



The Director, Species Listing, Information and Policy Section
Department of Climate Change, Energy, the Environment and Water
GPO Box 3090
Canberra ACT 2601

12 March 2025

Dear Director,

Oysters Tasmania response to draft angasi reef advice

I write on behalf of the Oysters Tasmania board in response to the draft conservation advice from the Threatened Species Scientific Committee regarding the *Ostrea angasi* oyster reefs of southern Australia.

Oysters Tasmania is the peak body representing Tasmania's oyster farmers, who farm Pacific oysters, and occasionally angasi oysters and mussels, in the north, east, and south of Tasmania.

Tasmanian oyster farming is environmentally friendly and consistent with the ongoing health of angasi reefs.

Listing

The draft conservation advice tentatively proposes that angasi reefs be listed in the Critically Endangered category of the threatened ecological communities list under the *Environment Protection and Biodiversity Conservation Act 1999*.

However the draft conservation advice does not provide sufficient evidence of angasi reefs meeting the criteria and thus being eligible for this listing.

There is no evidence of decline in angasi reefs since the cessation of dredging by the mid-1900s.

Given this, Oysters Tasmania calls on the Committee to recommend that angasi reefs do not meet the criteria and thus are not eligible for listing.

Actions from listing

The historical decline in angasi reefs occurred through dredging, a practice that state governments now ban. This suggests that no current Australian Government action is warranted.



Australian Government actions impinging on aquaculture would be particularly unwarranted. The historical decline in angasi reefs was not a result of farming. This is clearest in Tasmania, where oyster farming started only in the 1970s. It is particularly clear off St Helens, where there is Australia's largest known angasi reef and where significant oyster farming has occurred for decades and continues to this day.

As such, if the Committee recommends that angasi reefs meet the criteria and thus are eligible for listing, Oysters Tasmania calls for:

- no repetition of the assertions in the draft conservation advice that Pacific oysters and aquaculture are threats to angasi reefs, as such assertions are not supported by the literature; and
- no introduction of Australian Government actions that impinge on aquaculture, such as: requirements to seek Australian Government approval to undertake aquaculture; potential refusals to provide such approval; and potential conditions on such approval.

Conclusion

Detailed responses to the questions posed in the draft conservation advice are provided overleaf.

Oysters Tasmania would welcome any opportunity to discuss this matter with the Committee, Department, and/or Minister.

This response has been copied to Minister Plibersek, Minister Collins, Senator Duniam, Minister Abetz, Minister Ogilvie, Janie Finlay MP, and officials in the Department of Agriculture, Fisheries and Forestry and the Department of Natural Resources and Environment Tasmania.

Yours sincerely,

A handwritten signature in blue ink, appearing to read "Duncan Spender".

Duncan Spender
CEO
Oysters Tasmania



Oysters Tasmania

Detailed response to draft conservation advice

Ostrea angasi reefs of southern Australia

Name and area inhabited	6
Do you agree with the proposed geographic distribution and description of the area in nature for the ecological community?	6
Are there any suggested changes to better describe the area in nature inhabited by the ecological community?	6
Depth of habitat.....	6
Lack of confidence	6
Breadth of habitat.....	7
Species assemblage; relevant biology and ecology	8
Is there additional information on flora or fauna you would like to see included, particularly commonly encountered? How can the current information on the relevant biology and ecology be improved using latest data?.....	8
Key diagnostic characteristics.....	8
Are the key diagnostic characteristics suitable? If not, how should these key diagnostic characteristics be amended to ensure appropriate inclusion/exclusion of native flat oyster reefs as the ecological community?.....	8
Please provide any evidence of native flat oyster reefs occurring in waters deeper than 20 m. ...	8
Identifying an occurrence	9
Is the patch definition suitable? If not, how should it be amended to ensure appropriate inclusion/exclusion of native flat oyster reefs as the ecological community? Is the connectivity distance between native flat oyster reef patches within a mosaic that is needed to provide key ecological functions appropriate?	9
Is the recommended buffer zone range appropriate? If not, how should the recommended buffer zone be amended to ensure appropriate application?	9
Condition classes, categories, and thresholds.....	10
Are the condition thresholds appropriate for this ecological community? If not, please suggest and justify alternatives, including providing any relevant supporting evidence.....	10
Habitat critical to survival	10
Can you recommend what areas are critical to the survival of the ecological community, either in terms of condition or other attributes?.....	10
Threats	11



Do you consider that all threats to the ecological community have been identified and described adequately? If not, are you able to provide additional or alternative information on threats, past, current, or potential that may adversely affect the ecological community, with supporting references? Is the order of the threats in the Threats table (Table 4) correct (i.e. are they in order of highest threat, starting with the greatest threat)? If not, please indicate the correct order (e.g. by numbering the Threat factors). Are any of the listed threats more, or less, severe, or of different timing or scope than currently proposed for this ecological community? To what degree are the identified threats likely to impact on the ecological community in the future? To what degree are the identified threats likely to act cumulatively on the ecological community? Please supply us with additional information and examples of threats and impacts to the ecological community that you are aware of..... 11

- Historical commercial overharvesting, particularly using destructive fishing methods..... 12
- Coastal/catchment development and degraded water quality, including sedimentation..... 12
- Climate change and extreme weather events 13
- Exotic disease and infestations 13
- Invasive species..... 14
- Commercial fishing of the native flat oyster..... 16
- Commercial and recreational fishing (non-native flat oyster)..... 16
- Recreational take of native flat oyster..... 16
- Boating 16
- Aquaculture..... 16
- Mining and offshore drilling and associated onshore development 18

