

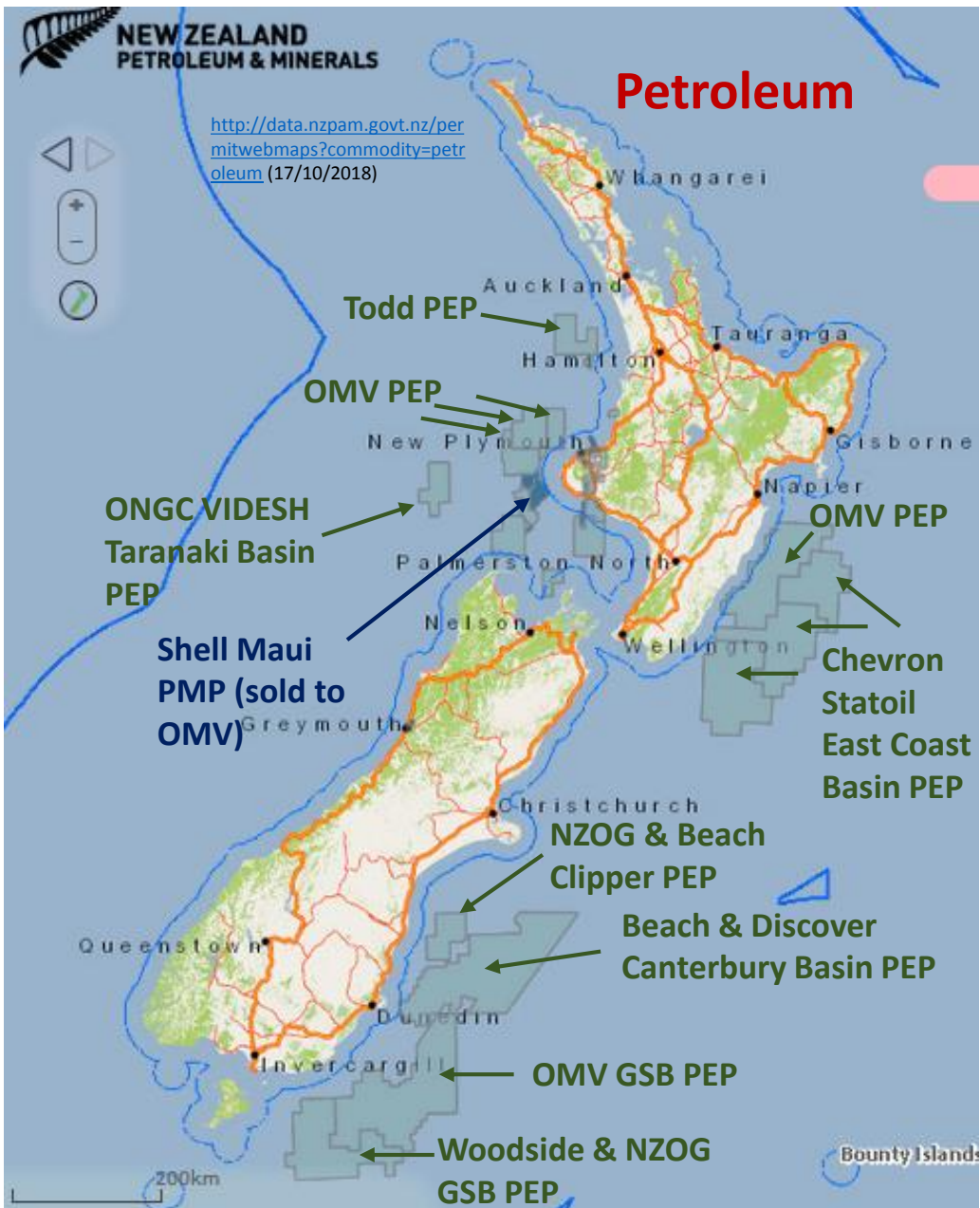
Offshore fossil fuel exploration & mining: Cumulative effects on Threatened species



‘Amazon Warrior’ seismic survey vessel
and Maui Platform, offshore Taranaki.
Photos from Stuff.co.nz

Lyndon DeVantier,
Climate Justice Taranaki
www.climatejusticetaranaki.wordpress.com





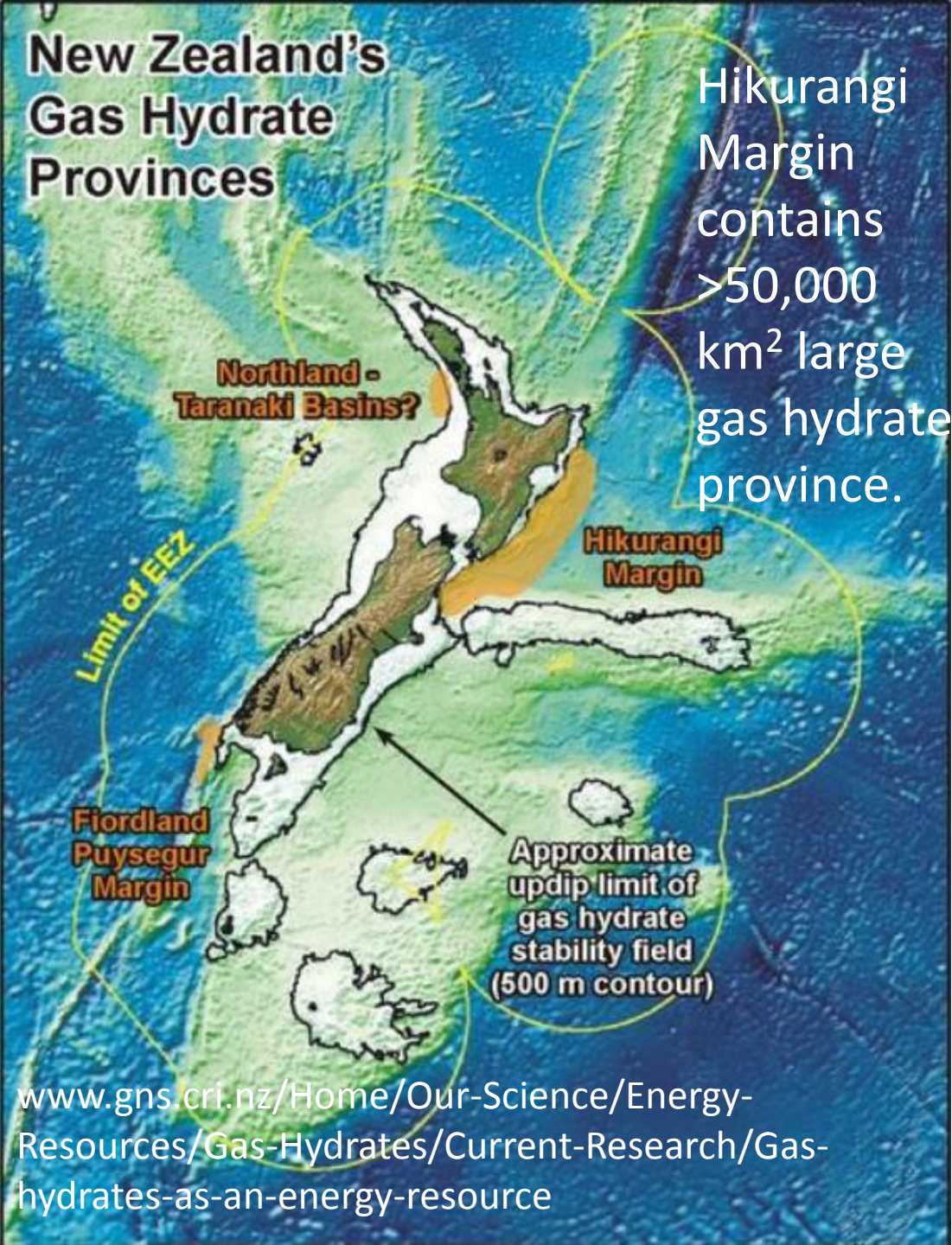
Previous NZ Govt policy (MBIE)

“The Government wants NZ to be a highly attractive global destination for petroleum exploration and production investment ... We have an opportunity to expand oil and gas exports. ... Our oil and gas production could be substantially increased – potentially to the point where New Zealand becomes a net exporter of oil by 2030.”

<https://www.mbie.govt.nz/info-services/sectors-industries/energy/documents-image-library/nz-energy-strategy-lr.pdf> (Accessed 15/3/2018).

“It is generally recognized that there is considerable potential for commercial hydrocarbon discoveries within New Zealand’s vast estate of approximately 6,000,000 km².” <https://www.nzpam.govt.nz/doing-business/investing-petroleum/resource-potential/> (28/12/18).

Future block offers? Policy changes?



GNS Science: research on NZ's gas hydrate deposits, with NIWA, U. Otago and U. Auckland, funded by MBIE (Harnessing New Zealand's gas hydrate resources: towards exploration drilling).

“Should even only a fraction of NZ’s gas hydrates be economically recoverable, they could provide the main source of natural gas for New Zealand for several decades (Pecher and GHR Working Group, 2011).”

Present NZ Government policy

- Nov 2018 Crown Minerals Amendment Bill ended all **new** oil & gas exploration offshore
- But existing permits continue for years to decades
- And Oct 2018 extension for OMV's drilling permit in GSB

“The Ministry of Business, Innovation and Employment (MBIE) has agreed to extend the Austrian oil and gas company's application for drilling the well from July 2019 to July 2021. MBIE said new geological data shows there was justifiable need to change elements of OMV's permit. The changes allow the company more time to ... drill the exploratory well. OMV's permit for exploration for oil and gas in the Great Southern Basin has not changed, and will expire in 2022. The company was granted the permit in 2007 for a 16,715 sq/km area.” <https://www.radionz.co.nz/news/business/368878/omv-gets-extension-to-drill-well-off-otago-coast>

Future Govt. Policy?

Future NZ Government policy (Energy & Resources)

Megan Woods (27/3/2018): "Our plan, in terms of being carbon neutral by 2050 by being down to 100 percent renewable electricity by 2035 are very clear indicators of the pathway this government wants to go on, and what our responsibility as a government now is to put together a very clear, a very predictable plan of what that transition looks like".

