

REVIEW OF PROPOSAL TO LEAVE THE REMAINS OF THE MV RENA ON ASTROLABE REEF: POTENTIAL IMPACTS ON MARINE MAMMALS

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Reports Assessed:

The following reports were assessed:

- Cawthron (2014) Marine Mammal Assessment: Proposal to leave the remains of the *MV Rena* on Astrolabe Reef. Report No. 2258. 16 May 2014.
- Marshal Day Acoustics (2014) Acoustic Assessment: Proposal to Leave the Remains of the *MV Rena* on Astrolabe Reef. Report No. 2012441A. 16 May 2014.
- BECA (2014) Application for Resource Consent (*MV Rena*) Volume One. 27 May 2014.
- Boren L (2014) Review of “Marine Mammal Assessment: Proposal to leave the remains of the *MV Rena* on Astrolabe Reef” Cawthorn Report No. 2258
- Baxter A (2014) Comments on acoustical impacts of the proposal to leave the remains of the *MV Rena* on Astrolabe Reef. Email correspondence.

Reviewed by:

Dr Simon Childerhouse, Senior Marine Scientist, Blue Planet Marine, Nelson, NZ.

This review is based on original assessments and advice provided by Dr Laura Boren (Science Advisor) (Appendix 1) and Andrew Baxter (Technical Advisor) (Appendix 2), Marine Species and Threats Team, Department of Conservation.

Scope of work:

Details in emails from Sacha Walters on 9 June 2014:

- *“What is required is a review of the final report and then updating of the original advice given on the draft report by Laura. One possibility is that Simon will confirm that the advice Laura gave on the draft still stands. There is currently no request for attendance at future meetings or presenting his findings. However, there will be some interaction with myself and Alice Camaivuna (DOC lawyer) to finalise the advice”* and,
- *“It would be helpful if you [Andrew Baxter] could liaise with Simon and your advice could be combined into one marine mammals advice piece that covered both”.*

I have deliberately kept this review short and concise as most of the material has already been covered by Boren and Baxter previously.

Executive Summary

I have reviewed the material associated with the proposal to leave the remains of the *MV Rena* on Astrolabe Reef and any potential impacts on marine mammals. Overall, the application was comprehensive, thorough and with appropriate conclusions with respect to impacts on marine mammals. Four main potential sources of impact from leaving the *MV Rena* on the reef were identified:

- a. Increased vessel traffic leading to increased risk of ship strike;
- b. Increased vessel traffic leaving to increased underwater noise;
- c. Toxic effects from contaminants remaining on the *Rena*; and
- d. Habitat/prey loss from damage/disturbance to the reef.

The applicants considered that these potential impacts all have a low or no likelihood of effect, consequences ranging from major to less than minor, with an overall risk level of Acceptable or Tolerable. I agree with these assessments and that the overall risk of impact from this consent is likely to be negligible or low for marine mammals. The main gaps in the application relate to two main areas:

- a. Monitoring – the Monitoring Plan for the site includes no reference to marine mammals and it should. While I do not believe that dedicated marine mammal surveys are warranted, the applicant should be required to report all marine mammal sightings and other incidents (e.g. vessel strikes, entanglements) to DOC. Consideration could be given dedicated surveys associated with sonar operations depending on the frequency and length of these and also potentially the autopsy of any marine mammals that strand in the vicinity of, and during, these operations
- b. Conditions of consent – the application does not make clear what conditions of consent they are proposing. With respect to marine mammals, I would recommend two main conditions
 - i. Marine mammal reporting – to formally include this issue as identified above;
 - ii. Mitigation procedures for sonar operations – to include the mitigation as proposed by Marshal Day Acoustics with some specific modifications to better define them (e.g. using minimum required sonar power, specifying mitigation zones for applying soft start and shut down procedures, marine mammal monitoring during operations).

Detailed Points

1. I have reviewed the original advice provided by Boren (Appendix 1) and Baxter (Appendix 2) and agree with the general conclusions of their previous work. I have summarised my general conclusions in the following points.
2. The original Cawthron Report provides a good description of the distribution and presence of marine mammal fauna in the Bay of Plenty area and the Astrolabe Reef. There were two main limitations of the Report, specifically:
 - a. the main data set used to describe presence of marine mammals in the area is from Department of Conservation sighting records which are both non-random, non-systematic and contain considerable known biases with respect to effort; and

- b. there was no dedicated marine mammal survey effort undertaken in the region as part of this study.

