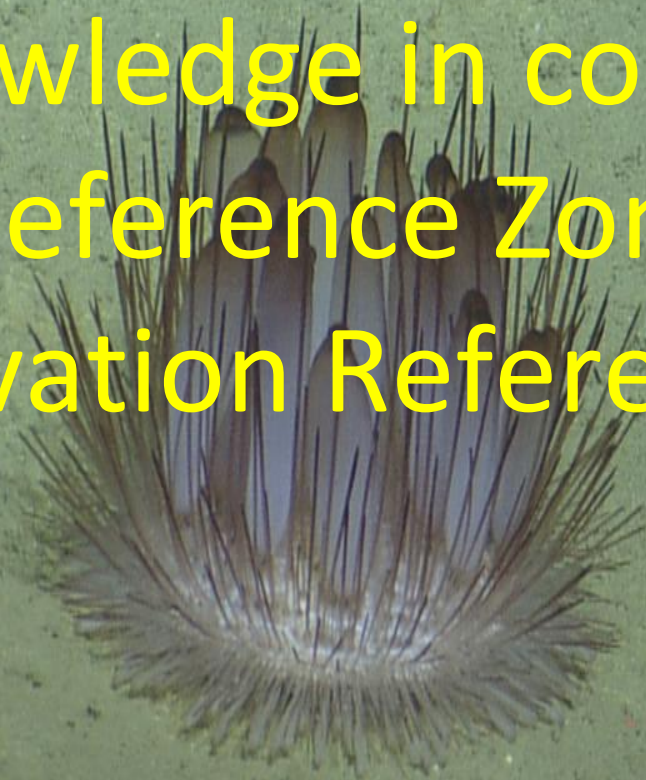


Species composition & Taxonomy:

Critical knowledge in considerations of Impact Reference Zones (IRZs) and Preservation Reference Zones (PRZs)



Dr. Judith Gobin
(Faculty of Science and Technology,
University of the West Indies, St. Augustine, Trinidad and
Tobago, West Indies.

and
Dr. Diva Amon



IRZs and PRZs (ISBA/19/LTC/8, Para. 26(d))

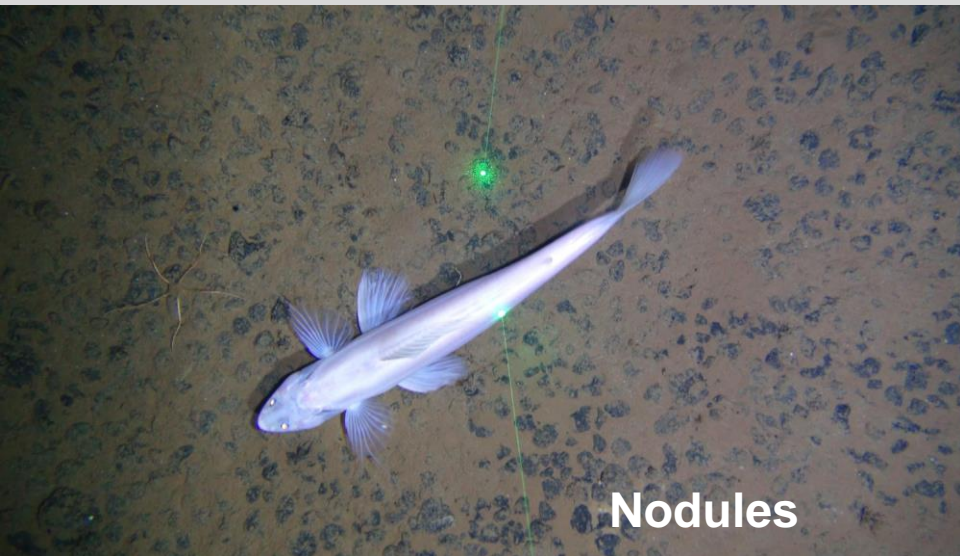
Recommendations for the guidance of contractors: “Information to be provided by the contractor”

(d) Delineation of impact reference areas and preservation reference areas.

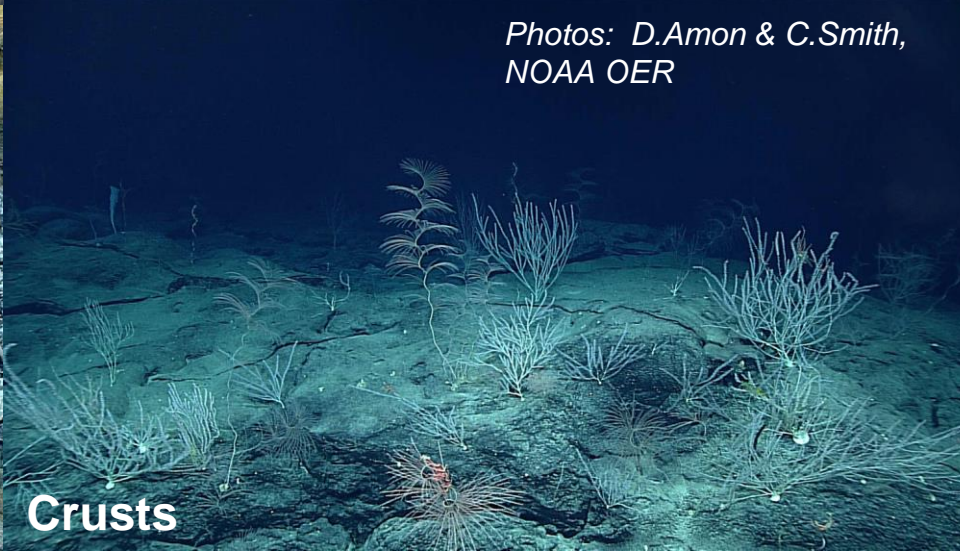
The impact reference area should be representative of the site to be mined in terms of environmental characteristics and the biota.

