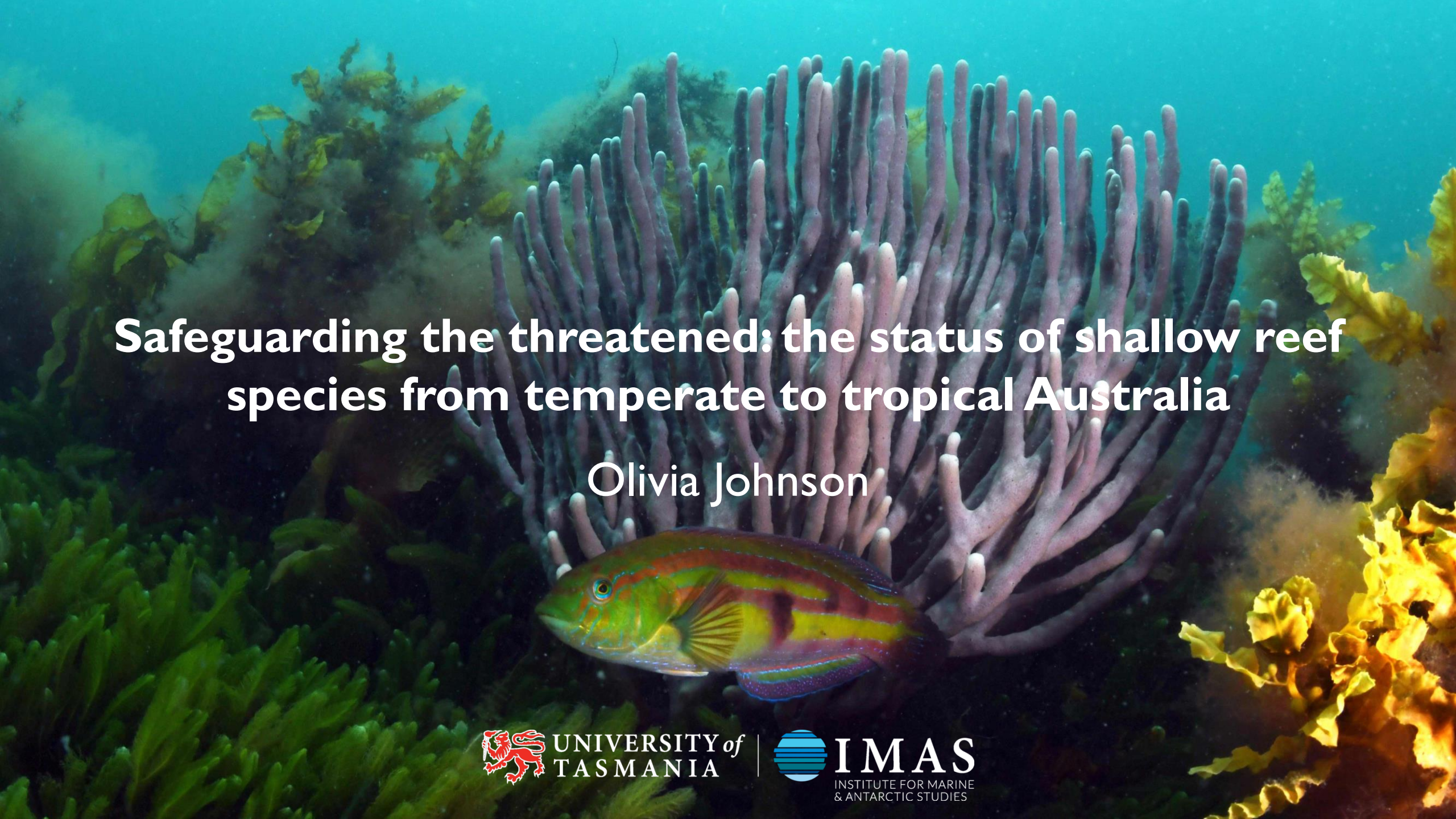