Notwithstanding these limitations (which were also noted in the Report), the conclusions of the Cawthron Report about the distribution and presence of marine mammal fauna are appropriate and reasonable.

3. The Cawthron Report identifies four main potential sources of impact from leaving the Rena on the reef:
 - a. Increased vessel traffic leading to increased risk of ship strike;
 - b. Increased vessel traffic leaving to increased underwater noise;
 - c. Toxic effects from contaminants remaining on the Rena; and
 - d. Habitat/prey loss from damage/disturbance to the reef.

As part of a risk assessment they consider that these potential impacts all have a low or no likelihood of effect, consequences ranging from major to less than minor, with an overall risk level of Acceptable or Tolerable. I agree with these assessments and that the overall risk of impact from this consent is likely to be negligible or low for marine mammals. I do not consider 3(c) and 3(d) further here.

4. The issue of increased vessel traffic is a likely consequence of the wreck remaining on the reef from increased tourism but is outside the control of the applicants. There are two main forms of mitigation that would reduce any impact on marine mammals. The first is limiting access to the area either completely or to a maximum number of vessels but this seems unnecessary given the likely low impact. As Boren notes, the best option is through standard permitting procedures for marine mammal tourism operations, safe ship management and following Marine Mammal Protection Regulations for appropriate behaviour around marine mammals and the communication of these to vessel operators using the area.
5. Marshal Day Acoustics provide a summary of the underwater noise in their Section 3 from the existing wreck and reef system describing the measured levels as between 114 – 148 dB re 1 μ Pa, with a median of 127 dB re 1 μ Pa. This noise includes a combination of ambient background noise, noise from the wreck itself and noise from vessel traffic in the area. The limitation of this work is that there are no pre-wreck noise data so it is difficult to determine the pristine noise level of the reef prior to the Rena arriving. They identify three potential sources of impact:
 - a. Direct effects due to the remains of the wreck moving in the dynamic reef environment;
 - b. Indirect effects due to commercial and recreational boats visiting the wreck once the Exclusion Zone is lifted; and
 - c. The effects of sonar used to survey the location of the wreck if required in the future.
6. Marshal Day Acoustics conclusions from Section 4.5 for 5(a) are that *“The direct noise effects from the remains of the wreck on the Reef are predicted to be negligible”* and for 5(b) are that *“The indirect noise effects from commercial and recreational vessels operating near the Reef are predicted to be less than minor. This is unlikely to be significantly different to effects of recreational and commercial boats in the vicinity prior to the grounding”*. While there are some potential inaccuracies in the Marshal Day Acoustics assessment of noise levels at which impacts

may be seen on marine mammals, I agree with both these assessments and that no specific mitigation will be required.

7. With respect to 5(c), Marshal Day Acoustics note (Section 4.4) that *“High powered sonar may be required to survey the location of the wreck in the future. The source strength of these units may exceed the impulse safe exposure levels at close range and result in behavioural disturbance”*. They go on to say (Section 4.5) that, *“The noise effects from sonar used to survey the location of the wreck if required in the future are predicted to range from minor to severe if not managed appropriately”* and propose the following mitigation for sonar operations (Section 5):
 - a. *“Prioritise equipment and technology that results in low noise levels (e.g. sonar signal strength) and has favourable spectral characteristics (e.g. low frequency settings)*
 - b. *Prioritise periods that avoid mammal presence and breeding seasons*
 - c. *Soft starts (gradually increasing the source noise level), minimising duty cycle and limiting the speed of vessels near the Reef whilst undertaking sonar.*
 - d. *Implement mitigation procedures, such as visual or passive acoustic monitoring of marine mammals and low power or shut down (safety/buffer) zones*
 - e. *Divers should not be permitted in the water within a minimum safety range of 3km from geographic survey/sonar equipment”*.
8. These assessments and suggested mitigation measures are good but could be improved through some further clarification. As Boren correctly notes, the Marshal Day Acoustics report doesn't highlight two occasions after the *MV Rena* ran aground when there was an increase in the number of marine mammals stranded in the region, both coinciding with the use of Navy sonar for relocating lost containers from the wreck. While there has been no direct relationship proved, these results are consistent with what has been observed from various international naval operations involving sonar use and increased incidence of marine mammal strandings. Based on this, it would be sensible to adopt a precautionary approach with further details provided in the following paragraph.
9. Some more specific comments on the mitigation proposed in 7 above:
 - a. 7(a) – I agree with using the lowest possible sonar power necessary for the purpose but, as Baxter points out, reducing the spectral characteristics into lower frequency bands will mean that sonar simply becomes audible to those species with sensitivities in the lower frequency bands such as baleen whales. I would recommend simply reducing power to the minimum required.
 - b. 7(d) – Implementing mitigation procedures is an excellent idea but this is described too broadly to be of benefit. I would recommend that shut down zones be implemented during sonar operations (i.e. specified distances from the sonar source within which if marine mammals are seen, the sonar is shut down until the marine mammals move outside the zone). Specifically, I agree with Baxter's suggested zones:
 - i. 1 km for all cetaceans (i.e. no start-up until this zone is free of whales or dolphins, and shut down should any cetaceans come within this zone); and
 - ii. 200 metres for seals (i.e. no start-up until this zone is free of seals, but no requirement for shut down should any seals come within this zone).