The preservation reference area should be carefully located and large enough not to be affected by mining activities, including the effects from operational and discharge plumes. The reference site will be important in identifying natural variations in environmental conditions. Its species composition should be comparable to that of the test-mining area.

Knowledge of fauna: Key information for designations



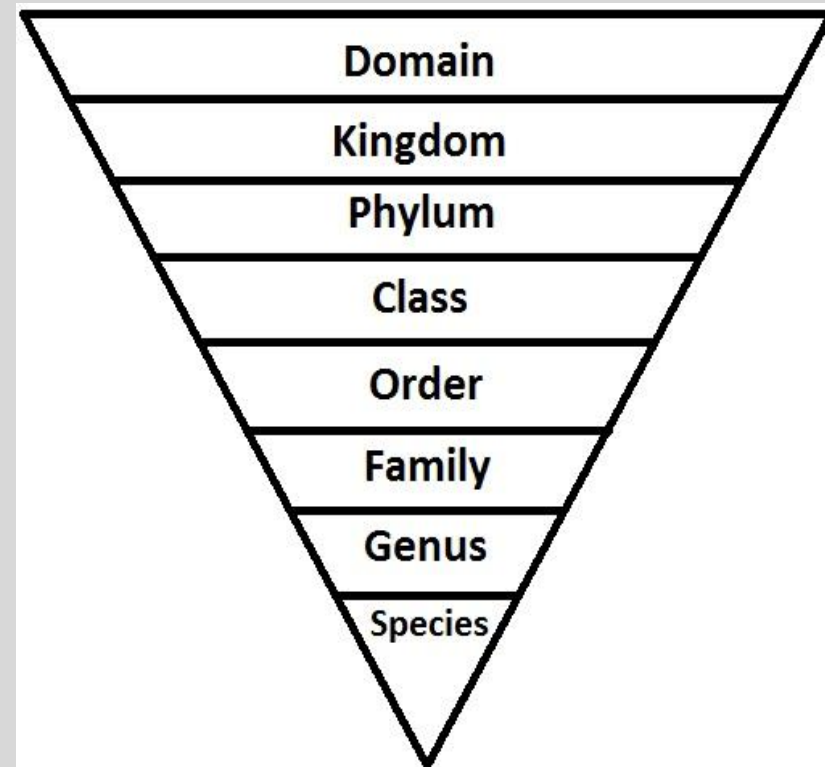
For effective IRZs and PRZs:
What fauna inhabit the areas to be mined?
What fauna inhabit the reference areas?
Need to know species composition (taxonomy) for the different habitats!



What's in a **name**?

Why should we care about identifying **species**?

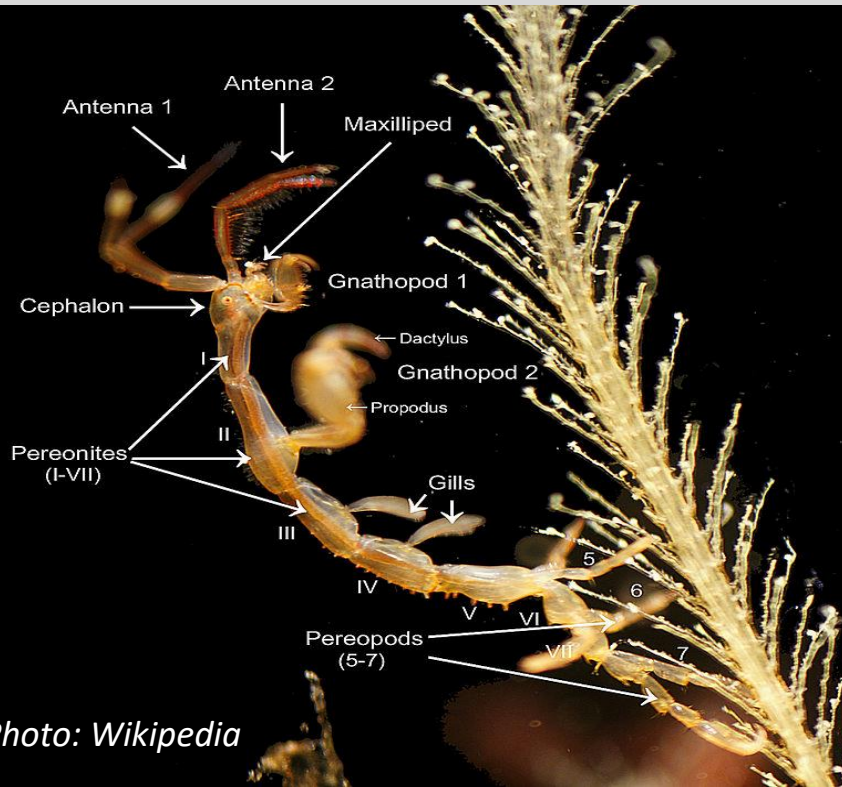
- Taxonomic units are the fundamental units of Biology (as the Elements in Chemistry)
- If we cannot identify and distinguish species- then we will never fully understand biology
- Pre-requisite for all research
- Facilitates our understanding of-specific traits, needs and relationships
- Central to how we understand, utilise and enjoy nature in a sustainable way



