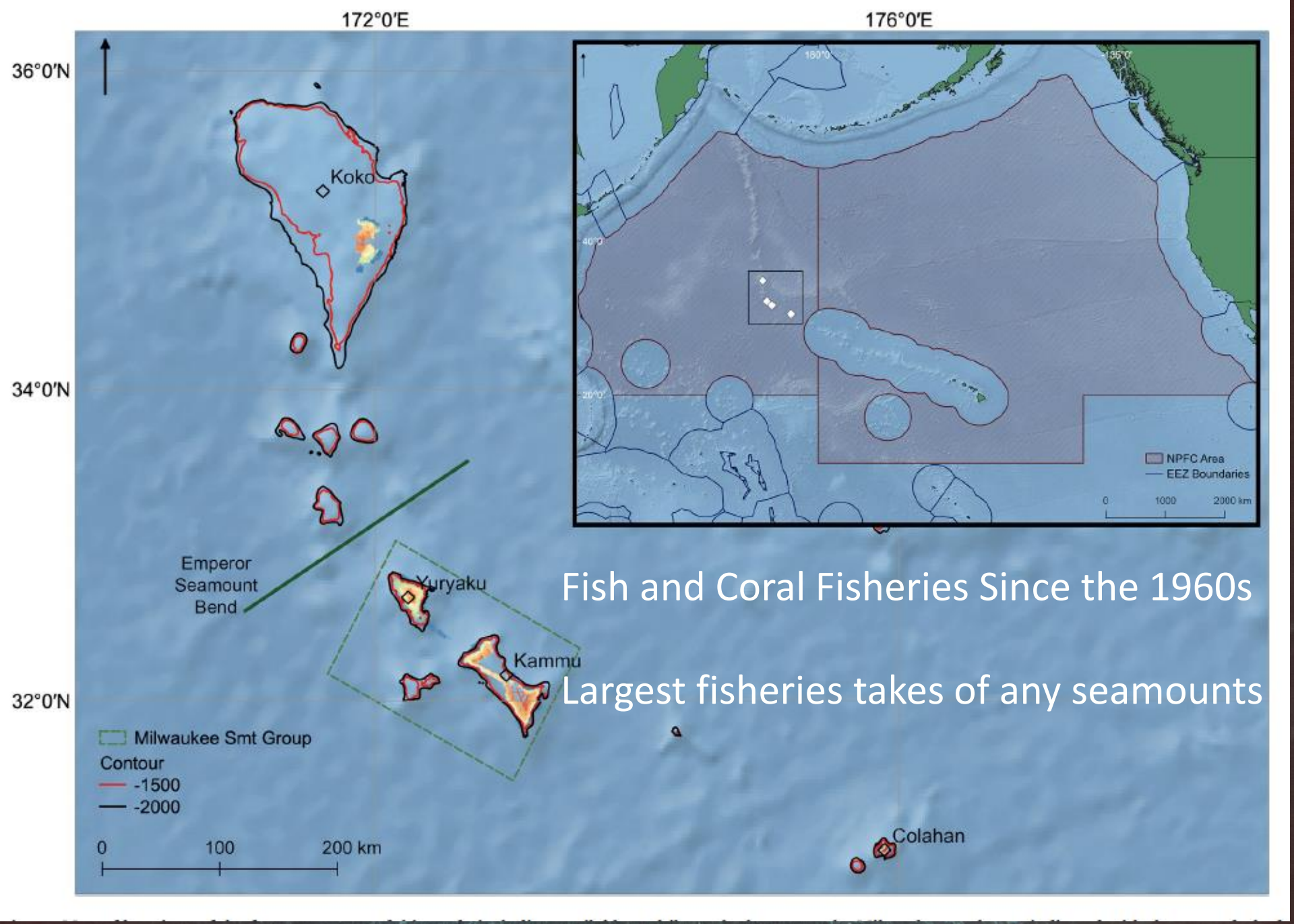
Impacts of bottom fisheries on vulnerable marine ecosystems and the long-term sustainability of deep-sea fish stocks on Seamounts of the Northwestern Hawaiian Ridge and Emperor Seamount Chain

Amy Baco-Taylor
Brendan Roark
Nicole Morgan

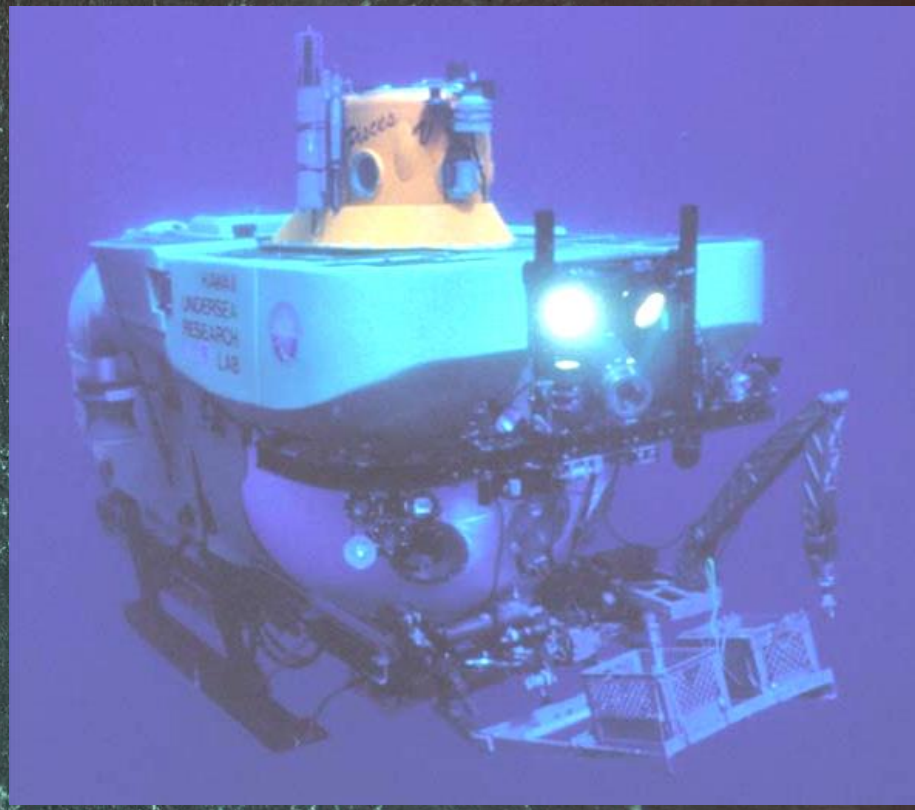


Fish and Coral Fisheries Since the 1960s

Largest fisheries takes of any seamounts

Deep Ocean Observation Tools

- 2014 and 2015
- AUV Sentry
- 200-700m



- 2016 and 2017
- Pisces IV and V submersibles
- 400, 500, 600m depths

Overview

- Implementation of paragraphs 113,117,and 119 to 124 of resolution 64/72, paragraphs 121,126,129,130 and 132 to 134 of resolution 66/68 and paragraphs 156,171,175, 177 to 188 and 219 of resolution 71/123

- Identify VMEs
- Prevent SAIs
- Take action to protect VMEs
- Precautionary approach
- Best available scientific data

Management to Prevent SAIs

".. If it is considered that individual fishing activities are causing or likely to cause SAIs on VMEs or marine species, the member of the Commission is to adopt appropriate conservation and management measures to prevent such SAIs…"

