Hurricane Impacts and Macroarthropods Resilience at Yunes River

By: Juan A. Meléndez & Dariany Ayala
Prof. Elliot M. López-Machado
Juan Ponce de León HS
Florida, Puerto Rico

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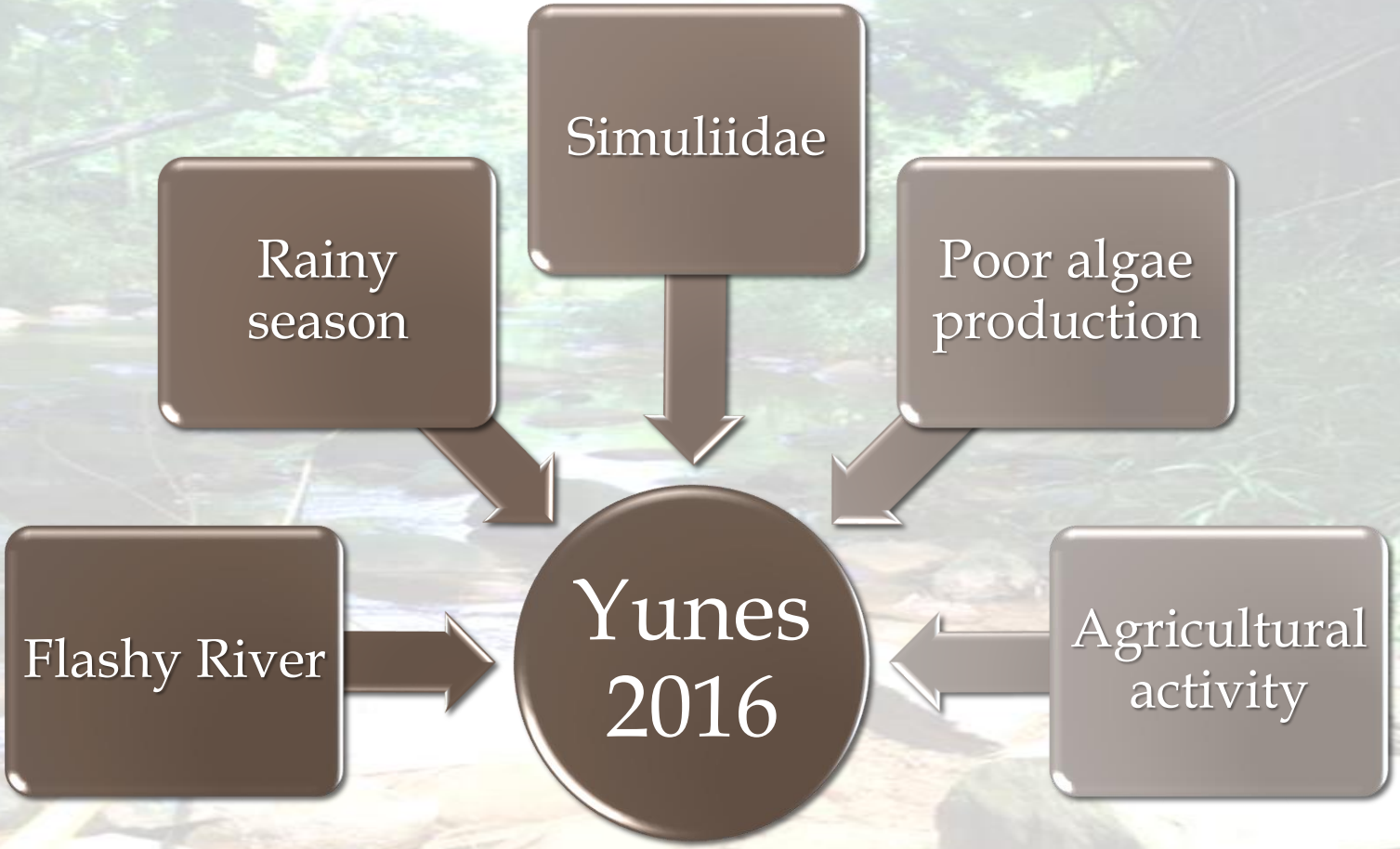
Background



Quiles & Matias (2016)

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Objectives

- To compare 2016 and 2017 and identify changes during hurricane season of 2017 in:
  - Physico-chemical parameters
  - Benthic macroarthropod abundance

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Problem

- Which macroarthropod families are more resilient after a hurricane?

