

Research Experiences for Teachers

Comparison of the Diversity of Chironomidae in Lotic and Lentic Systems

John Smolley¹, Bill Buza¹, Jesse Yonkovich², Carlos de la Rosa³

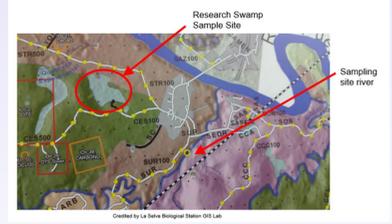
¹Mid Valley School District Throop, Pennsylvania; ²Milton Hershey School Hershey, Pennsylvania; ³OTS Le Selva Biological Research Station, Costa Rica

Chironomidae Research Overview

Costa Rica is a world hot spot for biodiversity. This includes the freshwater invertebrate taxon Chironomid, Non-Biting midges. These aquatic insects are often the most abundant species in aquatic ecosystems and global estimates suggest a species diversity between 8,000 to 20,000 [1]. They form a significant part of food webs and like other aquatic invertebrates, serve as indicators of stream health. However, despite their significance, there is a paucity of information on this species in Neotropical regions [2]. With ever increasing rainforest fragmentation, this limits our ability to make conservation decisions to protect our world's most diverse areas. In this study, we analyzed species richness of Chironomid in 2 areas of Costa Rica's La Selva Biological Station.



OTS Le Selva Biological Research Station

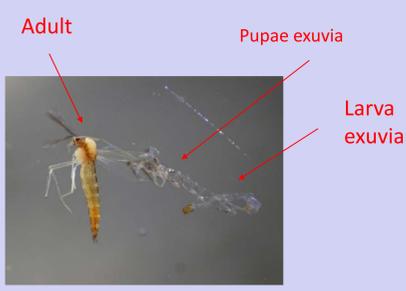


La Selva Biological Station is a protected area encompassing 1,536 ha of low-land tropical rain forest in northeastern Costa Rica. It is owned and operated by the Organization for Tropical Studies,[2] a consortium of universities and research institutions from the United States, Costa Rica, and Puerto Rico.[3] Recognized internationally as one of the most productive field stations in the world for tropical forest research and peer-reviewed publications

Photo Sources: Carlos de la Rosa, John Smolley

References:
Coffman, W. P., & De la Rosa, C. L. (1998). Taxonomic Composition and Temporal Organization of Tropical and Temperate Species Assemblages of Lentic Chironomidae. *Journal of the Kansas Entomological Society*, 71(4): 388-406.
De la Rosa, C., & Nicole, B. (1993). *Guia de los Organismos Comunes de las Aguas Dulces de Costa Rica*. Costa Rica : Office of Manejo Ambiental.
De la Rosa, C. (2015). Chironomids: A Personal Journey. *Journal of Chironomids Research*, 30-35.
De la Rosa, C. (n.d.). Dr. William P. Coffman Celebrating 50 Years of Research on Chironomidae. Organization of Tropical Studies.
Rosa, C. L., & Nockle, C. C. (2000). *A guide to the carnivores of Central America: natural history, ecology, and conservation*. Austin, Tex: University of Texas Press.
Ferrington, L. C., Crisp, N. H., Kavanaugh, J. L., & Schmidt, F. J. (1991). A protocol for using surface-floating pupal exuviae of chironomidae for rapid bio assessment of changing water quality. *Proceedings of the Vienna Symposium*, 203: 181-190.
Mandaville, S. (2002). *Benthic Macroinvertebrates in Freshwaters- Taxa Tolerance Values, Metrics and Protocols*. Soil and Water Conservation Society.
Saether, O. A. (1997). *Taxonomic studies on chironomidae: Nanoclaudius, Pseudochironomus, and the Harnischia complex*. Ottawa, Canada: Supply and Services.
Wiederholm, T. (1986). *Chironomidae of the holarctic region. keys and diagnoses: Pupae (Part ed., Vol. 2, Pupae)*. Sandby: Sweden .

