Day 1 – Monday, 9 July 2018

1. Neil Gilbert (Chair) introduced the workshop and gave a quick overview of the workshop schedule. He noted that all participants had agreed to the Terms of Reference (TOR). Declared potential Conflicts of Interest were not expected to be an issue. It was also noted that observers were able to submit questions during the workshop via the Chair.

2. Ian Angus (DOC) presented an overview of the Threat Management Plan (TMP) process.

3. Laura Boren (DOC) and Rochelle Constantine (University of Auckland) presented the public sighting and validation process for west coast North Island on behalf of Deanna Clement (Cawthron Institute). Workshop participants acknowledged that after using a proxy for effort (aerial surveys of recreational boats), the presence-only public sightings data has generated some excellent outputs from the model.

4. Rochelle Constantine gave a presentation on Hector’s and Māui dolphin abundance and behaviour based on genetics and photo ID sampling.

5. Jody Weir (KORI) presented on the behaviour and population structure and movement of Hector’s dolphin in Kaikoura using photo ID.

6. Darryl MacKenzie (Proteus) and Deanna Clement (Cawthron Institute) gave a presentation on Hector’s dolphin aerial surveys to inform estimates of population size and spatial distribution.

7. David Middleton (Trident) gave a presentation on inshore fisheries relevant to Hector’s and Māui dolphins, and a study looking at where set-netting was occurring in harbours (where fishing effort has previously only been reported by statistical area rather than precise locations). Using a smartphone application used by commercial fishers it was possible to track boats and infer set-net fishing effort distributions. An observer questioned how recreational set-netting and illegal set-netting would be treated in the risk assessment, which resulted in it being noted that these threats would have to be addressed qualitatively rather than factoring them into the model due to a lack of data. In subsequent discussions Fisheries New Zealand committed to using available data (after
the workshop) to estimate the spatial distribution of recreational set-net fishing effort and incorporating this layer within the multi-threat risk assessment.

8. Wendi Roe (Massey University) gave a presentation on the impacts of disease on Māui and Hector’s dolphins. Massey University has been contracted to do necropsies on all recovered Hector’s and Māui and dolphin carcasses since 1998. Dolphin necropy data since 2007 has been used for this risk assessment as there is greater confidence in the diagnosis of cause of death over that period. In terms of disease the following have been detected during necropsy: toxoplasmosis, brucellosis, tuberculosis, pneumonia (fungal and bacterial), meningitis, encephalitis, and myocarditis. Toxoplasmosis is the most commonly diagnosed infectious disease in the Hector’s and Māui dolphin population. No viral cause of death has been detected.

9. Day 1 of the meeting closed at 1700 hrs.

**Day 2 – Tuesday, 10 July 2018**

10. Craig MacPherson (JASCO) presented the development of an underwater sound propagation model to estimate received sound arising from 2D and 3D seismic exploration and vessel noise at a regional scale, applied to the west coast of the North Island. Small vessels are not accounted for in the modelling - only vessels large enough to carry automatic identification systems. The data represented a single year of seismic activity and large vessel traffic (July 2014 – June 2015).

11. Ben Sharp (Fisheries New Zealand) gave a presentation detailing the spatially explicit fisheries risk assessment (SEFRA) method. The method framework was originally developed for fisheries, but conceptually can be adapted for any spatially resolved threat. Outputs are designed to help managers estimate and manage risk(s) arising from different sources.

12. Jim Roberts (NIWA) presented an overview of the spatially-explicit multi-threat model structure that has been developed for the dolphin risk assessment.

13. Darcy Webber (Quantifish) presented the methodological approach to estimate relative threat intensity between subpopulations for non-fishery threats, based on spatial overlap, for incorporation into the multi-threat risk assessment model.

14. Jim Roberts (NIWA) presented new science to inform the estimation of dolphin demographic parameters used as inputs in the risk assessment model. He also presented the results of seasonally resolved dolphin spatial distribution models.

15. Time limitations meant some scheduled presentations were postponed, either to be worked thorough with the panel on Wednesday or presented on Thursday. Working group participants were alerted to changes to the agenda by email prior to Thursday.

16. Day 2 of the meeting closed at 1700 hrs.
Day 2.5 – Wednesday, 11 July 2018

17. On Wednesday the workshop was not in session. Instead, on this day the independent panel met with the science project team to interrogate the model structure and its parameterisation, and to examine model inputs in greater detail with the opportunity to answer questions and explore alternatives. The contents of this meeting between the panel and the project scientists were summarised for the larger workshop when it reconvened on Thursday.

