

Evolution in the field of fish-habitat associations: a comprehensive review of years of research

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Photo by Kerry Borgula



Photo by Peter Fuchs

Study aims



To explore and summarise the current state of knowledge of fish-habitat associations, focusing on three general habitat variables and two fish variables.



Importance of habitats

- **All organisms are associated with particular habitats**
 - ✓ **Ecosystem services**
 - ✓ **Provide key resources: food, shelter, reproduction sites**
 - ✓ **Modify the outcomes of biological interactions: predation & competition**
 - ✓ **Impact survival** (Jaxion-Harm & Speight 2012, Komyakova & Swearer 2021)
 - ✓ **Influence abundances & diversity of associated fauna** (Komyakova et al., 2013, Shelamoff et al., 2020)
- **Habitat dependence varies between species and life-stages** (Komyakova et al. 2019, Prahalad et al. 2019)
- **Habitat loss and degradation caused loss of species across a range of different environments** (McCauley et al., 2015)



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Photos by Peter Fuchs

Habitat characteristics



Habitat complexity



Habitat diversity



Biogenic cover

Habitat complexity	Habitat diversity	Biogenic cover
Surface rugosity (e.g., chain (Risk 1972), surface depth variation)	Species richness	% cover
Number/size of holes and crevices	Diversity index (Shannon-Wiener; Simpsons etc.)	CPCe
Distance between branches and branch length	CPCe	
% branching coral cover	Visual <i>en situ</i>	
Vertical relief or algal height		
Algal density		
3D (e.g., Opel et al. 2017)		
Visual		



Photo by Kerry Borgula

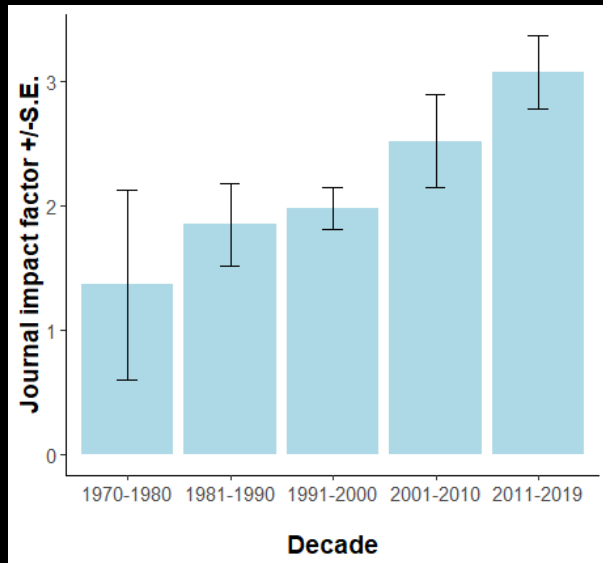
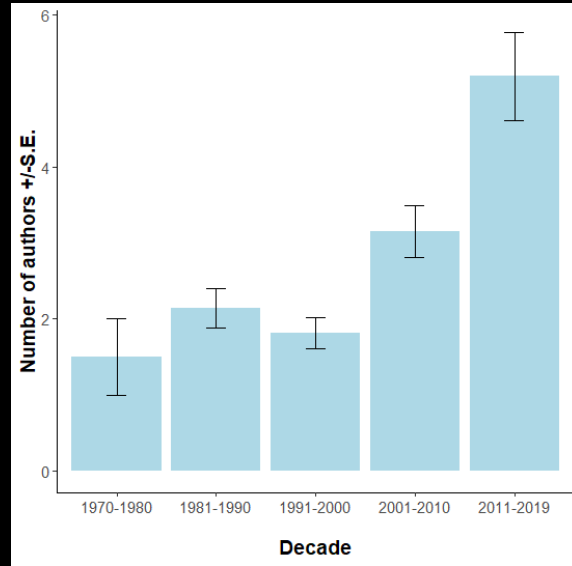
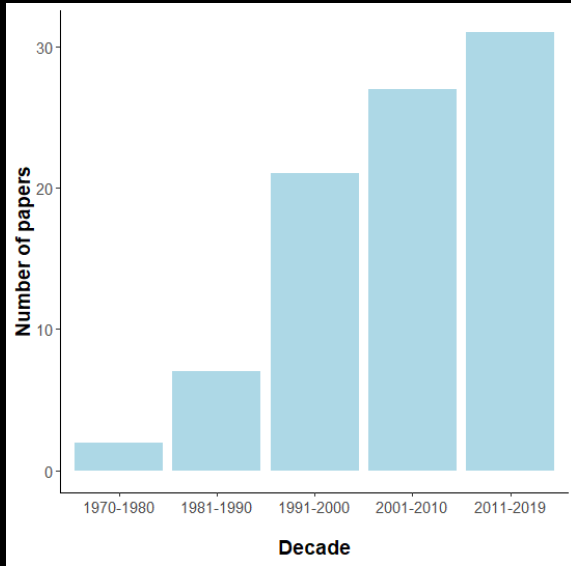


