

Victorian Central Zone Blacklip Abalone TACC Submission

Industry Submission for the 2020 - 2021 Season



Produced By

Abalone Victoria Central Zone

Abalone Victoria



Central Zone

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Published by Abalone Victoria Central Zone Ltd. February, 2020.

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VFA 2020/21 Season Central Zone Abalone TACC

	Size limit	Lower Limit	Lower Threshold	Target	Upper Threshold	Upper Limit
SHIPWRECK COAST SMU	130	24.4	26.5	31.6	30.9	33.0
CAPE OTWAY SMU	125	44.5	48.4	54.9	56.2	60.1
SURFCOAST SMU	110	1.0	1.2	2.0	2.5	5.0
PORT PHILLIP BAY SMU	105	0.0	0.0	0.0	2.5	5.0
BACK BEACHES SMU	119	44.6	45.8	47	48.2	49.4
FLINDERS SMU	112	23.0	24.2	25.5	26.8	28.1
PHILLIP ISLAND SMU	112	32.3	33.2	34.0	34.9	35.7
KILCUNDA SMU	115	8.9	10.8	12.7	14.6	16.5
CAPE LIPTRAP	110	10.5	11.1	11.7	12.3	12.9
PROM WESTSIDE SMU	115/120	14.7	17.9	21.0	24.2	27.3
PROM EASTSIDE SMU	110	6.0	6.5	6.7	7.5	8.1
CLIFFY GROUP SMU	110	3.5	4.3	5.5	5.8	6.5
2020/21 blacklip TACC				252.6		
2020/21 greenlip TACC				3.4		

Figure 1. Total Allowable Commercial Catch of blacklip abalone in the Victorian Central Zone Abalone Fishery proposed for the 2020/21 fishing season by the Victorian Fisheries Authority in *Fisheries (Central Abalone Zone) Notice 2020* under Sections 67, 68A, 114 and 152 of the *Fisheries Act 1995*. Figure produced by VFA taken from 2020/21 stock assessment and quota workshop summary.

Introduction

Abalone Victoria Central Zone (AVCZ) wishes to thank VFA for the opportunity to comment on the proposed *Fisheries (Central Abalone Zone) Notice 2020* as per Section 3A of the *Fisheries Act 1995*.

There are a number of significant changes contained within the proposed Fisheries Notice which will be discussed in greater detail throughout this document. Analysis of the SMU Targets set out within the Fisheries Notice are largely consistent with the recommendations set out under the Draft Harvest Strategy (Appendix **Figure 1**), supplemented and supported by the outcomes of the 2020 TACC Forum.

Ensuring that the draft Fisheries Notice is consistent with the recommendations and outcomes of the TACC forum greatly increases confidence in the consultation process as it demonstrates cooperation between the regulator and industry. Furthermore, the use of the Draft Harvest Strategy as a framework for the TACC setting process is also greatly beneficial, by providing additional confidence that allocations will not be altered drastically, unless in the most extreme circumstances.

Whilst the Harvest Strategy is still in draft format, we must be aware that some minor deviation from recommendations is acceptable, with this being the case until such time that the document is finalized and ultimately, MSE tested. Finalizing the Draft Harvest Strategy must be made a priority for the 2020 calendar year to provide certainty and consistency to the Central Zone abalone industry.

Harvest Strategy and CPUE

The use of harvest strategies in managing commercial wild harvest fisheries is considered to be international best practice, and is a requirement for third party accreditations such as that provided by the Marine Stewardship Council. Globally, Marine Stewardship Council third party accreditation is largely considered to be the benchmark of a well managed fishery.

The rationale behind the use of Harvest Strategies in wild harvest fisheries is to provide structure, predictability, transparency and confidence in the management and decision making process relating to the fishery, whilst utilising the best available science.

The Harvest Strategy which the Central Zone operates under relies on Catch Per Unit Effort (CPUE) expressed as kilograms of abalone harvested per hour as a proxy for biomass. CPUE is also the Primary and Secondary stock performance indicator within the harvest strategy.

When managing a fishery that utilises catch rates as the most critical indicator for setting quota levels, caution must be taken when making any amendments to management arrangements that the amendment will not adversely impact catch rates. An instance where this is applicable would be the increasing (or decreasing) of LML.

Adjusting the size at which abalone are able to be commercially harvested effectively controls the proportion of the stock able to be accessed by fishers. A reduction in LML increases the proportion able to be accessed, whilst an increase in LML reduces the proportion.

Whilst some believe that increasing or decreasing the LML will change the size structure of the wild stock, 28 years of fishery independent length frequency data (Appendix, **Figure 2**) would demonstrate otherwise. Median size of abalone sampled over the last 20 years has remained consistently around 110mm, despite LMLs during this time being altered significantly across almost all SMUs.

There is a published correlation between increasing abalone LMLs and CPUE decline (Haddon and Mundy 2016), which must be considered when assessing CPUE in years following LML adjustments. It is critical that this is factored into the 2020 assessment to reduce the likelihood of LML increases being misinterpreted as declining biomass, when in fact the only change has been the proportion of the stock able to be accessed.

The current CPUE standardisation does not sufficiently account for this factor and must be addressed by MRAG during the 2020 calendar year. The constant change experienced in recent years, especially relating to LMLs, hampers the ability of the Harvest Strategy to function appropriately. If a sound method of standardisation is developed, and a period of stability is entered into, especially relating to LMLs, analysing the performance of the fishery will be made far simpler.

It is encouraging that CPUE from 2010 onwards when looked at across a zonal level has remained relatively stable as highlighted by the most recent stock assessment. Whilst

TACC has declined especially from 2002 onwards, much of this can be attributed to AVG and Marine Protected Areas which are highlighted in **Appendix Figure 3**.