Day 3 – Thursday, 12 July 2018

18. Meeting commenced at 0840 hrs and the Chair gave an overview of the revised agenda.

19. Jim Roberts (NIWA) gave a presentation on the estimation of non-fishery threat intensities. Except for commercial fishing effort, spatial threat intensity is an area of less certainty. There was much discussion around the representativeness of beach-cast individuals as an indication of death rates occurring in the wider population. Non-fishing threats that were discussed included toxoplasmosis, great white sharks, aquaculture, oil spills, noise, commercial tourism, and recreational boat disturbance. One of the limitations in looking at the threat of noise is that there is very little information about the likely effects of different noise levels on the dolphins to estimate at what level impacts may become adverse. There was some concern from observers and others that recreational and illegal set-netting had not been spatially mapped. Some workshop participants felt that illegal set-netting could potentially be a significant concern.

20. Darcy Webber (Quantifish) presented an introduction to Risk Atlas, a software platform to query and disaggregate spatially explicit risk models. Risk Atlas allows modellers to take all the catch effort data, spatial distribution maps, and fit a model using the SEFRA method. It enables users to estimate risk at any user-defined scale, e.g. at the scale of the whole species, at sub-population scales, or at the scale of local features.

21. Lethal non-fishery threats were discussed. There was some concern from participants that using the necropsy data to estimate relative rates of non-fishing deaths may be biased, thereby potentially over, or under, estimating the importance of some non-fishing related deaths.

22. Ben Sharp (Fisheries New Zealand) and Sam Whinam (Te Uru Rakāu) presented dolphin sightings from the public and from fisheries observers relative to the dolphin spatial distributions generated by habitat preference modelling, using GIS to examine levels of agreement between predicted and observed distributions at finer spatial scales.

23. Day 3 of the meeting closed at 1700 hrs.
Day 4 – Friday, 13 July 2018

24. Day 4 of the workshop deviated from the agenda. Instead, the focus of the day was on discussion of the draft recommendations provided by the panel. The recommendations below are draft only, and are recorded to detail the thought process undertaken by the panel. The workshop resumed at 1000 hrs.

25. Draft recommendation:

**Distribution and Abundance**

- Look at the effects of artificial zeros on the offshore limits of the Māui GAMS.

- Consider whether turbidity affects detectability in aerial surveys, the implications of any affect and how to account for them. Note that detection probability differences could contribute to both underestimates of abundance in turbid areas and overestimates in clear waters. Comparisons of circle-back data from areas of differing turbidity would be an immediate source of data to investigate this issue. There is some potential that the differing abundance estimates in Cloudy Bay (which ironically is indicated as having relatively lower turbidity than the high-turbidity areas near Banks Peninsula) are positively biased if dolphins in Cloudy Bay had a longer detection period than more typical areas.

- Aerial survey data from University of Otago may be available via DOC, and an effort should be made to find and use that data to improve the distribution and relative density predictions – as a supplement to, or a check on, the data from the aerial survey currently used in the model.

- Need to include illegal and recreational fishing risks.

26. Barbara Taylor (NOAA) referenced some decision rules she had drafted up about which data to use for abundance estimates for use in demographically independent populations (Appendix 1).

27. Draft recommendation:

**Population Status**

- For depleted populations, managers may want to minimise the amount of time in which those populations remain at very low abundance and therefore the risk of losing the population is greater. Identifying which populations are at such risk will help managers if they have this preference. The current model does not give managers this information (status relative to historical numbers). In future risk assessments this would be useful information to provide. In lieu of such information in this iteration, it would be helpful to identify demographically independent populations that are at numbers that are typically identified as being at such low abundance that they are generally regarded as at risk (below the low hundreds). For these populations it would be helpful to project the consequences of management options over the near future (say 20 years).
• A population analysis along the lines of that by Cooke et al. for Maui dolphins should be considered for inclusion, somehow, in the risk assessment. Ideally, this would probably be done on a ‘stock’ by ‘stock’ basis but that may be seen as too ambitious or demanding in the time available. It is not clear how meaningful (or practical) a range-wide analysis of the hectori subspecies as a single unit would be. The rationale for including an analysis showing population trajectories (as in Cooke et al.) is that this would supplement for the Ministers the insights that emerge from the spatial analysis or risk.