CMM2019-06 Annex 2

Criteria

1. VMEs are known or likely to occur

2. Fisheries are causing SAIs

Criteria

1. VMEs are known or likely to occur

2. Fisheries are causing SAIs

Vulnerable Marine Ecosystems

Slow-Growing, Late-Maturing

Recruitment Limited

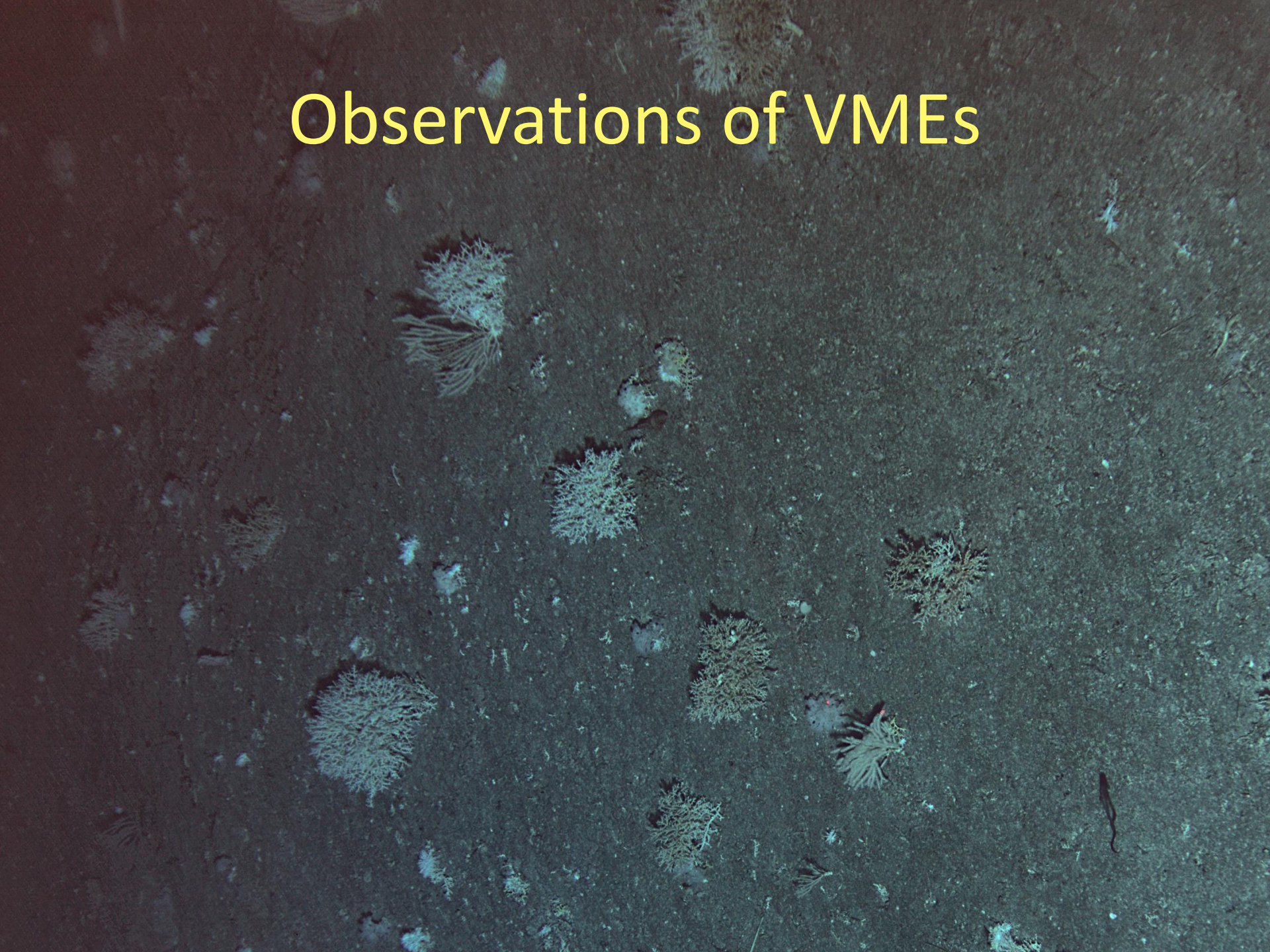
Selective of substrate

Long-Lived

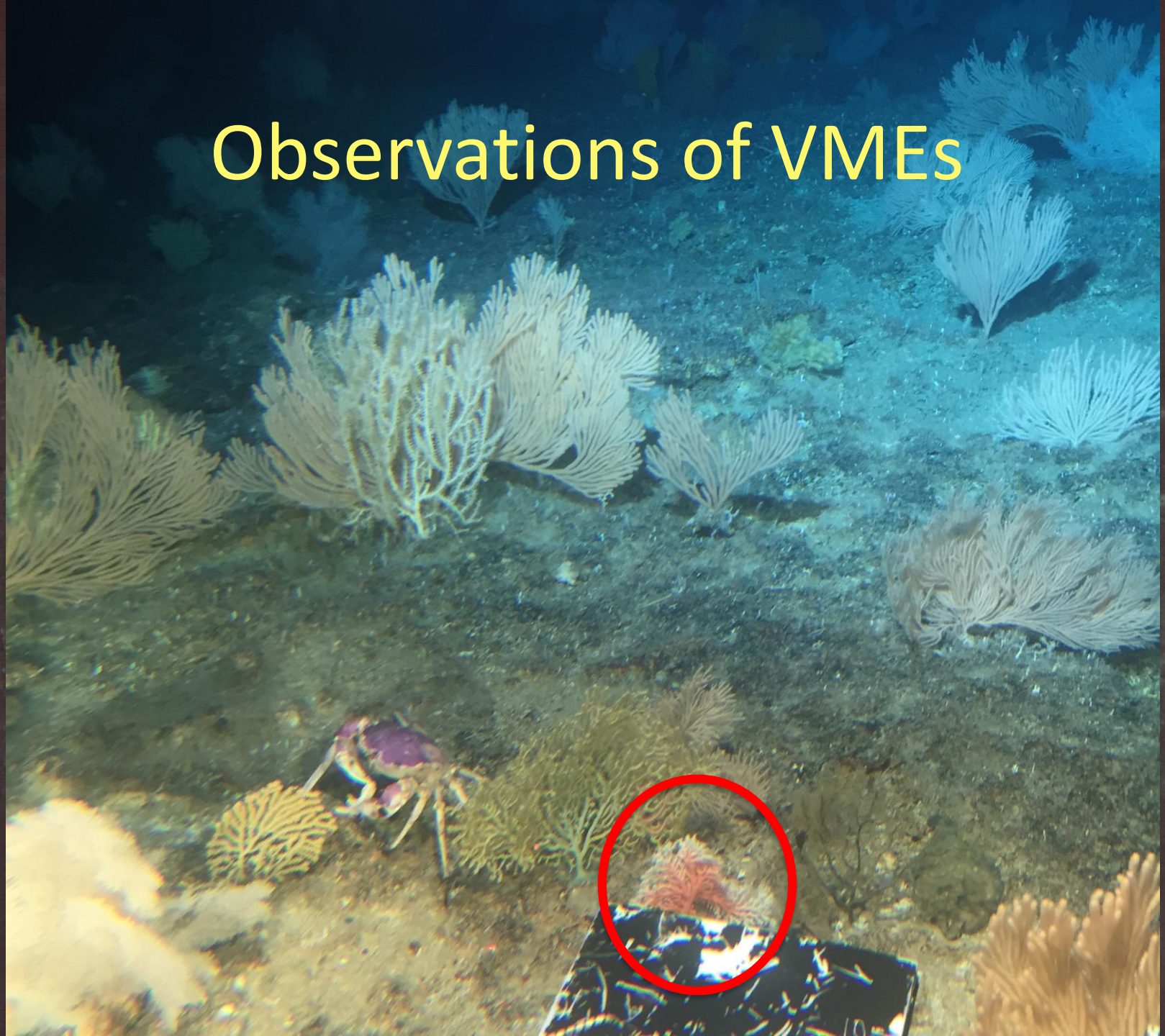
→ Fragility and Life-History Traits