Hypothesis

- After the impact of a hurricane, the *Simuliidae* family will resist physical changes in the ecosystem and colonize again.

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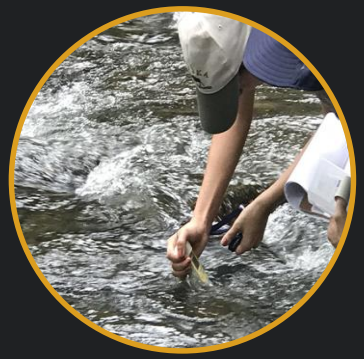
Simuliidae – Black fly

- Common in North America
- Larvae develop in running waters attached to the rocks
- Some species have multiple generations
- Larvae diet - filter small aquatic organisms and detritus

Methodology

Equipment, instructions and workshop review



Chemical and physical parameters

Macro

arthropods collection

Habitat assessment before and after hurricane Maria.

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Physical Chemical Parameters

Parameters	2016	2017
pH	8	7.52
Dissolved Oxygen (ppm)	7	7.75
Nitrate (ppm)	5.67	3.5
Phosphate (ppm)	0.3	0.25
Ammonio (ppm)	0.233	0.21
TDS (ppm)	143	147.5
Water Temp (ºC)	25.03	26.1
Salinity (ppm)	95.35	100.95
Conductivity (µS)	198	209.05
Cannopy (%)	80	70.5 (**0 after sept**.)

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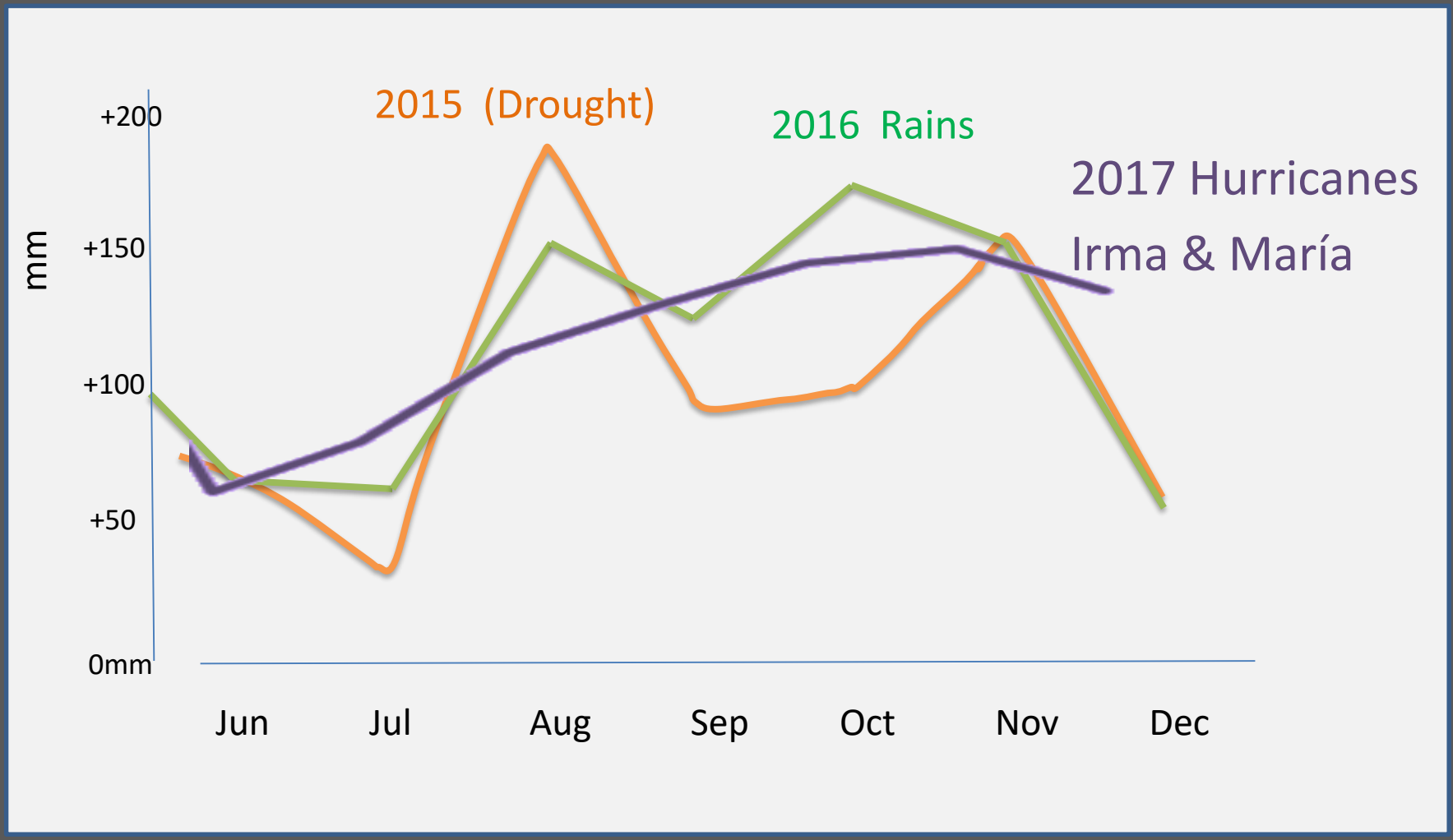
Average precipitation in basin of Río Yunes, Ciales PR



