Blacklip Abalone (2016)

Haliotis rubra rubra

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STOCK STATUS OVERVIEW

Jurisdiction	Stock	Fisheries	Stock status	Indicators
Western Australia	Western Australia	N/A	Negligible	
New South Wales	New South Wales	NSWAF	Sustainable	Catch, CPUE, mean weight
Victoria	Victorian Central Zone Fishery	VCZF	Transitional-depleting	Catch, CPUE, Fishery independent surveys
Victoria	Victorian Eastern Zone Fishery	VEZF	Transitional-depleting	Catch, CPUE, Fishery independent surveys
Victoria	Victorian Western Zone Fishery	VWZF	Sustainable	Catch, CPUE, Fishery independent surveys
Tasmania	Tasmanian Bass Strait Zone Fishery	TBSZF	Sustainable	Catch, CPUE
Tasmania	Tasmanian Central Western Zone Fishery	TCWZF	Transitional-depleting	Catch, CPUE
Tasmania	Tasmanian Eastern Zone	TEZF	Sustainable	Catch, CPUE

	Fishery			
Tasmania	Tasmanian Northern Zone Fishery	TNZF	Transitional-depleting	Catch, CPUE
Tasmania	Tasmanian Western Zone Fishery	TWZF	Transitional-depleting	Catch, CPUE
South Australia	South Australian Central Zone Fishery	SACZF	Transitional-depleting	Catch, CPUE
South Australia	South Australian Southern Zone Fishery	SASZF	Transitional-depleting	Catch, CPUE
South Australia	South Australian Western Zone Fishery	SAWZF	Transitional-depleting	Catch, CPUE

NSWAF New South Wales Abalone Fishery (NSW), SACZF South Australian Central Zone Fishery (SA), SASZF South Australian Southern Zone Fishery (SA), SAWZF South Australian Western Zone Fishery (SA), TBSZF Tasmanian Bass Strait Zone Fishery (TAS), TCWZF Tasmanian Central Western Zone Fishery (TAS), TEZF Tasmanian Eastern Zone Fishery (TAS), TNZF Tasmanian Northern Zone Fishery (TAS), TWZF Tasmanian Western Zone Fishery (TAS), VCZF Victorian Central Zone Fishery (VIC), VEZF Victorian Eastern Zone Fishery (VIC), VWZF Victorian Western Zone Fishery (VIC), N/A Not Applicable (WA)

STOCK STRUCTURE

Empirical field studies[1] and molecular techniques[2,3] strongly suggest Blacklip Abalone (*Haliotis rubra rubra*) fisheries comprise a large number of small, ecologically independent populations. Each biological stock may extend over only a few hundred metres, with each Blacklip Abalone fishery likely consisting of an indeterminate number of small biological stocks (populations), which may number in the thousands for a single fishery management unit. Given the large number of biological stocks, it is not practical to assess each stock separately.

Here, assessment of stock status is presented at the jurisdictional level—Western Australia; and at the management unit level (for each spatial quota management area)—New South Wales Abalone Fishery, Victorian Central Zone Fishery, Victorian Eastern Zone Fishery, Victorian Western Zone Fishery, Tasmanian Bass Strait Zone Fishery, Tasmanian Central Western Zone Fishery, Tasmanian Eastern Zone Fishery, Tasmanian Northern Zone Fishery, Tasmanian Western Zone Fishery, South Australian Central Zone Fishery, South Australian Southern Zone Fishery and South Australian Western Zone Fishery.

STOCK STATUS

New South Wales

Blacklip Abalone stocks in New South Wales have substantially recovered, or are recovering, from what are now understood to be historically persistent levels of overfishing and over-depletion[19,20]. Recent changes in the status of the stock, together with substantial contrast in historical and recent fishery-dependent measures (notably, catch and catch rate) provide a basis to infer historical status and reference levels of catch rate, assuming they are comparable and provide a relative measure of stock abundance through time.