Assessing Species Taxonomy

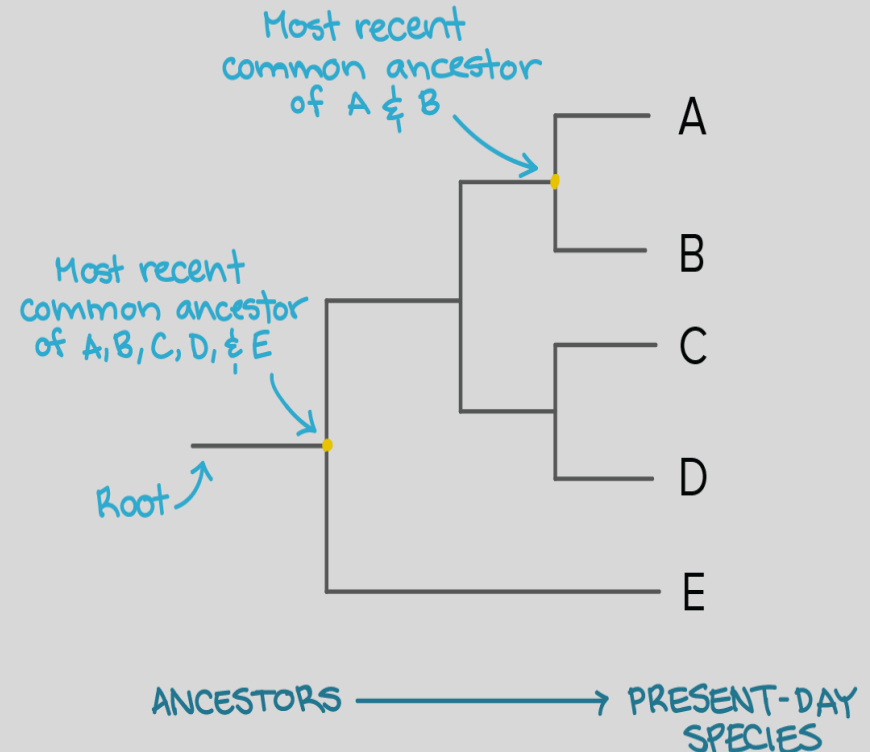
Morphological

Uses the appearance or body structures of the organism



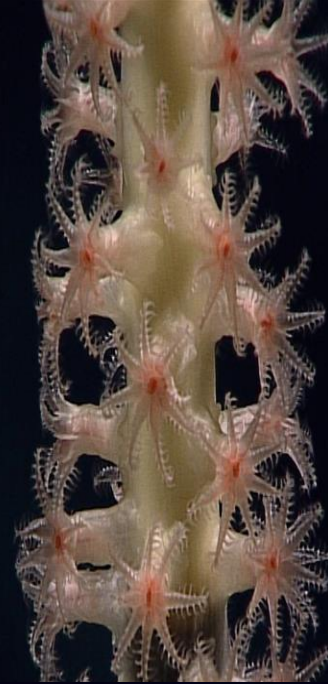
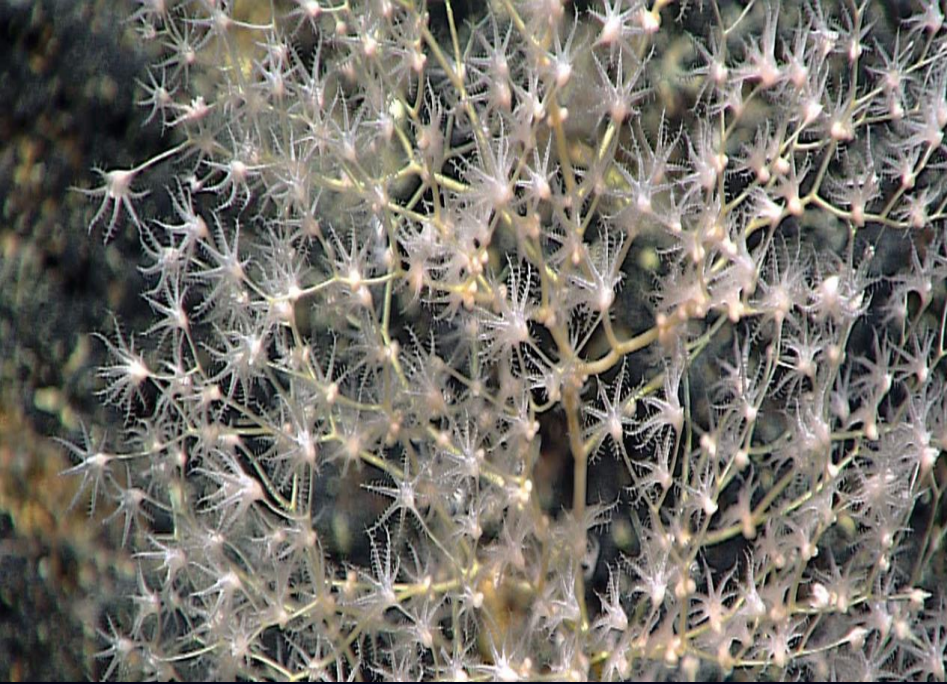
Molecular

