

Sponge Restoration Aquaculture

Re-establishing Shallow-Water Sponges in the Florida Keys

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Introduction

Where have all the sponges gone? Healthy sponge populations are an important part of the Florida Keys ecosystem. Hurricanes, algal blooms, and marine heatwaves have reduced once-thriving sponge communities.

Since 2010, the Florida Fish and Wildlife Conservation Commission (FWC) and a coalition of scientists have engaged in sponge restoration aquaculture to mitigate a series of massive sponge die-offs in nearshore hardbottom habitats of the Florida Keys. For restoration to be successful, it is important that these restored sponges are becoming reproductive and contributing new recruits to sustain the population.

Research Objectives

- Determine spawning months in adult Sheepswool Sponge *Hippospongia* cf. *lachne* (Figure 1) and Loggerhead Sponge *Spheciospongia vesparium* in the Florida Keys.
- Survey propagule gametogenesis for 4 spongiid species (*H. cf. lachne*, *Spongia tampa*, *Spongia graminea*, *Spongia barbara*; Figure 2) and *S. vesparium* in the FWC Stafford Sponge Nursery near Key West, Florida.

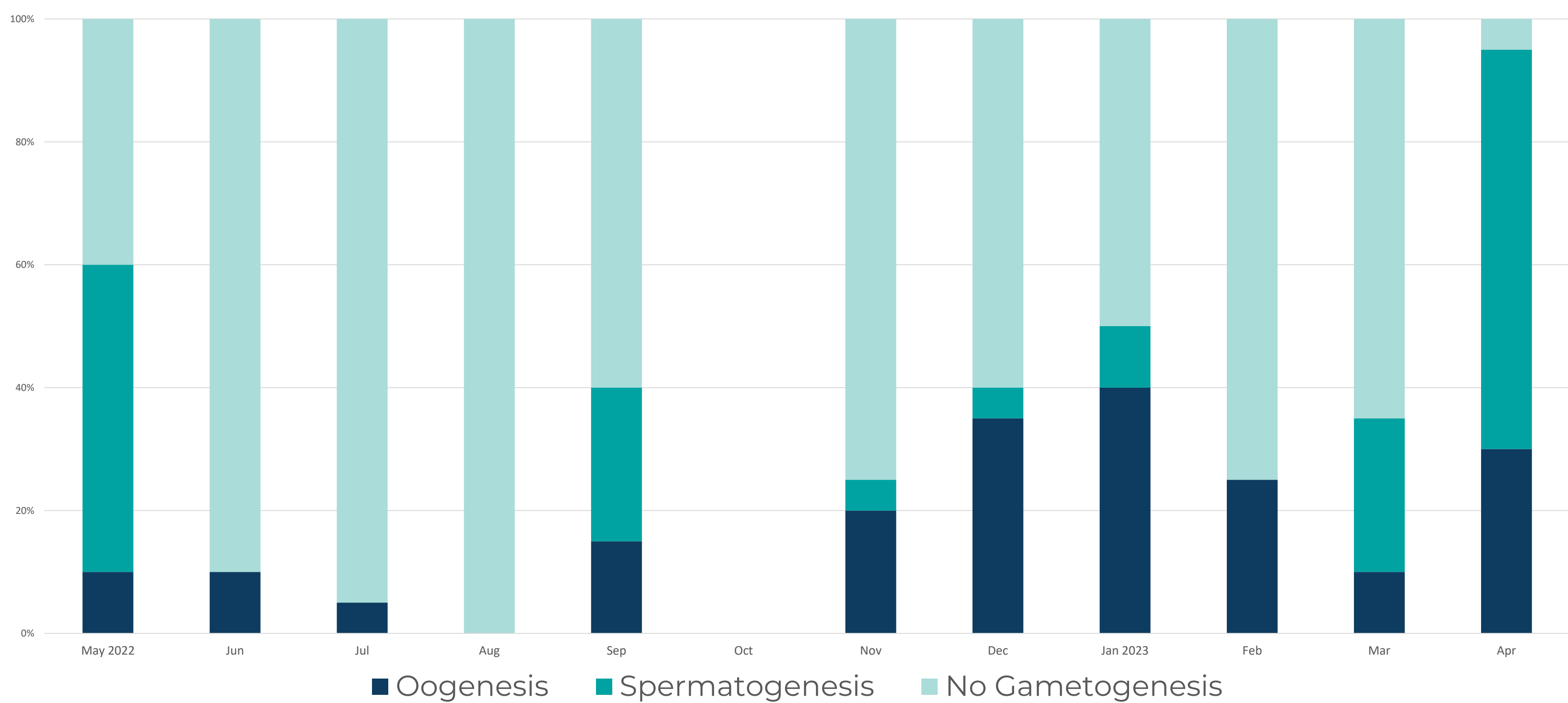


Figure 1: Sheepswool Sponge *Hippospongia* cf. *lachne* gametogenesis by month (n=20 per month; October 2022 not sampled due to inclement weather and a sponge die-off in August 2023 precluded sampling in October 2023)

