



Overview of potential future capacity needs in deep-sea research relating to the protection of marine environment

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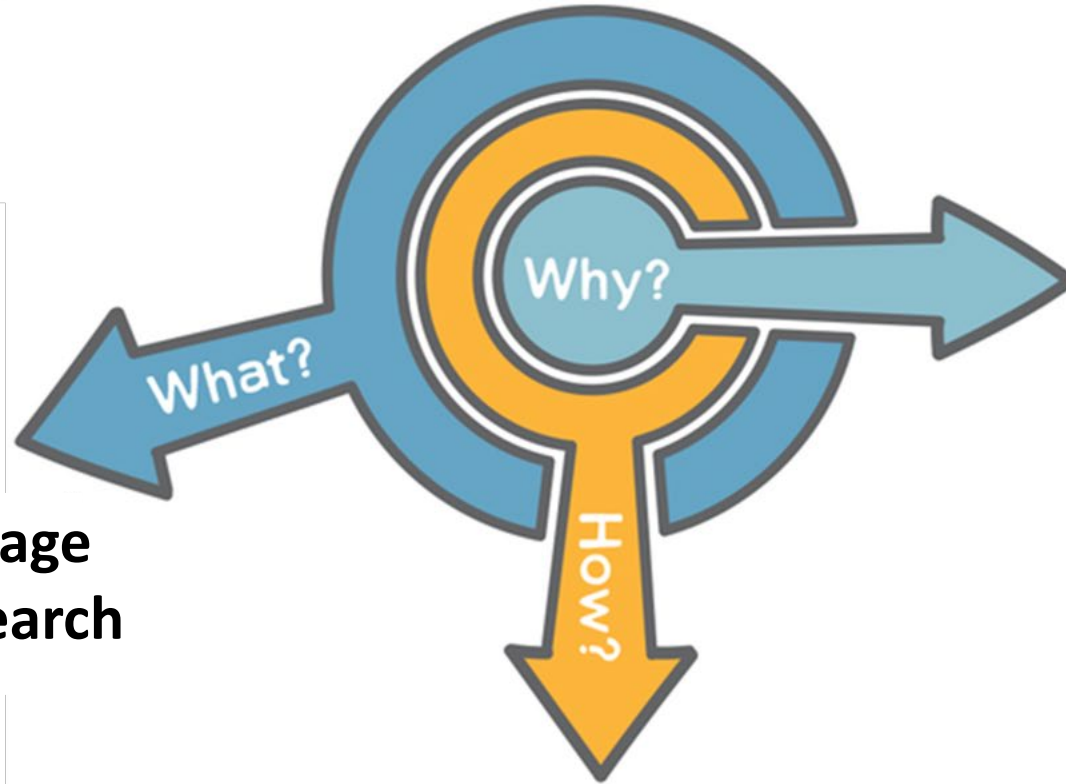
Outline

- The golden circle: Why, How, What
- MSR role in developing robust environmental management system
- The future of deep-sea environmental research
 - Basic knowledge
 - Cost-effective and standardized methodologies
 - Increased synergies and adequate resources mobilization
- Sustainable Seabed Knowledge Initiative (SSKI)
- Potential future capacity development: needs and priorities



STRATEGIC PLAN 2019-2023

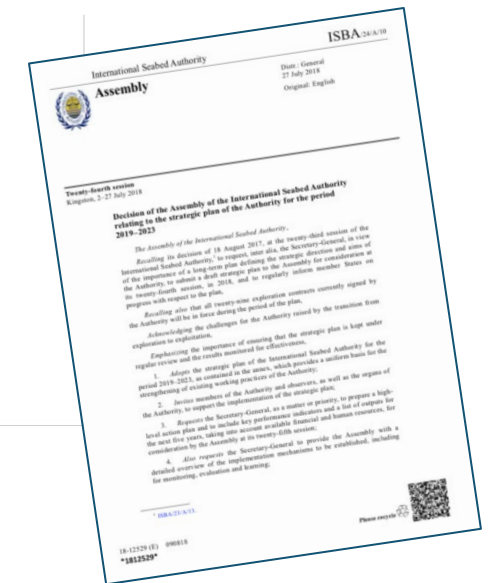
ISBA/24/A/10



Inform decision-making
Benefit sharing

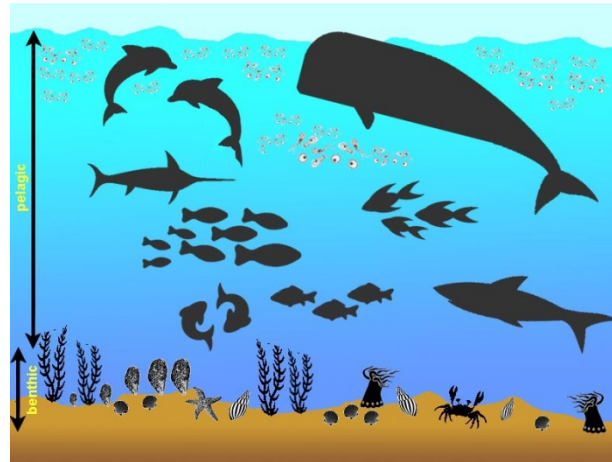
**Promote and encourage
Marine Scientific Research
in the Area**

**Develop Capacity and
Cooperation among stakeholders**

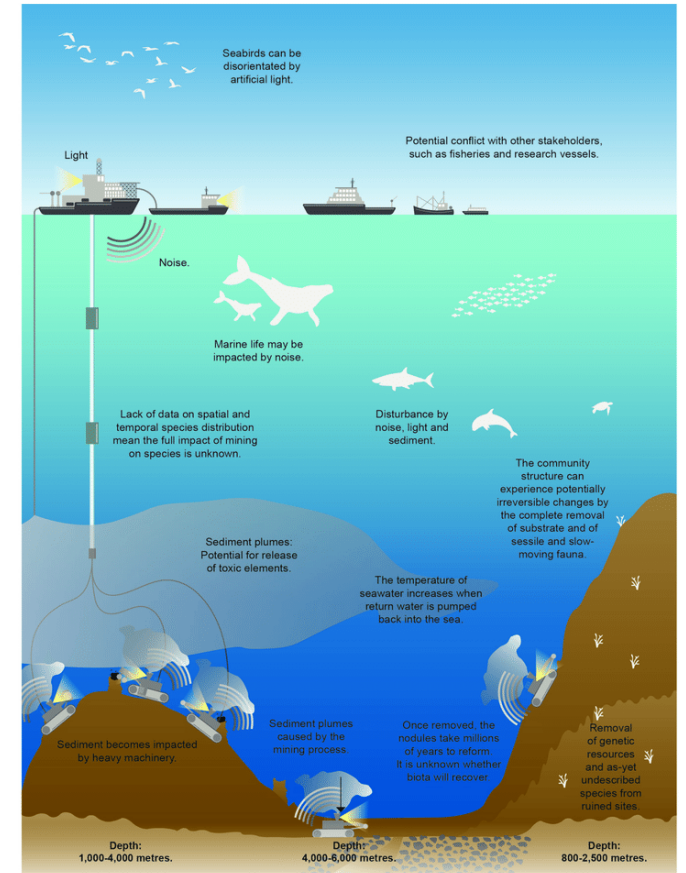


MSR role in developing robust environmental management system for effective marine environmental protection

