UNIVERSITY of TASMANIA | IMAS INSTITUTE FOR MARINE & ANTARCTIC STUDIES

CMS CENTRE FOR MARINE SOCIOECOLOGY

Gretta Pecl & lots of collaborators

Marine climate change challenges & adaptation

Director, Centre for Marine Socioecology; IMAS, ARC Future Fellow; IPCC Lead Author

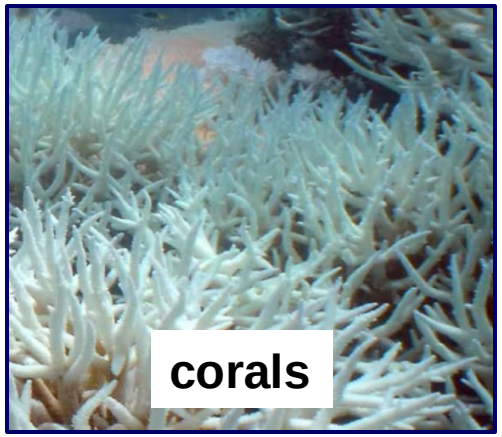
Gretta.Pecl@utas.edu.au, @GrettaPecl

Key messages for Australia from IPCC AR6

Climate trends and extreme events have combined with exposure and vulnerabilities to cause major impacts for many natural systems, with some **experiencing, or at risk of, irreversible change** (*very high confidence*)

Major changes in species distributions

Extreme climatic events (2011 to 2017) led to abrupt & extensive mortality of key habitat-forming organisms along over 45% of the coastline (*high confidence*)



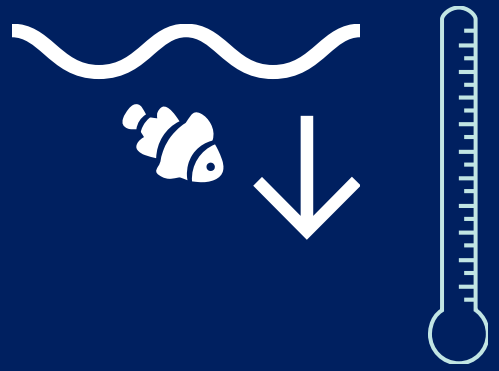
- Loss of kelp species Australia-wide totals at least 140,187 ha.
- Habitat species of critical importance for ecosystem structure and function, fisheries productivity, coastal protection and carbon sequestration
- These ecosystem services are extremely likely to decline with continued warming.

Climate-driven global re-distribution of species

17km dec^{-1} on land

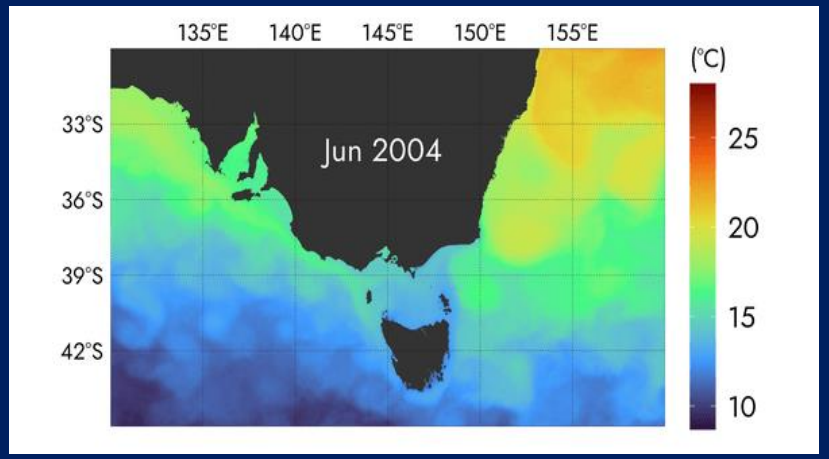
72 km dec^{-1} in ocean

(Poloczanska et al. 2013)



Deeper in ocean

(Dulvy et al. 2008)



