OMV GSB Hearing presentation

Applications for marine consent and marine discharge consent under the EEZ-CS Act (2012)

Before the EPA Decision Making Committee, 31 July 2019

Lyndon DeVantier, PhD

Oppose.

Cumulative Effects – ‘reductio ad absurdum’ or holism?

Cumulative effects of O&G mining applications under the EEZ-CS Act have all been deemed by industry consultants and EPA to be ‘low or negligible’, taking a reductionist view.

In the present case, sig. infrastructure must be put in place, and serviced, before the trace amounts of harmful substances that this hearing is deliberating over will be produced. In a holistic, rather than reductionist, view, placement and operation of that infrastructure are all cumulative effects of the application, with major attendant risks, not just the discharge itself, irrespective of ‘notification’ status.

Deepwater Horizon photos courtesy Wikipedia

Cumulative Effects

Assessments for notified (and non-notified) applications under the EEZ-CS Act should focus on the overall impact, including synergisms, of adding that application to those already occurring, and predicted to occur in coming decades.

This is consistent with Sections 6, 28, 33 and 59 of the EEZ-CS Act, which provide broad discretion to the DMC, and also consistent with the Precautionary Principle.

EEZ-CS Act ‘cumulative effects’

6 Meaning of effect

(1) In this Act, unless the context otherwise requires, *effect* includes—

(a) any positive or adverse effect; and

(b) any temporary or permanent effect; and

(c) any past, present, or **future** effect; and

(d) any cumulative effect that arises **over time or in combination** with other effects; and

(e) any potential effect of high probability; and

(f) any potential effect of low probability that has a **high potential** impact.

(2) Subsection (1)(a) to (d) apply regardless of the scale, intensity, duration, or frequency of the effect.

EEZ-CS Act ‘cumulative effects’

33 Matters to be considered …

(3) The Minister must take into account—
(a) any effects on the environment or existing interests of allowing an activity with or without a marine consent, including—
(i) **cumulative effects**; and …
(i) the **effects of activities that are not regulated under this Act**; and
(ii) …
(d) the importance of **protecting the biological diversity and integrity of marine species, ecosystems, and processes**;
(e) the importance of **protecting rare and vulnerable ecosystems and the habitats of threatened species**; and
(f) **New Zealand’s international obligations**; and
(i) the nature and effect of other marine management regimes; …

UN Convention on Biological Diversity

Article 8 requires the following of Parties, including New Zealand (which signed and ratified the Convention in 1992 and 1993):

- Article 8(d) Promote the protection of ecosystems, natural habitats and the **maintenance of viable populations of species in natural surroundings**;
- Article 8(f) Rehabilitate and restore degraded ecosystems and **promote the recovery of threatened species**,…

Why is this relevant?

Threatened cetaceans from NZ waters

Species	IUCN Red List / NZ (if different)	Species	IUCN Red List / NZ (if different)
Antarctic Minke Whale	DD (NT)	Risso's Dolphin	LC
Common Minke Whale	LC	Short-finned Pilot Whale	DD
Southern Right Whale	LC **(NV) *****	Long-finned Pilot Whale	DD (NT)
Bryde's Whale	DD **(NC) ***	Spectacled Porpoise	DD
Sei Whale	**En**	False Killer Whale	DD (NT)
Humpback Whale	LC	Killer Whale	**DD (NC) ***
Fin Whale	**En**	Pygmy Sperm Whale	DD (NT)
Blue Whale	**En**	Southern Bottlenose Whale	**LC (DD)**
Pygmy Blue Whale (subspecies)	**En**	Hector's Beaked Whale	DD
Hector's Dolphin	**En (NE) ****	Shepherd's Beaked Whale	DD
Maui's Dolphin (subspecies)	**En (NC) ***	Cuvier's Beaked Whale	**LC (DD)**
Dusky Dolphin	DD	Ginkgo Toothed Beaked Whale	DD
Pan Tropical spotted Dolphin	LC	Gray's Beaked Whale	DD (NT)
Indo-Pacific Bottlenose Dolphin	DD	Arnoux's Beaked Whale	DD
Common Bottlenose Dolphin	**LC (NE) ****	Andrew's Beaked Whale	DD
Striped Dolphin	LC	Strap-toothed Whale	DD
Southern Right Whale Dolphin	**DD (NT)**	**Sperm Whale**	**Vu (NT)**

DD: Data Deficient; LC: Least Concern; Vu: Vulnerable; En: Endangered.

- **6 spp. Endangered**
- **1 sp. Vulnerable**
- **18 spp. Data Deficient**

*** 3 spp. Nationally Critical (NC)**
**** 2 spp. Nat. Endangered (NE)**
***** 1 sp. Nat. Vulnerable (NV)**
NT – Not Threatened

Threatened NZ sea and shore-birds

Nationally Critical

Most severely threatened, facing an immediate high risk of extinction:

- Antipodean wandering albatross/toroa
- Black-billed gull/tarāpuka
- Chatham Island oystercatcher/tōrea tai
- Chatham Island shag
- Chatham Island tāiko
- Gibson's wandering albatross/toroa
- Kermadec white-faced storm petrel
- New Zealand fairy tern/tara iti
- Pacific white tern
- Pitt Island shag
- Salvin's albatross/toroa
- Shore plover/tuturuatu
- South Georgian diving petrel
- Southern New Zealand dotterel/tūturiwhatu
- White heron/kōtuku

Source: https://www.doc.govt.nz/nature/conservation-status/threatened-birds/

Nationally Endangered

Facing high risk of extinction in the short term:

- Black-fronted tern/tarapirohe
- Kermadec petrel "Summer"
- King shag
- Masked (blue-faced) booby
- Reef heron/matuku moana
- White-bellied storm petrel

Nationally Vulnerable

Facing a risk of extinction in the medium term:

- Auckland Island shag
- Banded dotterel/tūturiwhatu
- Black petrel/tāiko
- Campbell Island mollymawk
- Caspian tern/taranui
- Chatham petrel/ranguru
- Eastern rockhopper penguin
- Fiordland crested penguin/tawaki
- Flesh-footed shearwater/toanui
- Foveaux shag
- Grey-headed mollymawk
- Hutton's shearwater
- New Zealand storm petrel

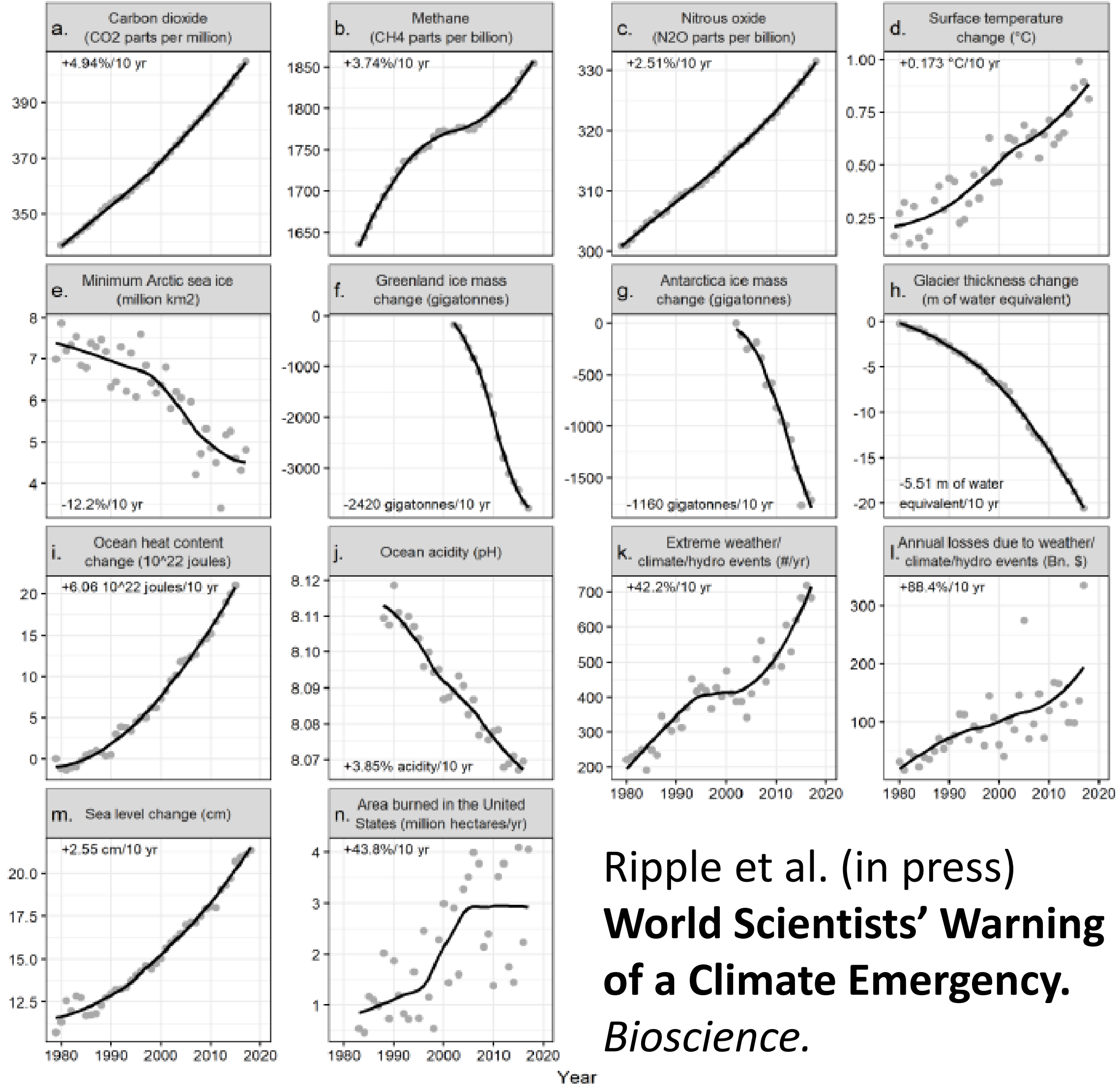
The Future: A ‘Perfect Storm’ of cumulative effects

The physical, chemical and biological oceanography of earth’s oceans are changing, not just from local industrialization, but also from climate disruption. Rising sea temperature, storms, ocean acidification, deoxygenation and associated impacts on productivity and food webs will all increase in coming decades.