Those targets commit the government to a "long-term" transition away from fossil fuels and towards renewable energy. BUT: "We already have very long timelines on what is already consented - we're talking about 20 to 30 (years), in some case longer horizons here. What we have, is to chart out a pathway beyond that, and that is the job this government wants to **begin doing**". <https://www.radionz.co.nz/news/national/353496/govt-holds-off-on-block-offers-for-oil-and-gas-permits>

Main Legislation and Conventions

1. New Zealand

- **EEZ-CS Act** - administered by EPA
- **Crown Minerals Act – MBIE**
- RMA (to 12 nautical miles offshore) – mainly regional & district councils (Eg. TRC)
- **Marine Mammals Protection Act** (focus on fishing impacts, does not mention O&G) – DoC
- Wildlife Act - DoC, Marine Reserves Act – DoC, Fisheries Act – MPI
- Marine Transport Act – MoT
- **Pending - Zero Carbon Act?**

2. International

- MARPOL and London Convention – administered by MfE and MoT
- UN Framework Convention on Climate Change and subsequent updates –MfE
- **UN Convention on Biological Diversity** –MfE

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**,...

So how are we doing?



<https://koordinates.com/layer/6025-doc-marine-mammal-sanctuaries/>

Marine Mammal Sanctuaries

“... create a permanent refuge for marine mammals. Such sanctuaries may prohibit activities known to harm particular marine mammal species ...

Under the Marine Mammals Protection Act 1978, the Department of Conservation is responsible for administering and managing marine mammal sanctuaries.”

(1) Seismic survey is a permitted activity if it complies with DoC’s *2013 Code of Conduct for Minimising Acoustic Disturbance to Marine Mammals from Seismic Survey Operations*. *

* Subclause (1) does not apply to seismic surveying within Te Rohe o Te Whānau Puha Whale Sanctuary established under [section 11](#) of the Kaikōura (Te Tai o Marokura) Marine Management Act 2014.

W coast N Isl. Marine Mammal Sanctuary – established 2008

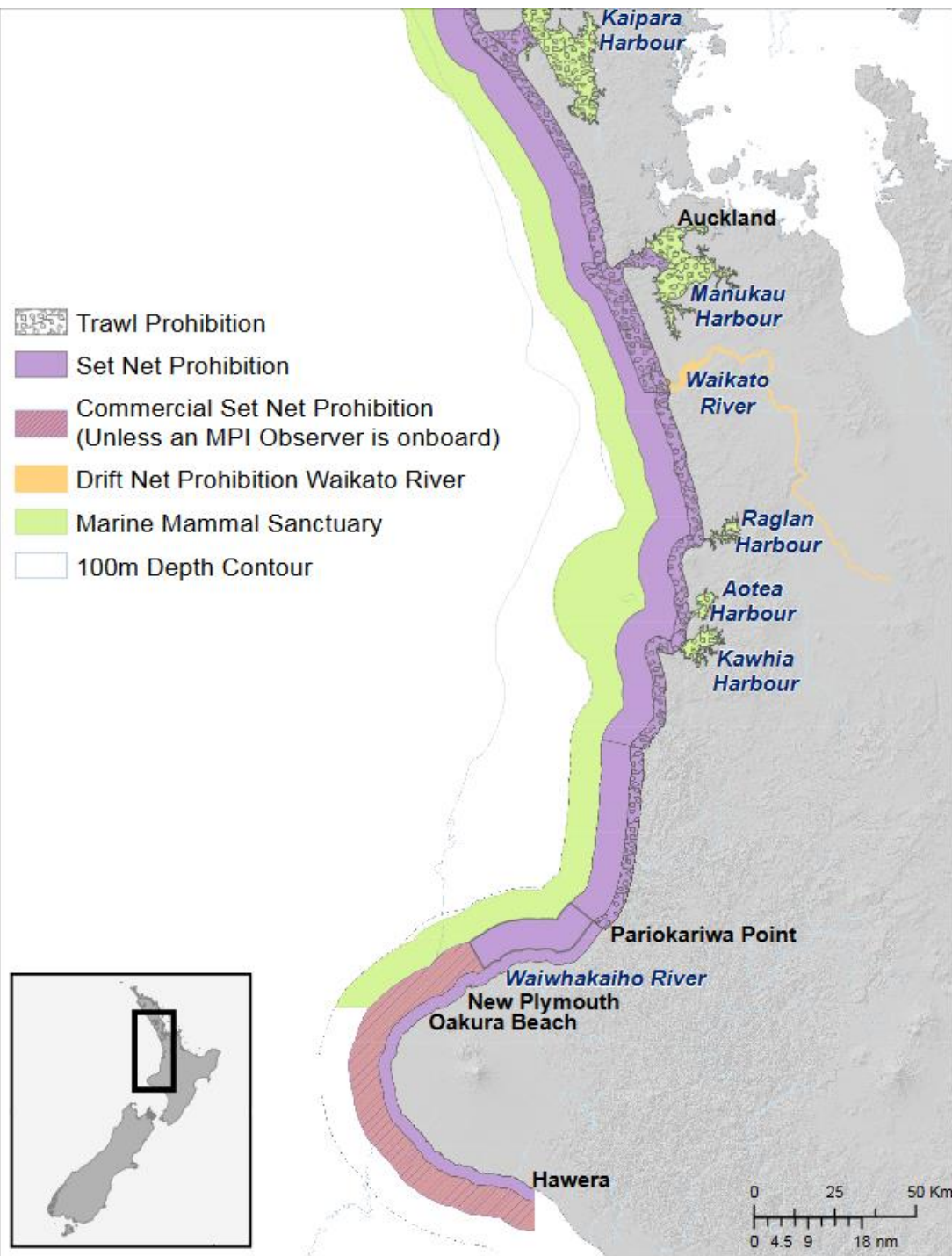
Maunganui Bluff to Oakura

Restrictions to set nets and trawling.

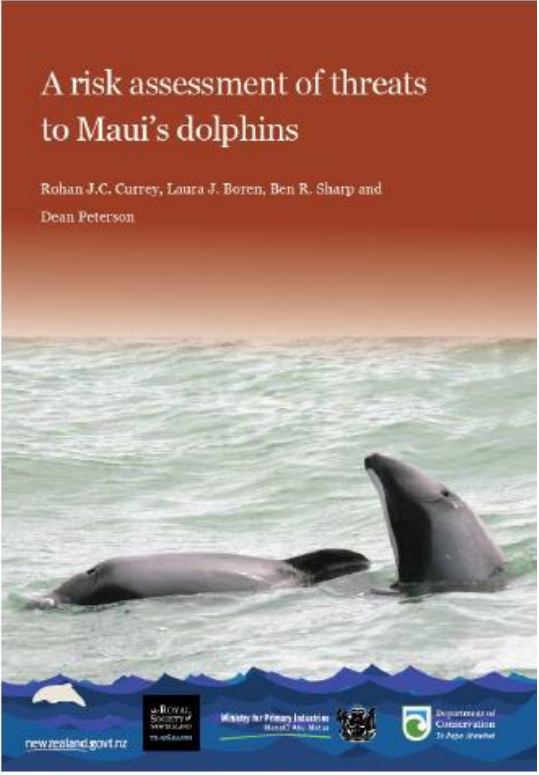
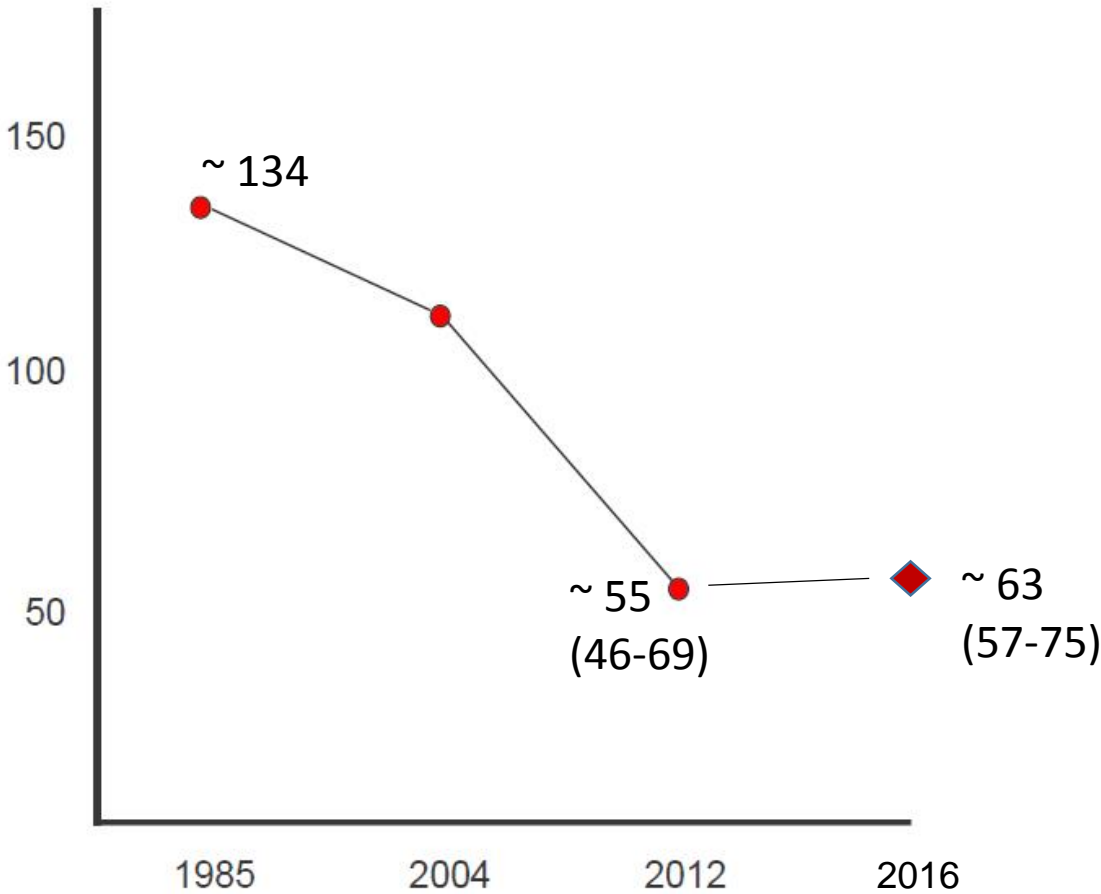
Non-fishing measures:

- Seismic surveys are permitted
- Seabed mining is prohibited out to two nautical miles along the full length of the sanctuary, and out to four nautical miles from south of Raglan Harbour to north of Manakau Harbour.