Shifts greatest where climate has warmed the most, like SE Australia

Animation by Barrett Wolfe, IMAS

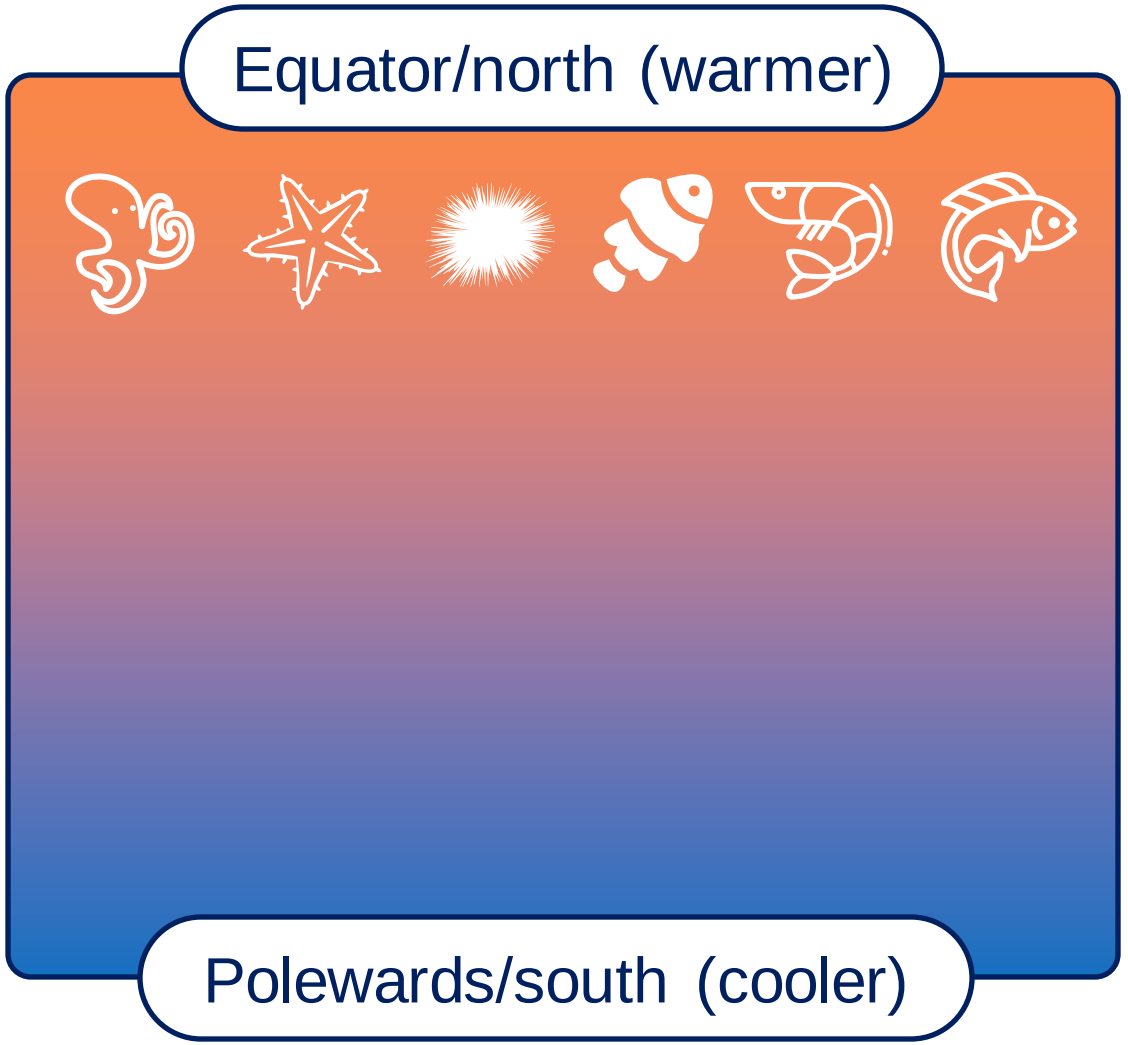
Just one aspect of climate change that affects humans & conservation

Globally, ~50% of examined species are shifting (IPCC AR6)