Sir Peter Gluckman (2013): *“For New Zealand, the resulting impact of changes in wind patterns, precipitation, and the chemistry of our oceans can be expected to be at least as significant as the changes in temperature itself.”*

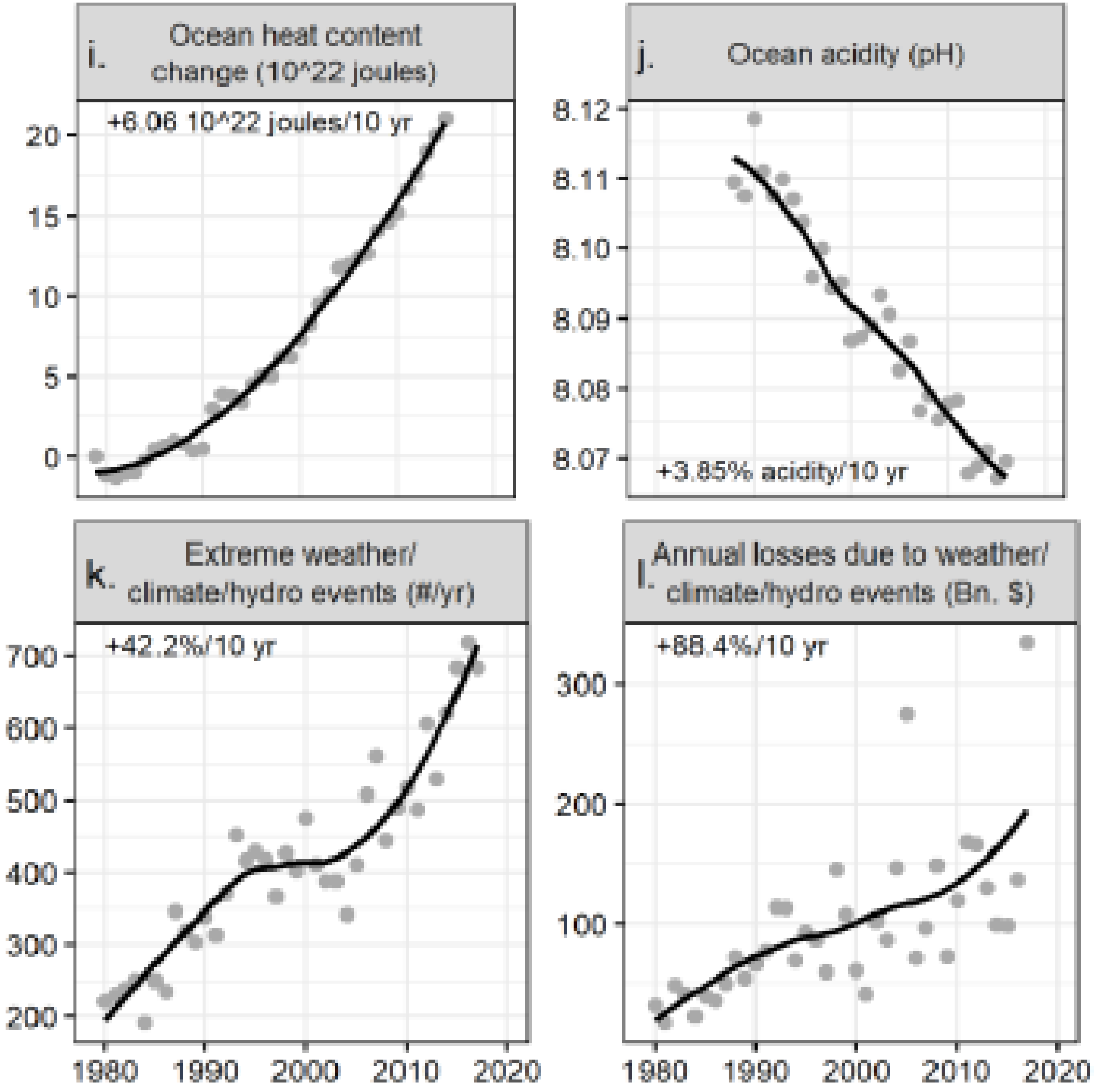
‘Cumulative effects’ under Sections 6, 28, 33 and 59 of EEZ Act

Eg. see: Babcock et al. (2019) Severe Continental-Scale Impacts of Climate Change Are Happening Now: Extreme Climate Events Impact Marine Habitat Forming Communities Along 45% of Australia’s Coast. *Front. Mar. Sci.* https://doi.org/10.3389/fmars.2019.00411



Ripple et al. (in press) **World Scientists' Warning of a Climate Emergency.** *Bioscience.*

Figure 2. Climatic response time series from 1979 to the present. Rates shown in panels are the decadal change rates for the entire ranges of the time series. These rates are in percentage terms, except for the interval variables (d, f, g, h, i, m), where additive changes are reported instead. For ocean acidity (pH), the percentage rate is based on the change in hydrogen ion activity, a_{H^+} (where lower pH values represent greater acidity). Annual data are shown using gray points. Black lines are local regression smooth trend lines. Sources and additional details about each variable are provided in supplemental file S2.



Climate system feedbacks and tipping points:
why this is an emergency driving a mass extinction

- Polar and sub-polar albedo loss
- Melting permafrost releasing methane
- Warming oceans releasing methane from ‘ice gas’ hydrates
- Industrial agriculture releasing methane & nitrous oxide
- Related deforestation
- Among others

Anthropocene mass extinction

Patterns of past marine extinctions are, among other factors, linked to climate change, high levels of CO_2, acidification and deoxygenation.

‘Those who do not remember the past are doomed to repeat it’ (George Satayana).