<http://www.doc.govt.nz/nature/native-animals/marine-mammals/dolphins/maui-dolphin/current-protection-measures/>



Maui's dolphin population decline

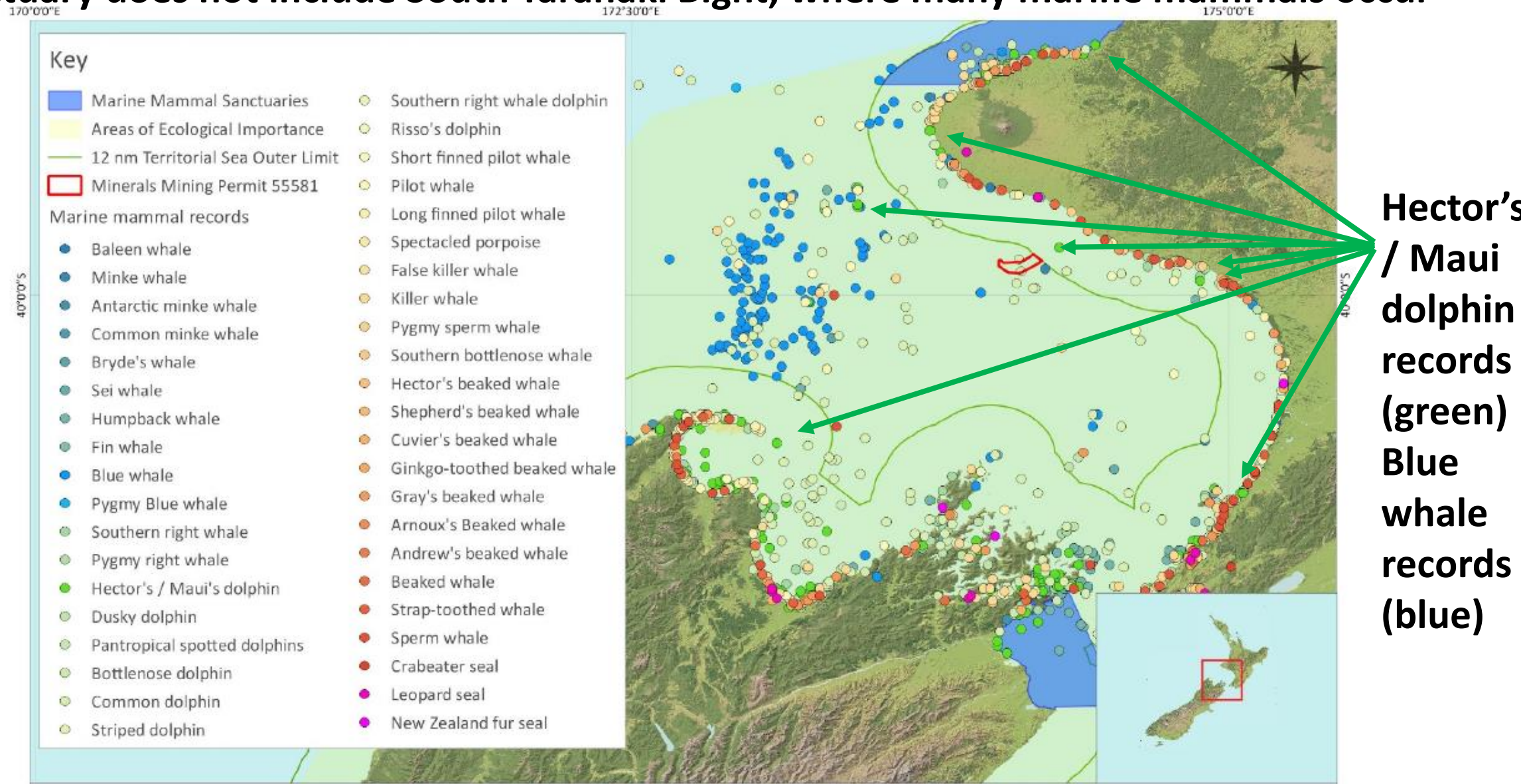


1985	140	(46-280)
2004	111	(48-252)
2012	55	(46-69)

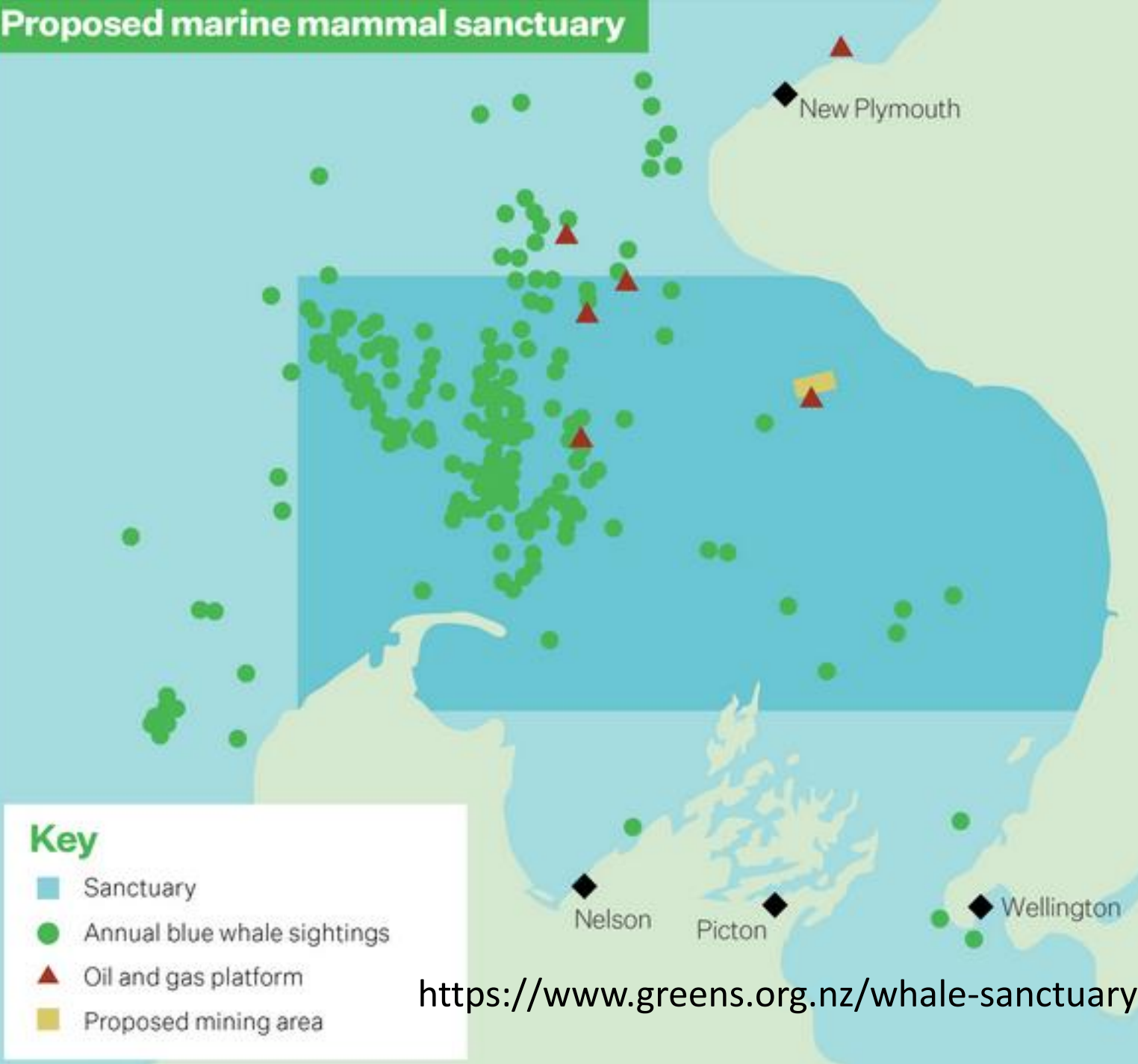
May have stabilized decline in Maui's dolphins – too soon to tell definitively

Slide modified, original courtesy Prof. Liz Sloaten

Sanctuary does not include South Taranaki Bight, where many marine mammals occur



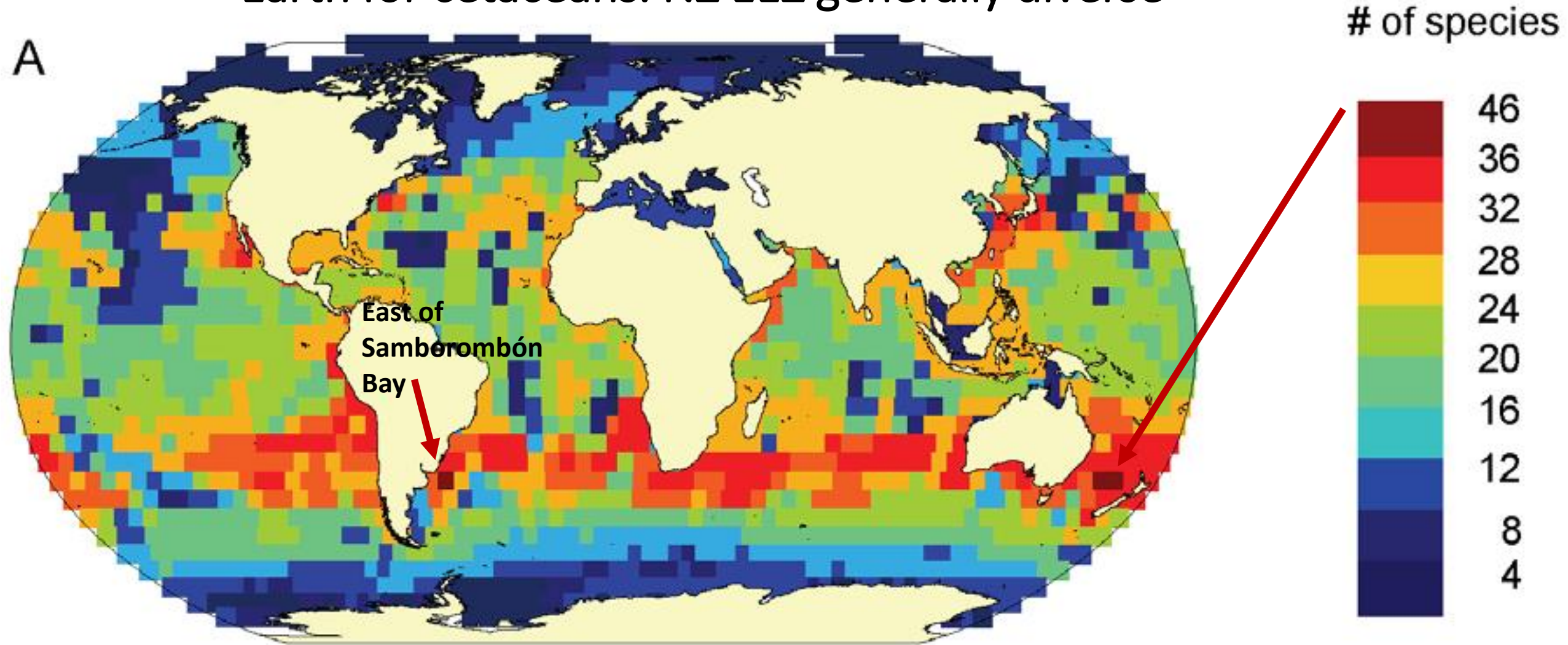
Proposed marine mammal sanctuary



Green Party, supported by F&B, propose new marine sanctuary to prevent seabed mining and phase out existing extractive activity, under the Marine Mammals Protection Act 1978.