Variation in timing & pace of species shifts

- Confounding factors, influences other than climate
- Detectability
- Not all species can/will shift – adapt, move or die
- Species shift at different rates

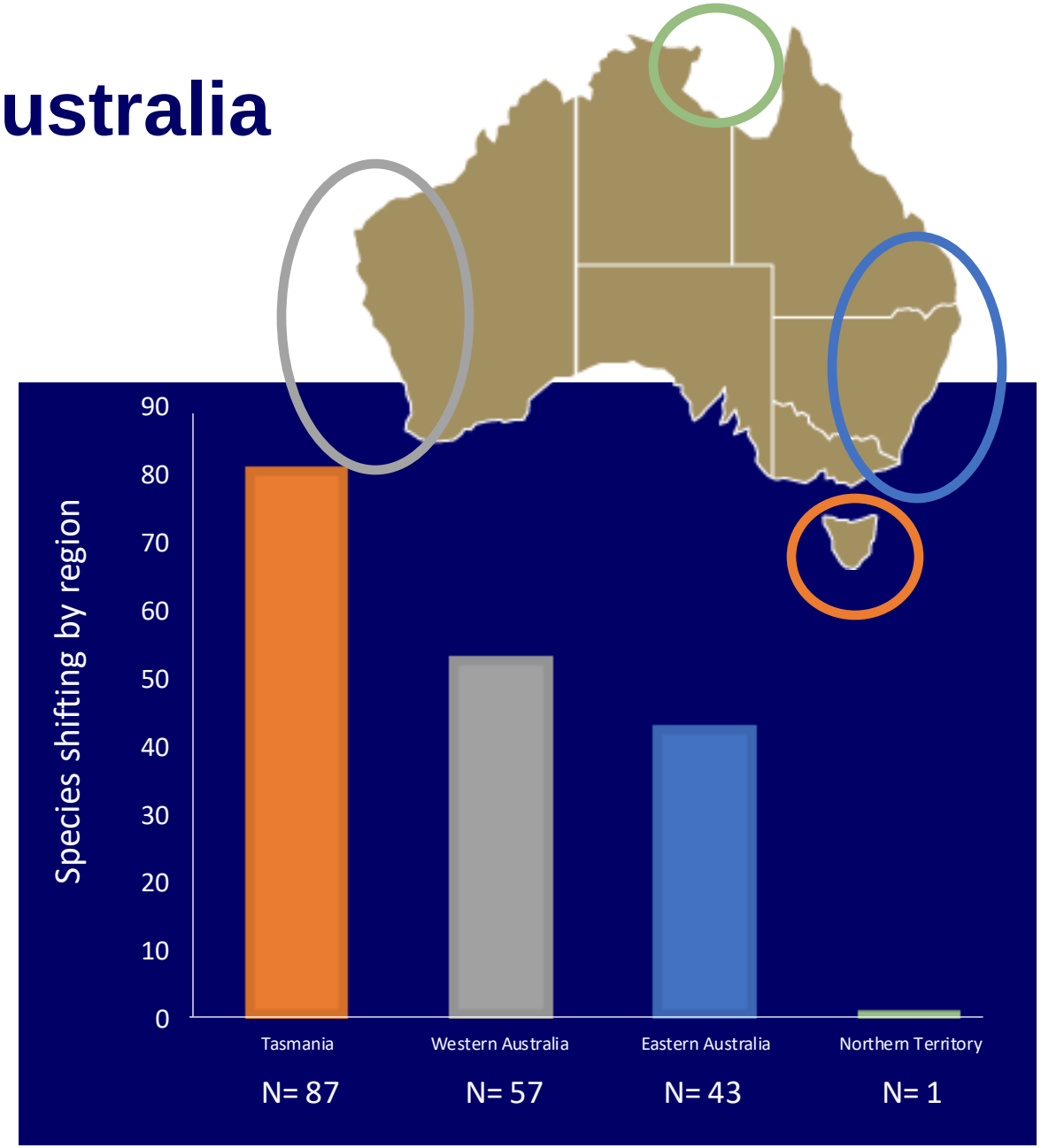
Contraction at northern edge *&* *extension* at southern edge