→ Functionally Significant, Structurally Complex

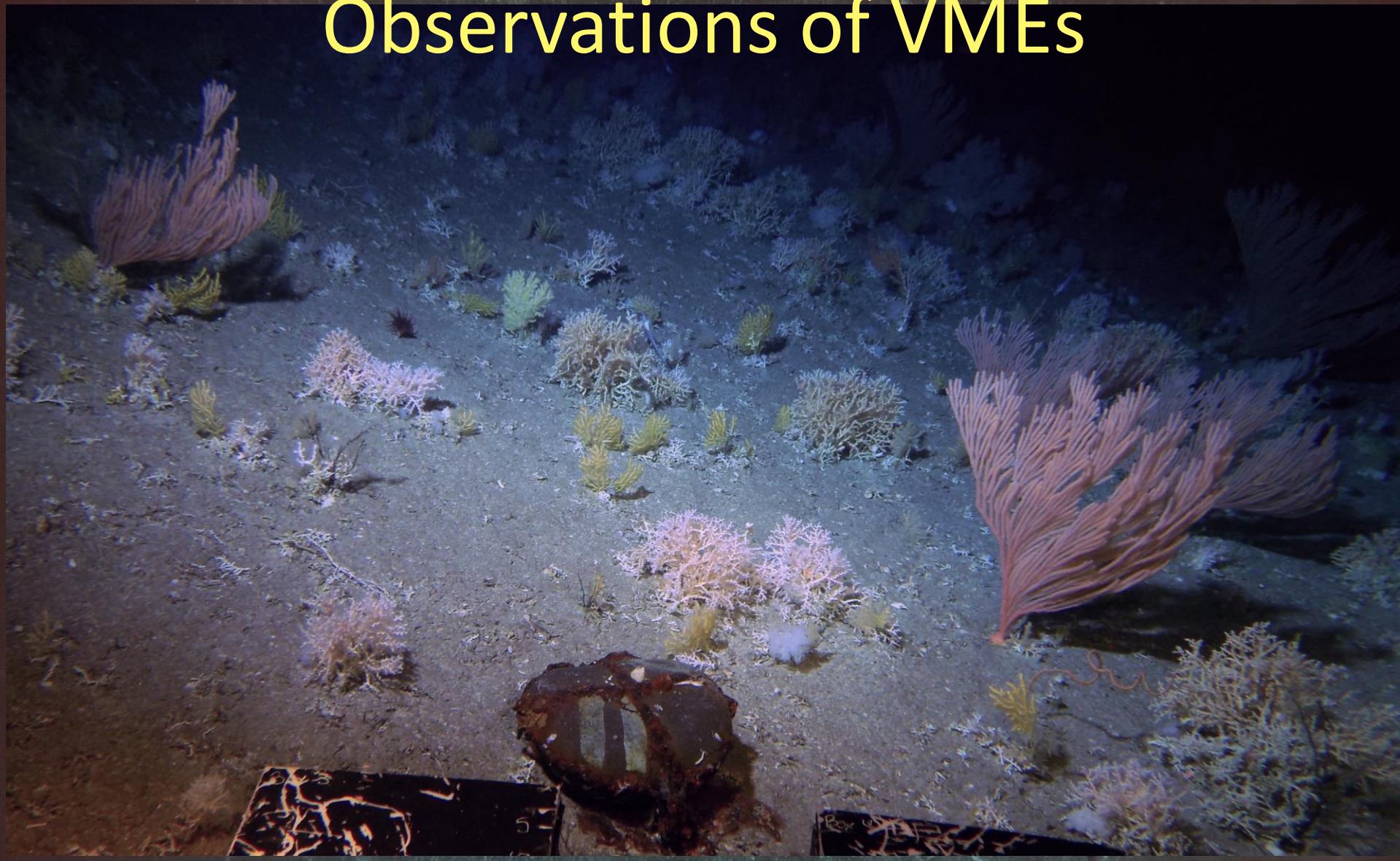
Observations of VMEs

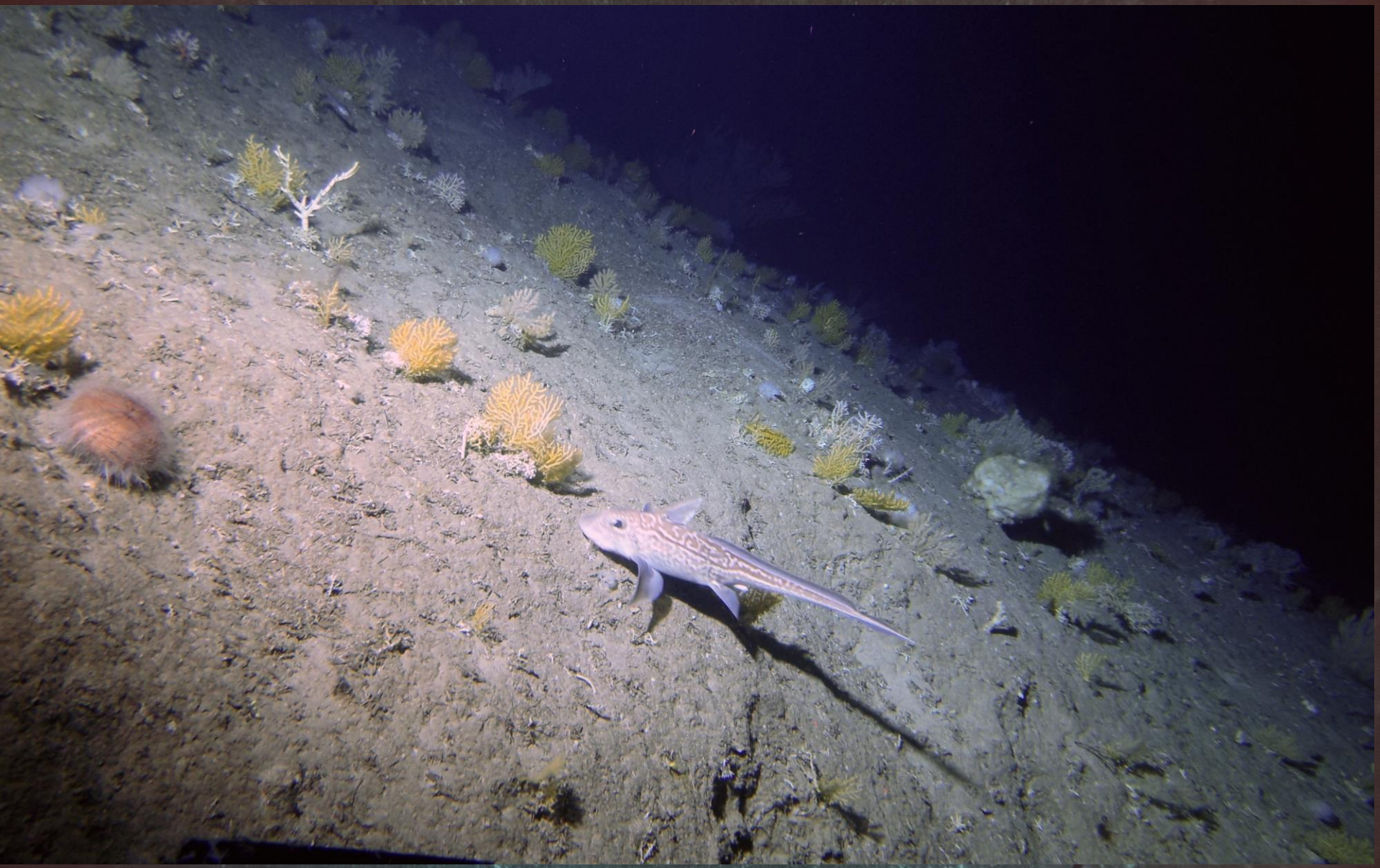


Observations of VMEs

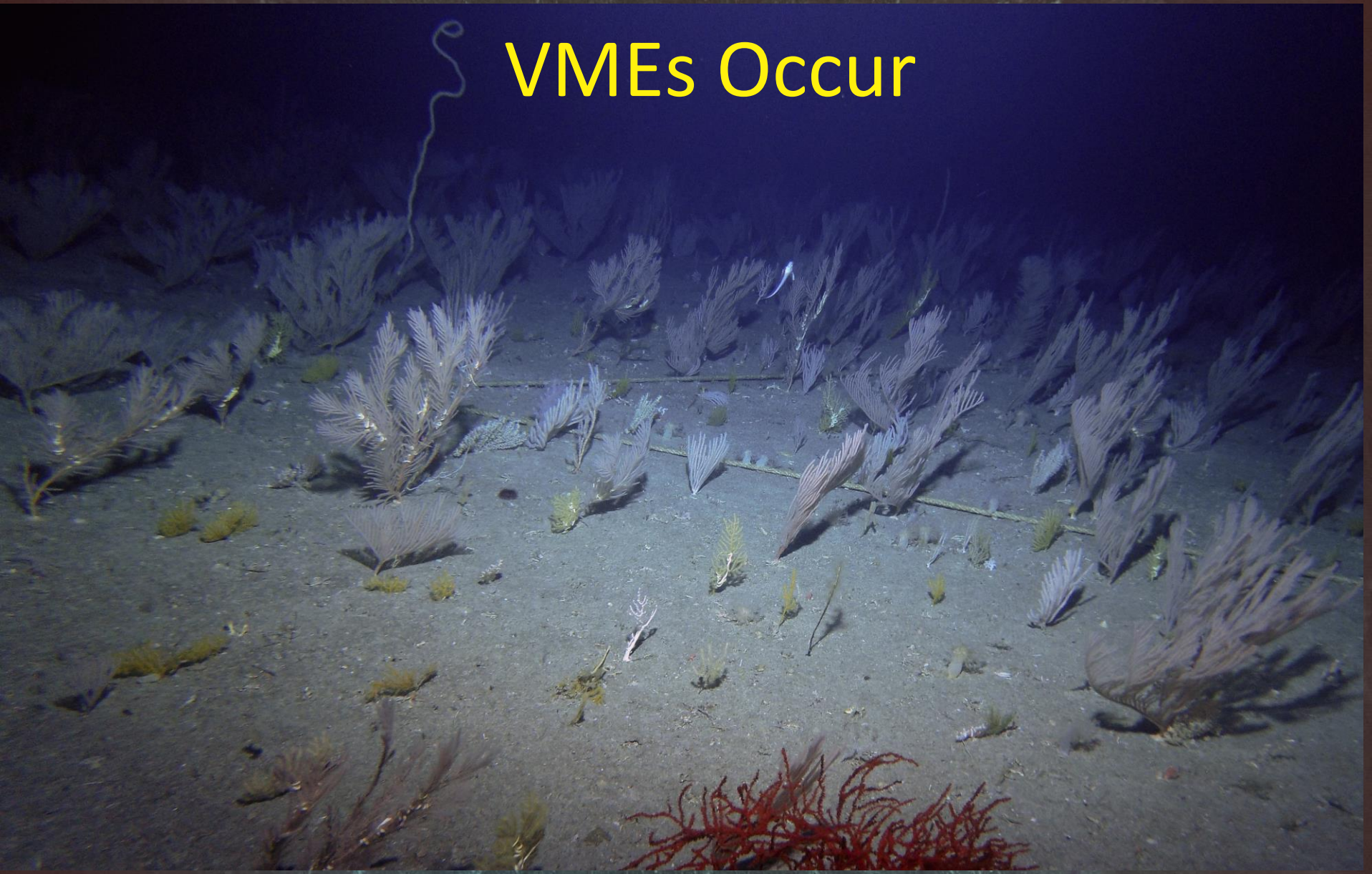


Observations of VMEs

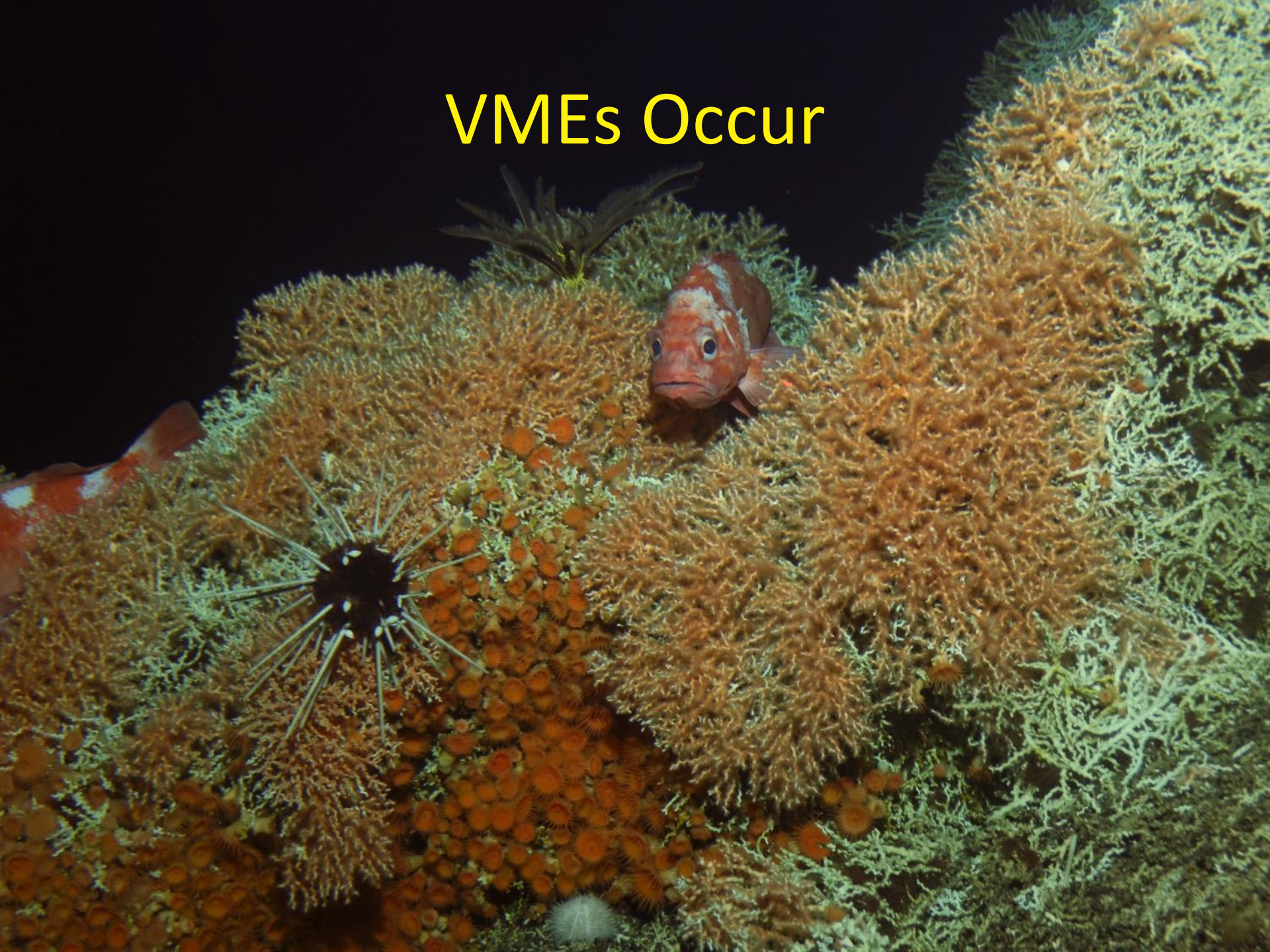




VMEs Occur



VMEs Occur



Marine Biodiversity for a Healthy Ocean –
Biodiversity, Functional Groups and Ocean Health

