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Continental-scale hotspots of pelagic fish abundance inferred from commercial catch records



THE UNIVERSITY OF
WESTERN
AUSTRALIA

IMCC4 – St John's, August 3, 2016

 @phbouchet

Phil Bouchet

Jessica Meeuwig, Zhi Huang, Tom Letessier,
Scott Nichol, Julian Caley, Reg Watson



**“WOULD YOU CARE MORE
IF I WAS A PANDA?”**

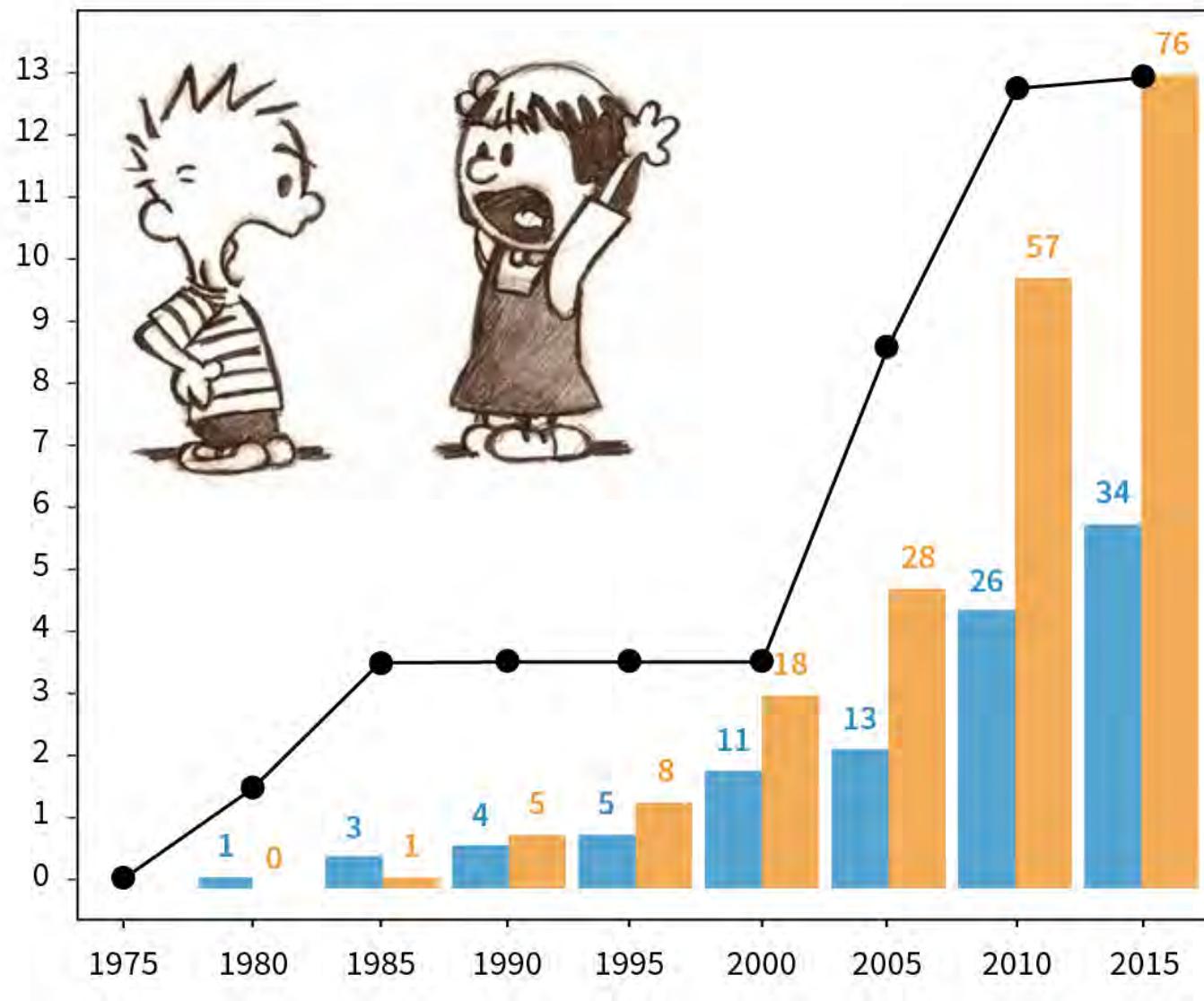
The Bluefin Tuna is being fished to extinction.
So like a few other species, it would appreciate your help.



wwf.com

2

The rise of (giant) marine reserves



Letessier, Bouchet, Meeuwig (In press). BIOLOGICAL REVIEWS

First evidence that marine protected areas can work for marine mammals

Andrew M. Gormley^{1,2}, Elisabeth Slooten^{1*}, Steve Dawson³, Richard J. Barker⁴, Will Rayment³, Sam du Fresne^{3,5} and Stefan Brager^{3,6}



journal homepage: www.elsevier.com/locate/biocon



Pelagic marine protected areas protect foraging habitat for multiple breeding seabirds in the central Pacific



