

Australomedusa baylii Brackish Jellyfish

Taxonomy

Australomedusa baylii Russell, 1970

The taxon was originally described by Russell (1970). The discovery of a new species of the same genus, *Australomedusa thrombolites* (Zeidler and Gershwin, 2004), which shares similarities to *A. baylii* yet differs in key characteristics, raises the question of whether the South Australian and Victorian populations of *A. baylii* are in fact the same species, considering that they are geographically isolated and sexual dimorphism is not observed in both described species. Zeidler and Gershwin (2004) cite Jankowski (2001) to argue that other freshwater jellyfish in Australia (namely *Craspedacustsa*) have demonstrated incredible dispersive capability, resulting in several unique forms, which may be true of *Australomedusa*, which should be taken into consideration when discerning new species.

Current conservation status

Categorised as Vulnerable in the 2009 Advisory list of threatened invertebrate fauna in Victoria (DSE 2009).

Proposed conservation status

Endangered in Victoria

Criterion B2ab(iii)c(iv)

This species may be more common than originally thought, but it is restricted to estuarine and coastal lagoons. It is part of the nationally listed ecological community *Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community* (DoEE 2018). To date, records are limited to three estuaries and one lagoon. The endangered category is solely based on a continuing decline of population based on habitat quality.

Species Information

Description and Life History

Considered endemic to Australia, the original description of *Australomedusa baylii* prompted the establishment of the family Australomedusidae, due to its distinct morphology (Williams, 1980). Only two genera of freshwater jellyfish occur within Australia (*Australomedusa* and *Craspedacustsa*) the latter of which is considered cosmopolitan and there is no evidence that it occurred in Australia prior to 1950 (Zeidler and Gershwin, 2004; Williams, 1980). Global diversity of inland water cnidarians is low, containing with less than 40 species worldwide (Jankowski et al. 2008). Despite some genera of freshwater cnidarians being well studied their relative importance in food webs is not well understood (Dumont, 1994).

Freshwater and brackish medusa are considered opportunistic predators, with fish eggs and zooplankton significant food sources, although the impact on zooplankton may be limited to short pulses of planktivory (Dumont, 1994). The two well studied genera, *Craspedacusta* and *Limnocnida*, exhibit benthic resting and potentially feeding, and is thought to possibly be predator avoidance behaviour as well (Dumont, 1994). Specific information on the feeding habit of *A. baylii* is limited. Neale and Bayly (1974) noted that medusa caught from the Werribee River estuary were feeding on calanoid copepods and polychaete larvae with several found within the subumbrellar surface.



Australomedusa baylii Brackish Jellyfish

Little is known regarding this taxon's life history, partly due to the delicate nature of medusae, such that they often do not survive collection techniques used for other invertebrates (Zeidler and Gershwin, 2004). Information available for other species (e.g. from the family Austromedusidae and Oliniidae) suggests that as with most Hydrozoa, the life cycle of *A. baylii* may include an attached polyp (asexual) stage and a swimming medusa (sexual) stage (Williams, 1980; Duggan and Eastwood, 2012). However, research suggests that the species is maintained by vegetative reproduction, as all specimens from the South Australian population were found to be female and all specimens from the Victorian population were found to be male.

Following its original discovery, Bayly (1971) suggested that *A. baylii* may have a resistant life history stage as a means of ensuring survival during unfavourable environmental conditions. Newton's (1994) study of the Hopkins River estuary also suggested it had a resting stage which allows it to re-establish populations in late winter early spring post flooding. It is possible that the medusoid form of *A. baylii* may develop from resistant bodies (podocysts) following the death of the polyp. Newton (1995) noted that densities peaked in summer in the Hopkins estuary with maximum numbers of 1000 to 3000/m³ in the downstream reaches and 400 to 1000/m³ in the upstream reaches surveyed. Densities were high during autumn but declined significantly in winter, being generally absent from the Hopkins River from late winter to early spring (Newton 1995). They re-occurred about 2-3 months post a flood.

Generation Length

The generation length of *Australomedusa baylii* is suspected to be 30 to 40 days. This has been historically very difficult to estimate, as a result of the structurally and functionally distinct forms which a hydrozoan can take (asexual polyp stage and sexual medusae) and the environment factors that affect reproduction. The figures provided are based on the generation length of *Eleutheria dichomoa* and *Craspedacusta sowerbyi*. Dank et al. (2018) found that reproductive rate of both sexual and asexual reproduction for *Eleutheria dichoma* peaked between the 30th - 40th day of life, and decreased later in life. Acker and Muscat (1976) suggested it took roughly 5 weeks for the medusa of *C. sowerbyi* to reach maturity, but that there was no data on longevity.

Distribution

The taxon has been found in a small lagoon on the north shore of the Andersons's Inlet near Inverloch (Russell, 1971), the Hopkins River estuary, Barwon River estuary (Newton 1994) and the Werribee River estuary, west of Melbourne (Neale and Bayly, 1974).