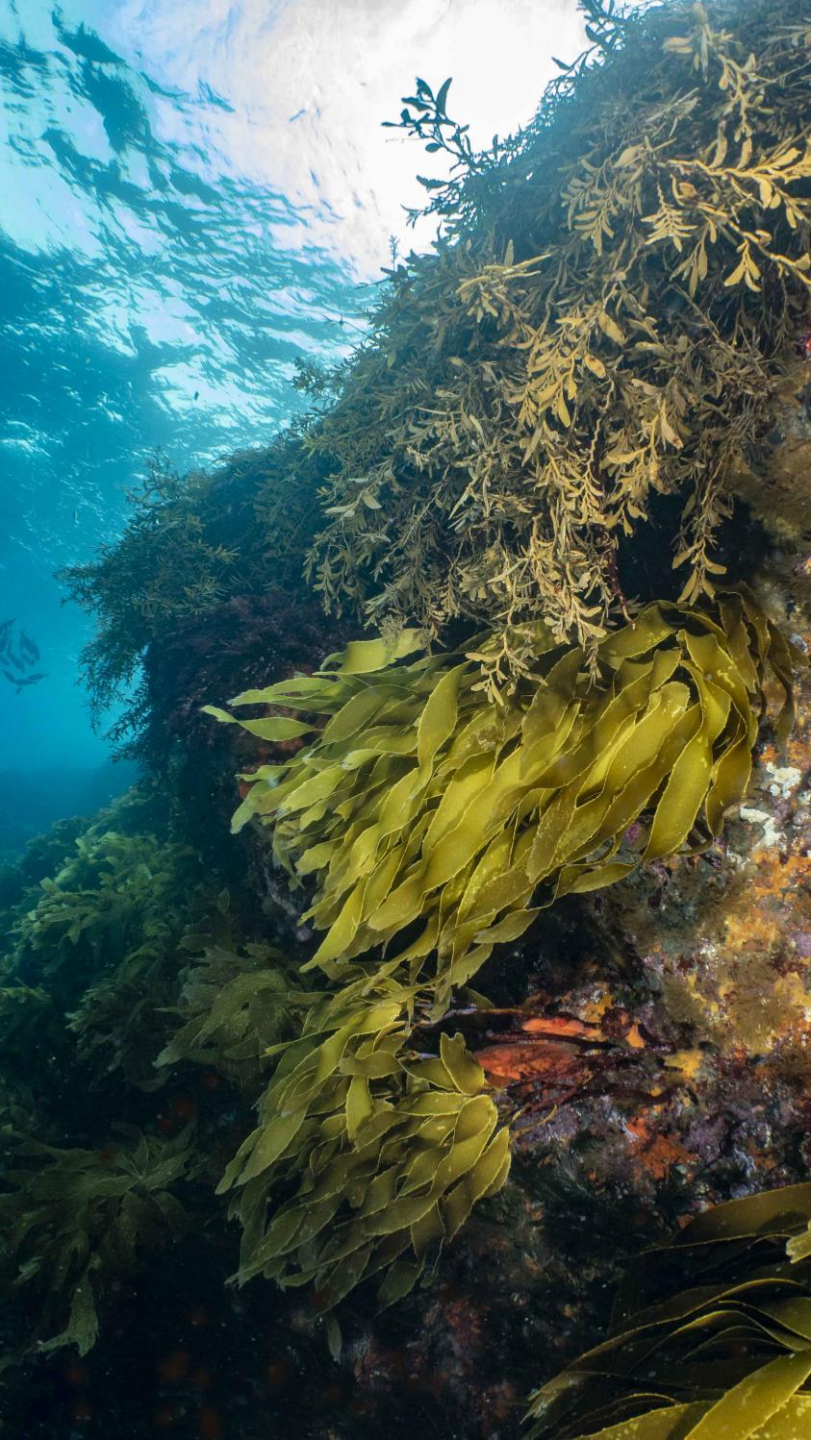


