BEFORE THE HEARINGS PANEL

IN THE MATTER of Schedule 1 of the Resource Management Act 1991

AND

IN THE MATTER of the Proposed Marlborough Environment Plan

MEMORANDUM OF COUNSEL FOR THE ENVIRONMENTAL DEFENCE SOCIETY INCORPORATED RESPONDING TO PANEL REQUEST FOR FURTHER INFORMATION

(TOPIC 6: INDIGENOUS BIODIVERSITY)

26 FEBRUARY 2018

.

Environmental Defence Society Inc
PO Box 91736
Victoria Street West, Auckland
1142

M C Wright
0274687778
madeleine@eds.org.nz

INTRODUCTION

1 Subsequent to hearing EDS's oral submissions and evidence on Topic 6 Indigenous Biodiversity on 5 February 2018 the Hearings Panel requested further information on two points:

- Professor Thrush's proposed revised definitions of "dredging" and "bottom trawling".
- Compilation of the key research documents relied on by Professor Thrush and EDS as providing justification for control of fishing dredging and bottom trawling in significant marine sites, and on sediment impacts in the Marlborough Sounds.

DEFINITIONS

Dredging

2 In giving oral evidence Professor Thrush recommended that the current definition of "dredging" in the proposed Marlborough Environment Plan (**MEP**) be amended to capture dredging for fishing purposes as follows:

> *Means the use of mechanical devices that that as defined by their very purpose come into contact (or 10m above it) with the seafloor and are moved across the seabed including (but not limited to) for:*
>
> - ~~*any activity involving the dredging of the seabed to*~~ *provide**ing** an adequate water depth for any purpose**;**~~*; and includes*~~*
> - ~~*any dredging activity necessary to*~~ *maintain**ing** water depth levels*~~*.*~~ *; and*
> - *fishing.*

Bottom trawling

3 In response to questions regarding the adequacy of the definition of bottom trawling proposed in the s42A Report, Professor Thrush recommended the following amendments in order to capture the entire trawling structure[1]:

> *The action or practice of fishing by dragging a net including associated mechanical or other supporting operational devices over or just above the seabed.*

RESEARCH DOCUMENTS

4 The following documents are provided in response to the Hearings Panel's request for hard copies of research which illustrates environmental effects relating to fishing and. A short blurb is provided in respect of each. Documents are provided in order of date of publication beginning with the most recent.

[1] Specifically, Professor Thrush outlined that trawl nets are held open by mechanical arms commonly called 'doors' and that often it is the 'doors' not the net which comes into contact with the sea floor.

Fishing

- **Foveau, A., S. Vaz, N. Desroy, and V. E. Kostylev.** 2017. Process-driven and biological characterisation and mapping of seabed habitats sensitive to trawling. PLoS ONE **12**. Paper is based on work in the highly impacted North Sea. It nevertheless shows that more complex seafloor habitats are negatively correlated to trawling pressure.

- **Ordines, F., M. Ramón, J. Rivera, C. Rodríguez-Prieto, M. T. Farriols, B. Guijarro, C. Pasqual, and E. Massutí.** 2017. Why long term trawled red algae beds off Balearic Islands (western Mediterranean) still persist? Regional Studies in Marine Science **15**:39-49.
  Study focuses on red seaweeds – similar to those identified in the MEP's SMAs. Shows impacts on these seaweed beds.

- **Thrush, S. F., K. Ellingsen, and K. Davis.** 2015. Implications of fisheries impacts to seabed biodiversity and ecosystem-based management. Ices Journal of Marine Science 10.1093/icesjms/fsv114.
  Conference presentation that emphasised the lack of consideration of seafloor biodiversity in fisheries management – and what we might consider doing about it.

- **Mangano, M. C., M. J. Kaiser, E. M. D. Porporato, G. I. Lambert, P. Rinelli, and N. Spanò.** 2014. Infaunal community responses to a gradient of trawling disturbance and a long-term Fishery Exclusion Zone in the Southern Tyrrhenian Sea. Continental Shelf Research **76**:25-35.
  Paper shows that large and long lived animals are more abundant in areas not subjected to trawling.

- **Lambert, G. I., S. Jennings, M. J. Kaiser, T. W. Davies, and J. G. Hiddink.** 2014. Quantifying recovery rates and resilience of seabed habitats impacted by bottom fishing. Journal of Applied Ecology **51**:1326-1336.
  Study in the Irish Sea. Shows recovery of species after trawling ranged from <1 to >10 years, depending on the group, with faster recovery in areas with faster tidal currents. Importantly the work shows recovery of large species was faster when conspecifics were abundant within a radius of 6 km, suggesting an important role for maintaining local sources of recruits to repopulate impacted areas. They conclude that limiting bottom trawls and dredge fisheries to more resilient areas and maintaining unfished patches interspersed within those areas will minimise the collective impacts of a given amount of fishing effort on seabed habitats.

