Fisheries and Oceans Canada
Pêches et Océans Canada

Marine biogenic habitats: assessing benthic cover and species-habitat associations

Tse-Lynn Loh, Lily Burke, Stephanie Archer, Anya Dunham

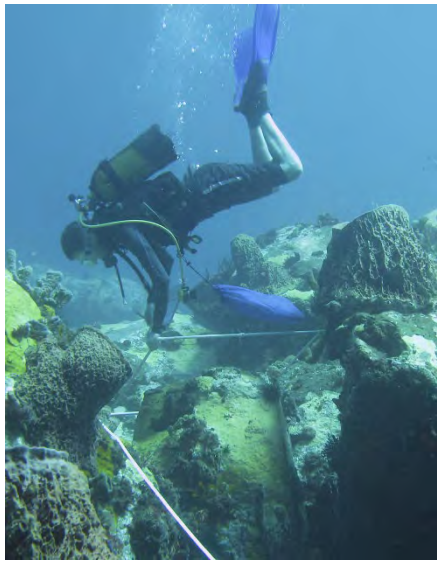
PICES S4 (October 30, 2018)

Outline

1. Habitat-forming species and community indicators
2. Monitoring protocol flowchart
4. Case study: glass sponge reefs in British Columbia, Canada

Habitat-forming species indicators

- ✓ Foundation species cover, biomass, and/or density
- ✓ Other habitat-forming species cover and community structure
- ✓ "Status" indicators (e.g. physical damage, disease, contaminants)
- ✓ Seascape ecology metrics (e.g. patch size and shape)
- ✓ Dominant ecological function (e.g. filtration capacity)



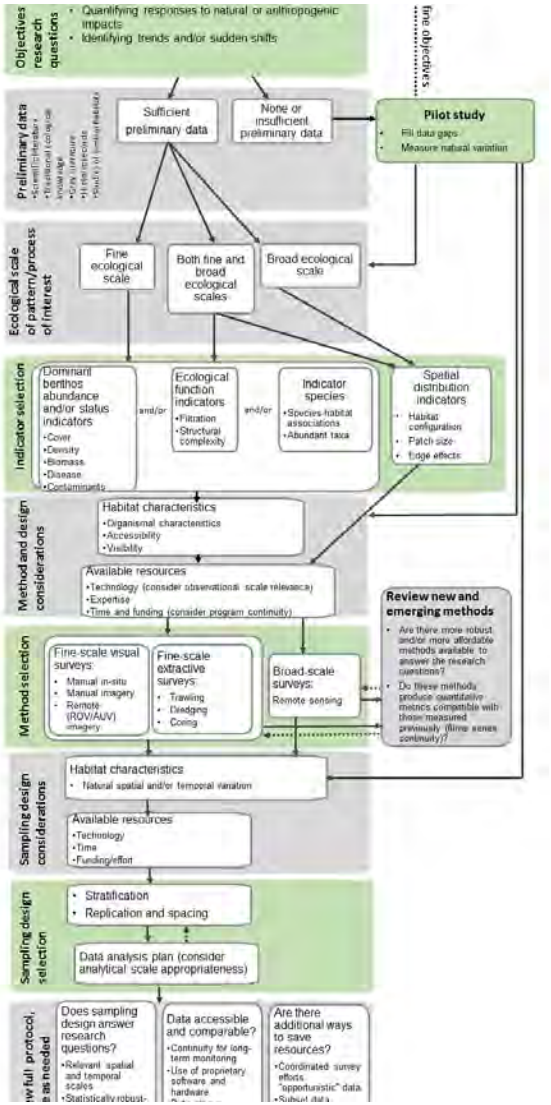
Community indicators

- ✓ Most abundant and/or widely distributed taxa
- ✓ Species-habitat associations

Types of functional associations:

- Shelter (from physical forces and/or predators)
- Breeding ground
- Nursery
- Indirect food source (habitat-associated prey)
- Direct food source