Table 1. Catch Per Unit Effort (CPUE) data expressed as kilograms of abalone harvested per hour, standardized and nominal for the last 3 years are detailed in the below table. Data for this table was sourced from the 2019 Reef Report Card.

SMU	2017 CPUE		2018 CPUE		2019 CPUE	
	Standardized	Nominal	Standardized	Nominal	Standardized	Nominal
Shipwreck	100	117	95	123	102	117
Otway	68	73	74	84	71	82
Surfcoast	72	95	60	73	78	93
PPB	-	-	40	47	-	-
Back Beaches	73	81	68	75	70	74
Flinders	57	61	56	60	61	64
Phillip Island	63	76	60	68	62	71
Kilcunda	55	66	59	67	64	69
Liptrap	63	76	64	81	63	79
Prom West	58	62	59	66	58	68
Prom East	50	52	58	59	55	57
Cliffys	74	78	76	82	69	80

Shipwreck SMU

The Shipwreck SMU has rebounded well following the AVG outbreak. Catch rates are exceptional with standardized CPUE increasing to 102 kg per hour from 95kg per hour. This SMU has the best catch rates out of any in the Central Zone, with the Threshold being reached in October, only half way through the season. **Appendix Figure 1** demonstrates the Harvest Strategy short term and long term indicator analysis recommending a stable final category for catch allocation of between -5 and +5% only due to decreasing pre-recruit biomass.

The proposed LML increase for Shipwreck will reduce CPUE for the subsequent season, especially considering the increase is 5mm, a significant amount to increase in one season which has concerned a number of AVCZ members.

AVCZ would prefer to see the LML for this SMU increased at a more incremental rate over two fishing seasons rather than 125mm straight to 130mm. AVCZ also recommends a boundary change for this SMU, shifting the Eastern most boundary of the Shipwreck SMU in an Easterly direction, incorporating reef code 6.01 into Shipwreck SMU and out of Otway SMU. The rationale behind this boundary change is to ensure that each SMU is as representative as possible in terms of biological characteristics. The AVCZ board feels that reef code 6.01 shares more in common with Shipwreck than

Otway. This also provides an additional level of protection to smaller abalone as 6.01 would be fished at the Shipwreck LML rather than the smaller Otway LML.

AVCZ support the catch Target proposed by VFA of 31.6t although feel that this is quite conservative. Based on the exceptional catch rates and continued early closure of this SMU, it is anticipated that the catch allocation will be increased next year

Otway SMU

Otway is another SMU that has performed exceptionally well during the 2019-20 fishing season. Standardized catch rates have decreased slightly from 74 kg per hour to 71 kg per hour, although all three categories under the harvest strategy recommend an increasing final result. Whilst long term indicators still show a decline in CPUE, comparing the current level of stabilized catch rates with the peak experienced in the early 2000s will likely always show a decline.

The proposed LML increase of 125mm up from 123mm is supported by AVCZ, although it should be noted that AVCZ recommends a LML of 120mm from Parker River to the Eastern SMU boundary to better suit the characteristics of this area. The 8.01 reef code should also be made part of the Surf Coast SMU not Otway. AVCZ support the target catch of 54.9t for the 2020/21 fishing season but as with Shipwreck, feel that this is quite a conservative figure.

Surfcoast SMU

Very little catch has come from the Surfcoast SMU in the last 20 years with 2016 to current being the lowest period of catch and effort ever recorded. As this SMU peaked at close to 40t catch in the early 1990s, there has either been significant decline in abalone abundance or changes in fishing practices. AVCZ would argue that the latter is more a consideration based on the standardized CPUE still being 78kg per hour, up from 60 kg per hour the year before.

Limited access for trailer boats remains an issue in the Surfcoast SMU with very poor launching facilities available. Divers launching from within Port Phillip Bay will work more productive and closer reefs in the Back Beaches SMU rather than the Surfcoast, and divers launching at Apollo Bay will work Otway over Surfcoast.

As a result of this, AVCZ would like to see a separate quota allocation for Surfcoast issued in the same manner as being proposed for Port Phillip Bay (10kg per unit) that must be caught in that area to encourage more effort in this area. Any allocation to this area should be taken from the Back Beaches or Flinders SMUs where effort is concentrated.

AVCZ supports the TACC recommendation of 5t to allow additional effort in this area and also supports the continuation of a 110mm LML to also encourage a greater level of effort.

Port Phillip Bay

Ensuring that fishing effort is adequately distributed across the entire central zone, and allowing equitable access for all divers across SMUs are high priorities for AVCZ.

Having the Upper Limits and Thresholds for the more productive SMUs ensure that more marginal areas such as Port Phillip Bay and the Surfcoast inevitably remain underutilized, as the quota is caught elsewhere. This leads to concentrations of effort in more productive areas.

AVCZ are proposing an additional 10kg per unit of quota to be allocated, encouraging divers to work in Port Phillip Bay. This 10kg must be caught in Port Phillip Bay. This allocation should be taken off the Back Beaches or Flinders SMUs as proposed for the Surfcoast SMU.

It is essential that commercial catches of abalone continue to be harvested from Port Phillip Bay with shell measuring machines, boat loggers and temperature depth loggers mandatory to improve our understanding of the resource. The current paucity of reliable catch data hampers science based decision making as demonstrated in the 2019 stock assessment, which is an area that needs to be addressed.

AVCZ supports the continued access to Blacklip Abalone in Port Phillip Bay, with the Upper Limit of 5t and LML of 105mm.

Back Beaches SMU

The 2019 fishing season has seen a winter with some of the worst weather for diving the Back Beaches in living memory. Standardized CPUE increased slightly from 68kg per hour to 70kg per hour, although under the Harvest Strategy parameters of CPUE 4 year gradient % change, 2 year ratio and 4 year gradient % change in pre-recruit abundance, all categories have demonstrated declines.

