Roe's Abalone (2023)

Haliotis roei

Lachlan Strain: Department of Primary Industries and Regional Development, Western Australia, **Ben Stobart**: South Australian Research and Development Institute

STOCK STATUS OVERVIEW

Jurisdiction	Stock	Stock status	Indicators
Western Australia	Western Australia Area 2 Fishery	Sustainable	Catch, CPUE
Western Australia	Western Australia Area 5 Fishery	Sustainable	Catch, CPUE
Western Australia	Western Australia Area 6 Fishery	Sustainable	Catch, CPUE
Western Australia	Western Australia Area 7 Fishery	Sustainable	Catch, CPUE, fishery-independent recruitment surveys
Western Australia	Western Australia Area 8 Fishery	Depleted	Catch, CPUE, fishery-independent surveys
South Australia	South Australia Western Zone Fishery	Undefined	

STOCK STRUCTURE

Roe’s Abalone is distributed from Shark Bay in Western Australia south around to western Victoria. Recent genetic evidence indicates the existence of a single Roe’s Abalone meta-

population across the species' distribution (sampled from Kalbarri in Western Australia to Spencer Gulf in South Australia) but with three differentiated adaptive population clusters [Sandoval-Castillo et al. 2015]. The southern adaptive population cluster extends across a substantial geographic range (Albany in Western Australia to Spencer Gulf in South Australia) traversing jurisdictional boundaries. The stock is currently managed as several separate units. Here, assessment of stock status is presented at the management unit level—Western Australia Area 2 Fishery, Western Australia Area 5 Fishery, Western Australia Area 6 Fishery, Western Australia Area 7 Fishery, Western Australia Area 8 Fishery and South Australia Western Zone Fishery.

STOCK STATUS

South Australia Western Zone Fishery

Prior to commercial catches, an experimental fishery for Roe's Abalone caught 45 t (whole weight) from November 2000 to December 2002 [Preece et al. 2004]. Results from the experimental fishery suggested that Roe's Abalone are widely, but patchily distributed across the Western Zone of South Australia with limited areas of high abundance [Preece et al. 2004]. In 2014, a commercial catch limit of 11 t (whole weight) with a minimum legal length of 75 mm shell length (L50 estimated at 50–59 mm shell length [Preece et al. 2004]) was implemented under a Ministerial exemption. Best estimates of annual catch were between 65% and 85% of the total catch limit, with the species being targeted on very few days and by a small percentage of licence holders. CPUE was between 30 and 33 kg/hr from 2017 to 2019. With the exception of a small catch in 2021, *H. roei* has not been fished in the Western Zone of South Australia from 2020 to 2023. There is no published assessment available for Roe's Abalone, and the data available are inadequate to estimate biomass or exploitation rates. There is little knowledge on recruitment or harvestable biomass, and there are no defined target or limit reference levels. This prevents assessment of current stock size or fishing pressure. Consequently, there is insufficient information available to confidently classify the status of this stock.

Based on the evidence provided above, the **S**outh Australia Western Zone Fishery management unit is classified as an **undefined stock.**

Western Australia Area 2 Fishery

Prior to commercial catches, an experimental fishery for Roe's Abalone caught 45 t (whole weight) from November 2000 to December 2002 [Preece et al. 2004]. Results from the experimental fishery suggested that Roe's Abalone are widely, but patchily distributed across the Western Zone of South Australia with limited areas of high abundance [Preece et al. 2004]. In 2014, a commercial catch limit of 11 t (whole weight) with a minimum legal length of 75 mm shell length (L50 estimated at 50–59 mm shell length [Preece et al. 2004]) was implemented under a Ministerial exemption. Best estimates of annual catch were between 65% and 85% of the total catch limit, with the species being targeted on very few days and by a small percentage of licence holders. CPUE was between 30 and 33 kg/hr from 2017 to 2019. With the exception of a small catch in 2021, *H. roei* has not been fished in the Western Zone of South Australia from 2020 to 2023. There is no published assessment available for Roe's Abalone, and the data available are inadequate to estimate biomass or exploitation rates. There is little knowledge on recruitment or harvestable biomass, and there are no defined target or limit reference levels. This prevents assessment of current stock size or fishing pressure. Consequently, there is insufficient information available to confidently classify the status of this stock.

