

The Use of Mass Spectrometry to Elucidate the Behavior of Two Aquatic Contaminants: UV Filters and Microplastics

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Goals

- To develop a method for quantifying UV filters in marine waters and use it to determine concentrations in south Florida
- To determine the fate and transport of UV filters in the marine environment

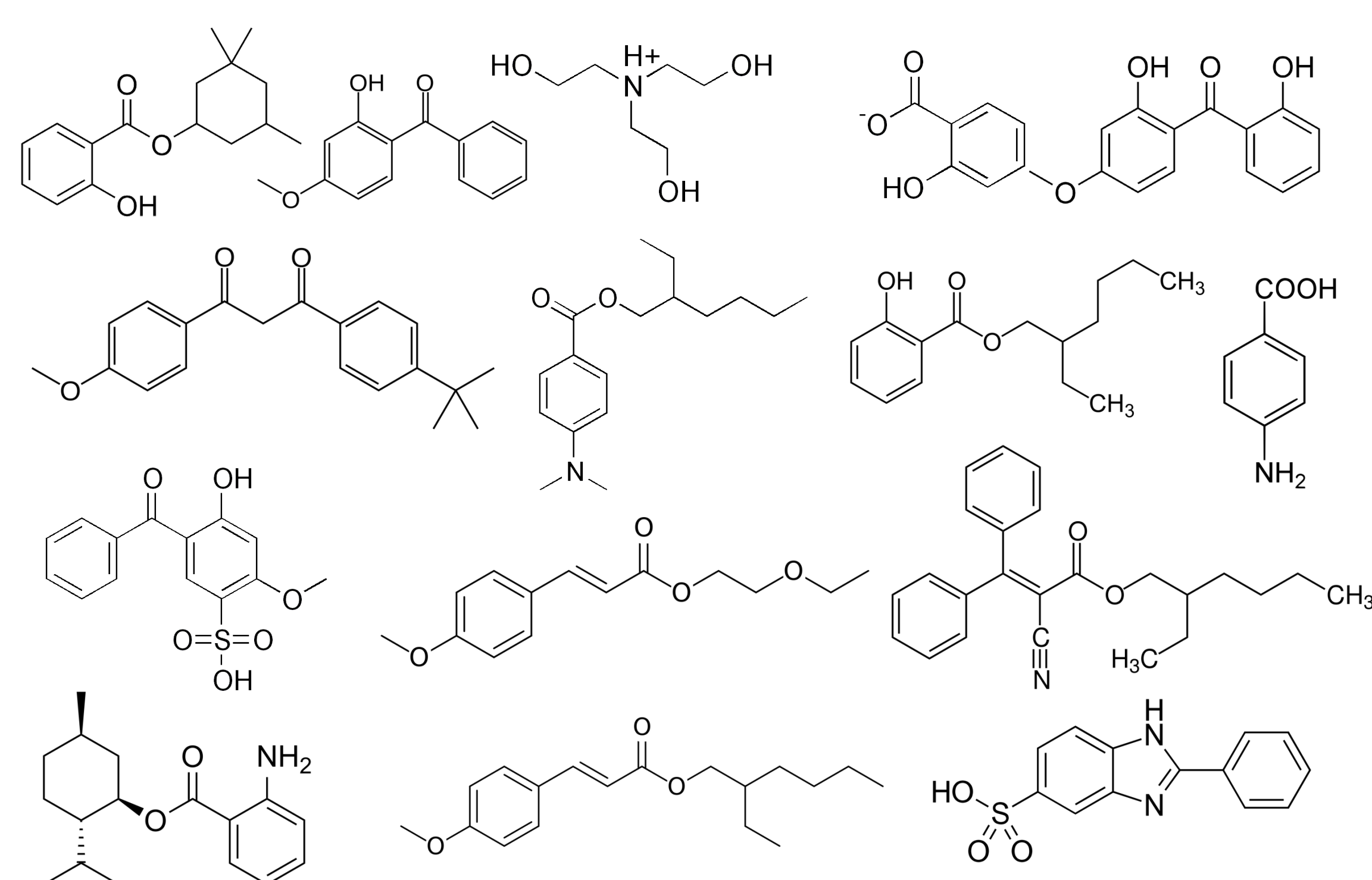


Figure 1. All FDA-approved organic UV filters

- To quantify the presence and characteristics of microplastics in south Florida
- To determine the nature of contaminants on microplastics