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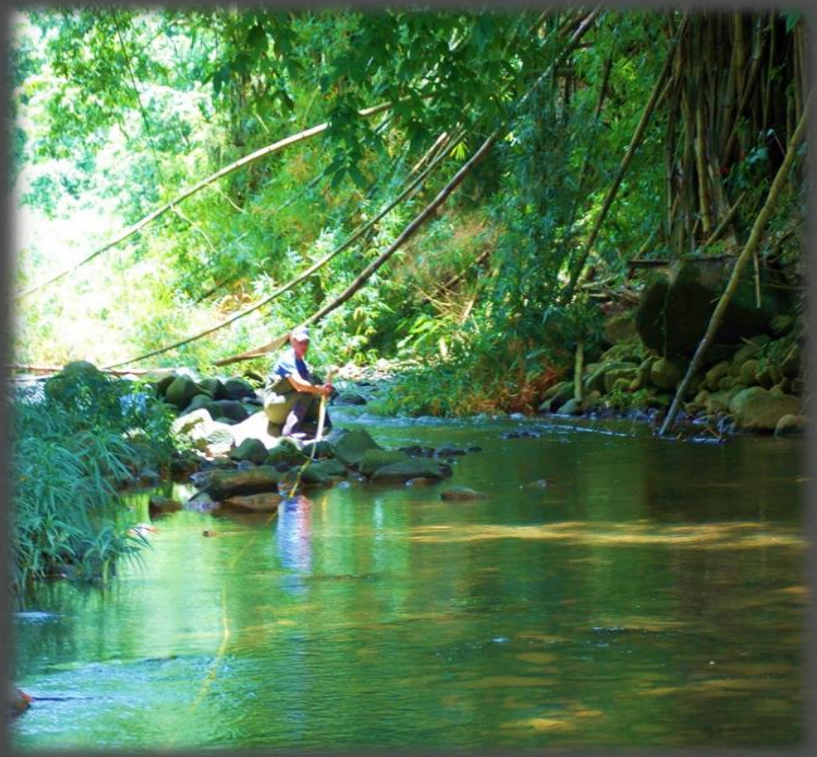
Hurricane María