- c. 7(d) - Visual or passive acoustic monitoring of marine mammals was also proposed and would be a requirement to ensure compliance with any mitigation zone. I would recommend that visual observations would be sufficient and could be undertaken by dedicated Marine Mammal Observers or suitably trained bridge crew.

10. Some other issues include:

- a. Monitoring Plan – the Monitoring Plan for the site includes no reference to marine mammals and it should. While I do not believe that dedicated marine mammal surveys are warranted, the applicant should be required to report all marine mammal sightings and other incidents (e.g. vessel strikes, entanglements) to DOC. Some consideration could be given dedicated surveys associated with sonar operations depending on the frequency and length of these and also potentially the autopsy of any marine mammals that strand in the vicinity of, and during, these operations;
- b. Conditions – While the potential impact of the operation is negligible to low, it is not zero. As a result, it would not be unreasonable to request some conditions be added to the consent to cover several issues, specifically:
 - i. Marine mammal reporting - as details in 10(a);
 - ii. Mitigation procedures for sonar operations – as proposed by Marshal Day Acoustics with the modifications identified in 9(a), 9(b) and 9(c).

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APPENDIX 1: ORIGINAL REVIEW BY DR LAURA BOREN, DOC

Report Assessed:

Report No. 2258

Marine Mammal Assessment: Proposal to leave the remains of the *MV Rena* on Astrolabe Reef

Reviewed by:

Laura Boren, Science Advisor, Marine Species and Threats Team, Department of Conservation

Executive Summary

I have assessed the report on the potential impacts to marine mammals by leaving the *MV Rena* on the Astrolabe Reef. The overall conclusions of the report were that the potential impacts were from the following; 1) increase in vessel traffic, 2) increase in underwater noise, 3) possible toxicity effects from unknown contaminants, and 4) initial habitat/prey loss from damage/disturbance to the reef. These were all considered to be likely to have a minimal impact on marine mammal populations. The conclusions are well considered and are based on accurate information. However, the report doesn't recognise the potential difference in the impact of increased vessel traffic between the two groups of marine mammals it considers. The potential impact to dolphins and small whales from an increase in vessel traffic would be of a higher concern than to migratory baleen (large) whales. However, this can be appropriately mitigated through existing protocols and legislation.

In addition the report does not present the pros/cons of the applicants other options so a decision on whether or not to leave the wreck is being solely based on the impacts of one option. It would be better to have all options discussed for a more informed decision to be made.

Detailed Points

1. Description of the proposal. It may have been provided in other reports, but a map of the location of the wreck, with depth profile, or even some images would be useful. It is stated that snagging or entanglement hazards would be removed as far as practicable to a depth of 30 m. I'm not sure the justification of 30 m, and there may be some very logical reason for that, but not enough information has been provided to know why that decision is made. Some of the species of marine mammals in the region are capable of diving to depths greater than 30 m when foraging, DOC would recommend removing ALL potential entanglement hazards.
2. Direct Effects – Vessel Strike. This section is broken into two sections as to the potential impacts on a) Migrant baleen whales, and b) Resident of visitor odontocetes. This breakdown is particularly appropriate because the type of vessel traffic that these two groups are more susceptible to is different, however, this is not actually discussed.

