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Introduction and background

This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for Environment under Section 44 of the *Environmental Protection Act 1986* (EP Act) on the proposal by Marine Produce Australia Ltd (the proponent) to increase production of barramundi (*Lates calcarifer*) to 2000 tonnes per annum (tpa) at its sea cage aquaculture facility in Cone Bay, West Kimberley (the proposal).

The proponent currently has approval under Ministerial Statement 798 to produce 1000 tpa of barramundi per year. This proposal was assessed by the EPA in 2008 at the Public Environmental Review level of assessment.

The proposal to increase total production from sea cage aquaculture in Cone Bay to 2000 tpa was referred to the EPA on 22 November 2011 and the EPA, under Section 40 of the EP Act, determined that the level of assessment for the proposal is Assessment on Proponent Information (API) – Category A.

The EPA advised that it would consider a revised Environmental Monitoring and Management Plan (EMMP) as the API document, with the expectation that the revised EMMP would accommodate the impacts associated with a 2000 tpa proposal and demonstrate that the proposal can be managed to meet the EPA's objectives. The proponent has submitted the revised EMMP for assessment. If the 2000 tpa proposal is approved this revised EMMP will replace the previous EMMP for the 1000 tpa proposal. A copy of the revised EMMP can be found on the proponent's website at: www.marineproduce.com/annual_reports.html

The proposal

The proposal is to increase production of barramundi from 1000 tpa to 2000 tpa at its sea cage aquaculture site in Cone Bay which is located approximately 215 km north north east of Broome in the Buccaneer Archipelago and forms part of the Yampi Sound in the Kimberley region of Western Australia. The proponent has a 21 year Aquaculture Lease (AL0020) over its existing aquaculture site (Aquaculture Licence No. 1465) which is approximately 700 hectares. The location of the proposal is shown in Figure 1 of Appendix 2.

The bay is approximately 20 km long and 6.5 km wide near its west-facing opening and is fringed by sandstone cliffs on both sides. The aquaculture site is situated in the southern part of the bay and encompasses Turtle Island where infrastructure exists for both pearling and aquaculture activities.

Since implementation of the 1000 tpa proposal no significant adverse impacts on the Cone Bay marine environment have been reported by the proponent.

Key environmental factors

Under Section 44 of the EP Act the report must set out:

- the key environmental factors identified in the course of the assessment; and
- the EPA's recommendations as to whether or not the proposal may be implemented, and, if the EPA recommends that implementation be allowed, the conditions and procedures to which implementation should be subject.

It is the EPA's opinion that the following key environmental factors relevant to this new proposal are:

- (a) Marine environmental (water and sediment) quality; and
- (b) Benthic habitat (including benthic primary producer habitat).

Description

The principal threat to the environment from the proposal is nutrient and organic enrichment from uneaten fish feed and faecal matter leading to a deterioration in water and sediment quality and subsequent downstream adverse effects on key biota such as corals and seagrass. Nutrient enrichment stimulates algal growth and an increase in phytoplankton biomass which can lead to shading and loss of photosynthetic benthic organisms; this is also a consequence of undissolved feed and faecal matter in the water column. The resulting sedimentation of this organic matter can smother benthic organisms and cause anoxia of the sediment and a decline in water quality.

There are other potential impacts associated with the proposal, such as introduction of pathogens, escape of cultured fish and interactions with marine wildlife. These have been considered by the proponent and management measures addressing these issues are contained in the EMMP.

Three levels of ecological protection, each of which represent the minimum acceptable level of environmental quality to be achieved through management, were defined through the 1000 tpa proposal. A level of moderate protection has been assigned around the sea cages, a level of high protection has been assigned outside the immediate area of impact, and a level of maximum protection has been assigned for most of the waters of Cone Bay surrounding the proposal. A component of this proposal is a slight modification to the eastern moderate ecological protection zone. The levels of ecological protection and their spatial allocation have been proposed in accordance with the EPA's Environmental Quality Management Framework and are shown in Figure 2 of the recommended conditions (Appendix 2) and Figure 2.1 of the EMMP.