Before



After

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Hurricane María

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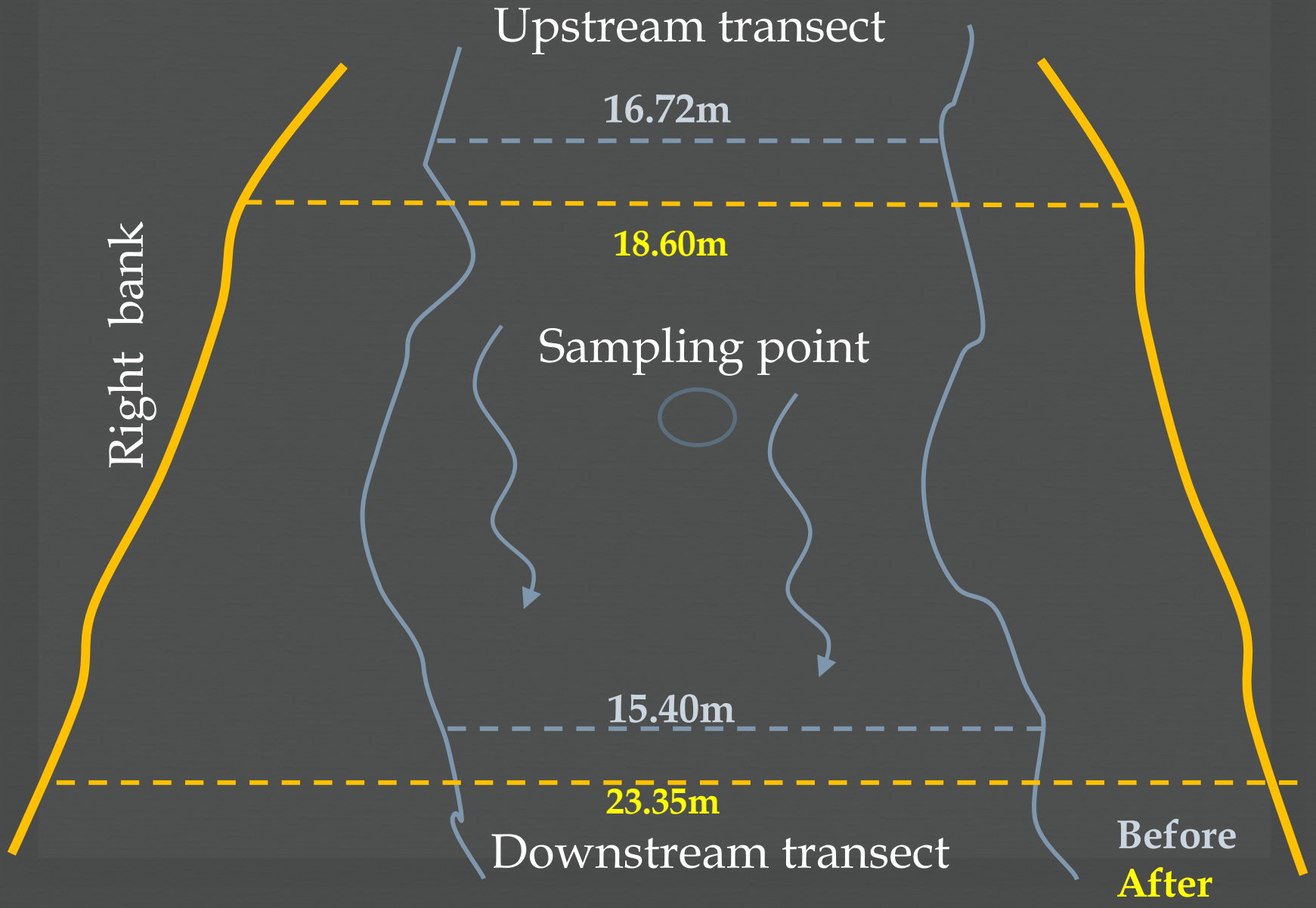
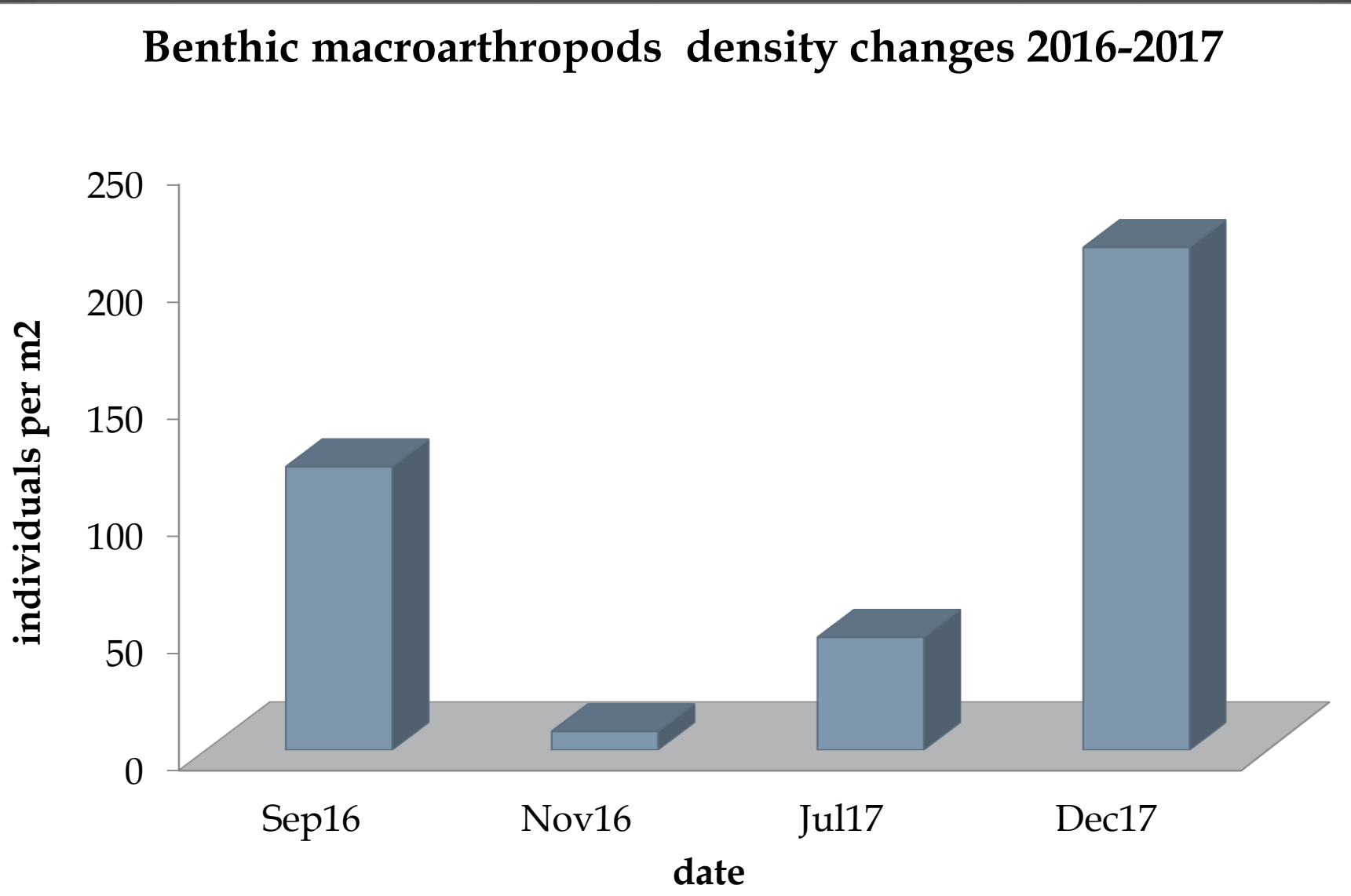
Changes in channel width after hurricane María



