is that catch targets are set through an effective Harvest Strategy (Management Strategy Evaluation (MSE) tested, scientifically peer reviewed, with a good track record, etc.) that are likely to lead to rebuilding of biomass in areas of relative depletion. The second is the stock status to show that biomass rebuilding is underway such that it would satisfy any external certification or evaluation (e.g. Status of Australia's Fish stocks (SAFS), Marine Stewardship Council (MSC), and whatever specific framework DCCEEW uses).

Jurisdictions without both of the above in place are likely subject to far higher risk, as even the most effective/conservative abalone Harvest Strategies currently used in Australia have taken years to bring about appropriate levels of catch to arrest depletion. It then takes further years to yield enough of a track record to show that the stock status has changed for the better, and potentially some years after that before external classifications are reviewed (noting that for example, SAFS classifications are only reviewed once every 2 years). From that perspective 6 years, let alone 3 is not far away in terms of getting a fishery's "house in order" to pave the way for a positive NDF.

Recommendation re: CITES

Industry, and quite possibly, state-based regulators and scientists currently lack understanding of the processes by which abalone species might be CITES listed, and if listed, the framework through which they might be issued a positive NDF to allow export. There are also unanswered questions around whether this IUCN red-listing means additional or higher level of regulatory or other scrutiny. Each must strengthen capacity in this area to facilitate appropriate advocacy and decision-making. The understanding, importance and strategies to minimize CITES-related risk must be communicated widely within industry, and in fisheries management and science.

Regarding TACC setting, there are two important goals. The first is to facilitate a positive Non-Detriment Finding in the event of Blacklip CITES listing in Victoria. The second is to minimize the chances of CITES listing in the first place, in part by mounting an ability to show that Blacklip abalone deserves to be de-escalated from the IUCN Red List. Both goals require demonstrating positive biomass trends across a fishery.

As we have seen with an analysis of fishery scale, the decisions taken in both Central and Eastern Zones will likely be critical in this regard. There are three key points here, and in fact, VFA have signalled a move to implement all three. It is the second point that will be the key determinant in success. Unfortunately, VFA's draft quota order will not achieve the second point, hence the necessity for this submission.

1. Ensure best practice, science based fishery management. Implement an effective Harvest Strategy if not yet in place. Look to outputs from the [MSE project](#) for guidance.
2. **Fast-track a satisfactory stock status.** If fishery areas are categorized as depleting, consider immediate, significant catch reductions over the next 1-2 years, that attempt to set catch below a likely current Sustainable Yield for each catch target, allowing for a good margin for error. These catch cuts may go beyond what is recommended by most Harvest Strategies in any given year, but a good Harvest Strategy can then be used to manage catch from that point in time.
3. Resting on 1a and 1b, ensure that any required scientific reports, reviews, surveys etc. are in place to ensure a positive NDF. MSC pre-assessment and/or certification may also be helpful in this regard.

Sustainability in light of CITES

CITES Checklist

There are multiple factors that are evaluated through the “CITES Checklist to Assist in Making Non-Detriment Findings for Appendix II Exports”. From the perspective of acting to prevent CITES listing or enable positive NDF, it is worth dividing this list into controllable vs uncontrollable factors (e.g. the biological factors are fixed), and so focusing on the controllable factors, as follows:

These factors are:

- 2.6 National abundance
 - The Tasmanian and Victoria populations of Blacklip abalone are key here. Key populations are close to the Point of Recruitment Impairment, making it especially important that action (catch cuts of effective scale) be taken to leave no doubt with population trend.
- 2.7 National population trends
 - It is useful to see that Tasmania appears to have an increasing biomass across the board, since its large quota cuts taken in 2019 and 2020; Victoria is again key here. Depletion must be reversed.
- 2.8 Quality of information
 - This is being worked on in Victoria in regards to CPUE standardization and improved accuracy, hopefully via mandated GPS depth loggers. The FIS survey is also being modernized. Hopefully more, useful information is gathered more frequently rather than less here.
- 2.10 Illegal off-take or trade (which explicitly refers to unmanaged off-take, i.e. non-commercial. This can be measured.)
 - Although VFA has helpfully limited the catch season in Central Zone, the daily limits remain high and there is no requirement to record catch of either recreational or indigenous. This parallels MSC criteria 1.2.3 “Information and monitoring” where an increased score is obtained by measuring these takes. It stands to reason that one must control Total Allowable Catch and not just Total Allowable Commercial Catch (TACC) such that it is less than Sustainable Yield, in order to sustainably harvest.
- 2.11 Management History
 - The recent inscrutable decisions by VFA to not take even their own draft quota orders, or not follow TACC workshops resulting in reductions, result in a black mark in this area. This parallels MSC 3.2.2 “Decision-making processes”. E.g. *“It needs to be demonstrated that serious issues such as stock declines are responded to in a transparent, timely and adaptive manner. Use of the precautionary approach should also be evident.”*
 - It is notable that the Checklist mentions *“An ongoing but informally managed harvest may not have a nationally approved structure, but may nonetheless have a good chance of sustainability, particularly if associated with strong local resource ownership.”* We have local resource ownership, and the indication here is that it would be seen as a positive to take appropriate precautionary action even if outside of a Harvest Strategy.
- 2.12 Management Plan
 - Further work needs to be done here, and it should take into account the results of the FRDC MSE project, as VFA has indicated. I suggest that Sustainable Yield modelling and the yield-based approach I use in this submission also has merit.

- 2.13 Aim of harvest regime in management planning
 - With parallels to MSC 3.1.3 “Long Term Objectives” and MSC 3.2.1 “Fishery Specific Objectives”, the Management Plan’s “Rebuild or Maintain” is clearly a problem – it is inappropriate to just maintain a stock below B_{MSY} , as practically all of the Victorian abalone fishery appears to be. The objective should be at least, to Rebuild to above B_{MSY} .
- 2.14 Quotas
 - It is to be noted that the CITES checklist affirms the Individually Transferrable Quota (ITQ) system as a positive towards sustainability, which the evidence suggests is the case.
- 2.16 Harvesting in areas with strong resource tenure or ownership
 - Again, it is to be noted that strong ownership of quota that is fostered in Victoria is seen as a positive in the CITES Checklist. Tasmanian Seafoods is proud to be at the forefront of demonstrating appropriate stewardship of the resource here.
 - Where VFA can improve here is to encourage sustainability-aligned ownership of quota and industry involvement. Where there are those focused on obtaining stable income, it should be suggested that there are other investments and financial instruments that give income security suitable for retirement that players without a long-term outlook should transition to.
- 2.18 Confidence in Harvest Management
 - There are some very good people within VFA, however, the political will to take appropriate, sustainable TACC setting decisions has been lacking in the past. This needs to be turned around. The science provider appears to be doing the best it can under the circumstances; a directive to provide prescriptive catch targets under Sustainable Yield in future might be helpful in obtaining a more helpful result.
- 2.19 Methods used to monitor harvest
 - The actual catch data is the most accurate of all data collected. VFA is working on upgrading the reliability of CPUE and FIS, which should be helpful here.
- 2.20 Confidence in harvest monitoring
 - This points to appropriate intervals and comprehensiveness of FIS sites chosen; hopefully an appropriate choice is made to have more, and more frequent, FIS information of high quality rather than less.
- 2.23 Incentives for habitat conservation (re: Centrostephanus)
 - It is notable in Tasmania that the Abalone Industry Reinvestment Fund actively funds habitat restoration via Centrostephanus (a marine pest) removal. This is seen as a positive in terms of CITES. Opportunity exists to do similar in Central Zone in Port Philip Bay, and for the first Centrostephanus which have been found in the Zone.

Marine Stewardship Council

MSC is the most well-known third-party sustainability certification program used by a number of Australia's fisheries and seafood companies. It provides a useful framework to improve a given fishery's likelihood of achieving sustainability. The goal of MSC, expressed in performance indicator 1.1.1, is to get the fishery to a state of being able to produce MSY level of recruitment, or at least B_{MSY} with a high degree of confidence.

If in a position to certify successfully, a company or the industry may pay a licensing fee to brand their product with the MSC logo, however, this is an optional benefit. The primary use from our perspective is to identify gaps such that the fishery can be managed more sustainably in future, and hopefully those gaps can then be closed.

MSC Pre-Assessment

Tasmanian Seafoods has recently commissioned an independent MSC pre-assessment on the Victorian abalone fishery, including analysis of the 3 Zones. The preliminary indication, likely to be carried through into the final report, is that significant improvement in stock status and management would need to take place before successful MSC accreditation is possible in any of the 3 Zones.

Stock Status (1.1.1) is a necessary requirement for MSC accreditation, and an intrinsic part of that is to be above the Point of Recruitment Impairment (PRI). According to my modelling, the Central Zone fishery presently sits below the Point of Recruitment Impairment, but not too far away if action is taken now. Each year action is not taken both takes us further from that goal, and extends the time we will need to rebuild to that level. This is why I stress it is both urgent and important that appropriate catch cuts are taken now, of at least the ~27% level, but preferably more.