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3

Finding proxies of pelagic hotspots

BIOLOGICAL
REVIEWS

Camb
Philosophi

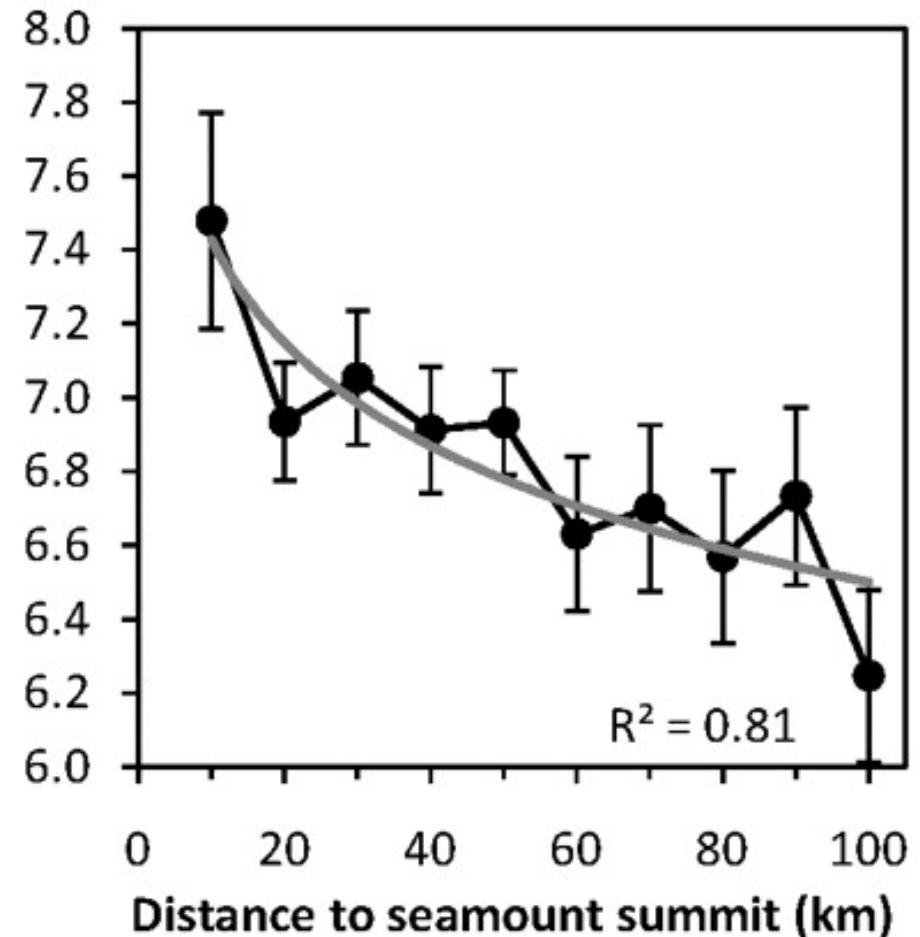
Biol. Rev. (2015), **90**, pp. 699–728.
doi: 10.1111/brv.12130

Topographic determinants of mobile vertebrate predator hotspots: current knowledge and future directions

Phil J. Bouchet^{1*}, Jessica J. Meeuwig^{1,2}, Chandra P. Salgado Kent³,
Tom B. Letessier² and Curt K. Jenner⁴

Physical surrogacy

- Seminal work of Telmo Morato *et al.* [on seamounts](#)
- Little research [on other features or ocean basins](#)



Morato *et al.* (2010). PNAS 107: 9707-9711

4 Aims of **study**

- 1 | Mapping pelagic **fish hotspots**
- 2 | Assessing the role of **seabed topography**
- 3 | Measuring overlap with **marine reserves**

