Citizen Science Year End Project Summary Report
2023

Project Title:
Vernal Pool Monitoring Program

No. of active volunteers:
45

Season Schedule:
February to May

Total # of field project hours (incl field, data, maintenance, etc.):
525

Project Overview:
Jug Bay's Vernal Pool Monitoring Program aims to map the location of upland and floodplain vernal pools, document how the pools change over time, and assess the status of their amphibian populations, particularly wood frogs and spotted and marbled salamanders. The project's goals are to answer questions like: Which Jug Bay vernal pools are amphibian breeding sites and what are their use patterns; and, Is climate change affecting our vernal pools' hydroperiods, water quality, or threatening their permanence?

Methods:
Following Jug Bay's Vernal Pool Monitoring Protocols, the survey encompasses three methodologies for each pool: dip netting, hydrology and water quality assessment, and log rolling. See the protocols for more detail on each.

Key Findings:
Data was examined from the period 2014 to 2023. The primary assessment was limited to Mark's Pond (MP). Linear regression shows that Marbled Salamander larvae (ML) are undoubtedly being detected earlier in MP. Their last detected presence has regularly extended past the end of the survey, so no conclusions can be drawn about changes in the final date. The span of Wood Frog and Spotted Salamander egg mass presence in MP has been relatively consistent, although with some variation.

Examining air and water temperature at MP over intermittent years, 2017, 2020, and 2023, does not show any consistent trend suggesting a correlation with the earlier arrival of ML.

Lastly, the presence of Fairy Shrimp (FS) was explored throughout all 11 pools in the study between 2014-2023. Beginning in 2017, when FS are seen in a season, they are always first detected in February;

their presence may even predate the start of the survey period. The last detection of FS is becoming earlier: April or May prior to 2019, and primarily March thereafter.

To summarize, whereas the detection of first observed ML in MP is becoming earlier, the detection of last observed FS in all pools is becoming earlier as well. These prominent shifts suggest that other environmental factors may be causing or contributing to this shift, be it water availability, dissolved oxygen, contaminants, or even water or air temperature if those were to be evaluated over a longer period of time or between more pools. Climate change is one prevailing citation for alterations in natural phenomenon from what had previously been expected. However, other causes may be at play, including contaminants, increased human intervention, degradation of the surrounding habitat, etc.

Of note, in 2018, FS were seen in four separate pools, as opposed to a maximum of two in all other years; and of concern, prior to 2019 FS inhabited six different vernal pools, and after this, only two pools. 2019 appears to have been a pivotal year in the life of FS at Jug Bay.

Consideration might be given to extending the survey earlier to pinpoint the earliest emergence of FS, and later to determine the latest presence of ML. Deeper investigation into the existing data regarding the above would surely reveal further compelling associations, especially the environmental effects on FS before and after 2019.

Impact:
Jug Bay's Vernal Pool Monitoring Program provides education and hands-on field experience to dozens of volunteers each year. The community's documentation of pools has led to conservation achievements such a biannual salamander migration monitoring program, best practice exchanges with other citizen science research groups, and prioritization of land purchases by the county to protect pool-adjacent properties.

Challenges Faced:
This season, the vernal pool leads introduced new decontamination protocols – both when volunteers first arrive at the Sanctuary and between pools. These required some adjustment, but the team is confident the additional work and supplies are worth the protection against diseases like Ranavirus which could affect our local species. As always, field work can take an emotional toll. This season volunteers saw hundreds of salamander egg masses stranded by pool evaporation. The leadership team is always amazed by the fortitude of the program's volunteers, who return season after season.

Recommendations:
This Fall, the vernal pool leads will revisit the log rolling protocol to assess if there are ways to lessen the impact on amphibians and reptiles exposed during the survey.

Volunteer Acknowledgment:
Vernal pool volunteers cope with temperatures ranging from freezing to boiling, battle greenbrier, and risk exposure to poison ivy and ticks. Some travel great distances to spend a few hours in the field. The dedicated leadership team includes: Jason Boren, Michelle Campbell, Katy Clark, Jeanette Kazmierczak, Christina Olsen, Travis Roney, Jessica Roney, and Michael Wagman. The heroic data analysis in this report was conducted by Siobhan Percey.

Acknowledgments:

The leadership team is grateful for honorary leader Ellis Ribeiro and Chesapeake Conservation Corps member Eva Blockstein for their invaluable efforts this season. They thank the Jug Bay staff for the constant opportunities and encouragement they're provided at the Sanctuary.