- would be NZ's largest at around 30,000km²,
- boundaries would be confirmed following negotiation with iwi and affected communities, and advice from DoC.

Eastern Tasman Sea – Taranaki Bight: 1 of the 2 richest places on Earth for cetaceans. NZ EEZ generally diverse



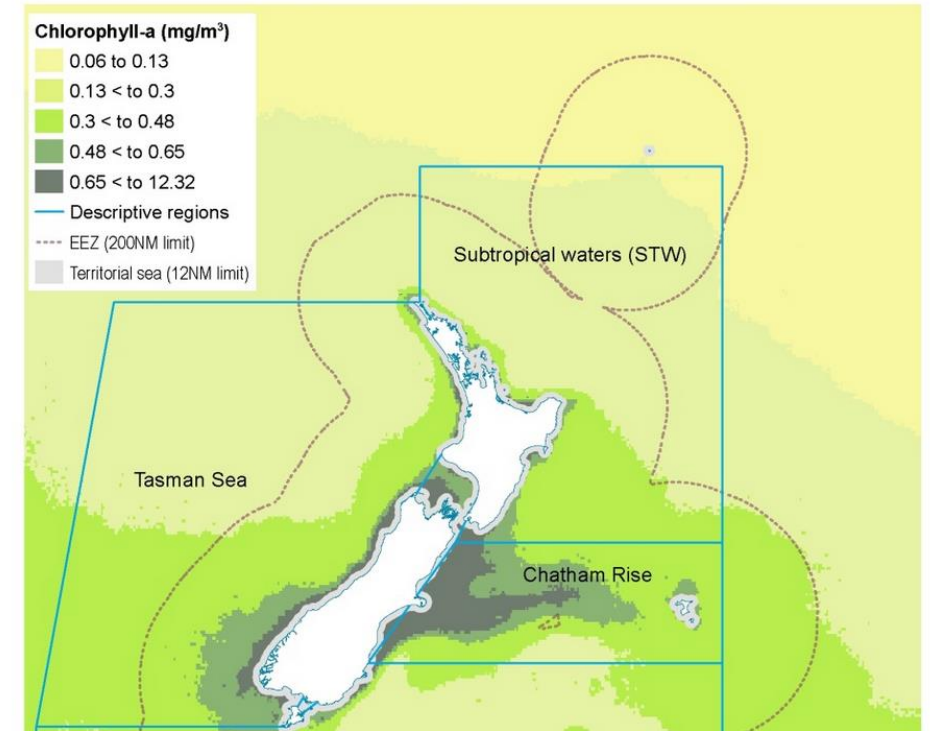
Kaschner et al. (2011) Figure 4. Validation with empirically observed marine mammal occurrences (56x56 cells, 1990–1999). A. Predicted species richness of all cetaceans.

Why is STB globally significant for cetaceans?



Courtesy Todd Chandler and
Dr. Leigh Torres

Primary productivity (chlorophyll-a concentrations), 1997–2016



http://archive.stats.govt.nz/browse_for_stats/environment/environmental-reporting-series/environmental-indicators/Home/Marine/primary-productivity.aspx

High productivity, evidenced by krill *Nyctiphanes australis*. Krill populations, and those of their predators, shift seasonally, related to upwelling off Farewell Spit, sea temperature and presence of phytoplankton (Foster & Battaerd 1985, Bradford & Chapman 1988, James & Wilkinson 1988 among others).

Species from South Taranaki Bight on IUCN Red List

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

Are cetaceans at risk? 1. Seismic survey

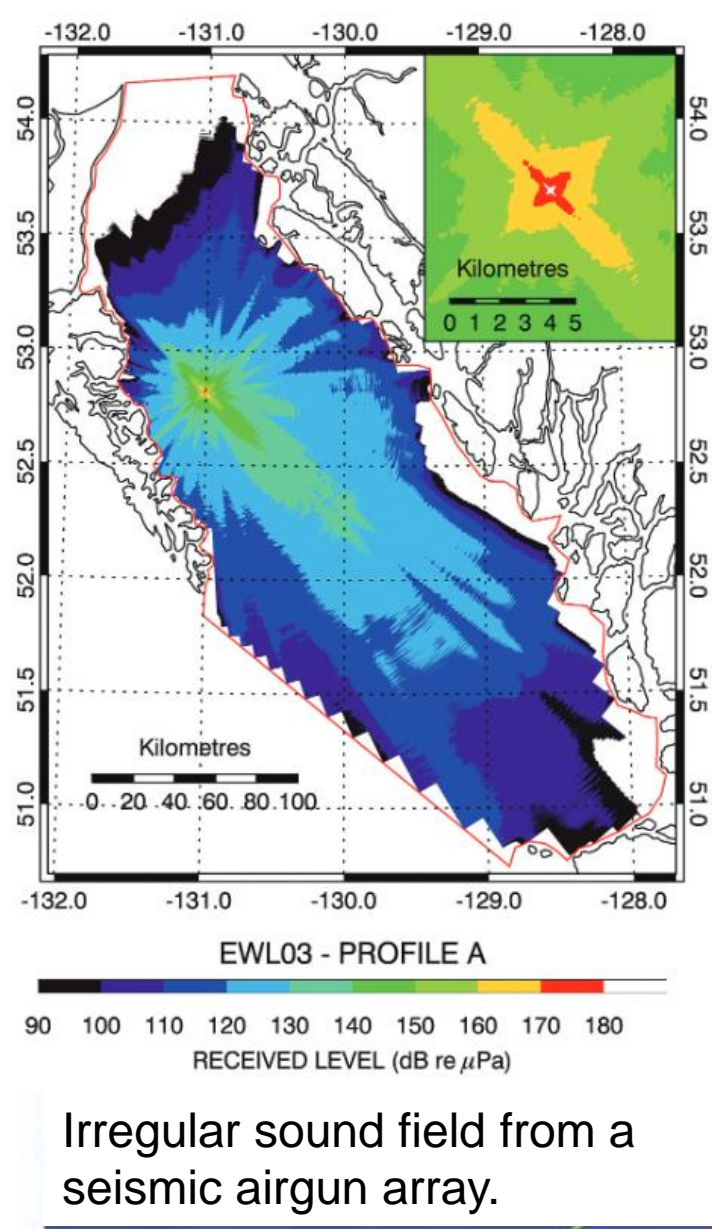
Petroleum Exploration and Production Association of NZ website (2/2018) claimed: *“For more than four decades, **seismic surveying and countless research projects (both in New Zealand and worldwide)** have shown **no evidence** to suggest that sound from oil and gas exploration activities in normal operating circumstances has **harmed marine species or marine ecological communities.**”*

Claim was challenged by Climate Justice Taranaki through the Advertising Standards Authority complaints board. CJT was vindicated:

“The Advertiser amended the two statements subject to complaint”

Are Cetaceans at risk? 1. Seismic surveys

Torres and Klinck (2017): seismic airguns elevated noise intensity across all frequencies, especially in the 10-80 Hz frequency range, which is where the blue whale and many other large baleen whales hear and communicate. DoC's Code of Conduct "*... only stop airgun blasting when animals are within 1,000 m of the vessel (1.5 km if a calf is present), yet seismic airgun blasts are so intense that the noise travels much farther. So, while these guidelines may be a start, they only prevent hearing damage to whales and dolphins by stopping airguns from blasting right on top of animals.*"



Irregular sound field from a seismic airgun array.

Gisiner (2016) <http://acousticstoday.org/wp-content/uploads/2016/12/Seismic-Surveys.pdf>



Climate Justice Taranaki
1/2/2018 Press Release:

“In the last 42 days, the seismic survey ship ‘Amazon Warrior’ has been forced to stop 28 times according to reports from iwi marine mammal observers onboard because the ship has come too close to whales, dolphins or seals.” said Climate Justice Taranaki spokesperson Emily Bailey.

Photo: The Amazon Warrior’s path of destruction, from Google Earth KMZ

Are Cetaceans at risk? 1. Seismic surveys

Yes. In other jurisdictions at least:

In 2012, California Coastal Commission declined high energy seismic survey operations because of “... *impacts to the harbor porpoise (Morro Bay stock), whose range is limited to the general project area and the entire population of which is likely to be subject to behavioral harassment.*” (Prof. Liz Slooten, pers. comm.).

Unexplained deaths of threatened species in STB

In May-June 2018, 13 sperm whales died at sea. The deaths followed

- record heating of Tasman Sea
- failure of upwelling with related probable impacts on the food web
- months of seismic blasting from the Amazon Warrior
- and other industrial activities.

Sperm whales, and other toothed whales, use echolocation in hunting, effectively 'seeing with sound'.

It is likely the whales were under significant physiological stress from multiple impacts, contributing to or causing their deaths.

Cumulative effects

Impacts on marine mammals – Precautionary principle?

<https://www.stuff.co.nz/national/104292673/extremely-unlikely-seismic-surveying-linked-to-death-of-12-sperm-whales>



GRANT MATTHEW/STUFF

Twelve sperm whales have washed up on a South Taranaki beach.

DOC is not intending to investigate the potential cause of death for these sperm whales any further. Once the veterinary pathologist made his determination about the usefulness of a necropsy, there were few other options for investigation. Iwi flensed several of the whales to collect bone for cultural purposes and reported no gross abnormalities or other unusual findings. Samples described in our separate response to Q3 were collected but are unlikely to provide insight on the reason for these strandings. DOC is always keen to understand why these events happen, but options for investigating are unfortunately limited.