5

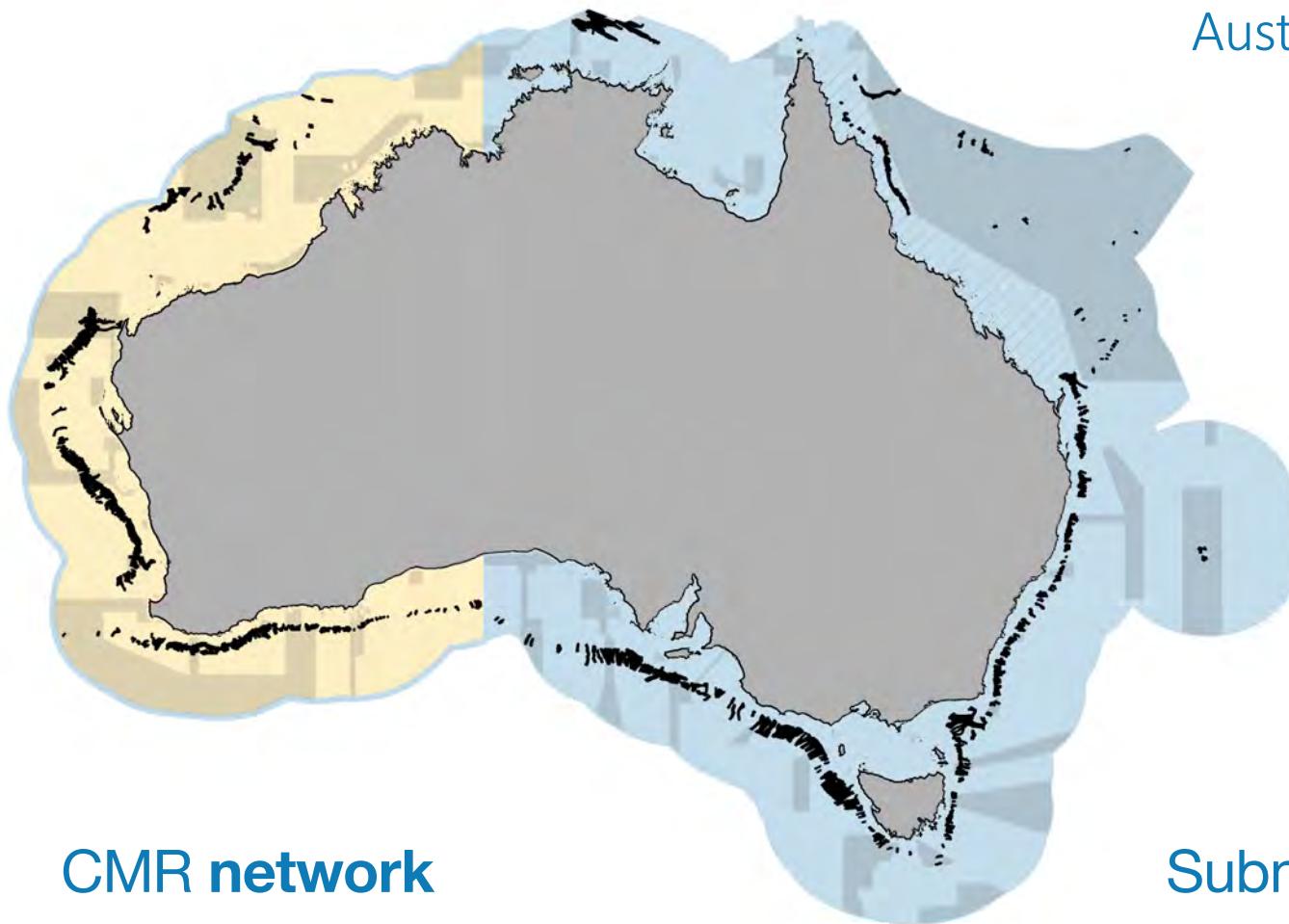
The Australian **case study**

WA

2.3 million km²

Australia

6.9 million km²



CMR network

- Announced in 2012
- Guided by geomorphic features

Submarine canyons

- High number & diversity
- Revised mapping (2014)

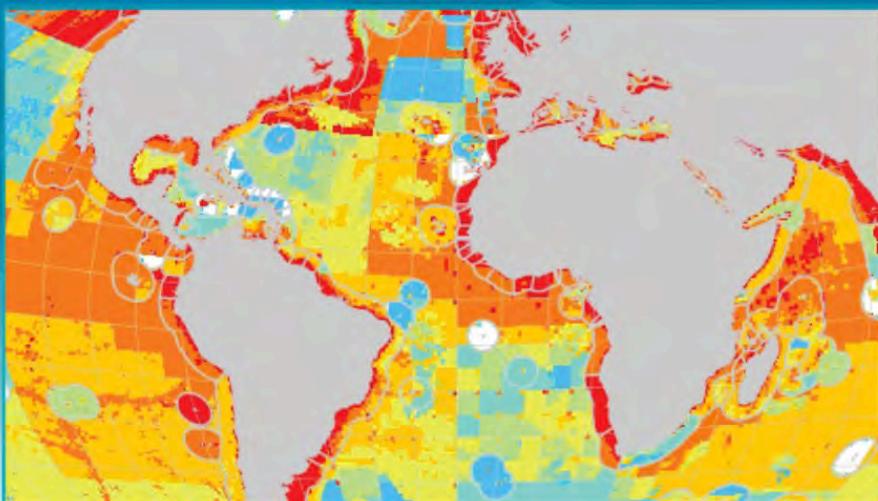
6

Historical catch data

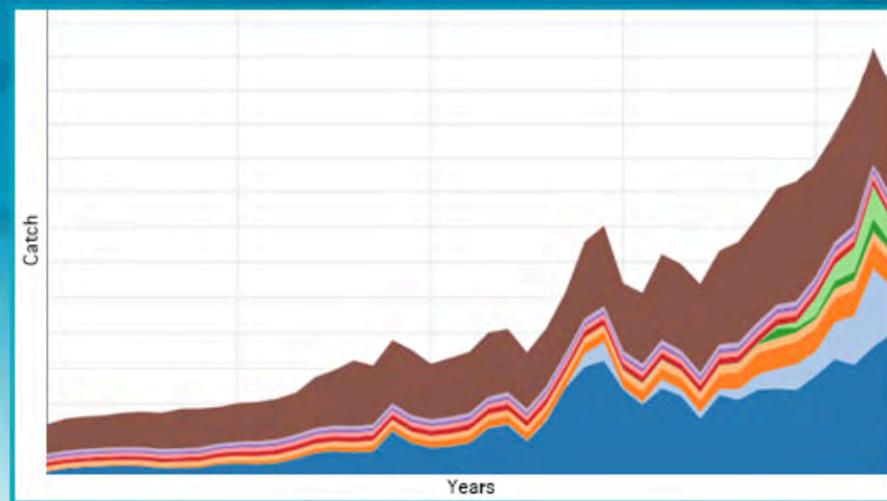


TOOLS & DATA GETTING STARTED PUBLICATIONS NEWS PEOPLE PROJECTS PARTNERS HELP

We present fisheries and fisheries-related data at spatial scales that have ecological and policy relevance, such as by Exclusive Economic Zones, High Seas, or Large Marine Ecosystems.