Safeguarding the threatened: the status of shallow reef species from temperate to tropical Australia

Olivia Johnson

UNIVERSITY of TASMANIA | IMAS INSTITUTE FOR MARINE & ANTARCTIC STUDIES



MARINE BIODIVERSITY

- Reef ecosystems (coral & rocky) are some of the most productive and diverse on the planet
- Australia's rich marine biodiversity is unique
  - Endemism some of the highest globally:
    - 50% algae species
    - 31% echinoderm species
    - 38% mollusc species
    - 67% of annelid species
    - 56% of sponge species
- Distinct coastline creating unique biogeographic regions for rocky & coral reef systems

Phillips 2001, Kerswell 2006, Cork et al. 2006, Wernberg et al. 2011, McClanahan et al. 2021

CHANGE & THREATS

87% of oceans have been modified by humans, resulting in **oceans currently facing a <u>biodiversity crisis</u>**

Threats and pressures are multifaceted:

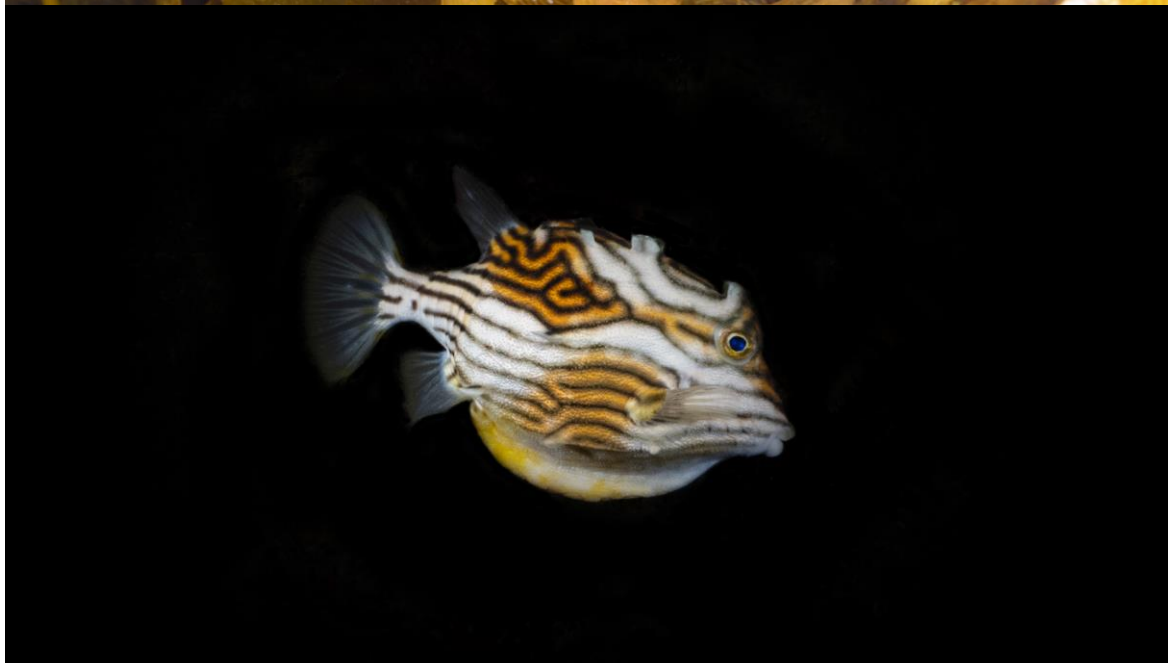
- Climate change
- Ocean acidification
- Pollution
- Marine heatwaves
- Overfishing
- Invasive species
- Habitat degradation
- Species are shifting ranges

Watson et al. 2018, Halpern et al. 2019, Edgar et al. 2020, Trewin 2020, Bergstrom et al. 2021, Guy et al. 2021

MARINE DECLINES

Population trend and distribution data are logistically challenging to collect for marine species

- Invertebrates have 1000 times fewer conservation papers compared to turtles
- Compared to birds, amphibians & mammals (12 – 24%), as little as 0.1% of invertebrates & fish are considered threatened



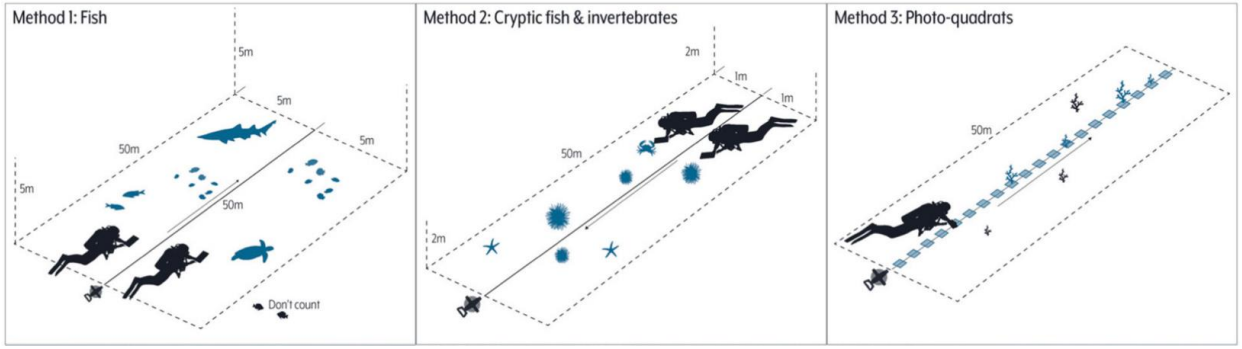
Watson et al. 2018, Halpern et al. 2019, Edgar et al. 2020, Trewin 2020, Bergstrom et al. 2021, Guy et al. 2021

