

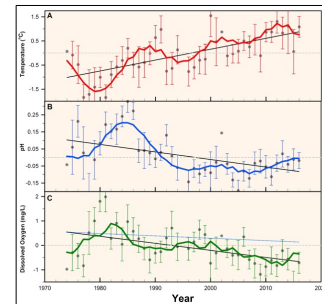
# Use of historic underwater imagery, logbooks, and reports to assess stability and change in boulder habitat communities over decadal periods

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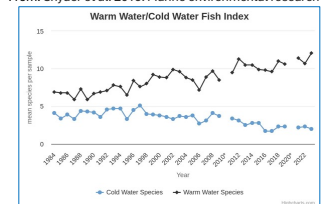
1

## Some self-evident bits:

- Field studies generally match the tenure of graduate students or post-docs and the limited period of project funding.
- Climate change and other human-caused disturbances not limited to poles and tropical coral reefs
- LIS region, a large estuary, with taxa adapted to change, exhibits empirically demonstrable effects of climate as well as local disturbances
- Complex habitats and landscapes difficult to sample but have important functional roles
- Archives of qualitative seafloor images are useful resources to assess change
- Useful for ecological status and trends as well as conservation alternatives



From: Snyder et al. 2019, *Marine environmental research* 146

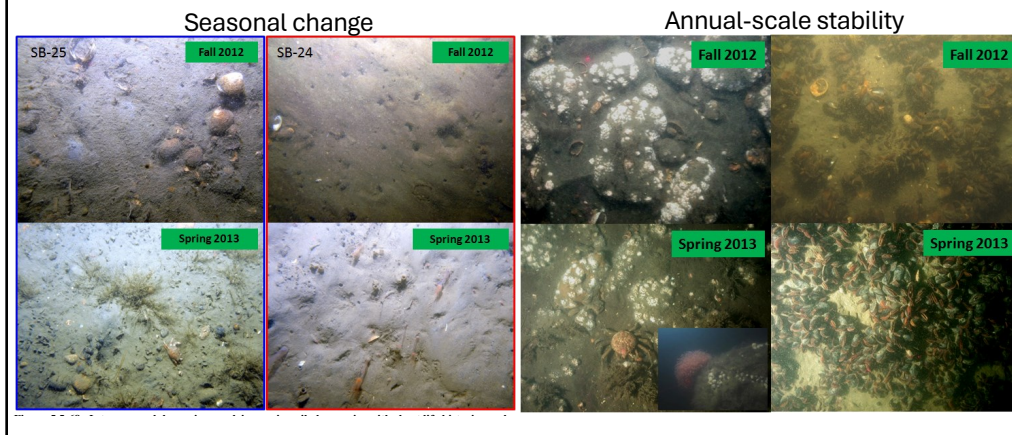


From: <https://longislandsoundstudy.net/ecosystem-target-indicators/warm-water-cold-water-fish-index/>



2

Seafloor habitats, characterized by structure forming fauna, exhibit patterns of seasonal change or annual stability, based on underlying geology and LH of dominant taxa



3

Decadal-scale studies of complex habitats are rare

**1991-2010**

**Loss of an erect sponge on a rock reef in Long Island Sound (north-west Atlantic)**

Marine Biodiversity Research, page 1 of 6. © Marine Biological Association of the United Kingdom, 2012. <https://doi.org/10.1017/S1462291312000014>. Published online

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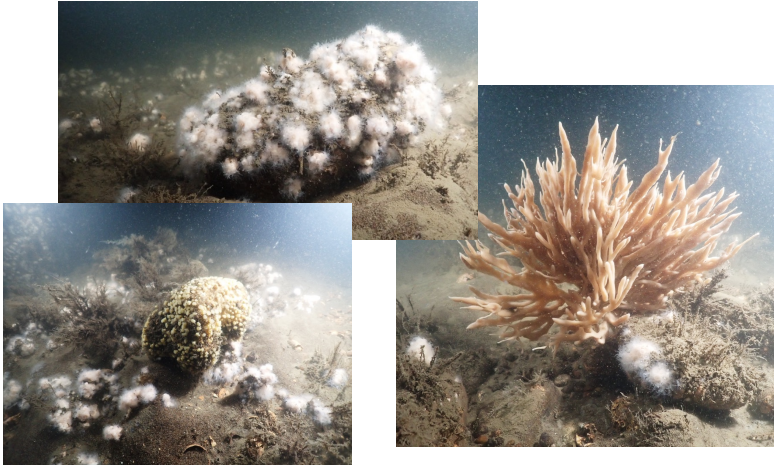
Shuffled Shoal is a topographic high dividing the west and central basins of Long Island Sound (north-west Atlantic). The northern end of the shoal has a linear, north-south-trending boulder reef along the crest. Reported observations of the reef using remote and diver-held cameras from 1991 to 2006 found an apparently stable epibenthic community dominated by *Halysion nodosum* (branching sponge), *Astrangia pectinata* (erect star coral), *Mytilus edulis* (blue mussel) and erect sponges. In 2006, when the boulder reef area was imaged as part of a benthic habitat mapping project, *A. pectinata* was still abundant, but no *H. nodosum* was found. A number of mechanisms (e.g. species interactions, disease, recruitment failure, thermal stress, sediment loading, freshwater input and physical disturbance) may have contributed, individually or synergistically, to the community shift. However, because of the ad hoc and sporadic nature of the observations,