• Using habitat models as the sole means of producing dolphin density maps for a given abundance is unlikely to faithfully capture abundance of separate populations. Habitat models use current distribution to predict where dolphins ‘should’ be. However, this species has experienced depletion to the point of local extirpation (or nearly so) in the North Island and it is not implausible that the South Island has been differentially depleted because of likely unequal historical set-netting because of different access by fishers in different areas. Differential depletion is also expected because Hector’s dolphins show high site fidelity with ample data from both photo-id and genetic studies, and because protections have been extended in differing amounts at different times.

• Given the apparently low numbers of individuals and the relative demographic isolation of certain local populations, consideration should be given to conducting genetic/photo-id mark-recapture studies modelled after those carried out on Māui dolphins. The rationale for doing this is that the desired recovery and “long-term viability” of these populations may require management interventions similar to those being applied to Māui dolphins.

28. Randall Reeves stated that to manage for long-term recovery, the status of the animal is important – i.e. where a population is at now in relation to the past. Therefore, the recommendation is to include a historical distribution of the dolphins in the risk assessment write up, which will likely be based on anecdotal accounts.

29. Barbara Taylor recommended that where it is not possible to model the trajectory of the very small sub-populations due to a lack of data, it is better to estimate population growth in the absence of anthropogenic threats, and the likely rate of decline from threats. These small sub-populations are unlikely to be able to sustain even a small rate of decline.

30. Draft recommendation:

**Bycatch**

• Observers on-board trawlers should be tasked with recording information on how Hector’s dolphins behave near the nets. This information would be used to help determine whether depredation or scavenging might increase the vulnerability of Hector’s dolphins to bycatch in trawls. Since depredation is a learned behaviour, there may also be differential risk in different populations.
• If a Minister is being pressured to increase observer coverage on fishing vessels, the model as presently constructed can provide advice on this by using Darcy’s ‘risk coverage’ concept (identifying high-risk areas with little or no observer coverage). However, on Wednesday Mike proposed that a separate simulation exercise using artificial data could/should be carried out – Darcy understands how to do it.

• Need to be explicit that observer effect has been recognized and accounted for in calculating (and mapping) dolphin bycatch – is there a problem here or not?

• The modelling team should seek a way to incorporate or account for bycatch events in which multiple (2 to 5) dolphins were caught. Darcy indicated that this could be done, and he intended to try to implement it.

31. Andy McKay (Fisheries New Zealand) indicated that there is a summary line for dolphin interaction with fishing gear on the NOMAD form, and that data could be retrieved.

32. The conversation moved on to the threat from illegal fishing and recreational fishing. Barbara Taylor flagged that illegal fishing has been a significant threat for other dolphin species, and while there is currently little information for New Zealand to account for this threat in the model, determining the level of this threat should be addressed in future research.

33. Draft recommendation:

**Modelling**

• Subjective decisions seem to have crept into the choice of models. A way needs to be found for dealing with sightings and habitat distributions that do not match.

• Can observations be weighted, rather than informal model selection be used, to make habitat usage maps fairer representations of low density areas – noting that this is only a problem if the patterns change between areas

• Interaction terms in GAMS?

• Excluded/unused data?

• Uniform priors?

• Shape of lower end of adult survival prior is really unconstrained other than by zero. The input for the current adult survival rate is a very important input to the model. There are adult survival rate data for only two areas: Māui dolphins and Banks Peninsula. The upper limits to adult survival are constrained by biology, but low survival is unconstrained. For most of the distribution of Hector’s dolphin there are no data to inform the model, so whatever distribution is put in is what you will get out. Since Banks has protected waters and has had for longer than anywhere in New Zealand, using the Banks adult survival rate as a prior could result in a positive bias.
Thus, in areas that are demographically data free (particularly small or vulnerable areas like Te Waewae Bay and Golden Bay) the model has the potential of giving a picture that all is well, when there are no data that would give 'feedback' that the prior did not match empirical data (because there are no empirical data for those areas). For such cases that lack independent demographic data, and are small, and are clearly so genetically different that they have no connection to nearby populations for the purposes of rescue, there needs to be independent data to inform the model. Such verification data would include data on trends in abundance or estimates of adult survival.

34. Mike Lonergan clarified that subjectivity is not necessarily bad, but that it is important to be explicit about how choices were made.