[Our interactive maps »](#)

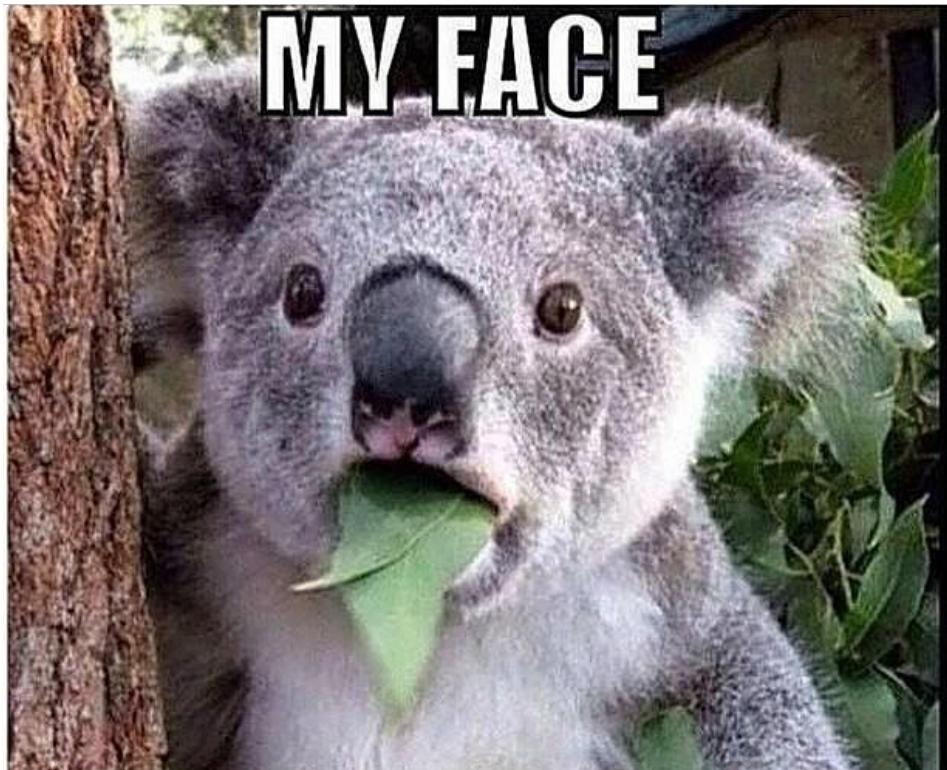


[Our interactive graphs »](#)