Uses the genetic makeup of the organism

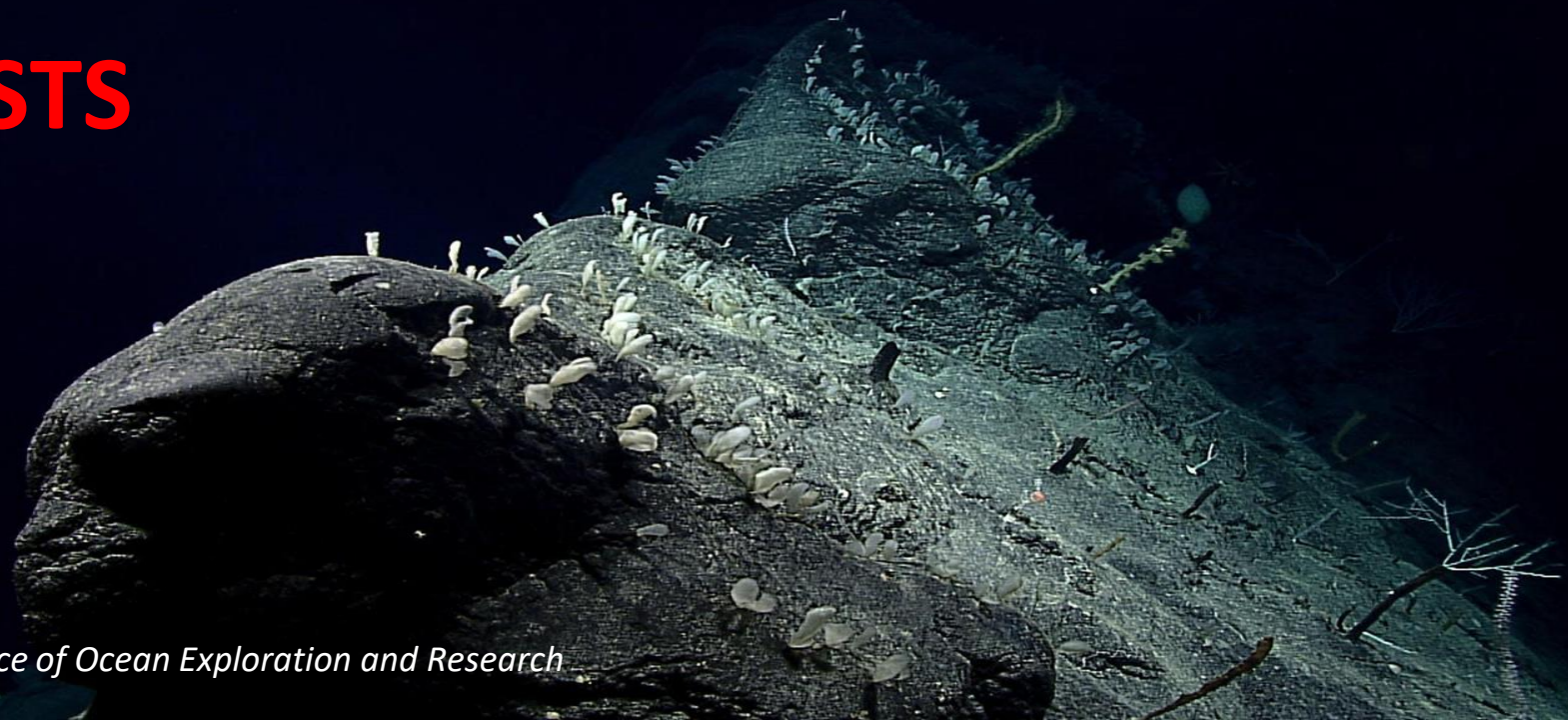


Fauna differ *between* habitats

- 3 key heterogeneous habitats: important reservoirs of mineral deposits
- All support unique assemblages
- **Cobalt-rich ferromanganese Crusts:** found on seamounts, which are highly heterogeneous in terms of habitat
- **Polymetallic Nodules-** eg. the Clarion Clipperton Fracture Zone (CCZ), in the north-eastern equatorial Pacific, is the area of greatest commercial interest
- **Polymetallic Sulphides** – includes hydrothermal vent sites, sites of endemic species (found nowhere else on earth)