Assessment and monitoring protocol



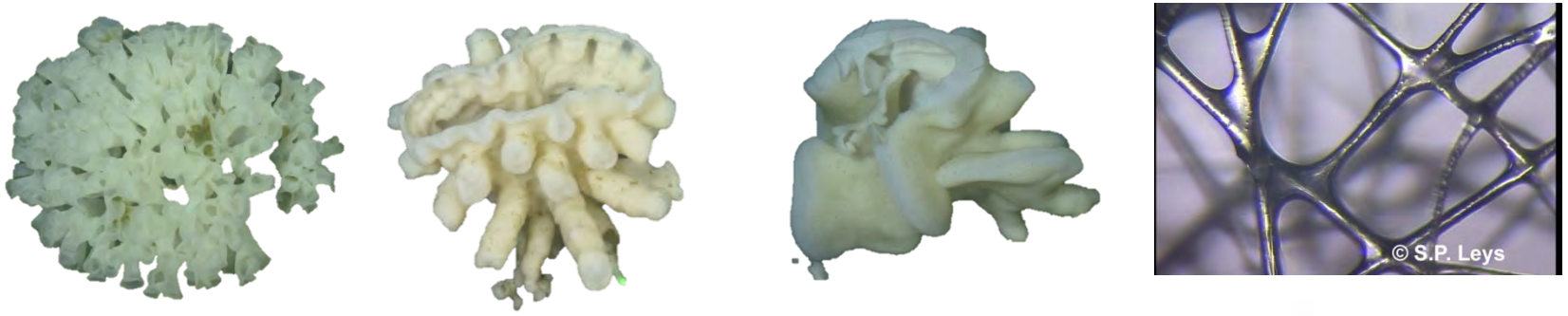
- Objectives and research questions
- Preliminary data/pilot study
- Ecological scale of pattern and/or process of interest
- Indicator selection
- Methods considerations (habitat- and resource-driven); new + emerging methods
- Method selection
- Sampling design considerations
- Sampling design selection
- Full protocol review