OIA response from DOC to CJT, 24/10/18

Tamarind oil spill modelling, 21/3/2018

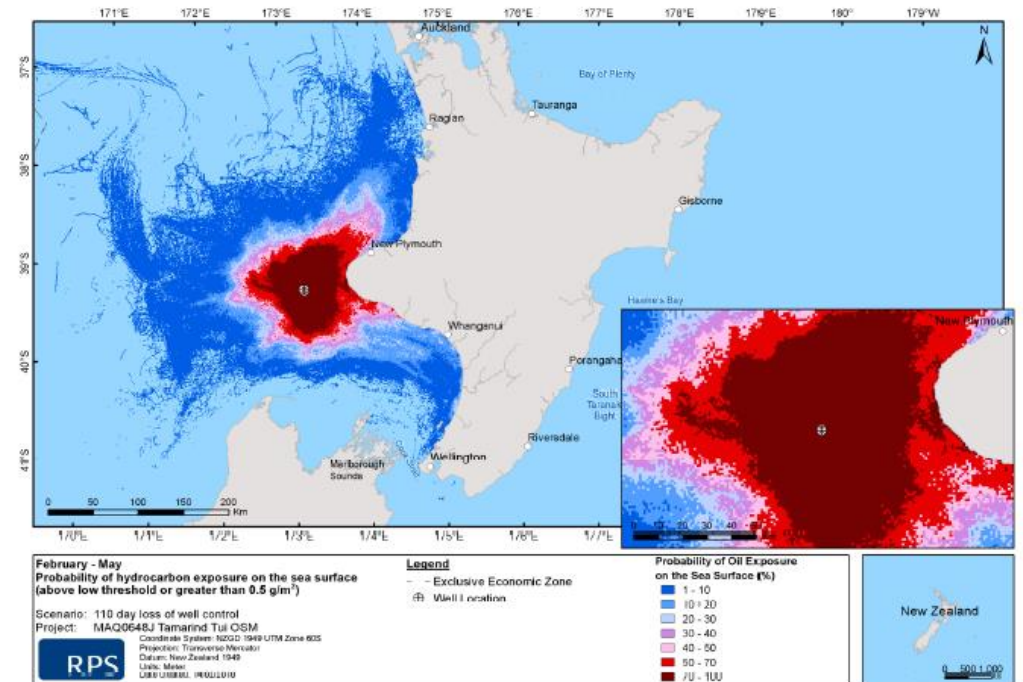


Figure 20 Probability of oil exposure on the sea surface above low exposure (≥ 0.5 g/m³) from a 110-day loss of well control.

Are cetaceans at risk? 1. Seismic survey

Krill – main food source of baleen whales – at significant risk from seismic surveys (McCauley et al. 2017):

*“Experimental air gun signal exposure decreased zooplankton abundance ..., as measured by ... net tows (median 64% decrease within 1 h), and caused a **two- to threefold increase in dead adult and larval zooplankton. ... all larval krill were killed after air gun passage.** There is a significant and unacknowledged potential for ocean ecosystem function and productivity to be negatively impacted by present seismic technology.”*

‘Trophic cascades’

Biodiversity & Fishery Impacts of Seismic survey

Peer-reviewed evidence across multiple levels of food web:

- **Zooplankton** – mortality (McCauley et al. 2017)
- **Molluscs** – mortality and physiological and behavioural disruptions (Day et al. 2017)
- **Lobsters** – impact nutritional condition and immunological capacity (Fitzgibbon et al. 2017)
- **Fish and squid** – changes in abundance (Lokkeborg and Soldal 1993, Engas et al. 1996, Fewtrell and McCauley 2012)

Biodiversity & Fishery Impacts of Seismic survey

Peer-reviewed evidence across multiple levels of food web:

- **Penguins** – strong avoidance of preferred foraging areas, and increasing overall foraging effort, with potential longer-term repercussions on hearing (Pichegru et al. 2017)
- **Whales and dolphins** – behavioural (Tyack 2008, Clark et al. 2009, Di Iorio and Clark 2009, Castellote et al. 2012).

Are cetaceans at risk? Sea Temp., OA & O₂

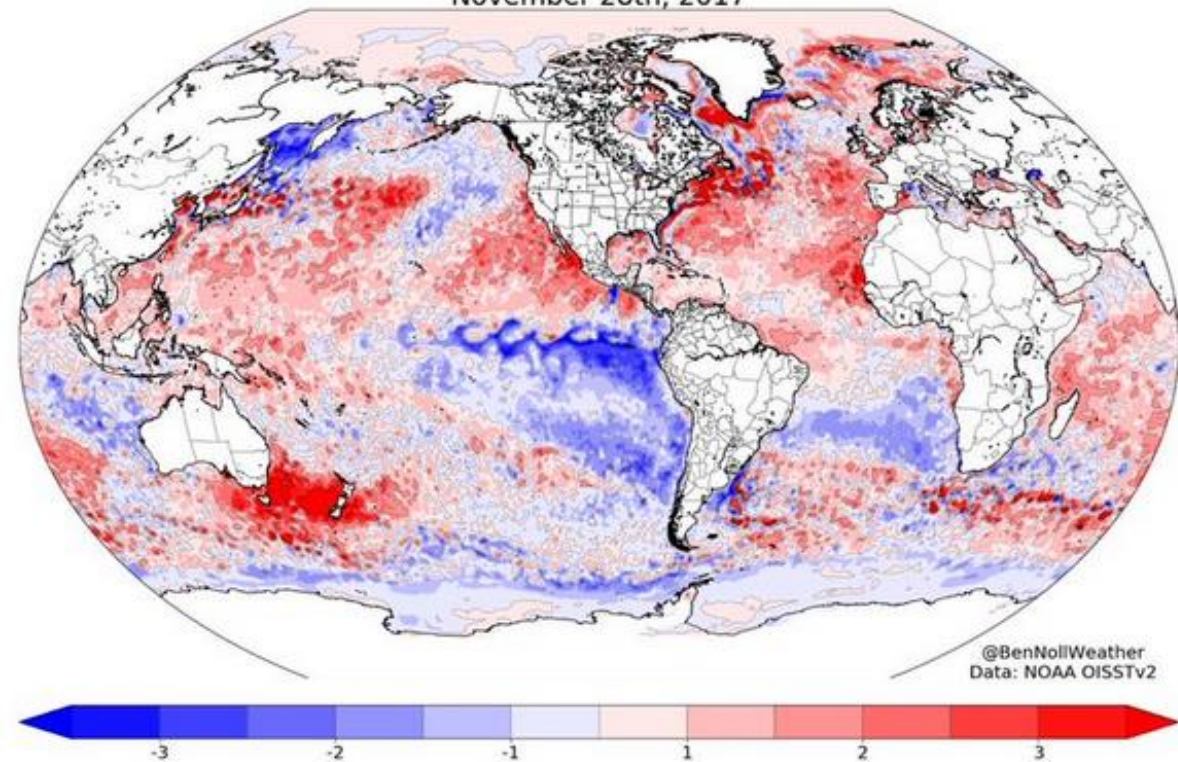
Krill – also at significant risk from increasing sea temperature (Johnson et al. 2011):

“Reduced nutrient availability in warm years leads to reduced production and a shift to smaller phytoplankton species, resulting in a drastic reduction in the biomass of larger zooplankton, especially krill (Nyctiphanes australis).”

And Ocean Acidification (eg. Kawaguchi et al. 2013):

“Unless CO₂ emissions are mitigated, the Southern Ocean krill population could collapse by 2300 with dire consequences for the entire ecosystem.”

Sea Surface Temperature Anomaly (°C)
November 28th, 2017

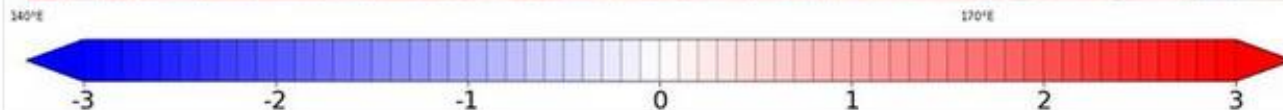
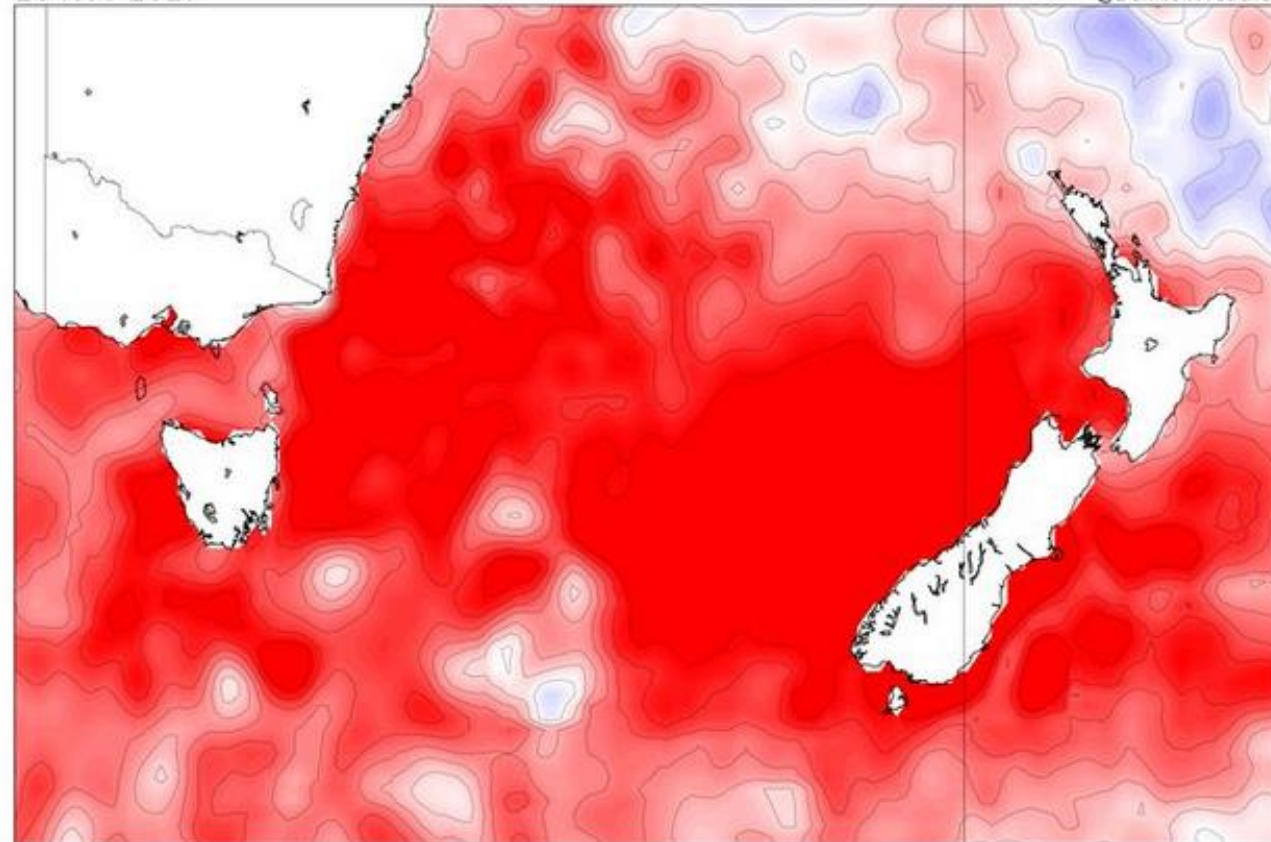