Based on the evidence provided above, the **S**outh Australia Western Zone Fishery management unit is classified as an **undefined stock.**

Western Australia Area 5 Fishery

Catches in the Western Australia Area 5 Fishery (WAA5F) are managed by the same process as described above in the WAA2F and defined in the Abalone Resource of Western Australia Harvest Strategy 2021–26 [DPIRD 2023]. In the WAA5F over the last ten years less than 53% of the annual TACC has been caught, and the full allocation has not been caught since the early 2000s. The commercial industry has attributed the reduced catch to economic (beach price and market competition) and accessibility (remote region and prevailing weather) factors, while in recent years COVID-19 has significantly impacted markets. Annual SCPUE was relatively stable between 1995 and 2012, declined in 2013 and then remained stable but slightly lower than the historical average over next six years. Over the last three years (2020–2022) the SCPUE has increased to the 1995 to 2012 level, but the low annual catches have resulted in a high degree of uncertainty around the SCPUE estimates. However, the annual SCPUE estimates have always been above the target reference level. The fishery has a legal minimum length of 60 mm, which allows 1–2 years of spawning to occur before recruitment to the fishery. The above evidence indicates that the biomass of this stock is unlikely to be depleted, that recruitment is unlikely to be impaired and that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

Based on the evidence provided above, the Western Australia Area 5 Fishery management unit is classified as a **sustainable stock**.

Western Australia Area 6 Fishery

Catches in the Western Australia Area 6 Fishery (WAA6F) are managed by the same process as described above in the WAA2F and defined in the Abalone Resource of Western Australia Harvest Strategy 2021–26 [DPIRD 2023]. In the WAA6F the annual TACC had been constant since 1999 (12 t whole weight) but in 2019 it was reduced to 7.5 t due to the implementation (start of 2019 season) of the Ngari Capes Marine Park which excludes abalone fishing from regions within the WAA6F [Hesp et al. 2008]. Prior to 2012, 90% or greater of the TACC was caught annually but since then the catch has declined to an annual average of 2.1 t since the 2019 reduction in TACC. The commercial industry has attributed the low annual catches in proportion to the TACC to economic (beach price and market competition) and accessibility (remote region and prevailing weather) factors, while in recent years COVID-19 has significantly impacted markets. After a period of relative stability (1998 to 2011) the annual SCPUE declined sharply between 2011 and 2013 to the lowest level on record, which was just below the target reference level. In 2014 the annual SCPUE increased (above the target reference level) and has continued to increase back to the 1998 to 2011 level, although with a high degree of uncertainty around the estimate. The increase in annual SCPUE and high uncertainty from 2014 onwards resulted from the decline in catch (post 2011) and the very low levels of catch between 2014 and 2022. The fishery has a legal minimum length of 60 mm, which allows 1–2 years of spawning to occur before recruitment to the fishery. The above evidence indicates that the biomass of this stock is unlikely to be depleted, that recruitment is unlikely to be impaired and that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

Based on the evidence provided above, the Western Australia Area 6 Fishery management unit is classified as a **sustainable stock.**

Western Australia Area 7 Fishery

Catches of Roe's Abalone in the Western Australia Area 7 Fishery (WAA7F) are managed using a stock prediction model as defined in the Abalone Resource of Western Australia Harvest Strategy 2021–26 [DPIRD 2023]. This model uses a fishery-independent survey recruitment index (Age 1+) along with an annual environmental factor (summer sea surface temperature - SST) to predict the density of harvest-sized animals (71+ mm) and set the annual TAC. The TAC is then separated into the commercial TACC and recreational TARC by using the available biomass in each habitat and both sectors' pattern of usage.