- **van Denderen, P. D., N. T. Hintzen, A. D. Rijnsdorp, P. Ruardij, and T. van Kooten**. 2014. Habitat-Specific Effects of Fishing Disturbance on Benthic Species Richness in Marine Soft Sediments. Ecosystems **17**.
  North Sea study. Shows negative relationship between trawling intensity and species richness (a measure of biodiversity).

- **Thrush, S. F., and P. K. Dayton.** 2010. What can ecology contribute to ecosystem-based management? Annual Review of Marine Science **2**:419-441.

This paper argues for the need for an ecosystem-based and non-sectarian management approach to managing marine ecosystems. Fishing impacts are a central issue in this context.

- **de Juan, S., M. Demestre, and S. F. Thrush**. 2009. Defining ecological indicators of trawling distrubance when everywhere that can be fished is fished: A Mediterranean case study. Marine Policy **33**:472-478.
  This study highlights the difficulty of finding meaningful areas for comparison of trawling effects in fishing grounds as generally everywhere that can be fish is fished.

- **de Juan, S., S. F. Thrush, and M. Demestre.** 2007. Functional changes as indicators of trawling disturbance on a benthic community located in a fishing ground (NW Mediterranean Sea). Marine Ecology-Progress Series **334**:117-129.
  This study was conducted in the north western Mediterranean. It examined seafloor communities in fished areas and in an area that had been a marine reserve for 20 years. It showed the seafloor in the reserves was characterised by higher abundance of surface living animals, especially suspension feeders (similar kinds of animals as found in the MEP's SMAs). This study clearly demonstrates that changes in the functional components of a benthic community can result from fishing in areas dominated by organisms not considered especially vulnerable to trawling activities.

- **Callaway, R., G. H. Engelhard, J. Dann, J. Cotter, and H. Rumohr.** 2007. A century of North Sea epibenthos and trawling: Comparison between 1902-1912, 1982-1985 and 2000. Marine Ecology Progress Series **346**:27-43.
  Paper is based on North Sea. Assesses seafloor communities over the last century and shows decreases in large, long-lived species with delicate shells or exoskeletons. Concludes changes in abundance of animals living on the seafloor were observed since the beginning of the 20th century and have resulted primarily from intensified fisheries.

- **Thrush, S. F., J. S. Gray, J. E. Hewitt , and K. I. Ugland.** 2006. Predicting the effects of habitat homogenization on marine biodiversity. Ecological Applications **16**:1636-1642.
  This paper is based on work in the Hauraki Gulf and Tasman Bay. It highlights how the loss of sensitive habitats (to physical disturbance and sedimentation) will reduce biodiversity and ecosystem function.

- **Talman, S. G., A. Norkko, S. F. Thrush, and J. E. Hewitt**. 2003. Habitat structure and the survival of juvenile scallops (*Pecten novaezelandiae*): comparing predation in habitats with varying complexity. Marine Ecology Progress Series **269**:209-221.
  This study is based on field work in Tasman Bay and laboratory experiments. It shows how the removal of habitat forming organisms and associated habitat structure (as created by organisms protected in SMAs) increases the mortality of juvenile scallops.

- **Thrush, S. F., and P. K. Dayton.** 2002. Disturbance to marine benthic habitats by trawling and dredging - Implications for marine biodiversity. Annual Review of Ecology and Systematics **33**:449-473.
  Summarises global research on the impacts of trawling and dredging on biodiversity and ecosystem function.

- **Rester, J.K.** 2000. Annotated bibliography of fishing impacts on habitat. Gulf States Marine Fisheries Commission. Number 73. Ocean Springs, Mississippi. 168 p.
  This list of older papers considering impacts on seafloor habitats and biodiversity – it provides a summary of a large number of papers.

- **Thrush, S. F., J. E. Hewitt, V. J. Cummings, P. K. Dayton, M. Cryer, S. J. Turner, G. Funnell, R. Budd, C. Milburn, and M. R. Wilkinson**. 1998. Disturbance of the marine benthic habitat by commercial fishing: impacts at the scale of the fishery. Ecological Applications **8**:866-879.
  This study from the Hauraki Gulf was the first in the world to show changes in seafloor biodiversity at the scale of the fishery. In the general sense the trends observed with increasing fishing pressure have been supported by many more recent studies from around the world.

- **Dayton, P. K., S. F. Thrush, T. M. Agardy, and R. J. Hofman.** 1995. Environmental effects of fishing. Aquatic Conservation: Marine and Freshwater Ecosystems **5**:205-232.
  Early review of fishing impacts. This was fundamental in drawing attention to loss of seafloor biodiversity.

Sediment

- **Thrush et al**, Muddy waters: elevating sediment input to coastal and estuarine habitats, Frontiers in Ecology (2004), 2(6): 299–306, The Ecological Society of America.
  This is a summary of about 10 years of research on the reposition of terrestrial sediment on the seafloor, the effects of elevated suspended sediment concentrations and the implications for biodiversity and ecosystem function.

5 Further research, in particular on sediment impacts, can be provided on request.

M C Wright
Counsel for EDS