Macrobenthics Results



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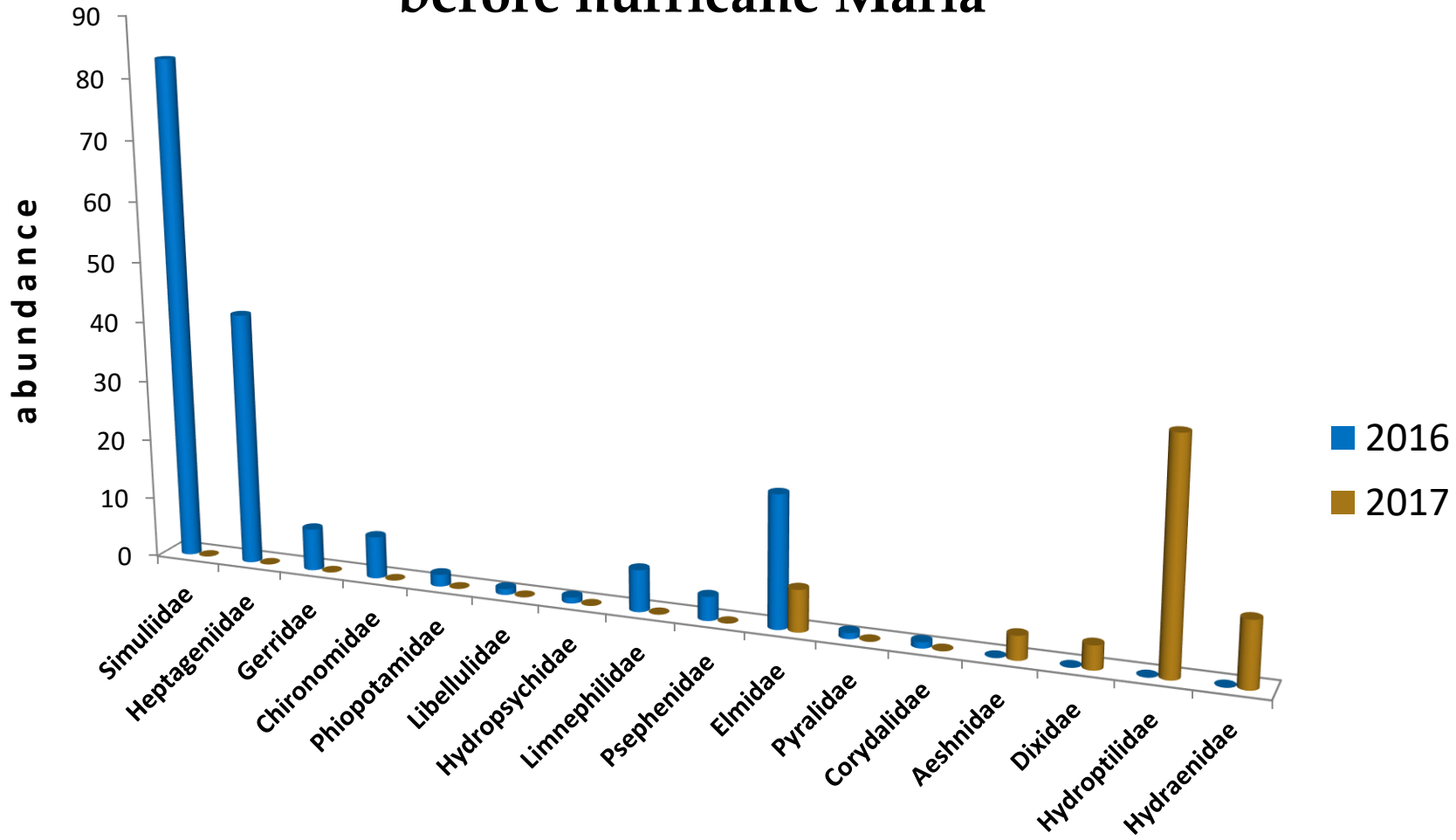
Comparison of abundance and diversity of macroarthropods families in Río Yunes before hurricane María