Systematic literature review

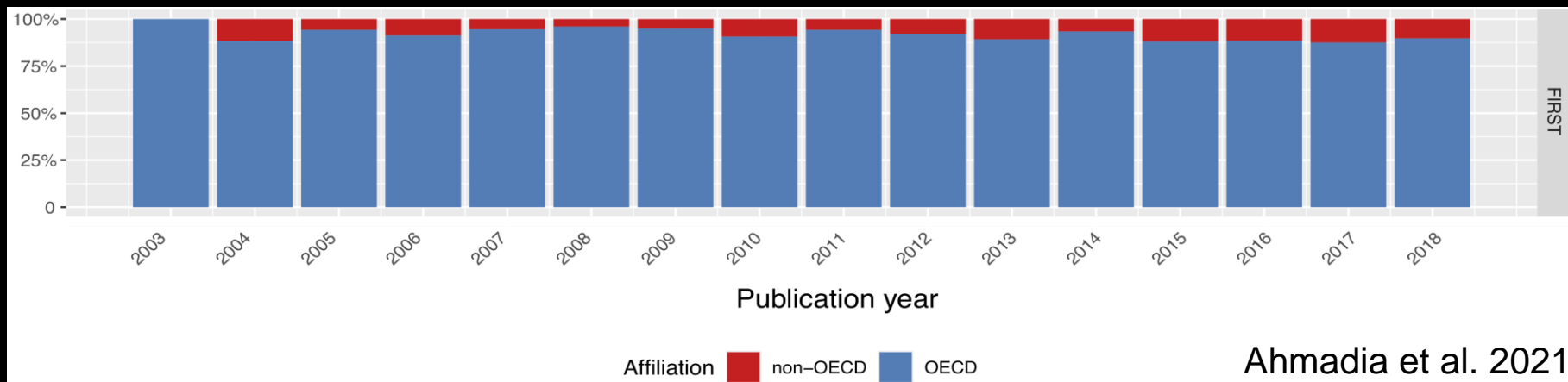
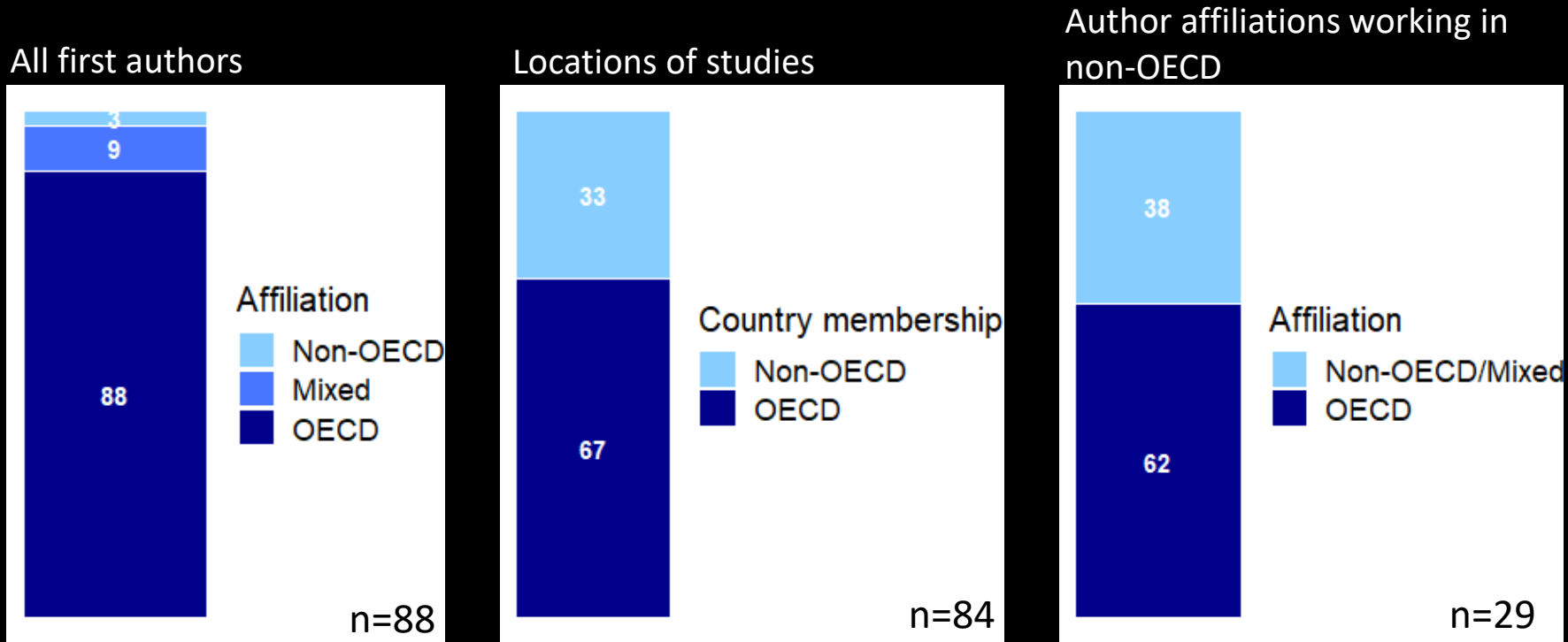
Table 1: Search conducted using Boolean logic in Web of Science (6.1.2023)