Figure 2. Microplastics

Research Methodology

- A method was developed to test UV filters on a Thermo Q-Exactive Orbitrap mass spectrometer using the following parameters: Atmospheric Pressure Chemical Ionization (APCI) Source, Resolution of 17500, Positive mode, 10 mL injection volume, PRM scan, Mass tolerance <5ppm
- The method was used to analyze samples from Biscayne National Park
- UV filters will be subjected to photodegradation to identify transformation products that can be tested for in environmental samples.



Figure 3. Thermo Q-Exactive Orbitrap

- A device was built to separate plastics from sediment using a saline solution.
- Collected plastics will be analyzed for shape and size.
- Organic contaminants will be extracted from the plastics and analyzed via non-target mass spectrometry

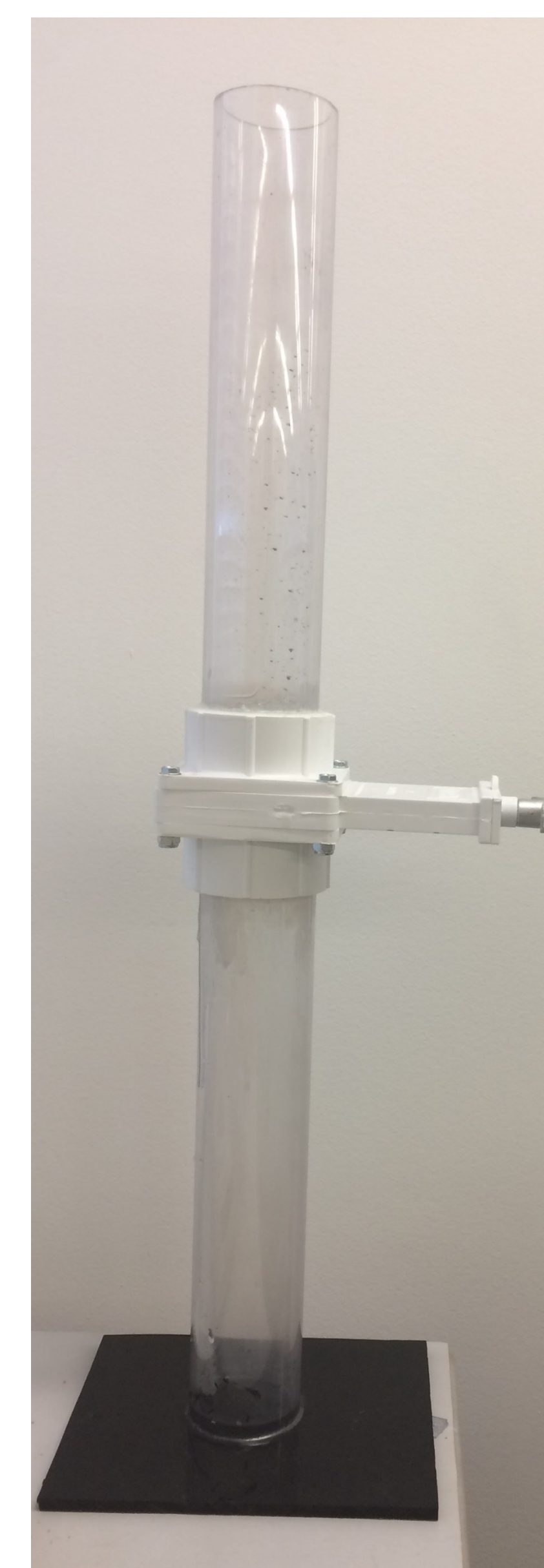


Figure 4. Plastic Separator

Results

- Benzophenone was detected above MDL (21 ng/L) in 49% of the samples at concentrations up to 131 ng/L.
- Oxybenzone was detected above MDL (20 ng/L) in 29% of the samples at concentrations up to 31 ng/L.
- Benzocaine and dioxybenzone were not detected above the MDL in the collected BNP samples.