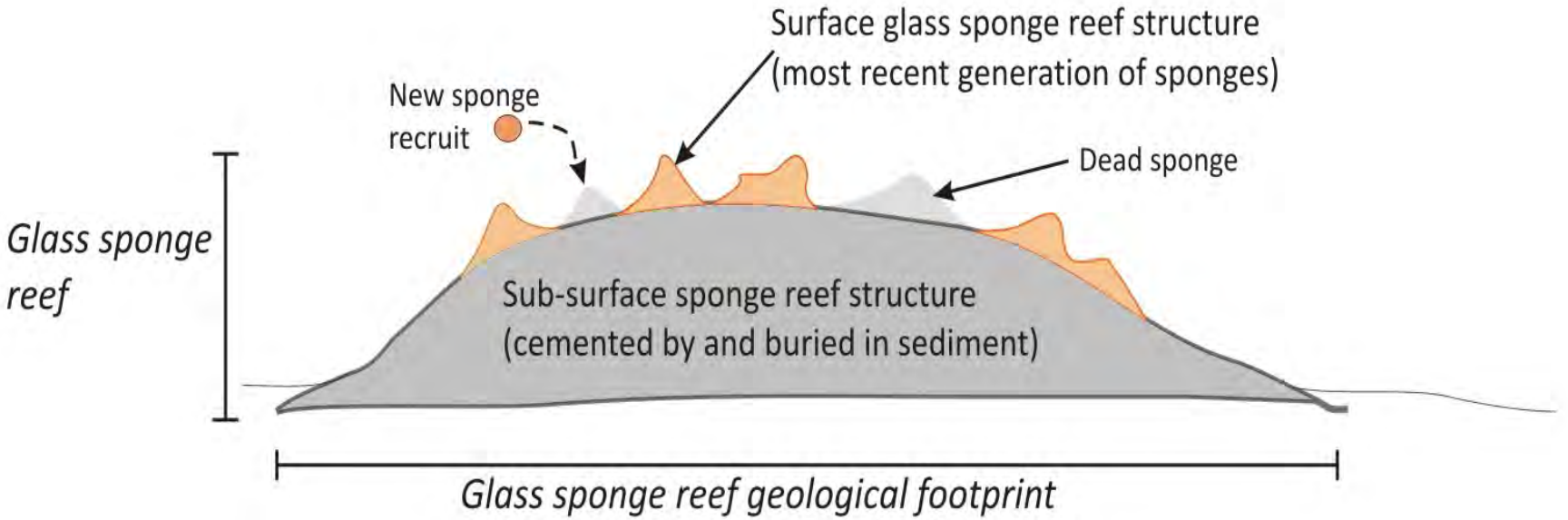
Loh et al, in review

Outline

1. Habitat-forming species indicators
2. Community indicators
3. Monitoring protocol flowchart
4. Case study: glass sponge reefs in British Columbia, Canada

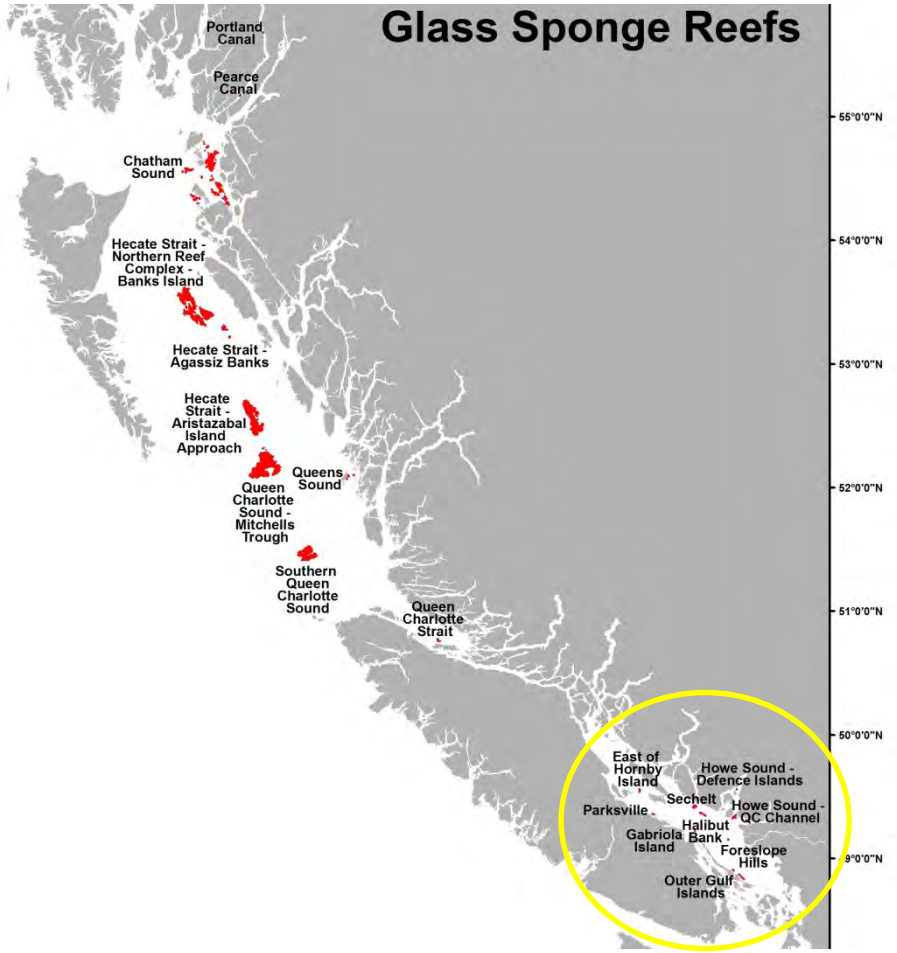
Case study: glass sponge reefs





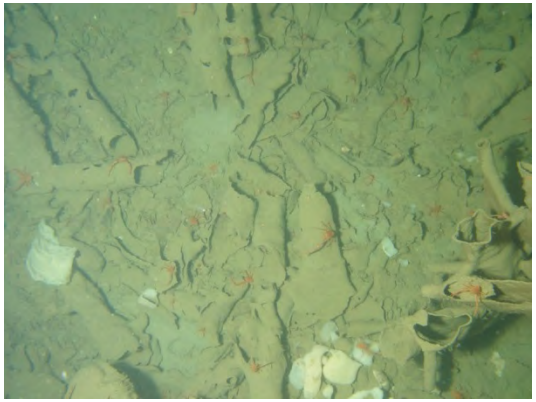
Objective

"To establish a baseline for the status of structural habitat, biodiversity, and ecosystem function for 9 glass sponge reefs in the Salish Sea and recommend a monitoring approach capable of detecting trends over time"