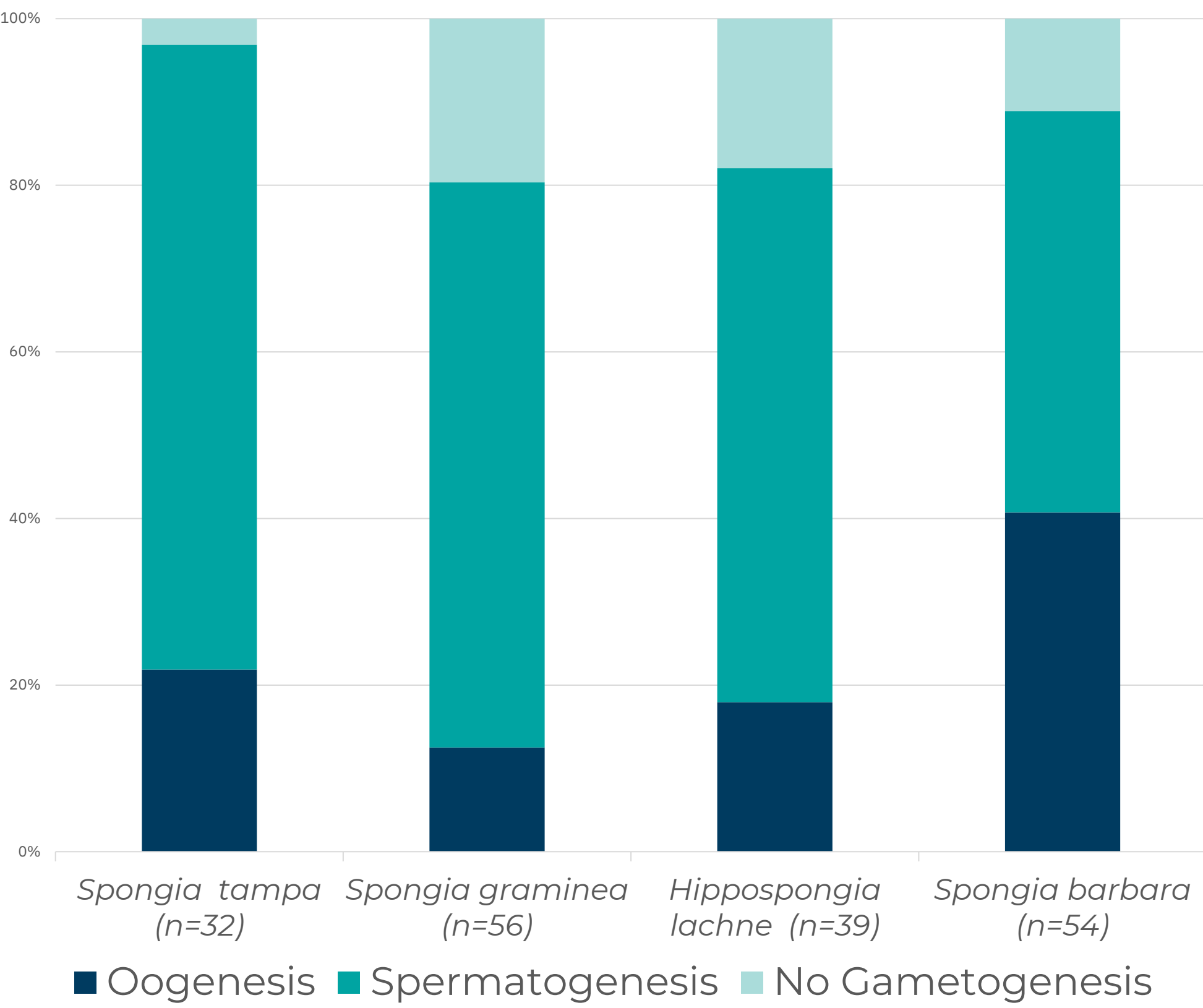


Figure 2: Propagule gametogenesis in 4 spongiid species (April-June)

Materials & Methods

Year 1, *H. cf. lachne* and *S. vesparium* were measured at the widest diameter (cm) and 1 non-lethal 5 cm section was collected haphazardly from 20 individuals per species per month. Years 2-3, ≤6 sections were collected from each of 4 spongiid species and 10 *S. vesparium* per month, April-June. These sponges were propagated 3-6 years prior at the FWC Stafford Sponge Nursery. Sections were fixed in Bouin’s solution, preserved, and sent to the Pomponi Lab at FAU Harbor Branch Oceanographic Institute for histology processing and staining into standard cassettes and viewed using light microscopy.