Octocorallia as a key taxon in the vulnerable marine ecosystems of the Emperor Chain (Northwest Pacific): diversity, distribution and biogeographical boundary

Tatiana N. Dautova

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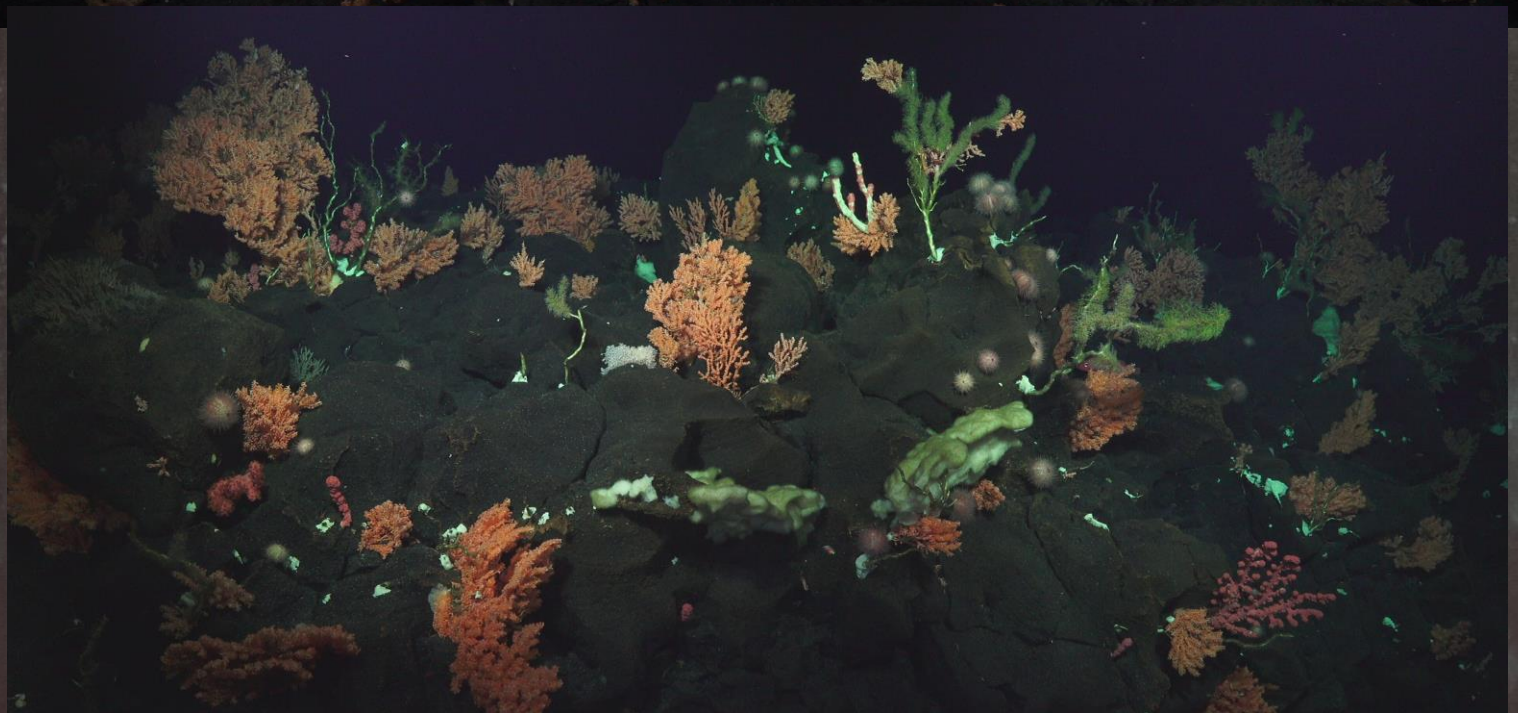
The First Data on the Structure of Vulnerable Marine Ecosystems of the Emperor Chain Seamounts: Indicator Taxa, Landscapes, and Biogeography

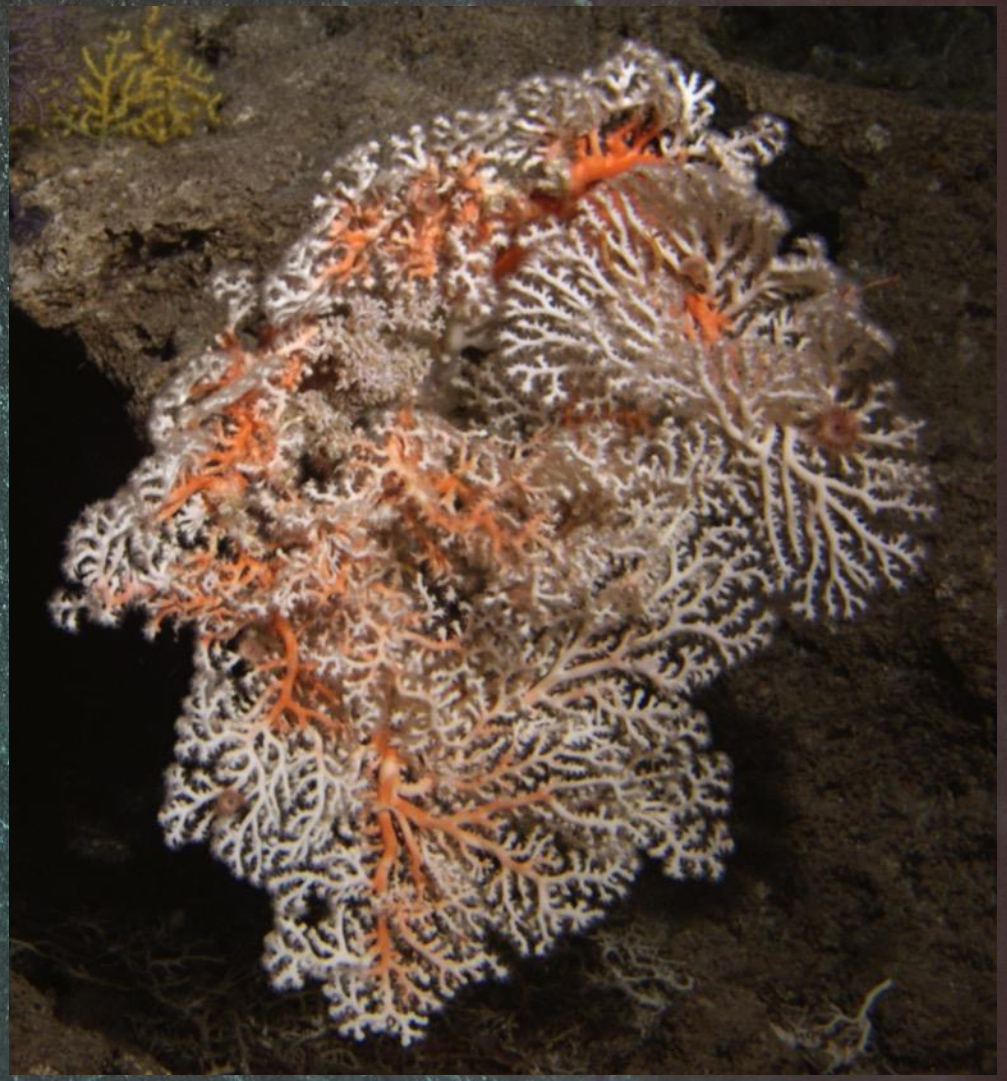
T. N. Dautova[a, *], S. V. Galkin[b], K. R. Tabachnik[b], K. V. Minin[b], P. A. Kireev[a], A. V. Moskovtseva[a], and A. V. Adrianov[a]

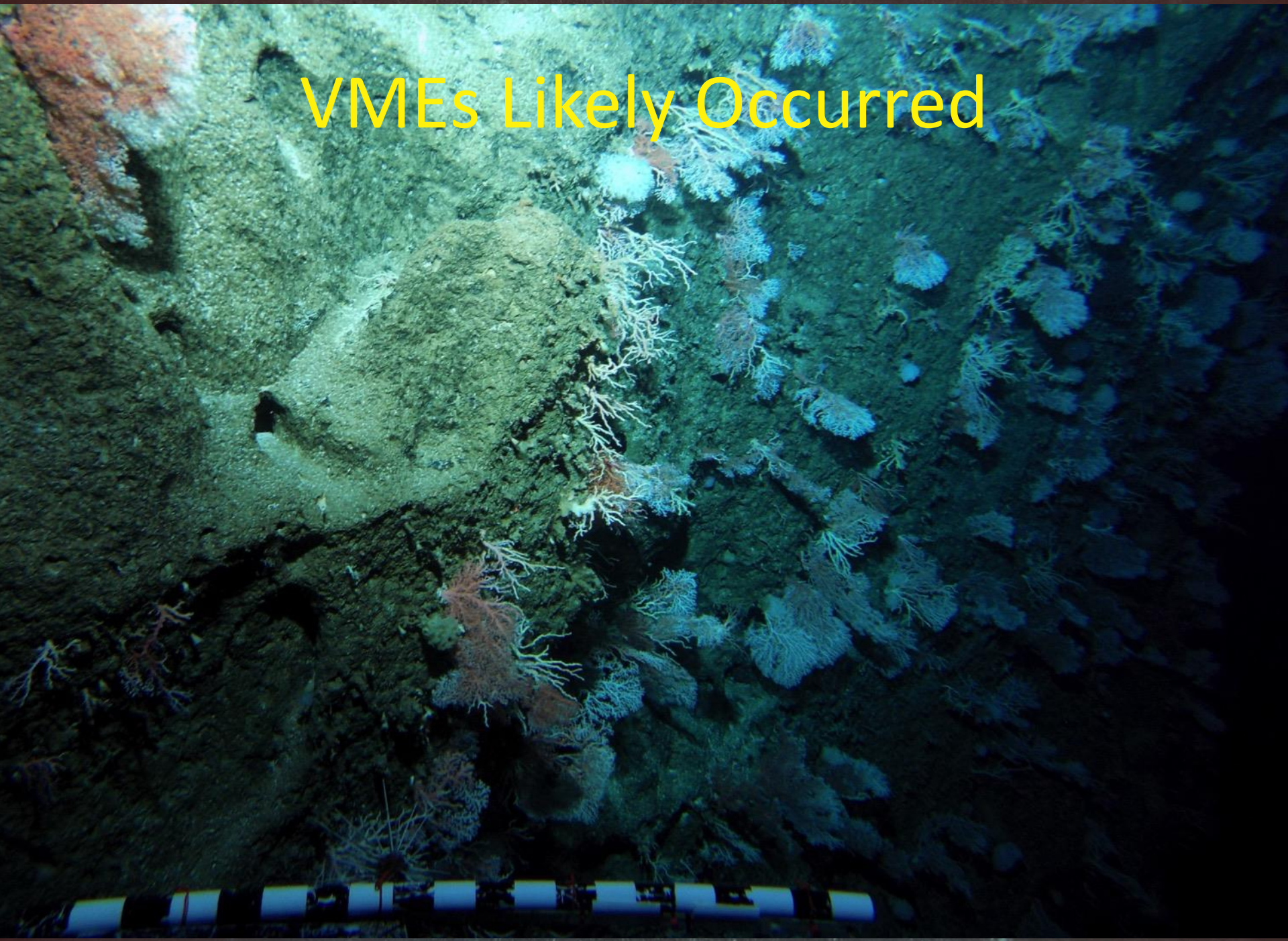
VMEs Occur



Precious Coral Fishery

- 1965-1980s
- 50-70% of annual catch of coralliid octocorals
- Milwaukee Banks (Kammu, Yuryaku)