The historical status of stocks, inferred largely from changes in the level of catch rate though time and the overfished status of the stock in the mid-2000s, strongly indicates that stocks were subject to recruitment overfishing and were overfished in the mid-1980s (catch rate less than 20 kg per hour) and that overfishing continued throughout the 1990s to the mid-2000s (catch rate less than 20 kg per hour, with intermittent peaks to less than 25 kg per hour). This period of declining and historically low catch rate occurred during a period of relatively stable catches through the 1990s and a reduction in TACCs during the early-2000s from 305–130 tonnes (t)

Following further reductions in TACCs, to 75 t in 2010, there has been a strong and steady recovery in catch rate and mean weight of abalone, particularly from southern areas of New South Wales, which provide most of the catch, to levels not previously recorded in the fishery. In 2010, the catch rate exceeded 30 kg per hour for the first time since the early-1980s and has increased annually, to about 50 kg per hour in 2015. In addition, recent measures of legal size biomass density (kg per hectare) derived from GPS-logger and logbook data, indicate that there has been a two-fold increase in biomass since 2009[19]. These GPS-logger estimates have a greater precision than catch rates from logbook data alone, which may overestimate increases in abundance. In response to these indicators of increasing biomass[19], the TACC has been cautiously increased since 2011, and in 2015 was 130 t. Additional protection for the fishery has also been achieved through several increases in the LML from 100 mm, established in 1972, through four increases to 117 mm in 2008. In the southern areas of the state, the LML for the commercial fishery was increased further to 120 mm in 2010 and then 123 mm in 2013. On this basis, a catch rate of 30 kg per hour seems appropriate as a limit reference point below which the stock would be classified as recruitment overfished.

Stock recovery has not been uniform throughout the state, with evidence indicating the greatest levels of rebuilding in the south. Northern stocks were subject to high exploitation rates through the mid- to late-1980s and early-1990s and were further depleted by mortality associated with infection by the parasite *Perkinsus* sp.[19,20] during the 1990s and into the early-2000s. Stock within this northern area has not demonstrated similarly strong, consistent improvements in fishery-dependent data, compared to those observed in the south. Relatively low, sporadic catches, together with modest and variable increases in CPUE and mean weight, suggest that recovery is occurring, but the status of these northern stocks is less certain.

The evidence presented above indicates that the stock within the New South Wales management unit was overfished through the mid-1980s and into the early-2000s. Since the early-2000s, management measures have supported ongoing recovery, as indicated by changes in catch rate and mean weight of abalone in the commercial catch since the mid-2000s. Recent performance measures indicate that stocks are continuing to recover, although at a slower rate[19] and current management measures provide greater protection to the fishable biomass, with LMLs being more precautionary than at any other time in the history of the fishery. A fishery harvest strategy is under development to provide greater certainty in the response of management to future changes in the performance of the fishery.

The above evidence indicates that stocks in the New South Wales Abalone Fishery are unlikely to be recruitment overfished and that the current level of fishing mortality is unlikely to cause these stocks to become recruitment overfished.

On the basis of the evidence provided above, the New South Wales Abalone Fishery management unit is classified as a **sustainable stock**.

South Australian Central Zone Fishery

In the Central Zone Fishery management unit of South Australia, CPUE for Blacklip Abalone increased rapidly from 19 kg per hour in 1979 to 26 kg per hour in 1989, the highest level on record. In 1990–2003, CPUE was relatively stable, but variable between years. Recent CPUE peaks were 25 kg per hour in 2003 and 22 kg per hour in 2009, after which CPUE declined substantially to a mean of 19 kg per hour for the years 2012–14. These were the lowest consecutive values since 1985 and occurred despite 40 per cent reductions in the TACC since 2004, culminating in the lowest catch since 1984[13]. However, this recent CPUE was similar to the average since 1979.

Based on similar evidence to that presented above, the Central Zone Blacklip Abalone fishery was classified as transitional–depleting in 2014[14]. There is some evidence to suggest that Blacklip Abalone stocks may be improving[13]. This evidence includes: 1) the increase in CPUE between 2014 and 2015 for the Central Zone and the West Kangaroo Island fishing grounds; and 2) an increase in the proportion of small Blacklip Abalone harvested that, in conjunction with this CPUE increase, may reflect improved recruitment to the fishable stock. In contrast, much of the available evidence, including: 1) the low recent and current catches harvested at relatively low catch rates; 2) limited evidence of stock recovery despite substantial (40 per cent) reductions in the TACC in 2005–06; 3) recent low and/or declining catch rates in the main fishing grounds; 4) apparent spatial contraction of the fishery from a previously larger fished area; and 5) record low catches (about 1 t meat weight) from the South Kangaroo Island fishing grounds, an area that regularly supported catches in excess of 5 t per year (meat weight) between 1980 and 2000, indicates that Blacklip Abalone stocks may still be subject to overfishing[13]. The above evidence indicates that the biomass of this stock is unlikely to be recruitment overfished, but that the current level of fishing pressure may be likely to cause the stock to become overfished.