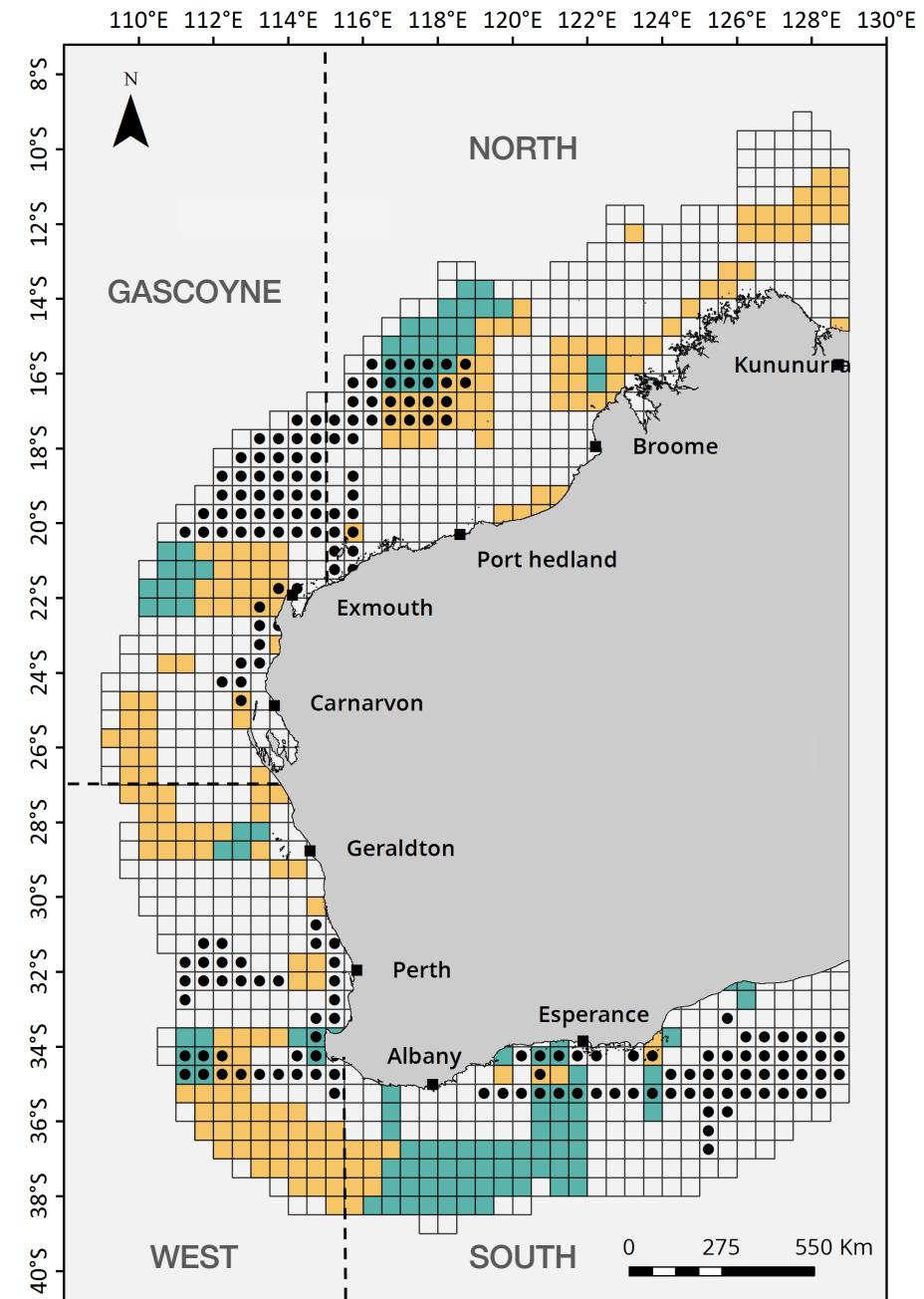


8

Mapping hotspots



- Commonwealth Marine reserves
- Marine national parks



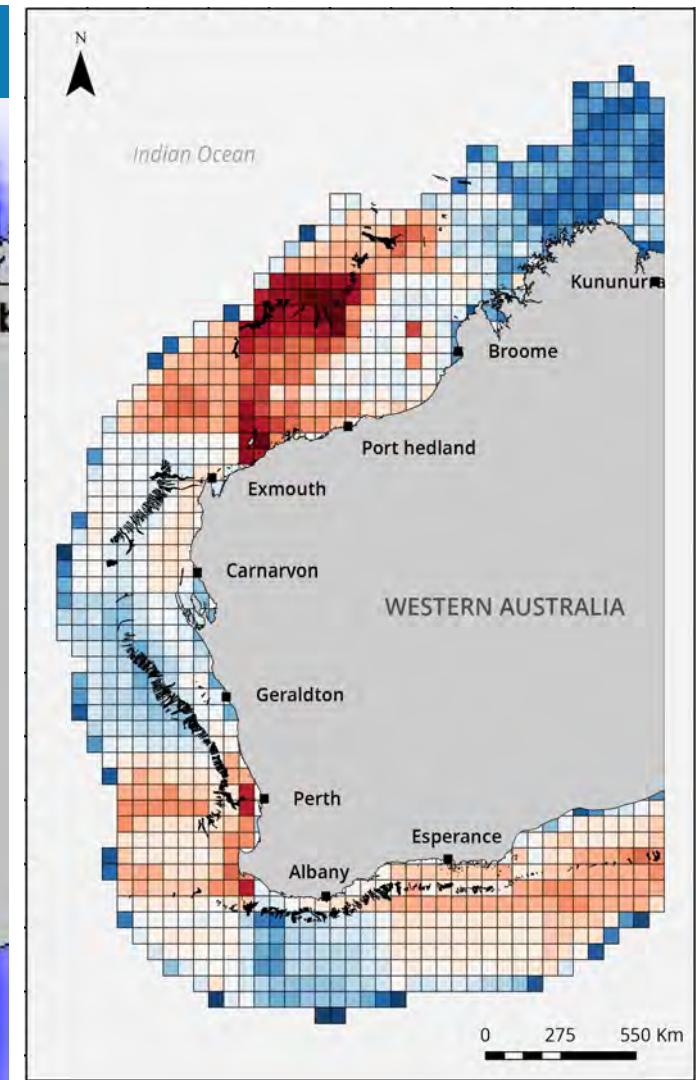
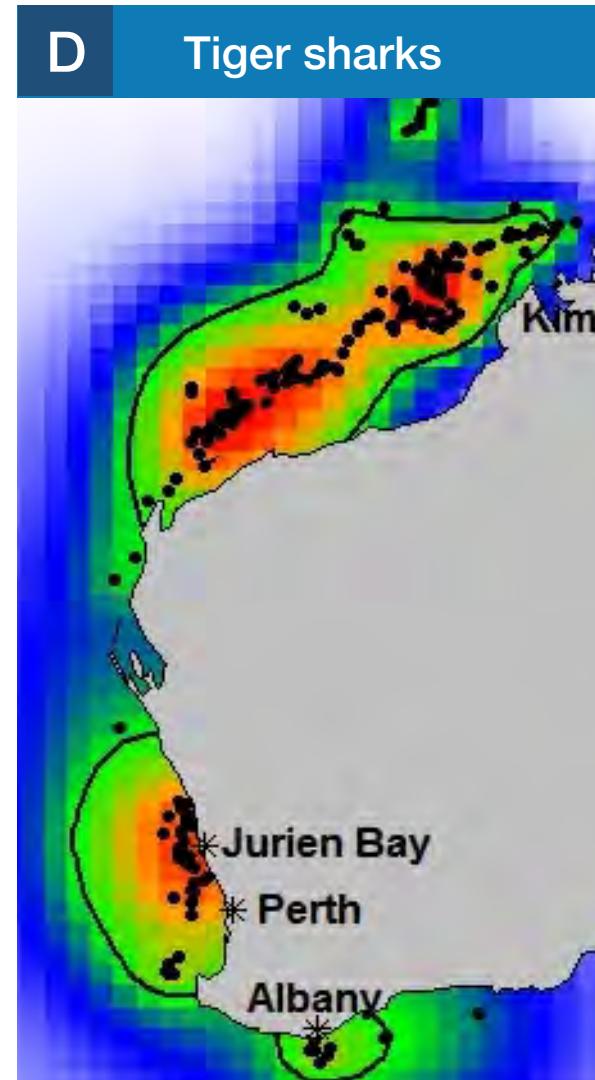
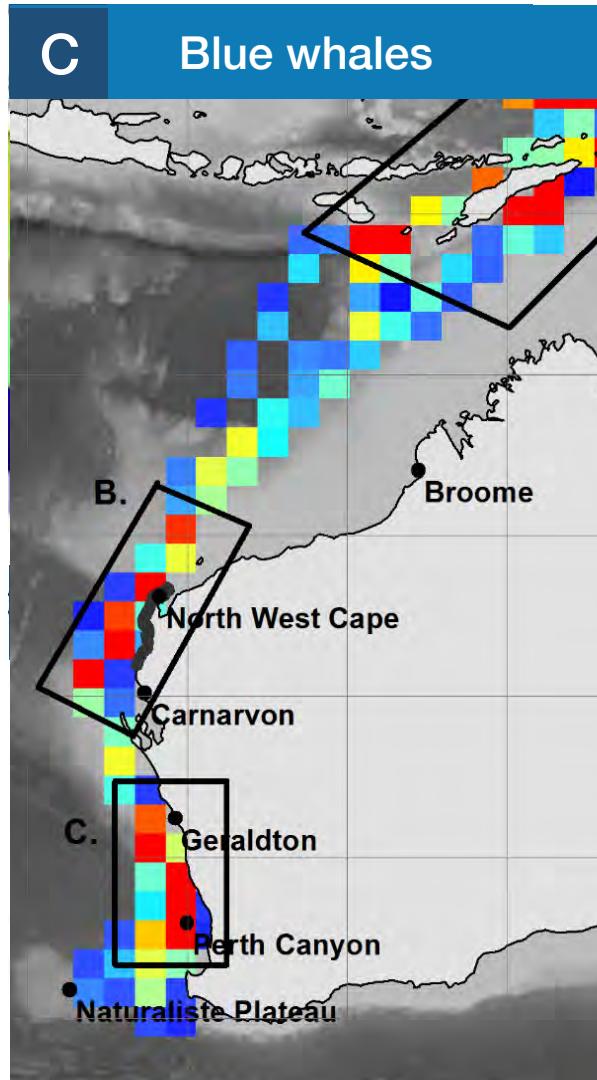
Cross-taxon perspective