Sources:

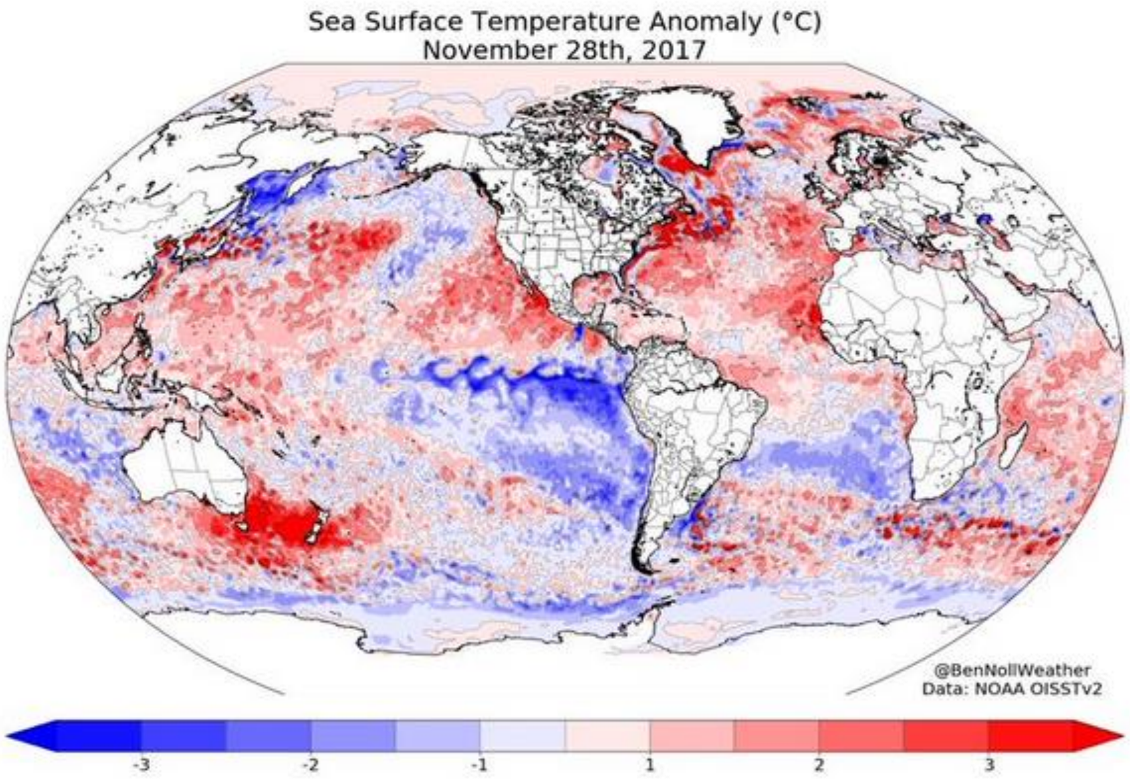
Keller, G. 2005. Impacts, volcanism and mass extinction: random coincidence or cause and effect? *Australian Journal of Earth Science* 52/4: 725-757.

Ward, P. 2007. Under a Green Sky: Global warming, the mass extinctions of the past, and what they can tell us about our future. HarperCollins, NY, 135 pp.

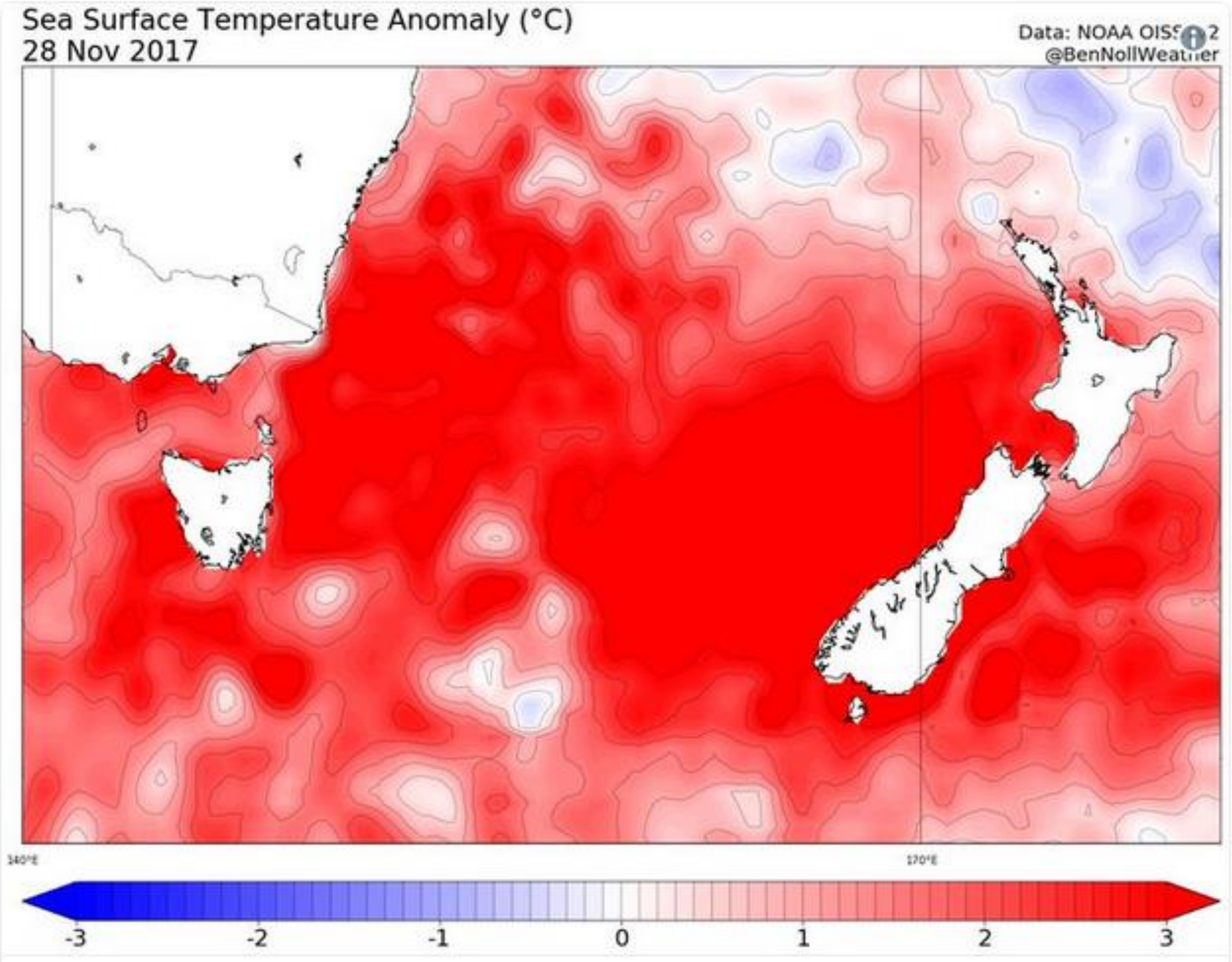
Veron, J.E.N. 2008. Mass extinctions and ocean acidification: biological constraints on geological dilemmas. *Coral Reefs* 27: 459-472.