The commercial catch in the WAA7F was 55% of the TACC in 2022 (24 t whole weight) and was the third year in a row the annual commercial catch has been below 97% of the allocated TACC. Prior to this period the commercial fishery effectively caught the TACC annually and subsequent changes in catch were a result of changes to the TACC. The commercial industry has attributed the recent reduction in annual catch to economic influences (low value of catch, few viable markets and COVID-19). The annual SCPUE in WAA7F has declined slightly over the last three seasons, but this followed a continual increase over the previous five seasons, since a steady decline occurred between 2005 and 2014. The SCPUE is above the target reference level and the TACC was set using the stock prediction model based on juvenile abundance and an environmental factor. The recreational catch estimate for 2022 was 21–25 t (23.2 t) whole weight and within the TARC range (21–25 t).

The marine heatwave in 2011 had a range of effects on the abalone stocks, including the decline in large animals and spawning biomass, growth stunting and recruitment impairment [Hart et al. 2018]. Fishery-independent surveys determined that the density of harvest-sized Roe's Abalone in both the subtidal and platform habitats, and across both fished and unfished areas experienced substantial declines between 2003 and 2012. Density of harvest-sized animals then increased from record-low levels during 2012–16, and in 2021 were nearing/at record-high levels in the subtidal and platform habitats. In 2022, density of harvest-sized animals increased again in the subtidal habitat (third highest on record), whereas it declined slightly in the platform habitat. The increasing trend in density in both unfished and fished stocks from 2012–13 halted in 2022, but both are still near record-high levels. The increase in density in unfished stocks indicates increased productivity (recruitment and growth) in response to good environmental conditions (low summer SST) during this time. Spawning biomass declined slightly in the fished areas in 2022 but is still above pre-2011 marine heatwave levels, while in the unfished area it increased again and is at record-high levels. Density of Age 1+ (17–32 mm) animals also showed an increase from record-low levels between 2015 and 2021 in both fished and unfished areas, after juvenile recruitment declined by 80% between 2010 and 2013 (post marine heatwave). However, in 2022 the juvenile recruitment exhibited a sharp decline in both areas. All stock indicators (harvest-size animals, spawning biomass and recruitment) have returned to pre-marine heatwave levels with some at or near record-high levels.

The fishery has a legal minimum length of 60 mm, which allows 1–2 years of spawning to occur before recruitment to the fishery. However, the commercial sector targets large animals (71+ mm), which allows 2–3 years of spawning to occur before harvest. The above evidence indicates that the biomass of this stock is unlikely to be depleted, that recruitment is unlikely to be impaired and that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.

Based on the evidence provided above, the Western Australia Area 7 Fishery

management unit is classified as a **sustainable stock.**

Western Australia Area 8 Fishery

Catches in the Western Australia Area 8 Fishery (WAA8F) are managed by the same process as described above in the WAA2F and defined in the Abalone Resource of Western Australia Harvest Strategy 2021–26 [DPIRD 2023]. The WAA8F has been closed to both commercial and recreational abalone fishers since the 2011 season. This was in response to the Roe's Abalone populations in WAA8F suffering catastrophic mortality (99.9% in certain areas) due to an anomalous environmental event in the summer of 2011 [Strain et al. 2019]. During this event (marine heatwave) a sustained period of elevated sea surface temperatures rose to lethal levels for Roe's Abalone and effectively wiped out an entire stock.

Prior to the 2011 marine heatwave the WAA8F had a TACC of 9 t whole weight (2010 season) and even with fluctuations from year to year was expected to continue at this harvest level. The SCPUE had fluctuated above the target reference level ever since a TACC was specified for WAA8F in 1999. Fishery-independent surveys in the major region of the WAA8F, as identified by commercial catch distribution, have shown no evidence of natural recovery between 2012 and 2019 [Strain et al. 2019].