CRUSTS



Photos: NOAA Office of Ocean Exploration and Research



NODULES

Photos: D.Amon and C.Smith

Photo: V. Tunnicliffe

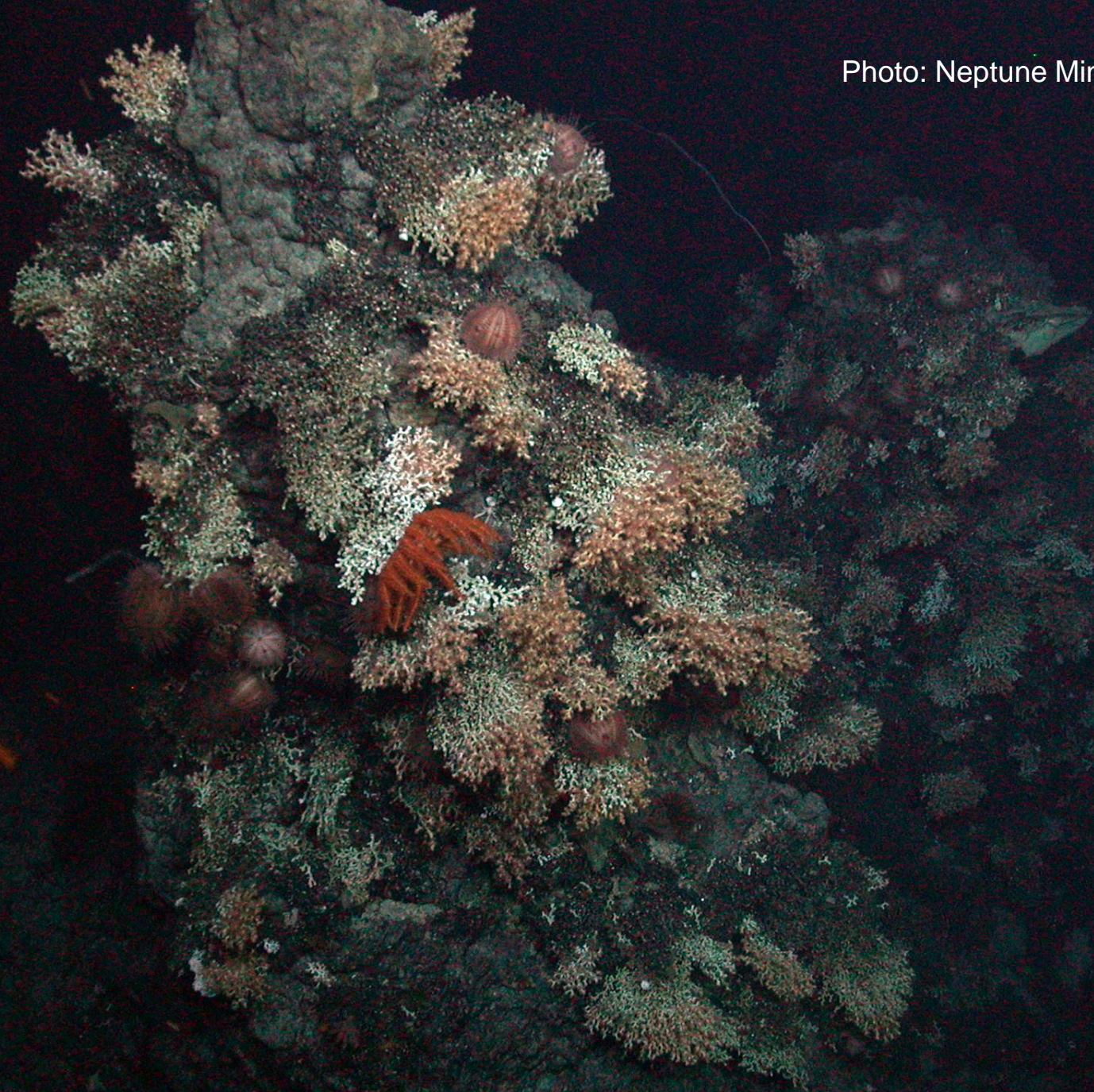


Photo: NERC

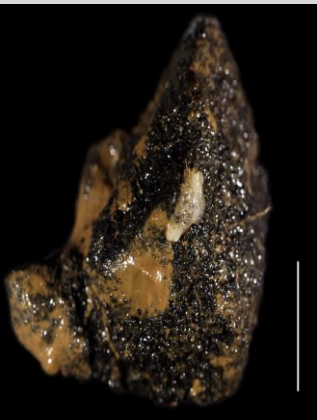


SULPHIDES

Photo: Neptune Minerals Inc.



Different Spatial Scales exist

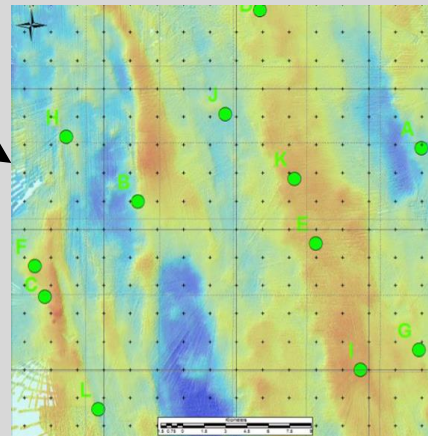


Millimetres to centimetres

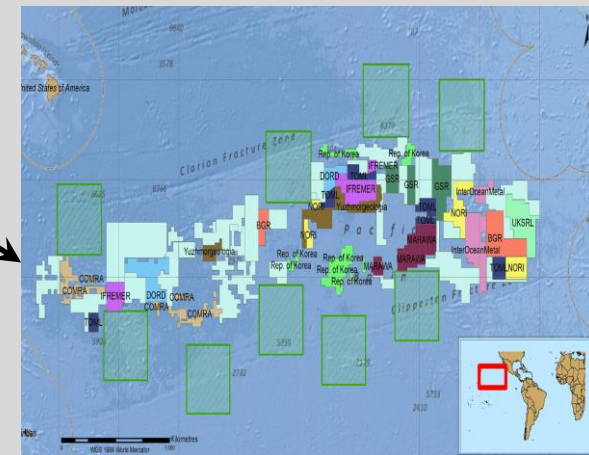


Tens of metres

Polymetallic nodules



Kilometres



Hundreds of kilometres

For an accurate picture of fauna, spatial scales must be considered !

There are also differences *within* each heterogeneous habitat

Substrate type

Physico-chemical

Topography

Geological origins

Geochemistry

Activity levels etc.