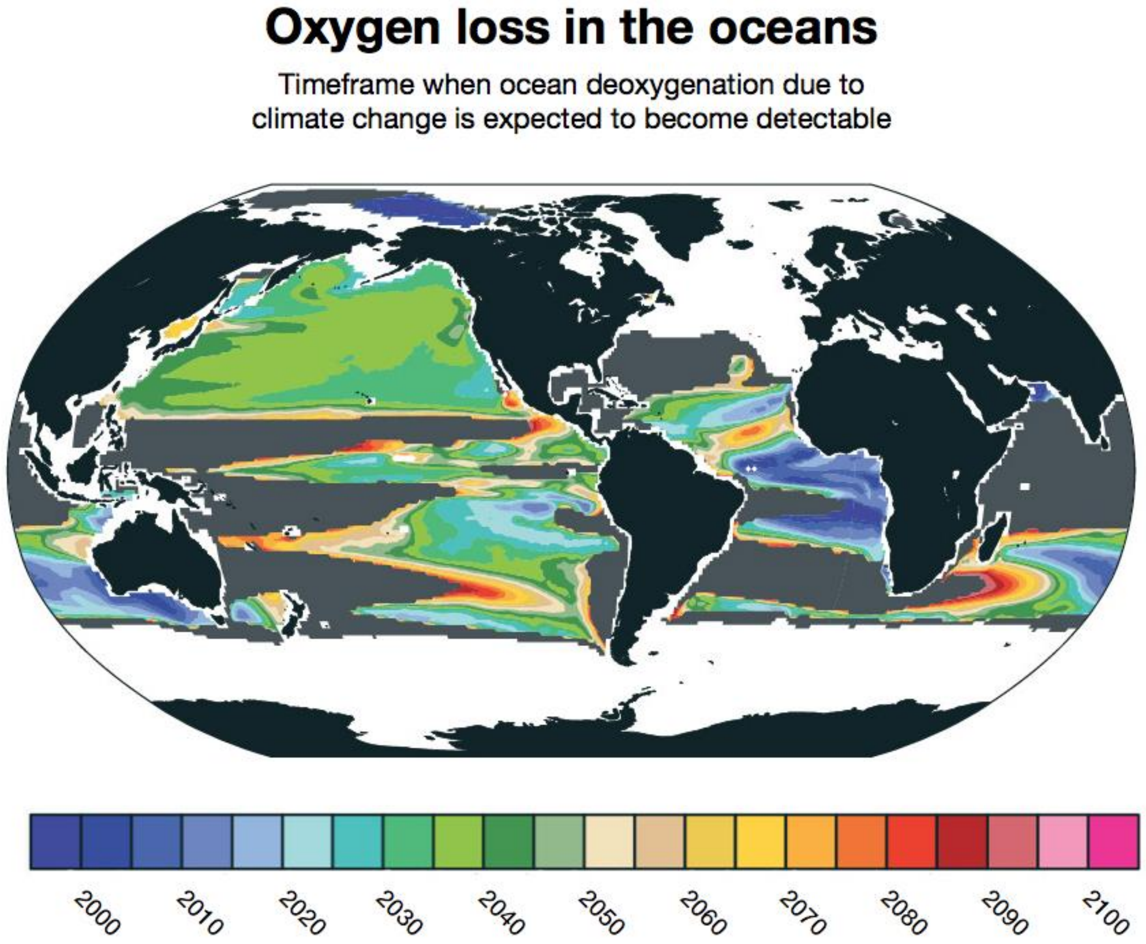
Royer, D. 2008. Linkages between CO_2, climate, and evolution in deep time. *Proceedings National Academy of Science* 105: 407–408.

NZ EEZ temperature 'snapshot' 28th Nov. 2017



Record-breaking sea temps have cascading effects on food webs (eg. 'drastic reduction in krill biomass'). Johnson et al. (2011) Climate change cascades: Shifts in oceanography, species' ranges and subtidal marine community dynamics in eastern Tasmania. JEMBE doi:10.1016/j.jembe.2011.02.032





Oceans already showing Oxygen loss – direct ‘cumulative effect’ on ecosystems and indirect effect on threatened species via trophic cascades.