@BenNollWeather
Data: NOAA OISSTv2

Tasman Sea temperature 'snapshot' 28th Nov. 2017

Sea Surface Temperature Anomaly (°C)
28 Nov 2017

Data: NOAA OISSTv2
@BenNollWeather



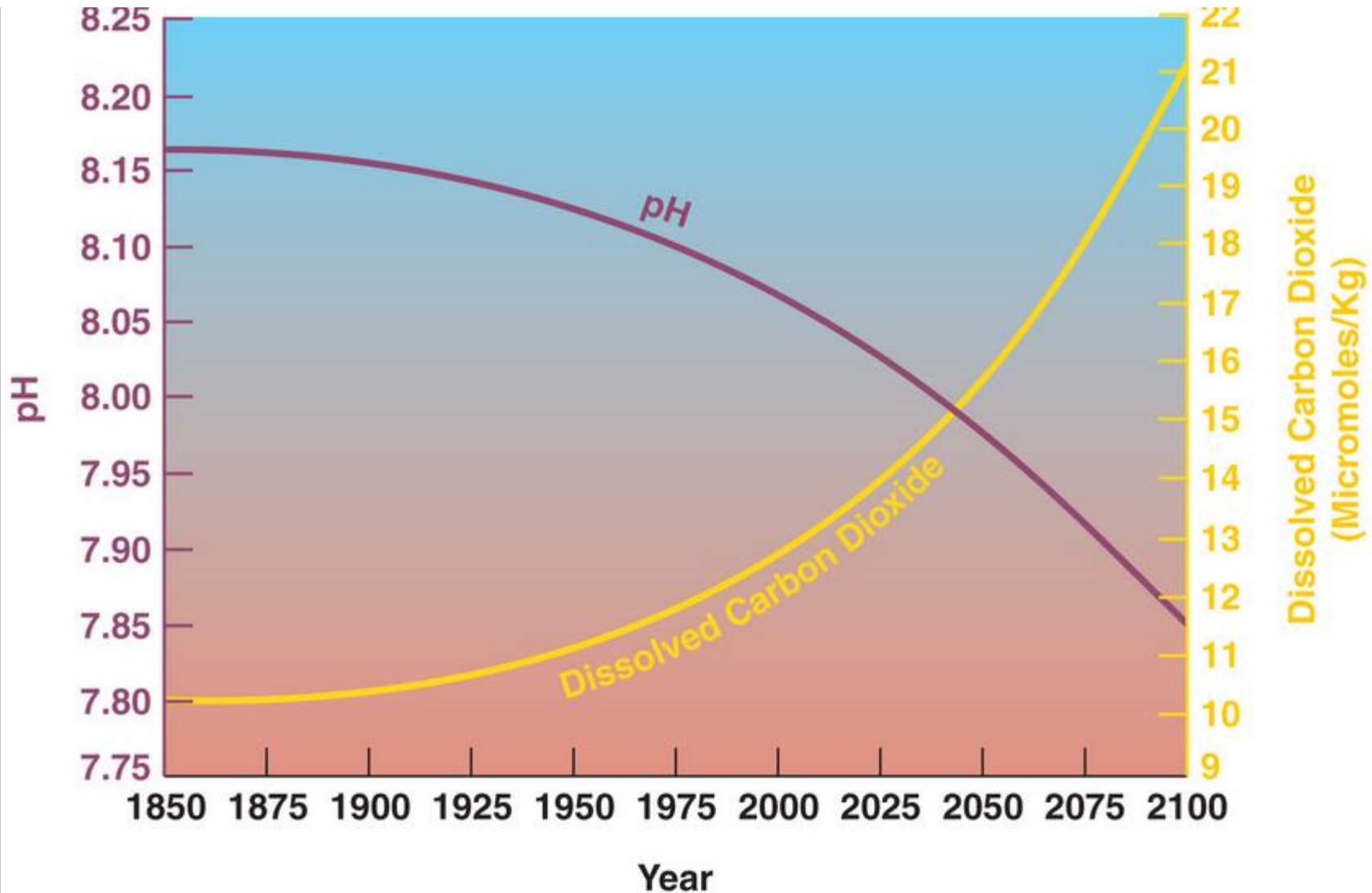
Record-breaking sea temps
have cascading effects on food
webs (eg. 'drastic reduction in
krill biomass', Johnson et al.

2011)

Cheng, L. & Zhu (2018) 2017 was the warmest year on record for the global ocean.

J. Adv. Atmos. Sci. 35: 261. <https://doi.org/10.1007/s00376-018-8011-z>

Ocean acidification

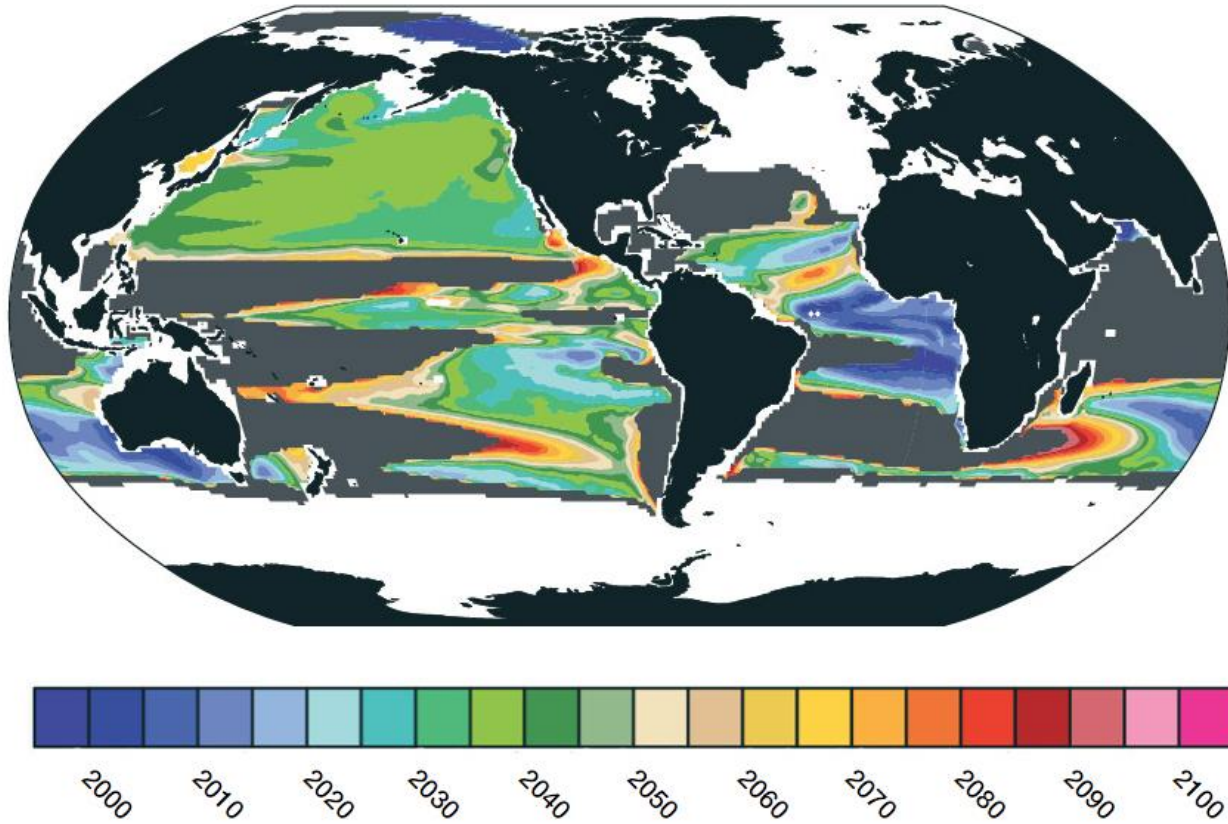


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- increased by > 25 % in < 100 years.
- at least 10 times the rate of acidification in the last big event, 56 mya, and may be the most rapid in 300 million years.

Oxygen loss in the oceans

Timeframe when ocean deoxygenation due to climate change is expected to become detectable



Western Tasman Sea already showing Oxygen loss – indirect ‘cumulative effect’ on cetaceans via trophic cascades.

High-precision O₂ 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.