**2012**

4

## Summer 2023 – What process/model applies?

Recovery, resilience, tipping points in LIS complex habitats?


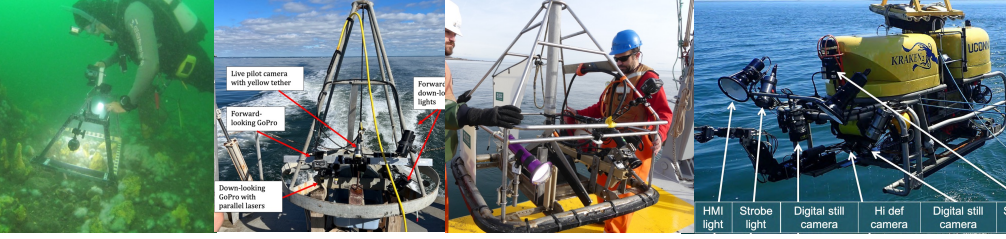


	1991-2010	2012-13	2022-23
Astrangia	↑	↑	↑
Haliclona	↑	↓	↑
Mytilus	↑	↓	↓
Crepidula	↓	↑	↑
Bryo-Hydro	↑	↑	↑

5

## Look what I found behind the file cabinets?

- 35mm color transparency film (primarily Kodachrome and Ektachrome) were identified from years 1975 to 2013
- Scanned images examined as digital jpeg files n = 271
- Field logbooks from 57 dives at select sites with images
- NURTEC archive of ROV video – 13 dives 1989-2006
- Recent LISMaRC surveys using wet diving (quadrapod, oblique stills), SEABoSS, K2 ROV, PISSAH

6

### Places that old people remember (images, logbooks, video, and paper copies of unpublished reports)



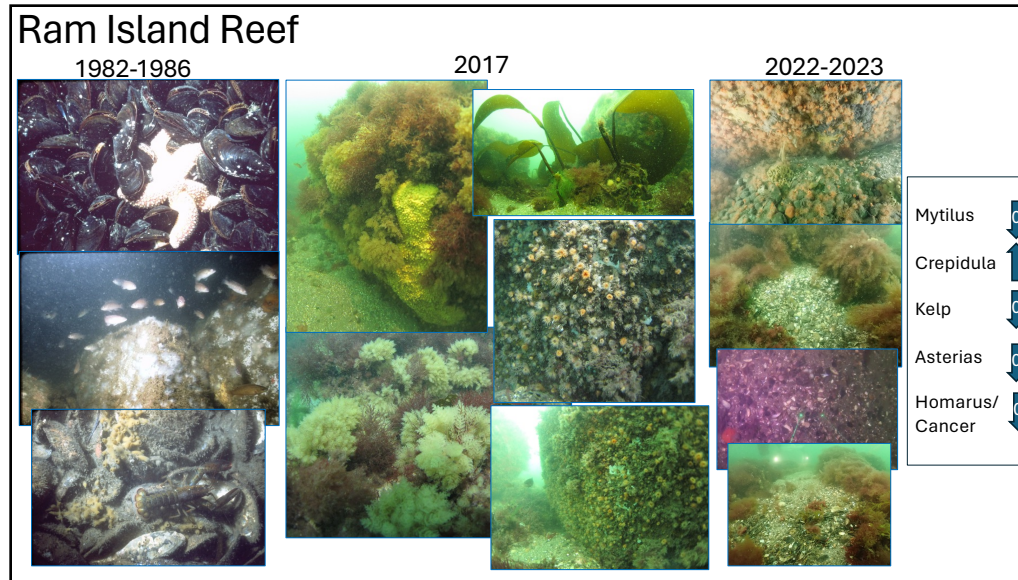
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### Ellis Reef