High-precision O_2 measurements dating to 1991 suggest that ocean warming is at the high end of previous estimates.

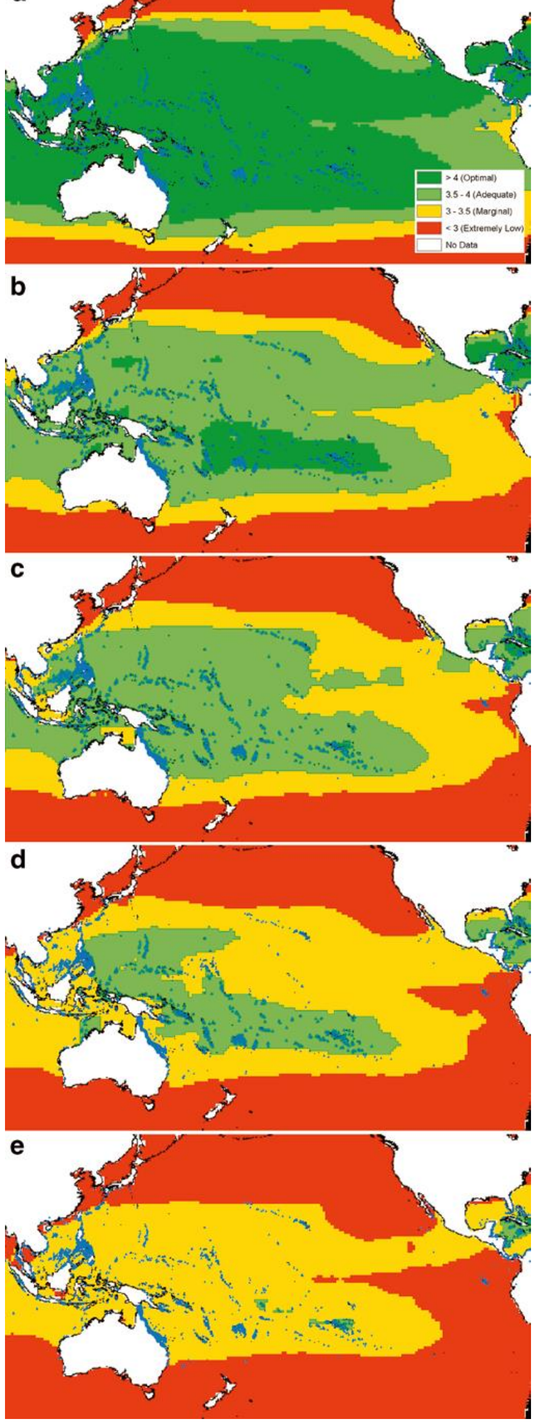
Deoxygenation is already detectable - will likely become widespread by 2040.

Long et al. (2016) Finding forced trends in oceanic oxygen. *Global Biogeochemical Cycles* 30: 381-397.
Ito et al. (2017) Upper Ocean O2 trends: 1958-2015. *Geophysical Research Letters* DOI: 10.1002/2017GL073613
Resplandy et al. (2018) Quantification of ocean heat uptake from changes in atmospheric O2 and CO2 composition. *Nature* 563: 105-107
Clarkson et al. (2018) Uranium isotope evidence for two episodes of deoxygenation during Oceanic Anoxic Event 2. *PNAS* 115: 2918-2923
Bartlett et al. (2018) Abrupt global-ocean anoxia during the Late Ordovician–early Silurian detected using uranium isotopes of marine carbonates. *PNAS* 115: 5896-5901

Ocean acidification

- rapidly changing the carbonate system of the oceans. Past mass extinction events have been linked to ocean acidification, and the current rate of change in seawater chemistry is unprecedented. Evidence suggests that these changes will have significant consequences for marine taxa, particularly those that build skeletons, shells, and tests of biogenic calcium carbonate.

High latitude reefs become extremely marginal (W_{arag} <3.0) by 2069 (Fig. 2e).



Aragonite saturation state

a. Calculated pre-industrial (1870) values; pCO_2=280 ppmv.

b. Projected values, 2000–2009; pCO_2=375 ppmv.

c. Projected values, 2020–2029; pCO_2=415 ppmv.

d. Projected values, 2040–2049; pCO_2= 465 ppmv.

e. Projected values, 2060–2069; pCO_2=517 ppmv.

Sources: Guinotte et al. 2003. *Coral Reefs* 22: 551-58; Guinotte & Fabri 2008. Ann. N.Y. Acad. Sci. 1134: 320–342 (2008).C©2008 New York Academy of Sciences. doi: 10.1196/annals.1439.01