Priority actions 18

Have the relevant protection, management or conservation priorities for the ecological community been adequately identified? If not, please provide additional actions and supporting information. 18

Have the relevant research and monitoring priorities for the ecological community been adequately identified? If not, please provide additional actions and supporting information.... 19

Have the relevant priorities for restoration of the ecological community been adequately identified? If not, please provide additional actions and supporting information..... 19

Listing Assessment Criterion 1 20

Do you agree with the estimates of decline relative to the 1750 timeframe? Do you have any feedback on the preliminary assessment under Criterion 1 or further data or information that would support or update the assessment? 20

Listing Assessment Criterion 2 21



Do you have any feedback on the preliminary assessment under Criterion 2 or further data or information that would support or update the assessment? Please provide additional supporting information. Do you agree with the estimates of the current extent of occurrence (EOO), area of occupancy (AOO) or average patch size provided in the assessment? If not, can you provide an estimate of the current geographic distribution (EOO and AOO in km²) and average patch sizes (in km²), with supporting data? Based on your knowledge and expertise, do you think it is likely that the ecological community could be lost in the immediate (10 years), near (20 years) or medium-term future (50 years)? If so, please provide supporting information. 21

Listing Assessment Criterion 3 21

Do you have any feedback on the preliminary assessment under Criterion 3 or further data or information that would support or update the assessment? Please provide additional information and supporting evidence. 21

Listing Assessment Criterion 4 22

Do you have any feedback on the preliminary assessment under Criterion 4 or further data or information that would support or update the assessment? Please provide additional information and supporting evidence. 22

Listing Assessment Criterion 5 23

Do you have any feedback on the preliminary assessment under Criterion 5 or further data or information that would support or update the assessment? Please provide additional information and supporting evidence. 23

Listing Assessment Criterion 6 23

Do you have any feedback on the preliminary assessment under Criterion 6 or further data or information that would support or update the assessment? Please provide additional information and supporting evidence. 23

Appendix C – Survey techniques..... 23

Is there any further information or survey approaches that should be noted within this section? Please providing supporting information. 23

Appendix D – Evidence of historical extent and decline..... 23

Are there any additional examples of historical extent and/or decline that should be represented above? Please provide supporting information..... 23

Name and area inhabited

Do you agree with the proposed geographic distribution and description of the area in nature for the ecological community?

No.

Are there any suggested changes to better describe the area in nature inhabited by the ecological community?

Yes.

The Committee's lack of information regarding the location of angasi reefs means that no area should be listed.

If an area is to be listed, the area should be described as the subtidal zone at the sites with known, current angasi reefs.

Each of the above points is explained below.

Depth of habitat

Angasi reefs are subtidal. The claim in the draft conservation advice (at p5) that angasi reefs typically form in both the intertidal zone and subtidal zone is unsubstantiated.

- The claim is followed by a reference to Gillies et al. (2018). However Gillies et al. (2018) states that angasi reefs are subtidal, not intertidal.
- The claim is followed by a reference to Gillies et al. (2020), which states (at p3) that angasi reefs "typically occur subtidally, from low intertidal to a depth of 30 m and favour fully marine salinities".
- The claim is followed by references to 'personal communications' about an angasi reef in South Australia and angasi reefs in New South Wales. No weight should be placed on such unverified, unpublished, un-peer-reviewed communications.

The spurious claim about angasi reefs being intertidal underpins:

- the breadth of claimed environmental services (e.g. wave attenuation) from angasi reefs,
- the argument that angasi reefs are threatened by factors in the intertidal zone;
- the claimed area of angasi reefs pre-colonisation; and
- the proposed area to which the listing is to relate to.

As such, the proposed listing is fundamentally flawed and should not proceed.

Lack of confidence

The draft conservation advice proposes to list an area presented on a map, but then states in a caveat to that map that:

"While every effort has been made to ensure accuracy and completeness, no guarantee is given, nor responsibility taken by the Commonwealth for errors or omissions, and the

Commonwealth does not accept responsibility in respect of any information or advice given in relation to, or as a consequence of, anything containing herein” (p7).

The Commonwealth should not proceed with listing an area until such time as the Commonwealth is confident that the listing is not in error. As such, given the above caveat, the Commonwealth should not proceed with the listing.

Breadth of habitat

The draft conservation advice proposes an excessive area of southern Australia be listed.

The options before the Committee were as follows. The first option is the most justifiable, but the draft conservation advice favours the sixth option.

1. List areas with known, current angasi reefs.
 - This would be akin to listing a species known to exist.
2. Also list areas with likely, current angasi reefs.
 - This would be a case of putting the cart before the horse, as the Commonwealth should find ecosystems before listing them in the hope that they are there.
3. Also list areas with current artificial reefs.
 - Such a listing would represent bad faith. Restoration projects should not be a stalking horse for expanding the area of Commonwealth regulation. Restoration projects were supported by the Tasmanian oyster farming industry. Restoration projects were pursued with the view that they would succeed without Commonwealth regulation, so the presence of a restoration site does not justify an area’s inclusion in a listing.
4. Also list areas likely to have been sites of angasi reefs at the point of colonisation.
 - This would be excessive, and akin to listing an extinct species in the hope that it could be brought back.
 - Moreover, it may well be that angasi reefs cannot be re-established at sites that had angasi reefs at the point of colonisation but that no longer have such reefs. In this case, listing such sites would be akin to listing an extinct species despite there being no hope of the species being brought back.
5. Also list the IMCRA bioregions containing any of the above sites.
 - This would be excessive, and would cover areas well out to sea, where there is no evidence of angasi reefs now or in the past.
6. Also list the IMCRA bioregions that contain none of the above sites, but that are in between IMCRA bioregions that do contain any of the above sites.
 - This would be excessive, covering areas like the Eucla Shelf, where there is no evidence of angasi reefs now or in the past.