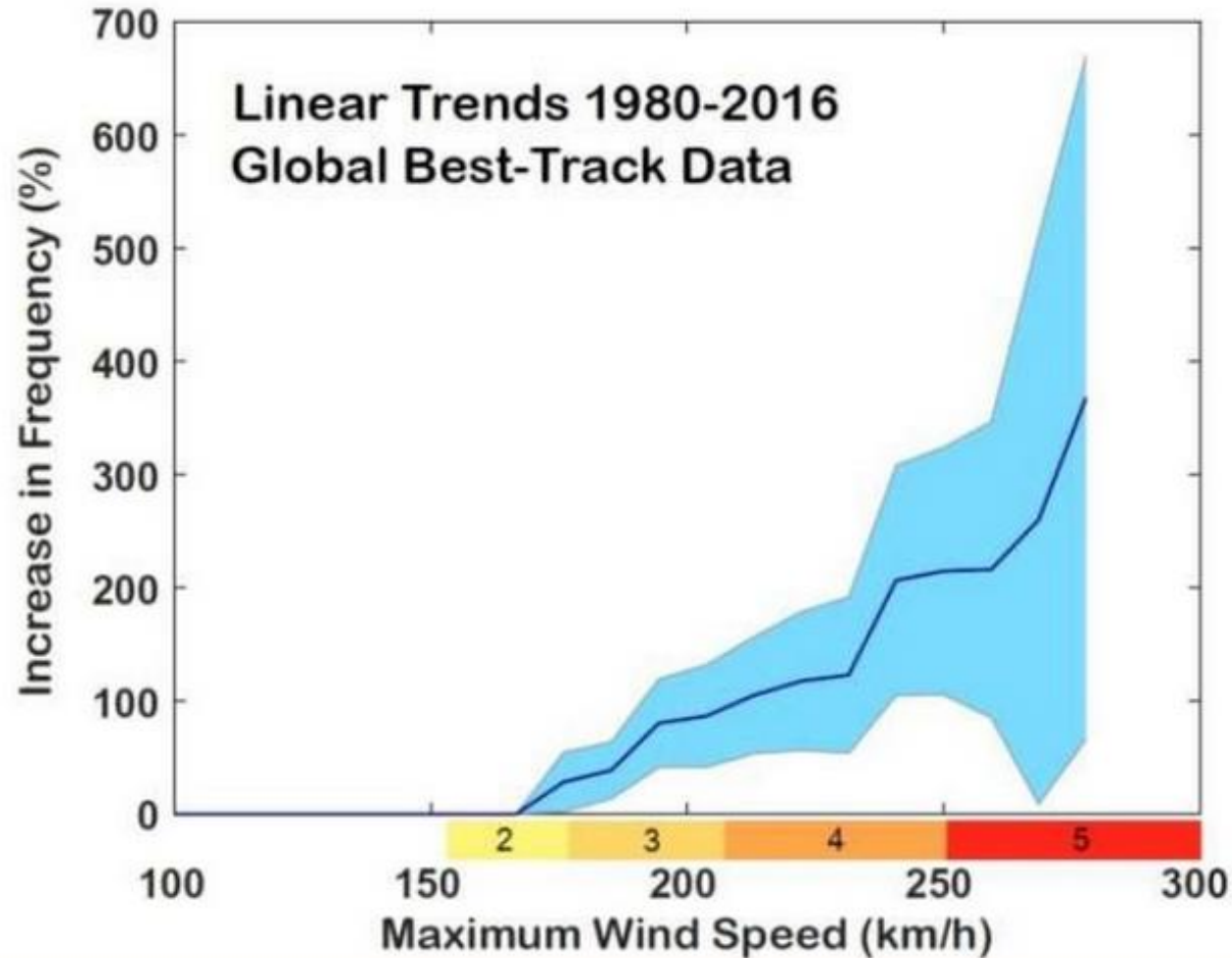
Long et al. (2016) Finding forced trends in oceanic oxygen. *Global Biogeochemical Cycles* 30: 381-397.

Takamitsu Ito, Shoshiro Minobe, Matthew C. Long, Curtis Deutsch. Upper Ocean O₂ trends: 1958-2015. *Geophysical Research Letters*, 2017; DOI: [10.1002/2017GL073613](https://doi.org/10.1002/2017GL073613)

Resplandy et al. (2018) Quantification of ocean heat uptake from changes in atmospheric O₂ and CO₂ composition. *Nature* 563: 105-107

30th May
2018

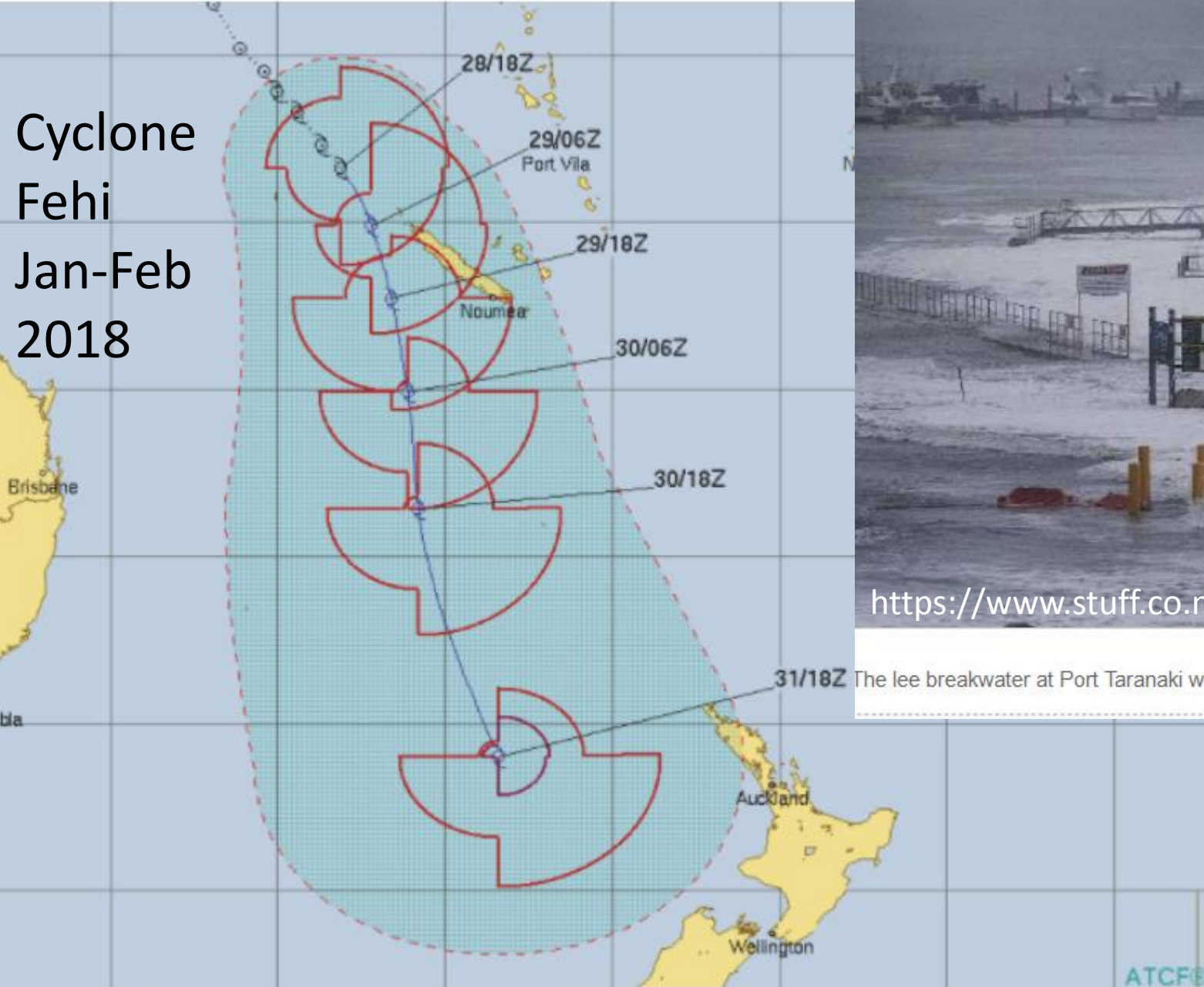
“Global warming is making tropical cyclones stronger”, renowned climatologists conclude



Slide courtesy of Jeremy Leggett

“Especially storms of previously unobserved strength.” Very bad news for the insurance industry, and all who live in cyclone belt.

Cyclone Fehi Jan-Feb 2018



Tracking and the 'cone of uncertainty' (ie, the centre of the low may track anywhere in the shaded area) / Joint Typhoon Warning Center (US Government)



<https://www.stuff.co.nz/taranaki-daily-news/news/101148777/> (3/2/18)

GRANT MATTHEW/STUFF

The lee breakwater at Port Taranaki was hammered by king tide swells on Thursday.

Increased risks to aging O&G infrastructure, Huge decommissioning costs (est. \$800 million to NZ govt).

The Future: A 'Perfect Storm'

The physical, chemical and biological oceanography of the 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, a major part of cumulative impact.

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.”*

But are these 'Cumulative Effects' under the EEZ Act?

Of laws and Asses

The EEZ-CS Act (Section 59 (5) (b)) explicitly excludes consideration of the effects on climate change of discharging greenhouse gases into the air, surely a pertinent example of that famous old quote comparing laws and asses.

Nevertheless, CJT has argued that climate disruption to the EEZ should be considered under the Act as a major and growing cumulative effect.

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; ...

Assessment of Cumulative Effects

Assessments under the EEZ-CS Act have focused on the application at hand, not on the overall impact, including possible synergisms, of adding that application to those already occurring, and predicted to occur in STB in coming decades.

Cumulative Effects – ‘nothing to see here’

Cumulative effects of fossil fuel mining applications have all been deemed by industry and by EPA decision makers to be ‘low or negligible’, taking the ‘reductionist’ approach.

Dr. Simon Childerhouse, witness for Shell Taranaki Ltd (October 2017):

“... assessments provided in the IA and other comparable assessments undertaken for other regional activities... also have assessments of low or negligible impact (e.g. such as those evaluated by the EPA in approved consents for OMV, STOS and TTRL)”

Independent cetacean specialists did not agree with the industry-funded assessments, and raised serious concerns.

Cumulative Effects – negligible or negligent?