Water column	Surface	Marine mammals and other large vertebrates Bird aggregations
		Pelagic and benthic boundary layer communities
Seafloor		Micro-, Meio-, Macro-, Megafauna Demersal scavengers Resource-associated fauna
Environmental variability		Habitats
		Bottom topography
		Depth
		Seabed and sediment characteristics
		Abundance and mineral type



- ✓ Standard methodologies
- ✓ Statistical power
- ✓ Spatial-temporal comparisons



Baseline data

Environmental impact/risk assessment

Environmental monitoring

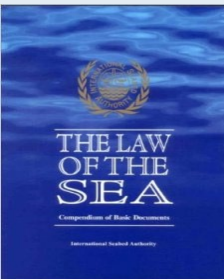
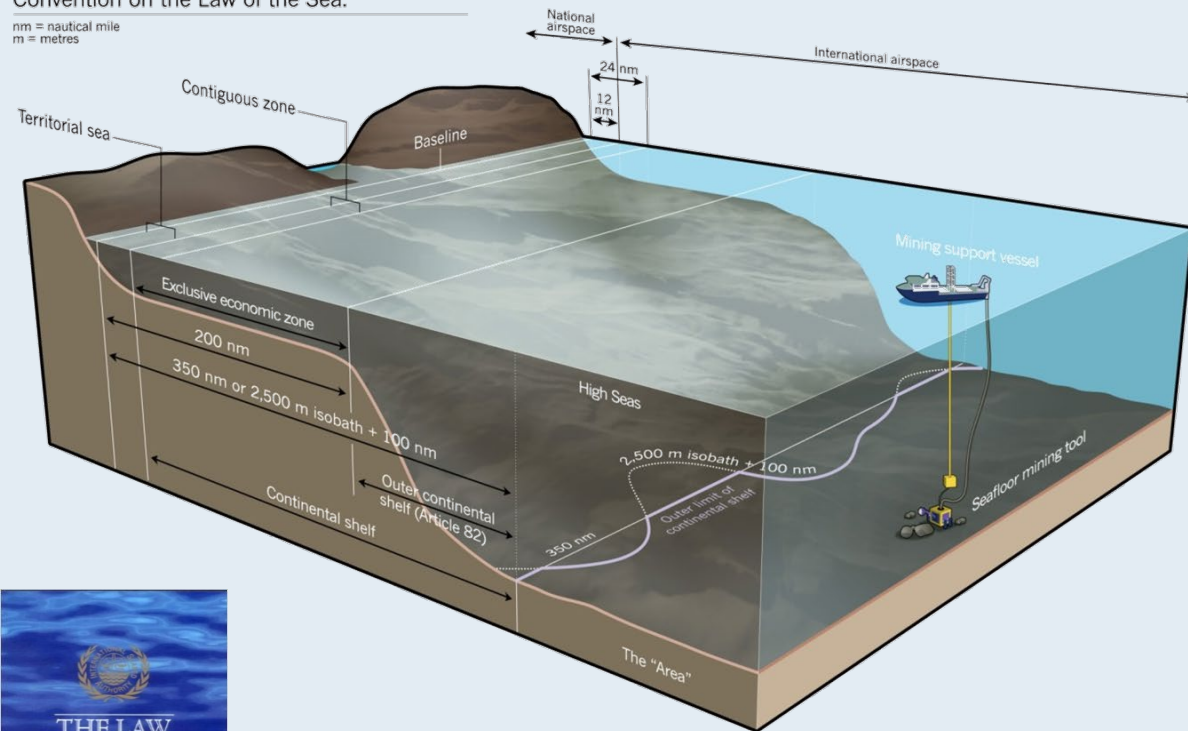
The future of deep-sea environmental research



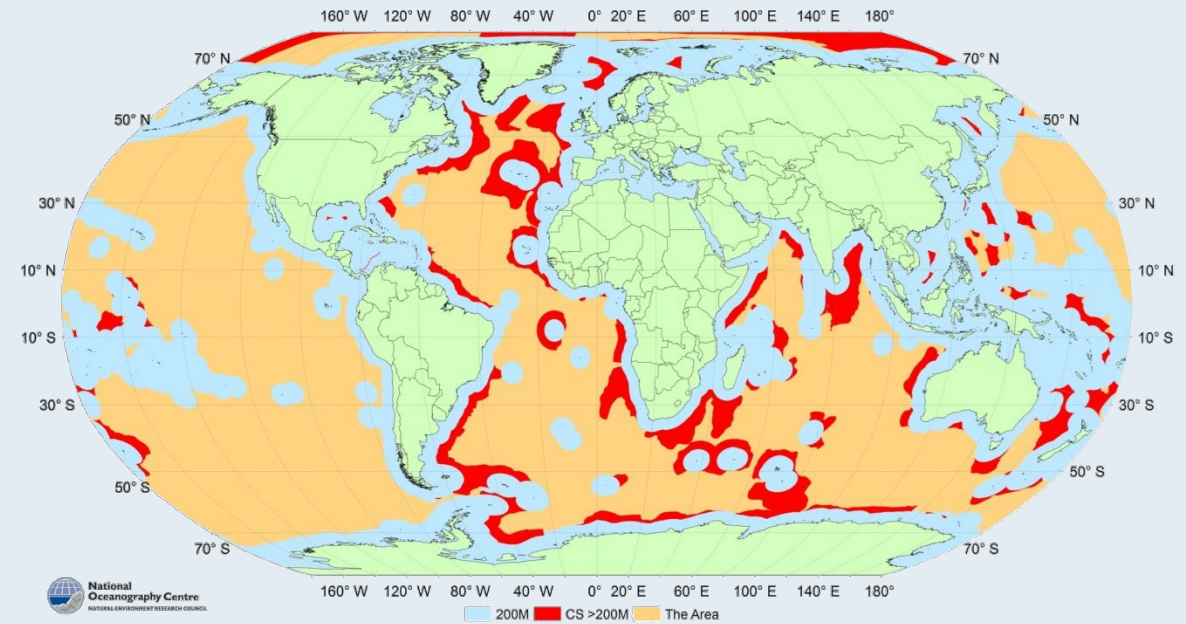
1.3 M sq km seafloor under exploration (=1% of international seabed area)