Cone Bay is a deeply incised bay with high energy characteristics strongly influenced by tidal ranges from nine to 11 metres and high velocity currents. Fast flushing rates and dynamic circulatory patterns are prevalent within the bay. Natural fluctuations in water quality associated with seasonal variations are characteristic of the Buccaneer Archipelago.

The benthic habitat types at Cone Bay, including the habitats of the moderate ecological protection zone, contain large expanses of soft sediments. The Cone Bay sediment provides habitat for flora and fauna communities (including mobile invertebrates, benthic infauna and microphytobenthos), which play an important ecological role. The high and maximum ecological protection zones, however, are also characterised by fringing coral reefs and ephemeral seagrass. Additional details of the coral and seagrass habitats observed in Cone Bay are shown in Appendix 1 and Figure 2.1 of the EMMP.

The proposal will have some direct impact on water quality locally due to the input of nutrients and organic matter from uneaten feed and faecal matter. The potential extent of deterioration in water quality, however, is largely influenced by the extent of flushing and water current circulation. The hydrodynamics of Cone Bay are characterised by large tides and rapid flushing of water with the proponent's modelling suggesting that 90% of the water at the aquaculture site is exchanged within two hours. This reduces the potential for significant direct and localised impacts on water quality from the proposal.

The proposal will have some direct impact on the sediment from shading and sedimentation of organic matter beneath, or in close proximity to the sea-cages. Modelling undertaken by the proponent determined that waste settles within 250 metres downstream of the cages. The magnitude of impact depends largely on the depth of the water and the rate of water movement through the site. The proponent predicts, therefore, that impacts to sediment and associated biological communities will be minimal due to the extent of flushing.

In terms of benthic primary producer habitat (BPPH), the EMMP focuses on the monitoring of coral communities. Corals will provide an early indication of adverse environmental impacts from light reduction and smothering caused by nutrient and organic enrichment. The proponent predicts that there will not be any adverse impacts to coral health because coral does not occur within the immediate zone of impact (moderate ecological protection zone). Impact to coral in the high and maximum ecological protection zones will be limited as a result of high flushing rates, coral monitoring and management measures that will be implemented to ensure protection of corals.

The proponent's management strategies to reduce excessive organic loading from the proposal include:

- minimising wasted feed through controlling overfeeding;

- managing stocking densities to promote fish health and growth, to reduce the impact of uneaten feed and faeces;
- implementing fallowing practices to facilitate restoration of sediment quality under the sea-cages; and
- using feed cameras and or pellet sensors during fish feeding to reduce wasted feed.

In the event that the proposal causes adverse impacts beyond those predicted, contingency actions will be undertaken to reduce the impact and restore environmental quality to comply with the specified level of ecological protection. Examples of the proponent's contingency actions include:

- fallowing of sea cages;
- moving stock;
- reducing stocking densities; and
- reducing feed input rates

In summary, based on its environmental investigations, the proponent predicts:

- there will be no adverse impacts on corals and mangrove health in Cone Bay resulting from the proposal;
- there will be no measurable impact on water or sediment quality outside of the aquaculture lease;
- any adverse effects (if they occur at all) to sediments or water quality can be managed and/or reversed such that the Environmental Quality Objectives (EQOs) can be restored; and
- the EQOs and Environmental Values will not be compromised.

Assessment

The EPA considers that the following key environmental factors are relevant to this new proposal:

- (a) Marine environmental (water and sediment) quality; and
- (b) Benthic habitat (including benthic primary producer habitat); and

The EPA's environmental objectives for these factors are:

- to maintain the quality of marine water and sediment so that environmental values, being both ecological and social values, are protected; and
- to maintain marine ecological integrity through protection and improved knowledge of benthic habitats, including benthic primary producer habitats (BPPH).