It has also been found to occur south of Robe, south-eastern South Australia (Russell, 1970 cited in Zeidler and Gershwin, 2004). A jellyfish was collected in coastal rivers in Western Australian which is also assumed to be *A. baylii* (Pinder et al., 2002).

Habitat

The taxon was first thought to be exclusively an athallassic species, in that it was first discovered in inland saline lakes with salinity of 22 - 340 ppt (Russell, 1970; Russell, 1971). However, later studies revealed that the taxon has been found to occur in true open estuarine systems with salinity as low as 6 ppt. (Bayly, 1972; Neale and Bayley, 1974). As such, it may be appropriate to consider the species euryhaline with a habitat preference for inland saline lakes (Russell, 1970; Russell, 1971), open estuarine systems (Neale and Bayley, 1974) and potentially for inland saline rivers (Pinder et al., 2002).

Threats

No specific threats have been listed for the taxon, however threatening processes pertaining to its habitat can be considered threats. These include increased salinity as a result of secondary salinisation, surface flow diversion, groundwater extraction, mining, pollution and global climate change (Timms, 2005; Williams, 2002). The broad major threats to estuarine environments (namely those that occur in Victoria) include changes to patterns of catchment land use, modifications to flow regimes, increasing urbanization of coastal regions and artificial opening of the estuary mouth (Barton et al., 2008).

During an early survey in Port Phillip Bay, Neale and Bayly (1974) found that of the four estuaries sampled, *A. baylii* was only found to occur in the Werribee River estuary. This was believed to be a result of the 'health' of that water system, relative to the other three estuaries. The others were considered highly urbanised, whilst Werribee River estuary was close to a natural system at the time. As such, it may be assumed that urbanisation may disturb the natural habitat of the species, by altering the water quality.

IUCN Criteria

Criterion A. Population size reduction. Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered	Endangered	Vulnerable
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%

<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]</p> <p>A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p>	<p>based on any of the following:</p>	<p>(a) direct observation [except A3]</p> <p>(b) an index of abundance appropriate to the taxon</p> <p>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</p> <p>(d) actual or potential levels of exploitation</p> <p>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</p>
--	---------------------------------------	---

Evidence:

Ineligible under Criterion A

There is insufficient evidence to determine whether there has been or will be a reduction in population sufficient to meet any threshold for Criterion A.

There is no evidence to indicate whether the taxon has suffered significant past or future decline in population size or any other demographic parameter. A decline in habitat quality is possible.

Australomedusa baylii

Brackish Jellyfish

Criterion B. Geographic range in the form of either B1 (extent of occurrence) and/or B2 (area of occupancy)			
	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km ²	< 5,000 km ²	< 20,000 km ²
B2. Area of occupancy (AOO)	< 10 km ²	< 500 km ²	< 2,000 km ²
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

Evidence:

Eligible under Criterion B2 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 16 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the Victorian Biodiversity Atlas.

The taxon is inferred to be severely fragmented naturally at the landscape scale. It has estuarine affinities, with the majority of records being from estuaries. The taxon does not undergo active dispersal between known habitats, so can be considered fragmented.

It is inferred to have 4 locations. It has a continuing decline in (iii); due to the operating threats, it is inferred that the habitat quality will continue to decline. However there have been no recent targeted surveys to confirm this.

The taxon is suspected to have extreme fluctuations in (iv) above in response to environmental conditions, but no data are available to confirm this.

Eligible under Criterion B1 as Vulnerable

The Area of Occupancy (AoO) across the taxon's range is estimated to be 9139 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA. S above, it is severely fragmented, has 4 locations, a continuing decline in (iii) and extreme fluctuations in (iv) above.

Australomedusa baylii

Brackish Jellyfish

Criterion C. Small Population size and decline		Critically Endangered	Endangered	Vulnerable
Number of mature individuals		< 250	< 2,500	< 10,000
AND at least one of C1 or C2				
C1	An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2	An observed, estimated, projected or inferred continuing decline AND least 1 of the following 3 conditions:			
(a)	(i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
	(ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b)	Extreme fluctuations in the number of mature individuals			

Evidence:

Ineligible under Criterion C as Data Deficient

No reliable estimate of the current population size of the species is available. No recent surveys have specifically targeted this species.

Criterion D. Very small or restricted populations		Critically Endangered	Endangered	Vulnerable
Number of mature individuals (observed or estimated)		< 50	< 250	< 1,000
D2. Only applies to the VU category Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time.		-	-	D2. Typically: AoO < 20 km ² or number of locations ≤ 5

Evidence:

Eligible under criterion D2 as Vulnerable

The taxon is suspected to be very restricted.

Criterion E (Quantitative Analysis) was not addressed as the taxon does not have a detailed Population Viability Analysis.

