

# N.A.U.T.I.L.U.S.: Natural Aquaculture Using Technology In Living Underwater Systems

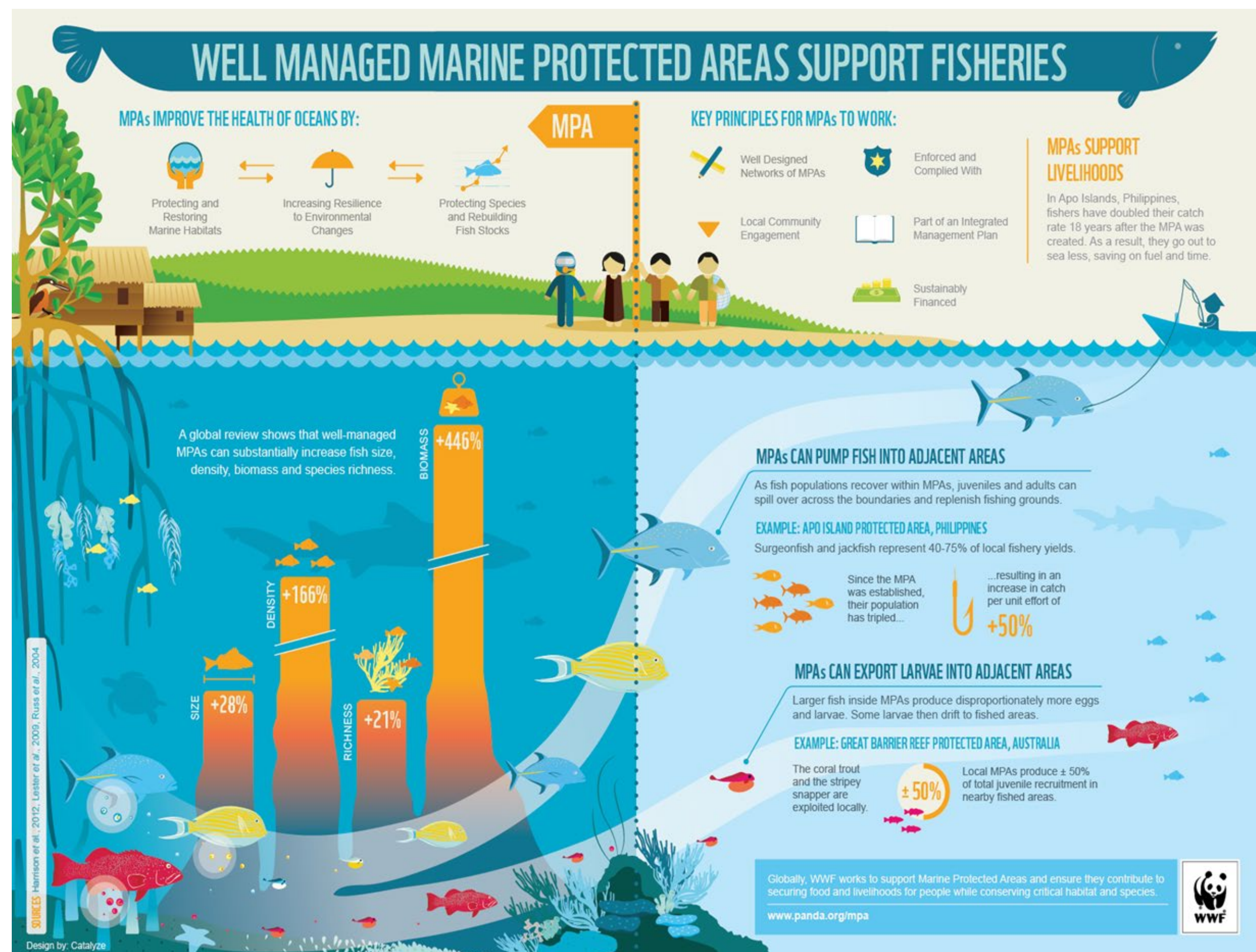
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## Background and Rationale

Marine protected areas (MPAs) are small subsets of marine ecosystems with limited to no access to exploitation to promote sustainability and growth of healthy populations of marine organisms.