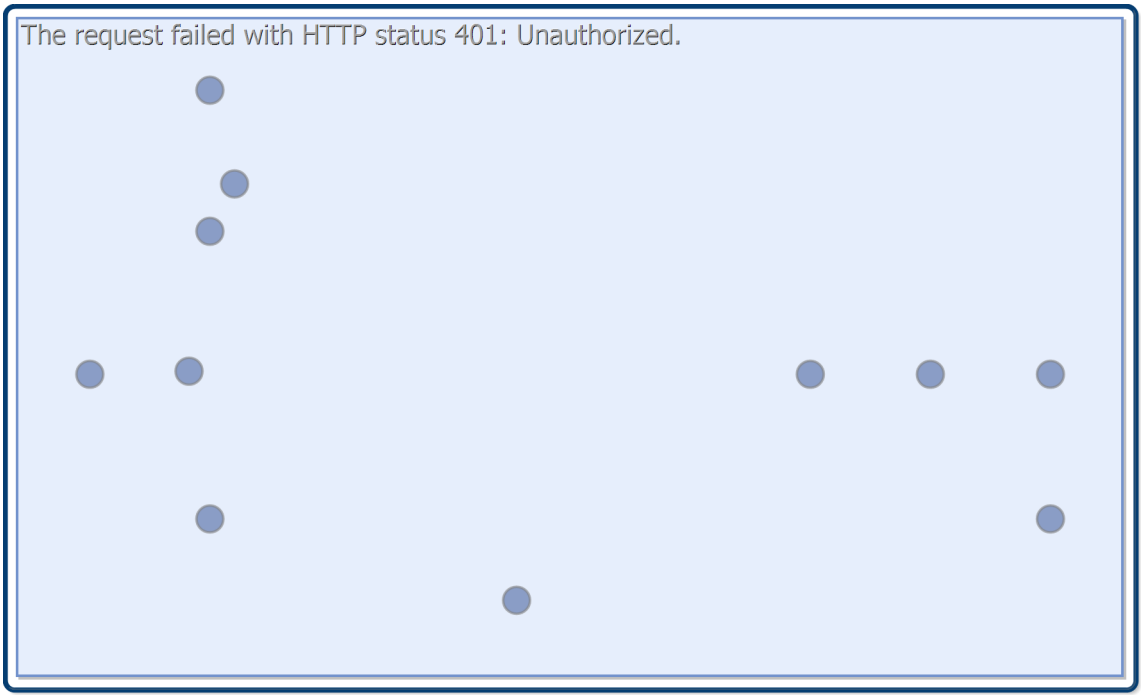
The above evidence indicates that the biomass of this stock is depleted due to environmental conditions. Based on the evidence provided above, the Western Australia Area 8 Fishery management unit is classified as a **depleted stock.**

BIOLOGY

Roe's Abalone biology [Keesing 1984; Hancock 2004]

Species	Longevity / Maximum Size	Maturity (50 per cent)
Roe's Abalone	15 years, 89 mm SL	3 years, 40 mm SL

DISTRIBUTION



Distribution of reported commercial catch of Roe's Abalone.

TABLES

Fishing methods		
	South Australia	Western Australia
Commercial		
Diving	✓	✓
Recreational		
Diving		✓
Hand held-Implements		✓
Various	✓	

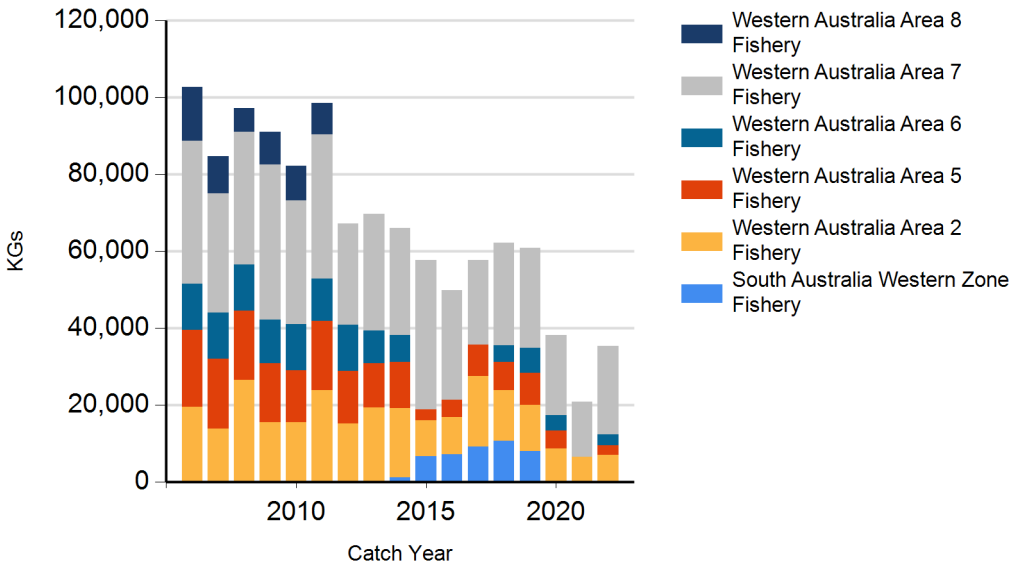
Management Methods		
	South Australia	Western Australia
Commercial		
Limited entry	✓	✓
Size limit	✓	✓
Total allowable catch	✓	✓
Recreational		
Bag limits	✓	✓