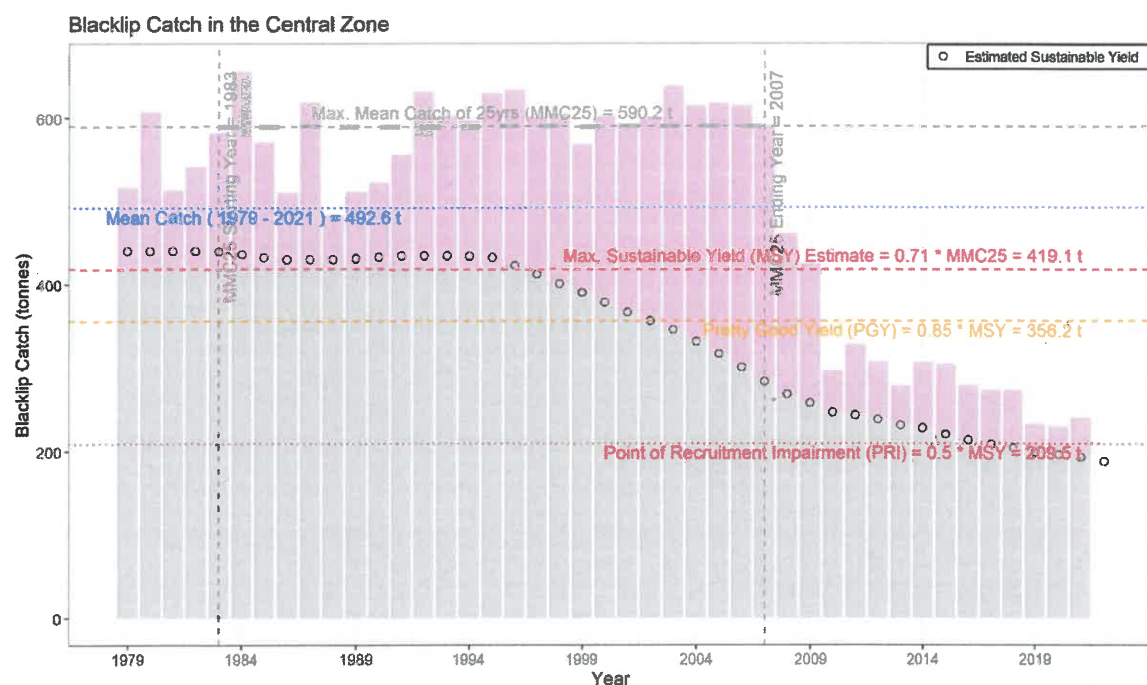


Figure 6: Central Zone – Sustainable Yield Below Point of Recruitment Impairment (PRI) and Depleting Further

Ultimately we will need to take those larger cuts (35-50% level if taken now, larger if delayed) regardless in order to secure a rebuild. A goal of rebuilding is a requirement of MSC (1.1.2), as well as

timeframes. The goal of “or maintain” in the Management Plan is unsuitable, and another instant “fail”.

As stated, the decision-making process is also a fail at this point. We can no longer have decisions such as was taken last year to hold TACC constant if we are to aim for MSC certification. *“It needs to be demonstrated that serious issues such as stock declines are responded to in a transparent, timely and adaptive manner. Use of the precautionary approach should also be evident.”*

Note that this is not a barrier to taking appropriate action now to reduce catch beyond a Harvest Strategy acknowledged as not working, and not adhered to, in any case. Such a move to halt depletion would be entirely appropriate in this circumstance.

VFA Responsibilities – “Where is VFA on this?”

I must acknowledge that in the last year, VFA has been increasingly responsive to the depletion situation; that trend must continue. At the last TACC setting meeting, we heard exceptional, pertinent talks by Maddie Watt, Toby Jeavons, and Cam Dixon (Mark Asplin also giving a competent summary of enforcement). Maddie’s presentation on the risks of CITES was excellent and timely, with her hands-on experience with shark she was well placed to talk authoritatively.

The letter re: Central Zone TACC setting process and strategic priorities sent by Travis Dowling on 2/2/2023 was positive, mentioning “The outcomes of the stock assessment and harvest strategy are likely to highlight the need to apply a precautionary approach and a conservative TACC decision” and that this would “ensure our fisheries management framework is robust, transparent and sustainability focused.” It is now time that the rubber meets the road.

It is worth reviewing the legislation around this topic.

Fisheries Act 1995 (of Victoria)

The Fisheries Act 1995 of Victoria, Australia, sets a comprehensive legal framework that emphasizes the importance of sustainability in managing fisheries and setting Total Allowable Commercial Catches (TACCs) for the Victorian Fisheries Authority (VFA). The key sections of the Act that contribute to this emphasis include:

Section 3 - Objectives of the Act:

The Act's objectives underscore the necessity of sustainable management and conservation of fisheries resources:

3 Objectives of Act

The objectives of this Act are—

(a) to provide for the management, development and use of Victoria's fisheries, aquaculture industries and associated aquatic biological resources in an efficient, effective and ecologically sustainable manner;

(b) to protect and conserve fisheries resources, habitats and ecosystems including the maintenance of aquatic ecological processes and genetic diversity;

(c) to promote sustainable commercial fishing and viable aquaculture industries and quality recreational fishing opportunities for the benefit of present and future generations

Section 28 - Fisheries management plans:

This section mandates that a fisheries management plan must contain provisions related to the management, development, or utilization of the fishery. Specifically, Section 6(a) specifies that the management plan must be consistent with the above objectives. Section 6 (f) states that it must *specify performance indicators, targets and monitoring methods*. 7(cb) suggests that it may *specify a fish harvest strategy, including actions to be taken if fish stocks fall below specified levels*.

By integrating sustainability into the Act's objectives, requiring the inclusion of sustainable measures in fisheries management plans, and mandating the consideration of sustainability when setting TACCs, the Fisheries Act 1995 of Victoria, Australia, creates a comprehensive legal framework that

guides the VFA towards ensuring the long-term sustainability and optimal utilization of fisheries resources. This framework necessitates that TACCs be set and managed in a manner that prioritizes the conservation and sustainable development of Victoria's fisheries.

Victorian Fisheries Authority Act 2016

7 Objectives of the Authority

The objectives of the Authority are—

(a) to promote sustainability and responsibility in fishing and fishing-related activities in Victoria; and

(aa) to promote sustainability and responsibility in boating and boating-related activities in Victoria;

The 2016 Act has a number of Guiding Principles, namely:

13 Principle of triple bottom-line assessment

The principle of triple bottom-line assessment means an assessment of all the economic, social and environmental costs and benefits taking into account externalities.

14 Principle of equity

The principle of equity means—

...

(b) equity between generations by not compromising the ability of future generations to meet their needs.

15 Principle of evidence-based approach

The principle of an evidence-based approach means considering the best available information when making decisions.

This Act further buttresses VFA's responsibility towards sustainable catch setting through an evidence-based approach. It is also noteworthy that the "triple bottom line" is not at the expense of the environment and the resource. A short-term economic result for a handful of people at the expense of a longer-term positive economic result and at the expense of the resource, can only be a net negative.

Federal Environmental Protection and Biodiversity Conservation Act 1999

3 Objects of Act

(1) The objects of this Act are:

(a) to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance; and

(b) to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources; and

(c) to promote the conservation of biodiversity; and

...

(e) to assist in the co-operative implementation of Australia's international environmental responsibilities;

The Federal EPBC Act also mandates that our natural resources are conserved and developed sustainably. There are other important aspects of this Act, but it is a long document, and these aspects will be covered elsewhere.

Summary

It seems the legislation binding VFA is emphatic about sustainability but seems inconsistent with a track record of 44 years of depletionary catches. Decisions taken by VFA should not be at the expense of sustainability.

As we have seen, the official science provider's view is that 25-50% cut is indicated. A 10.7% cut is unlikely to reach sustainability. My analysis is also that a 27% cut at the minimum is required for sustainability and I have suggested a 43% TACC cut with a suite of appropriately set Optimal Targets is a good compromise of keeping the industry viable while rebuilding the stock. Given the situation where we are now below the Point of Recruitment Impairment in aggregate, in an environment of vastly increased market access risk from CITES, it is time for VFA to act now for sustainability, consistent with the legislation in force.

It is notable that consistency with the existing draft Harvest Strategy hasn't been a governing concern for VFA as of the previous year and earlier occasions. Given the expert opinion is that this Harvest Strategy is not suitable for rebuilding, or even maintaining the fishery, it is now appropriate for VFA to set a TACC that has high confidence of being sustainable, irrespective of its draft TACC order or the Harvest Strategy.

Rewards

It is now appropriate to discuss the upside of acting now through catch cuts of appropriate size, to rebuild the Central Zone abalone fishery.

Fishery population dynamics is a mathematical science, much of which has been in place for decades now. If we start taking catches below Sustainable Yields, to the extent enough of a “delta” or difference between catch and recruitments, we will see exponential growth take place, and the limit is the carrying capacity of the original habitat. Most of the remaining stock is in the shallows, and being parallel to moderate and greater depths, is suitable for re-colonization.

We are presently seeing this in Tasmania, for example. See the following graphs showing recent catch and CPUE in the Western Zone Tasmania.