VMEs Likely Occurred

VMEs Are Likely to be Widespread

- Extremely high habitat suitability for all octocorals – Yesson et al 2012
- High octocoral habitat suitability on Colahan and Koko – Miyamoto et al 2017
- Very high habitat suitability for antipatharians – Yesson et al 2017
- High habitat suitability for Solenosmilia, Enalopsammia and Madrepora – Davies and Guinotte 2011

Criteria

1. VMEs are known or likely to occur

2. Fisheries are causing SAIs

Significant Adverse Impacts (SAIs)

"Impacts that compromise ecosystem integrity (i.e., ecosystem structure or function) in a manner that:

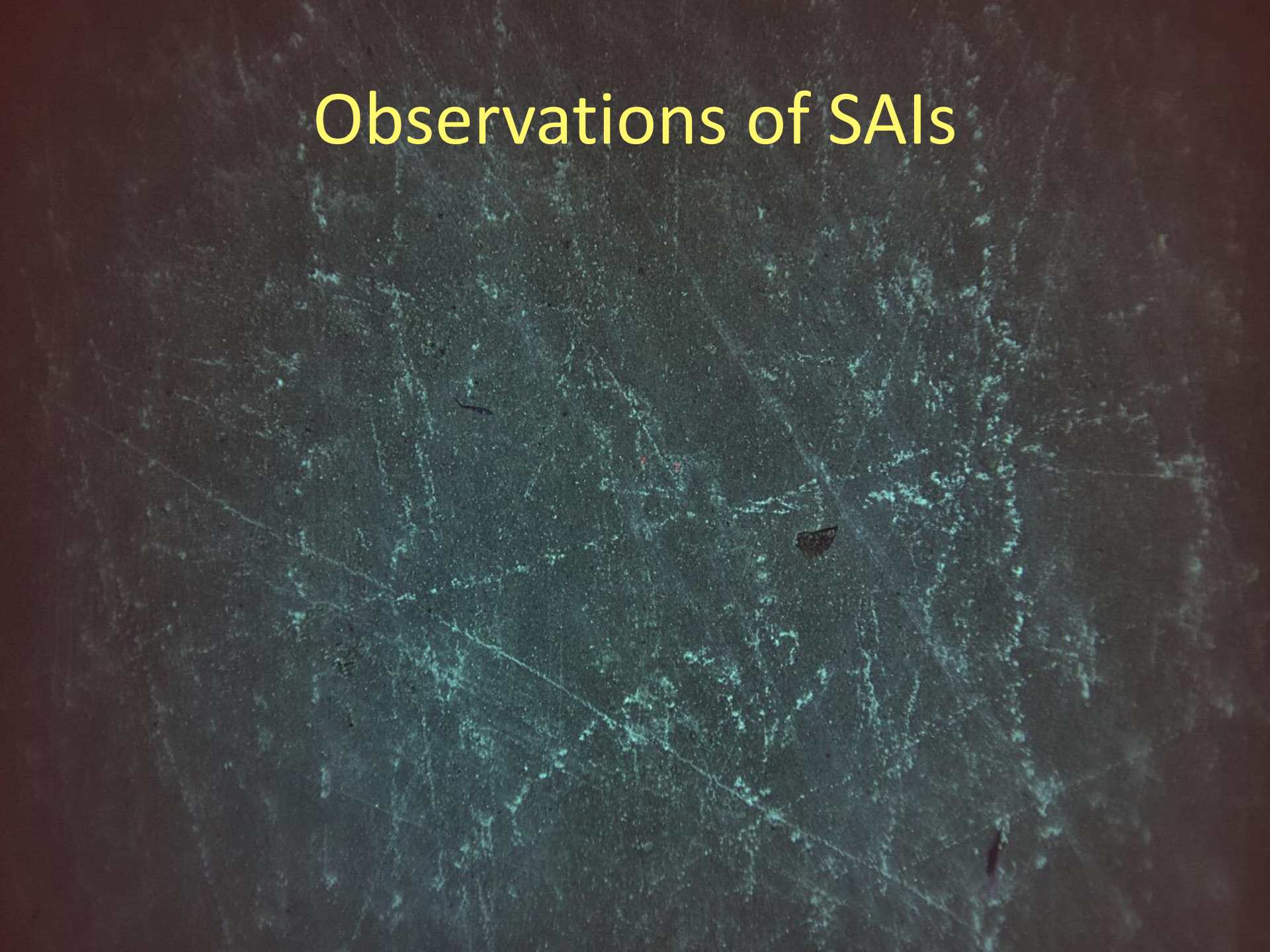
(i) impairs the ability of affected populations to replace themselves;

(ii) degrades the long-term natural productivity of habitats; or

(iii) causes, on more than a temporary basis, significant loss of species richness, habitat or community types…"