Maritime space under the 1982 United Nations Convention on the Law of the Sea.

nm = nautical mile
m = metres



Deep Sea > 200 m depth



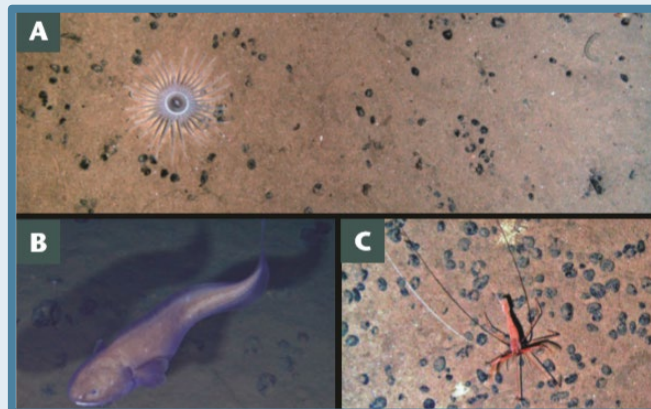
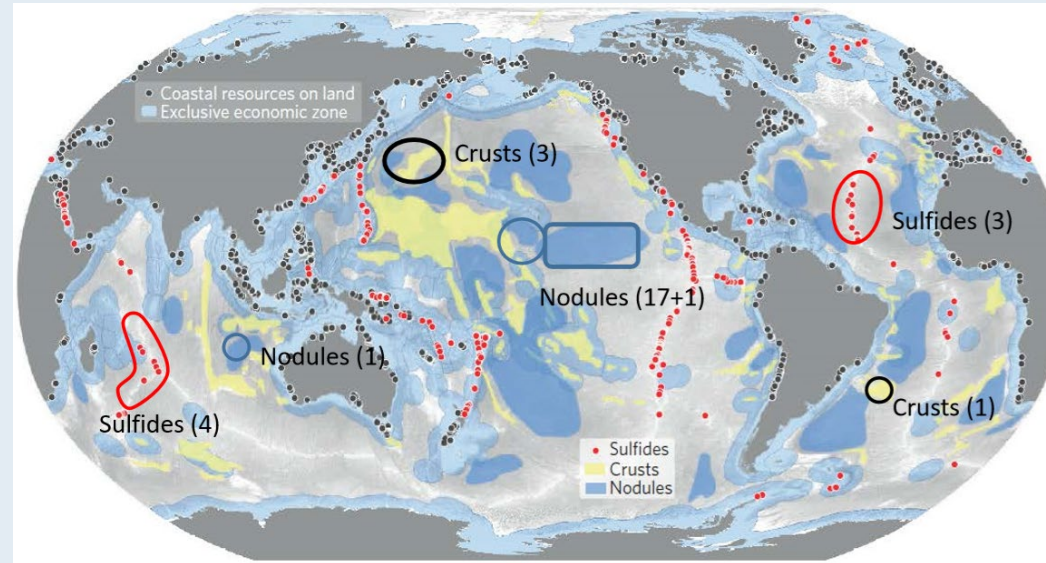
38% EEZs

8% OCS

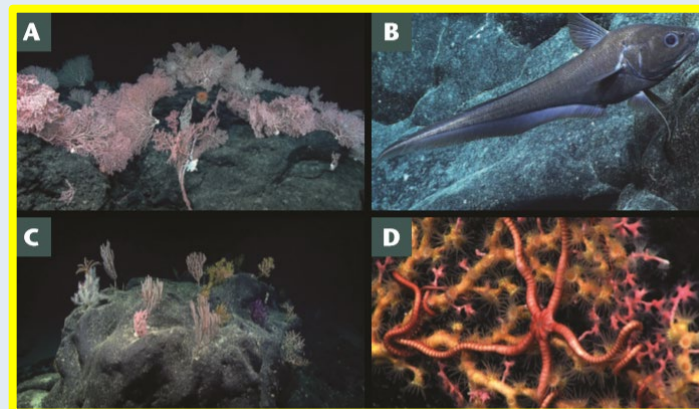
54% Area



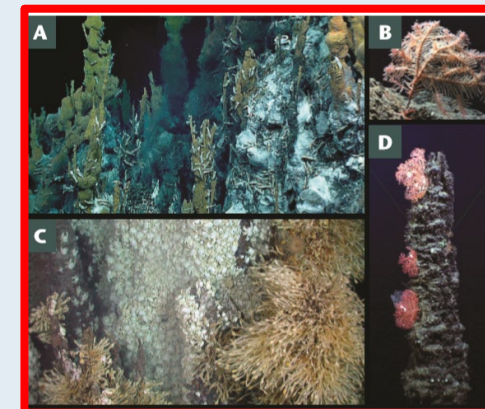
The future of deep-sea environmental research