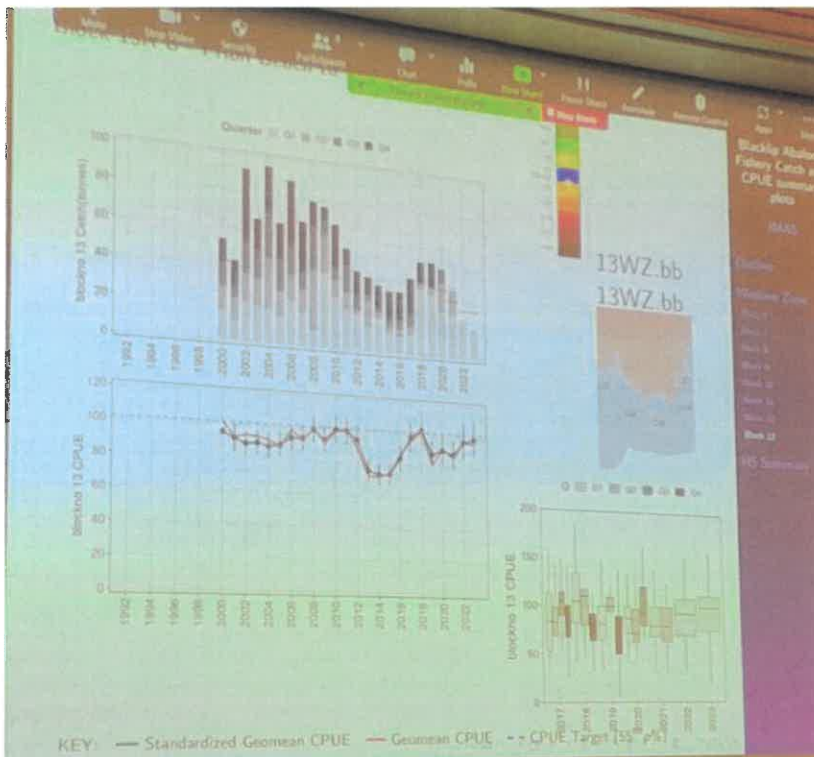


Figure 7: Block 13AB

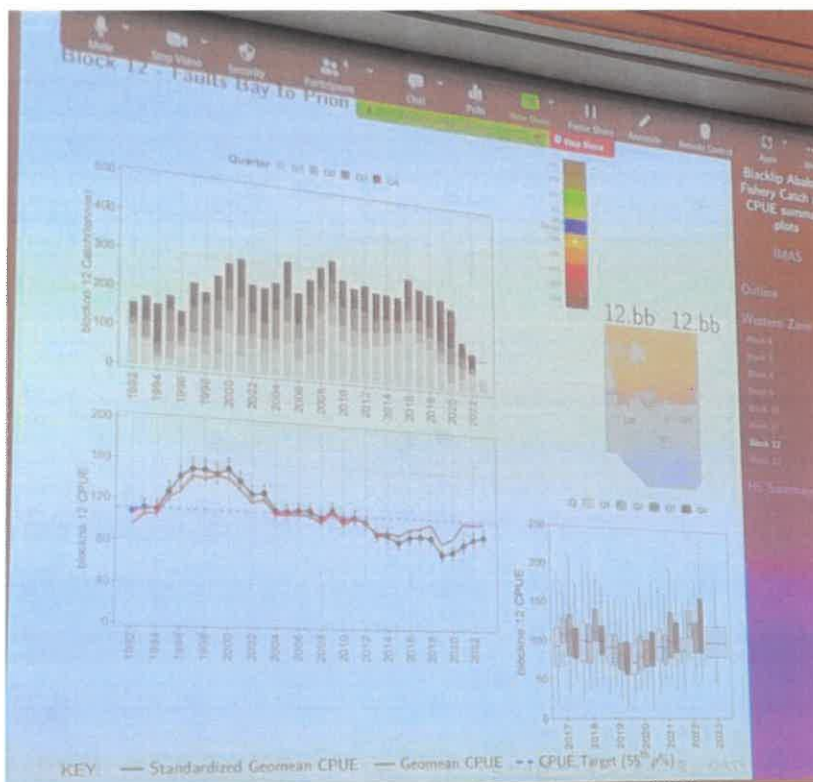


Figure 8: Block 12 (2nd largest MSY historically in WZT)

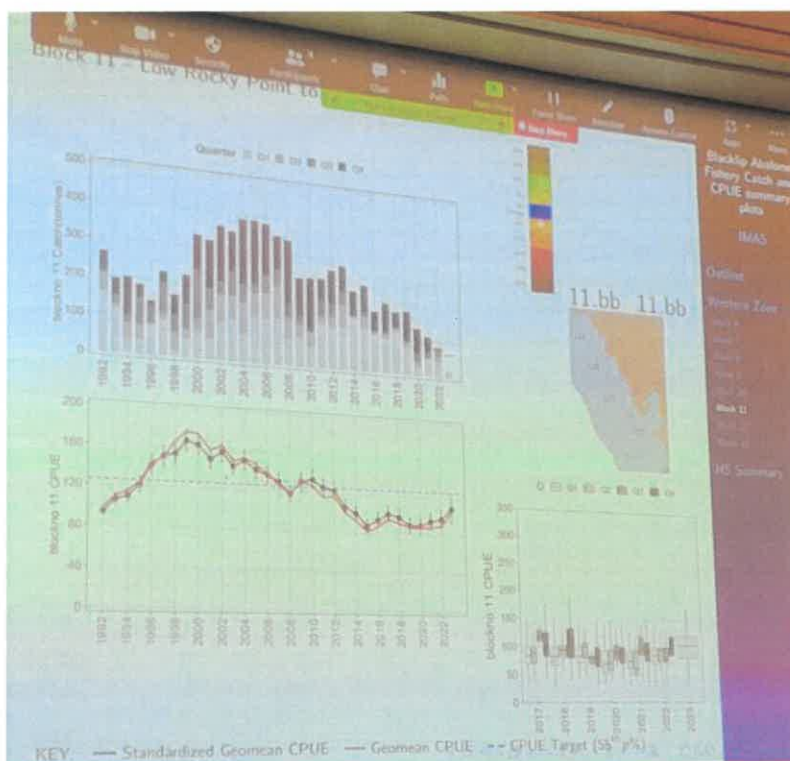


Figure 9: Block 11 (Largest MSY in WZT)

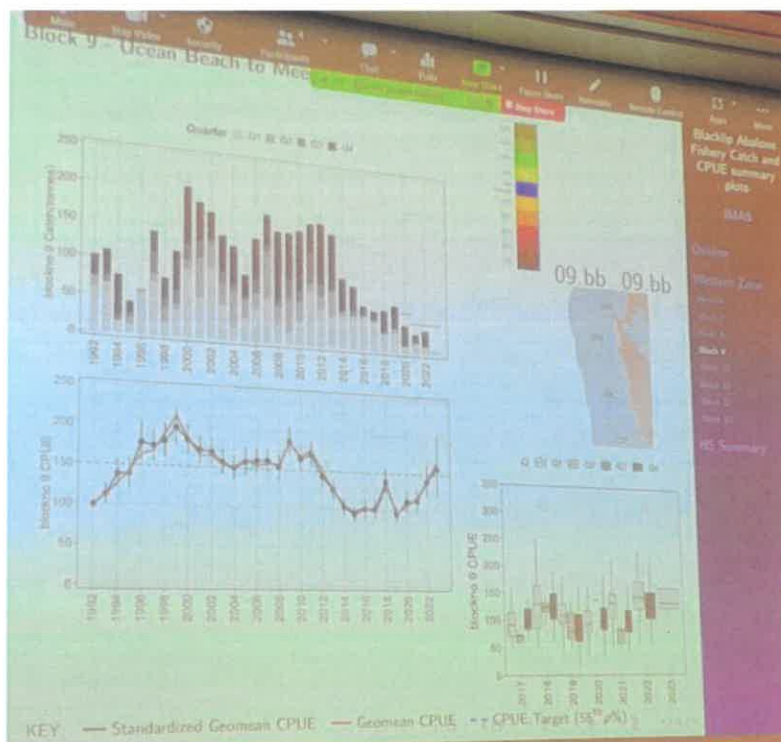


Figure 10: Block 9, WZT

It is worth noting that just as this process took 44 years to get to this point, and to 1995 when we first began to deplete below B_{MSY} , we can't expect a rebuild to produce B_{MSY} and just as importantly, MSY level of recruitment to work through the 7 years to harvest, in a timescale of a year or two.

However, there will be some relatively immediate bonuses to be had. If we take action now, the biomass will immediately begin to increase, making catching easier.

The second immediate benefit is that the mature biomass will be, on average, older, and hence larger, as the harvest fraction drops. Larger abalone are worth more, often substantially so (e.g. \$10+/kg) as it is suitable for the live market, or more sought-after canned sizes.

It is also notable that there is a vast difference in depletion levels across the different SMU. Some, like Flinders, are highly depleted and this is more of a "growth project". Others, like Prim Westside, already appear at a level capable of producing a "Pretty Good Yield" (PGY), or ~85% of MSY . Others, like Cape Otway and Back Beaches, can, with an appropriate reduction, be at a PGY level within a few years, at effective full capacity and growing in resilience.

Taken together, after initial catch cuts, we can have a relatively smooth increase in catch as each SMU rebuilds to a capacity where it makes sense to draw more catch from that area, while targeting growth in the most depleted areas, which "come online" later.

I have capacity to do this modelling and indicate what the road ahead looks like, and this can be done relatively quickly, but due to time constraints this is not yet in the submission.

The Opportunity

The game has changed. With the IUCN Red List signalling the dawn of a new era, it is time to act proactively without delay.

We can choose a legally compliant future of rebuilding stocks, a success story against the odds, with eventual “blue ticks” of MSC accreditation, rock solid market access, larger, more valuable fish, and a TACC that is growing every year for a good length of time with a reputation to go with it. It will be more difficult for a few years, and after that, much easier.

Or... we can choose an easy but foolhardy path of shame, embarrassment, and environmental degradation. It will result in eventual industry closure and financial ruin, one way or another, whether through market access denial or some other method.

The choice is obvious but difficult. However, there is opportunity to strike now.

It is notable that despite the highs beach prices rose to in the late 2010s, the industry did not want to take catch cuts at the opportune time, and fix income. Now, abalone is in a post-COVID drop in price (due to difficulties in eating at restaurants in various countries, and depressed demand in China affecting other markets), and with inflation yet to begin inflating export prices.

Industry has been forced to adjust to these prices, but they seem unlikely to last, at least in a nominal sense. And so, now is the perfect time to reduce catch to a sustainable level, if beach price can be increased to balance out the loss in volume.

If we consider that beach prices have been \$26-28/kg recently, we might call the beach price \$27/kg. If the dive rate is \$11/kg, then the quota holder is only netting \$16/kg less fees. Of that, there are ~\$4/kg of government fees to pay. So the net received by the quota holder is ~\$12/kg in the current environment. The required quota holder return is ~\$17/kg in order to see a 40% improvement. This would only require an increase in the beach price of \$5/kg, or to \$32/kg.

This seems very achievable, noting that in some sense abalone processing for the Singapore market is a bit of a gamble, with prices not agreed until September to November, and catching now.

It is also notable that VFA has already signalled at least a 10.7% catch reduction, so stakeholders have already priced in at least that level of income reduction.

With this cut is the opportunity to also request the measurement of the recreational and indigenous catches, e.g. with tagging, in line with improved MSC outcomes and the CITES checklist.

Analysis and Recommendations

It is appropriate in the current environment, with a Harvest Strategy deemed ineffective by the science provider, and increased depletion-related risk, to attempt to institute catch targets and TACC likely to be sustainable.

This mirrors in some respects what Keith Sainsbury has advocated for the Western Zone, in the sense that interim arrangements are needed there given their Harvest Strategy is out of date and key FIS data no longer collected (as is the case now in Central Zone).

I will outline my methodology and recommendations, such that they be considered for use. First, some comments about CPUE.

Finding Signal within CPUE

CPUE is variously regarded as being “hyper-stable”, and is problematic in terms of directly indicating a level of biomass. It is a destructive indication of the abundance that harvested abalone exhibited in the area it was fished. As such, it has a tendency to make things look good, or ok, until it doesn’t. Indications of biomass fall foul to catchability increases, as humans have improved technology and technique since the pioneering days of the fishery.

A common approach is to attempt to fit CPUE to a model of biomass. To increase accuracy, one might weight the low CPUE areas preferentially, and weight the more recent CPUE.