Species assemblage; relevant biology and ecology

Is there additional information on flora or fauna you would like to see included, particularly commonly encountered? How can the current information on the relevant biology and ecology be improved using latest data?

The draft conservation advice sets out the flora and fauna at angasi reefs, and states that there can be “as much as three times the diversity and abundance of fauna than in nearby soft sediments” (p8).

However, the draft conservation advice fails to set out the flora and fauna at other reefs and ecosystems in the proposed area of listing.

If the flora and fauna at such other reefs and ecosystems is similar, this weakens the case for listing angasi reefs.

Angasi reefs should not be listed prior to the flora and fauna at angasi reefs being compared with that at other reefs and ecosystems, to establish whether angasi reefs are unique.

Key diagnostic characteristics

Are the key diagnostic characteristics suitable? If not, how should these key diagnostic characteristics be amended to ensure appropriate inclusion/exclusion of native flat oyster reefs as the ecological community?

The draft conservation advice proposes to include restoration reefs in the listing. They should not.

As noted above, such inclusion would represent bad faith. Restoration projects should not be a stalking horse for expanding the area of Commonwealth regulation. Restoration projects were supported by the Tasmanian oyster farming industry. Restoration projects were pursued with the view that they would succeed without Commonwealth regulation, so the presence of a restoration site does not justify an area’s inclusion in a listing.

The draft conservation advice proposes to exclude angasi reefs that form on maintained infrastructure. Angasi reefs that form on infrastructure should be excluded, whether the infrastructure is maintained or not. Commonwealth regulation should not extend beyond natural reefs to human-created reefs, whether they are created deliberately or accidentally. The Committee presents no evidence on the value or rarity of angasi reefs that form on infrastructure. The undefined nature of ‘maintained’ means limiting the exclusion to ‘maintained’ infrastructure would generate uncertainty in the application of Commonwealth regulation. Limiting the exclusion to ‘maintained’ infrastructure could also mean that the option to recommence maintenance is lost due to the introduction of Commonwealth regulation when maintenance ceased.

Please provide any evidence of native flat oyster reefs occurring in waters deeper than 20 m. It is unbalanced for the Committee to seek evidence of angasi reefs occurring in waters deeper than 20 metres, but to not seek evidence for its claim of angasi reefs occurring in the intertidal zone. As outlined above, the intertidal claim is unsubstantiated.

Identifying an occurrence

Is the patch definition suitable? If not, how should it be amended to ensure appropriate inclusion/exclusion of native flat oyster reefs as the ecological community? Is the connectivity distance between native flat oyster reef patches within a mosaic that is needed to provide key ecological functions appropriate?

The patch definition is not suitable. Specifically, the definition of a mosaic patch is not suitable, including with respect to the issue of connectivity distance.

A patch is proposed to consist of either a single patch, or a mosaic patch. A mosaic patch is defined to allow as little as one per cent of the mosaic patch to be oyster reef area.

- The mosaic patch definition requires individual patches of oyster reef to be a minimum area of 5m^2 . This means the individual patch could be, say, an equilateral triangle with sides of 3.4m.
- The mosaic patch definition allows individual patches of oyster reef to be within 20m of each other.
- This means that three individual 5m^2 patches (each being an equilateral triangle with sides of 3.4m) could be 20m apart from each other, to form an equilateral triangle with sides of 30.2m and an area of 395m^2 . This 395m^2 area could form part of a mosaic patch, even though only 15m^2 (i.e. less than 4 per cent) of the area consists of reef.
- If there were a fourth individual patch with an area of 5m^2 that was 20m away, the area of the mosaic patch could double while the total area of reef would only rise to 20m^2 , such that less than 3 per cent of the mosaic patch would be reef.
- This process continues such that a mosaic patch totalling 250m^2 of reef that consists of 50 individual patches, each with 5m^2 of reef, could be more than $21,000\text{m}^2$ if the individual patches are 20m apart. Such a mosaic patch would be only 1 per cent reef.
- Moreover, if the individual patches are not grouped together, but are instead irregularly arranged such as in a V formation, the proportion of reef in a mosaic patch could be even lower.

If listing is to proceed, the minimum size of an individual patch should be more than 5m^2 , the maximum distance between individual patches should be less than 20m, and at least one internal angle in excess of 180 degrees should be allowed in the polygon, such that a mosaic patch is at least 50 per cent reef.

Is the recommended buffer zone range appropriate? If not, how should the recommended buffer zone be amended to ensure appropriate application?

There should be no buffer zone. If there is to be a buffer zone, the buffer should be no more than 12 metres.

The use of polygons in the definition of single and mosaic patches, and the allowance for gaps between individual patches of a mosaic patch, mean that protection of areas that are not reef is already factored in.

The draft conservation advice states that a reason for a buffer zone is to provide a corridor for transient assemblages. This amounts to listing any area that a fish can swim from to the reef. Other reasons for a buffer are provided without citation. The assertion that a buffer could minimise disturbance from dredging assumes a current threat from dredging — but nowhere in the draft conservation advice is such a threat established.