The Back Beaches SMU is a highly productive area and plays an important role in the Central Zone being the current second largest producer of Blacklip Abalone. Due to a large percentage of the TACC being allocated to the Back Beaches SMU and its close proximity to Melbourne, the Back Beaches are very popular amongst Central Zone divers.

The 2018 AVCZ TACC submission explores this theory in greater detail with the letter from Clarke Espie highlighting the shift of effort from Otway and Surfcoast when 3 divers local to that region retired between 2015 and 2018, with the quota being taken up by others based in the Mornington Peninsula region working the Back Beaches, Flinders and Phillip Island.

As the Back Beaches are anecdotally performing slower than previously, with the Harvest Strategy performance criteria indicating declines in CPUE, AVCZ support the VFAs decision to reduce target allocation from 55.3t to 47t. AVCZ also support the LML of 119mm for the Back Beaches SMU, although feel that any higher would be inappropriate as all effort would end up concentrated into the faster growing areas.

The Back Beaches is an important SMU and needs to be looked after accordingly. AVCZ would support the full 9.9t of quota cuts for the 2020-21 fishing season to be taken from the Back Beaches SMU and no others, as the downturn in this area is the primary concern amongst quota owners and divers, with most other SMUs tracking well in comparison.

Flinders SMU

Historically, Flinders contained blacklip abalone stock that inhabiting both deep water (>12m) and shallow water. In more recent years, the fishery has transitioned to be primarily a shallow water fishery. This can be seen when analysis of succorfish logger data is undertaken.

Standardized CPUE increased from 56 kg per hour to 61 kg per hour from last season. The Harvest Strategy parameters of CPUE 4 year gradient % change, 2 year ratio and 4 year gradient % change in pre-recruit abundance have been assessed as steady, increasing and decreasing respectively. This resulted in a final categorization of stable, with the majority of FRAG participants supporting the allocation to remain at 25.5t. This is consistent with what VFA is proposing, and as a result is supported by AVCZ.

The proposed LML increase from 110mm to 112mm for the 2020/21 fishing season is also supported by AVCZ, although as has been demonstrated previously, increasing further to 115mm is not appropriate due to the amount of stunted stock between Flinders Pier and the Blowhole.

Phillip Island

Catches remained excellent in the Phillip Island SMU until it was closed. The closure was a point of concern for many divers, who feel that the catch rates were far better at Phillip Island than Flinders, so therefore the stock is in a higher abundance, and the area can subsequently take slightly more fishing effort.

Both nominal and standardized CPUE for Phillip Island have increased for the 2019/20 fishing season as demonstrated in **Table 1**, although the Harvest Strategy Final Categorization of Phillip Island is stable. AVCZ support the continuation of a 34t target. The proposed increase of LML from 110mm to 112mm is also supported by AVCZ.

Kilcunda SMU

The Kilcunda SMU underwent a size limit change upon the commencement of the 2019/20 Season, with the LML being increased from 110mm to 115mm for the Eastern reef codes within the SMU (Harmers Haven, Cape Patterson and Inverloch). This LML change represents a reduction of 20.6% in available abalone (**Figure 2**) from the three aforementioned reef codes.

During this current season a whale carcass on the beach at Kilcunda and repeated shark sightings for an extended period of time significantly discouraged divers from actively working the area.

Nominal CPUE has been steadily increasing for Kilcunda since 2015, with Standardized CPUE following the same trend from 2016 onwards (**Table 1**). For all categories under the Harvest Strategy Kilcunda is categorized as increasing, with a final categorization of increasing. This results in a 0%, 5% or 15% increase in catch. VFA have proposed a steady catch allocation for Kilcunda, although based on the consistent CPUE increases and Harvest Strategy recommendations, AVCZ propose that a 5% increase be adopted, with a target increasing from 12.7t to 13.3t.

In regards to the LML adjustment for Kilcunda upon the commencement of the 2019/2020 fishing season, AVCZ do not support a change of 5mm in one season. A better approach for Kilcunda would be to set the LML at 112mm for reef codes 15.03, 15.04, 15.05. Size structure of the commercial catch measured in the 3 Eastern reef codes of the Kilcunda SMU is detailed in **Figure 2**.