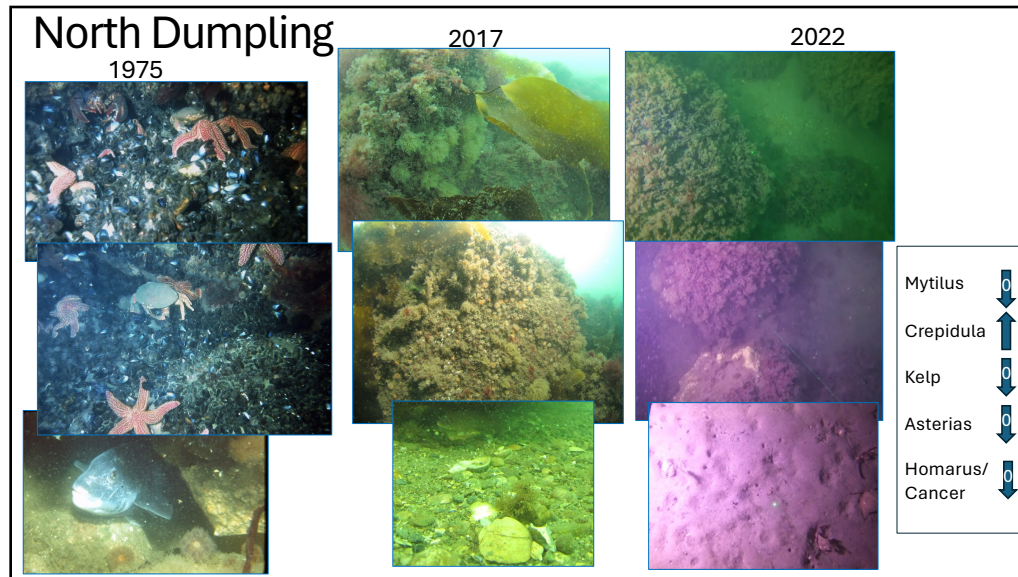
	1983-1988	2017-2018	2023
Cliona			
Astrangia			
Metridium			
Asterias			
Crepidula			
Homarus/ Cancer			

Cliona ↑  
 Astrangia ↑  
 Metridium ↓  
 Asterias ↓  
 Crepidula ↑  
 Homarus/  
 Cancer ↓