MPA in Belize compared to nonprotected area.  
Mares, 8 Nov. 2019 / Animals Australia, 23 Mar. 2023



Ecological and Economic Benefits of MPAs.  
WWF, 24 Jan, 2018

Factors that affect the performance of MPAs include Size, Age, Level of Protection, Enforcement and Compliance, Isolation and Connectivity, and Habitat Quality and Diversity.

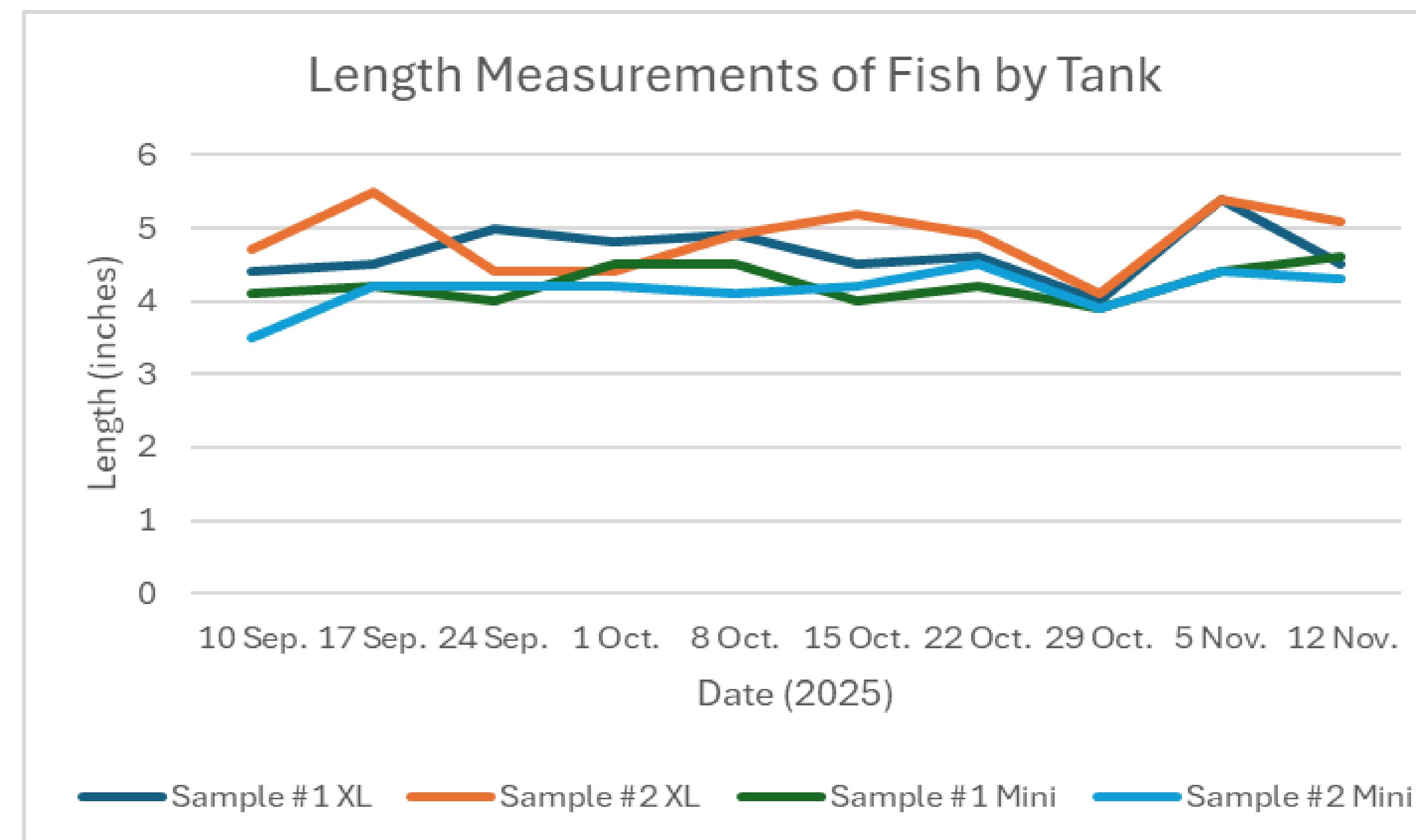