The draft conservation advice provides no citation for proposing 10 to 30 metre buffers in some instances and 50 to 100 metre buffers in others. A 100-metre buffer around a circular, 250m² single patch of reef would mean that a broader circle of 37,271m² would be covered by the listing. This means that less than one per cent of the listing would be reef. A 12-metre buffer for a circular, 250m² single patch of reef would mean that a little over half of the listing would be reef.

Condition classes, categories, and thresholds

Are the condition thresholds appropriate for this ecological community? If not, please suggest and justify alternatives, including providing any relevant supporting evidence.

The condition thresholds are inappropriate.

Extending listing to instances where there are a small number of angasi oysters in a wide area is inconsistent with the requirement that only matters of national environmental significance receive Commonwealth protection.

The draft conservation advice proposes listing for 'Class C' groupings where there can be as few as five oysters in a square metre. Such groupings can hardly be considered to be reefs.

Only 'Class A' groupings with more than 50 oysters per square metre are consistent with the concept of matters of national environmental significance.

Habitat critical to survival

Can you recommend what areas are critical to the survival of the ecological community, either in terms of condition or other attributes?

The draft conservation advice states (p23) that:

“Key physical conditions required for the survival of the ecological community includes (sic) marine and coastal areas with relatively stable salinities ranging from 25-35 ppt (with acute episodes of low salinity common during heavy rainfall), temperatures between 10-29°C, relatively sheltered locations, and no prolonged periods of hypoxia.”

Any listing should exclude areas that lack these 'key physical conditions', otherwise the listing would not relate to habitat critical to survival. No listing should proceed without satisfaction of these 'key physical conditions'.



One consequence of this is that many waterways around Tasmania where oyster farming is carried out, particularly in southern Tasmania where water temperatures fall below 10°C, should not be included in a listing.

Threats

Do you consider that all threats to the ecological community have been identified and described adequately? If not, are you able to provide additional or alternative information on threats, past, current, or potential that may adversely affect the ecological community, with supporting references?

Is the order of the threats in the Threats table (Table 4) correct (i.e. are they in order of highest threat, starting with the greatest threat)? If not, please indicate the correct order (e.g. by numbering the Threat factors).

Are any of the listed threats more, or less, severe, or of different timing or scope than currently proposed for this ecological community?

To what degree are the identified threats likely to impact on the ecological community in the future?

To what degree are the identified threats likely to act cumulatively on the ecological community?

Please supply us with additional information and examples of threats and impacts to the ecological community that you are aware of.

This series of questions about the description, ranking, and severity of threats presumes that there are threats to begin with. This should not be presumed, and to do so indicates bias.

The discussion of threats in the draft conservation advice includes claims that were not followed by citations, as well as claims that were followed by citations that do not support the claim.

No weight should be put on such unsubstantiated claims.

Where none of the claims about something being a threat to angasi reefs is substantiated, that thing should no longer be listed as a threat.

If no threats remain, then there can be no case for listing.

A conclusion that there are no threats would be unsurprising, given that there is no evidence of angasi reef decline since the cessation of dredging, and associated damage to the substrate, since the 1950s.

Regarding the onus of proof, the Committee's claims that a thing hurts angasi reefs could be proven by pointing to an instance where that thing hurt an angasi reef. It is not possible to prove the negative, namely, that the thing never has and never will hurt an angasi reef. As such, it is for the Committee to prove its claims, rather than for others to disprove them.

Comments on specific claims of threats are outlined below.



Taken together, the below comments suggest that there is no evidence of current or future threats to angasi reefs, and thus no case for listing.

Historical commercial overharvesting, particularly using destructive fishing methods

Historical dredging undeniably damaged angasi reefs.

But that does not justify counting a past practice as a current or future threat.

The historical dredging of angasi reefs ceased by the 1950s and is now prohibited under state law.

Given this, the Committee should either remove historical dredging as a threat to angasi reefs, or somehow argue that dredging of angasi reefs will return in the absence of Commonwealth listing.

As an aside, the discussion on historical commercial overharvesting includes a statement that:

“Intertidal oyster beds may have also been harvested through skinning, which involved raking live oysters together at low tide that were then loaded onto berthed vessels (Ogburn et al. 2007; Ogburn 2011).”

This statement incorrectly implies that it was angasi reefs that were intertidal and harvested through skinning. The discussions of skinning in the cited Ogburn publications were in the context of discussions about Sydney Rock oyster reefs. The Ogburn publications do not support any implication of angasi reefs being intertidal or historically subject to skinning.

Coastal/catchment development and degraded water quality, including sedimentation

The draft conservation advice argues that coastal/catchment development and degraded water quality has hindered the process of natural recovery of angasi reefs following the cessation of dredging. The draft conservation advice cites literature that makes this argument.

Nonetheless, the argument is conjecture.

Proof of the argument would come from pointing to an area where: there was historical dredging of an angasi reef; there has been a lack of coastal/catchment development and associated water quality degradation; and the angasi reef has recovered.

The draft conservation advice does not point to such an area.

As such, the facts presented by the draft conservation advice are consistent with an argument that, once dredged, an angasi reef will not recover, irrespective of water quality.

The draft conservation advice makes no argument that coastal/catchment development and degraded water quality hinder angasi reefs that have never been dredged, such as off St Helens.

Given all this, the Committee should either remove references to coastal/catchment development and degraded water quality being threats to angasi reefs, or point to an instance of angasi reef recovery in the presence of good water quality, or an instance of poor water quality hindering an angasi reef that has never been dredged.