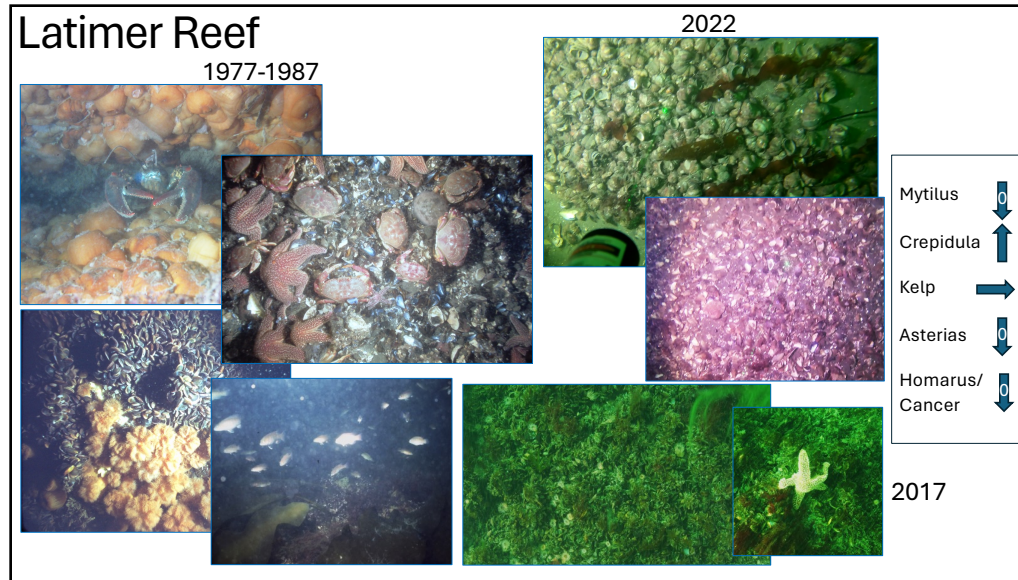
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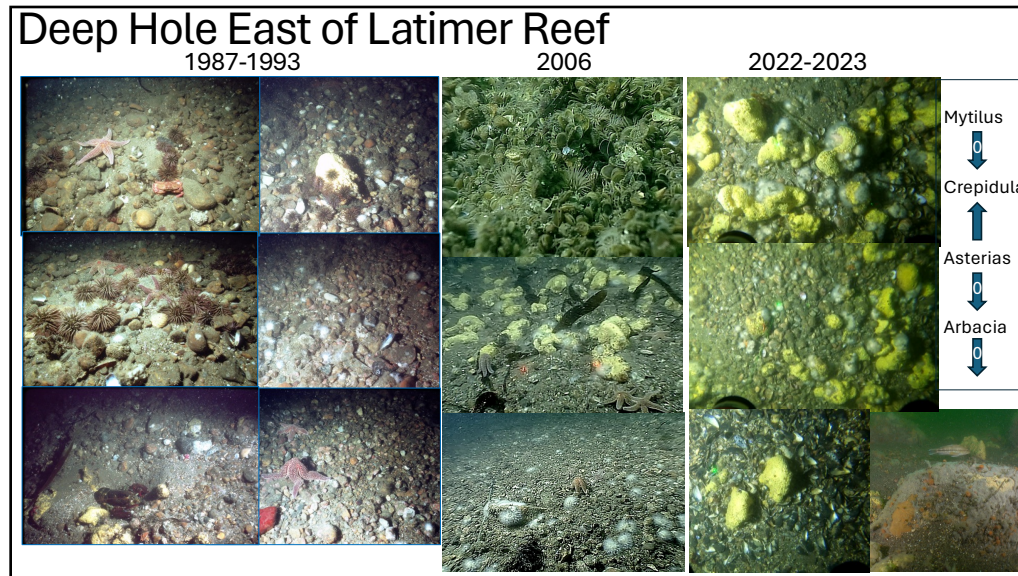
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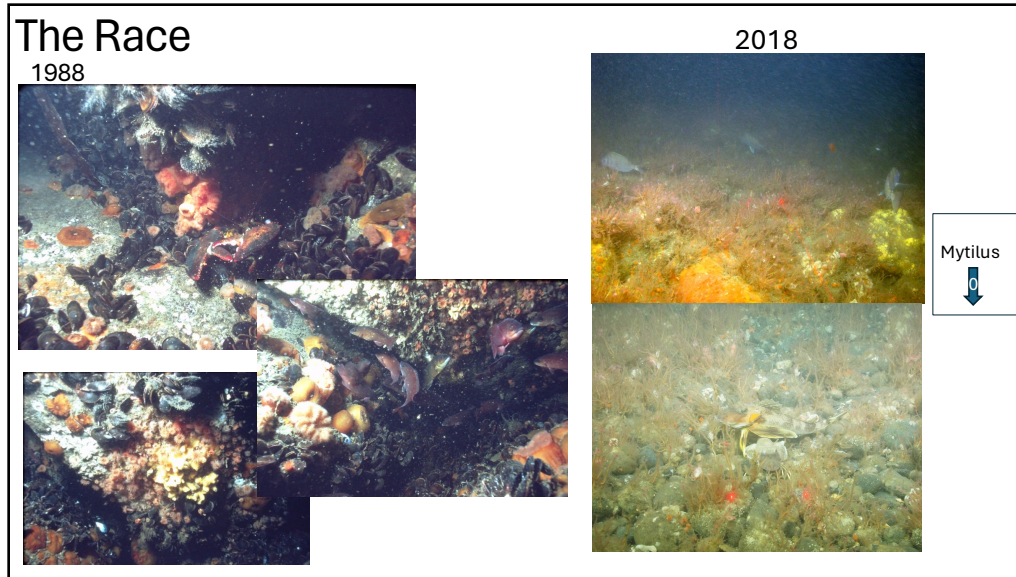
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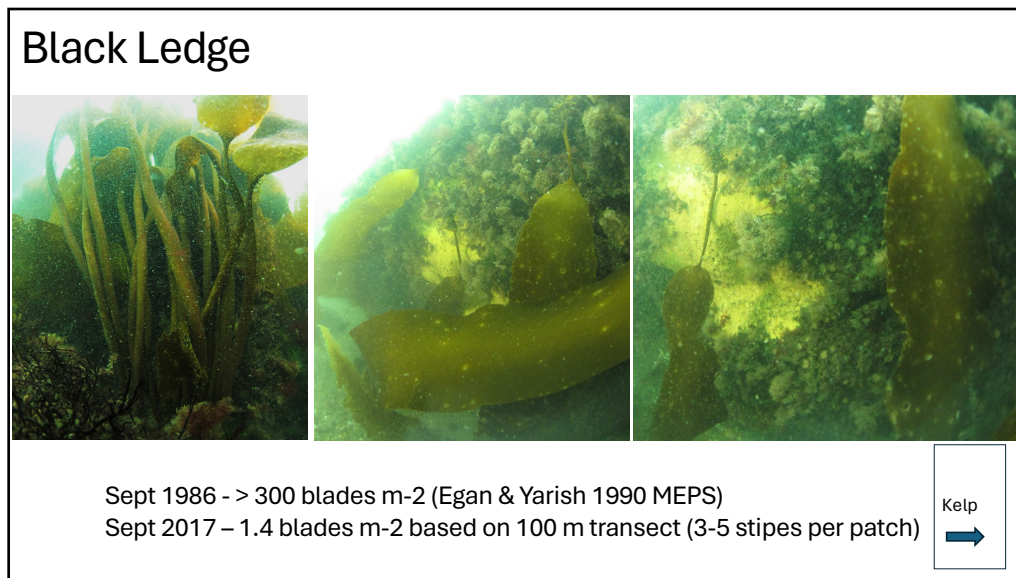
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12