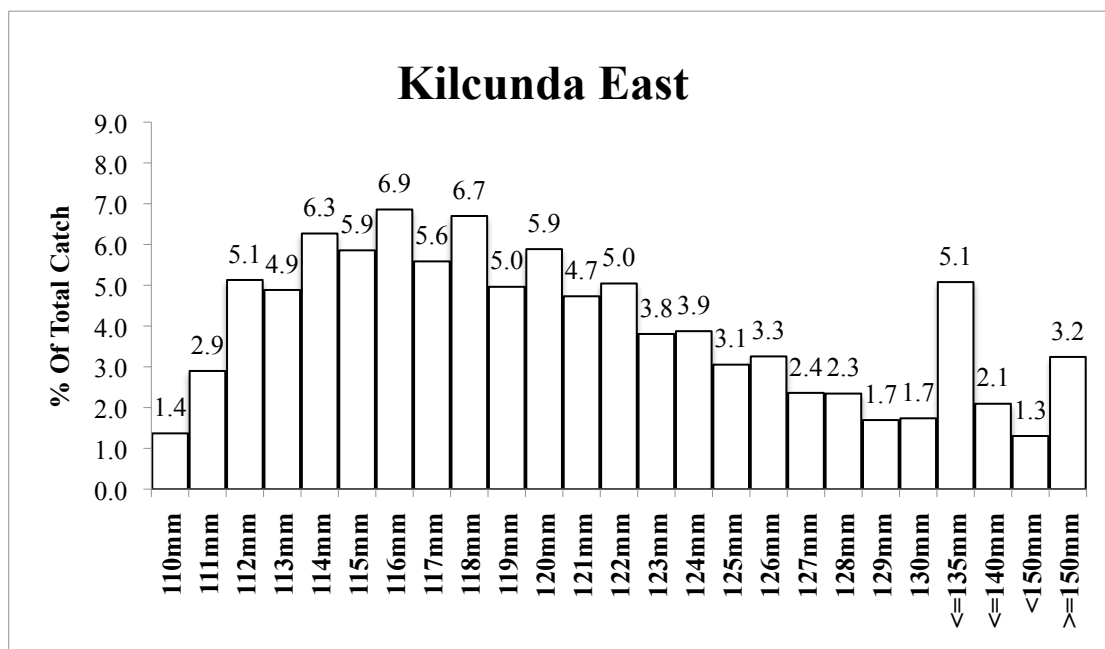


Figure 2. Shell measuring data summary from 2014 to 2019 for Kilcunda East SMU reef codes 15.03, 15.04 and 15.05. A total of 21,235 individual shell measurements are collated to demonstrate the size structure of the Eastern reef codes within the Kilcunda SMU. Note data points over 150mm are greenlip measurements.

Cape Liptrap SMU

The Cape Liptrap SMU also underwent a size limit increase at the start of the 2019/20 fishing season. This change increased the LML from 105mm to 110mm for reef codes 16.04, 16.05 and 16.06. Historically, these reef codes had a lower LML due to the protection offered by Cape Liptrap and the prevailing westerly weather.

Based on shell measuring data from 2014 to 2019, catches from 105mm to 109mm from the Eastern reef codes in Cape Liptrap represent 21.3% of available abalone by number (**Figure 3**). This is based on a total of 35,169 length measurements collected from reef codes 16.04, 16.05 and 16.06 between 2014 and 2019.

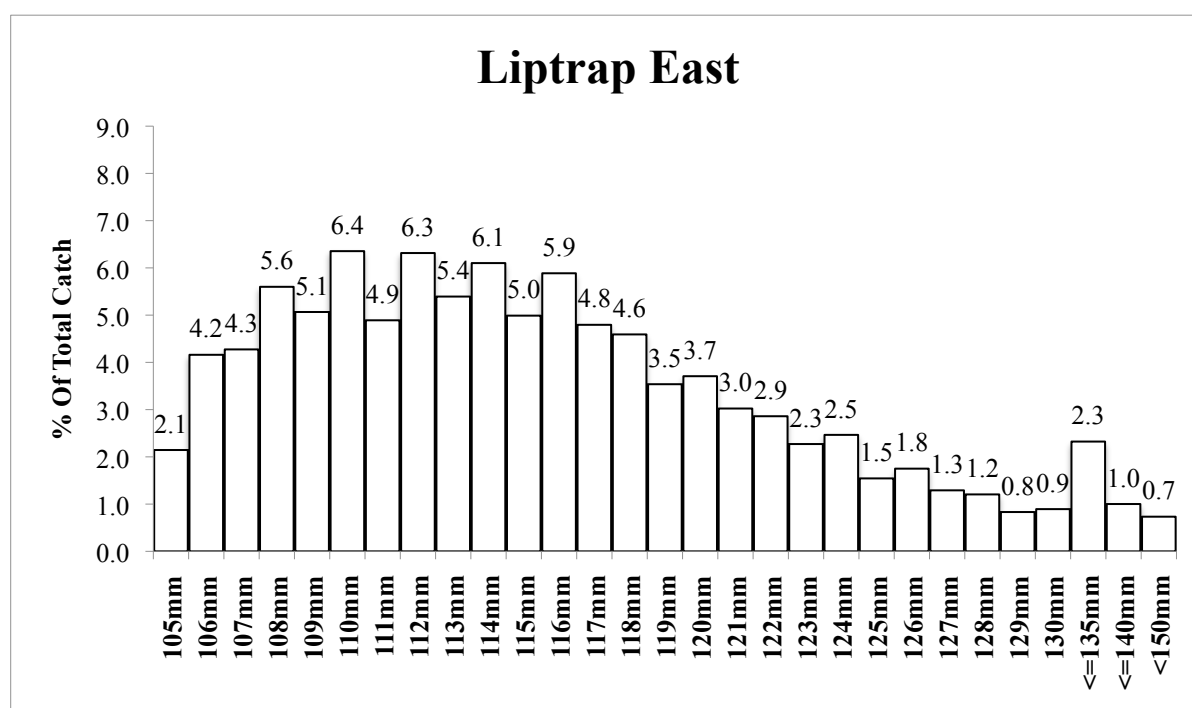


Figure 3. Shell measuring data summary from 2014 to 2019 for Cape Liptrap SMU east of light house (reef codes Cape Liptrap East 16.04, Walkerville 16.05 and Waratah reef 16.06). 35,169 individual shell measurements are represented in the above figure.

The three aforementioned reef codes produced 9.6t of abalone during the 2018/19 season, with catches to date for the 2019/20 season being only 1.7t as demonstrated in **Figure 4**. The reduced productivity of diving operations within this SMU has once again led to divers working other areas, which has displaced approximately 8t of catch.

In comparison, the reef codes which were not subject to an LML change at the start of the 2019/20 fishing season have had relatively steady catches from 2013 to current as demonstrated by **Figure 5**.