References

Acker, T.S. and Muscat, A.M. (1976). The ecology of *Craspedacusta sowerbyi* Lankester, a freshwater hydrozoan. *American Midland Naturalist*, 95: 23-336.

Barton, J.L., Pope, A.J., Quinn, G.P. and Sherwood, J.E. (2008) Identifying threats to the ecological condition of Victorian estuaries. Department of Sustainability and Environment Technical Report

- Bayly, I. (1970). Further studies on some saline lakes of south-east Australia. *Marine and Freshwater Research*, 21(2), 117. <https://doi.org/10.1071/MF9700117>
- Danko, A., Schaible, R., Pijanowska, J., and Danko, M. J. (2018). Population density shapes patterns of survival and reproduction in *Eleutheria dichotoma* (Hydrozoa: Anthoathecata). *Marine Biology*, 165(3). <https://doi.org/10.1007/s00227-018-3309-z>
- DoEE (2018). Approved Conservation Advice (including Listing Advice) for the Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community. Canberra: Department of the Environment and Energy. Available from: <http://www.environment.gov.au/biodiversity/threatened/communities/pubs/132-conservation-advice.pdf>.
- DSE (2009). *Advisory list of threatened invertebrate fauna in Victoria - 2009*. Department of Sustainability and Environment, Melbourne. Retrieved from: https://www.environment.vic.gov.au/__data/assets/pdf_file/0016/50452/Advisory_List_of_Threatened_Invertebrate_Fauna_2009_FINAL_Sept_2009.pdf
- Duggan, I., and Eastwood, K. (2012). Detection and distribution of *Craspedacusta sowerbii*: Observations of medusae are not enough. *Aquatic Invasions*, 7(2), 271-275. <https://doi.org/10.3391/ai.2012.7.2.013>
- Dumont, H.J. (1994). The distribution and ecology of the fresh- and brackish-water medusa of the world, *Hydrobiologia*, 272:1-12.
- Jankowski, T. (2001). The freshwater medusae of the world - a taxonomic and systematic literature study with some remarks on other inland water jellyfish. *Hydrobiologica*, 462, 91-113.
- Jankowski, T. Collins, A.G., and Campbell, R. (2008). Global diversity of inland water cnidarians, *Hydrobiologia*, 595:35-40.
- Neale, I., and Bayly, I. (1974). Studies on the ecology of the zooplankton of four estuaries in Victoria. *Marine and Freshwater Research*, 25(3), 337. <https://doi.org/10.1071/MF9740337>
- Newton, G. M. (1994). Estuarine zooplankton ecology in relation to the hydrological cycles of a salt-wedge estuary. Ph.D. Thesis, Deakin University, Victoria.
- Newton, G. M., and Mitchell, B. D. (1999). Egg dormancy in the Australian estuarine-endemic copepods *Gippslandia estuarina* and *Sulcanus conflictus*, with reference to dormancy of other estuarine fauna. *Marine and Freshwater Research*, 50(5), 441. <https://doi.org/10.1071/MF98161>
- Pinder, A. M., Halse, S. A., Shiel, R. J., Cale, D. J., and McRae, J. M. (2002). Halophile aquatic invertebrates in the wheatbelt region of south-western Australia. *SIL Proceedings*, 1922-2010, 28(4), 1687-1694. <https://doi.org/10.1080/03680770.2001.11901909>
- Russell, F.S. (1970). On a new species of medusa from an inland salt lake in South Australia. *Journal of Zoology*, 162 4: 449-452.
- Russell, F. S. (1971). On the female of the medusa *Australomedusa baylii*. *Journal of Zoology*, 164(1), 133-135. <https://doi.org/10.1111/j.1469-7998.1971.tb01300.x>
- Schuchert, P. (2019). World Hydrozoa Database. *Australomedusa baylii* Russell, 1970. Accessed through: World Register of Marine Species at: <http://www.marinespecies.org/aphia.php?p=taxdetails&id=289488> on 2019-02-17
- Williams, W.D. (1980). *Australian Freshwater Life: The Invertebrates of Australian Inland Waters*. Macmillan, Melbourne. 321 pp. Accessed at: <https://books.google.com.au/books?id=2qqrV5WaJ4sC&pg=PA44&lpg=PA44&dq>>
- Williams, W. D. (2002). Environmental threats to salt lakes and the likely status of inland saline ecosystems in 2025. *Environmental Conservation*, 29(02). <https://doi.org/10.1017/S0376892902000103>
- Zeidler, W., and Gershwin, L. (2004). A new species of *Australomedusa* (Cnidaria: Hydrozoa: Anthomedusae) from a saline lake in south-western Western Australia. *Records of the Western Australian Museum*, 22(2), 109. [https://doi.org/10.18195/issn.0312-3162.22\(2\).2004.109-113](https://doi.org/10.18195/issn.0312-3162.22(2).2004.109-113)