In relation to these factors, the EPA's assessment was based on the key issue of concern to the EPA which is the utilisation of supplementary feed and the consequential nutrient and organic enrichment of the surrounding marine

environment from uneaten food and faecal matter. This organic loading to the surrounding environment, if unchecked, can cause flow-on near-field and far-field effects to key biota such as corals and seagrass.

The EPA is aware that since implementation of the 1000 tpa proposal no significant adverse impacts on the Cone Bay marine environment have been reported by the proponent. There is, however, a level of uncertainty with regards to the capacity of the Cone Bay environment to assimilate the additional nutrients and organic waste generated by a 2000 tpa proposal. This is due to the relatively limited understanding of the local biodiversity and ecology and the natural tolerances and susceptibilities of the key sensitive biota.

The EPA therefore prepared a scoping guideline for the development of an EMMP for this proposal to ensure adequate monitoring is undertaken and that the moderate, high and maximum levels of ecological protection are not compromised. In developing the EMMP, the proponent has focussed on the major threats posed by the proposal and the cause-effect pathways by which those threats could cause unacceptable effects on key biota. The EMMP is designed to provide early warning of potential impacts, using suitable biological indicators, to trigger pre-emptive management that will ensure that the levels of ecological protection established for the project will not be compromised.

In summary, the EMMP is a clear and comprehensive document that contains the following key elements:

- a monitoring program designed to achieve stated objectives;
- management triggers;
- data evaluation procedures that identify where and when the management triggers have been reached;
- contingency management strategies;
- a monitoring/management feedback loop; and
- a reporting process.

The EPA considers that the proponent's EMMP is suitable to manage the environmental impacts of an increase from 1000 tpa to 2000 tpa production of barramundi. The EPA recommends that the proponent prepare Standard Operating Procedures to provide personnel with procedures for carrying out the specific monitoring and management requirements within the EMMP and to ensure the procedures are performed effectively and consistently.

The EPA has recommended condition 6 which requires that the proponent implement its EMMP to ensure adequate monitoring is undertaken and that the moderate, high and maximum levels of ecological protection are not compromised.

As the key issue of concern to the marine environment relates to the feeding of fish the EPA has also recommended condition 7 which requires that any

commercial feeds used by the proponent must meet environmental and industry standards. The EPA also notes from Table 1.4 of the EMMP that the proponent must undertake monitoring, within one year of implementation and then every three years, to determine whether trace elements (including heavy metals) contained within commercial feeds are accumulating in sediments beneath and/or adjacent to the sea cages.

With regard to public consultation during the assessment process, it is the EPA's expectation that stakeholders are provided with an opportunity to have input during the development of the proposal. The EPA noted that the proponent conducted limited consultation however, in this case, the proposal is an extension to an existing project which was subject to extensive consultation as part of a previous Public Environmental Review process.

Conclusion

The EPA has considered the proposal by Marine Produce Australia Ltd to produce 2000 tpa of barramundi in Cone Bay.

Having particular regard to the suitability and quality of the EMMP to manage the environmental impacts of a 2000 tpa operation; the EPA has concluded that it is unlikely that the EPA's objectives would be compromised provided there is satisfactory implementation of the recommended conditions set out in Appendix 2.