- Important to assess these and other drivers of species composition and taxonomy in environments being targeted for mineral extraction
- This heterogeneity **should** inform the design of the PRZs and IRZs

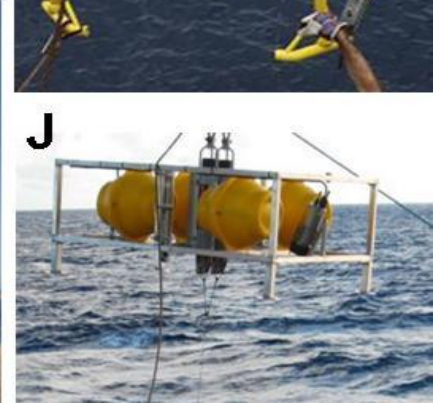
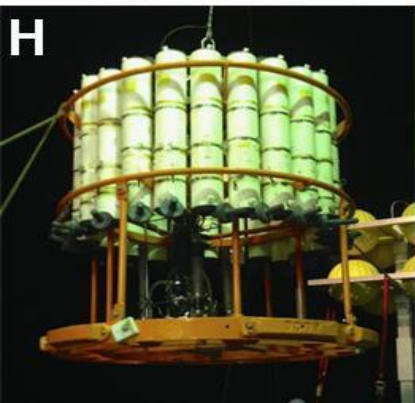
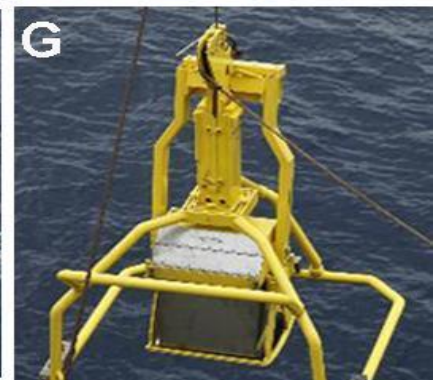
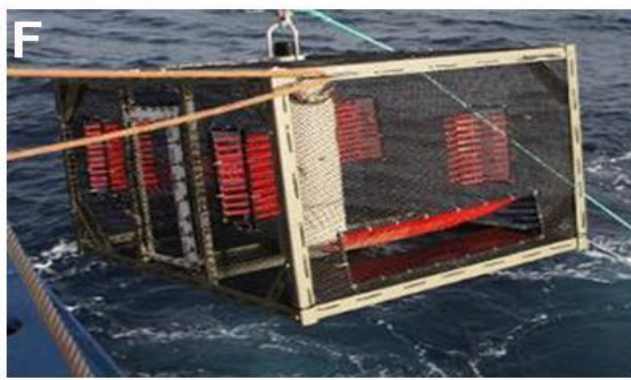
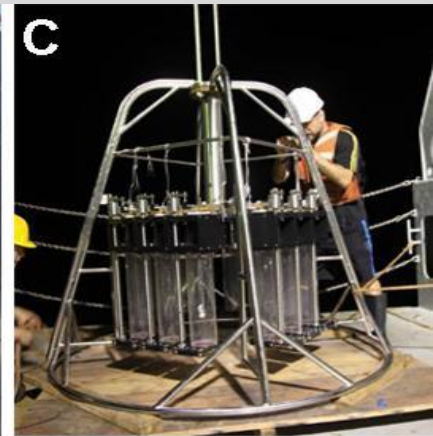
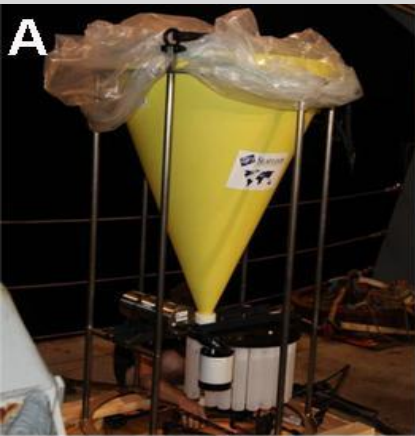
How then do we assess Species Composition?

- Need a range of sampling tools for each resource!
 - Different scales
 - Different habitats



Nodules Sampling (ABYSSLINE Project)