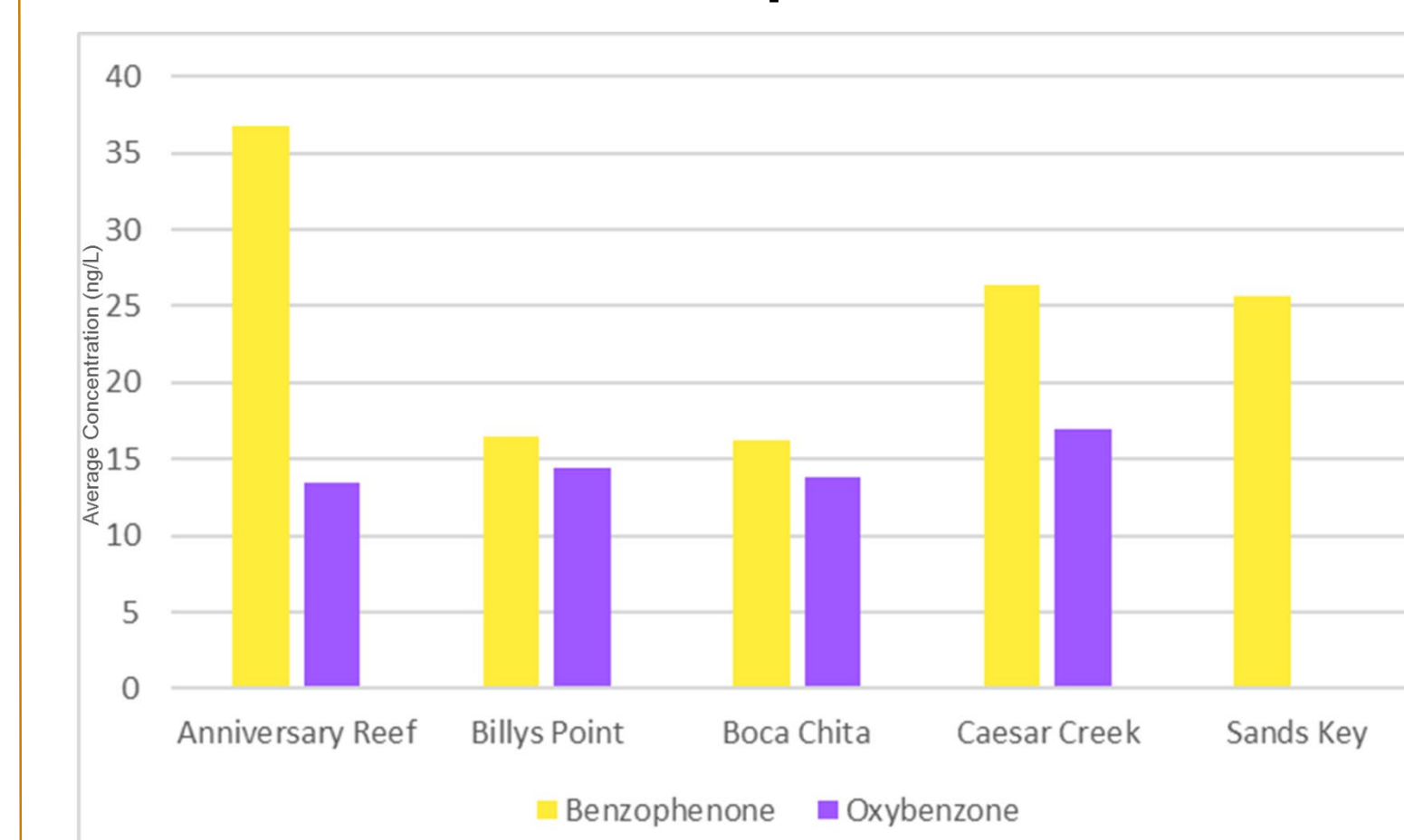


Figure 5. Spatial distribution of benzophenone and oxybenzone at BNP.