Climate change and extreme weather events

The draft conservation advice argues that extreme weather events and altered biophysical conditions can harm angasi reefs. This argument is echoed in the cited literature. However neither the draft conservation advice, nor the cited literature, base this argument on empirical evidence from angasi reefs.

There is no impediment to such empirical evidence being gathered. For instance, the health of the angasi reef off St Helens could be measured over time as biophysical conditions change and extreme weather events occur. This would provide more robust evidence of harm to angasi reefs from extreme weather events and altered biophysical conditions, compared to the evidence referred to by the Committee, namely experimental studies and oyster farming data (which relate to different species in different parts of the environment).

Yet no effort has been made to gather such empirical evidence.

Given this, the Committee should remove references to extreme weather events and altered biophysical conditions being threats to angasi reefs until empirical, time-series evidence of this is gathered.

The draft conservation advice also states that the likely impacts of sea level rise on angasi reefs are unknown. This entertainment of the possibility of there being any such impact is a result of the view that angasi reefs are intertidal as well as subtidal. As outlined earlier, this claim is unsubstantiated. Given this, the Committee should remove references to sea level rise as a possible threat to angasi reefs.

Overall, this suggests that the Committee should remove references to climate change and extreme weather events as threats to angasi reefs, pending empirical evidence to establish this.

Exotic disease and infestations

The draft conservation advice states that, since the introduction of *Bonamia*:

“transmission has occurred through human movements of sub-clinically infected oysters or from host to host via infective stages carried between oyster reefs by water currents (DAFF 2020).”

The first element of this quote is not supported by the DAFF (2020) document, which only refers to human movements of sub-clinically infected oysters as an explanation for the original introduction from overseas of *Bonamia*. The DAFF (2020) document provides no support for the claim that *Bonamia* transmission is the result of movements of oyster products within Australia. That claim should be removed.

Still on the issue of *Bonamia*, the draft conservation advice states that:

“Increased intensity of infection is also associated with increased density and proximity of oysters in farms (Bradley et al. 2019; Buss et al. 2019), where density and proximity could have a greater influence on infection intensity than other environmental parameters (Buss et al. 2020b).”

This statement should be removed as it is not supported by the three cited documents.

- Bradley et al. (2019) states that, for Field Trial 1, “density, both individually and as interaction terms, were not significantly associated with basket-level mortality rate” (p46), while for Field Trial 2, “the mean mortality rate... was not significantly greater or less regardless of the combination of basket cleanliness and density applied” (p47). This is a case of needing to go beyond the abstract.
- Buss et al. (2019) refers only to a PIRSA 2017 document that states there “may be” rather than “is” an association.
- Buss et al. (2020b) does not measure the influence on infection intensity of density and proximity relative to other environmental parameters.

Also on the issue of Bonamia, the draft conservation advice states that:

“...the documented prevalence of Bonamia sp. in native flat oyster farms could facilitate transmission to restoration sites and create mutual disease risk (Buss et al. 2020b).”

This statement should be removed, as Buss et al. (2020b) did not measure such transmission. Conjecture in the literature remains conjecture even when it is repeated by the Committee.

If the Committee agrees to remove the above statements, it is left with an argument that, while exotic disease and infestations threaten angasi reefs, this is a natural threat, and no evidence has been presented to demonstrate that current human activity exacerbates this threat.

A natural threat that is not exacerbated by current human activity is a weak basis for listing angasi reefs under the Act. The Committee should not proceed with listing if it is relying on this threat as justification.

Invasive species

The draft conservation advice states that:

“Biological surveys on the remnant native flat oyster reefs in Georges Bay, Tas, did not identify invasive pests as an issue (Crawford et al. 2019).”

Given this evidence, and given that this angasi reef is the only one that has been studied, the Committee should not proceed with listing if it is relying on a threat of invasive species as justification.

The draft conservation advice should remove references to Pacific oysters in its discussion of invasive species, as each reference is not supported by the literature.

The draft conservation advice states that:

“Introduced benthic filter feeders that compete for substrate and food with bivalves include... the Pacific oyster.”

This reference to Pacific oysters should be removed as none of the cited literature supports the claim that Pacific oysters compete with angasi reefs for substrate and food.

- Of the 12 articles cited, only four refer to Pacific oysters — Hayes et al. (2005), Wells et al. (2009), Gillies et al. (2015) and Gillies (2018). Each refers to Pacific oysters competing, but none refer to Pacific oysters competing with angasi reefs. References to Pacific oyster competition are unsurprising as Pacific oysters compete with Sydney Rock oyster reefs in the intertidal zone. Hayes et al. (2005) specifically refers to Pacific oyster competition in the intertidal zone, and Gillies et al. (2018) specifically refer to Pacific oysters competing with Sydney Rock oysters in New South Wales.

The draft conservation advice then refers to the above sentence containing a reference to Pacific oysters when it states:

“Collectively, these species occur across the historical extent of occurrence of the ecological community and in areas with existing native flat oyster reefs or restoration sites and can form extensive beds or dense covers that inhibit settlement, cause growth impacts to bivalves through food competition, and impact survivorship (Crooks 2001; Talman & Keough 2001; Crawford & Cahill 2008; Ford & Hamer 2016; Gillies et al. 2018; NRM South 2022; DAWE 2022e & f, 2023b, 2024; Strain et al. 2024).”

Pacific oysters should be removed from this concept of ‘these species’ as none of the cited literature supports the claim that Pacific oysters inhibit settlement, compete for food, or impact survivorship with respect to angasi reefs.