On the basis of the evidence provided above, the South Australia Central Zone Fishery management unit remains classified as a **transitional–depleting stock**.

South Australian Southern Zone Fishery

The CPUE for Blacklip Abalone in the Southern Zone Fishery management unit of South Australia increased from 64 kg per hour in 1979–80 to more than 107 kg per hour in 2010–11, the highest level on record. CPUE has subsequently declined, but remains above the long-term average since 1979–80; in 2014–15, CPUE was 90 kg per hour, 16 per cent below that in 2010–11 and at the lowest level since 2001–02[32]. Similar reductions in CPUE occurred across all fishing grounds[32]. In addition, the TACC was under-caught in 2013-14 (by 17 per cent) and 2014–15 (by 11 per cent)[32]. For the period from 2010–11 to 2014–15, the biomass declined, although the stock is not yet considered to be in a recruitment overfished state. The above evidence indicates that the current level of fishing pressure is likely to cause the stock to become recruitment overfished.

On the basis of the evidence provided above, the South Australia Southern Zone Fishery management unit is classified as a **transitional–depleting stock**.

South Australian

The CPUE for Blacklip Abalone in the Western Zone Fishery management unit of South Australia increased from 17.1 kg per hour in 1979 to more than

Western Zone Fishery

26 kg per hour in 2003, the highest level on record. Subsequently, CPUE has decreased each year: in 2014–15, CPUE was 19 kg per hour, 27 per cent below that in 2003, and the lowest since 1989[14]. Similar reductions in CPUE occurred across all fishing grounds[14]. In addition, the total catch in 2015 was 21 per cent below the TACC, reflecting a voluntary reduction in catch by the commercial sector to reduce fishing mortality[14]. The above evidence indicates that, for the period from 2003–15, the biomass declined and that the current level of fishing pressure is likely to cause the stock to become recruitment overfished.

On the basis of the evidence provided above, the South Australia Western Zone Fishery management unit is classified as a **transitional–depleting stock**.

Tasmanian Bass Strait Zone Fishery

Two different LMLs are in place (110 mm and 114 mm) in this zone, reflecting the variation in growth rates within this zone. Since the creation of this zone in 2003, catch and SCPUE have been relatively stable. The Bass Strait Zone was closed in 2007, due to concerns around the possible risk of transferring AVG from Victoria to Tasmania, and re-opened in 2008. In 2015, the TACC for the Bass Strait Zone remains at 70 t, and the zone-wide catch weighted block mean SCPUEcw was 87 kg per hour, compared with 79.1 kg per hour when the zone was established in 2003[4]. The zone-wide proxy for biomass is 6.5 and well above the LRP and the zone-wide proxy for fishing mortality is 0.4 and just above the TRP for sustainability[4].

The above evidence indicates that stocks in the Tasmanian Bass Strait Zone are unlikely to be recruitment overfished and that the current level of fishing pressure is unlikely to cause these stocks to become recruitment overfished.

On the basis of the evidence provided above, the Tasmanian Bass Strait Zone Fishery management unit is classified as a **sustainable stock**.

Tasmanian Central Western Zone Fishery

The Tasmanian Central Western Zone Fishery management unit has a LML of 132 mm. This part of the west coast was underexploited in the early- to mid-2000s[4] in preference to southern areas, where higher beach prices were achievable for the live market and spatial management measures were used to shift effort into this region in 2009. SCPUE has oscillated over the past 15 years, but has declined over the past 5 years, suggesting the biomass has been reduced. During 2012, 127 t was harvested from this area and associated with the zone boundary change, the TACC in this management unit was reduced by 20 per cent in 2013 to 105.1 t[28], by 25 per cent in 2014 to 73.5 t, and a further 28 per cent in 2015 to 52.5 t. The intention is to continue reducing the TACC until there is unambiguous evidence of stock rebuilding[4]. The mean SCPUE in 2015 was 62.8 kg per hour compared with an SCPUE of 136.5 kg per hour when this zone was created in 2009. The rate of decline in SCPUE since 2012 has been sharp despite several TACC reductions. The zone-wide proxy for biomass is 1.1, marginally above the LRP, while the proxy for fishing mortality is -3.7, which is below the TRP for sustainability[4].

The above evidence indicates that the stocks in the Central Western Zone are not likely to be recruitment overfished, but that the current level of fishing pressure is likely to cause the stocks to become recruitment overfished.