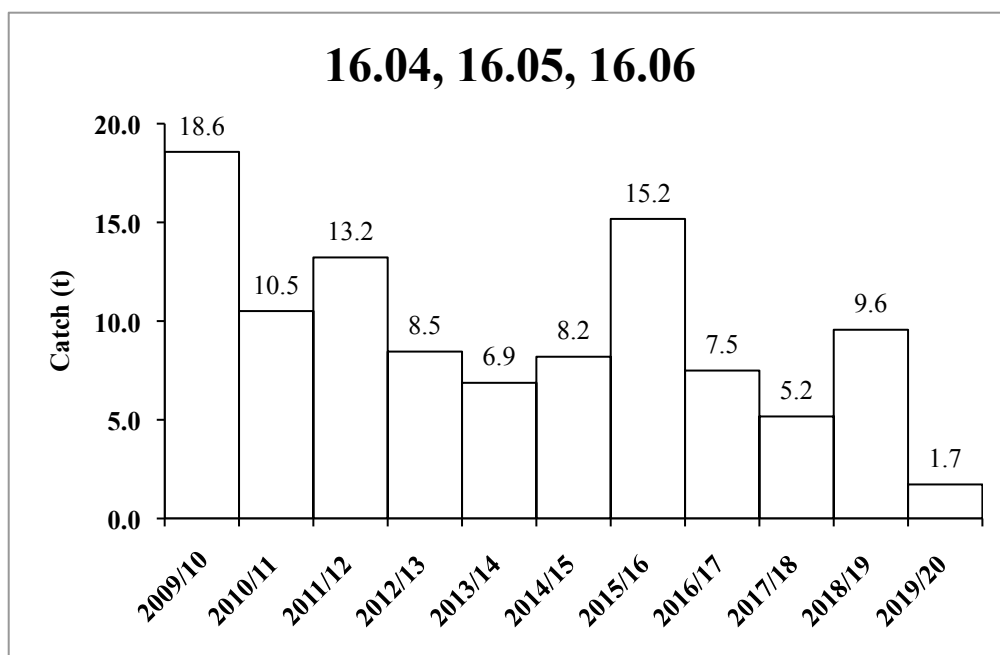


Figure 4. Catch of Blacklip Abalone from the reef codes 16.04, 16.05 and 16.06 (east of Cape Liptrap lighthouse) from the 2009/10 fishing season to current. The LML for these 3 reef codes was increased in 2019/20 from 105mm to 110mm. Catches for the 2019/20 season have reduced significantly as a result of displaced effort.

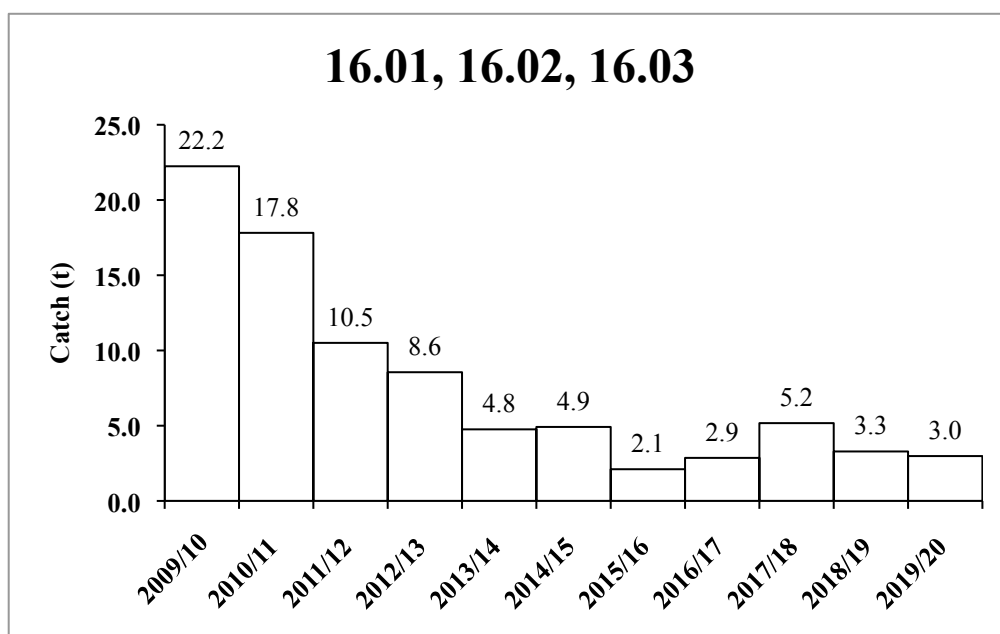


Figure 5. Catch of Blacklip Abalone from the reef codes 16.01, 16.02 and 16.03 (west of Cape Liptrap lighthouse) from the 2009/10 fishing season to current. The LML for these 3 reef codes was not increased in 2019/20. Catches have remained relatively stable for the last 7 seasons. Note that 2019/20 still has 2 months of fishing remaining.

VADA Cape Liptrap Stunted Stock Survey

In addition to the shell measuring and commercial catch data for Cape Liptrap, the Victorian Abalone Divers Association undertook an extensive survey of the area in conjunction with the Victorian Fisheries Authority in 2007 to demonstrate the size structure of the area and what the subsequent LML should be set at.

As part of the Stunted Stock Survey undertaken, 9 sites on the eastern side of Cape Liptrap were sampled, with 100 abalone collected and measured from each site under a timed collection methodology. Length frequencies were collected for all 100 abalone from each site, with the average size at each of these sites being determined. At site one, the average size was 107mm, site two 99mm, site three 108mm, site four 102mm, site five 102mm, site six 110mm, site seven 108mm, site eight 109mm and site nine 114mm.

The results of the survey demonstrate the variation in growth rate seen at Cape Liptrap. In some areas 100 abalone were sampled with the average size being under 100mm. To ensure that effort is able to be distributed evenly throughout the SMU and not focused on areas of fast growing fish, two LMLs are required, with the Cape Liptrap lighthouse being the appropriate boundary. AVCZ feel that for the Eastern side of Cape Liptrap 105mm was an appropriate size and do not support the increase to 110mm.