abyssal plain sediments



rocky seamounts and ridges



mid-ocean ridges



Basic knowledge



➤ who lives where → biodiversity and biogeography

Taxonomy

Species discrimination, identification and description



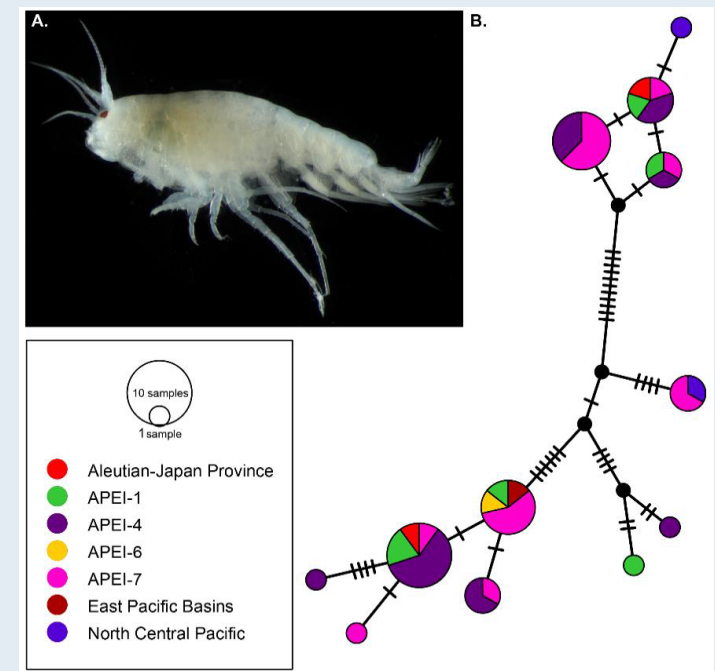
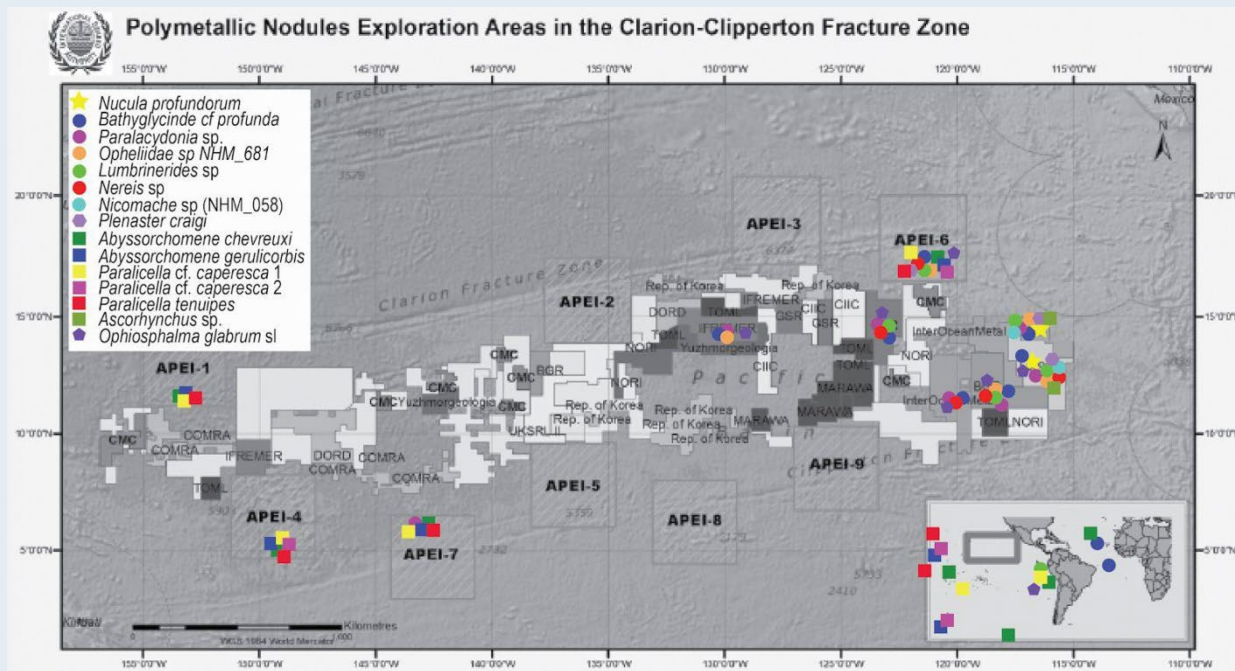
Worm A	Worm B



Basic knowledge



- who lives where → biodiversity and biogeography
- what it does → ecosystem functioning
- how it reacts to disturbance → connectivity and resilience

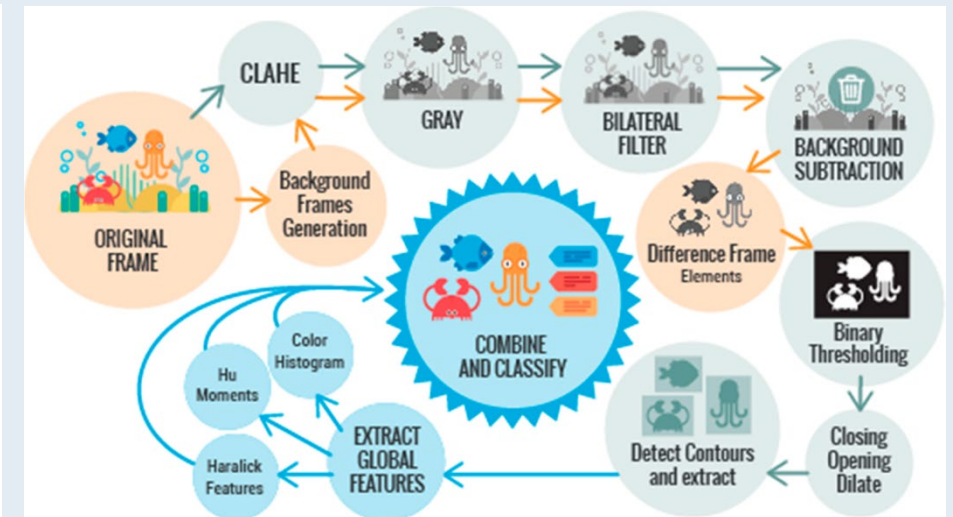
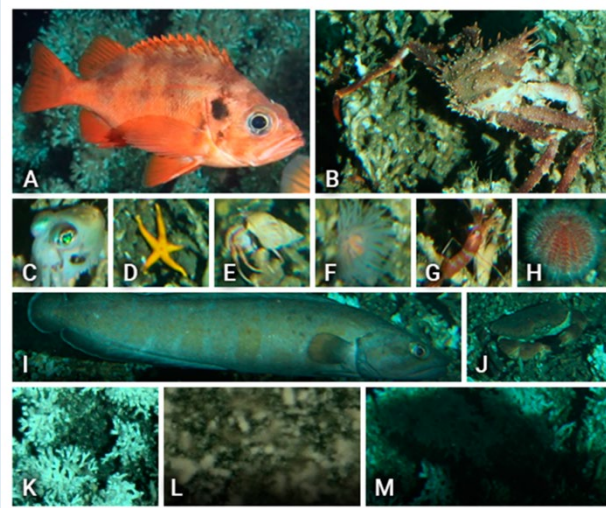
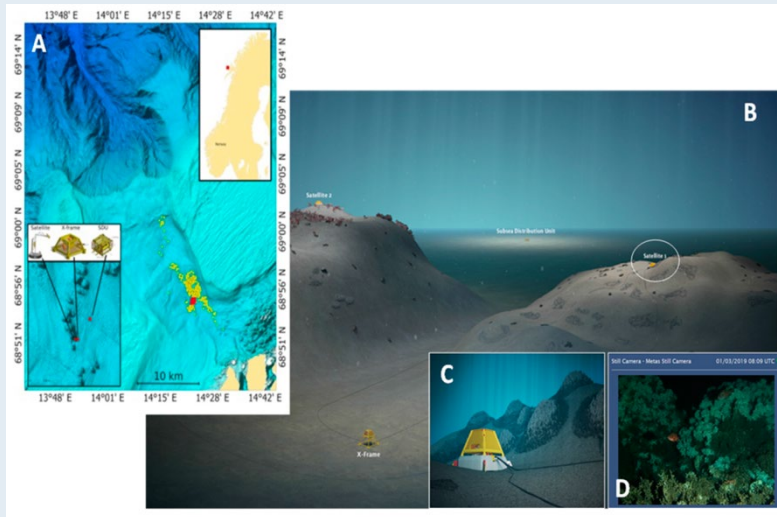