On the basis of the evidence provided above, the Tasmanian Central Western Zone Fishery management unit is classified as a **transitional–depleting stock**.

Tasmanian Eastern Zone Fishery

The majority of the Tasmanian Eastern Zone Fishery management unit has a LML of 138 mm, while the LML for a small area around Freycinet is set at 145 mm as part of a rebuilding program[4]. Relative stock biomass in this fishery (estimated using SCPUE as a proxy) has oscillated substantially since 1992, with evidence of an approximate 8-year cycle[4]. Based on declining mean SCPUEcw between 2000 (76 kg per hour) and 2003 (53.8 kg per hour), the TACC was reduced from 1190–857 t in 2002 and to 770 t in 2004[29]. Subsequent increases in SCPUE and increasing median length of the commercial catch led to increases in the TACC by five per cent in 2008, 2009 and 2010[30], resulting in a TACC of 896 t by 2010. Between 2007 and 2009, the mean SCPUEcw was stable at around 90 kg per hour, but reports from divers suggested the resource was declining in late-2009. Rapid declines in SCPUE in late-2010 resulted in a reduced TACC of 721 t for 2011. Mortality (per cent unknown) of abalone in the wild across a large proportion of the Eastern Zone was observed in March 2010, coincident with a marine heat wave. Further rapid decline in 2011 resulted in an additional TACC reduction to 549.5 t for 2012. In 2013, minor reductions in the TACC to 528.5 t were made to address local concerns in one sub-region and held for 2014 and 2015[4]. In 2015, the mean SCPUEcw was 59 kg per hour and has been stable at this level for 4 years. There was evidence of stock rebuilding in several key areas of the Tasmanian Eastern Zone in 2014 and 2015, primarily in the south, with some areas in the north of the zone declining. There remains an intent to further reduce the TACC to trigger faster rebuilding of biomass and to ensure the fishery remains resilient to further environmental change. Overall, the zone-wide proxy for biomass is 3.6 and above the LRP of 1 and the zone-wide proxy for fishing mortality is 0.1 and above the TRP for sustainability[4].

The above evidence indicates that stocks in the Tasmanian Eastern Zone are unlikely to be recruitment overfished and that the current level of fishing mortality is unlikely to cause these stocks to become recruitment overfished.

On the basis of the evidence provided above, the Tasmanian Eastern Zone Fishery management unit is classified as a **sustainable stock**.

Tasmanian Northern Zone Fishery

The geographic variability in dynamics within the Tasmanian Northern Zone are reflected by three different LMLs (120 mm, 127 mm and 132 mm)[4]. Regional catch and catch rates have varied between 2000 and 2015 as a function of changing market preference and adaptive management (that is, effort redistribution and change in LML). The majority of abalone landed from this zone are traditionally unsuited to the live market, and are processed for canned or frozen markets. In 2008, the first of two industry-driven experimental fisheries to improve fish quality commenced in Block 5 with a reduction in LML from 132–127 mm and a 50 t increase in catch, and a second industry-driven experimental fishery commenced in Block 49 in 2011, pushing the TACC for the Northern Zone to a peak of 402.5 t. This initiative was not successful[31], and has had longer-term negative impacts on biomass. SCPUE varies across different geographic regions within the Northern Zone, but SCPUE for the zone has fallen in all the key fishing grounds targeted in the industry program over the past 5 years despite TACC reductions in 2012, 2013 and 2014[28], and again in 2015[4]. The mean SCPUEcw in 2007 prior to the industry experiments was 93.1 kg per hour at a TACC of 280 t, compared with a mean SCPUEcw of 62.4 kg per hour in 2015 at a TACC of 224 t[4]. The rate of decline in SCPUE since 2012 has been sharp despite consecutive TACC reductions. The zone-wide proxy for biomass is 2.5, marginally above the LRP, while the proxy for fishing mortality is -2.5, which is below the TRP for sustainability[4].

The above evidence indicates that the current level of fishing pressure is likely to

cause this stock to become recruitment overfished.

On the basis of the evidence provided above, the Tasmanian Northern Zone Fishery management unit is classified as a **transitional–depleting stock**.