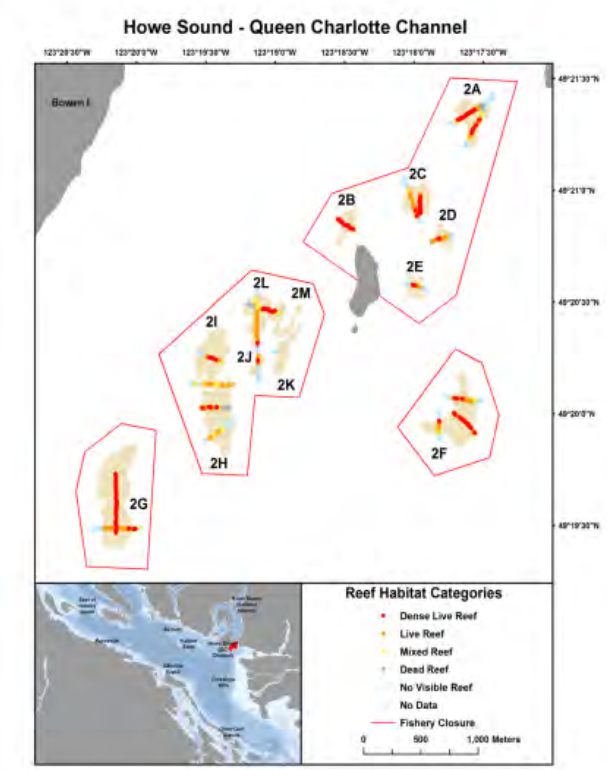
Preliminary data

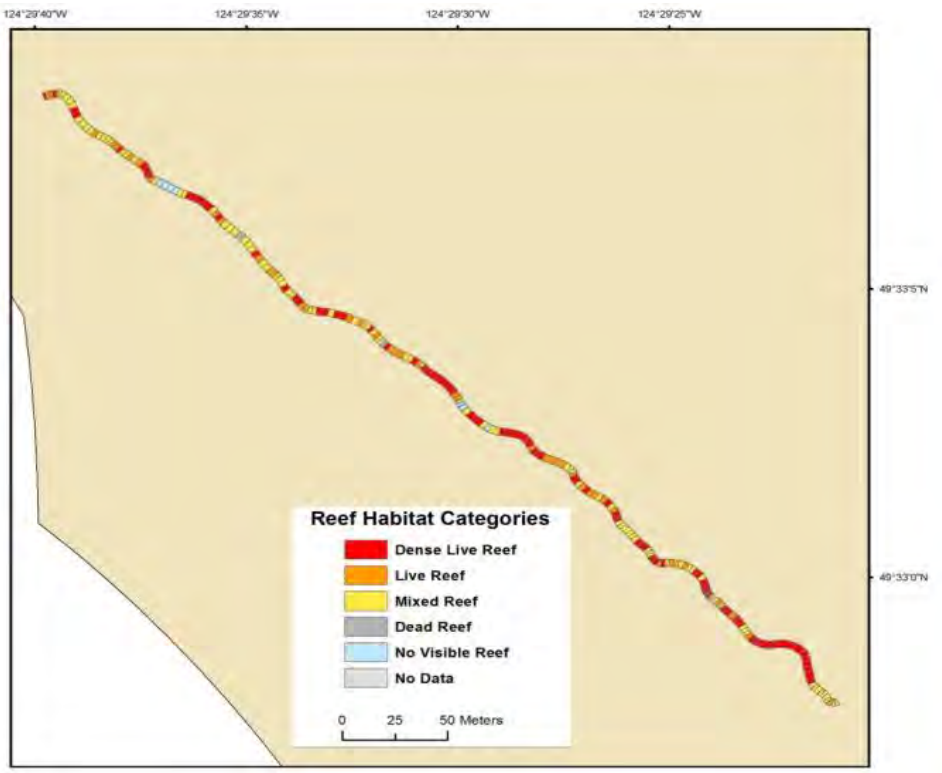
1. Geologic structure delineated using remote acoustics
2. Reef-building sponges are fragile and slow growing
3. Important stressor: suspended sediment
4. Natural patchiness
5. No quantitative methods available