However, this still calls into question where CPUE is accurate, and does it indicate biomass? It seems that when a fishery is left relatively alone to rebuild for a time and the remaining pockets of fish form hot spots, these are locally abundant, but this is not a reflection of the abundance at scale - compared to historical levels under depletionary type harvesting.

CPUE is most misleading during rebuilding for this reason. CPUE is most indicative of abundance when CPUE is low, because divers are very good at what they do (finding and harvesting abalone), and if the CPUE is low it means the abalone aren’t there in abundance.

Modelling population dynamics and stable CPUE

Why do I concentrate on periods of stable CPUE? Or a period where there has been no net gain or loss in CPUE? Because during these times, we have the best gauge as to the recruitment, because presumably catch has been just enough to cancel out recruitment and so we can gauge the recruitment by the average catch during that time.

There may be further opportunity to improve this approach by using multiple such periods in the history of the fishery, and attempt to get the least sum of squared errors between this delayed difference model fitted to them.

Biomass vs Yield Estimation

You will note that although MSC talk about status of a fishery in terms of Biomass relative to virgin levels (B0), my approach is to consider the abalone fisheries in terms of yield. i.e. the balance between what the fishery is recruiting into the fishery versus what is being taken from the fishery. It seems:

- easier (we have the data), all that is needed is to analyse it appropriately – write the code for that once, it’s easy after that point
- more accurate (catch is very accurate, down to the reef code level, and is measured rather than just sampled in a few places like a FIS)

- it can make use of the most accurate signals from CPUE, i.e. the points at which CPUE is constant to give a recruitment equal to the catch, approximately, and where CPUE is at low levels, and the more recent CPUE, comparing adjacent years where not much catchability creep is evident.
- widely applicable (i.e. to every reef code, even) and
- far less costly and error prone to determine where a given level of MSY is than the level of biomass required to produce MSY level of catch, and what the virgin level was. And since in a lot of cases there is a relatively recent level of catch where CPUE has been relatively constant, there is a reasonable indication of where the Sustainable Yield was at that time (likely, a little below that level).
- Can produce a number of useful features, e.g. MSY levels, PGY levels, PRI levels, and Sustainable Yield points.

Biomass modelling is recommended by MSC, but is problematic in abalone fisheries for a number of reasons, not limited to – we only harvest mature animals, and there is approximately a 7 year delay before spawning events work their way through into the fishery. A mature biomass may have a large recruitment pipeline (e.g. in 1994) capable of yielding an MSY level of recruits 7 years into the future, or it may have a reducing recruitment pipeline (e.g. 2007) or it may have a rebuilding pipeline with each year improving (not really seen in the Central Zone fishery yet). None of this is captured with an estimation of mature biomass.

By contrast, all of this information is captured with an estimation of Sustainable Yield, as the mature biomass and the entire recruitment pipeline at that point is modelled and encapsulated in a single number that can compare situations in terms of an equivalent yield that may be reasonably compared, irrespective of the mature biomass at the time.

Calculating MMC25, MSY, PGY, PRI

I look at each SMU separately, and the graphs depict a number of features.

- 1) What I've termed the Maximum Mean Catch of 25 years (MMC25), which could also be termed a Maximum Rolling Mean with a 25 year window. Essentially this measure finds the 25 year interval where most of the catch was taken, in almost all cases taking a resource from BMSY+ levels of stock to relative depletion. This is where the fishery has been "tested". The relevant interval is clearly depicted.
- 2) Also, my MSY estimate, which is simply the constant, 0.71, multiplied by the MMC25. I have done that in order to achieve a close fit to Malcolm Haddon's recent MSY estimates for blocks 7-12 in Western Zone Tasmania. (The MMC25 originally was a very close fit to Malcolm's estimates of the mid-2010s in that region, but he has since revised his estimates down by about 30%; and so have I accordingly.) The advantage of a catch-only approach is that it is not reliant on potentially erroneous CPUE data, and given catch is highly reliable (at least as a lower bound on the abalone coming out of an area), and abalone recruit within the reef level, it should be a good way of estimating productive capacity down to even reef code level.
- 3) Next is my Pretty Good Yield line, which is 85% of the MSY estimate. As an engineer, I like to have a margin of safety below a dangerous area to operate (MSY). So unless there are surveys to indicate MSY is higher, I like catch to be at all times below MSY estimates and preferably below an additional margin of safety (the PGY).

4) Lastly, the Point of Recruitment Impairment (PRI), which is half of the level of the MSY estimate. While MSC for example, uses B20% as the PRI, and if unknown B40% is equated to BMSY, so half of BMSY is PRI. Since I am operating in terms of Yield as opposed to Biomass, rather than attempt to divine what exactly B20% might correspond to in terms of yield, I've simply set it at a level of yield corresponding to half of MSY. One could argue that the yield for PRI should be somewhat higher than half as most models will show that B20% will be somewhat proportionately more productive than BMSY. On the other hand, abalone appears subject to Allee effect depensation which makes an abalone fishery less productive per kg at low densities. Setting this level higher will make more of the fishery appear in trouble though.

5) It is important to note that in terms of PRI, it is where the current Sustainable Yield sits relative to the PRI level of yield, that determines whether that fishery is below PRI, and not the given level of catch at any one time. This will be important when we are rebuilding to promote this feature, as catches will need to be significantly below Sustainable Yields from now on, basically, and Sustainable Yields will take time to climb above the PRI.

The Delay Difference Model

For each graph, I use a delay difference model to model the stock. This is a deterministic model, for which I assume that an equilibrium harvest fraction of 15% of a given level of mature biomass is produced after 7 years. This is reputed to be about the cut-off point where modelled abalone stocks rebuild reliably (below 15%) or not.

This recruitment scales up until the recruitment hits calculated MSY, at which it is capped.

In order to fit the model, using a global solving algorithm to avoid local minima/maxima, I solve for initial biomass, which is biased towards the lowest level of initial biomass that will fit the model, so that the modelled recruitment at a given catch and year matches that given by a "catch at stable CPUE" found by looking at the CPUE data from the stock assessment, for a recent such time period.

The biomass is capped at the initial biomass level. It seems reasonable that if there is mortality, then any gap below maximum capacity might be filled by the recruitment pipeline, to the extent there is a gap – with a large population of adult abalone providing large levels of spawn, and an assumed key limitation is in the habitat for adult abalone.

I could use recruitment models like Beverton-Holt, or Ricker, or a model featuring depensation and some of those might be easily looked at in future. However, assumptions have to be made and there is not a lot of data to support any particular of the above models as far as I am aware.

An age structured model would take into account somatic growth of spawning biomass, but would be significantly more complicated. The main feature required to capture is the delay between spawning, and recruitment into the fishery, which the Delay Difference Model does. By the time the abalone reaches LML, the growth has slowed down markedly, as energy will have been increasingly channelled into sexual reproduction rather than growth at that point.

Using this delay difference model, the initial biomass for each SMU ranges from 1.6 to 2.6 times the B_{MSY} and most in the 2-2.5 range. If we consider that MSC assumes that B_{MSY} is 40% of B_0 , or $B_0 = 2.5 * B_{MSY}$, then this seems in the ballpark, with some pre-1979 above-MSY fishing to partially deplete the initial biomass perhaps. This is some indication that the model behaves not unlike what we might expect.

Estimating Sustainable Yield

Having produced a Delay Difference model, it is now possible to compute a Sustainable Yield for any year in the history, including future years with arbitrary catches.

To do this, we extend the model for 30+ years, and solve for a constant level of catch that will yield recruitment in 30 years at that level of catch. Again, I use a global solving algorithm to find the appropriate value. For each year in the past, I set all future years from that point to be an identical level rather than the existing catch, and see what works according to the model.

Optimal (Catch) Target Setting Method

In each SMU, I recommended the following:

1. First, cap the Optimal Target at the level of PGY. This prevents overfishing, which is a significant risk if above-MSY level of catch is attempted, which is easy to get wrong and has asymmetrical problems if over-caught relative to under-catching.
2. If the Sustainable Yield is below the Point of Recruitment Impairment (PRI), institute a “soft limit”, not dissimilar to what is done in New Zealand. Catch at 25% of the current Sustainable Yield value (I used catch as a proxy earlier). This enables the vast majority of recruitment to be safely channelled into growth, with some nominal catch being used to destructively sample the CPUE to compare with the historical record.
3. If the Sustainable Yield is above PRI, then a moderate reduction to below SY is indicated, e.g. 15-20% below. This allows a good compromise of biomass increase, and catch used as income.