Photos: D. Amon and C. Smith



Mining affects species differently

SEABED MINING MAY HAVE DETRIMENTAL EFFECTS ON FISH RESOURCES VITAL TO COASTAL COMMUNITIES

PRODUCTION SUPPORT VESSEL

WASTE RELEASED MAY CONTAIN SEDIMENT AND HEAVY METALS

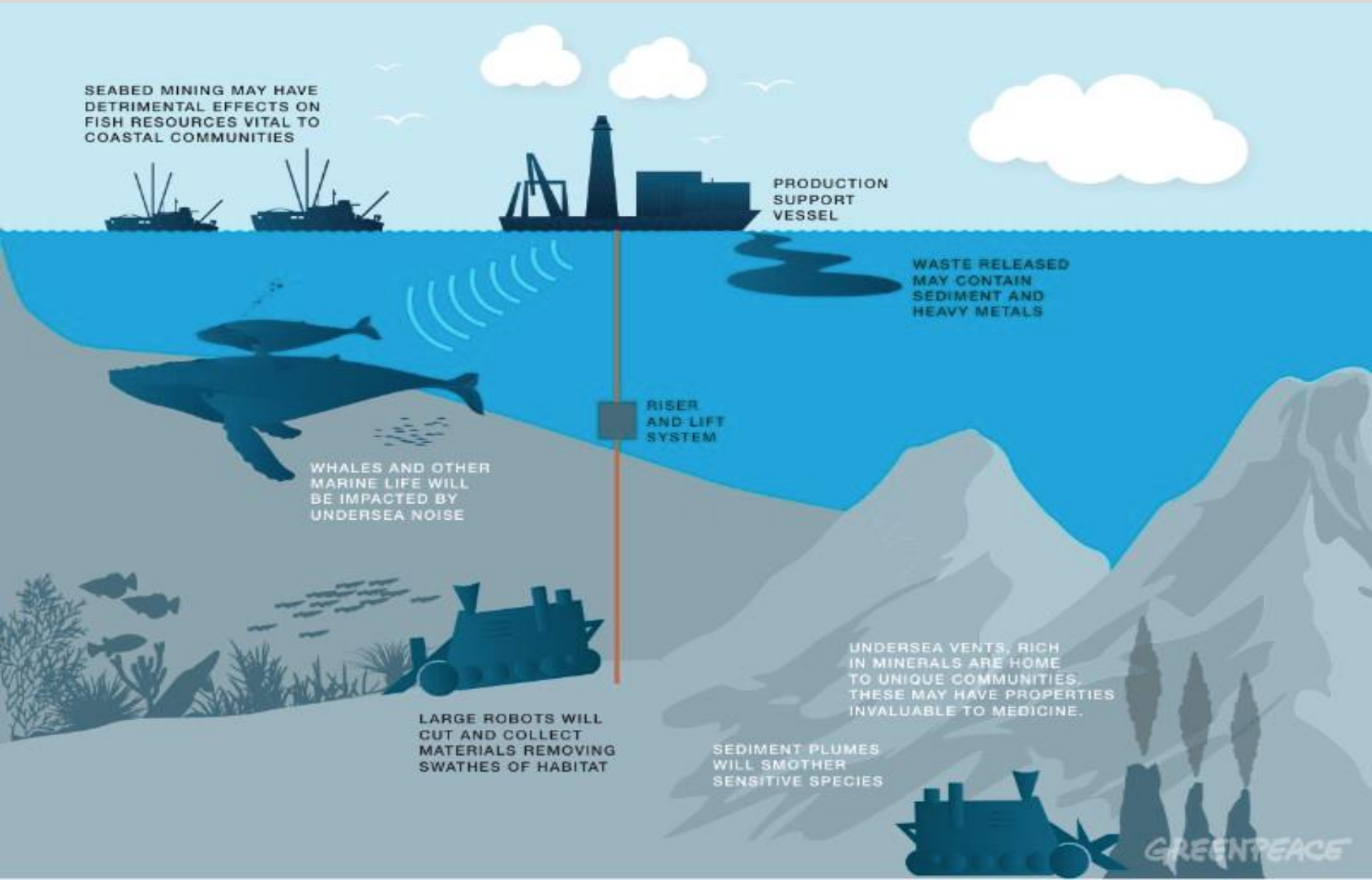
RISER AND LIFT SYSTEM

WHALES AND OTHER MARINE LIFE WILL BE IMPACTED BY UNDERSEA NOISE

UNDERSEA VENTS, RICH IN MINERALS ARE HOME TO UNIQUE COMMUNITIES. THESE MAY HAVE PROPERTIES INVALUABLE TO MEDICINE.

LARGE ROBOTS WILL CUT AND COLLECT MATERIALS REMOVING SWATHES OF HABITAT

SEDIMENT PLUMES WILL SMOTHER SENSITIVE SPECIES



Species belong to Communities

- "Biological diversity" *means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity **within species, between species and of ecosystems.*** (Convention on Biological Diversity, CBD)

Deep sea species- isolated, therefore tendency for increased speciation



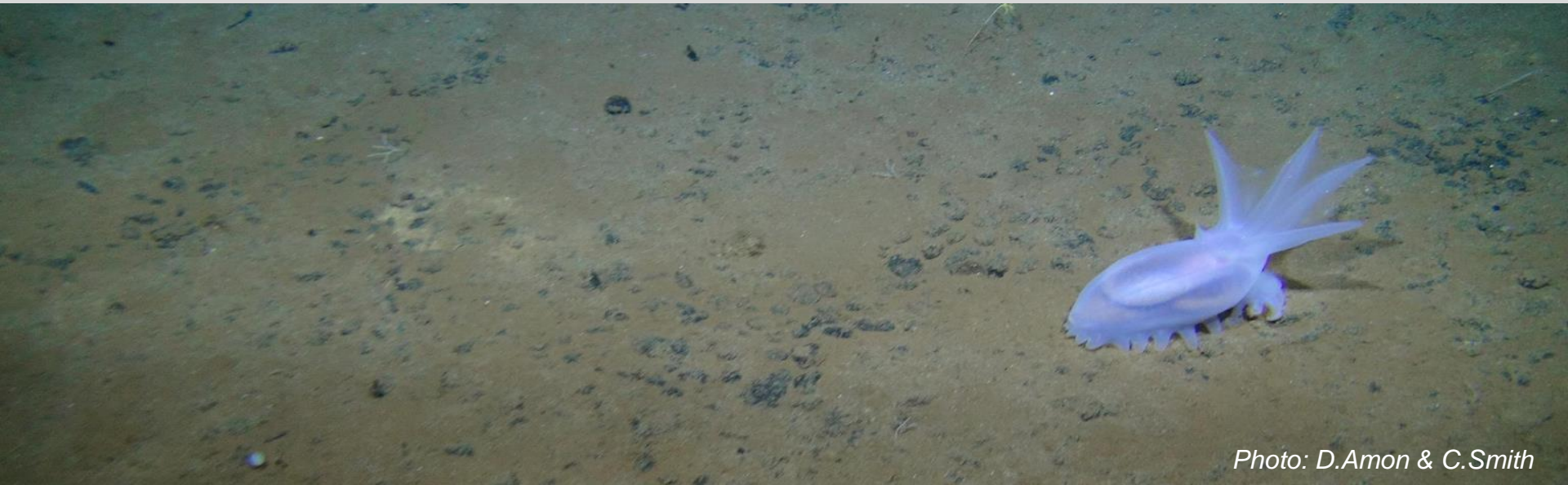
Photo: The Ocean Exploration Trust (OET)