Ecological scale of interest

1. Distribution at basin scale is unlikely to change within management time scales =>Reef level
2. Fine-scale patterns and processes within reefs

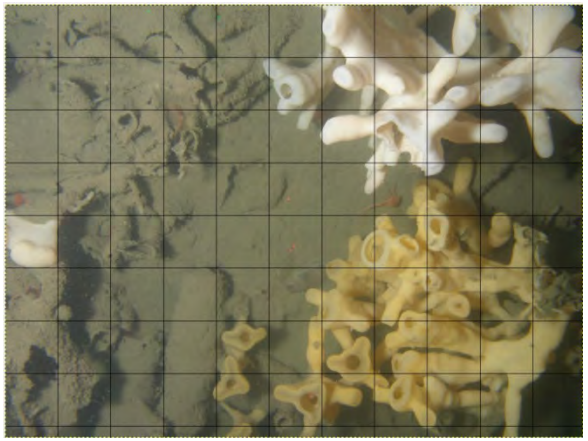




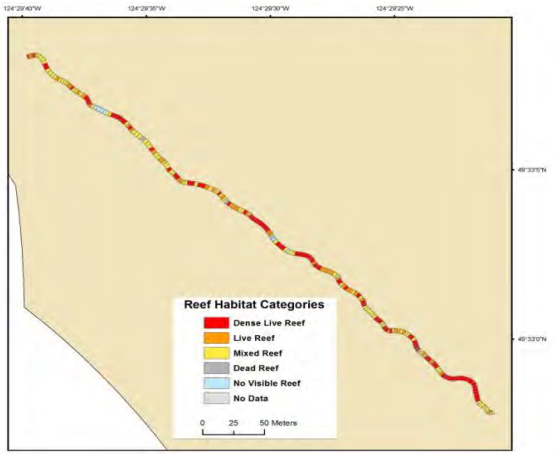
Indicator selection: habitat

~~Sponge density and biomass~~.

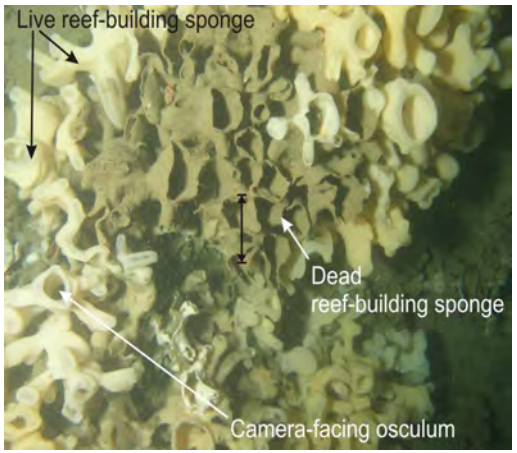
Reef-building sponge % cover (still images):



Relative proportion of live reef habitat (video):



Oscula (=filtration unit) density (still images):



% images with visibly broken sponges:

Dunham et al, in press

Indicator selection: community

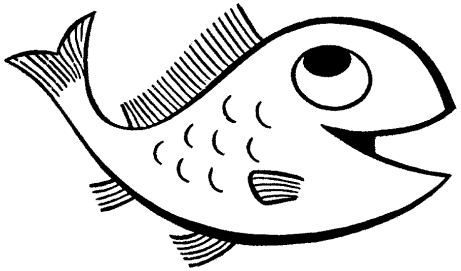
- Species diversity (Shannon-Wiener index)
- Indicator species (Dufrêne and Legendre 1997) densities:
  rockfish, spot prawn, squat lobster