Cost-effective and standardized methodologies



- automated data collection and processing methods

Computer vision and deep learning



Lopez-Vazquez et al. 2020 *Sensors*

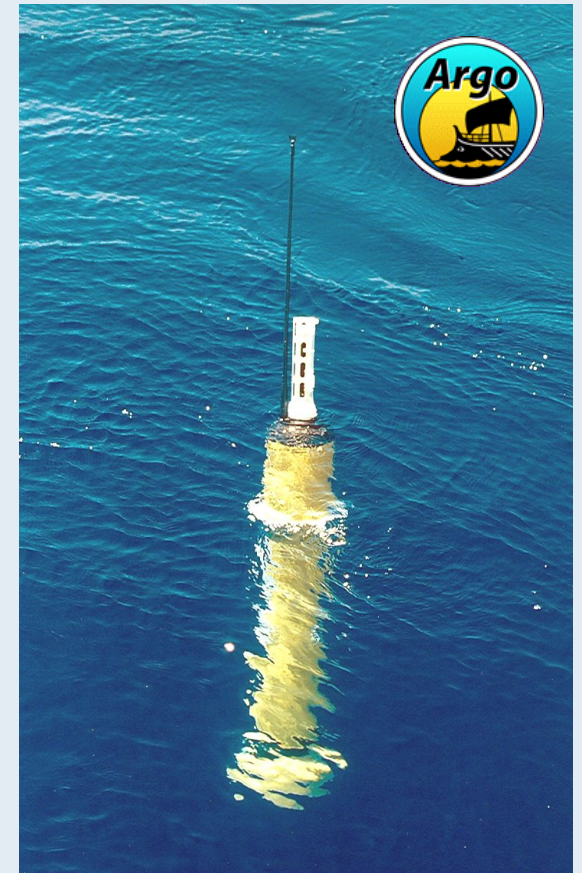
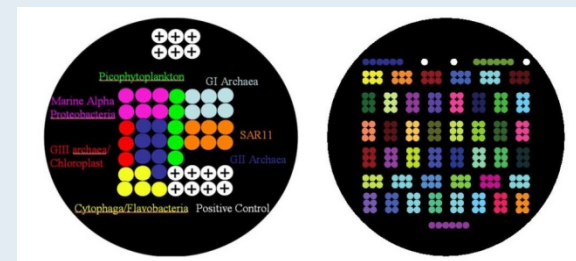
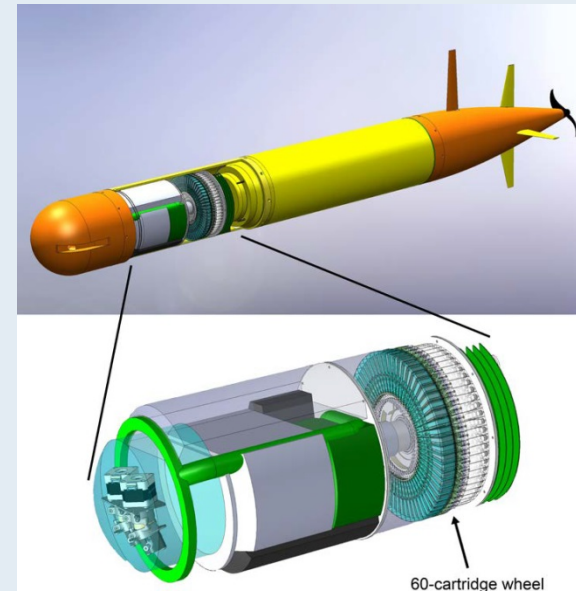
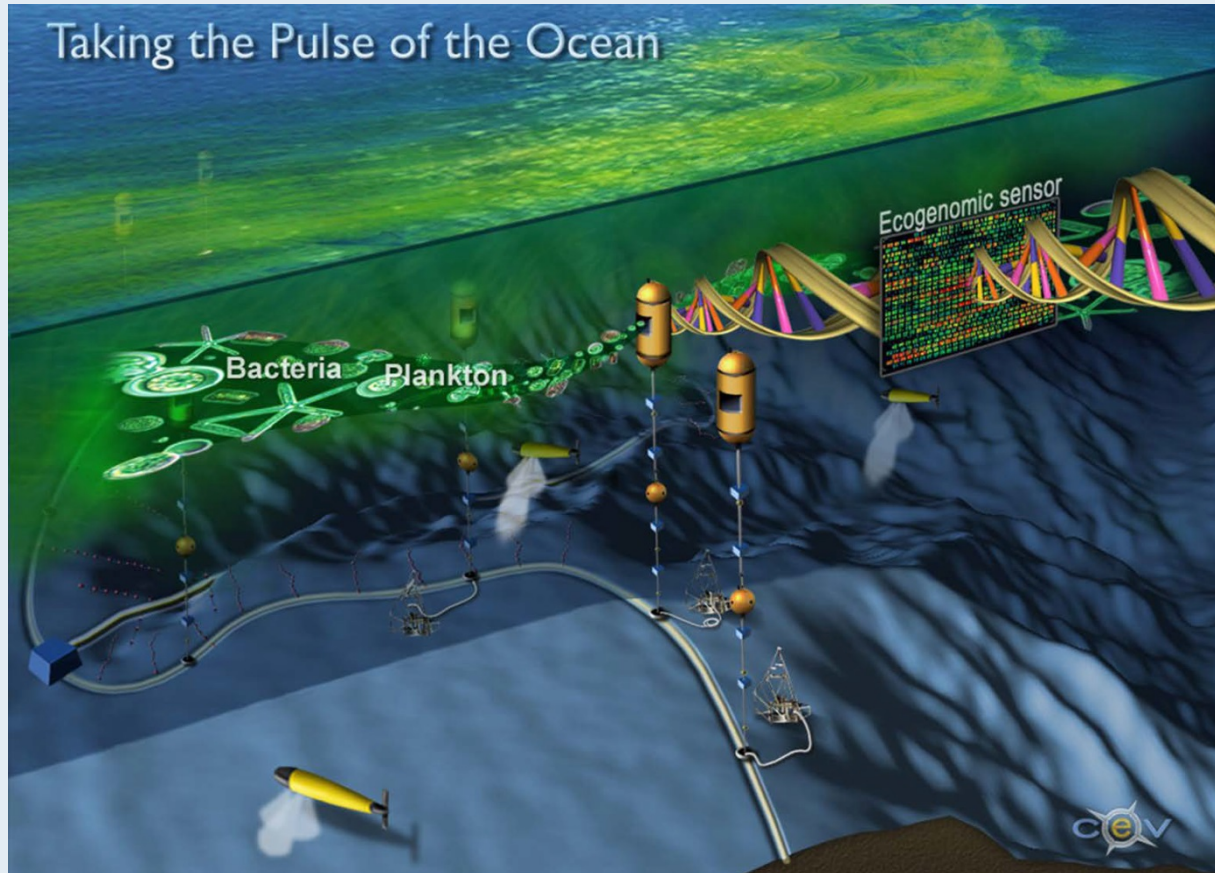