Central Zone Overview

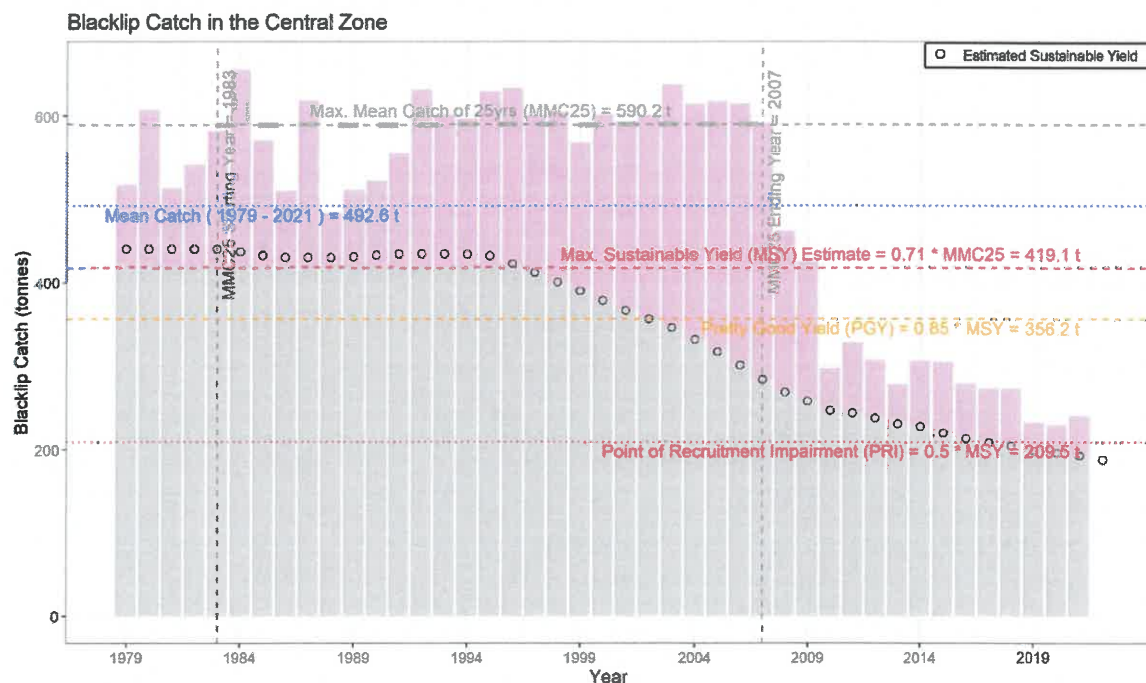
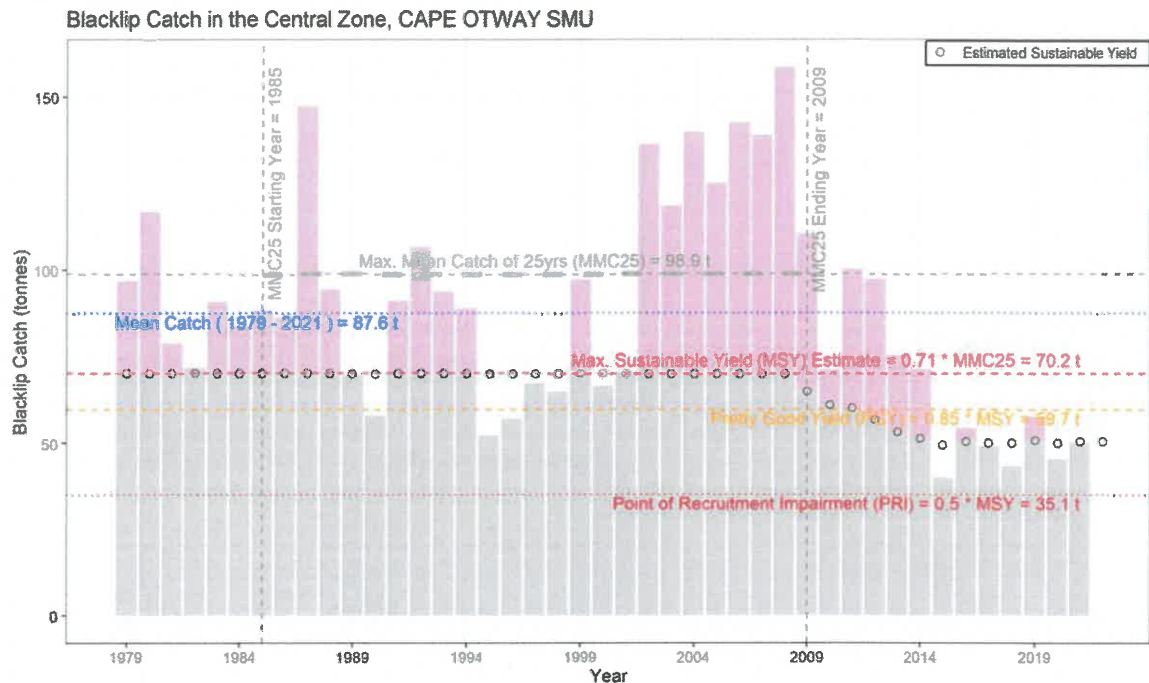


Figure 11: Central Zone Overview

As a whole, the Sustainable Yield for the upcoming quota period is 185t (26% reduction). I have recommended ~140t as an appropriate level of catch (~43% reduction), as this will both provide a necessary margin for error, and rebuild the biomass. The margin is 17% below Sustainable Yield with that proposed reduction, which is appropriate given a lot of the fishery is below PRI and requires a greater cut.

SMU Recommendations

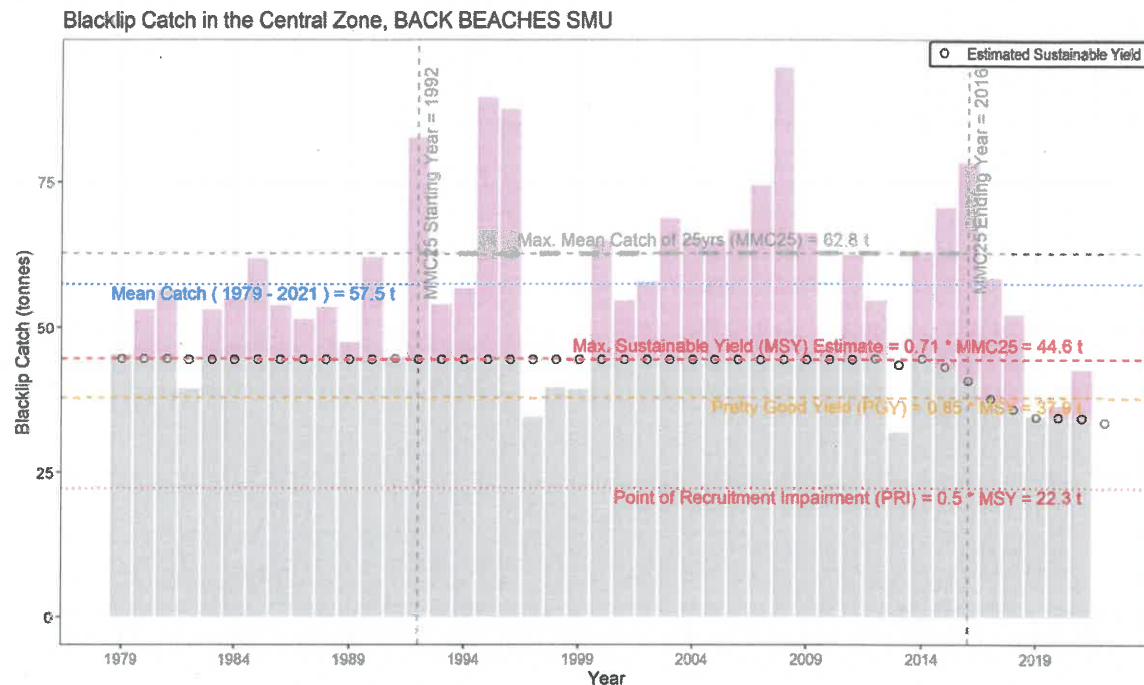
Cape Otway



I recommended 36t. The VFA position or 52.2t including carryover was a little over the Estimated Sustainable Yield of 50.7t. (I eyeballed the SY at 45t at the time of the TACC meetings.)

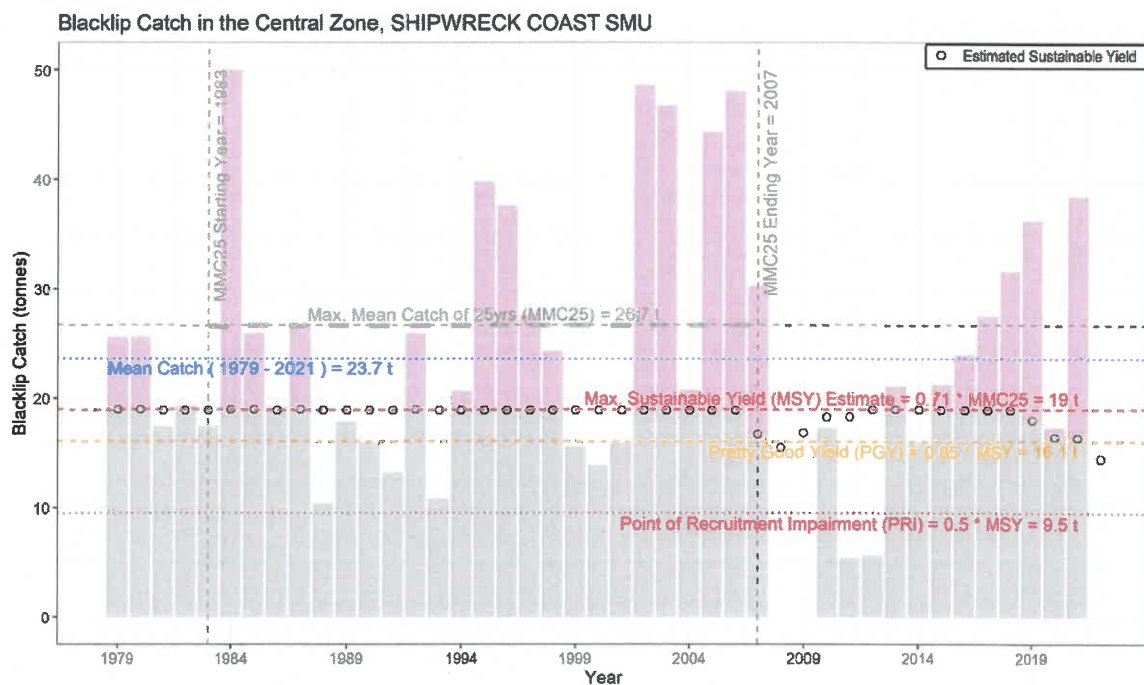
It would not be necessary to drop it to the level of 36t, but it should be below the SY with some margin, e.g. 40t or so.

Back Beaches



I suggested 30t to set the Optimal Target to. My eyeballed SY was 35t. The estimated SY value is 33.6t. VFA position was 38t including carryover, so this appears to be overfishing by about 6t. At minimum this should be brought back to 33t, and around my 30t value would be more appropriate.