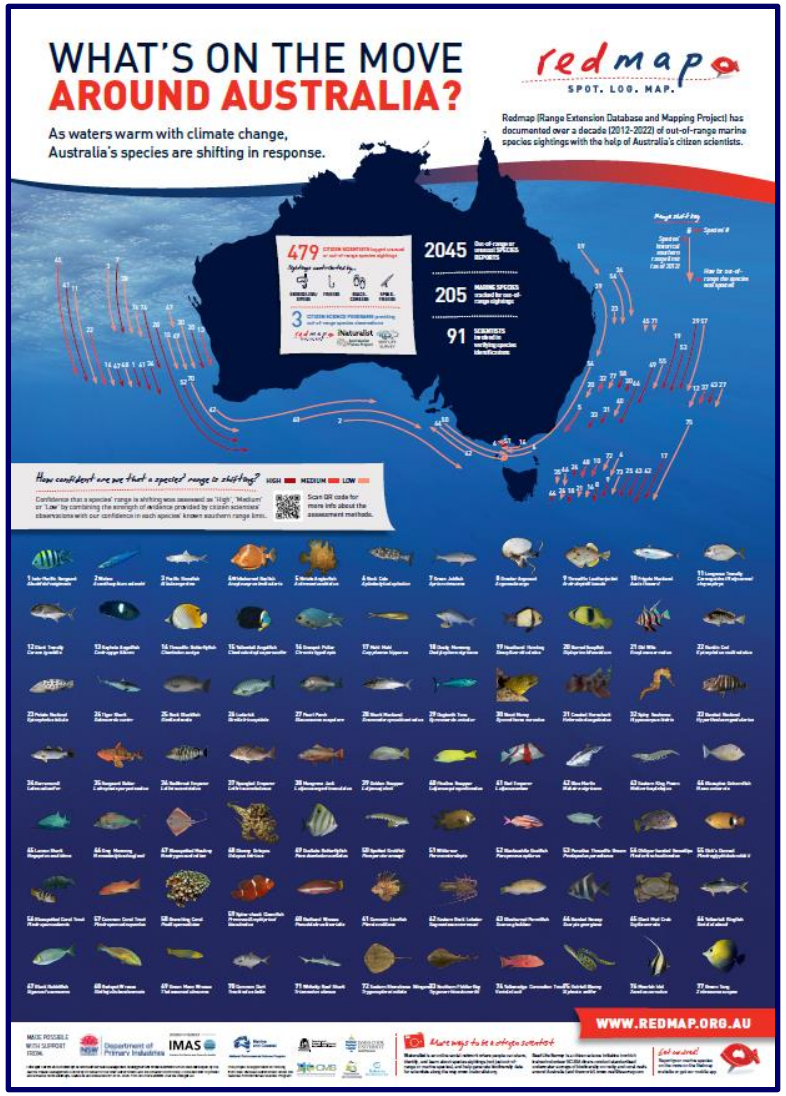
Shifts in distribution around Australia

- At least 198 species from 9 phyla have shifted distributions around Australia since 2003
- Tasmania main hotspot for range shifts, 88% were range extensions
- Western Australia - heatwaves facilitating range extensions (fish) and contractions (algae)
- Eastern Australia - larger proportion of range contractions - 23% species

Also new occurrences or increased prevalence of disease, toxins and viruses



Gervais, Champion, Pecl et al 2021, Global Change Biology



10 years of important citizen science contributions from Australian fishers, divers, and scientists