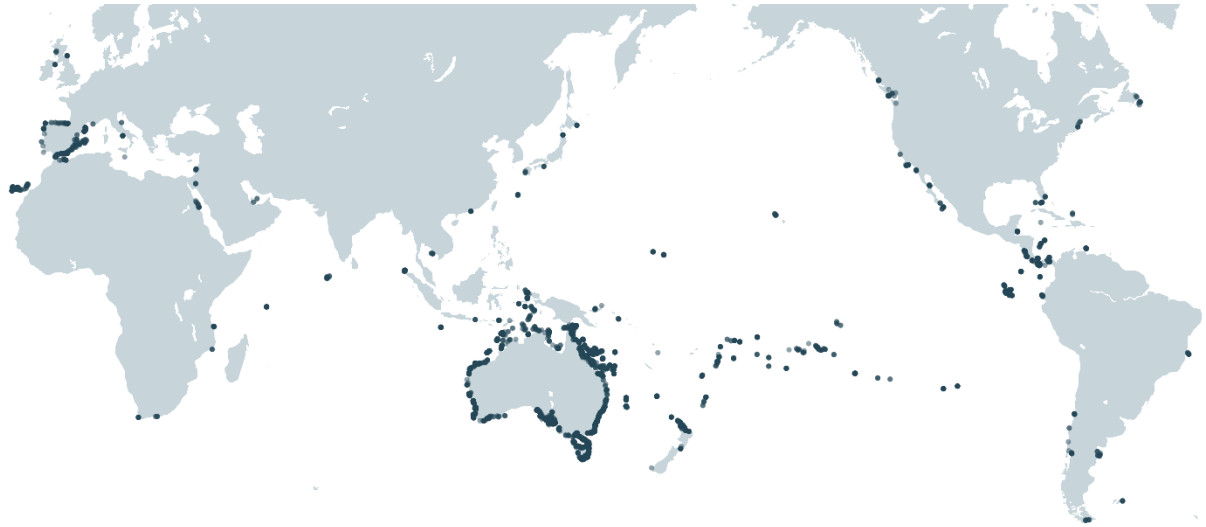
NATIONAL REEF MONITORING

Global dataset

- Reef Life Survey (2007 – 2022)
- Australian Temperate Reef Collaboration (1992 – 2022)

- 3 decades of change
- > 30, 0000 surveys
- > 4000 sites globally





Reef Life Survey methods: refer to https://reeflifesurvey.com/methods/ or Edgar et al. 2020