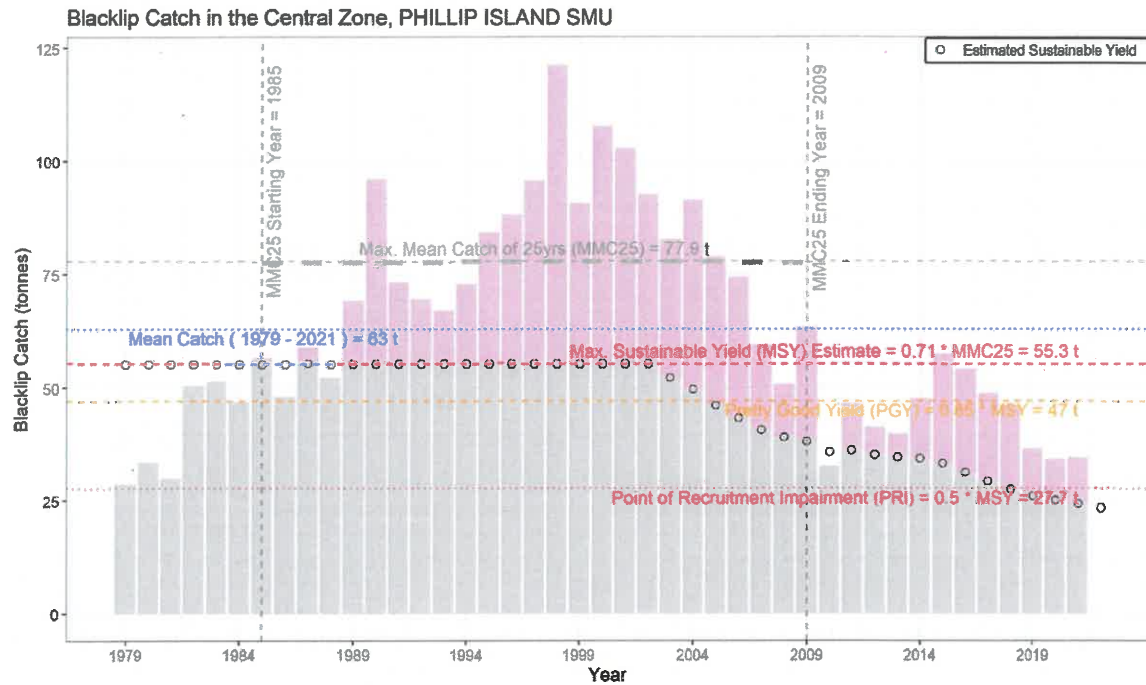
Shipwreck Coast



This represents the only SMU to my knowledge fully impacted by AVG, and so is more error prone to attempt to fit. It seems appropriate however to limit this to a PGY level of 16.1t just to be safe. The Sustainable Yield may be lower, at 14.5t. The VFA recommendation of 26.9t including carryover

seems certain to overfish the stock, unless survey can indicate that we didn't subject this area to depletionary catch prior to 2006, which seems unlikely.

Phillip Island



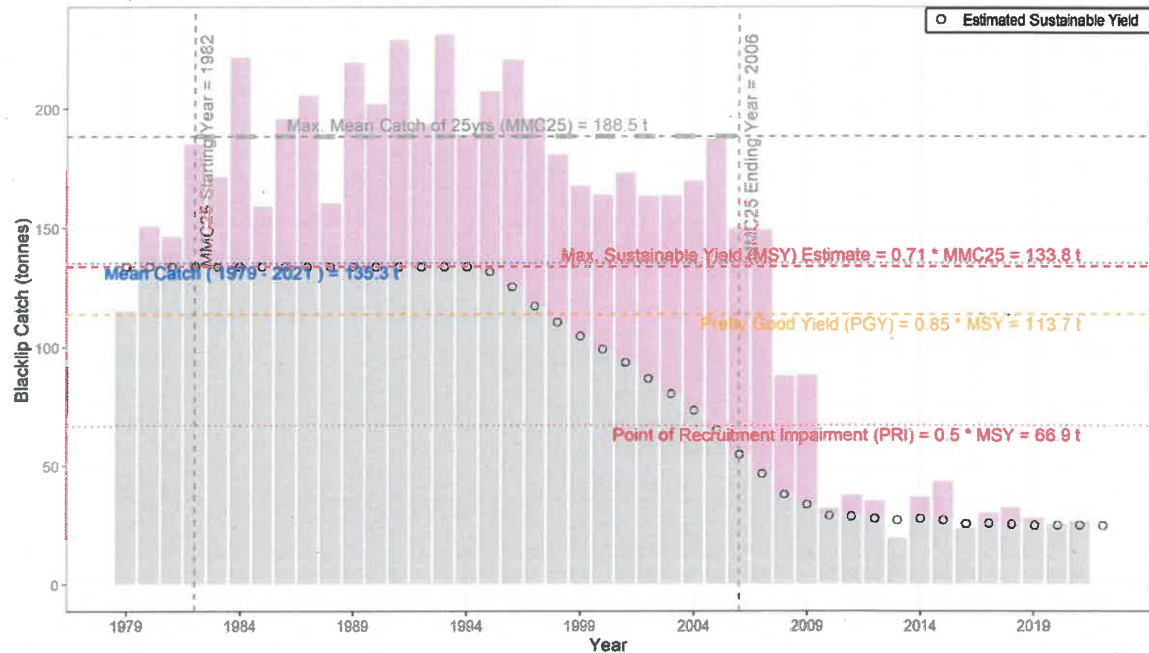
I eyeballed the current SY at 25-30t at the TACC meeting time, and suggested 25t. No rebuild at 34t, low CPUE, recruits at low level, have climbed but pre-recruits are trending down and at a low level.

The modelled SY value is 23.4t. It would be preferable to catch at some lower value, e.g. 20t.

VFA position was 32.3t, and it seems highly likely that it will be overfished at this level.

Flinders

Blacklip Catch in the Central Zone, FLINDERS SMU

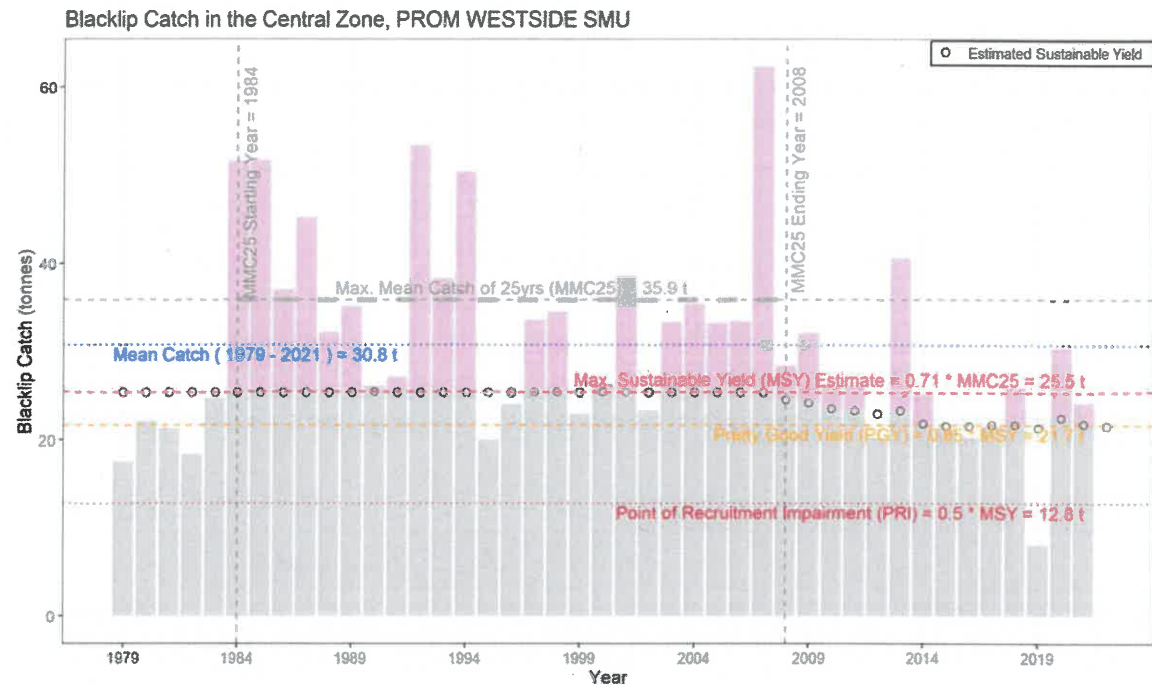


Flinders SMU is the great, unrealized potential of our Zone. It is very much below the Point of Recruitment Impairment. I eyeballed SY at about the 20t level. Modelled value is 24.5t.

I suggested 6.1t, or a quarter of the current catch. Somewhere around this level is appropriate given the obvious depleted status of this SMU, a soft limit should apply, and the SMU allowed to rebuild biomass at a fast, secure rate.

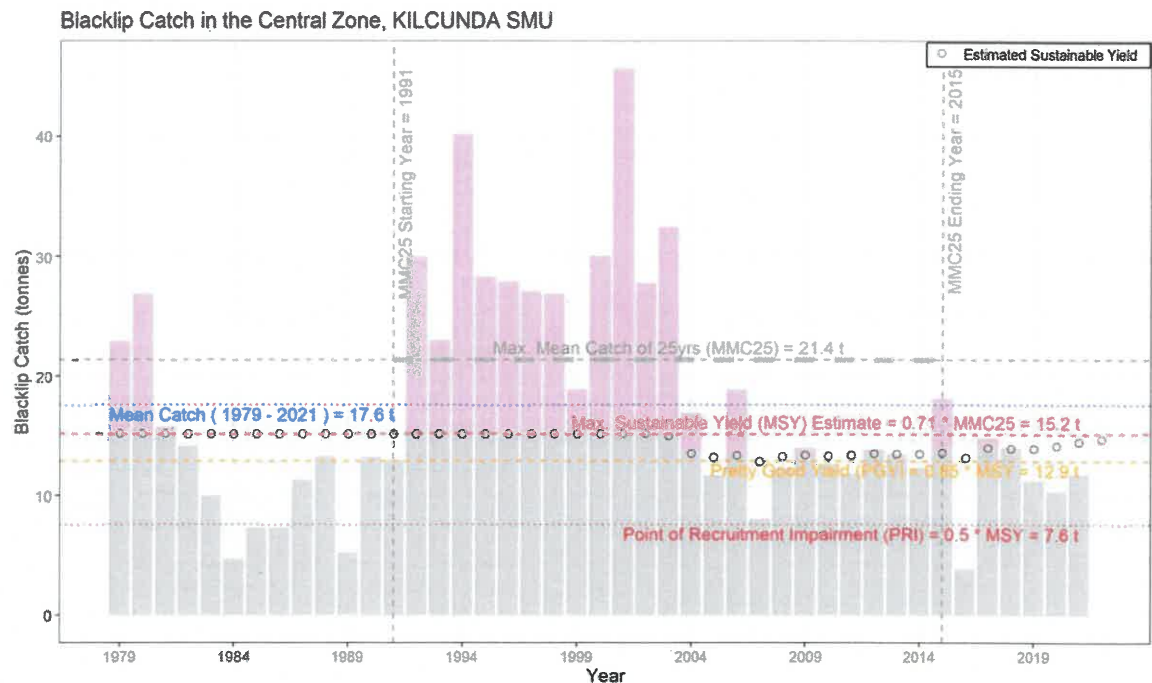
VFA position was 21t. Maybe rebuilding will happen here, but it is wasted potential and inappropriate. We should be harnessing the potential of this habitat.