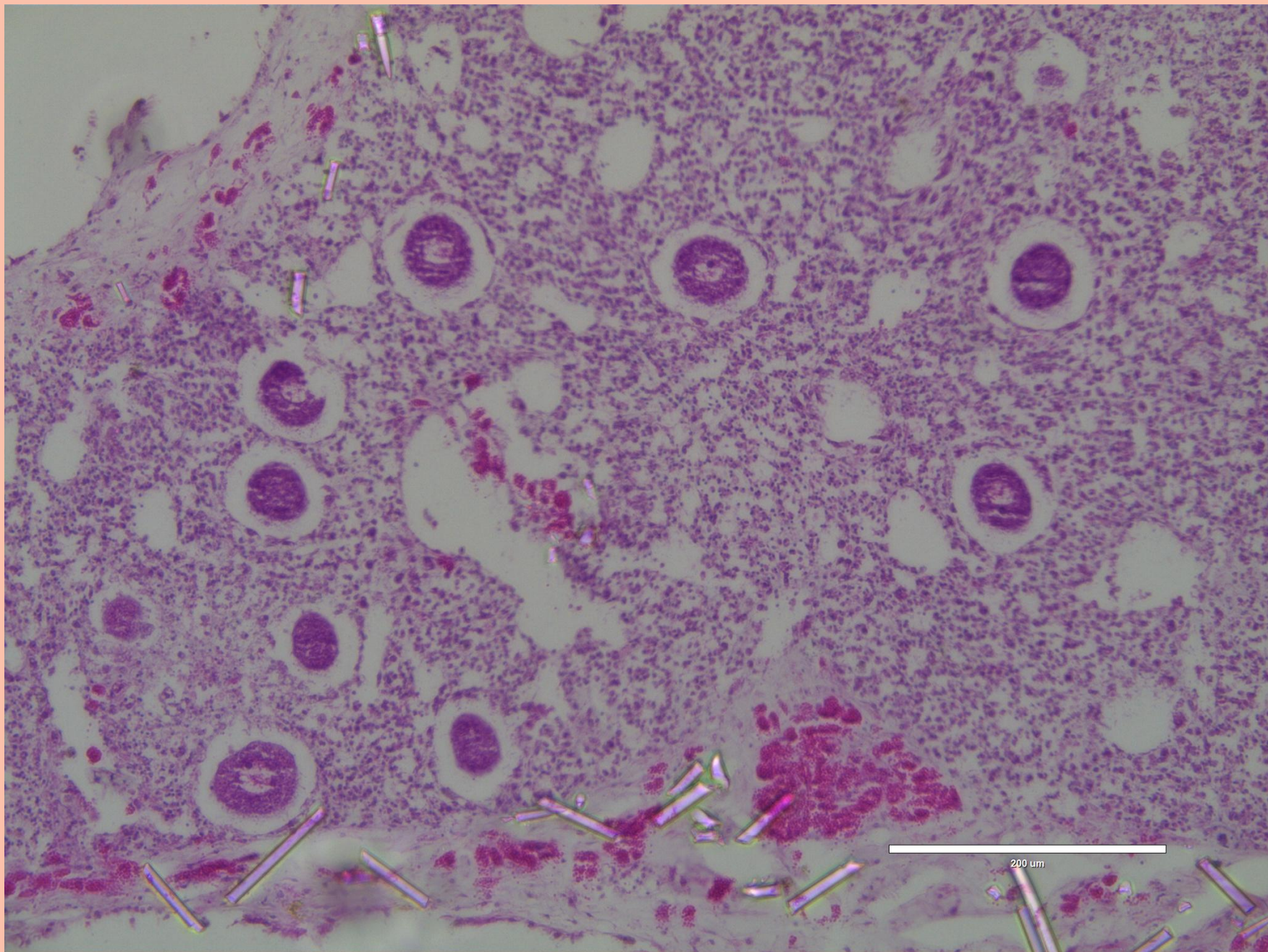


Figure 3: *S. vesparium* mature oocytes, scale bar 200 μ

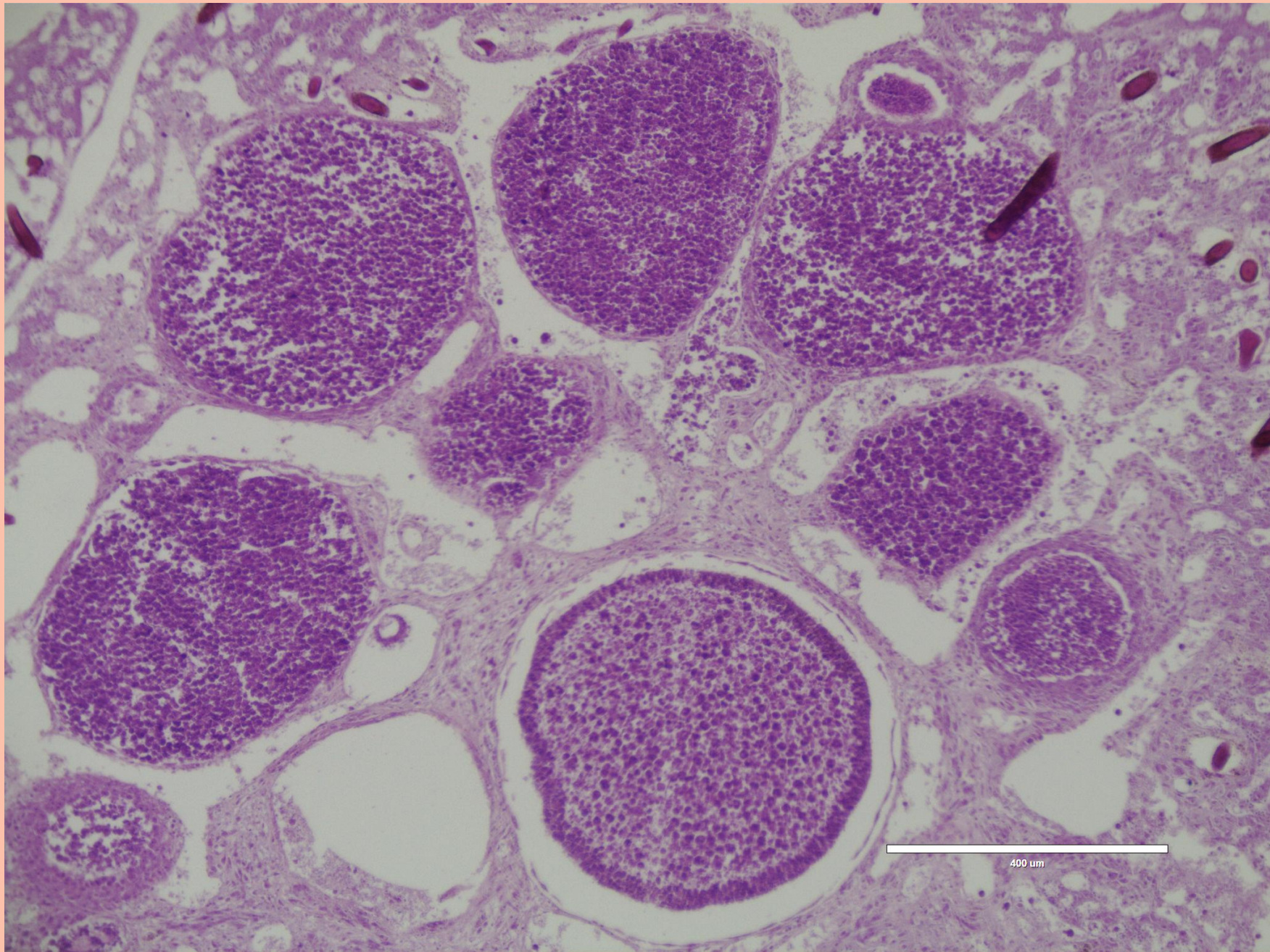


Figure 4: *H. cf. lachne* oocytes and larva, scale bar 400 μ

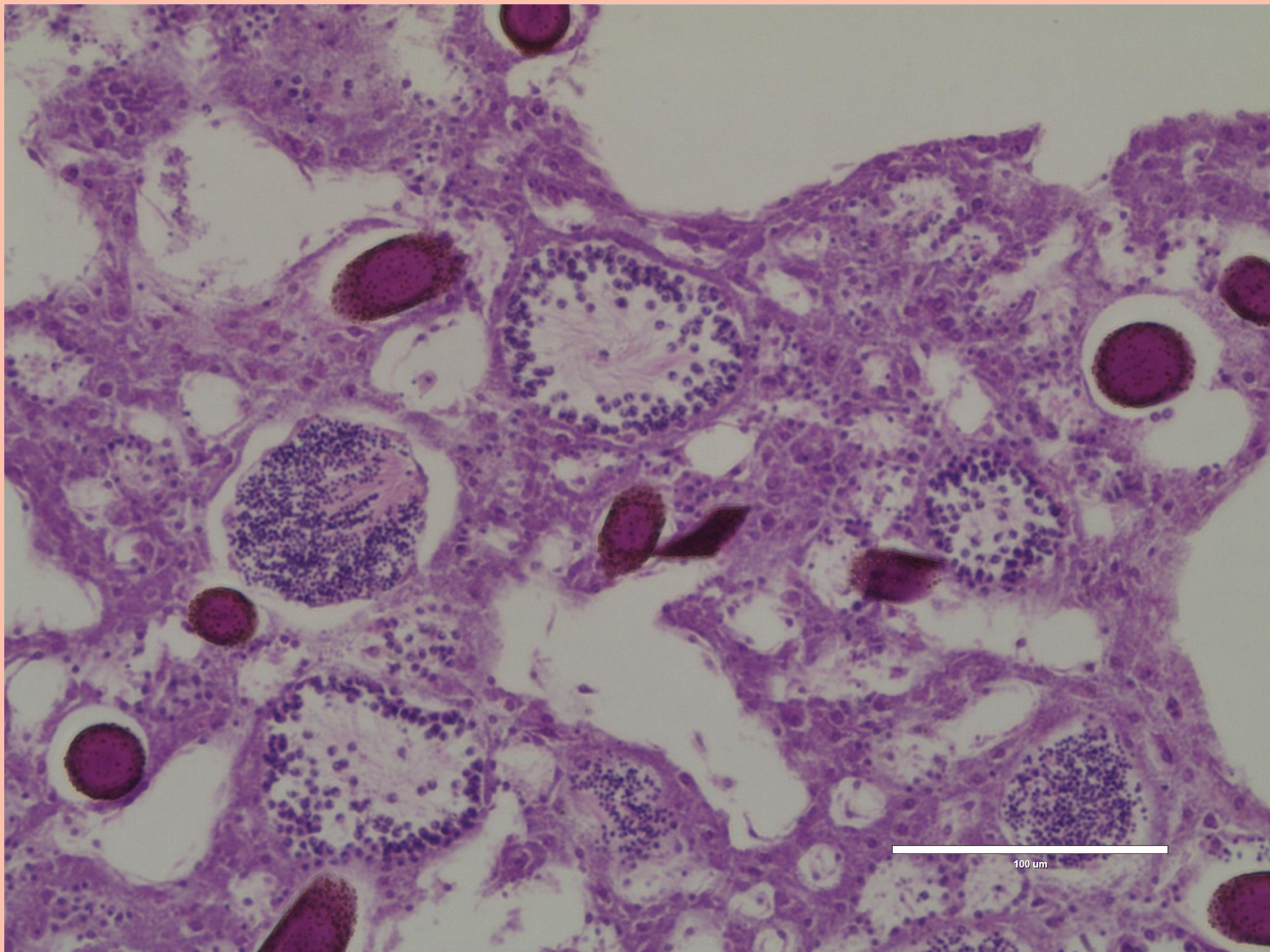


Figure 5: *H. cf. lachne* spermatc cysts, scale bar 100 μ

Results

Sheepswool Sponge *H. cf. lachne* had gametes every month of the year except August, with peaks April-May (60-94%) and a range of 6 cm to 28 cm (mean 15.51 cm; n=198). Mature oocytes were only found in a single *S. vesparium* (n= 261; Figure 3) sized 37 cm at the widest diameter. Diameters ranged from 12 cm to 80 cm (mean 36 cm; n=211). *S. vesparium* could be infrequent synchronized spawners like Giant Barrel Sponge *Xestospongia muta*. Eighty-seven percent of the propagules from 4 spongiid species were reproductive April-June (n=181; Figure 2) in the FWC Stafford Sponge Nursery near Key West, Florida and highly skewed for spermatogenesis.

Shallow-water sponges associated with seagrasses are critically important for water quality, clarity, and essential fish habitat for juvenile spiny lobster, stone crabs, and bonefish. Restoration aquaculture has the potential to reestablish sponges where they have been extirpated due to hurricanes, algal blooms, and marine heatwaves.

Acknowledgements

Thank you to Mimi and Simon Stafford, Dr. Cristina Diaz, Doug Gregory, Bill Sharp, & Kristene Parsons. Funding provided by the US Environmental Protection Agency. All research performed under Florida Keys National Maine Sanctuary Permit # 2019-057-A1.