redmap
SPOT. LOG. MAP.
WWW.REDMAP.ORG.AU

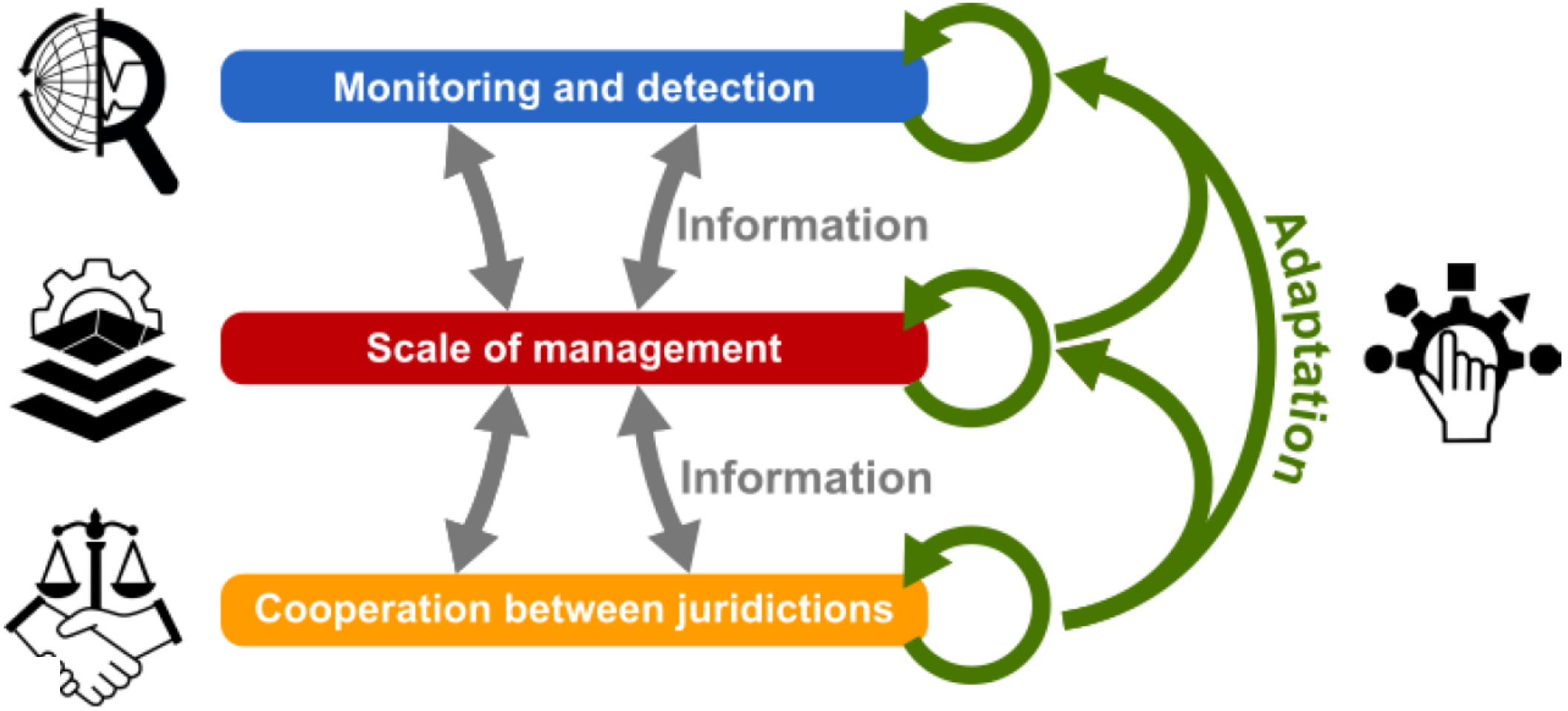
iNaturalistAU

REEF LIFE SURVEY

Funded by NESP Marine and Biodiversity Hub and a range of contributing organisations

Funded by the NSW Marine Estate Management Strategy Climate Change Initiative and NESP

Key drivers that shape future outcomes of redistribution



(Melbourne-Thomas et al Pecl 2021, Reviews in Fish Biology & Fisheries)

nature climate change

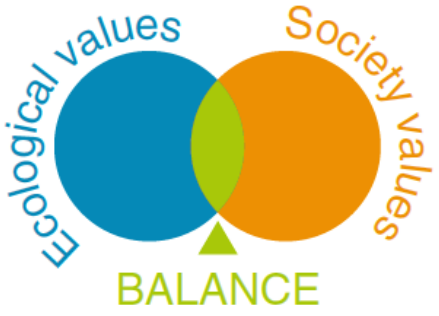
PERSPECTIVE

https://doi.org/10.1038/s41558-019-0526-5

Persecuting, protecting or ignoring biodiversity under climate change

Brett R. Scheffers[1*] and Gretta Pecl[2,3]