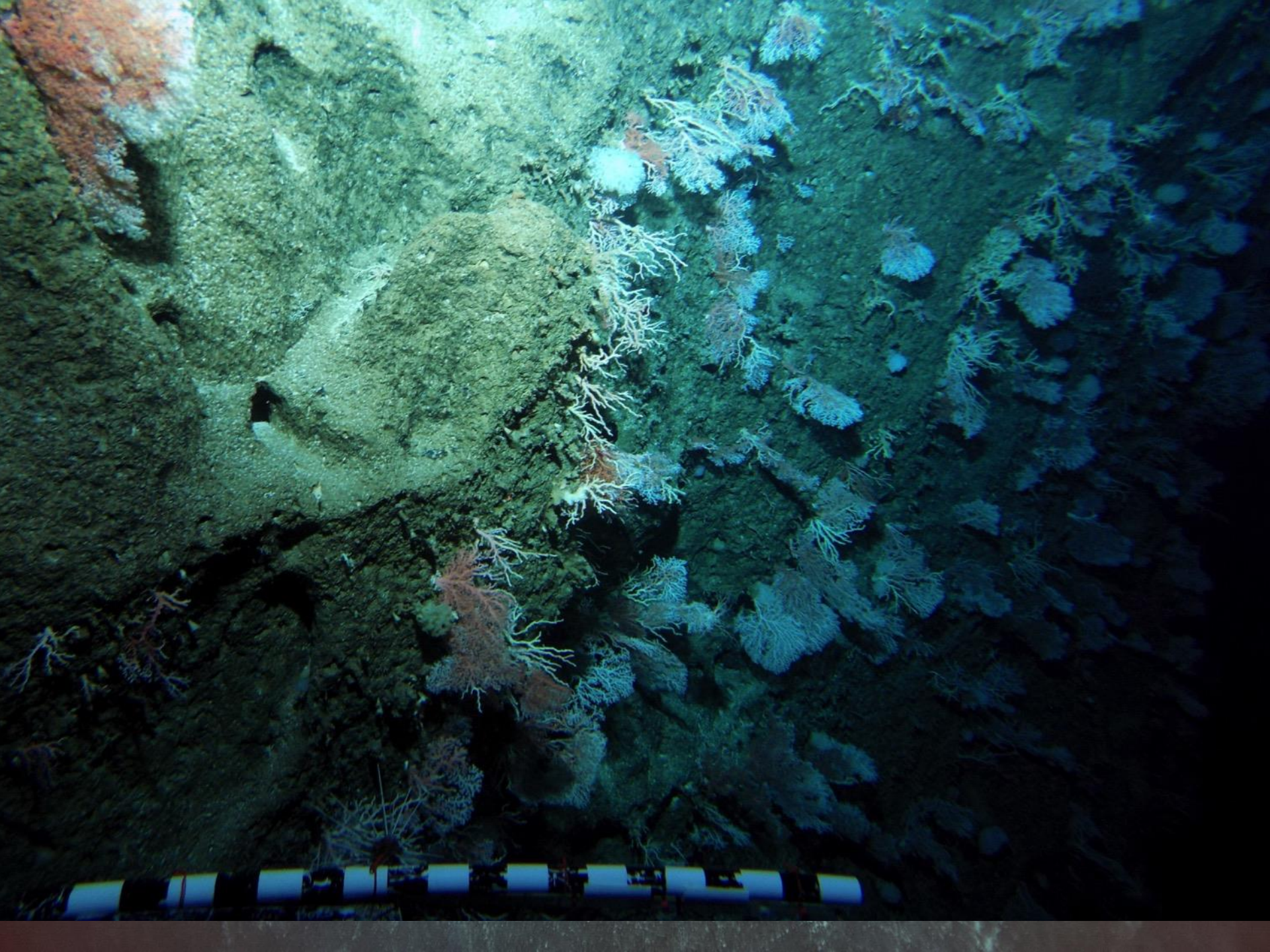
CMM2019-06 Annex 2

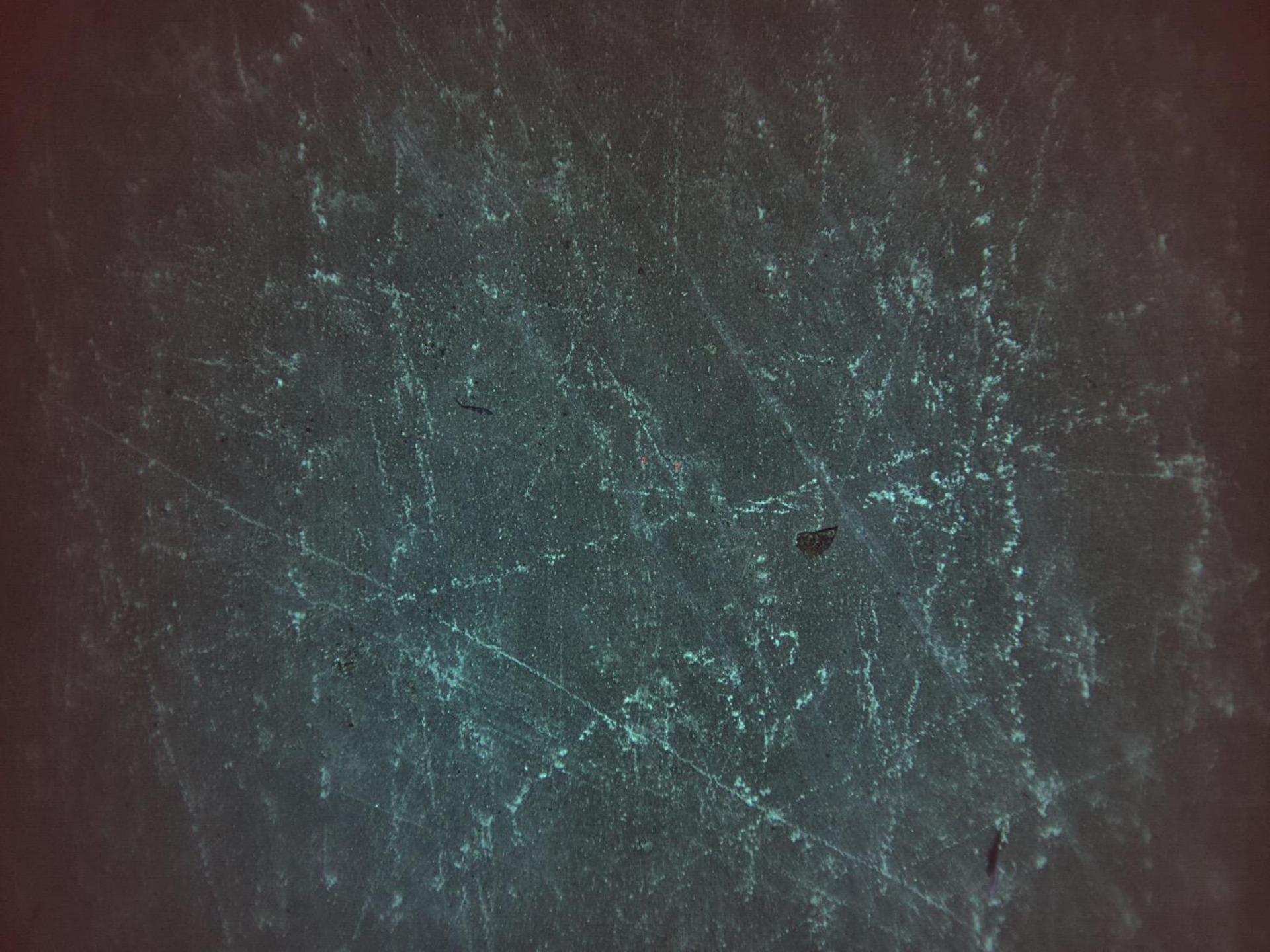
Observations of SAIs

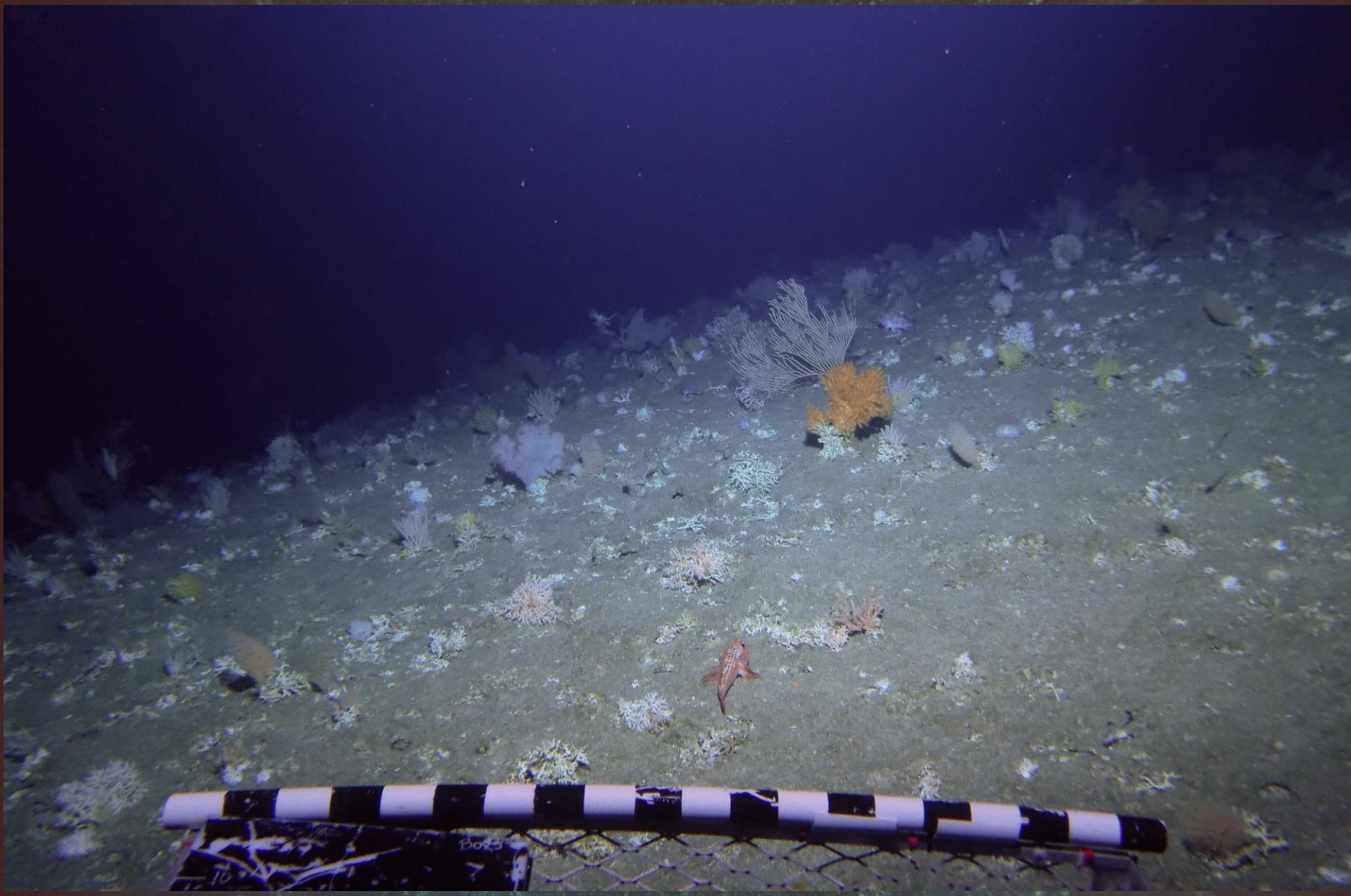


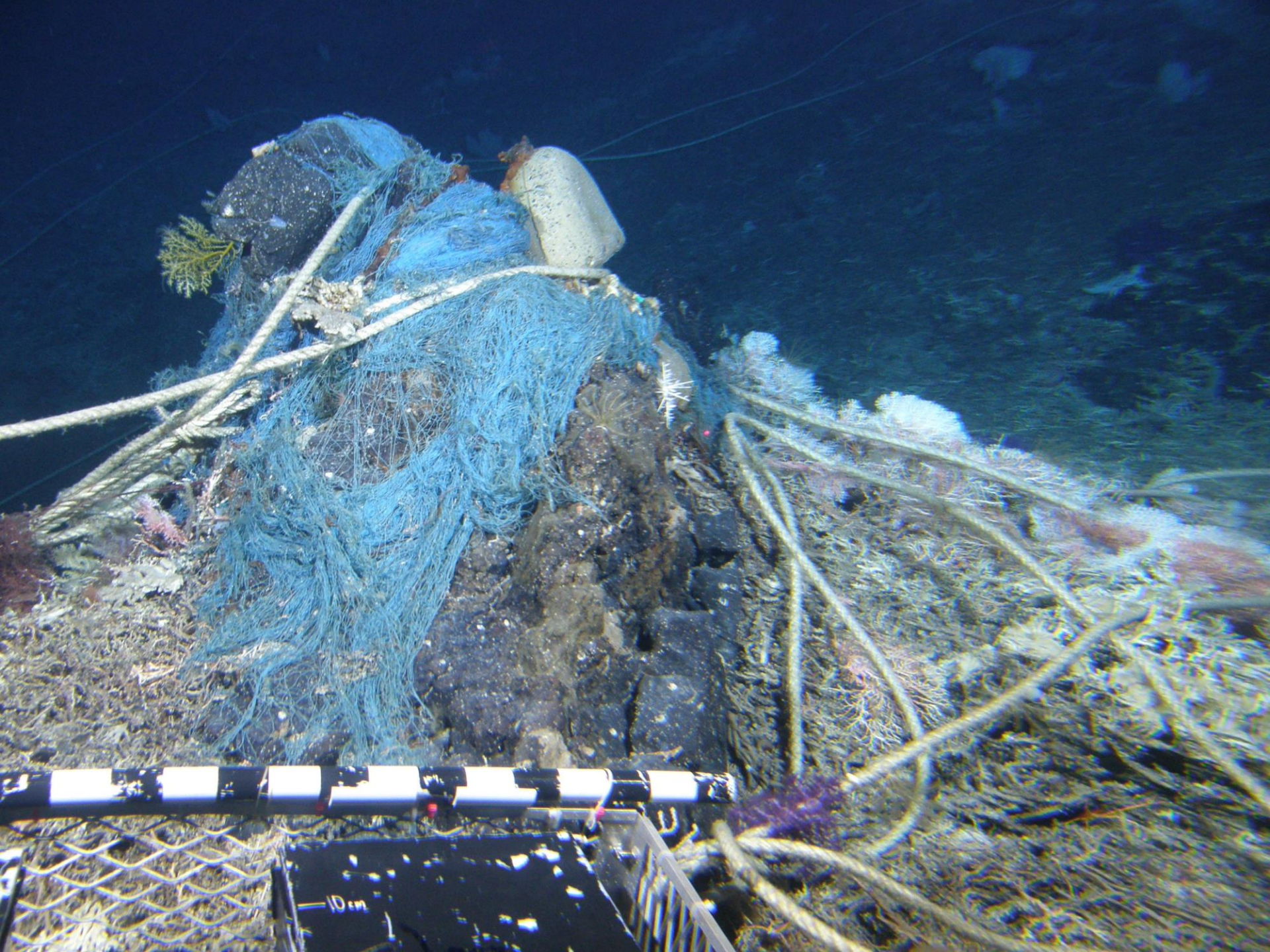
Impacts

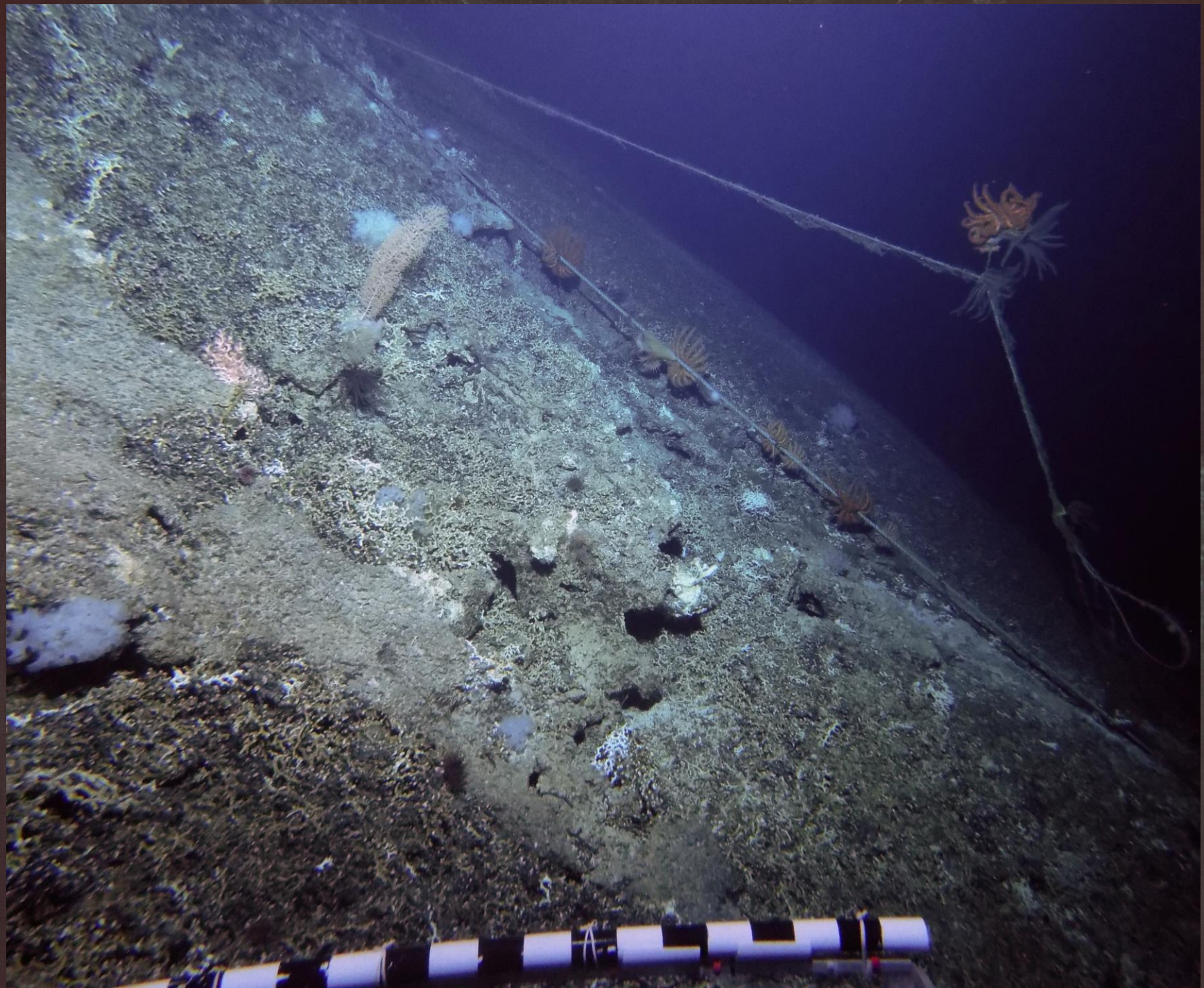
- Still trawled – 9 - 85% of images per transect
  - mean 24%
- Recovering – 0-19% of images
  - Mean 4.3%








10cm



Evidence of SAIs

1) Large areas of hard substrate devoid of fauna

2) These same areas showed numerous scars from bottom contact gear

3) Patches of coral stumps

4) Areas of coral rubble from scleractinian reefs.