Tasmanian Western Zone Fishery

The Tasmanian Western Zone Fishery management unit has a LML of 140 mm. In 1993–99, the majority of the Western Zone was under-fished (ranging from 500–750 t) in preference to the Eastern Zone where a higher beach price could be achieved, leading to substantial accumulation of biomass and very high catch rates (1993 mean SCPUEcw 104.5 kg per hour; 1999 mean SCPUEcw 163.0 kg per hour). With the introduction of zones in 2000–01 to manage the distribution of effort, the Western Zone TACC was elevated to 1260 t[4], and remained at this level through to 2008, with mean SCPUEcw declining to below 130 kg per hour. Widespread selective fishing, considered to be damaging to the resource at this time, along with long-term declines in SCPUE led to the zonal restructure described above and implementation of spatial catch caps set annually for four broad geographic regions within this zone, to prevent excess catch being harvested due to economic pressures. The TACC in this management unit was reduced in 2009 to 924 t. In 2013, Blocks 7 and 8 where moved from the Central Western Zone, back into the Western Zone and the TACC increased to 1001 t associated with the increased fishing area, but effectively retaining the same level of catch as in 2012[17]. In 2013, mean SCPUEcw declined to 111.7 kg per hour triggering a TACC reduction to 840 t in 2014, and held for 2015, with the TACC to be reviewed late in 2016 [28]. The zone-wide proxy for biomass is 2.5, marginally above the LRP, while the proxy for fishing mortality is -2.1, which is below the TRP for sustainability[4].

The above evidence indicates that the current level of fishing pressure is likely to cause this stock to become recruitment overfished.

On the basis of the evidence provided above, the Tasmanian Western Zone Fishery management unit is classified as a **transitional–depleting stock**.

Victorian Central Zone Fishery

Consistent among all Victorian management units, unstandardised commercial CPUE increased from about 65 kg per hour in the mid- to late-1990s to about 100 kg per hour in the early-2000s, with the increase thought to be influenced by changes in fishing practices that improved fishing efficiency[21]. CPUE peaked in the early-2000s at close to 100 kg per hour, but has shown a declining trend since, and in 2014–15 was at approximately 75 kg per hour and 75 per cent of the 2001 peak. This decline is of concern, however, the management unit is not considered to be recruitment overfished because the current CPUE is above 1992–93 levels, from which recovery was seen in the past. While some of the variation in CPUE since 2001 may be attributed to changes in LML and industry imposed size limits greater than the LML for individual reefs, declining CPUE trends have been observed since 2001 across most sub-zonal management units. The abalone viral ganglioneuritis (AVG) outbreak in the far west of the zone probably contributed to declining catches and catch rates, but the impacts were considered minor.

The TACC was reduced substantially from 620 t in 2006–07 to 285 t in 2010–11, and has since ranged from 279–307.7 t. TACCs have closely reflected the catch.

Trends in fishery-independent survey data were consistent with a decline in CPUE, showing a major decline in 2003–09 in the pre-recruit and recruit abundance indices (number/transect) of approximately 60 per cent and 55 per cent, respectively. Since 2009, the survey index of recruit abundance has been stable, while the pre-recruit index has continued to decline at a lower rate. In 2015, the pre-recruit abundance index was at approximately 25 per cent of

that measured in 2003 and 2004, although it is not yet clear whether this represents an overfished stock.

While fishing pressure was reduced through progressive decreases in the TACC of about 50 per cent from 2003–04 to 2010–11, more recently (with the exception of 2013–14), TACCs have been higher than in 2010–11 by between 13 and 47 t. This is despite the stable, but relatively low, levels of commercial CPUE and fishery-independent survey indices. The above weight of evidence indicates that the current level of fishing pressure is likely to cause the stock to become recruitment overfished.

On the basis of the evidence provided above, the Victorian Central Zone Fishery management unit is classified as a **transitional–depleting stock**.

Victorian Eastern Zone Fishery

The Eastern Zone management unit was not affected by AVG, but has seen impacts from environmental and ecosystem changes such as range expansion by the Long Spined Sea Urchin (*Centrostephanus rodgersii*)[22]. These urchins denude reefs of macro-algae, turning the reefs into 'barrens' that are unsuitable for abalone. Significant areas of reef in the Eastern Zone have been rendered unsuitable for abalone due to urchin expansion over the past 20 years[22]. This has led to increased fishing effort on urchin-free reef areas, with increased risk of localised depletion. Improvements in fishing methods have also occurred in this zone, and are thought to have caused fishing efficiency-related increases in CPUE from the mid-1990s–early-2000s.