Connectivity: *dispersal* among populations influences a wide variety of demographic, ecological and evolutionary processes

A “species approach” to understanding heterogeneity in terms of PRZ and IRZ placement is therefore **ecologically insufficient**

Recommendations

- Environmental objectives for the IRZs and PRZs must **directly inform** the sampling methodology
- Imperative that species composition (and their taxonomy) are known- in order to design **effective** IRZs and PRZs
- To be ecologically relevant- a series of IRZs and PRZs (a network) is needed



RECOMMENDATIONS

- Protected area network concept- not just a single IPZ/PRZ designated per contractor (or within contract area)
- IRZ/PRZs designation- as part of a coherent framework accounting for: existing APEIs, heterogeneity (multiple scales) and connectivity, etc.
- IRZ and PRZ placement- must be part of a Strategic Environmental/Regional Plan

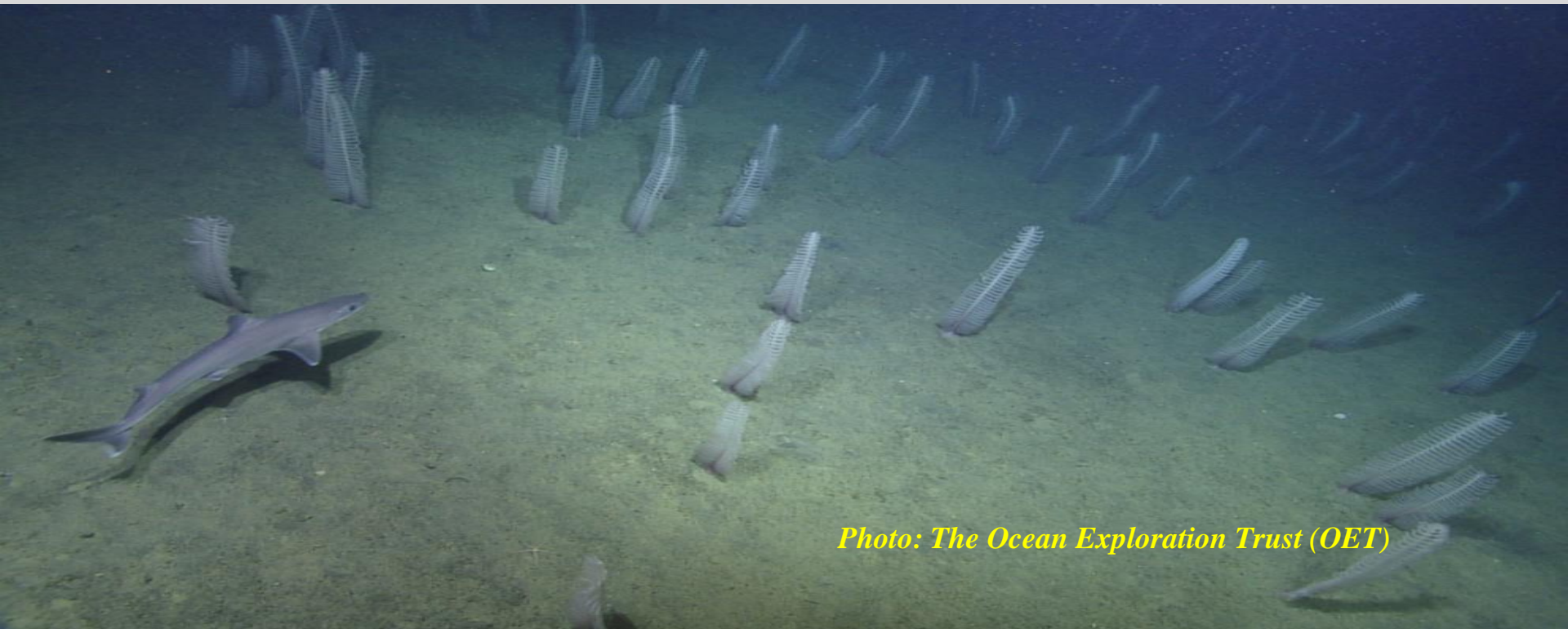


Photo: The Ocean Exploration Trust (OET)

Supporting environmental management and research of the deep seabed

GALATHEA
Deep-Sea Taxonomy

<https://galatheataxonomy.com>

- Global deep-sea benthic sample management and processing
- Global taxonomic expertise (40 taxonomists, 15 countries)
- Specimen and data curation
- Ensuring non-sensitive species data are comparable between surveys and available for the global scientific community
- Deep-water survey design and sample collection/archive advice



Dr Maria Baker, University of Southampton
Dr Tammy Horton, National Oceanography Centre



UNIVERSITY OF
Southampton

Thank You



Special thanks to:

- **The Pew Charitable Trust**
- **The University of the West Indies,
St. Augustine Campus**

Photo: The Ocean Exploration Trust (OET)