- Crooks (2001) is about a mussel affecting a mussel.
- Talman and Keogh (2001) is about a clam and a scallop.
- Crawford and Cahill (2008) record three species (*Musculita senhousia*, *Theora fragilis*, and *Corbula gilla*) that are likely to have displaced native species.
- Ford and Hamer (2016) refers to the potential impacts of the Northern Pacific seastar, *Sabella spallanzanii*, and various seasquirts.
- Gillies et al. (2018) refers to Pacific oysters competing with Sydney Rock oysters.
- NRM South (2022) makes no claim of Pacific oyster interaction with angasi reefs.
- DAWE (2022e) is about a screwshell.
- DAWE (2022f) is about *Sabella*.
- DAWE (2023b) is about *Varicoroula*.
- DAWE (2024) is about *Mya*.
- Strain et al. (2024) makes no claim of Pacific oyster interaction with angasi reefs.

The draft conservation advice states that:

“...the Pacific Oyster has been reported to likely be increasing in extent in NSW, Tas and SA (Gillies et al. 2018), which may increase competition with the native flat oyster reef for food and space, particularly in the intertidal zone (e.g. Coffin Bay, SA).”

As there is no citation for the claim that Pacific oysters ‘may increase competition with the native flat oyster for food and space’, this statement should be removed.



Commercial fishing of the native flat oyster

The draft conservation advice states that the only commercial fishery relevant to angasi reefs, namely the fishery off St Helens, is considered sustainable and low risk.

As such, there is no basis for the Committee's conclusion that appropriately regulated commercial fishing of the native flat oyster is a threat to angasi reefs.

This reference to appropriately regulated commercial fishing of the native flat oyster being a threat to angasi reefs should be removed.

There is no case for Commonwealth intervention in what the Commonwealth acknowledges is managed well at the state level.

Commercial and recreational fishing (non-native flat oyster)

The draft conservation advice states that:

“The overall impact of commercial and recreational fishing that disturbs the benthos or substrate on native flat oyster reefs is unknown.”

The Committee should know this impact prior to concluding that commercial and recreational fishing of species other than the native flat oyster is a threat to angasi reefs.

Recreational take of native flat oyster

The draft conservation advice states that:

“In theory, a small group of recreational fishers could reduce the condition of the ecological community, for both existing and restoration patches, by visiting the same patch over multiple days. This is further exacerbated in SA, where bag limits do not exist for native flat oyster. However, there is no evidence of this being practised in any of the States where the ecological community is located.”

Given the absence of this evidence, the Committee should not conclude that recreational take of the native flat oyster is a threat to angasi reefs.

Boating

The draft conservation advice states “that there is no published information present on the damage of boating activities on native flat oyster reefs”. Given this absence of evidence, the Committee should not conclude that boating is a threat to angasi reefs.

Aquaculture

There is no basis for the Committee's conclusion that aquaculture is a threat to angasi reefs. The reference to aquaculture as a threat to angasi reefs should be removed.

The draft conservation advice provides no empirical evidence of such a threat.

What empirical evidence there is indicates that no such threat exists. This empirical evidence is the situation off St Helens, where there is Australia's largest known angasi reef, and where significant oyster farming has occurred for decades and continues to this day.



The draft conservation advice does make a theoretical claim that aquaculture is a threat to angasi reefs. But it does so by misrepresenting scientific literature.

All of the cited literature relates to bivalve aquaculture, so it is careless for the Committee to make claims about aquaculture generally, which in the waterways of southern Australia includes the farming of fin-fish and seaweed.

None of the cited literature argues or demonstrates, either theoretically or empirically, that bivalve aquaculture is a threat to angasi reefs. This is set out in detail below.

Food and space

The discussion of aquaculture in the draft conservation advice starts with the statement that bivalve aquaculture depends on food and space available in the natural ecosystem.

The draft conservation advice does not argue that bivalve aquaculture competes for space with angasi reefs. This is as it should be, as angasi reefs form on the seabed and farmed bivalves in Australia are never on the seabed.

The draft conservation advice does however argue that bivalve aquaculture can result in phytoplankton depletion that “may reduce food availability for nearby oyster reefs”. Yet the literature cited for this statement does not support the statement.

All of the literature cited examines phytoplankton depletion as a potential impact on the *pelagic* environment. None of the literature cited refers to phytoplankton depletion as a potential impact on the *benthic* environment where angasi reefs are.

This makes sense because waterways are stratified. The phytoplankton available to farmed bivalves in the water column, typically just below the surface, are different, and are in a different environment, to the phytoplankton available to angasi reefs in the benthic environment.

The Committee’s implication to the contrary finds no support in the cited literature, and is a fundamental misrepresentation of the literature. This is highlighted by the fact that many of the cited articles implore that the impact of potential phytoplankton depletion on the local pelagic environment not be extrapolated beyond that environment.

The food relationship from bivalve aquaculture in the pelagic environment, to the benthic environment where angasi reefs are, is a wholly positive one. To quote one of the cited articles, Smaal and Van Duren (2019, p 456) state that “Bivalve filtration and biodeposition enhance benthic-pelagic coupling, facilitating nutrient regeneration and denitrification (Cranford et al. 2007; McKindsey et al. 2011).”

Parasite and pathogen spread

The discussion of aquaculture in the draft conservation advice states that oyster farming may introduce parasites, pathogens, predators, and competitors for existing oyster reefs. Yet the Committee refers to no instance of bivalve aquaculture introducing any such harms to angasi reefs, and neither does the cited literature.