A climate-driven global redistribution of species is currently underway. As species alter their geographical distributions under climate change, many will not only cross into new habitats but also new geopolitical areas. In this Perspective, we discuss the historical archetypes of managing species redistribution—persecution, protection or ignorance—which points to diverse decisions and outcomes based on a balance of societal and ecological valuation. We build the case for increasing transboundary monitoring and management of species, and for shared governance agreements that are global in scope, consisting of legally binding and biologically defensible contracts among partner countries, in what would be a critical step for the future conservation of all species.



?

Ecological values
+ Society values

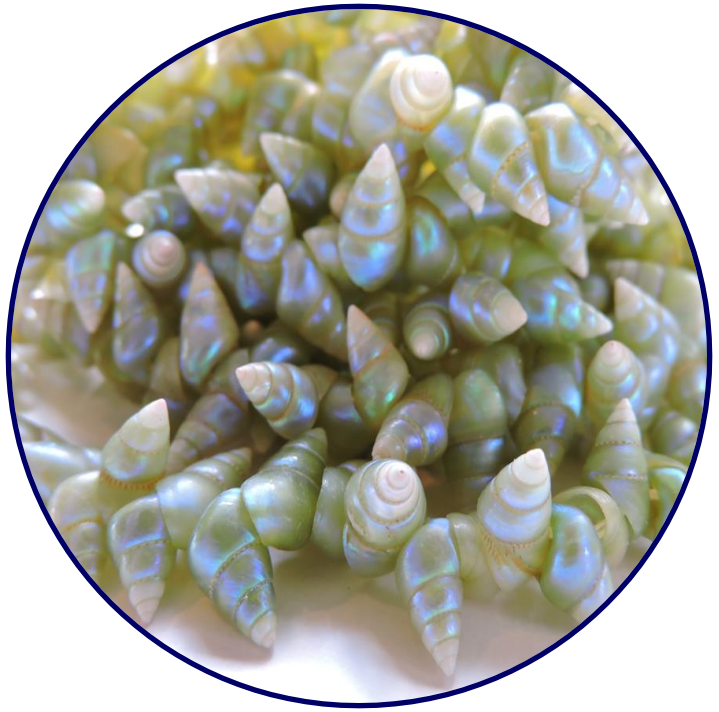
Conservation
outcomes/action

Future decisions under climate change

Some implications of climate-driven biodiversity changes cannot be adapted to

“When kelp and weed beds are dying and the rainbow kelp shells are depleted in rapid numbers, then women feel the cultural loss of governance and connections to sea country”

(tebrakunna country and Lee 2017).



Consideration for range-restricted endangered species

Red handfish (*Thymichthys politus*)

- Critically endangered, endemic to Tasmania
- Population size 100 adults (wild)
- Key threats: habitat loss (urchin overgrazing) & warming
- Limited dispersal ability & can't naturally track temperature changes

Jemina Stuart-Smith, Andrew Trotter, Tyson Bessell, Rick Stuart-Smith, Neville Barrett