## Research Question

**How does size (area) affect the biological and ecological performance of MPAs?**

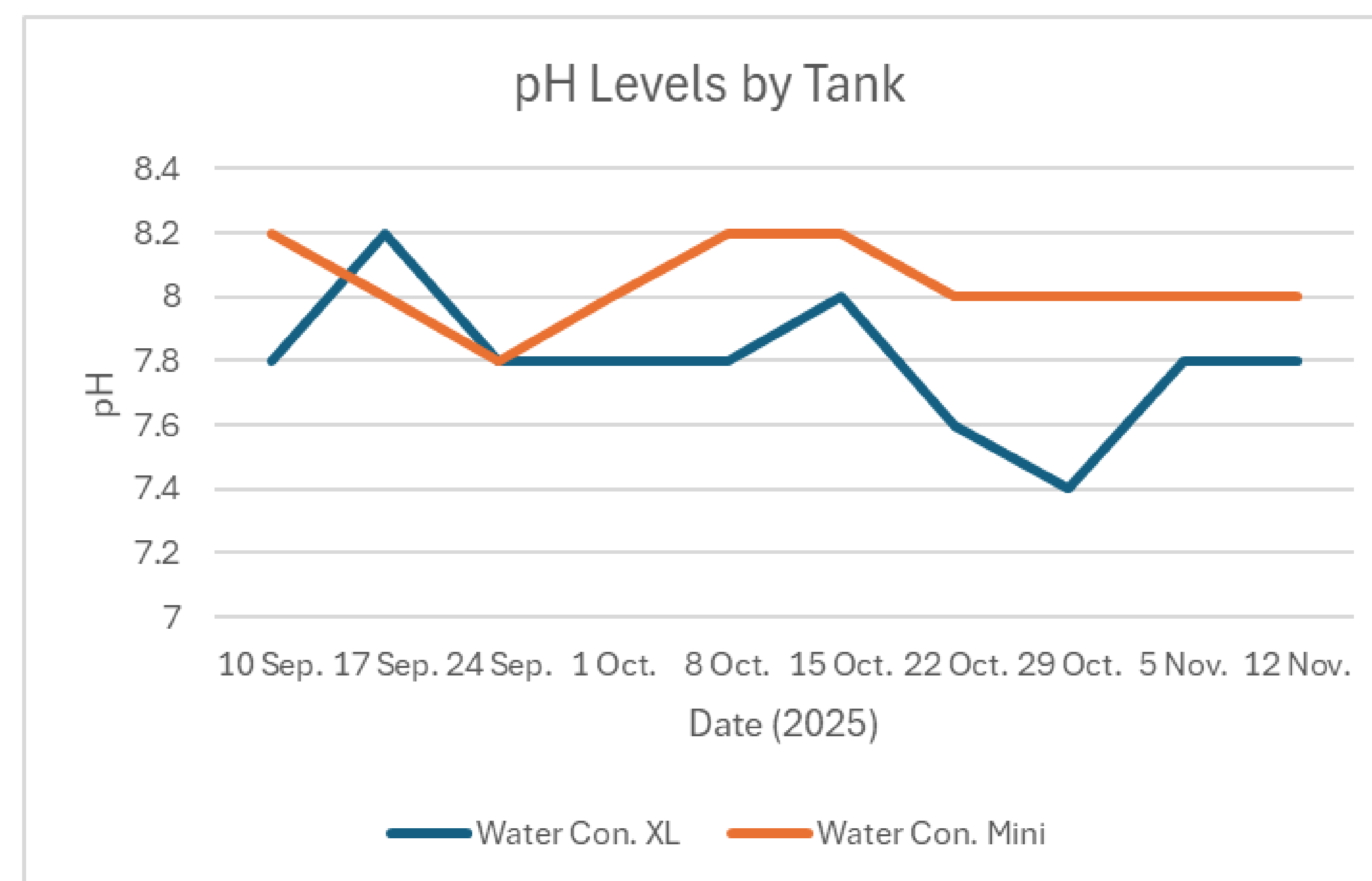
## Materials and Methods

We conducted a 10-week trial in 2025 to show the growth of Florida Pompano within an MPA. Two fish were in the 30-gallon tank, and sixteen were in the 240-gallon tank. We took random samples and measured girth, length, and width. Each tank was tested for water quality during each sample pull.