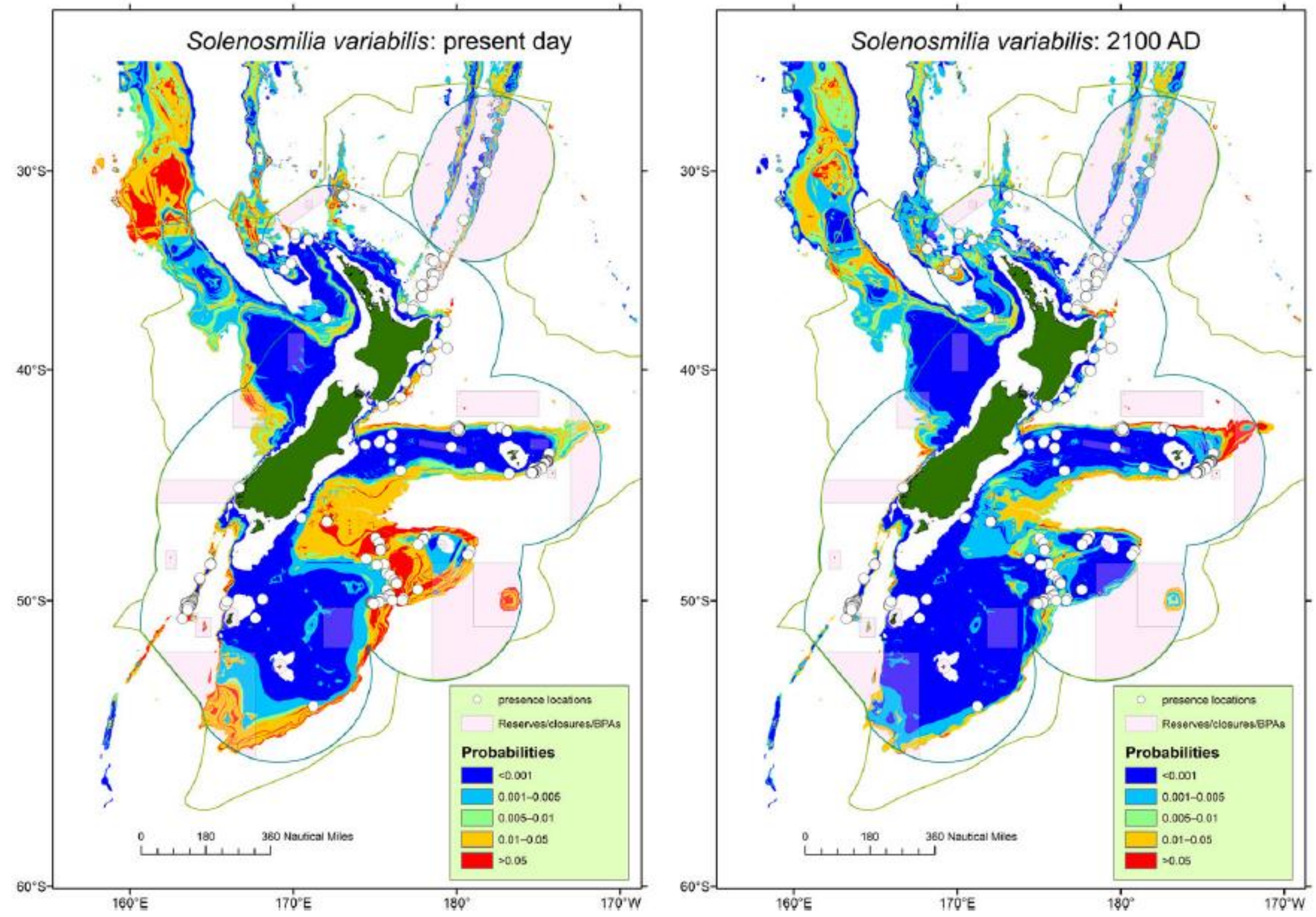


Figure 6. Habitat suitability maps for *S. variabilis* based upon present-day distribution from bottom tow data (left panel), and projected future distribution derived using an ESM (right panel, Anderson et al. 2016).

Law et al. (2017): 'From a broad survey of New Zealand cold-water coral species and carbonate saturation, Tracey et al. (2013) identified a strong dependency of coral distribution on ΩA and ΩC. …. A general decline in suitable habitat was identified for *S. variabilis* in most regions by 2100 …'

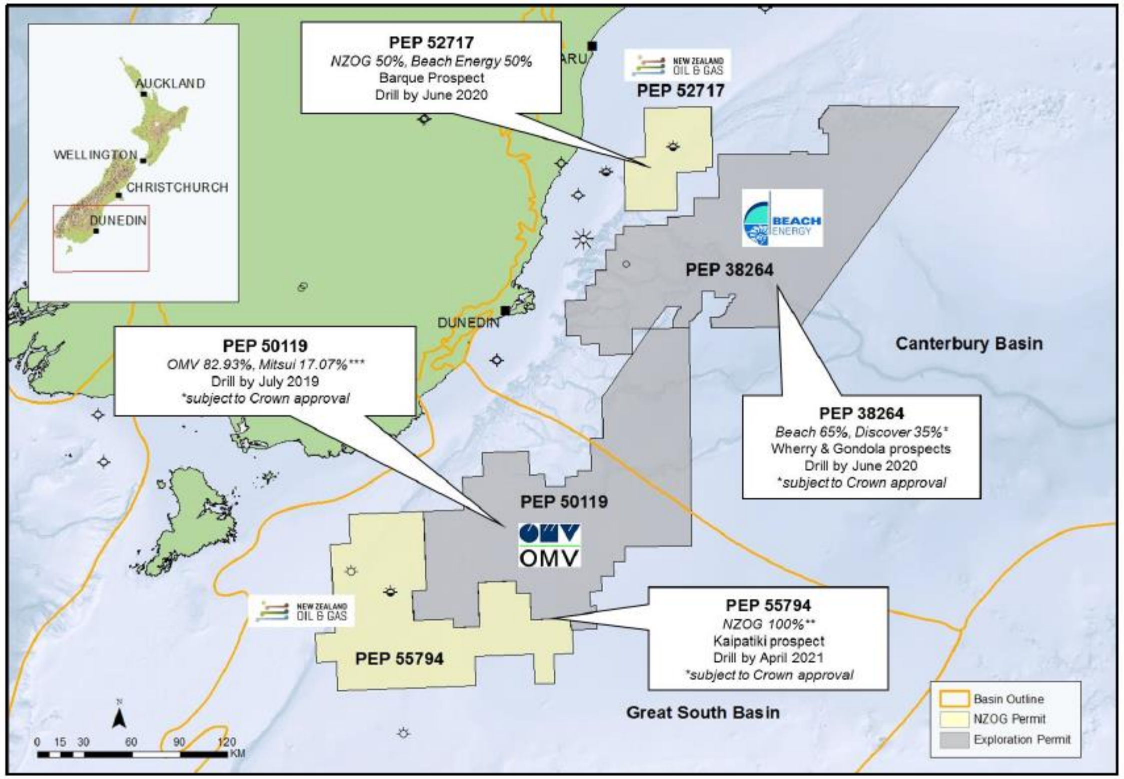
Law et al. (2017) Ocean acidification in New Zealand waters: trends and impacts, New Zealand Journal of Marine and Freshwater Research. http://dx.doi.org/10.1080/00288330.2017.1374983