Prom West SMU

AVCZ are pleased to see that the FRAG recommendation of returning the SMU to having two LMLs has been followed. The growth rate characteristics of abalone on the mainland Prom are drastically different to what is exhibited at the Islands. This is largely due to the protection offered by the islands. The LML of 120mm for the whole SMU led to fishing effort being concentrated on the islands, with little to no fishing effort on the Mainland. This can be seen in **Figure 6**. With the SMU being returned to having LMLs at both 115mm and 120mm, AVCZ support the proposed catch target of 21t.

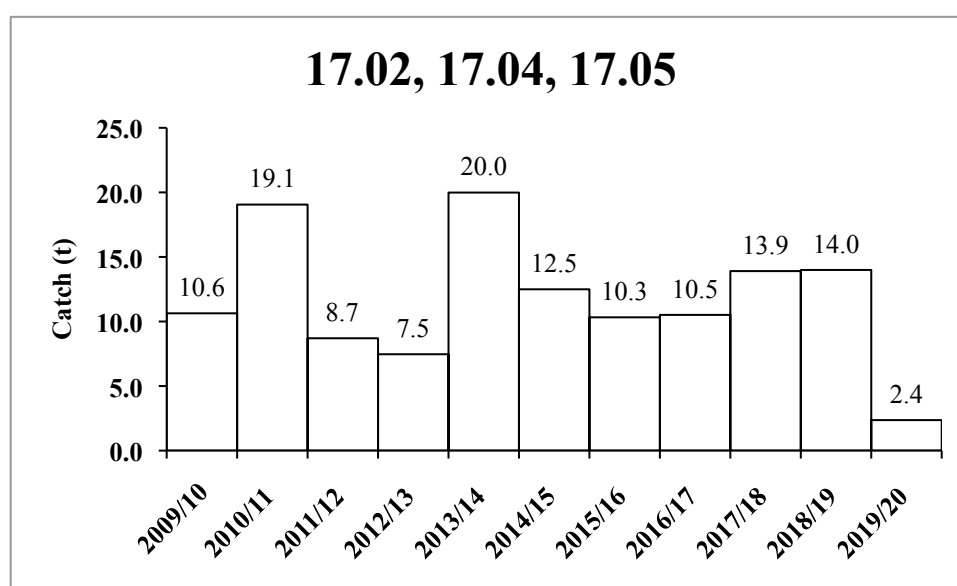


Figure 6. Catch of Blacklip Abalone from the reef codes 17.02, 17.04 and 17.05 (Prom West Mainland) from the 2009/10 fishing season to current. The LML for these reef codes was increased in 2019/20 from 115mm to 120mm. Catches for the 2019/20 season have reduced significantly as a result of displaced effort.

Prom East and Clifty SMU

Both Prom East and Clifty experience low amounts of catch and effort, with targets being easily reached. The FRAG consensus for both SMUs was to continue with the status quo, which has been adopted by VFA in the proposed *Fisheries (Central Abalone Zone) Notice 2020*. AVCZ support maintaining LMLs for these two SMUs at 110mm, and support the TACC recommendation of both the FRAG and VFA of 6.7t and 5.5t respectively.

Greenlip Abalone

AVCZ are planning to undertake a survey of Greenlip Abalone abundance building on the work done by VADA in 2008.

It should also be noted that AVCZ plan on investigating access to Greenlip stocks in Port Phillip Bay as discussed in the January 2020 TACC forum. This will be followed up in greater detail at a later date.

AVCZ support the continuation of Greenlip access, with the nominal quota allocation of 3.4t being considered appropriate.

It is well known that there are only four SMUs in the central zone that produce Greenlip in reasonable numbers, these being Flinders, Phillip Island, Liptrap and to a far lesser extent Surf Coast. As a result of the limited spatial distribution, there has been difficulty in accessing areas for Greenlip once the SMU has reached its Upper Limit and is closed.

With all boats being monitored with Vessel Monitoring Systems from mid 2020, AVCZ would like to see VFA permit the harvest of Greenlip Abalone from SMUs that are closed to Blacklip Abalone. The implementation of VMS was sold to industry as an efficiency gain. Facilitating activities such as improved access to Greenlip grounds would be one such benefit to industry.

Fishery Independent Surveys

AVCZ maintains the position that the current format of Fishery Independent Survey data collection is not representative of how the stock is performing. Survey sites are no longer in areas where abalone is commercially harvested. This is particularly evident in the Flinders SMU which used to have significant abundance of abalone stocks in deeper water (>12m), whereas now the majority of fishing effort is in shallow areas that receive greater nutrient and oxygen availability associated with the wave action.

This has become more evident over time as the logger data set increases in size. AVCZ in conjunction with WADA would welcome the opportunity to review the current survey format to ensure that data is being collected and analyzed from areas that greater represent where fishing effort is currently occurring. As Dr. Cathy Dichmont, Dr. Duncan Worthington and Dr. Antony Hart have all recommended a redesign of the Fishery Independent Survey from its current format, the opportunity to progress with said review would be welcomed by the broader Victorian abalone industry.

Logger and Shell Measuring Data

AVCZ maintains one of the most extensive abalone shell measuring and logger data bases in the world, with millions of individual data points being added every season. This data is our industry's largest and best asset and must be handled and treated accordingly. AVCZ hope to work more closely with MRAG during 2020 to develop a procedure for being able to incorporate performance indicators from the logger data into the Central Zone stock assessment. The work that has been done in the Western Zone by WADA is exceptional, and provides a sound example of where AVCZ would like to one day be positioned also.

Setting LMLs - Scientific Methodology

As per the recommendation coming from the November 2019 FRAG meeting, AVCZ in conjunction with FRAG Chair Dr. Ian Knuckey are planning to facilitate a workshop during the first half of 2020 which will bring together all the leading abalone scientists from around the country to determine the most suitable methodology for setting LMLs.