Search terms and restrictions	Output	Processed to date
TI= (fish OR "fish habitat") AND TS = ((fish AND habitat AND abundance OR richness OR diversity) AND "topographic complexity" OR "canopy structure" OR "coral cover" OR "algal cover" OR "complexity" OR "rugosity") AND PY=(1972-2022)	2414	
Refined by English Journal article Citation topics marine biology zoology & animal ecology WOS categories Marine freshwater biology Ecology Fisheries Oceanography Environmental sciences	1329	Data extracted: 88 Deemed unsuitable: 146

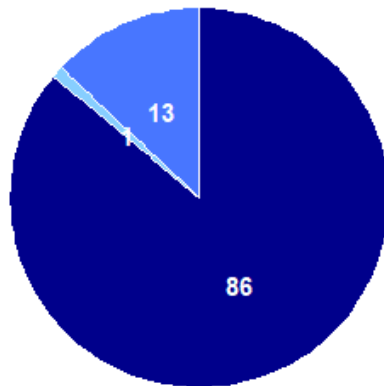
Evolution in the field and sociological components



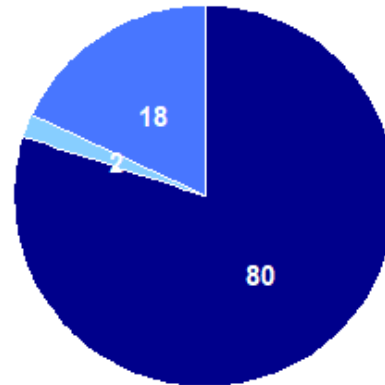
Evolution in the field and sociological components



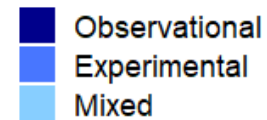
Evolution in the field and sociological components