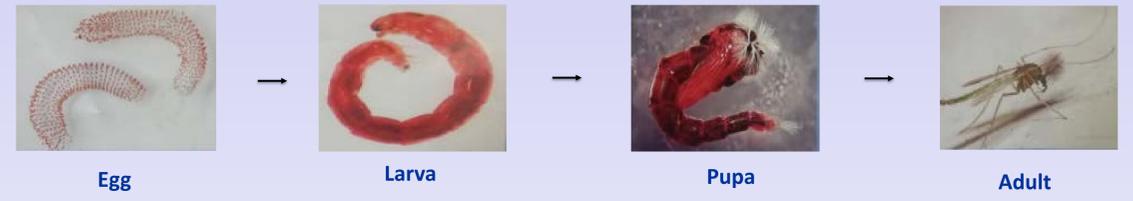
What is Exuvia?



Exuvia is the remains of an exoskeleton that is left after an insect, crustacean, or arachnid has molted. Insects grow in increments. Each stage of growth ends with molting, the process of shedding and replacing the rigid exoskeleton.

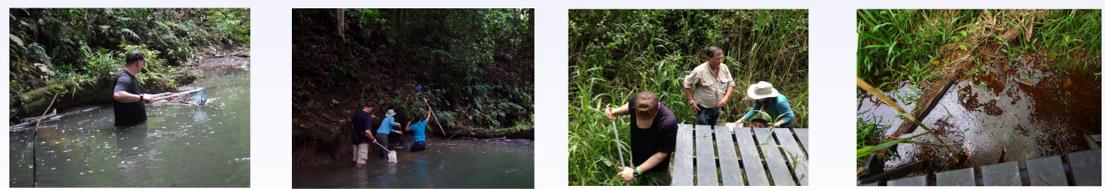
While at La Selva a new species of Chironomidea was discovered in the sample collected from the Research Swamp. Carlos de la Rosa decided to name this species after the Chance Program from Penn State.

Midge Life Cycle



Collection and Identification Methods

Macroinvertebrates were collected from the Sura River and Research Swamp by skimming their surfaces with nets. Most of these samples were gathered from the foam found floating on top of the water. This technique was used to lower the researcher disturbance to the environment. The sample was then sorted by using several size sieves in order to remove as much debris as possible.



Sorting through collected samples requires taking a small portion and placing it into a petri dish. From there a stereoscope at a low magnification (10x) is used to remove all exuvia from sample. Once all the exuvia is collected the magnification is increased to 40x. They are then sorted based on their different characteristics.

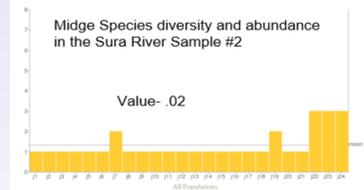
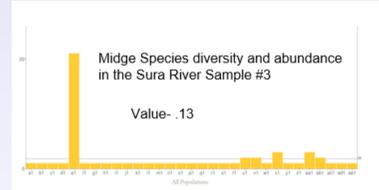


Sura River vs Research Swamp

Sample	Species Richness	Simpson Index
1	18	0.03
2	24	0.02
3	31	0.13
4	76	0.07

Sample	Species Richness	Simpson Index
1	2	0
2	2	0

Simpson Index



Simpson's Diversity Index is a measure of diversity which takes into account the number of species present, as well as the relative abundance of each species

Further studies

- Midge diversity was much lower than expected in the swamp
- Amphibian explosion, tadpole eggs (gelatin)
- Boardwalk construction
- Temporal -More sampling different times of year
- Hydrological cycle of the swamp

Acknowledgments

Special gratitude to Carlos de la Rosa for mentoring, Socorro Avila for help in identifying Chironomidae exuvia and to the OTS Research Station for hosting our research. This project was supported by grants from Boeing, Burkert, Sanofi Pasteur, and Atas, and in coordination with CSATS/PSU.