Recommendations

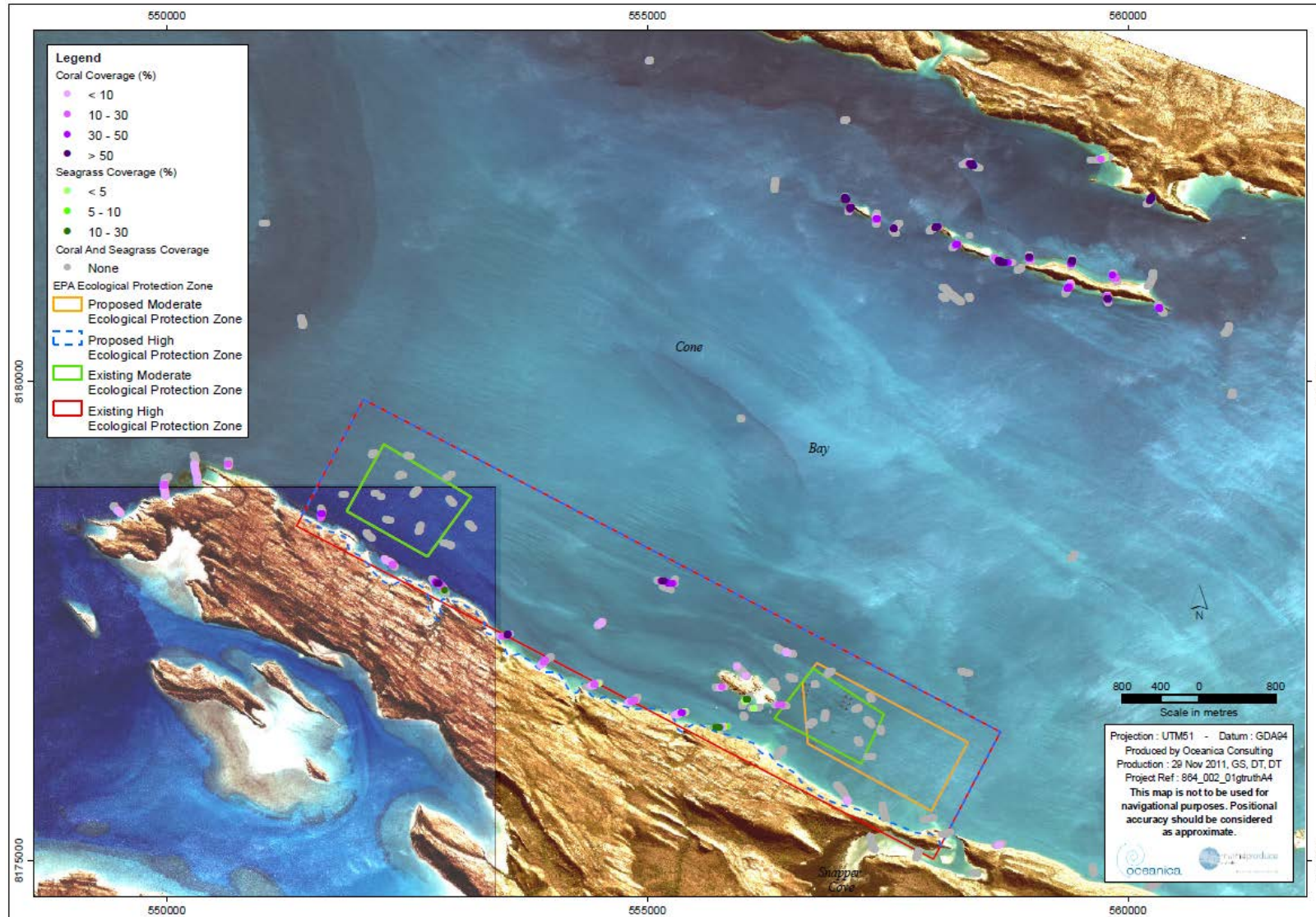
That the Minister for Environment:

1. notes that the proposal being assessed is to increase production of barramundi from 1000 tpa to 2000 tpa in Cone Bay;
2. considers this report and recommendations;
3. notes the EPA has concluded that it is likely that the EPA's objectives would be achieved, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 2; and
4. imposes the conditions and procedures recommended in Appendix 2 of this report.

Conditions

Having considered the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Marine Produce Australia Ltd to culture 2000 tpa of barramundi in sea cages in Cone Bay is approved for implementation. These conditions are presented in Appendix 2. Matters addressed in the conditions include the following:

- (a) standard conditions for proponent nomination, time limits for approval, compliance reporting; and
- (b) implementation of the EMMP.



Note: the habitats shown above are based on towed video transects conducted between the 21 and 24 October 2011. These data will be used in conjunction with GIS image processing to extrapolate the distribution of habitats across Cone Bay.

Figure 1: Extent of coral and seagrass habitats observed during towed video surveys

Appendix 2

Recommended conditions