Commercial CPUE (standardised) increased from about 70 kg per hour in 1992 to peak levels of about 120 kg per hour in 2011–12[23]. However, from 2011–15 CPUE declined by 20 per cent. Similarly, most sub-zonal management units have shown declines in CPUE in recent years. These declines are of concern, however, the management unit is not currently considered to be overfished because the CPUE suggests that biomass is now close to 2004-05 levels (100 kg per hour), from which recovery was seen in the past. This catch rate is also considered to be above levels observed in other abalone fisheries where stocks are not considered overfished.

The fishery-independent survey indices show relatively stable pre-recruit abundance from 2003–09, after which pre-recruit abundance declined by approximately 40 per cent, until 2014. The last few years of the pre-recruit survey index have been stable at 2014 levels. From 2003–08, the survey index of recruit abundance declined by approximately 55 per cent, and has also remained steady over the past 4 years.

In response to declining CPUE and survey indices, there has been an incremental reduction of TACCs since 2008–09, from 490 t in that year to 417 t in 2014–15. While there are signs of recent stability in the pre-recruit and recruit survey indices, it is too soon to tell whether this stability will continue, or if the current management arrangements and quota reductions are sufficient for preventing further decline and allowing the stock to rebuild. The recent declines in CPUE across much of the zone are concerning, as is the ongoing vulnerability of the zone to further habitat loss from urchins. The evidence indicates that biomass is declining in the zone, but this has been from historically high levels and it is not yet considered to be an overfished stock.

The above weight of evidence indicates that the current level of fishing pressure, combined with possible further impacts of increased habitat loss from urchins, is likely to cause the stock to become recruitment overfished.

On the basis of the evidence provided above, the Victorian Eastern Zone Fishery management unit is classified as a **transitional–depleting stock**.

Victorian Western Zone Fishery

The western zone management unit has undergone significant changes over its recent history. Most notable was the impact of the outbreak AVG in 2006. Mortalities due to this disease severely reduced the biomass and resulted in a major reduction in TACC for this zone from 280 t in 2001–02 to 20 t in 2008–09. While some fishing occurred on uninfected reefs for a period immediately after the disease was first recognised, by 2008 most areas in the Western Zone had been impacted and/or were closed to fishing. These events complicate the comparison of recent and historical fishery-dependent and independent data.

Progression of the disease through the fishery had abated by 2009, enabling fishers and researchers to conduct a structured fishing program[24] to gather information and assess capacity of remaining stocks to support a viable commercial fishery. Under this program, divers were assigned fishing areas, some of which were seldom fished in the past. In some cases, harvest on disease free reefs was initially set at zero to insure the maintenance of some healthy animals. From 2011 onwards, most reef areas were again open to fishing and 'normal' fishing practices resumed under a much reduced quota of 53 t and a higher LML (130 mm) than pre-AVG. Only trends in commercial CPUE from 2011 onwards are used in this assessment, due to the large changes that occurred prior to this. While there has been no formalised rebuilding strategy, fishing has been kept low by a precautionary TACC level set at approximately 50 t (or 10 per cent of estimated available biomass)[25–27]. Estimating available biomass involves the use of survey data to determine abalone density, converting numbers to biomass using length to weight relationships, and scaling the biomass estimates by the area of the fishing grounds[27].

Commercial CPUE for the management unit as a whole increased from 1992–2001, a period influenced by changes in fishing practice and the adoption of improved technology–both of which led to increased efficiency of the fleet. CPUE from 2001–05 declined slightly, until the 2006 AVG outbreak, resulting in substantial declines in catch and catch rate. After 'normal' fishing practices were resumed in 2011, CPUE increased until 2013, possibly due to fishers being able to target the more productive reefs again after the structured fishing ended. Since 2013, CPUE has stabilised at approximately 70 kg per hour across the zone compared to approximately 90 kg per hour during the 1990s and early-2000s, prior to AVG impacts. The current catch rate is evidence that the biomass is at a level comparable with stocks in other management units (for example, the Victorian Central Zone) which are not considered to be recruitment overfished. Since 2011, the TACCs have been reflected by the catch.

The fishery-independent survey data from 2003 onwards clearly show the impact of the AVG mortalities, with declines in the survey abundance indices (number/transect) for both pre-recruits and recruits of approximately 80 per cent and 40 per cent respectively from 2003–09. From 2009 onwards, both survey indices have been stable through to 2015, although the pre-recruit survey index has remained at about 30 per cent of that recorded prior to disease in 2003, while the recruit survey index is at approximately 70 per cent of that measured in 2003. The above evidence indicates that the biomass of the stock is unlikely to be recruitment overfished, as long as the AVG did not disrupt the fundamental breeding and juvenile recruitment processes.