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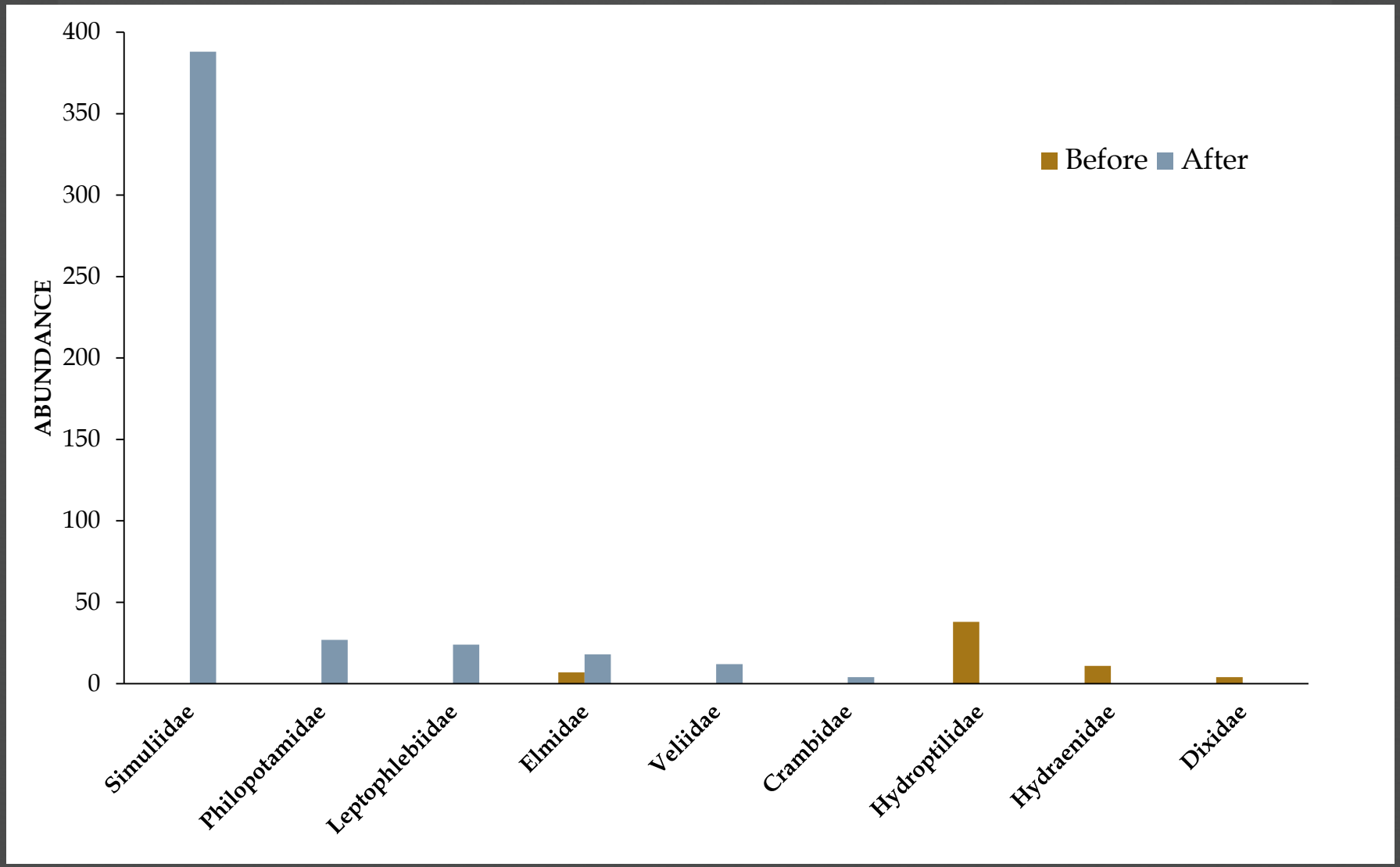
Most abundant families before and after hurricane María at Río Yunes