Strategies for building resilience

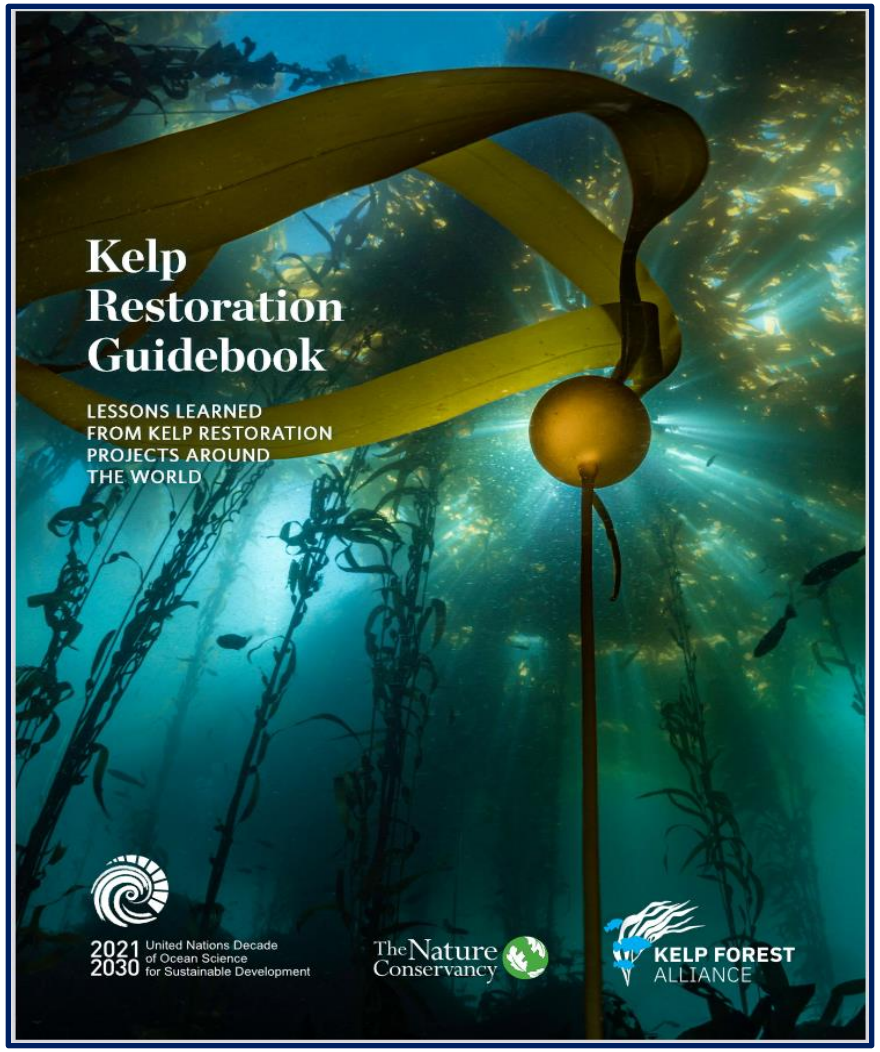
1. Population recovery (intervention): captive-raised and released individuals
2. Habitat management & augmentation: Threat mitigation and seaweed re-planting
3. Insurance populations: Captive populations, translocation, eDNA to locate extant populations
4. Building capacity and mitigating disturbance through community engagement

Restoration of key habitats, eg Giant Kelp

- Lab-rearing of thermally tolerant kelps
- Transplanting back into lost wild habitats
- Very labour & $ intensive
- Mixed but promising results so far!