Habitat type



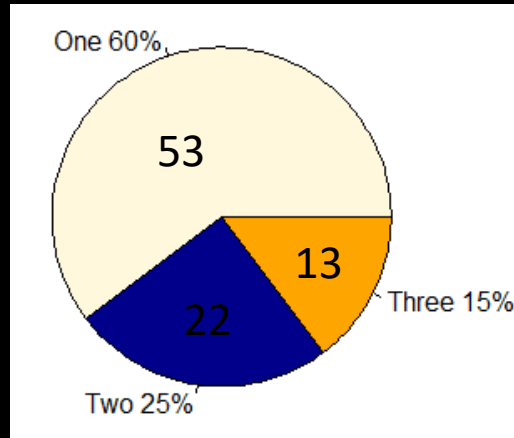
Study type



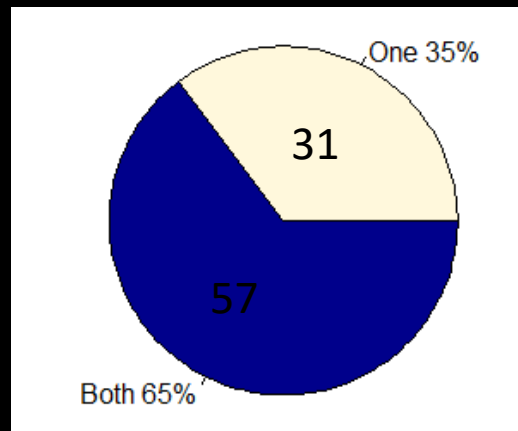


Fish-Habitat associations

Number of habitat variables measured per study

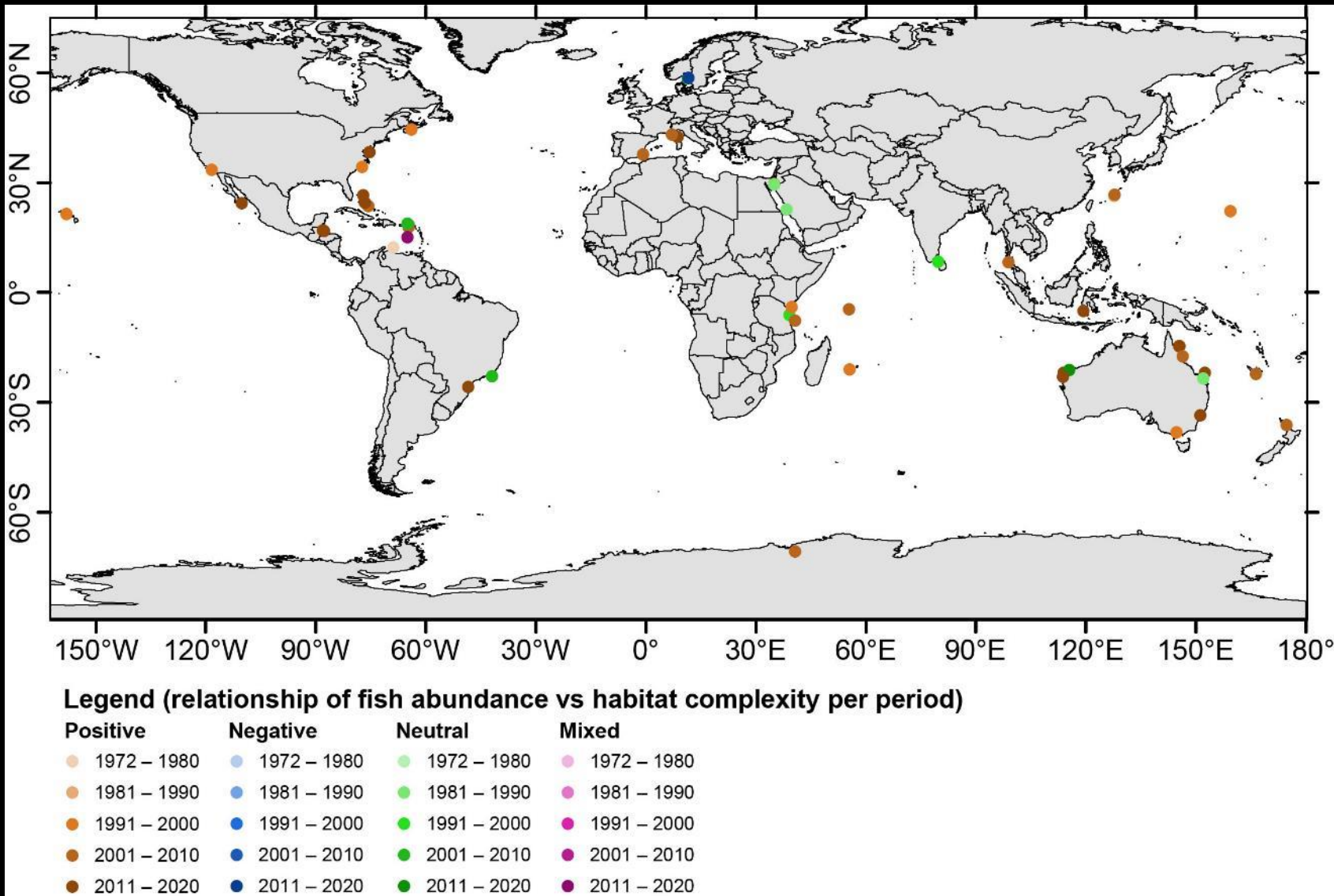


Number of fish variables measured per study



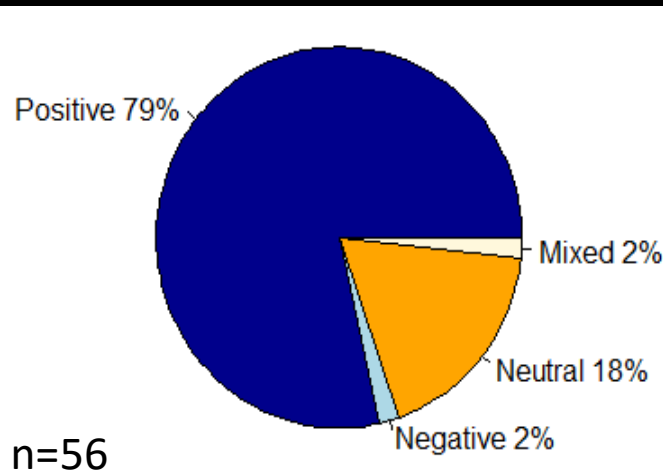