- A reference to Pacific oyster farming introducing a harm to a non-angasi feature of the environment is not evidence for harm to angasis. Pathogens for Pacific oysters frequently are not pathogens for angasis.
- Forrest et al. (2009) makes no reference to angasis, to angasi reefs, or to flat oysters more broadly. The most directly relevant passage (p9) is about diseases and parasites associated with Pacific oysters not posing a threat to natural ecosystems.
- Coen and Bishop (2015) makes no reference to angasis or angasi reefs. The sole reference to flat oysters is a statement (p188) about *Bonamia* affecting *Ostrea edulis*.
- Bishop et al. (2006) makes no reference to angasis, to angasi reefs, or to flat oysters. The article is about an introduction to the United States of Suminoe oysters, a species not farmed in Australia.
- Ogburn et al. (2007) hypothesises about a movement of angasis from New Zealand in 1861 contributing to a report of mudworm in 1862. This is not evidence for a claim that bivalve aquaculture harms angasi reefs.
- Sas et al. (2020) is a guide to restoration projects and does not provide evidence of bivalve aquaculture harming angasi reefs.

Mining and offshore drilling and associated onshore development

The draft conservation advice refers to oiling events, but states that “The extent that oiling events may occur, or impact native flat oyster reefs is unknown.” Any impacts are unlikely given the subtidal nature of angasi reefs.

The draft conservation advice refers to activities generating sound, but states that “The evidence of the likelihood of impact of the sound from these activities on oyster reefs is lacking.”

The draft conservative advice also states that “dredging, barge use or land reclamation activities undertaken to develop infrastructure” may harm angasi reefs. No weight should be put on this claim as no citation is provided.

The draft conservation advice concludes that “The overall impacts of these offshore activities and associated onshore development on native flat oyster reefs are unknown.” The Committee should know these impacts prior to concluding that mining and offshore drilling and associated onshore development are threats to angasi reefs.

Priority actions

Have the relevant protection, management or conservation priorities for the ecological community been adequately identified? If not, please provide additional actions and supporting information.

There are no citations for the claims made about protection, management, and conservation priorities. Actions should not be pursued without evidence of their effectiveness.

For example, the discussion recommending the introduction of buffer zones of up to 100 metres contains no citation supporting the effectiveness of such buffers.



It is not clear how protecting culturally important sites relates to listing as a critically endangered ecological community under the *Environment Protection and Biodiversity Conservation Act 1999*.

The references to actions to change state aquaculture policies and plans are inappropriate. No references are made to actions to change state policies and plans regarding other industries, despite aquaculture having no greater responsibility for, or relationship to, angasi reefs than many other industries.

Proposed actions relating to oyster translocation are inappropriate given that the Committee has not established translocation as a threat to angasi reefs.

A proposed action of including angasi reefs as Ramsar wetland sites is inappropriate as angasi reefs do not meet the definition of wetlands.

A proposed action of avoiding catchment and estuary modifications is unrelated to any threat to angasi reefs demonstrated by the Committee. Any action that does not directly respond to a verified threat is unjustified.

The actions requiring commercial and recreational fishing of angasi oysters to be evaluated against, and gain approval under, the Environmental Protection *Environment Protection and Biodiversity Conservation Act 1999*, and the action involving changes to boating regulations, are inappropriate given that the Committee has not established any inadequacy in state management of these issues.

Have the relevant research and monitoring priorities for the ecological community been adequately identified? If not, please provide additional actions and supporting information. It is inappropriate to list an ecosystem as critically endangered before mapping and surveying to learn of the ecosystem's current extent, and before research to establish its health. Listing is not a prerequisite for mapping, surveying, and research.

The proposals for research represent bias. References are made to demonstrating and supporting the Committee's assumptions regarding angasi reef vulnerability and value and the wisdom of the Committee's proposed actions. Research should instead scrutinise assumptions to determine if they are correct.

It is inappropriate to single out oyster farmers to identify angasi reefs sites. This proposal suggests that the Committee does not appreciate that farming is not dredging, and that Pacific and Sydney Rock oysters are not angasis. Aquaculture has no greater responsibility for, or relationship to, angasi reefs than many other industries.

Have the relevant priorities for restoration of the ecological community been adequately identified? If not, please provide additional actions and supporting information.

Imposing requirements on states with respect to restoration sites would represent bad faith given state and industry involvement and cooperation in creating the restoration sites in the first place.

Listing Assessment Criterion 1

Do you agree with the estimates of decline relative to the 1750 timeframe?

Do you have any feedback on the preliminary assessment under Criterion 1 or further data or information that would support or update the assessment?

Criterion 1 has not been satisfied.

The criterion reads: "Its decline in geographic distribution is: very severe... severe... substantial." The criterion does not read 'Its decline in geographic distribution was: very severe... severe... substantial'. The criterion is described in the present tense, not the past tense. Therefore, the criterion relates to a decline to now, not a decline over a period that started and finished sometime in the past.

The literature cited by the Committee outlines that angasi dredging occurred from 1788 to the 1950s and that the productivity of this dredging declined over that period. From this it can be reasonably inferred that there was a decline in the geographic distribution of angasi reefs over the 172 years from 1788 to the 1950s.

That is not a decline to now.

The 172-year period from 1788 to the 1950s cannot be a period upon which to make a conclusion regarding Criterion 1, any more than the 172-year period from 788 to 960 can be.

The Committee has released guidelines outlining two approaches the Committee has taken to the criterion since 2013. One of the Committee's approaches is to consider decline over the "past 50 years", and the other is to consider decline "since 1750".