Cost-effective and standardized methodologies



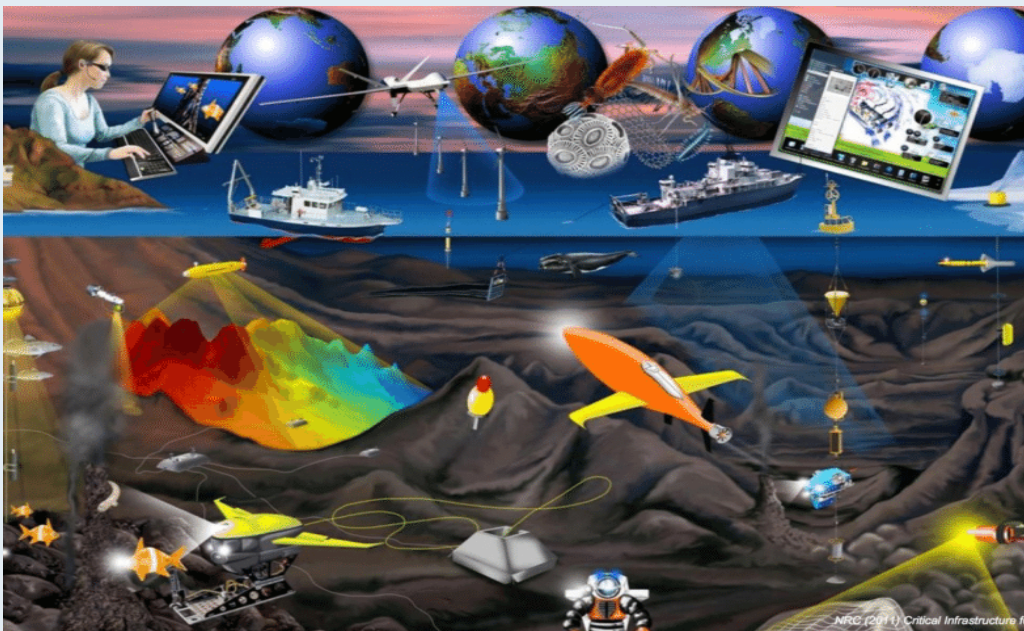
- automated data collection and processing methods

Environmental DNA



Cost-effective and standardized methodologies

- efficient data management systems
- modelling → uncertainty
- predictions → temporal and spatial scales



Increased synergies and adequate resource mobilization



- strategic partnerships
- coordination among stakeholders



Sustainable Seabed Knowledge Initiative (SsKi)

1. Knowledge

- 1000 species
- Biogeography Map
- Connectivity, Resilience & Evolution

2. Tools

- DNA/eDNA
- AI / Genomic Vocabulary
- Species ID app

3. Training

- Taxonomic Capacity
- Centers of excellence
- Technology transfer

5. Data Products & Deep-Sea Literacy

- Impact assessment/ REMP
- Long-term observation strategy
- Deep sea literacy
- Stakeholder engagement

4. Innovating Data Flow

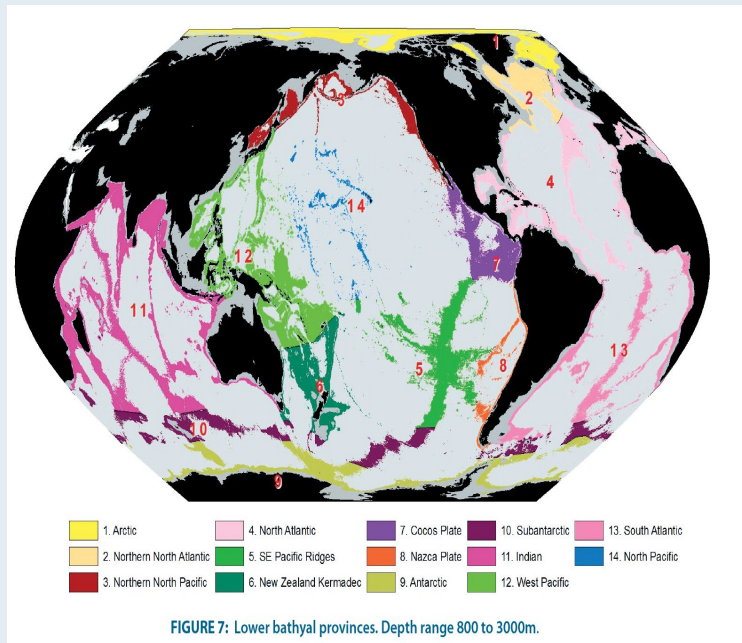
Innovative Global Knowledge Framework Underpinning Effective Protection of the Marine Environment in the Area

New Knowledge



Component 1.

- ◆ 1000 new species
- ◆ The first biogeography map for the Area incorporating species-level biology
- ◆ Taxa relevant to regional environmental management plans

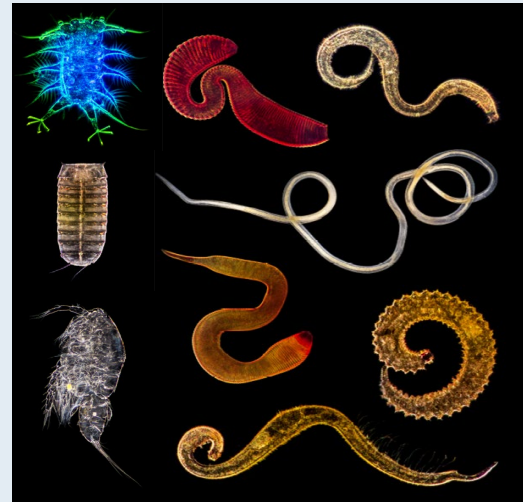


Innovative Tools



Component 2.

- ◆ **Species identification Apps and Toolkits**
- ◆ **Genomic reference libraries**
- ◆ **Underwater image reference libraries**
- ◆ **Standard operating procedures for baseline data collection and long-term observations**

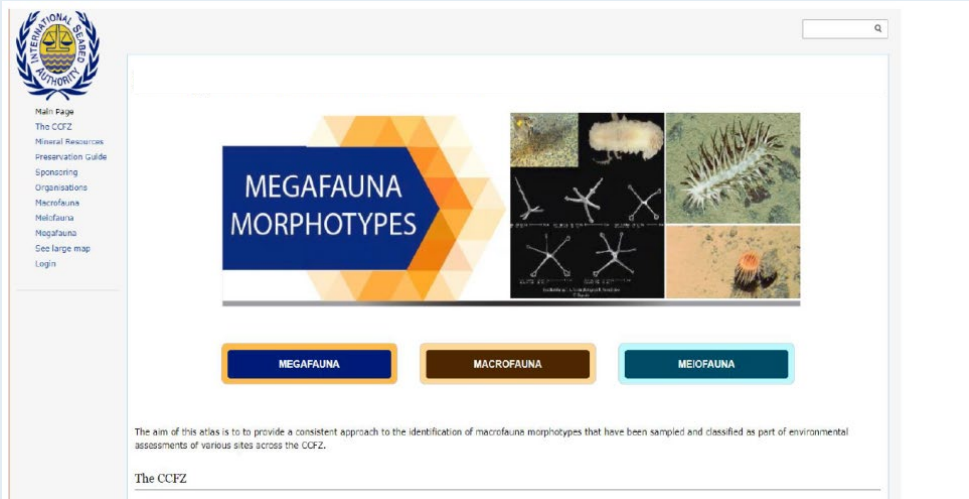


Innovative Networks



Component 3.