The conclusion that a potential increase in vessel traffic is likely to have a minimal impact on migrating baleen whales is appropriate, especially given the most likely increase in vessel traffic is going to be from smaller vessels, and the greatest risk of direct mortality to large whales is going to be from large ships. However, the greatest risk of direct mortality to small whales and dolphins is from the smaller recreational or commercial tour operator vessels, which are likely to increase. This risk can be mitigated through permitting procedures, safe ship management and the Marine Mammal Protection Regulations for appropriate behaviour around marine mammals. The potential impact of vessel strike to resident or visitor odontocetes would be greater than the risk to migrating baleen whales, however, there are mechanisms in place to mitigate this risk to ensure that it is near negligible. Potential recommendations: monitoring of vessel traffic in / around the reef, and relevant decision makers are made aware of the potential increase in boat traffic and take this into consideration when assessing permit/concession applications.

3. Lack of presentation of the other options available to the applicant. This report focused on the potential impacts of the proposed action but does not present the other options that might be available to the applicants. So it is difficult for a decision maker to make a properly informed decision in this respect. It would be advised to have the potential impacts from continuing to remove the wreckage discussed in order for a decision maker to assess which is the better option.

4. A further thought is the potential risk of the wreck snagging fishing nets, thereby increasing the potential entanglement hazard to marine mammals. This may have been addressed in other reports, or there may in fact be a net ban around the dive sites on the Astrolabe Reef. But this is not explained here so one cannot be sure this potential risk has been considered. If it is not already addressed by a net ban for a reasonable radius around the site, consideration should be given to implement some measures to protect against this occurring.

Acoustic Impacts on Marine Mammals

I have also assessed the acoustic assessment regarding the proposal to leave the remains of the *MV Rena* on Astrolabe Reef (2012441A). This report is being fully assessed by NIWA, however, representatives from DOC have been asked to consider whether or not it adequately addressed the impacts of underwater noise to marine mammals. Table 2 (copied and highlighted below) is overly simplified and does not seem to reflect the recommendations of Southall *et al* (2007) which is still considered the most authoritative paper in this field.

Table 2: Underwater noise behavioural disturbance and auditory injury thresholds

Medium	Subject	Received Threshold Level	Description
Underwater	Mammals and Fish	210 dB re 1µPa peak 150 dB re 1µPa rms 180 dB re 1µPa rms	Impulse safe exposure Behavioural disruption Risk of auditory injury

For example, I am unsure where the 150 dB figure comes from. Southall et al (2007) notes that for low frequency baleen whales exposed to non-pulses (e.g. ship noise), there is an increasing probability of avoidance and other behavioural effects in the 120 to 160 dB (re: 1 μ Pa rms) range. For mid-frequency cetaceans there are no clear thresholds due to variability within and between species and due to context.

High frequency cetaceans (using Harbour porpoise as the key example) are very susceptible to noise disturbance (90-120 dB for non-pulses; 140 dB induces profound and sustained avoidance). Hector's dolphins *might* come under this heading, but they are not present off Tauranga so are not really an issue there.

For all sounds (single pulses, multiple pulses, and non-pulses), Southall recommends 230 dB (re: 1 μ Pa peak) as the sound threshold for injury for all cetaceans (except beaked whales) and 218 dB (re: 1 μ Pa peak) for pinnipeds.

Notwithstanding these comments, I don't think any changes to this table would alter the report's conclusions (Table 1 of the report).

The report also highlights that the use of sonar could be considered severe. I agree with this assessment. However, the report doesn't highlight the two times after the *MV Rena* ran aground when there was an increase in the number of marine mammals stranded in the region, both coincided with the use of Navy sonar for relocating lost containers from the wreck. If sonar is to be used in the future, further mitigation measures than what are currently presented in the report are recommended. In particular, Navy sonar should be avoided, with lower powered sonar (e.g. those used for scientific surveys) utilised instead. Mitigation measures should include contact with DOC in advance to discuss appropriate and specific mitigation. As a minimum, the Code of Conduct for Seismic operations should be used as a guideline in terms of using marine mammal observers, passive acoustic monitoring and "soft starts". Mitigation could also include recommendations for aerial surveys pre- operation, or marine mammal observers posted along the coastline, and an agreed protocol for the undertaking of necropsies of marine mammals which strand coincidental to any sonar use to determine cause of death.