35. Draft recommendation:

Sound

- The sound modelling was impressive, but a lot of computing power seems to be going into areas and frequencies that are not particularly relevant for Hector’s dolphins. Can the bounds (physical and noise frequency) and grid sizes (in time, space, and frequency) be ‘traded off’ to gain more spatial precision and generate results for more receiver locations? Maps with contours (or even bounds) of noise levels in the coastal habitat might be useful for discussions of rerouting traffic or otherwise limiting vessel activity.

- It was noted during Craig McPherson’s presentation that several sources of underwater sound that are particularly relevant to high-frequency cetaceans like Hector’s dolphins were not included in the JASCO modelling. If the results of this modelling are going to be used to help characterize and quantify noise disturbance as a threat, then the sound from small vessels (that are not normally equipped with AIS), echosounders, sonars and pile driving should either be incorporated into the modelling (which apparently would be prohibitively expensive) or, at a minimum, be described as a shortcoming of depending on this modelling study alone to account for the true scale of potential noise disturbance in the area. In later discussion it was noted that the auditory characteristics of Hector’s dolphins have not been characterized and that although these dolphins must hear at least within the same high frequency range in which they project sound, they may be able to hear in lower frequencies as has been shown for harbour porpoises. Captive Commerson’s dolphins (Cephalorhynchus commersonii) may provide an opportunity to quantify lower frequency hearing capacity and thereby improve evaluation of frequencies that likely heard by Hector’s dolphins. This would still leave unresolved the questions of how particular levels of exposure are likely to affect individuals and populations.

- Continue and if feasible expand acoustic monitoring with archival recorders in areas where Maui dolphins are ‘normally’ seen or are likely to be seen (based on habitat suitability, public sightings, historical information etc). Data obtained from such modelling would provide ground truthing for acoustic propagation models and more
importantly add high-frequency components, such as echosounders and sonar, that are currently not modelled.

- The initial efforts using C-PODs and sound traps to improve understanding of how far offshore Māui dolphins’ range were productive, and additional effort of this kind is encouraged. Passive acoustic monitoring should be further explored as a means of ground truthing the habitat suitability modelling results in areas of currently low dolphin density as well as learning more about dolphin occurrence in harbours, for example, where there is little or no coverage by aerial surveys or other sources.

36. It was re-emphasised that almost nothing is known regarding the hearing ability of Hector’s and Māui dolphins.

37. Barbara Taylor recognised that it is not always practical to undertake large expensive surveys on the entire population and suggested instead that priority should be given to the top few most vulnerable sub-populations.

38. Barbara Taylor then encouraged everyone to support the TMP review process to better enable the entire community to work together – “If you want to get nothing done, stir a controversy”.

39. In relation to the draft decision rules for dealing with small populations presented by the expert panel, a small group of relevant experts got together during one of the breaks to work out strata for reapportioning the Hector’s population estimates into the dolphin distribution model.

40. Meeting closed at 1700 hrs.

Next Steps

41. DOC and Fisheries New Zealand are now working through the recommendations from the international expert panel with NIWA. Some of this additional work was presented at to the Fisheries New Zealand Aquatic Environment Working Group on 6 September:

- Spatial distribution of recreational setnet fishing effort;
- Update on CPOD acoustic deployments for dolphin detection off Taranaki;
- Abundance and distribution of Hector’s dolphins on South Coast South Island; and
- Updated Māui dolphin population demographic modelling using input parameters derived from multi-threat risk assessment workshop.

42. For future updates on this work, progress on the Threat Management Plan review and opportunities for engagement, please refer to the TMP webpages:

Appendix 1 - Terms of Reference

All participants, including observers, were asked to agree to the Terms of Reference (TOR) at the start of the workshop. While some observers questioned the intent of parts, all agreed to abide by the TOR. The intent of the TOR was to ensure the integrity and robustness of the science review process and to prevent work in progress being presented externally out of context while still under review. The role of the observers is described quite strictly within the TOR for management of group size and discussion therefore requesting that observer input into the workshop is via the chair. In days 3 and 4 in particular the chair allowed for considerable participation by observers.
Appendix 2 - Workshop Agenda

Days 1 and 2 of the agenda were scheduled to allow the science advisors to present the data and inputs to the risk assessment to the expert review panel. There were several amendments to days 3 and 4 which largely allowed for discussion and questions for clarification, and more active participation by observers. Day 4 was spent in discussion with the expert review panel and the draft recommendations they presented to the workshop. The attached Agenda is the original Agenda and therefore does not reflect the discussion of Days 3 and 4.
Appendix 3 - Panel Recommendations
Appendix 4 – Workshop participants