Photo Antonia Cooper

DECLINING REEF SPECIES

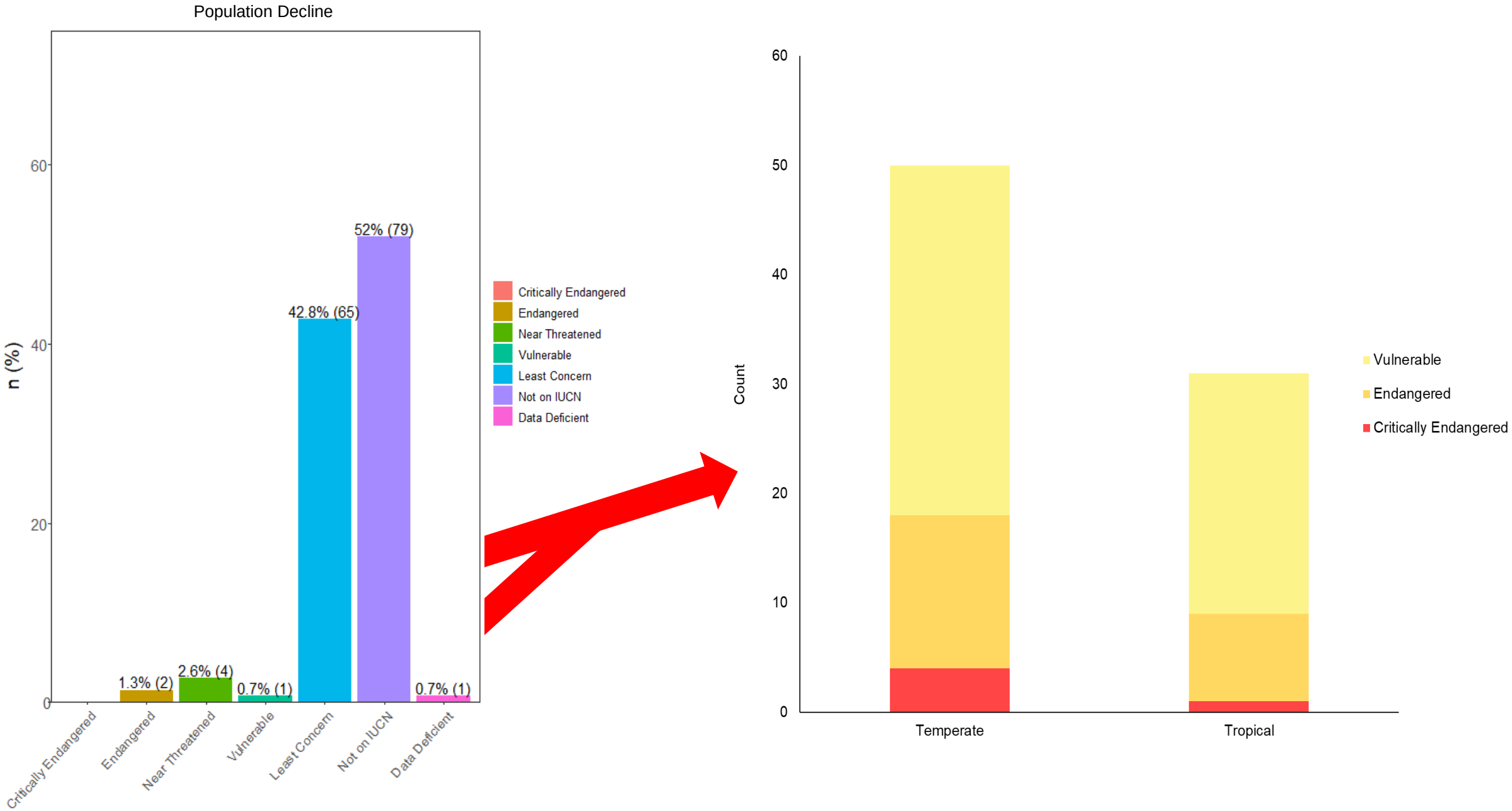
Population trend analysis from 2008 – 2021 over 1,636 sites:

1057 species were assessed

Bony fish (705), Sharks (19), Reptiles (2), Corals (55), Asteroids (27), Echinoids (20), Crinoids (7), Holothurioids (11), Gastropods (55), Bivalves (Giant clams – 5), Cephalopods (4), Crustaceans (13), Brown (48), Red (71) & Green (15) algae

57% of reef species declined from 2008 – 2021 ($P < 0.05$)

e.g. iconic endemic Weedy Seadragon (*Phyllopteryx taeniolatus*) declined 58% from 2011 to 2021



*note the other 905 species trends either did not change or increased over the decade