Archer et al, in prep

Methods considerations

- Most reefs are below safe SCUBA limits
- DFO ROV, 1 survey day per reef

New and emerging methods: passive acoustics



Frequency of soniferous fish calls

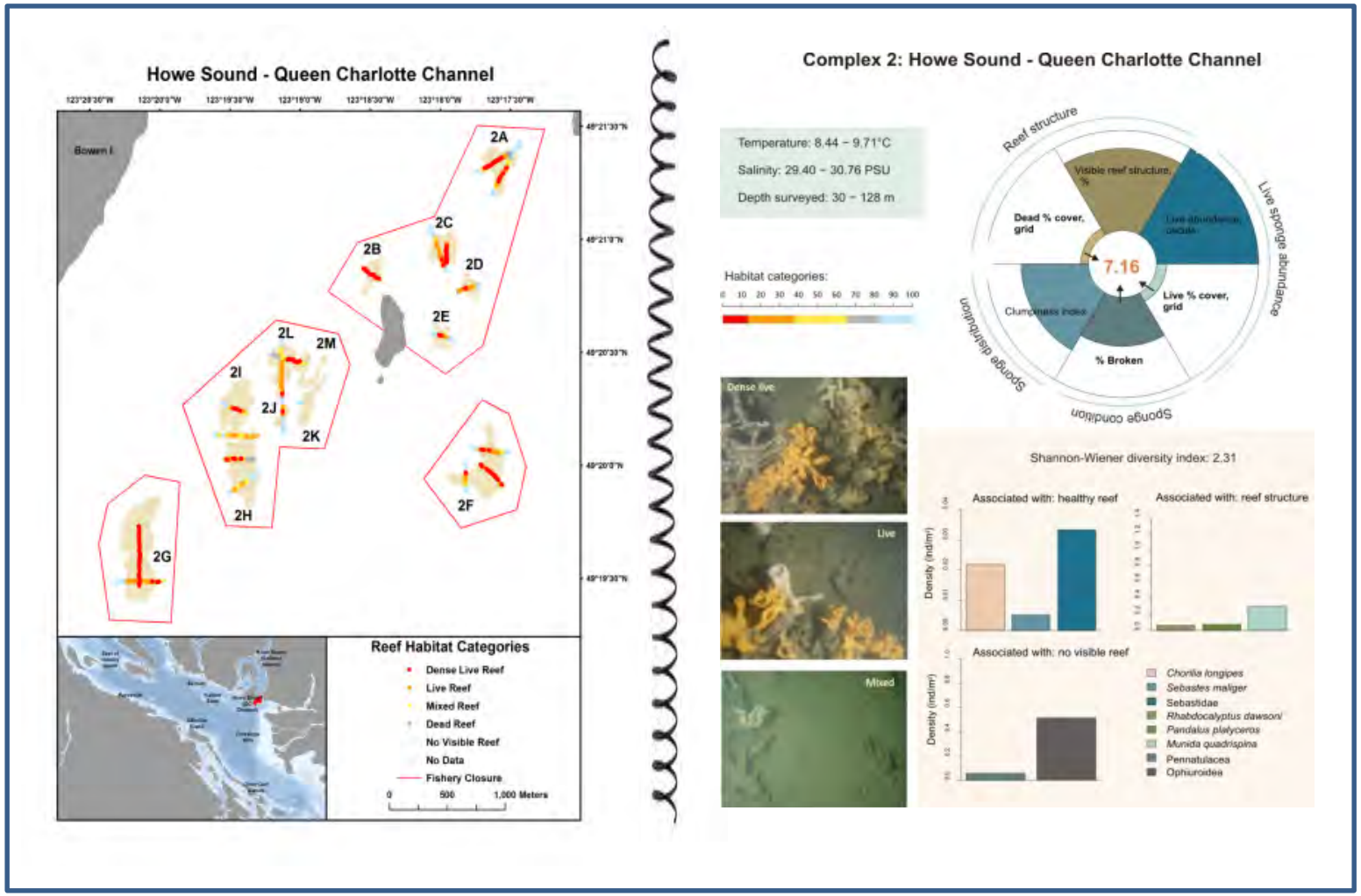
Archer et al 2017

Sampling design

Combination of:

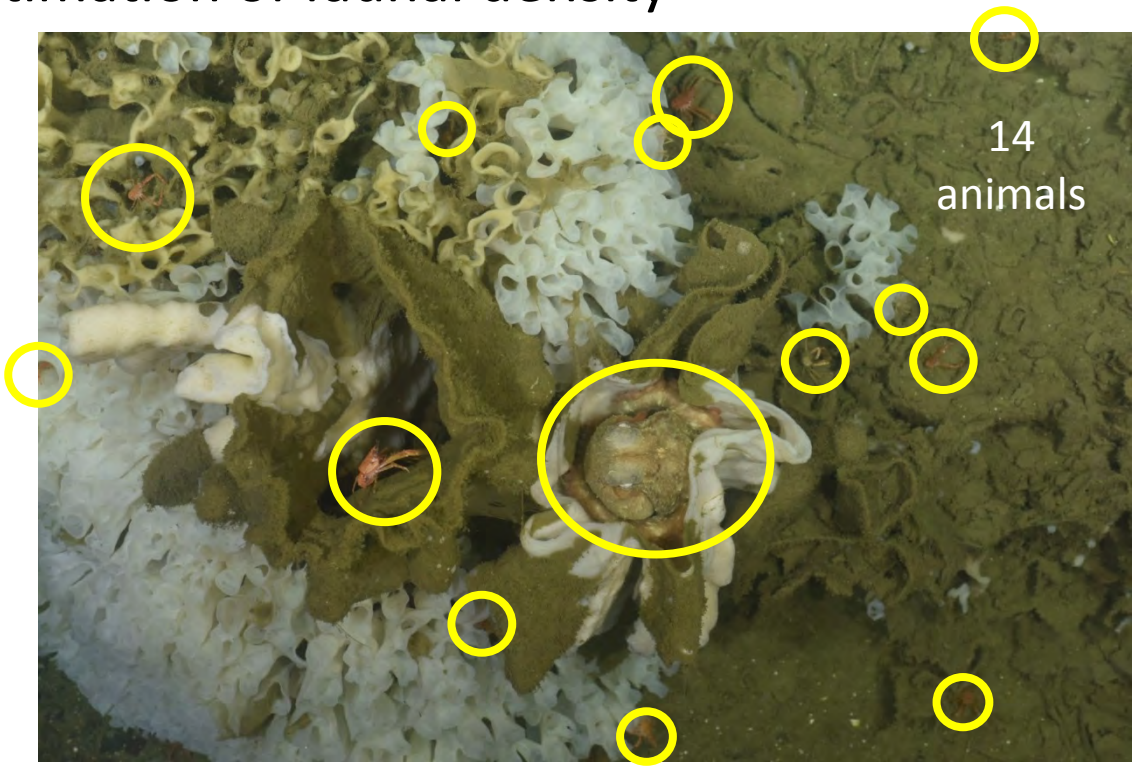
1. Fixed transects + index sites to assess trends in sponge abundance
2. Stratified random transects to increase likelihood of capturing stressor impacts

Reef status summaries



Uncertainties and future research needs

- Detectability: habitat complexity leads to under-estimation of faunal density



- Limited understanding of natural variability
- Lack of knowledge on glass sponge recruitment

Working together

Marine Life Sanctuaries Society

& Underwater Council of BC

Glen Dennison, Sheila Creighton, Lora McAuley, Lena Clayton, Adam Taylor, and others

University of Alberta

Dr. Sally Leys and her team: Nathan Grant, Dr. Amanda Kahn, Lauren Law, and others

University of Victoria

Dr. Francis Juanes and his team

DFO

Science

Sarah Davies, James Pegg, Wolf Carolsfeld, Erik Archer, and others

Oceans

Jazz Amyot, Brett Marchant, and others

Sustainable Fisheries Framework

Aleria Ladwig, Faith Yu, and others

Centre for Science Advice, Pacific

NRCan

Kim Conway

Rob Kung

CPAWS BC

Thank you