## Results and Discussion



Length of Samples N.A.U.T.I.L.U.S. Large and Small  
Will Marble, 15 Feb. 2026



pH Levels N.A.U.T.I.L.U.S. Large and Small  
Will Marble, 15 Feb. 2026

## Conclusion and Future Direction

Most of the MPAs are relatively small, and the effects of size are not well-understood. To further answer our questions, we will conduct another 10-week trial, this time in the Indian River Lagoon, to see how the system of N.A.U.T.I.L.U.S. behaves in open-water.

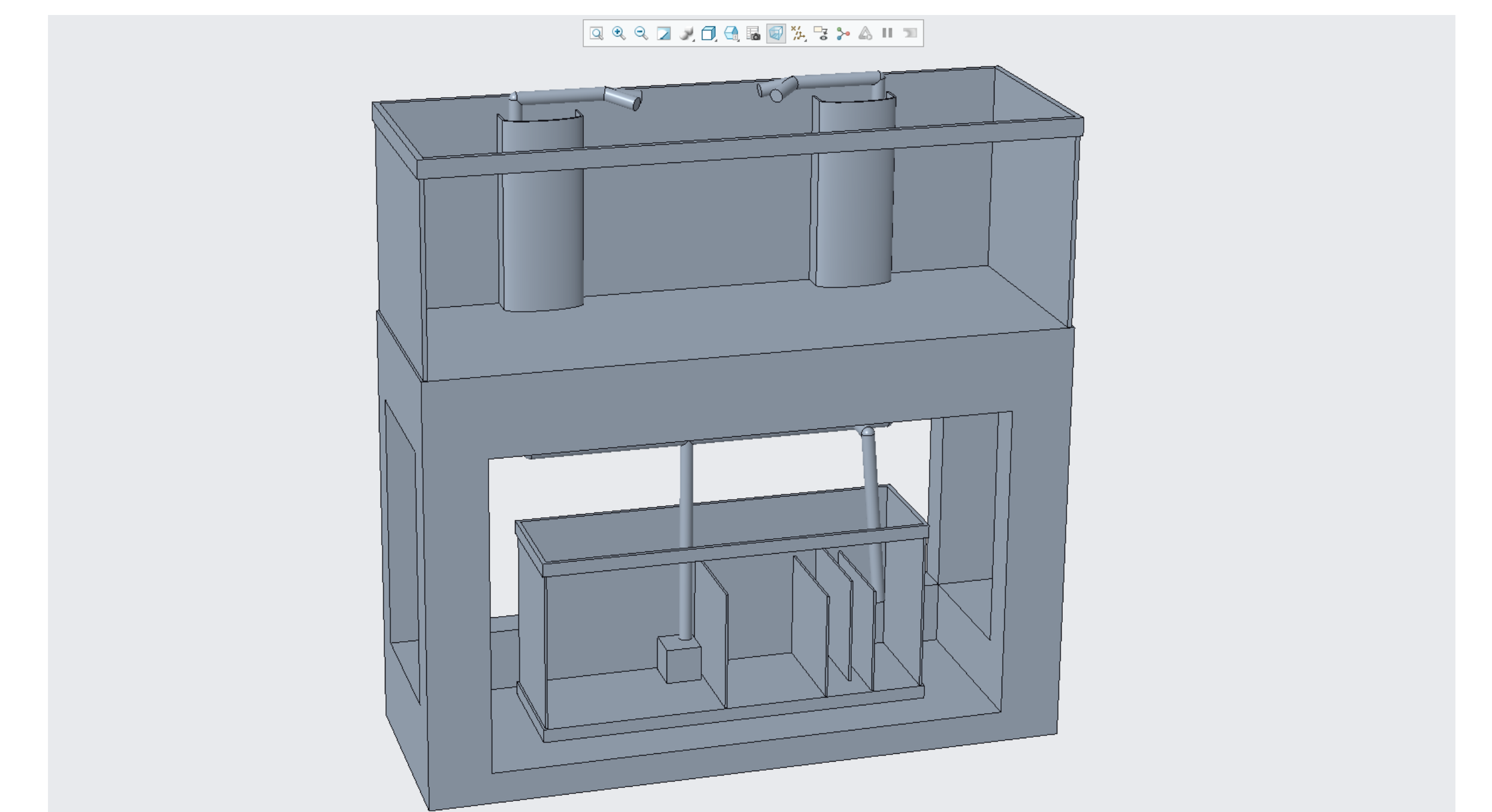


Diagram of the Large N.A.U.T.I.L.U.S.  