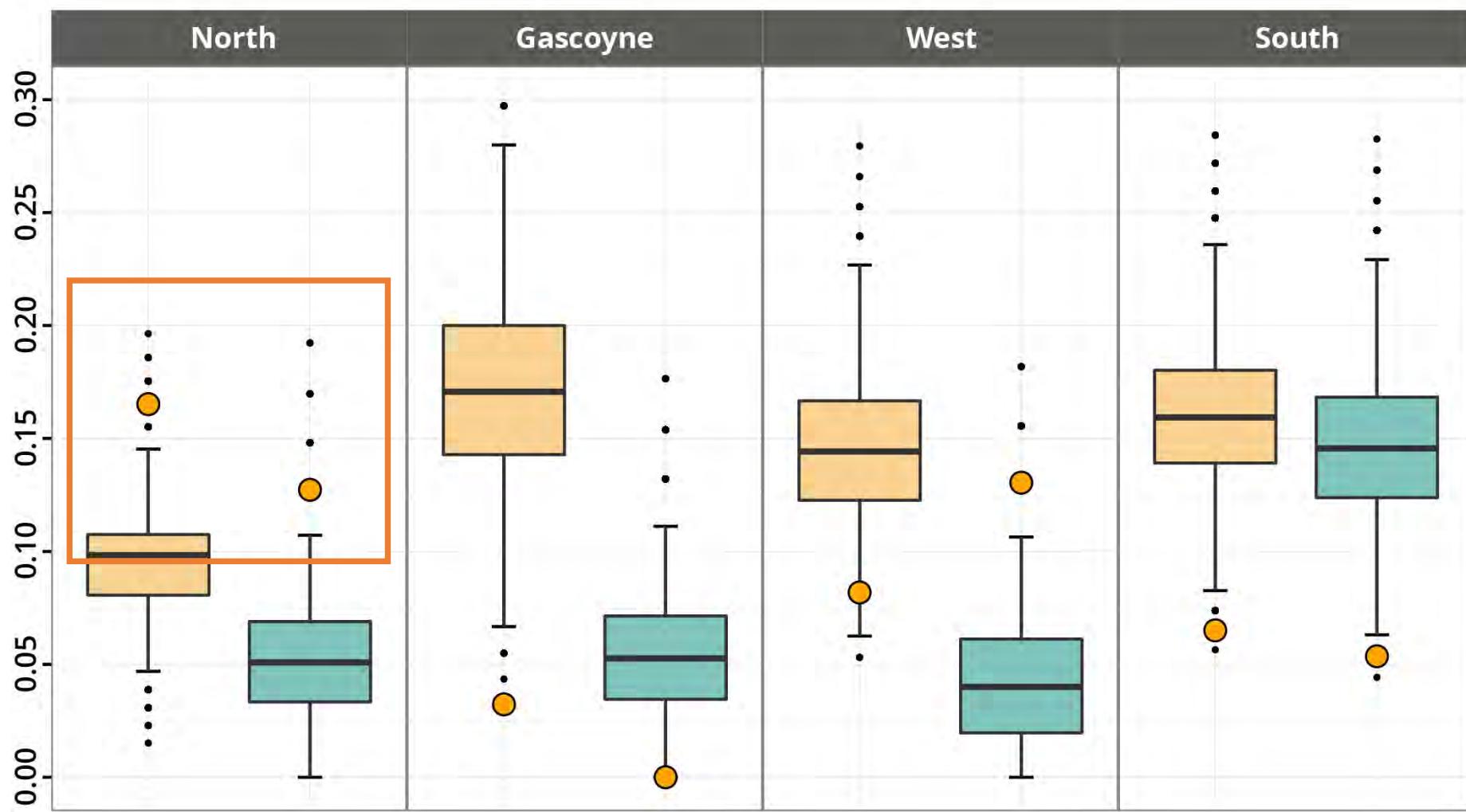
(A) Trebilco *et al.* (2011). BIOL CONV 144(5): 1758-1766