Licence		✓
Size limit	✓	✓
Spatial closures		✓
Temporal closures		✓

Catch		
	South Australia	**Western Australia**
Commercial	0 t	35.3983 t
Indigenous	Unknown	Unknown
Recreational	Unknown	21-25 t in WAA7F

Western Australia - Recreational (Catch Volume). [Smallwood et al. 2023].

CATCH CHART



Commercial catch of Roe's Abalone - note confidential catch not shown.

References	
DPIRD 2023	DPIRD 2023, Abalone resource of Western Australia harvest strategy 2021–2026: Version 2.0. Fisheries Management Paper No. 283. Department of Primary Industries and regional Development, Western Australia, Perth. 53pp.

Hancock 2004	Hancock, B 2004, The biology and fishery of Roe's abalone Haliotis roei Gray in south-western Australia, with emphasis on the Perth fishery. PhD thesis, University of Western Australia. 184pp.
Hart et al. 2018	Hart, AM, Strain, LWS and Brown, J 2018, Regulation dynamics of exploited and protected populations of Haliotis roei, and their response to a marine heatwave. ICES Journal of Marine Science, doi:10.1093/icesjms/fsy064.
Keesing 1984	Keesing, J 1984, Reproductive biology of the abalone Haliotis roei Gray, 1827, in south-western Australia. Honours Thesis. Murdoch University, Western Australia. 99 pp
Preece et al. 2004	Preece P, Mayfield, S and Saunders, T 2004, Biology of and feasibility fishing for Roe's abalone (Haliotis roei). Final report to the Abalone Industry Association of South Australia. SARDI Aquatic Sciences Publication No. RD04/2002:64.
Sandoval-Castillo et al. 2015	Sandoval-Castillo, J, Robinson, N, Strain, L, Hart, A and Beheregaray, LB 2015, Use of next generation DNA technologies for revealing the genetic impact of fisheries restocking and ranching. Australian Seafood CRC Report, No. 2012/714. Flinders University, Adelaide, 47pp.
Hesp et al. 2008	Hesp, A, Loneragan, N, Hall, N, Kobryn, H, Hart, AM, Fabris, FP and Prince, J 2008, Biomass and commercial catch estimates for abalone stocks in areas proposed as sanctuary zones for the Capes Marine Park. Fisheries Research Report, No. 170. Department of Fisheries, Western Australia, 52pp.
Strain et al. 2019	Strain, LWS, Brown, JM and Hart, AM 2019, Recovering a collapsed abalone stock through translocation. Australian Seafood CRC Project No. 2011/762. Fisheries Research Report No. 292, Department of Primary Industries and Regional Development, Western Australia. 93pp.
Smallwood et al. 2023	Smallwood, CB, Ryan, KL, Lai, EKM, Rudd, LJ and Strain, LWS. 2023, Recreational fishing for Abalone in Western Australia in 2021/22: estimates of participation, effort and catch. Fisheries Research Report No. 333. Department of Primary Industries and Regional Development, Western Australia. 33pp.