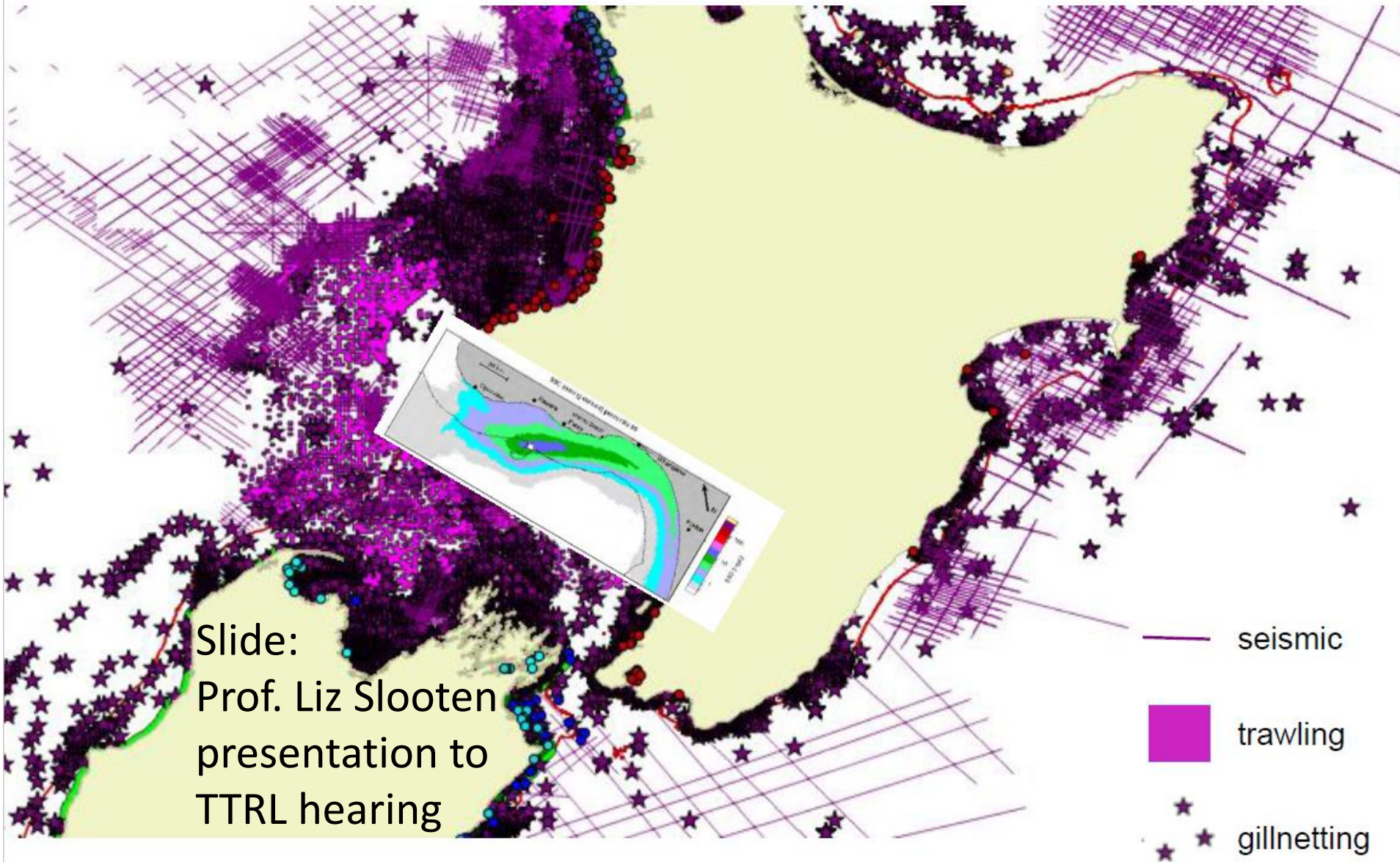
Torres et al. (2017): *“Cumulative and isolated impacts on blue whales and their habitat from these activities should be carefully considered by environmental managers. In particular, elevated anthropogenic ocean noise may disturb blue whale behavior and physiology, with consequences for individual health and population viability.”*

Cumulative Effects – negligible or negligent?

"Prolonged or repeated stress can increase susceptibility to other threats and impair immune function (e.g. Wright et al. 2011). ... Coastal species, like Maui dolphins are especially vulnerable due to the concentration of human activity ... Maui dolphins are already subject to a host of synergistic and potentially cumulative stressors that may be further aggravated by the effects of noise and other impacts associated with marine mining (Forney et al. 2017)."

Quote from Prof. Liz Slooten's expert evidence for KASM, 24/1/16

NZ coast – ‘Sacrificial Zone’? Cumulative impacts



NZ GNS have been searching for minable deposits of ‘ice gas’ methane clathrates off the E coast, as presented at 2017 Petroleum Conference in New Plymouth by Kellett et al.

Slide:
Prof. Liz Slooten
presentation to
TTRL hearing

- seismic
- trawling
- ★ gillnetting

EEZ-CS Act 'cumulative effects'

28 Regulations classifying areas of exclusive economic zone or continental shelf

(1) Regulations made under [section 27](#) or [29A](#) may identify and provide for areas of the exclusive economic zone or the continental shelf that—

(a) are important or **especially vulnerable because of their biophysical characteristics**;
or

(b) are important for specific uses; or

(c) must be managed in co-ordination with other marine management regimes; or

(d) are, or are likely to be, the subject of competition or **conflict arising from the incompatibility of different activities**; or

(e) are experiencing, or likely to experience, **cumulative adverse environmental effects**.

(2) The regulations may close an area of the exclusive economic zone or the continental shelf to all or any activities described in [section 20](#) or [subpart 2](#) of Part 2. (Excludes 'permitted activities') [Eg. Seismic survey is permitted]

Assessment of Cumulative Effects

Consigned to the 'too hard basket'.

Shell Taranaki Ltd witness Dr. Simon Childerhouse stated in evidence:

“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.”

Assessment of Cumulative Effects

There are in fact several quantitative and semi-quantitative approaches that can be used, as has been done elsewhere, including modelling future projections of changing sea temperature, acidification and productivity based on present conditions and various IPCC scenarios.

This approach can examine future habitat marginality, and when coupled with population viability analyses (PVA) could provide important insights into future cumulative effects on threatened species.

Cumulative Effects – negligible or negligent?

This all begs the obvious question:

How many ‘low or negligible impacts’ does it take to make a moderate or major impact?

Or:

How many industrial activities can we squeeze into NZ coastal zone and EEZ with ‘negligible impact’ in a rapidly changing oceanographic regime?

‘Having cakes and eating them’ comes to mind.

And it’s not just the Tasman Sea of course ...

‘The Impact of Climate Change on the World’s Marine Ecosystems’

“... rapidly rising greenhouse gas concentrations are driving ocean systems toward conditions not seen for millions of years, with an associated risk of fundamental and irreversible ecological transformation. The impacts ... so far include decreased ocean productivity, altered food web dynamics, reduced abundance of habitat-forming species, shifting species distributions, and a greater incidence of disease. ... create enormous challenges and costs for societies worldwide ...”

Source: Hoegh-Guldberg & Bruno (2010) *Science* 328

Oil majors braced for climate change in their engineering even as they fought climate regulations

Globally, > 1000 legal cases now lodged. [Sabin Center for Climate Change Law](http://climatecasechart.com/) (<http://climatecasechart.com/>)

<http://graphics.latimes.com/oil-operations/>
Image: Imgur.com

If institutions fail to adopt policies and enact laws constraining greenhouse gas emissions, current and future litigation will aim to recover damages for losses from climate change from those who should have prevented those losses.

LA Times investigation: e.g. Shell's Troll gas platform; Mobil factored in storms and sea level rise off Nova Scotia; etc

Just 100 companies are responsible for 71%
of greenhouse gases since 1988

Source: Carbon Disclosure Project and Jeremy Leggett



CODE GREEN

!@!



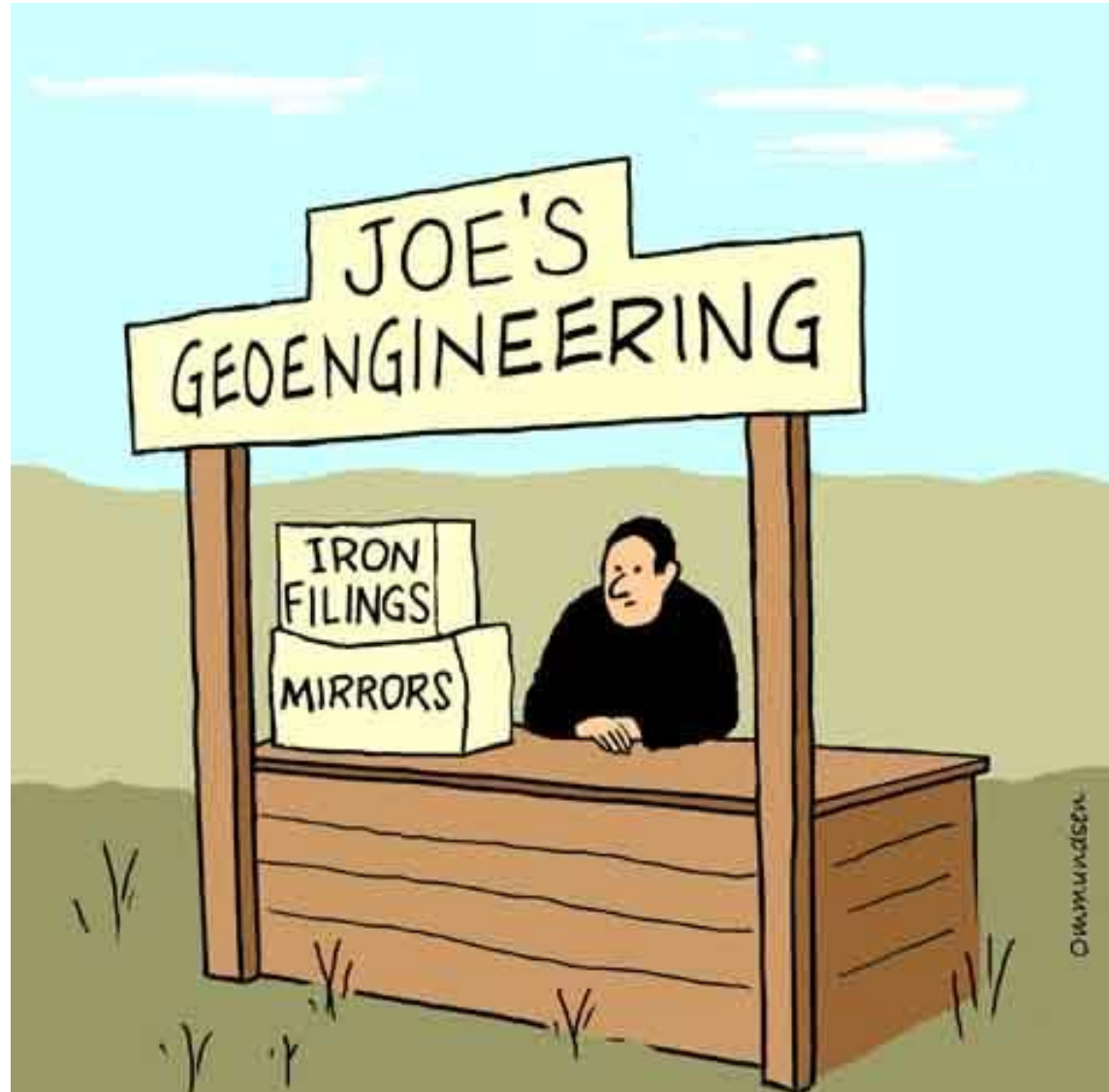
Geoengineering versus Precautionary Principle

Olivine dissolution to increase alkalinity in seawater and locally alleviate acidification

Montserrat et al. (2018)

[Mitigation Of Ocean Acidification Through Enhanced Olivine Weathering.](#)

<http://www.highco2-iv.org/category/theme-e-ocean-acidification-and-society-from-mitigation-to-food-security>



<https://www.google.co.nz/search?q=geoengineering+cartoons>

New ideas / proposals most weeks. Some literally are 'smoke & mirrors'.

But how about transitioning to clean energy, transport and agriculture?