(B) Worm *et al.* (2003). PNAS 100(17): 9884-9888

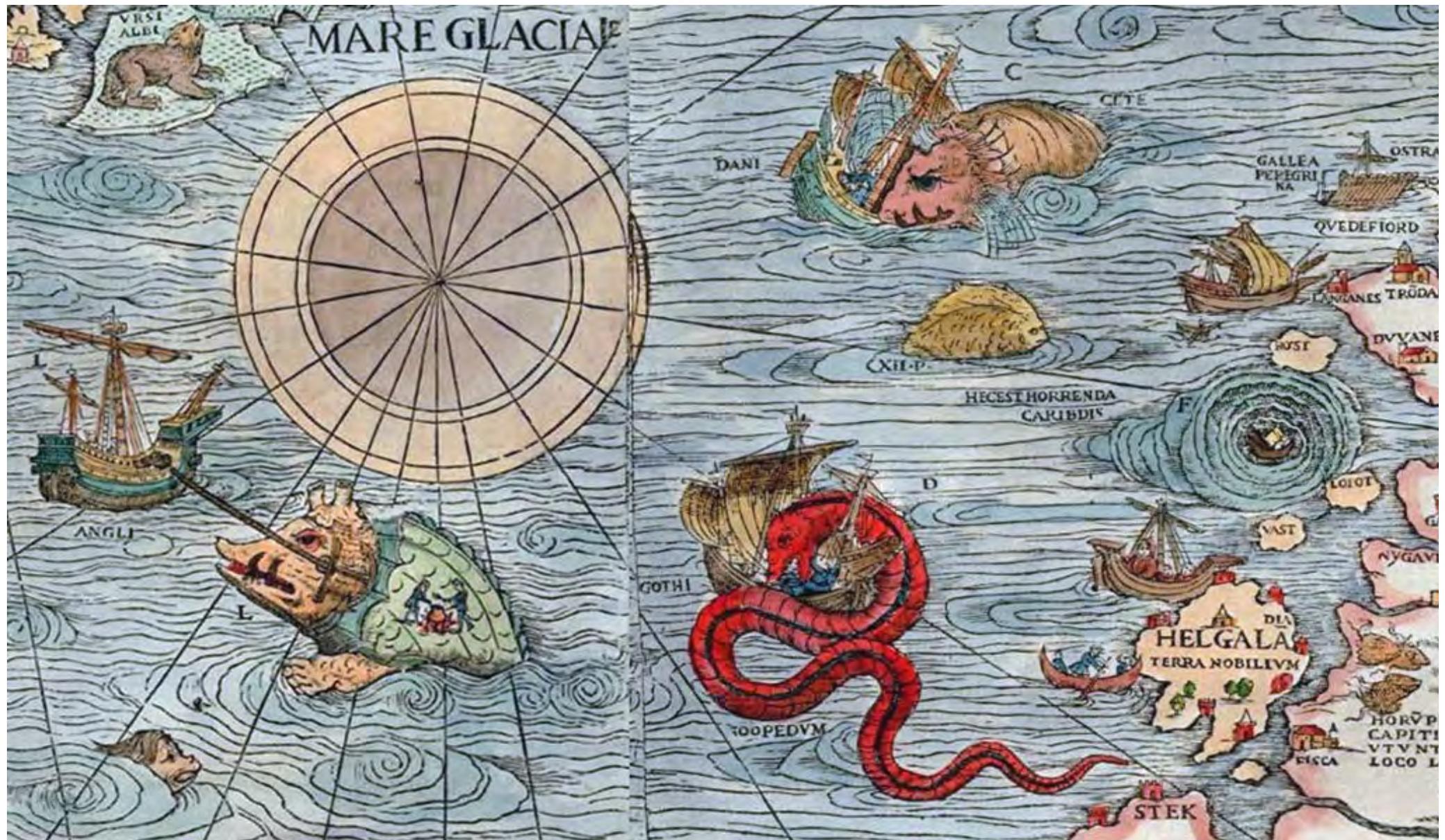
(C) Double *et al.* (2014). PLoS ONE 9(4): e93578