New Zealand's Great Southern Drilling Opportunity

NEW ZEALAND OIL & GAS

South Islands upstream landscape is evolving

- PEP 52717 Change of Conditions granted
  - Drill or Drop extended to April 2019
- Woodside withdrawing from PEP 55794 *
  - NZOG to acquire 100% (and Operatorship) (subject to regulatory approval)
- Shell exiting New Zealand & PEP 50119 **
  - Commitment well currently planned to be drilled in early 2019 (now by OMV?)
- Anadarko exiting Wherry (PEP 38264) ***
  - Leaving Beach & Discover
  - Extension situation being worked through



*	Assumes Woodside withdraw from permit
**	Assumes OMV acquire Shell's interest in PEP50119
***	Assumes Lattice Energy Deal is granted Section 41 consent and Beach and Discover resting interest 65:35

Slide by Dr. Chris McKeown
VP Exploration & Production, May 2018

May 2018 PESA Deal Day 2018 2

The rush for black gold continues unabated, as per the GSB 'opportunity' presented by NZ O&G.

Note that PEPs overlie potential future remaining habitat of *Solenosmilia variablis* and associated ecosystem.

It’s not just corals, it’s across food web. BUT sig. data gaps

Table 3. Qualitative assessment of a) the vulnerability, and b) the current state of knowledge of different aspects of OA research for the major biotic groups in New Zealand waters, based upon publications cited in the respective sections in the text and detailed in Supplementary Table 1. Vulnerability is classified on a Low to High scale, with “?” indicating where vulnerability is currently unknown. Current knowledge is also classified on a Low to High scale, and based upon the number and results of published studies (see key), with “-“ indicating that no studies have been carried out. Ongoing New Zealand studies are indicated by “+”, with those in the CARIM project indicated by “*”.

From: Law et al. (2017)	Heterotrophs	Primary Producers		Primary and Secondary Consumers						Tertiary Consumers	Higher Trophic
	Bacteria	Phytoplankton	Macroalgae	Bryozoa	Sponges	Cold Water Corals	Crustacea	Molluscs	Echinoderms	Fish	Cetaceans, pinnepids, seabirds
a) Vulnerability to OA in NZ waters	**Low**	**Low-Med**	**Low-Med**	**?**	**?**	**Medium**	**?**	**Med-High**	**Med-High**	**?**	**?**
b) Current knowledge in NZ waters											
Established Response to OA	Medium*+	Medium*	Med-High	-	Low	Low-Med	-	Medium*	Medium+	Low-Med*	-
Mechanistic understanding of response	Low-Med	Low-Med	Medium	-	Low	Low	-	Low-Med*	Low-Med+	Low	-
Indirect/Ecosystem interaction	Medium*+	Low-Med*	Medium*	Low	Low	Low	-	Low	Low-Med	-	-
Interaction with other stressors	Low-Med*+	Med-High*	Medium	Low	Low	Low	-	Medium	Medium+	-	-
Socio-economic/Ecosystem services	Low	Low-Med	Low-Med	Low	-	Low	-	Medium	Low-Med		-
Adaptive capacity	-	-	-	-	-	-	-	-	Low	-	-

Key			
Low	single study low confidence	Low-Med	1-2 studies low-medium confidence
Medium	2-3 studies medium confidence	Med-High	4+ studies medium-high confidence

Adequate assessment of Cumulative Effects?

Always consigned to the 'too hard basket'.
Eg. Shell Taranaki Ltd witness Dr. Simon Childerhouse stated in evidence, before Shell sold out to OMV (October 2017):

"To address cumulative impacts quantitatively is not possible, as it is not possible to collect detailed data on all potential impacts across the region and their potential interaction due to their complexity and scale."

If this were true, what ever happened to the much-lauded Precautionary Principle?

Assessment of Cumulative Effects

It is not true. There are several quantitative and semi-quantitative approaches, including modelling future projections of changing sea temperature, acidification, upwelling and productivity based on present conditions and IPCC scenarios. This approach can examine future habitat marginality (eg. see previous maps for Aragonite saturation and distribution of *Solenosmilia variabilis*), and when coupled with population viability analyses would provide insights into future cumulative effects. Eg. Law et al. (2018) 'Advanced ecosystem models of OA, that incorporate the indirect effects of OA and interactions with other climate stressors, are required for robust projection of the future status of New Zealand marine ecosystems.'