Fish-Habitat associations

Fish abundance vs habitat complexity

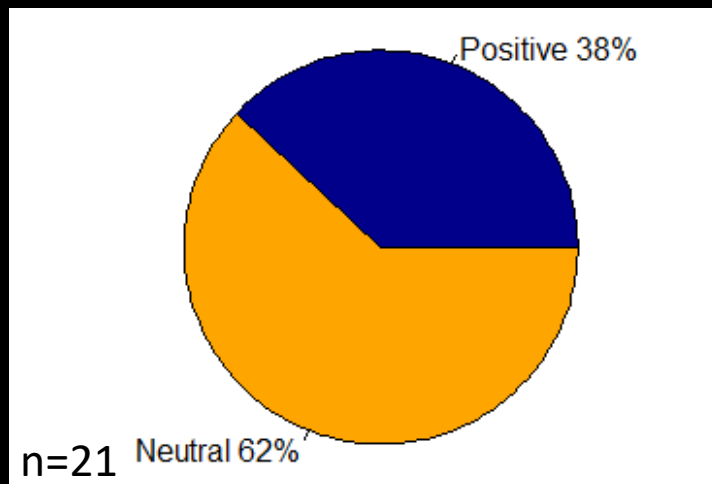


Fish-Habitat associations

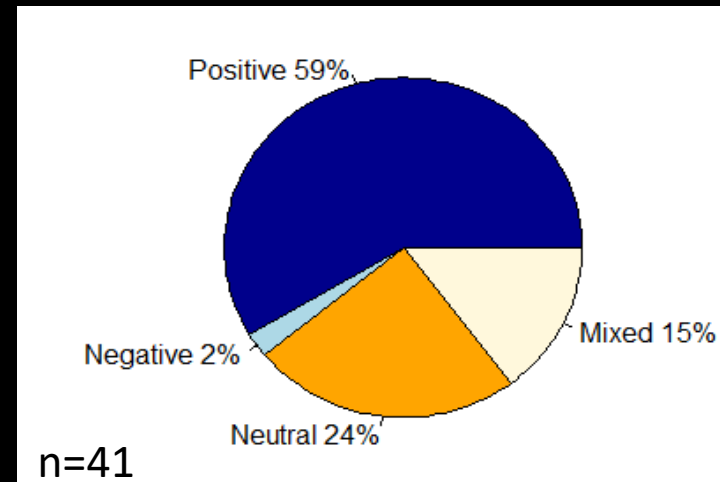
Fish abundance vs habitat complexity



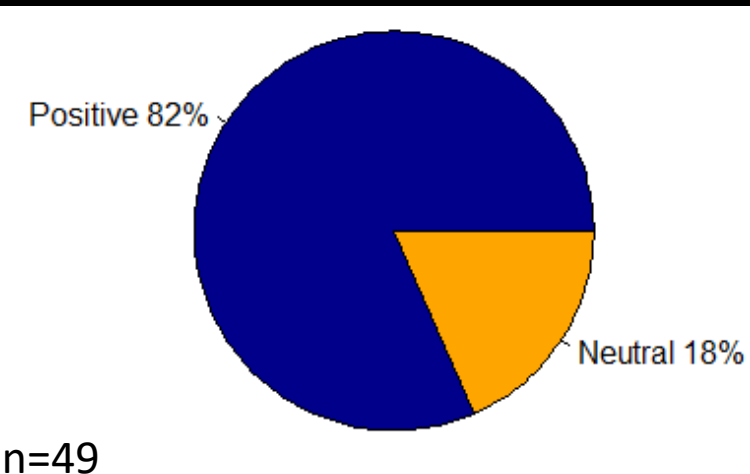
Fish abundance vs habitat diversity



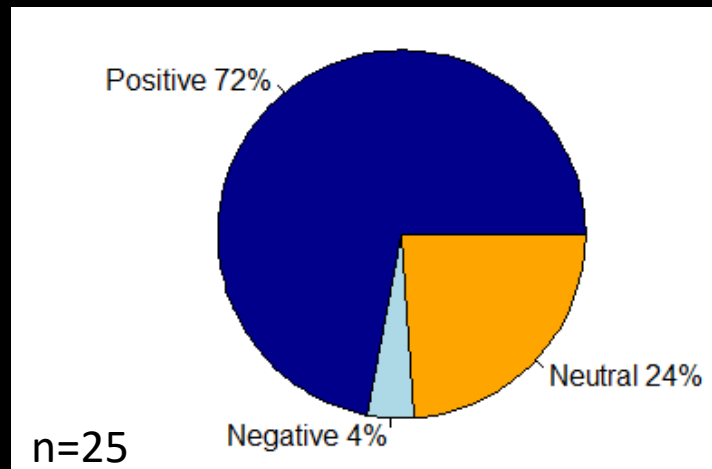