(D) Ferreira *et al.* (2015). PLoS ONE 10(2): e0116916





- Only in North is overlap better than random





- Numerous conservation opportunities within EEZ
- **Hotspot concept is relevant** for pelagic species
- Catch data **can be informative**
- Hotspots are dynamic but relate well to static features
- **Seabed topography** can be used as a foundation for spatial planning
- Expansion or revision of zones within MRs warranted

Acknowledgements



Prof. Jessica Meeuwig
University of Western Australia



Dr. Zhi Huang
Geoscience Australia



Dr. Scott Nichol
Geoscience Australia



Dr. Tom Letessier
Zoological Society of London



Dr. Julian Caley
Queensland Univ. of Technology



Prof. Reg Watson
University of Tasmania



National Environmental Science Programme



Australian Government
Geoscience Australia



Thanks also to: Daniel Pauly, Scott Foster, Eddie Game, Damien Garcia, Peter Harris, Johnathan Kool, Timothy Leslie, Sara Maxwell, Hugh Possingham, Rachel Przeslawski, Jarod Santora and Carolin Strobl

“ As hunters, farmers, road-builders and retailers have learned in our moving fluid-dominated world, **topography is destiny.**

Would one guess that is less true in the sea? I don’t think so. ”

Elliott Norse, Marine Conservation Institute



1

High price and long life: A double jeopardy

They are **highly prized**

- 5 MT of tuna caught in 2014
- Up to \$1M for an individual fish



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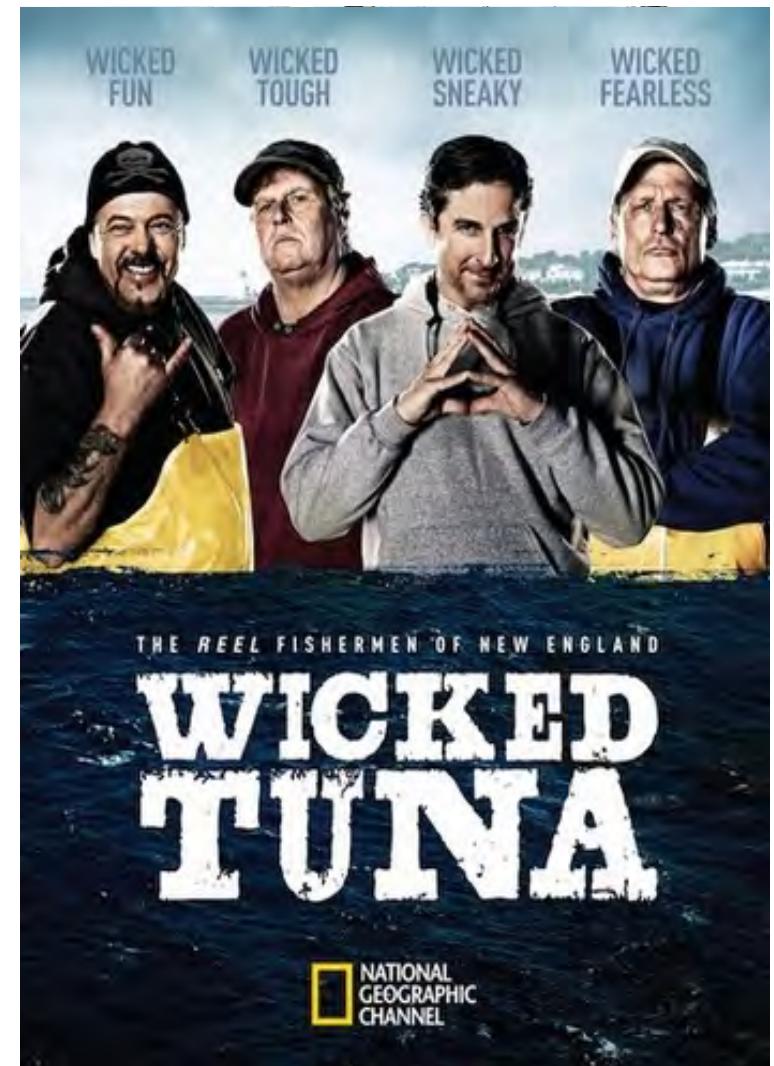


Some are **long-lived**

- ≈ K-selected traits
- Generation lengths up to 18 yrs

A number are **threatened**

- Numerous **population declines**
- Ecosystem-scale consequences



Collette et al. (2011). SCIENCE 333 (6040): 291-292