The fishery-dependent and independent information indicate that the management unit has been stable since 2011, but at a much lower biomass than pre-AVG. The recent stability of the commercial CPUE under the higher LML, combined with stability of the fishery-independent pre-recruit and recruit survey indices, suggest that the current management arrangements restricting fishing pressure are not causing further decline. The management unit is not, however, substantially rebuilding. The above evidence indicates that the current level of fishing pressure is unlikely to cause the stock to become recruitment overfished.

On the basis of the evidence provided above, the Victorian Western Zone Fishery management unit is classified as a **sustainable stock**.

Western Australia

Stock status for the Western Australia is reported as negligible due to low catches by this jurisdiction.This stock is generally not targeted by commercial fishers and not recorded by charter operators. Very small catches by recreational fishers are recorded in recreational surveys.

BIOLOGY

Blacklip Abalone biology

Species	Longevity / Maximum Size	Maturity (50 per cent)
Blacklip Abalone	20–50 years; 150–220 mm SL	~ 5 years; 80–130 mm SL

DISTRIBUTION

Distribution of reported commercial catch of Blacklip Abalone

TABLES

Commercial Catch Methods	New South Wales	South Australia	Tasmania	Victoria	Western Australia
Diving	✓	✓	✓	✓	
Unspecified					✓

Fishing methods					
	New South Wales	South Australia	Tasmania	Victoria	Western Australia
Commercial					

Diving	✓	✓	✓	✓	
Unspecified					✓
Indigenous					
Diving	✓	✓	✓	✓	
Recreational					
Diving	✓	✓	✓	✓	

Management Methods				
	New South Wales	**South Australia**	**Tasmania**	**Victoria**
Commercial				
Limited entry	✓	✓	✓	✓
Size limit	✓	✓	✓	✓
Spatial closures	✓		✓	✓
Total allowable catch	✓	✓	✓	✓
Indigenous				
Bag limits	✓	✓	✓	✓
Section 31 (1)(c1), Aboriginal cultural fishing authority	✓			
Size limit	✓	✓	✓	✓
Spatial closures	✓			
Recreational				
Bag limits	✓	✓	✓	✓
Size limit	✓	✓	✓	✓
Spatial closures	✓			

Active Vessels				
	New South Wales	**South Australia**	**Tasmania**	**Victoria**
	29 License in NSWAF,	5 license in SACZF, 6 license in SASZF, 22 license in SAWZF,	55 Vessel in TBSZF, 51 Vessel in TCWZF, 97 Vessel in TEZF, 62 Vessel in TNZF, 91 Vessel in TWZF,	22 Vessel in VCZF, 17 Vessel in VEZF, 7 Vessel in VWZF,

NSWAF New South Wales Abalone Fishery(NSW)

SACZF South Australian Central Zone Fishery(SA)

SASZF South Australian Southern Zone Fishery(SA)

SAWZF South Australian Western Zone Fishery(SA)

TBSZF Tasmanian Bass Strait Zone Fishery(TAS)

TCWZF Tasmanian Central Western Zone Fishery(TAS)

TEZF Tasmanian Eastern Zone Fishery(TAS)

TNZF Tasmanian Northern Zone Fishery(TAS)

TWZF Tasmanian Western Zone Fishery(TAS)

VCZF Victorian Central Zone Fishery(VIC)

VEZF Victorian Eastern Zone Fishery(VIC)

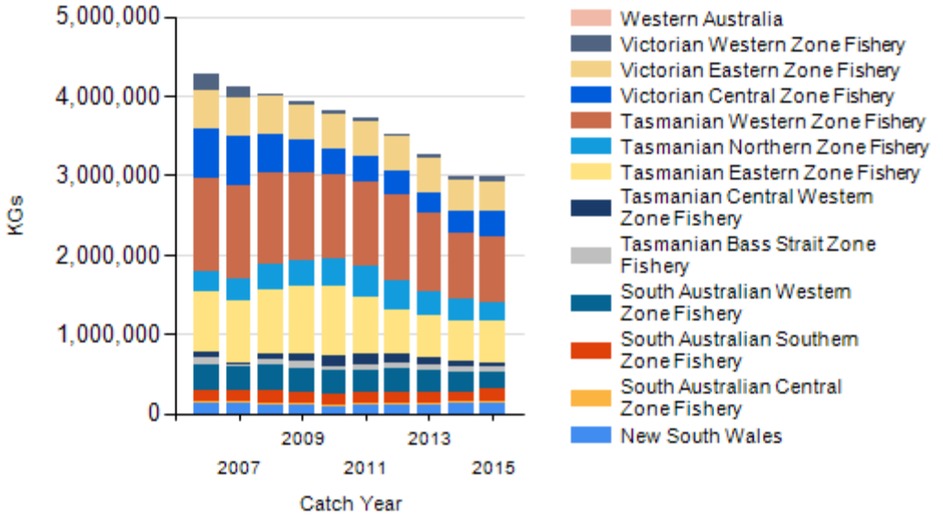
VWZF Victorian Western Zone Fishery(VIC)