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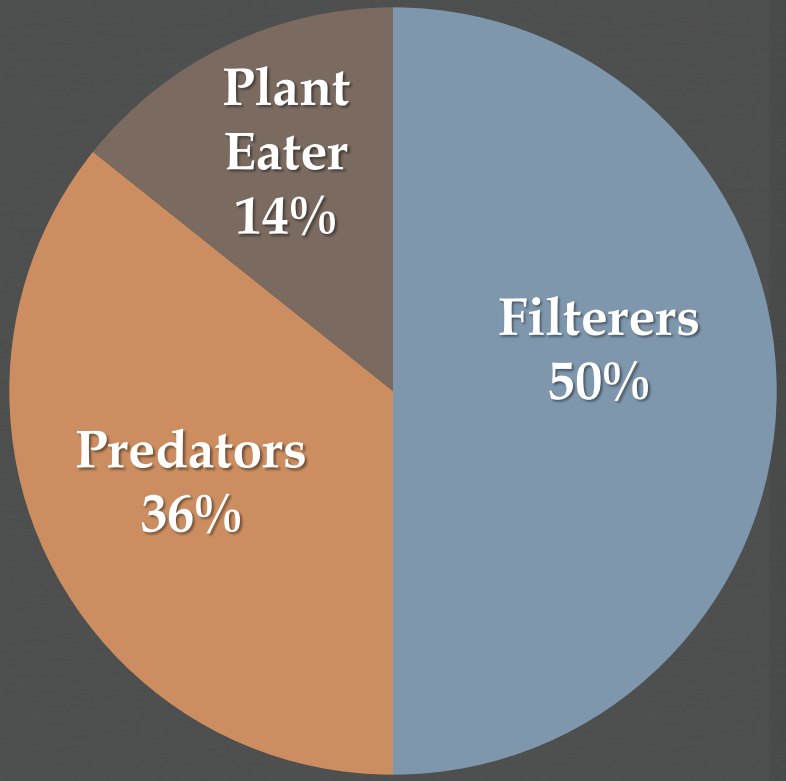
Feeding Habits

Feeding Habits	Families
Filterers	Simuliidae
	Philopotamidae
	Leptophlebiidae
	Polycentropodidae
	Chironomidae
	Xiphocentronidae
	Dixidae
Predators	Veliidae
	Aeshnidae
	Staphylinidae
	Hydroptilidae
	Hydraenidae
Plant Material	Elmidae
	Crambidae



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RIO YUNES BENTHIC FOODWEB AFTER HURRICANE MARIA

LIGHT

NUTRIENTS

WATER

FILTERERS
SIMULIIDAE
PHILONOMIDAE
LEPTOMIDAE
DIXIDAE

PREDATORS
VELIIDAE
HYDROPTILIDAE
HYDRAENIDAE

PLANT EATERS
ELMIDAE

VEGETATIVE DEBRIS ORGANIC MATTER

ALGAE

PHYSICAL-CHEMICAL PARAMETERS

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Conclusions

- Benthic macroarthropod communities change from being dominated by predators to communities dominated by filterers. It is part of the effects of a loss of riparian vegetation, abundance of vegetative debris and organic matter suspended in the stream and algae growth caused by a loss of canopy.

- Simuliidae family has shown the resistance and abundance to colonize again as we expected.

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References

- Blackfly biology. http://www.blackfly.org.uk/simbiol2.htm
- Ciales (00638) Monthly Climate Average, Puerto Rico. https://www.worldweatheronline.com/v2/weather-averages.aspx?q=00638
- Droughts and macroinvertebrate community responses in tropical streams in Puerto Rico. Omar Pérez-Reyes1, Todd A. Crowl2, Alan P. Covich3, Alonso Ramirez1 & William McDowell4
- Malcom, J. (2008). The ecology of riffle beetles. http://www.bioone.org/doi/abs/10.1608/FRJ-1.2.4
- RACC Reference Manual (2017-2018)
- Simuliidae images. Bug Guide. Iowa State University, Department of Entomology. https://bugguide.net/node/view/26281

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JPL Elliot's Team

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