Prom West



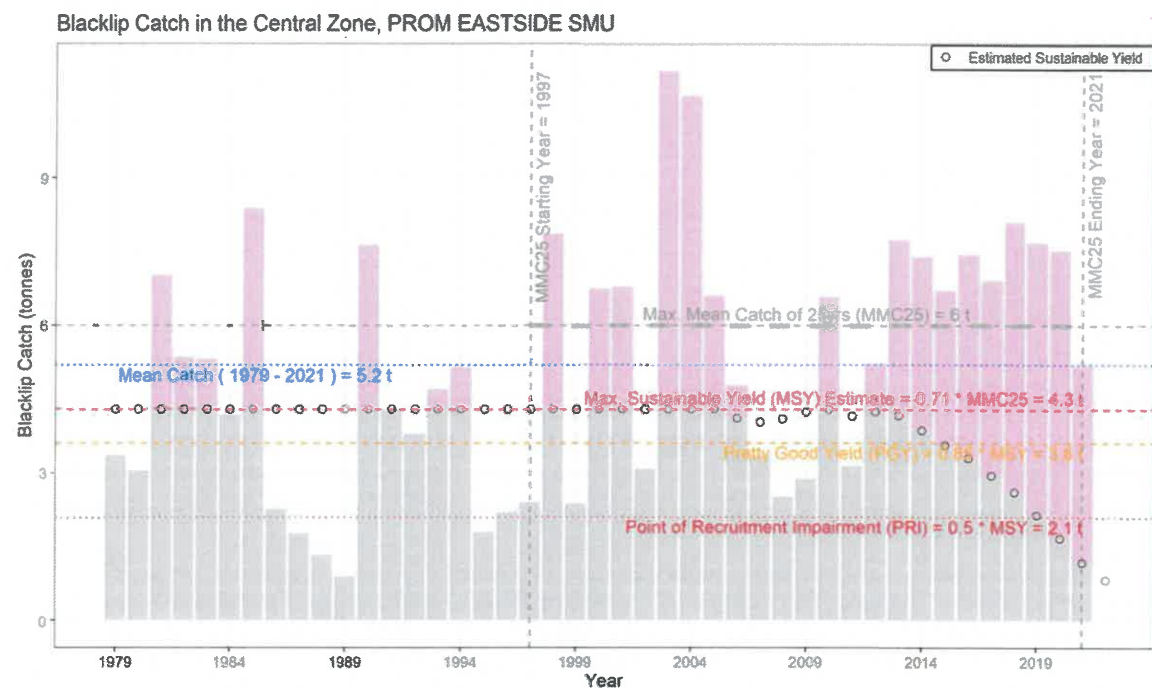
I eyeballed Sustainable Yield at ~20t, and have modelled it at 21.6t. I suggested 15t would be appropriate to set at. This SMU seems in a relatively healthy state. The VFA position is 21t. That would be sustainable, and below the PGY, so it wouldn't be a terrible decision, but not much margin for error.

Kilcunda



I eyeballed the Sustainable Yield at 11t, and later modelled it at 14.7t. I suggested reducing catch to 8t. VFA position was 10.3t including carryover. The VFA position could be sustainable, but there would not be much margin for error.

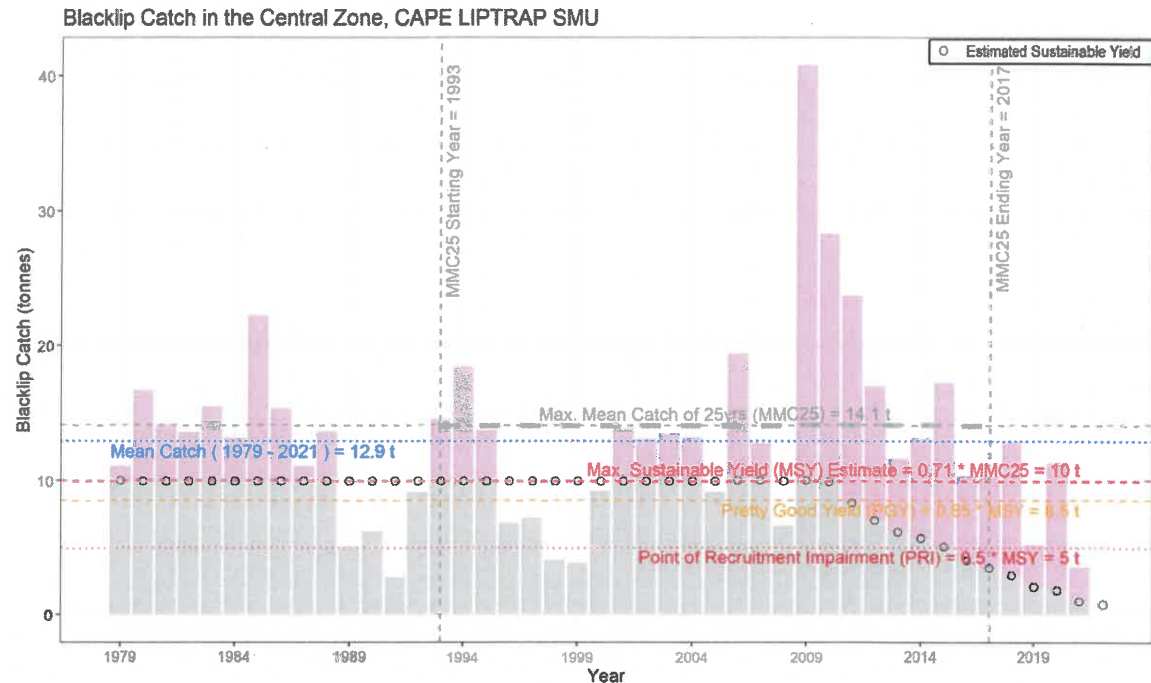
Prom East



There was a reasonable error associated in trying to fit this to the model, which can be more common when recent catches have set the MMC25.

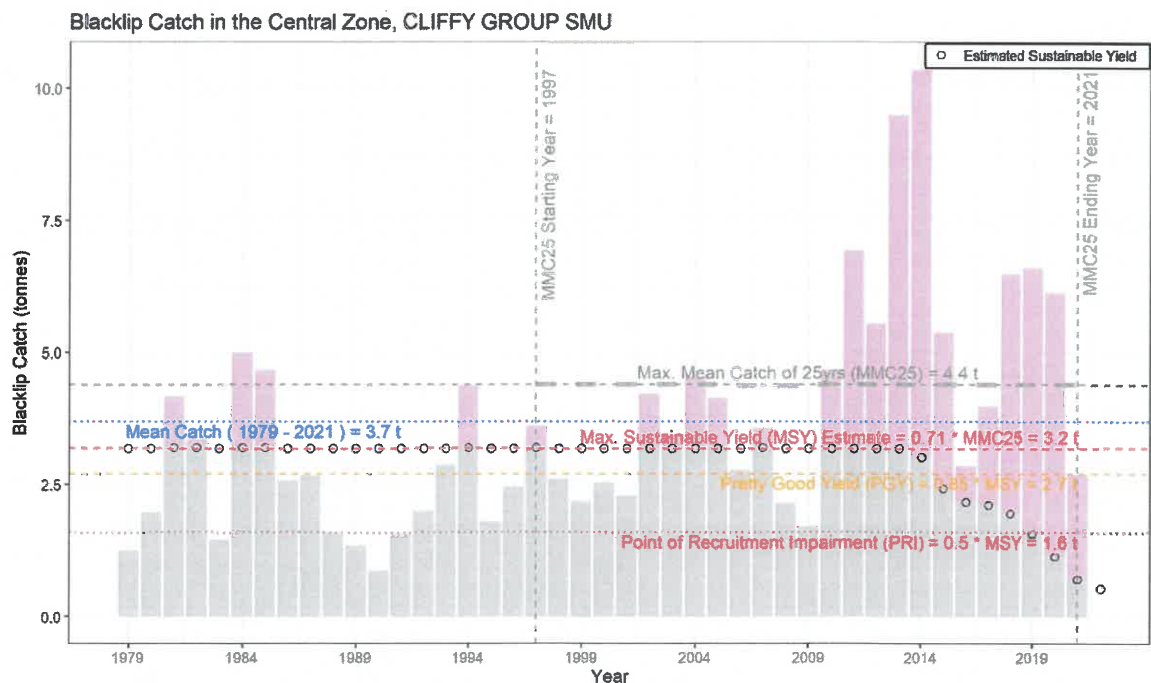
I eyeballed the SY at 3-5t, and the model suggests 0.8t. I suggested 2.4t. VFA's position was 4.1t. It is hard to say what is sustainable here, although it is not a particularly important SMU. By my model it is below PRI.

Cape Liptrap



With low and declining CPUE at ~8t, I thought Sustainable Yield likely lower at ~5t or so, suggested 4t. Recruits and pre-recruits strangely increasing though. VFA position was 8.3t. My modelled Sustainable Yield was 0.8t, which would suggest below PRI. I tend to doubt that the VFA position is sustainable here.