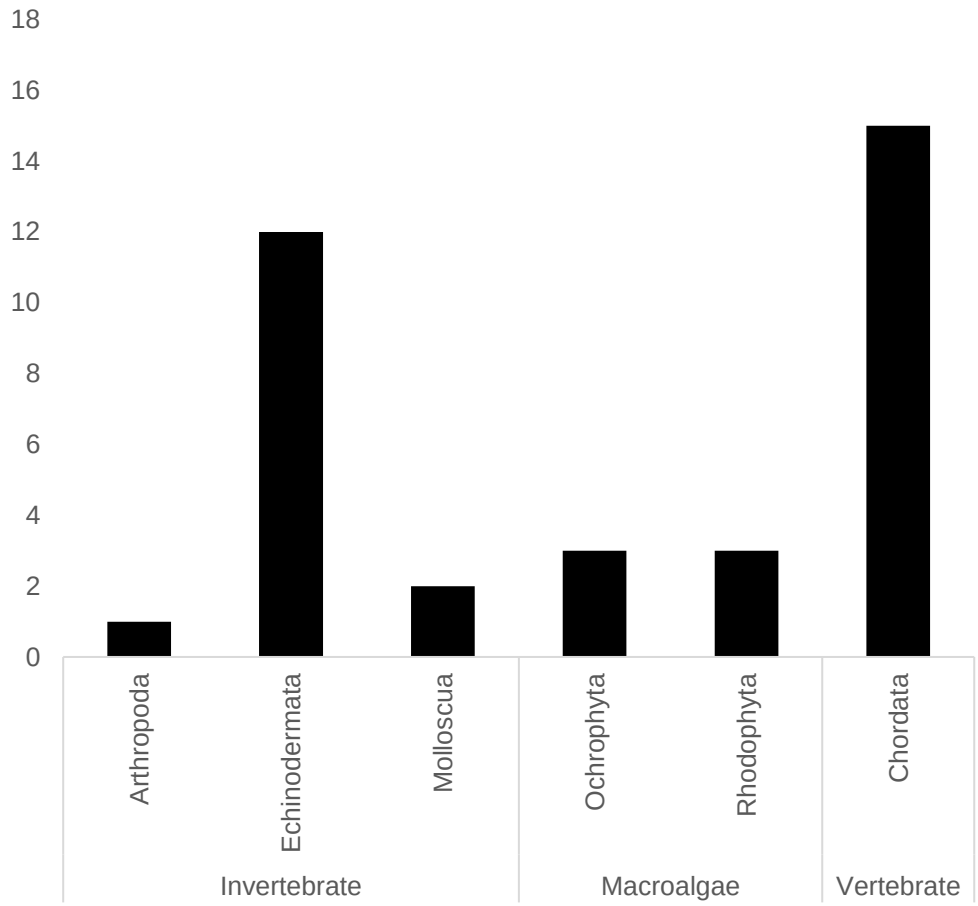
ENDEMIC DECLINES

<u>All endemic species</u> listed below are **<u>temperate</u>**

36 endemic species in decline

- 12/15 invertebrates in decline are echinoderms

Macroalgae		Invertebrates		Vertebrates	
Brown Algae	*Carpoglossum confluens* *Cystophora moniliformis* *Sargassum heteromorphum*	**Hermit Crab**	*Strigopagurus strigimanus*	**Fish**	*Aracana aurita* *Chelmonops curiosus* *Chelmonops truncatus* *Diodon nicthemerus* *Dotalabrus aurantiacus* *Heteroclinus tristis* *Hypoplectrodes maccullochi* *Nelusetta ayraud* *Neoodax balteatus* *Parequula melbournensis* *Phyllopteryx taeniolatus* *Pseudolabrus rubicundus* *Siphonognathus caninis* *Trachinops noarlungae*
		Gastropod	*Campanile symbolicum* *Turbo torquatus*		
		Crinoid	*Cenolia trichoptera* *Comanthus tasmaniae* *Ptilometra australis*		
		Urchins	*Amblypneustes ovum* *Goniocidaris tubaria* *Heliocidaris erythrogramma* *Holopneustes porosissimus*		
Red Algae	*Euptilota articulata* *Gelidium asperum* *Nizymenia australis*	**Sea star**	*Meridiastra calcar* *Nectria ocellata* *Pentagonaster dubeni* *Tosia australis* *Tosia magnifica*	**Ray**	*Hypnos monopterygius*



WHAT'S NEXT?

What characteristics, such as life history or ecological traits, are common to those species that are threatened?

Which locations are currently most important for multiple threatened reef species, and which of these are most vulnerable to predicted impacts of climate change versus locally managed stressors?

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UNIVERSITY of TASMANIA | IMAS INSTITUTE FOR MARINE & ANTARCTIC STUDIES | RLS REEF LIFE SURVEY | ATRC | ECOLOGICAL SOCIETY OF AUSTRALIA | Holsworth Wildlife Research Endowment

Thank you!

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