CJ Gagni and Martin Pham, 17 Apr. 2025

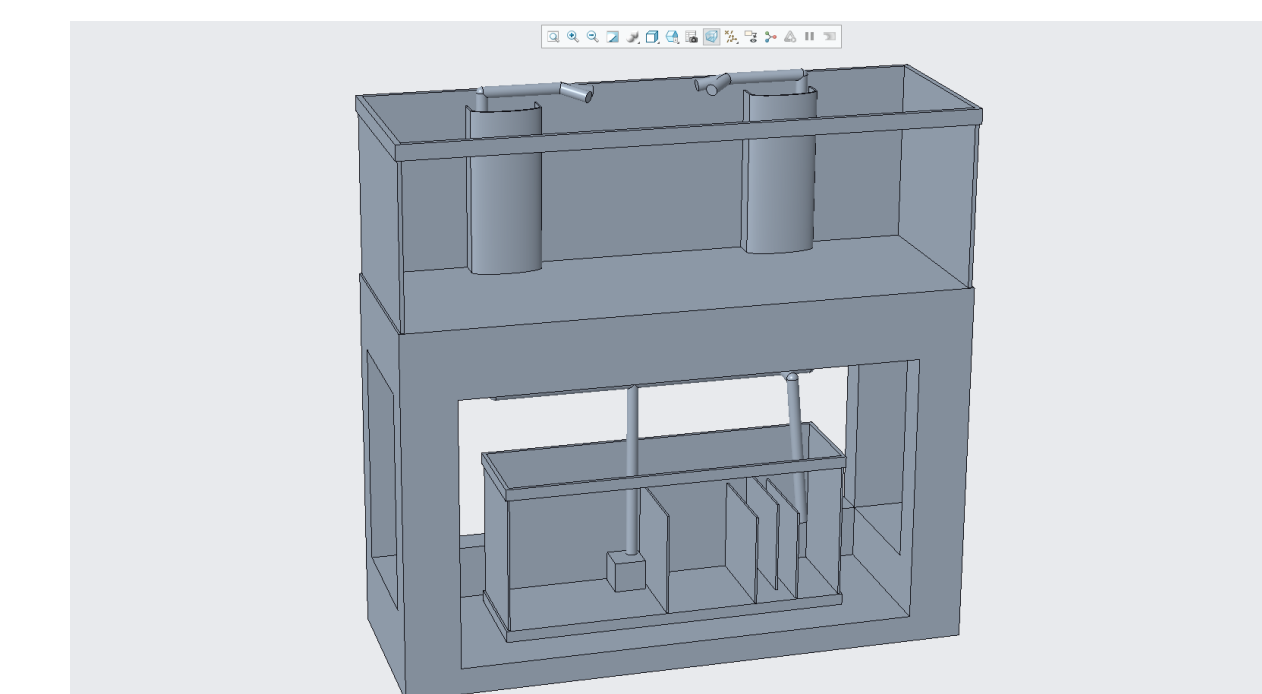
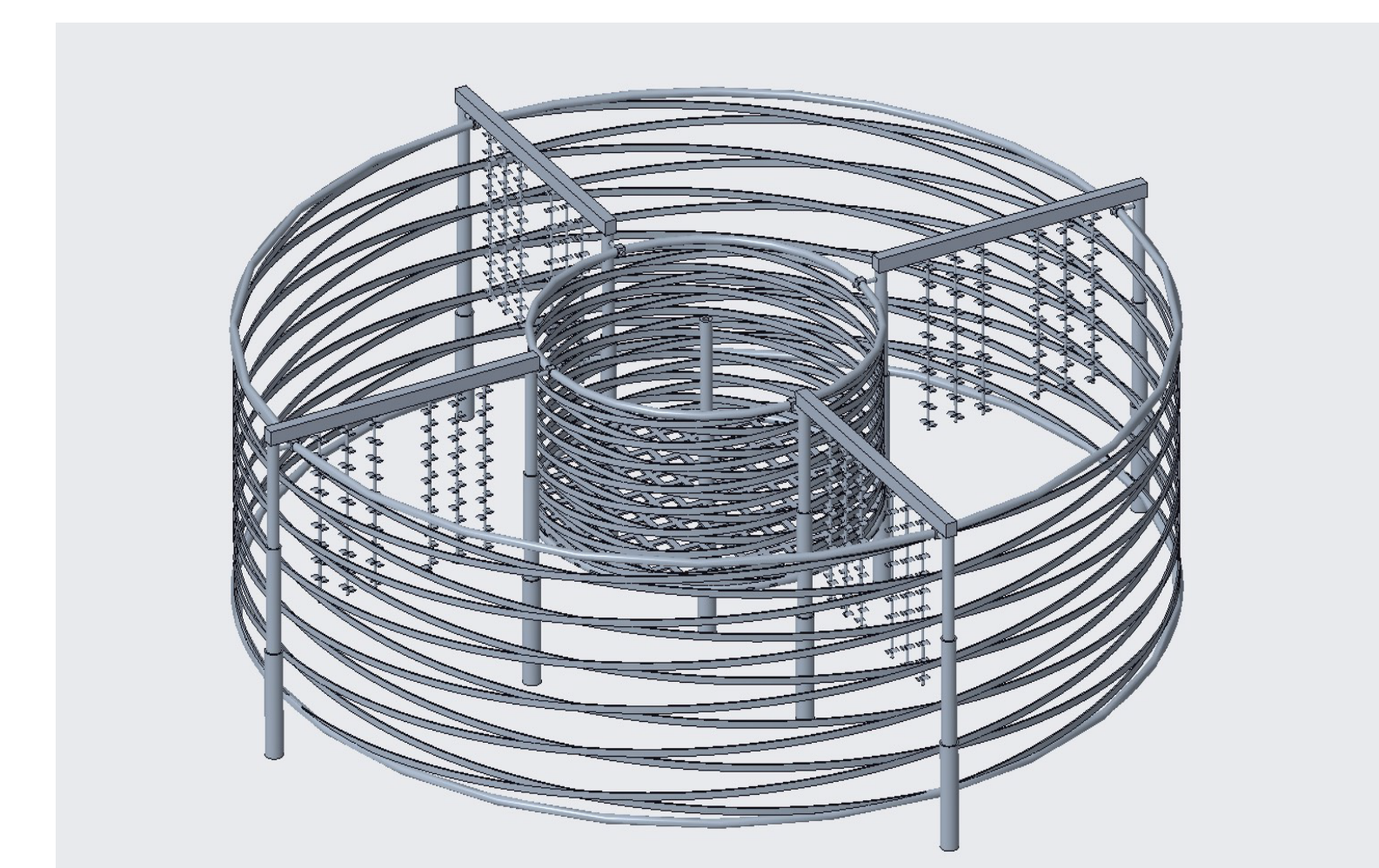


Diagram of the Small N.A.U.T.I.L.U.S.  
CJ Gagni and Martin Pham, 17 Apr. 2025



Prototype of Open-Water N.A.U.T.I.L.U.S.  
CJ Gagni and Martin Pham, 18 Apr. 2025