Cliffy's

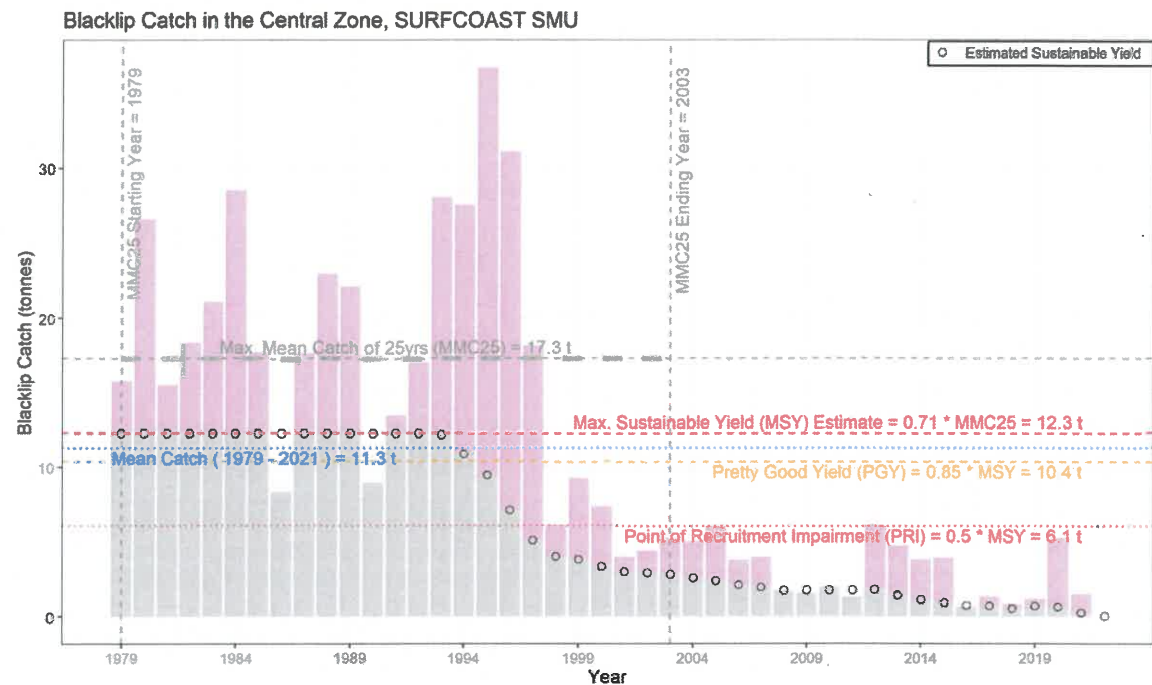


Current Sustainable Yield hard estimate as CPUE dropping at the 6.3t level. Seems likely at most 3t. I suggested 2.4t. We have just set the MMC25, and the fishery does not appear in great shape as you

would expect. My modelled Sustainable Yield was 0.5t, with a notable degree of error to fit the model (as tends to happen more with recently set MMC25). This is below the PRI.

VFA position 4.1t. I don't think this is sustainable or advisable.

Surf Coast

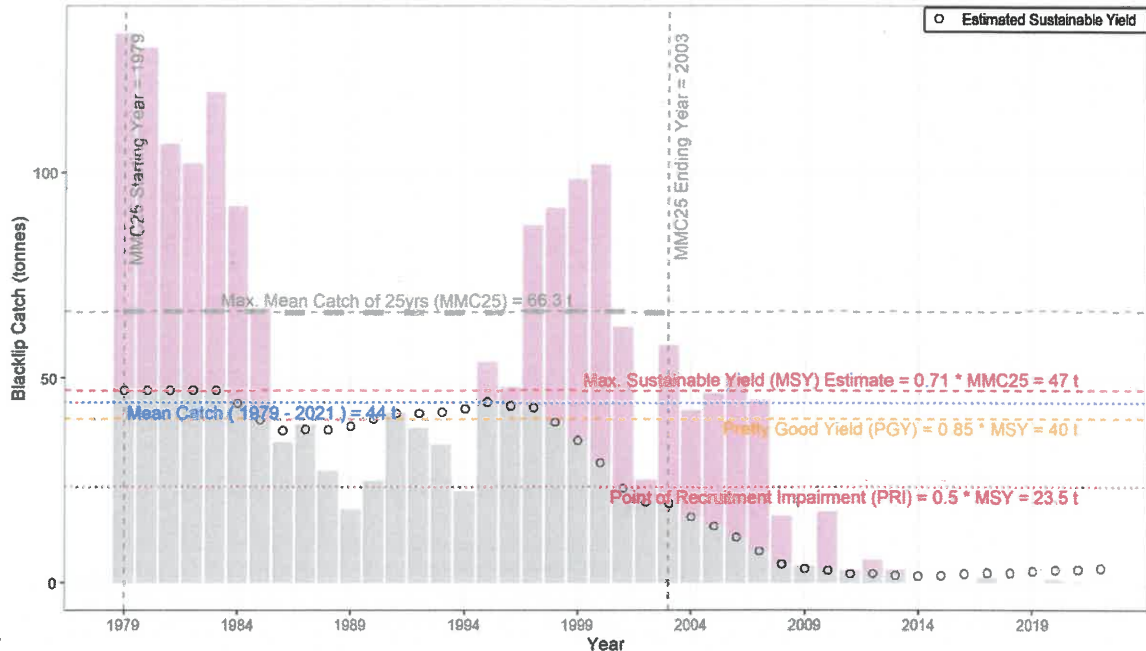


I eyeball estimated Sustainable Yield of 1t or so, and suggested 0.5t was appropriate. Modelled Sustainable Yield was 0.1t. This appears below PRI to a significant extent.

VFA's position was 1.5t, which seems likely to overfish.

Port Phillip Bay

Blacklip Catch in the Central Zone, PPB SMU



This seems to be well below the Point of Recruitment Impairment, and there should be no fishing here for a long time. What would be interesting is to fund trials of Helio urchin harvesting, to see if the algae recover, and see how the remaining small seed populations of abalone respond. According to Anton Krsinich, the bay abalone have vastly different tolerance to heat and low dissolved oxygen, as one might expect. They are also smaller. Thus, they should be preserved for that environment as translocating other abalone in there won't adapt to that location.

VFA position was 0t with 5t exploratory fishing. In my view, only non-destructive survey is appropriate here.

In order for the model to approximate what is reported (and not contribute to a strange looking Central Zone graph), it was difficult to do and so there is significant error here. I would attribute no Sustainable Yield to this area irrespective of what the model says.

The challenge here appears that the bottom has changed with Helio inundation, and quite possibly the reduction in sewerage effluent has contributed to the changed habitat. An argument for it not contributing to the MSY, PRI etc of the Zone could be made, as being a special case.

Calculated and Modelled Values/Estimates

SMU	Stable	Stable	MMC25	MMC25	MMC25	MSY(t)	PGY(t)
	Year	Catch (t)	(t)	StartingYear	EndingYear		
BACK BEACHES	2019	47	62.8	1992	2016	44.6	37.9
CAPE LIPTRAP	2017	9.7	14.1	1993	2017	10	8.5
CAPE OTWAY	2019	50	98.9	1985	2009	70.2	59.7
CLIFFY GROUP	2017	5	4.4	1997	2021	3.2	2.7
FLINDERS	2019	26	188.5	1982	2006	133.8	113.7
KILCUNDA	2018	14	21.4	1991	2015	15.2	12.9
PHILLIP ISLAND	2020	35	77.9	1985	2009	55.3	47
PPB	2009	0.1	66.3	1979	2003	47	40
PROM EASTSIDE	2016	7.3	6	1997	2021	4.3	3.6
PROM WESTSIDE	2019	22.2	35.9	1984	2008	25.5	21.7
SHIPWRECK COAST	2017	27.5	26.7	1983	2007	19	16.1
SURFCOAST	2017	0.94	17.3	1979	2003	12.3	10.4
Total			620.2			440.4	374.2

SMU	PRI(t)	MeanCatch (t)	Biomass	model	B1979/	relative	Sustainable
		1979-2021	1979 (t)	stable year	BMSY	error size	Yield 2022 (t)
BACK BEACHES	22.3	57.5	775.1	44.6	2.6	5.1%	33.6
CAPE LIPTRAP	5	12.9	145.6	9.8	2.2	1.1%	0.8
CAPE OTWAY	35.1	87.6	1198.4	50.0	2.6	0.0%	50.7
CLIFFY GROUP	1.6	3.7	34.3	3.2	1.6	36.0%	0.5
FLINDERS	66.9	135.3	1723.6	26.0	1.9	0.0%	24.5
KILCUNDA	7.6	17.6	258.1	14.0	2.5	0.0%	14.7
PHILLIP ISLAND	27.7	63	790.2	35.0	2.1	0.0%	23.4
PPB	23.5	44	632.7	8.8	2.0	8680.7%	3.5
PROM EASTSIDE	2.1	5.2	47.3	4.3	1.7	41.1%	0.8
PROM WESTSIDE	12.8	30.8	417.0	22.2	2.5	0.0%	21.6
SHIPWRECK COAST	9.5	23.7	294.4	19.0	2.3	30.9%	14.5
SURFCOAST	6.1	11.3	163.0	1.4	2.0	49.8%	0.1
Total		492.6				-PPB	185.4

Conclusion

In summary, the VFA catch targets appear unlikely to yield a sustainable outcome.

A ~25% catch reduction is likely around what is just sustainable, with rebuilding achieved by a larger reduction, e.g. 35-50%.

I have approached this problem by modelling the biomass, recruitment and Sustainable Yield, which gives at least a reasonable methodology to setting Optimal Targets here in a responsible manner. Obviously, what has been done thus far has not been working well, and greater reductions appear to be required. For the most part, there appears to be less error in my modelling of the larger

contributors (historical and present), and so for the most part following my recommendations should prove to be more reliable where it counts.

My use of PGY as a safety margin fits with the precautionary principle, as does modelling Sustainable Yields and attempting to go below them with some margin, and to be much more precautionary when below PRI, as is appropriate.

If VFA were to follow the recommendations, we would be in the best possible stead for the future. A staged approach of first going to likely Sustainable Yields would be slower and result in a less obvious rebuilding.

It must be emphasized that each year we remain in a depletionary environment the situation will get worse, and we will never again have the level of biomass and recruitment pipeline we have now, for a long time. That is our asset. Considering the looming risks, taking larger, more precautionary cuts in a methodical manner, and finding ways to help the industry adjust is the way forward.

Managing Stakeholder Expectations Amidst Fishery Rebuild

It seems inappropriate for the government to bail out license holders. In general license holders have held the assets for a long time, they should be long since paid off; they have taken a commercial risk and been rewarded for that risk. So, other ways should be sought.

What is more congruent with the needs of an abalone fishery is to have those with a long time horizon, who are conservatively financed and can afford to have lean years as appropriate, and have some sense of environmental stewardship, own more of the fishery. These may not necessarily be large companies but that is the kind of ITQ holder that will be of benefit to the resource, and the resource should respond in kind.

Alternatively, stakeholders should be counselled to expect harder times, and that catch and income cuts of 25-50% are in order.

I merely list some ideas to help address this situation, perhaps some combination should be considered and/or implemented.