This will also assist in highlighting any data or knowledge gaps that may currently exist, which industry in conjunction with VFA can work towards addressing. LML setting is an extremely divisive issue in the Central Zone and as a result, needs to be addressed in a structured and scientific manner where both industry and government have confidence that the appropriate size has been set for each area. Once this has been determined a period of stability would be greatly beneficial to both the resource and the assessment process to enable the harvest strategy to be finalized and commence working efficiently.

Coronavirus and Quota Rollover

AVCZ and its members wish to commend VFA for the proactive and supportive measures which have been put in place to ensure that financial losses associated with the current trade restrictions are minimized. AVCZ, WADA, EZAIA and ACV the peak body for abalone representation in Victoria, all strongly support the ability for any uncaught 2019-20 season quota to be rolled over and caught during the 2020-21 season.

The rollover provision will ensure that owners, divers and processors are able to maximize the economic returns from the resource by harvesting at a more appropriate time when the market has once again returned to normality.

Summary of Recommendations

AVCZ once again wish to thank Mr. Travis Dowling and the VFA for writing to both AVCZ Chairman Tony De Domenico and Executive Officer Josh Cahill seeking comment on the proposed *Fisheries (Central Abalone Zone) Notice 2020*. The recommendations provided within this document are summarized in the Table below.

SMU	AVCZ Recommendations
Shipwreck	Support proposed target of 31.6t although feel that this is rather conservative. LML increase of 5mm in one season too great.
Otway	Support proposed target of 54.9t although feel that this is rather conservative. LML increase supported contingent on boundary changes.
Surfcoast	Support 5t upper limit to encourage effort and LML of 110mm. SMU significantly underutilized.
Port Phillip Bay	Support 5t upper limit and LML of 105mm. Allocation of additional 10kg per unit required to encourage effort.
Back Beaches	Support catch cuts to 47t target and LML increase to 119mm. Concerns with SMU performance in recent years due to effort concentration.
Flinders	Support 25.5t target and 112mm LML. Note issues with LML of 115mm previously experienced.
Phillip Island	Support 34t target although feel that this SMU has been fishing exceptionally well and could potentially handle higher target. Support 112mm LML.
Kilcunda	LML of 112mm and 115mm not single LML. Also feel target should be increased from 12.7t to 13.3t based on Harvest Strategy indicators.
Liptrap	LML of 105mm and 110mm not single LML. Target 11.7 supported although will likely not be fully caught on single 110mm LML.
Prom West	Support LML of 115mm for mainland and 120mm for islands. Support 21t catch target.
Prom East	Support LML of 110mm and 6.7t catch target.
Cliffys	Support LML of 110mm and 5.5t catch target.

Reference Material

Haddon, M. and C. Mundy (2016) *Testing abalone empirical harvest strategies, for setting TACs and associated LMLs, that include the use of novel spatially explicit performance measures*. CSIRO. FRDC Final Report 2013/200. Hobart. 182 p.

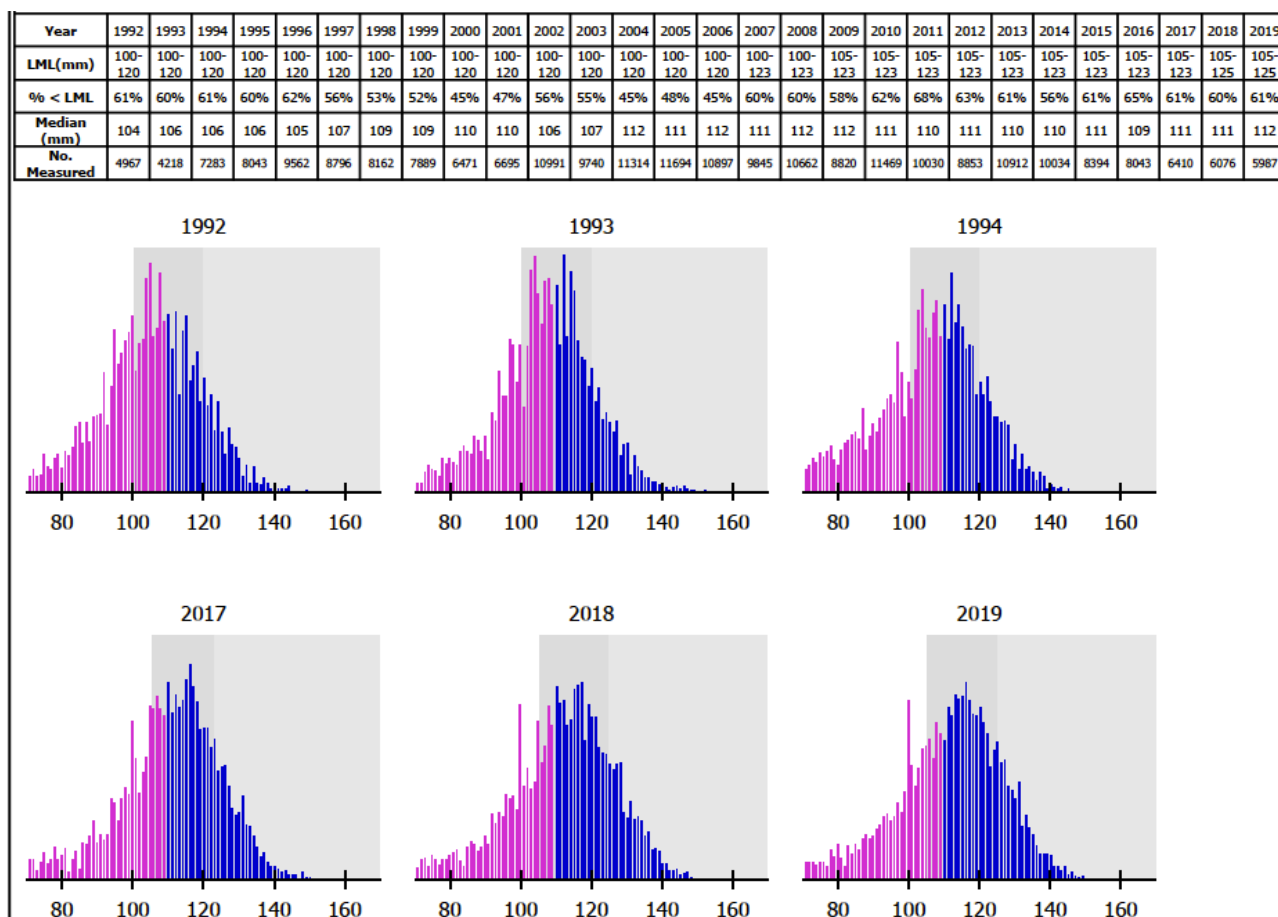
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Dixon, C. and Dichmont, C. (2019) Stock Assessment for the Central Zone of the Victorian Abalone Fishery. MRAG Asia Pacific.