- ◆ Network of deep-sea taxonomic fellows
- ◆ Centers of excellence on deep sea taxonomy
- ◆ Transfer of technology relating to taxonomic knowledge generation



Lee Kong Chian
Natural History Museum

MUSÉUM
NATIONAL D'HISTOIRE NATURELLE

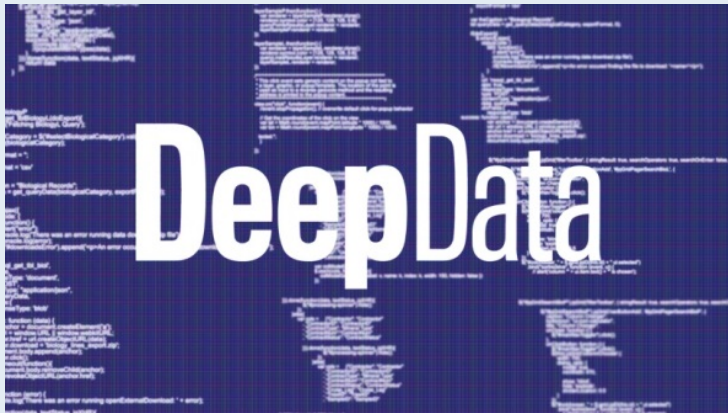
N NATURAL HISTORY MUSEUM



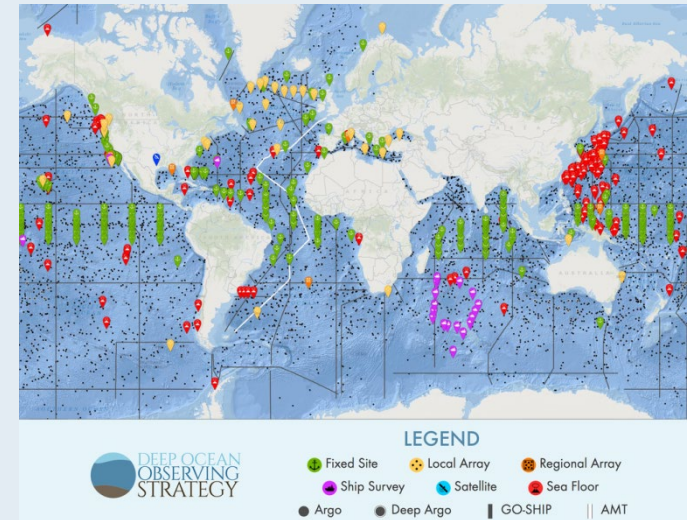
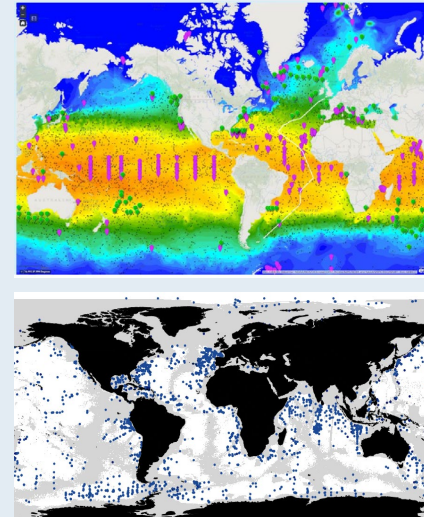
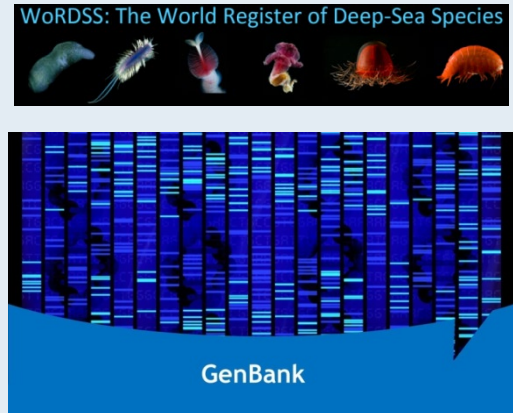
Data Flow

Component 4.

- ◆ Interoperable links among existing data platforms
- ◆ Data quality control
- ◆ ISA database



(<http://data.isa.org.jm>)

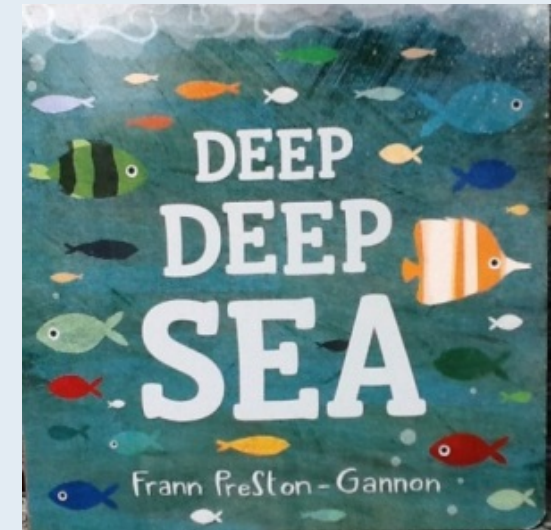
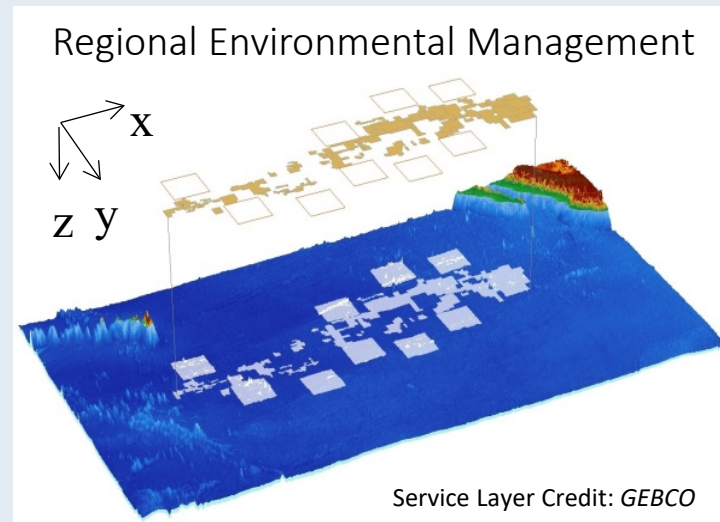
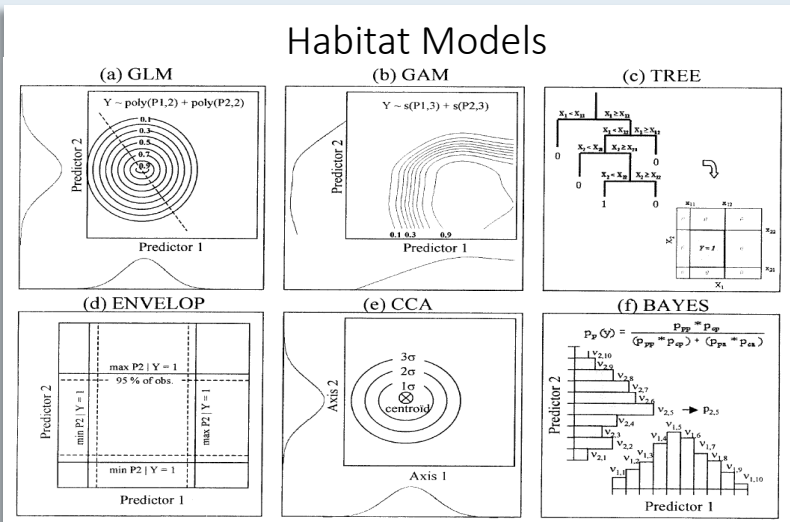