5) Presence of lost gear observed on every seamount, including many observations of coral rubble in or around the nets, lines, floats, etc entangled in corals or laying across the coral beds

SCIENCE ADVANCES | RESEARCH ARTICLE

abacotaylor@fsu.edu

ECOLOGY

Amid fields of rubble, scars, and lost gear, signs of recovery observed on seamounts on 30- to 40-year time scales

Amy R. Baco[1]*, E. Brendan Roark[2], Nicole B. Morgan[1]

Marine Policy 115 (2020) 103834

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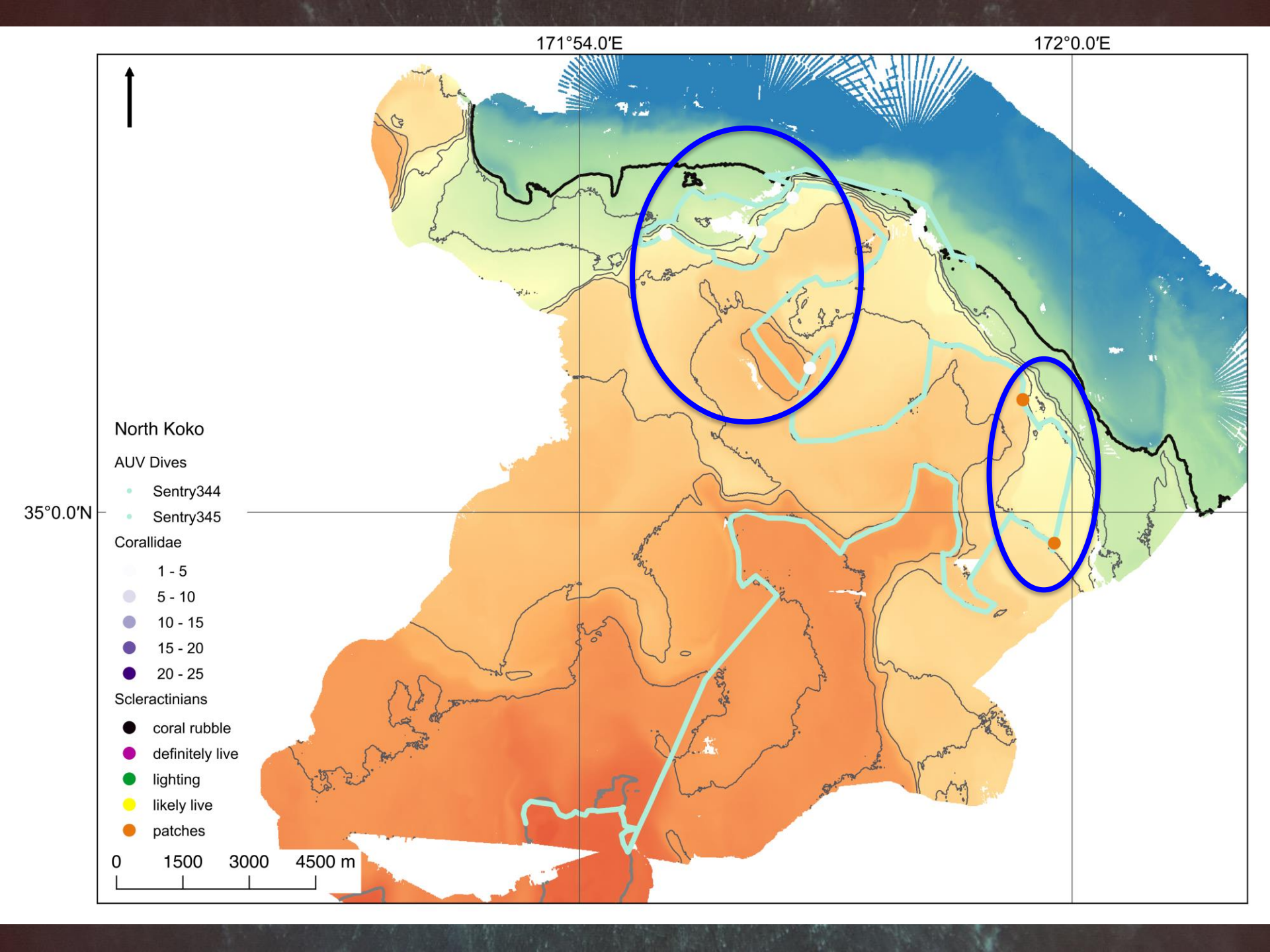
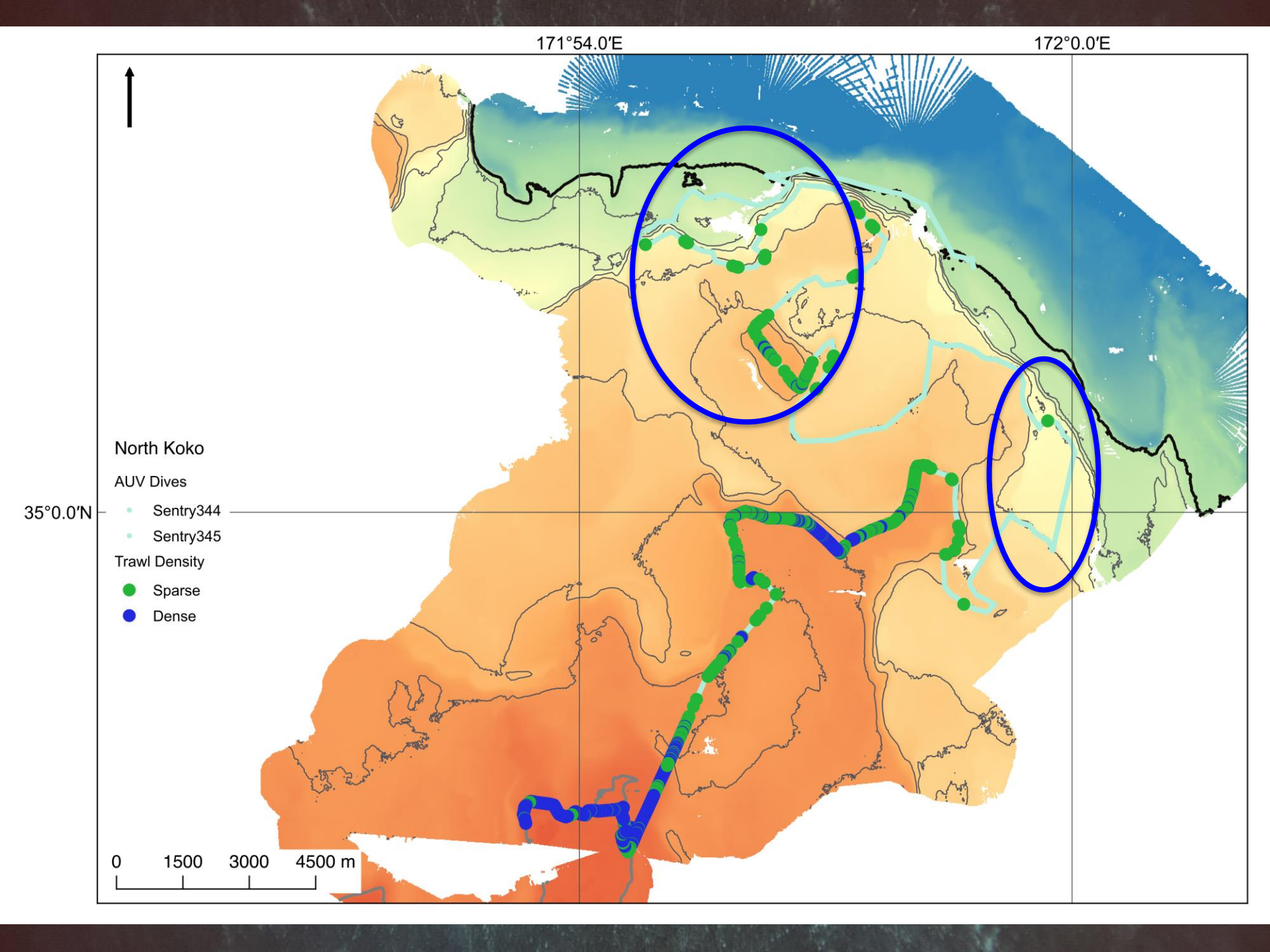
journal homepage: http://www.elsevier.com/locate/marpol