The endpoint for both approaches is now.

The Committee has no basis for concluding decline over the "past 50 years". The Committee makes no argument nor provides any evidence for a decline from 1975 to 2025. The geographic distribution of angasi reefs may well have been steady or increased from 1975 to 2025.

- The only evidence presented by the Committee pertaining to the "past 50 years" is the discussion (p35) of the angasi reef fishing grounds off St Helens increasing from 2008 to 2016, and the angasi biomass at those grounds increasing from 2016 to 2024.

While the Committee can technically conclude decline "since 1750", this is solely because of a likely decline from 1788 to the 1950s, a historical decline that is inconsistent with Criterion 1.

When a conflict occurs between the two approaches of the Committee, the Committee should favour the approach that is more in keeping with the present tense used in Criterion 1. That approach is the "past 50 years" approach. It would be inconsistent with the present tense used in Criterion 1 for the



Committee to conclude that Criterion 1 is met simply because of a likely historical decline from 1788 to the 1950s.

Listing Assessment Criterion 2

Do you have any feedback on the preliminary assessment under Criterion 2 or further data or information that would support or update the assessment? Please provide additional supporting information.

Do you agree with the estimates of the current extent of occurrence (EOO), area of occupancy (AOO) or average patch size provided in the assessment? If not, can you provide an estimate of the current geographic distribution (EOO and AOO in km²) and average patch sizes (in km²), with supporting data?

Based on your knowledge and expertise, do you think it is likely that the ecological community could be lost in the immediate (10 years), near (20 years) or medium-term future (50 years)? If so, please provide supporting information.

Criterion 2 has not been satisfied.

The condition of limited geographic distribution has not been demonstrated. Mapping to determine the 'area of occupancy' and the 'patch sizes' of angasi reefs from Perth to Port Stephens has not been done. An absence of evidence is not evidence of absence.

The condition of a likelihood of angasi reefs being lost in the medium-term future, from a combination of the action of a threatening process, and the nature of distribution, has not been demonstrated. The Committee acknowledges this. The continuation of angasi reefs from the cessation of dredging by the 1950s, to today, indicates that the condition has not been met. Given this, the Committee should not continue to claim current threats to angasi reefs, for the reasons outlined in the above discussion of threats.

Listing Assessment Criterion 3

Do you have any feedback on the preliminary assessment under Criterion 3 or further data or information that would support or update the assessment? Please provide additional information and supporting evidence.

Criterion 3 has not been satisfied. The Committee acknowledges this.

This criterion requires, among other things, species decline in the last 10 years. There is no evidence of species decline since the cessation of dredging by the 1950s.

Listing Assessment Criterion 4

Do you have any feedback on the preliminary assessment under Criterion 4 or further data or information that would support or update the assessment? Please provide additional information and supporting evidence.

Criterion 4 has not been satisfied.

The Committee's conclusion to the contrary reflects the Committee's failure to follow its own guidelines in assessing Criterion 4.

The guidelines state that Criterion 4 "recognises that an ecological community can be threatened by 'functional' extinction..." and that:

"in order to assess the risk of extinction under this criterion, the TSSC takes into account the potential for recovery of the ecological community as an indication of the severity of degradation or disruption (i.e. the reduction in integrity must have the potential to precipitate change in community structure or function sufficient to lead to the eventual extinction of the ecological community)."

Yet the Committee's discussion of Criterion 4 in the draft conservation advice contains no mention of extinction.

The guidelines refer to two steps in assessing Criterion 4. Step 1 involves assessing factors sufficient to lead to "ongoing" change in biota. Step 2 involves assessing whether, even if there is yet to be change in biota, disruptions to ecological processes are "evident" and these disruptions risk future change in biota. The upshot of these two steps is an assessment of whether functional extinction within the medium-term future is likely.

The Committee does not go through its own Steps 1 and 2. The Committee does not demonstrate "ongoing" change in biota — only changes between 1788 and the 1950s. The Committee does not demonstrate any "evident" disruptions risking future change in biota. By not going through its own steps to assess Criterion 4, the Committee avoids stating the obvious conclusion that functional extinction is unlikely within the medium-term future.

For Criterion 4, it is not enough for the Committee to lament a steady state in angasi reefs since the 1950s, because a steady state is inconsistent with there being a lack of integrity and there being a risk of functional extinction. As such, Condition 4 is not met.

Listing Assessment Criterion 5

Do you have any feedback on the preliminary assessment under Criterion 5 or further data or information that would support or update the assessment? Please provide additional information and supporting evidence.

Criterion 5 has not been satisfied. The Committee acknowledges this.

Listing Assessment Criterion 6

Do you have any feedback on the preliminary assessment under Criterion 6 or further data or information that would support or update the assessment? Please provide additional information and supporting evidence.

Criterion 6 has not been satisfied. The Committee acknowledges this.

Appendix C – Survey techniques

Is there any further information or survey approaches that should be noted within this section? Please providing supporting information.

Each survey technique is expensive. If listing were to occur, and surveys were then required as a prerequisite to gain Commonwealth approval for certain activities (such as establishing a new marine farm lease), the survey cost alone could be sufficient to prevent the activity from being pursued.

Given this, and given the Committee's failure to establish that certain activities (such as bivalve aquaculture) are threats to angasi reefs, the proposed listing should not proceed.

Appendix D – Evidence of historical extent and decline

Are there any additional examples of historical extent and/or decline that should be represented above? Please provide supporting information.

None of the extensive list of published historical instances of angasi reefs indicates reefs in the intertidal zone.