Fish abundance vs biogenic cover



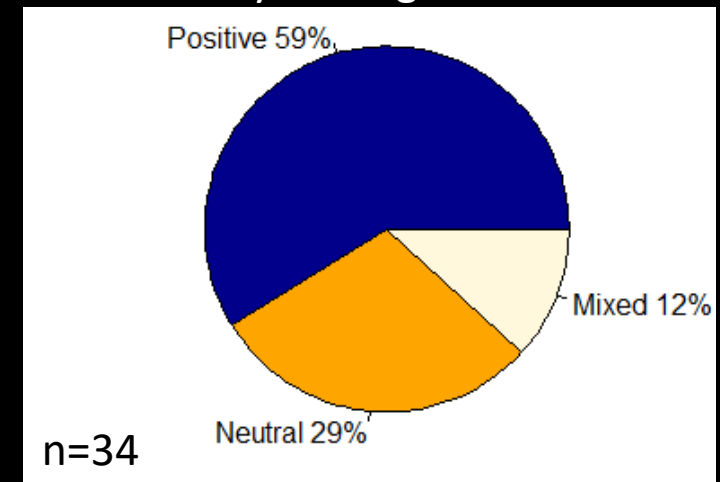
Fish diversity vs habitat complexity

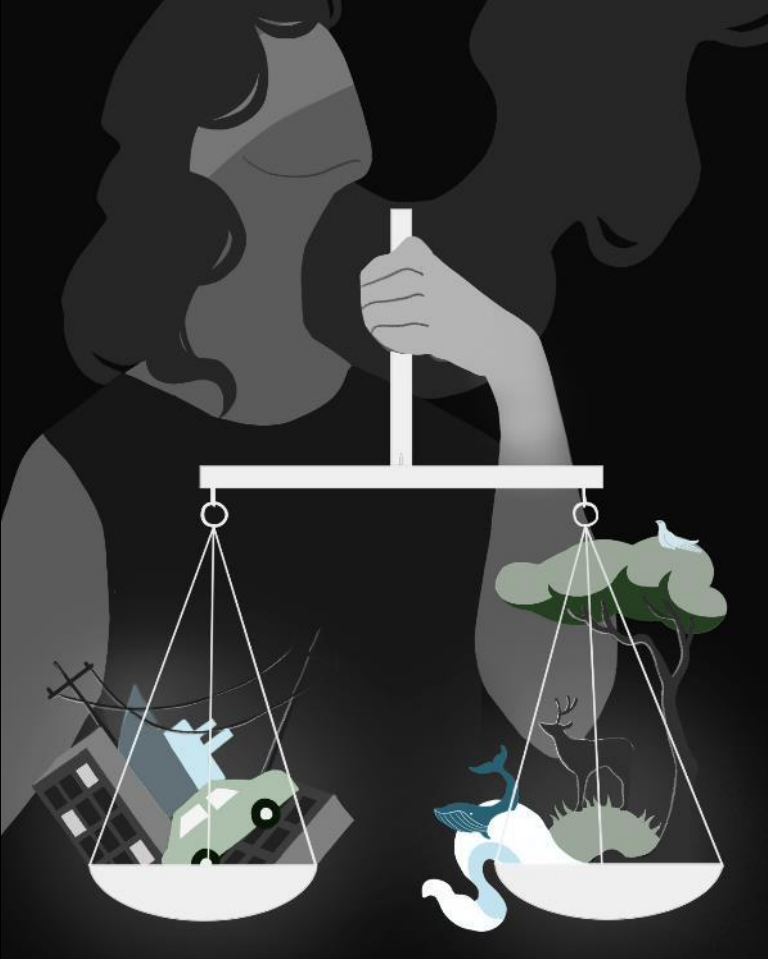


Fish diversity vs habitat diversity

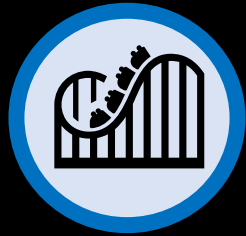


Fish diversity vs biogenic cover

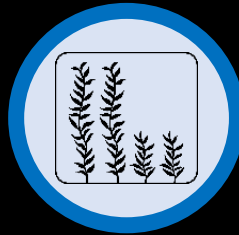




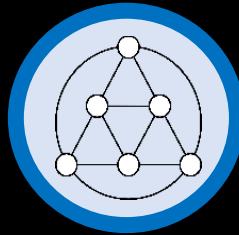
Broad applications



Impacts & change



Habitat restoration



Artificial habitats



Photo by Kerry Borgula



Photo by Kate Murphy

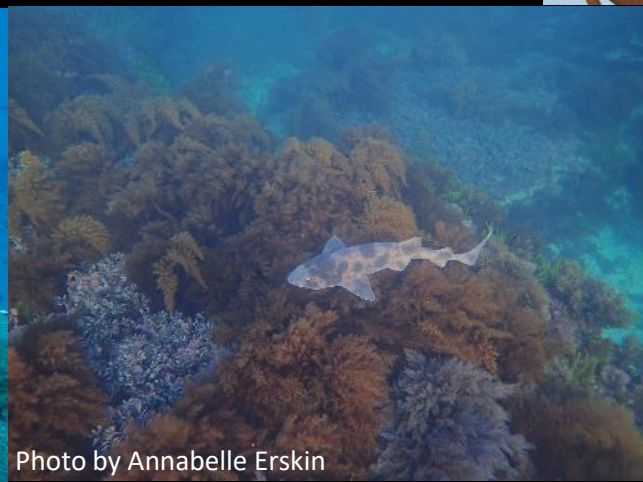


Photo by Annabelle Erskin



Photo by Kerry Borgula

Thank you for your attention

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