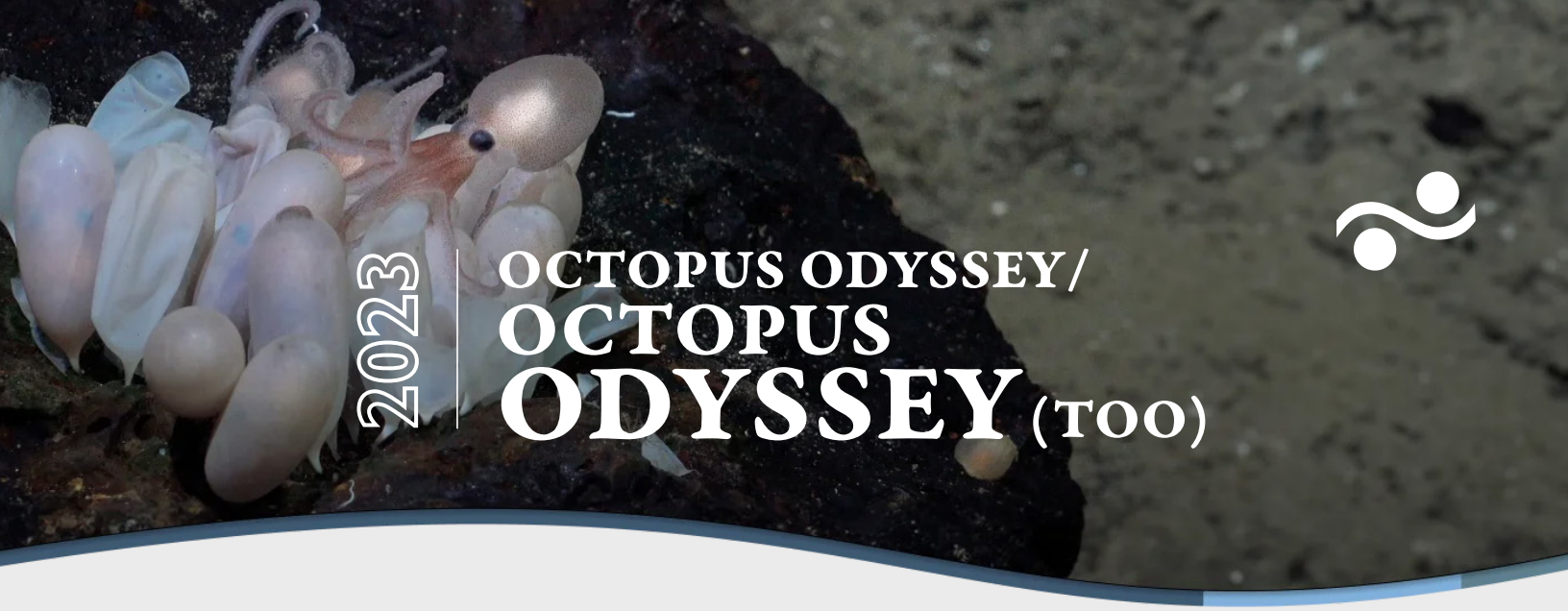

2023 | OCTOPUS ODYSSEY/ OCTOPUS ODYSSEY (TOO)

FKt230602 & FKt231202 | #OctoOdyssey

- Costa Rica
- 2 - 21 June 2023 | 2 - 15 December 2023
- Drs. Beth Orcutt, Bigelow Laboratory for Ocean Sciences and Jorge Cortés, University of Costa Rica
- Ship Track - Octopus Odyssey
- Ship Track - Octopus Odyssey (too)

- 32 science days
- 46 terabytes of data collected
- 28 ROV dives
- 13,725 sq km mapped
- 18 CTD & rosette casts
- 473 ROV samples collected

Expedition objectives:

- Determine if octopuses are brooding viable eggs in the warm waters of hydrothermal vents found at the Dorado Outcrop in Costa Rican waters.
- Ascertain linkages between the microbes harnessing energy from the fluids and rocks surrounding them, other microbial processes, and animals inhabiting the seamounts in Costa Rican waters.
- In June, the team deployed microbial colonization experiments and different types of animal shelters; they returned in December to recover experiments that were designed to improve understanding of the connections between the life present and the rocks and fluids around these seafloor features.

In June 2023, Co-chief Scientists Drs. Beth Orcutt and Jorge Cortés led an international team to map and examine the Dorado Outcrop — the site of the first-discovered octopus nursery, found in 2013. One of their initial goals for this expedition was to determine if the eggs at the nursery were viable, as past expeditions to the outcrop had never seen evidence of developing embryos. The science team documented nurseries with hundreds of *Muusoctopus*, a genus of deep-sea octopus, brooding viable eggs in low-temperature hydrothermal fluids at the study site.

The team returned in December of 2023 to further study the nurseries and to collect time-series experiments placed at the site in June. As a result, scientists confirmed that *Muusoctopus* nurseries offshore of Costa Rica support baby octopuses throughout the year, not just during the rainy season, as observed in June. The team believes they have discovered four new octopus species during the two expeditions; these discoveries will undergo a rigorous analysis and peer review to be confirmed and published in the coming months. One of the discoveries may be a new species of *Muusoctopus*, the only type of octopus observed brooding its eggs on the low-temperature hydrothermal vents. This discovery supports the previous hypothesis that only the *Muusoctopus* genus has evolved to brood their eggs in warm springs on the seafloor.

Three different kinds of low-temperature hydrothermal vents were detected during the expedition, each sustaining life. Fluid samples collected at these sites allow researchers to study the microbiomes of these unique hydrothermal spring waters to understand what functions microbes perform and how they connect to the microbiomes of animals living in places like these. And, the water samples collected have shown interconnectivity between features, which helps researchers understand the deep sea as a network of connected habitats rather than a series of isolated features.

The observed deep-sea octopus and skate nurseries meet definitions of Vulnerable Marine Ecosystems and Ecologically and Biologically Sensitive Areas because they are essential for the survival of these populations. These nutrient-rich ecosystems are home to sensitive species that are slow to recover from disturbance. The research from this expedition will aid in creating more effective conservation management plans for the country.

Resulting highlights include:

- Confirmed the Dorado Outcrop hosts a year-round octopus nursery with hundreds of *Muusoctopus* brooding viable eggs in low-temperature hydrothermal fluids.
- Possibly discovered four new octopus species, observed a variety of octopus behaviors, carefully collected specimens for identification, and gained insights into population biology and animal microbiomes.
- Discovered a thriving deep-sea skate nursery on top of Tengosed Seamount.