Observations of vulnerable marine ecosystems and significant adverse impacts on high seas seamounts of the northwestern Hawaiian Ridge and Emperor Seamount Chain

Amy R. Baco [a,*], Nicole B. Morgan [a], E. Brendan Roark [b]


171°54.0′E
172°0.0′E
35°0.0′N
North Koko
AUV Dives
Sentry344
Sentry345
Corallidae
1 - 5
5 - 10
10 - 15
15 - 20
20 - 25
Scleractinians
coral rubble
definitely live
lighting
likely live
patches
0
1500
3000
4500 m


171°54.0′E
172°0.0′E
35°0.0′N
North Koko
AUV Dives
Sentry344
Sentry345
Trawl Density
Sparse
Dense
0
1500
3000
4500 m

Criteria

1. VMEs are known or likely to occur

2. Fisheries are causing SAIs

3. Recovery is possible, remnant pops key

".. the Commission is to adopt appropriate conservation and management measures to prevent such SAIs…"

CMM2019-06 Annex 2

Recommendations

- Closure of the ES-NHR seamounts to bottom contact fisheries until the gear being used can be proven to not cause SAIs.

- not only untrawled areas (‘freeze the footprint type measures”) should be closed, but also actively fished areas should be closed to bottom contact gear to allow them time to recover.

Considerations

- Bottom Trawling is only 1.31% of total fishing in the NPFC ES-NHR area

Table 1

Total fishing hours for each year from Global Fishing Watch AIS data for the selected area in the North Pacific. *Possible-Trawling is a subset of the "Fishing" designation and is thus not added into the totals.

Year	Drifting Longlines	Fixed Gear	Other Fishing	Purse Seines	Squid Jigger	Trawlers	Driftnets	Fishing	Possible-Trawling	Total
2012	6651.54		3906.35		5.52	197.74				10761.16
2013	25237.27		6870.27		2985.50	1671.74				36764.78
2014	26640.12		111.96		2796.98	58.11				29607.17
2015	47090.47		3025.16		2225.82	425.12				52766.57
2016	92431.19		3504.29	88.08	1731.30	116.05				97870.91
2017	102440.24		6180.51	619.59	7955.12	155.36	10.97	2308.02	11.99	119669.82
2018	110904.09		2461.39	237.65	20588.50	1847.74	3.82	3767.67	1901.54	139810.86*
Total	411394.92	0.00	26059.93	945.32	38288.75	4471.86	14.79	6075.69	1913.54	487251.26*
Percent	84.43	0.00	5.35	0.19	7.86	0.92	0.00	1.25	0.39	

Morgan and Baco 2021

Considerations

- Discussions of Need for Rebuilding Pelagic Armourhead stock

- Discussions of Need for Rebuilding Splendid Alfonsino stock

Benefits of Closure

- Protect VME areas
- Allow for surveying and mapping
- Allow for HSM of VME taxa
- Allow time for rebuilding of target fish stocks
- Allow time for development of methods that do not cause SAIs to VMEs

Challenges

- Presented in 2018 to NPFC
- Reporting VMEs and SAIs does not equal protection

Challenges

- Evidence of VMEs
- Evidence of SAIs to VMEs
- Directly supports/informs management actions

⇒Breakdown of the process

- Broad-scale survey

Acknowledgments

- NSF grants OCE-1334652 to ARB and OCE-1334675 to EBR
- Permits PMNM-2014-028, PMNM-2016-02
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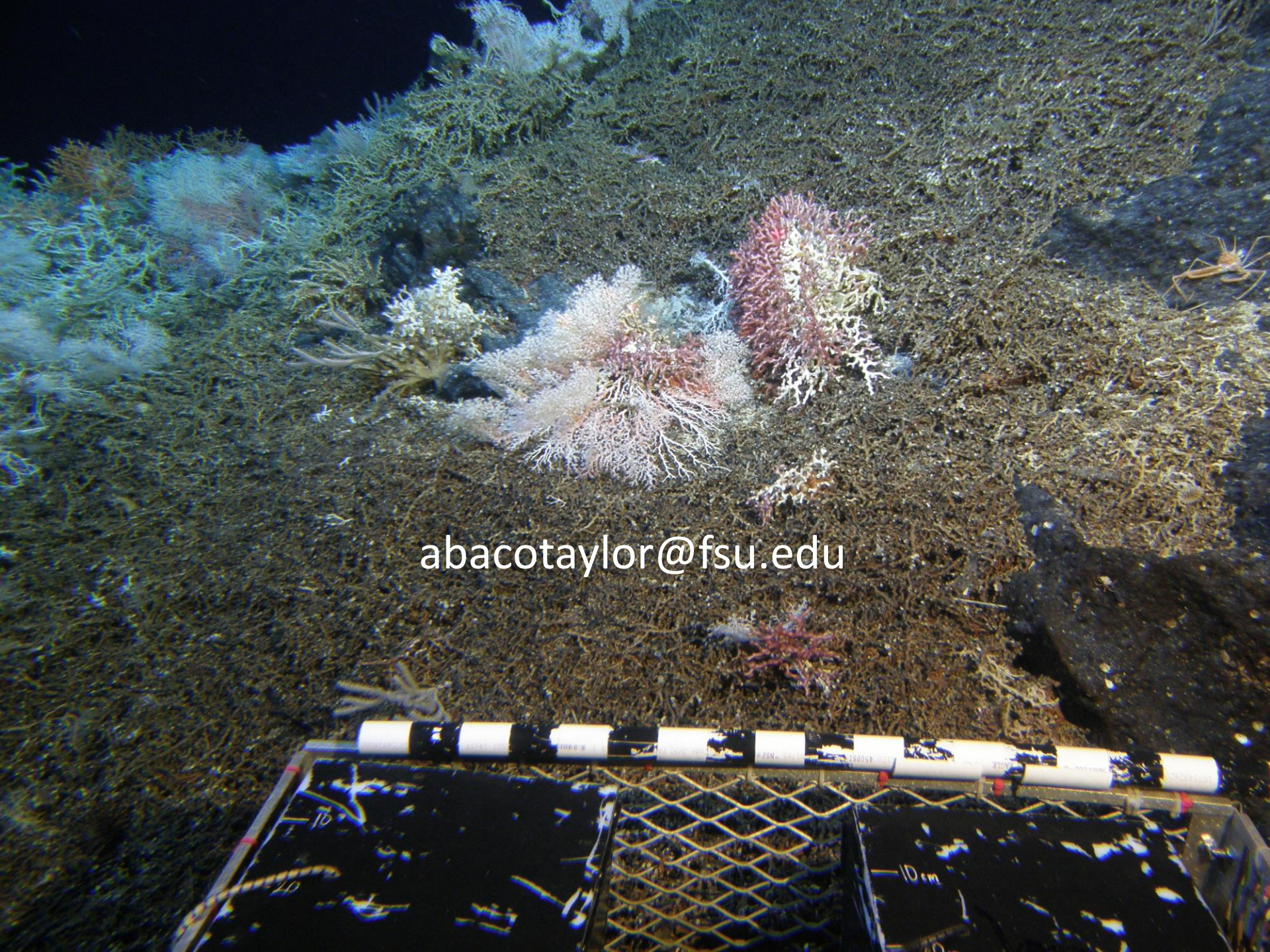
- A. Shantharam, K. Miller, M. Schoemann, J. Schift, A. Metcalf, M. Betters, J. Andrews

- Matt Gianni, Deep Sea Conservation Coalition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