Information products & Deep-Sea Literacy



Component 5.

- ◆ Higher precision design maps for area-based management
- ◆ Environmental impact assessment and monitoring plans
- ◆ Links to observing systems
- ◆ Outreach information products



Potential future capacity development



High-level education

Marine biology & Ecology
Systematics
Molecular biology
Genetics
Bioinformatics
Modelling & Statistics



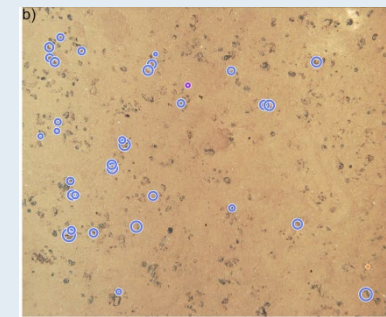
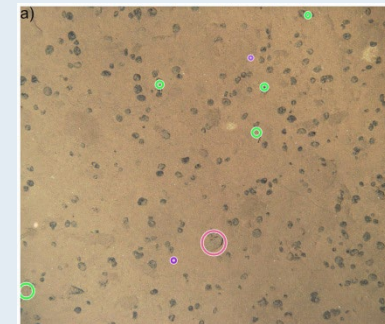
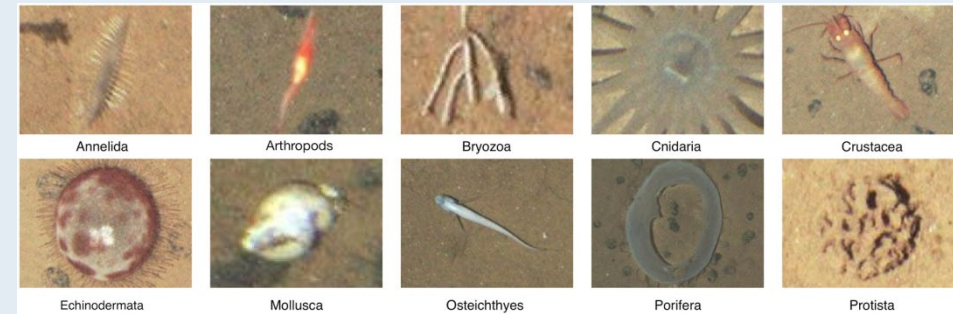
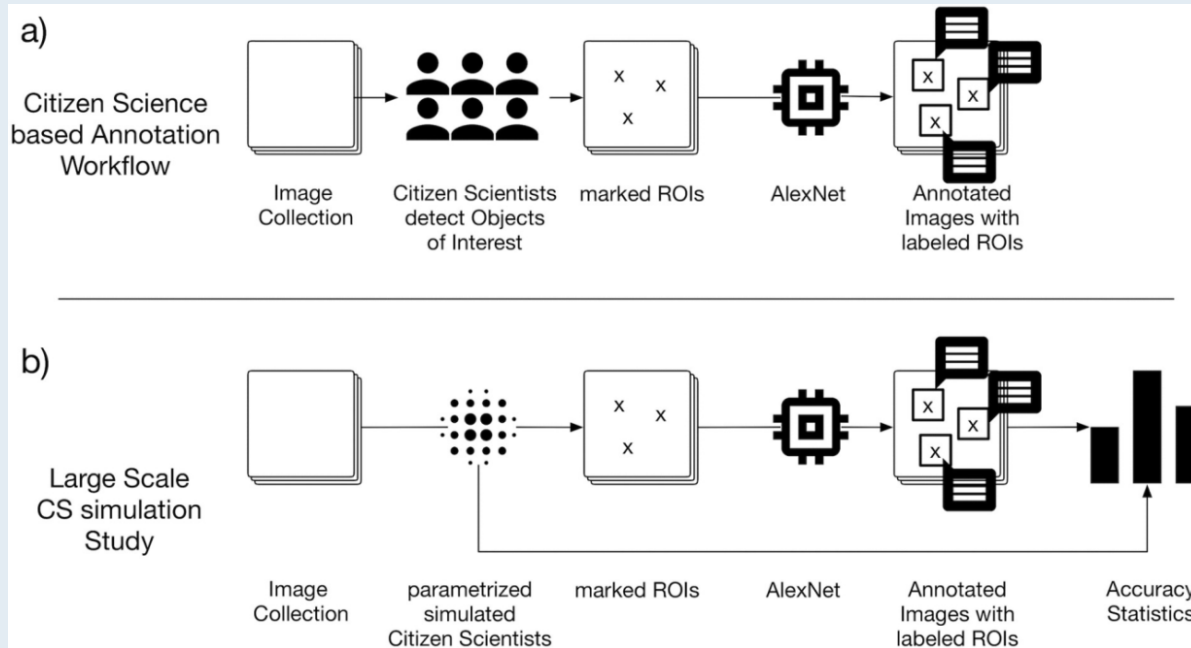
Offshore and Onshore training



Potential future capacity development



Citizen Science



Langenkämper et al. 2019 PLoS ONE





THANK YOU!

www.isa.org.jm