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14

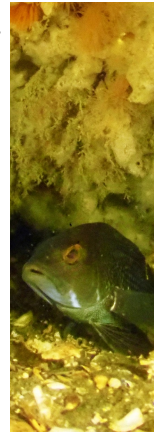
## Patterns, inference and conclusions? Questions that emerge? What can we do?

### Structure forming species

- Stability over decades in *Cliona-Astrangia* community
- Reduced kelp habitat
- Decline in *Mytilus* - increase *Crepidula* dominated communities

### Predators

- Apparent *Asterias* decline
- Apparent *Metridium* decline
- Decline in *Homarus/Cancer*
- Decline in *Tautoglabrus*, increase in *Centropristis*



### Drivers

- Climate
- Food resources
- Predation
- Shifts in cyclical recruitment/mortality
- Overlaid on temp driven increases

### Processes

- Where are tipping points?
- What does recovery look like?
- Recovery without resilience?

### The Future

- Research=Confirm–monitor–drivers?
- Policy=Focused on disturbance?
- Management=ABM?

15

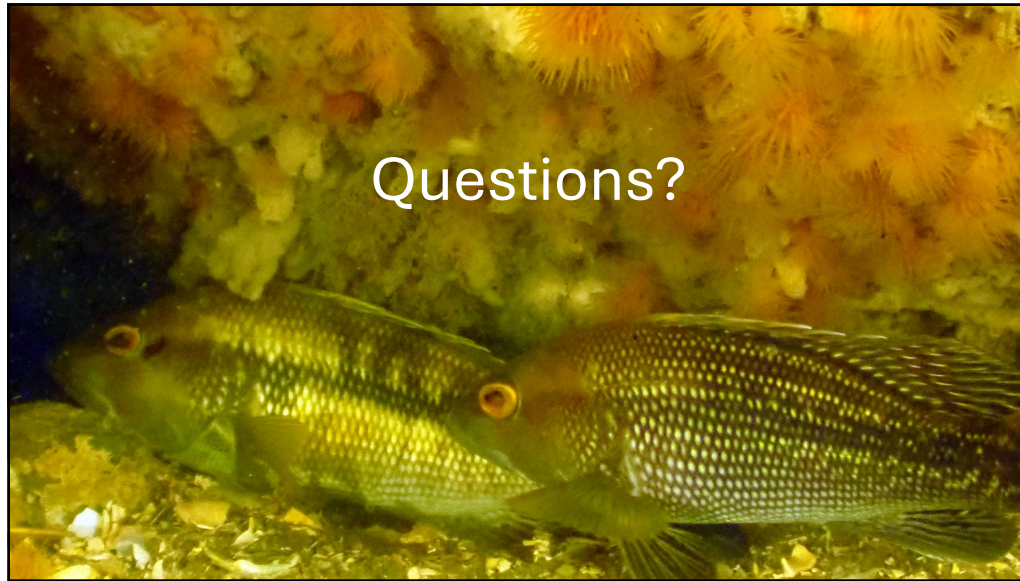
## Acknowledgements

Support for this work comes from:

- The Long Island Sound Seafloor Mapping Fund administered cooperatively by the EPA Long Island Sound Study and the CT Department of Energy and Environmental Protection
- Mystic Aquarium
- CT National Estuarine Research Reserve
- CT Sea Grant
- USGS Woods Hole Coastal and Marine Science Center
- UConn Marine Sciences Vessel Operations, Diving Program, and NURTEC ROV Group



16



17