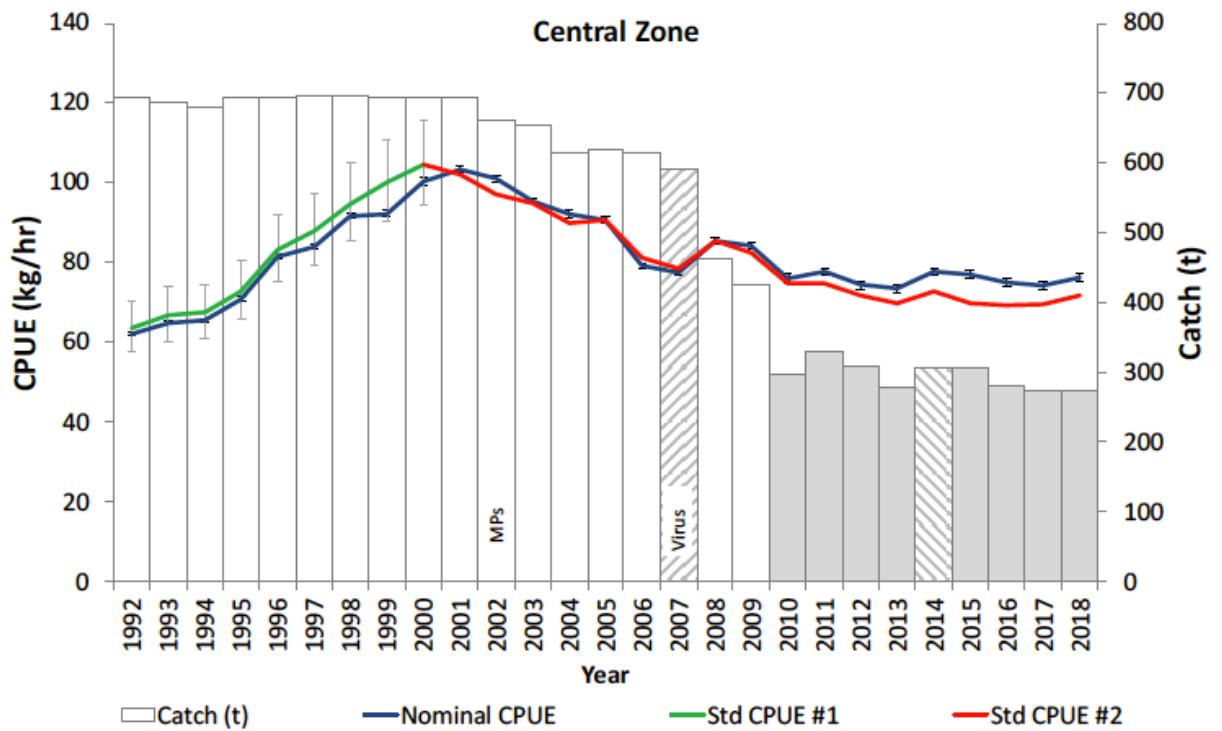
Appendices

SMU	Current Target	HS Outcome	2020/21 HS Minimum Change	2020/21 HS Maximum Change
Shipwreck	31.6	-5 to +5	30.0t	33.2t
Otway	54.9	0/+5 to +15	54.9, 57.6	63.1
Surfcoast	1.5	0/+5 to +15	1.5, 1.6	1.7
PPB	0	0	0	0
Back Beaches	55.3	-15 to -5	47.0	52.5
Flinders	25.5	-5 to +5	24.2	26.8
Phillip Island	34.0	-5 to +5	32.3	35.7
Kilcunda	12.7	0/+5 to +15	12.7, 13.3	14.6
Liptrap	13.8	-15 to -5	11.7	13.1
Prom West	21.0	0/+5 to +15	21.0, 22.0	24.2
Prom East	6.7	-15 to -5	5.7	6.4
Cliffys	5.5	-5 to +5	5.2	5.8
TOTAL	262.5		246.3, 250.7	277.1

Appendix Figure 1. Catch targets for each Central Zone SMU in tons for the 2019/20 season, and the harvest strategy recommendation (increase, stable or decrease) for the 2020/21 season. Recommendation determined following analysis of CPUE four year gradient, short term biomass trend using two-year CPUE ratio and pre-recruit trend using standardized average count of abalone from the fishery independent survey in the same size range of the current LML to 20mm below LML.



Appendix Figure 2. Zonal fishery independent length frequency data from 1992 to 2019 collated to inform 2019 reef report card. Note the median size of abalone sampled consistently around 110mm for the last 20 years.



Appendix Figure 3. Central Zone catch per unit effort data demonstrated as kilograms of blacklip abalone harvested per hour standardized and un-standardized from 2019 Central Zone stock assessment report. Note the relative stability in CPUE from 2010 to current.