Catch					
	New South Wales	South Australia	Tasmania	Victoria	Western Australia
Commercial	129.339t in NSWAF,	19.2201t in SACZF, 172.603t in SASZF, 197.54t in SAWZF,	69.769t in TBSZF, 51.879t in TCWZF, 522.022t in TEZF, 225.592t in TNZF, 830.991t in TWZF,	324.886t in VCZF, 384.539t in VEZF, 58.1085t in VWZF,	
Indigenous	Unknown	Unknown	Unknown	Zero	
Recreational	Unknown	Unknown	36t	Unknown	

NSWAF New South Wales Abalone Fishery (NSW), SACZF South Australian Central Zone Fishery (SA), SASZF South Australian Southern Zone Fishery (SA), SAWZF South Australian Western Zone Fishery (SA), TBSZF Tasmanian Bass Strait Zone Fishery (TAS), TCWZF Tasmanian Central Western Zone Fishery (TAS), TEZF Tasmanian Eastern Zone Fishery (TAS), TNZF Tasmanian Northern Zone Fishery (TAS), TWZF Tasmanian Western Zone Fishery (TAS), VCZF Victorian Central Zone Fishery (VIC), VEZF Victorian Eastern Zone Fishery (VIC), VWZF Victorian Western Zone Fishery (VIC), N/A Not Applicable (WA),

a Victoria – Indigenous (management methods) In Victoria, managing fishing activities by Indigenous people is grouped with the recreational fishing sector. Recognised Traditional Owners (groups that hold native title or have agreements under the Traditional Owner Settlement Act 2010 [Vic]) can apply for permits under the Fisheries Act 1995 (Vic) that authorise customary fishing (for example, different catch and size limits or equipment). The Indigenous category in Table 3 has been interpreted to mean customary fishing being undertaken by Recognised Traditional Owners.
b New South Wales – Indigenous (management methods) Aboriginal Cultural Fishing Interim Access Arrangement - allows an Indigenous fisher in New South Wales to take in excess of a recreational bag limit in certain circumstances, for example, if they are doing so to provide fish to other community members who cannot harvest themselves.
c New South Wales – Indigenous Aboriginal cultural fishing authority - the authority that Indigenous persons can apply to take catches outside the recreational limits under the Fisheries Management Act 1994 (NSW), Section 37 (1)(c1), Aboriginal cultural fishing authority.

CATCH CHART



Commercial catch of Blacklip Abalone - note confidential catch not shown

EFFECTS OF FISHING ON THE MARINE ENVIRONMENT

- Blacklip Abalone are hand-selected by divers operating from vessels that seldom anchor, hence the fishery has negligible direct physical impact on the environment. There is also substantial evidence that the ecosystem effects of removing abalone are minimal[34–36].

ENVIRONMENTAL EFFECTS on Blacklip Abalone

- AVG established in the wild fishery following initial infection in two land-based abalone aquaculture farms and two offshore experimental farms adjacent to the wild fishery in 2005[24]. AVG is highly pathogenic, resulting in estimated mortalities of between 60 and 95 per cent in infected wild populations.
- South and westward strengthening of the relatively oligotrophic East Australian Current[37] into the inshore waters in eastern Victoria and Tasmania is thought to have triggered changes in nearshore community structure over the past two decades[38]. This is primarily through range expansion of species such as the Long Spined Sea Urchin (*Centrostephanus rodgersii*) from New South Wales to Tasmania and Victoria, and the significant reduction in Giant Kelp (*Macrocystis porifera*) biomass[39]. This has resulted in localised depletions of abalone populations and a reduction in the habitat available for abalone[40].
- Above average warm water events were inferred to have resulted in minor mortalities of abalone in Tasmania in February 2010 (pers. comm., Tasmanian Abalone Divers), although the spatial extent and magnitude of the mortality was not quantified. These events are expected to increase under most climate change scenarios.

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