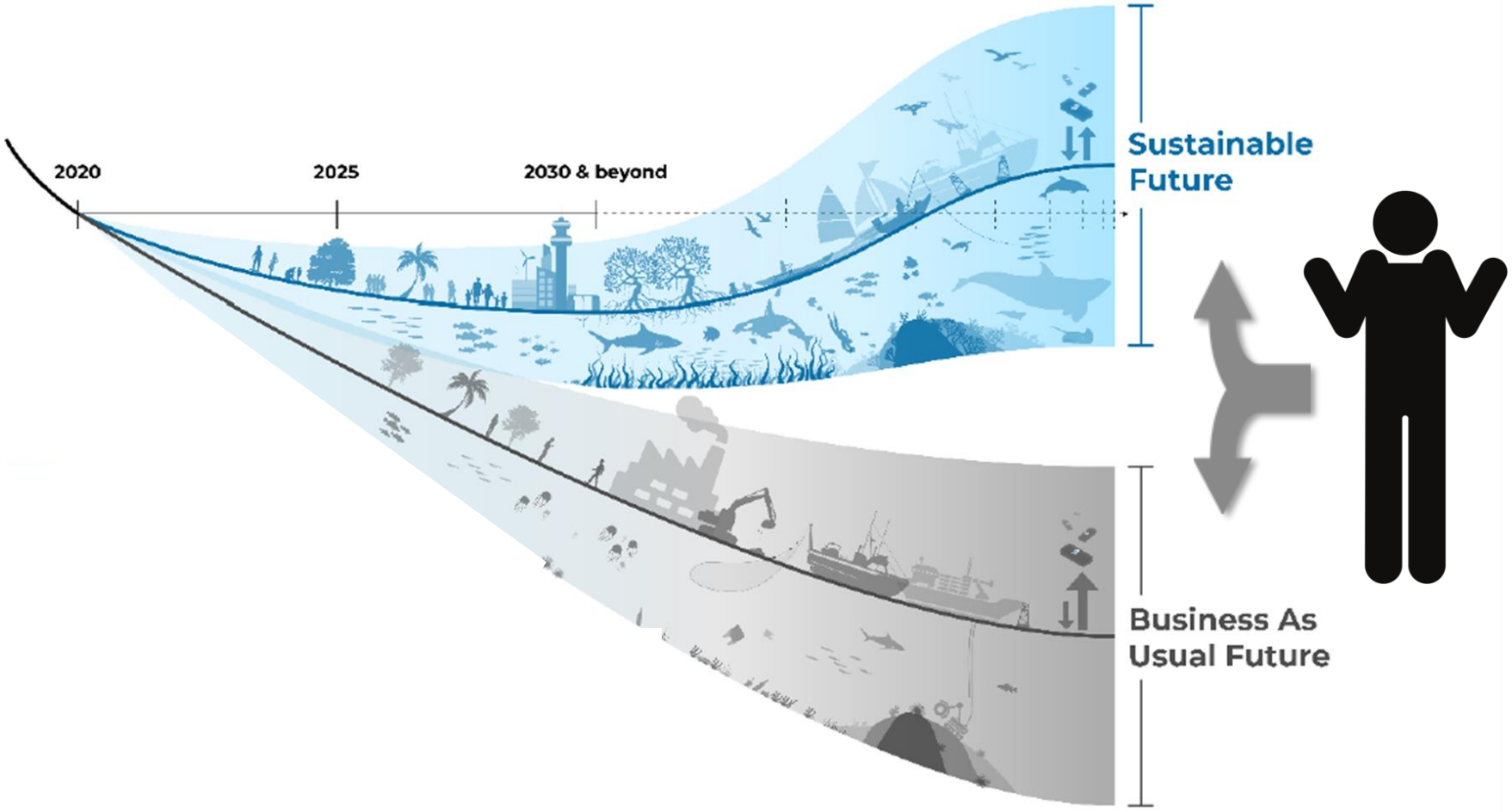
However……

- Need to <u>understand natural kelp forests</u> first before we pursue restoration (the whole community & kelp)
- Consider why restoration needed at all (urchins, warming, urbanisation)?
- <u>Restoration is hard -</u> reinforces need to study/value/protect existing kelp forests



Kelp Restoration Guidebook: Lessons Learned from Kelp Restoration Projects Around the World
(FREE download, just google '*kelp restoration guidebook*')

Future is not fixed……. depends on our choices & actions



Choices
Behaviour
Values
Decisions
Management
Policies
Political will

Safeguarding marine life: conservation of biodiversity and ecosystems.
Ward, Melbourne-Thomas, Pecl et al, 2021, Review in Fish Biology & Fisheries

Future Seas 2030
https://futureseas2030.org/

So what could/should we prioritise?

Engagement, co-creation & building trust

Governance & policy for responsible, equitable & effective interventions

Creating a shared vision of the future & a mobilising narrative

Thank you!

@GrettaPecl
Gretta.Pecl@utas.edu.au

Ocean literacy toolkit available at Future Seas website

Redmap Australia
@RedmapMarine
www.facebook.com/RedmapAustralia
www.redmap.org.au

Species on the Move
@SpeciesOnTheMov
www.facebook.com/SpeciesOnTheMove
www.speciesonthemove.com

Curious Climate Tasmania
https://curiousclimate.org.au/

Future Seas 2030
https://futureseas2030.org/

Centre for Marine Socioecology
https://marinesocioecology.org/