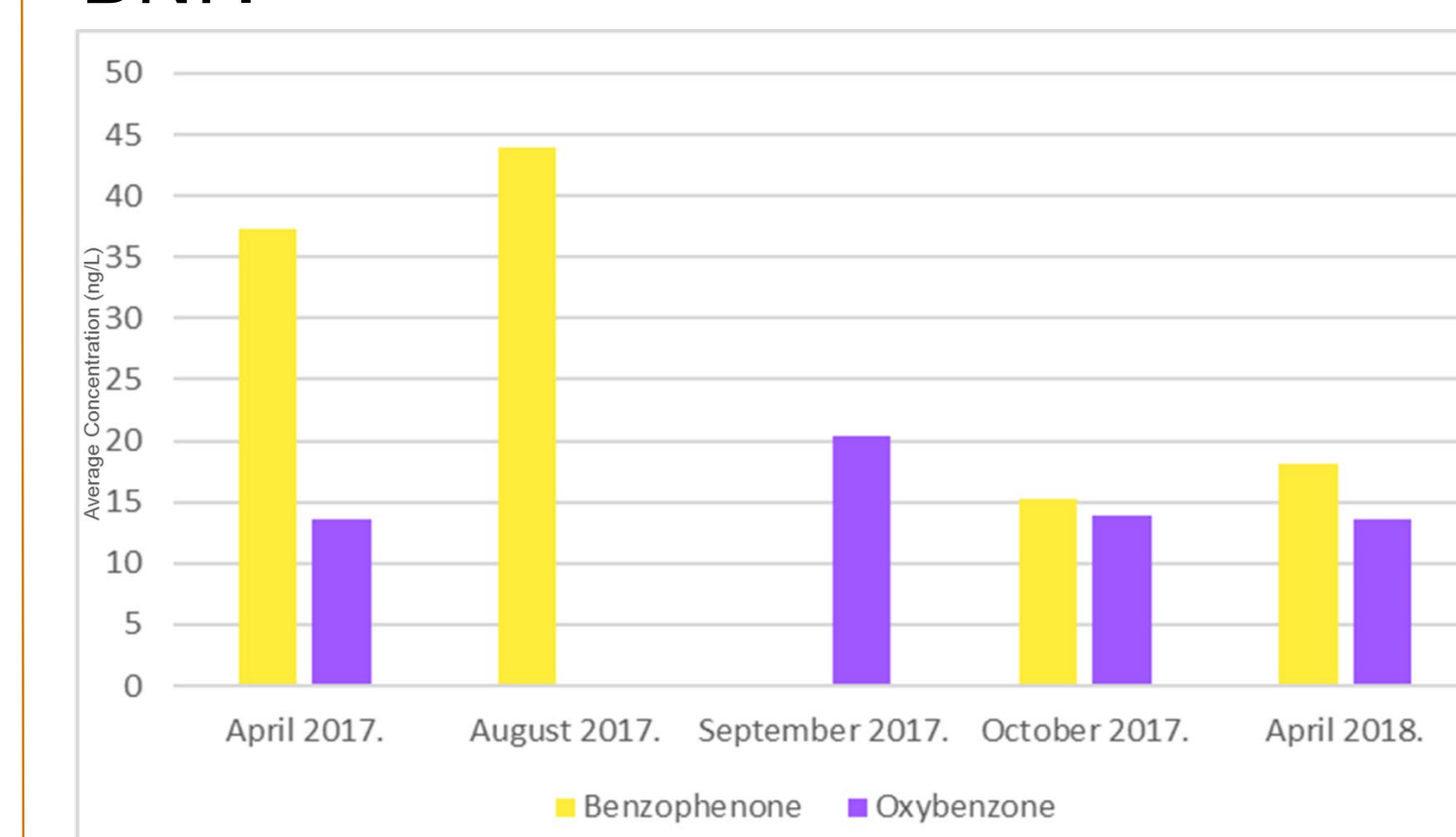


Figure 6. Seasonal distribution of benzophenone and oxybenzone at BNP.

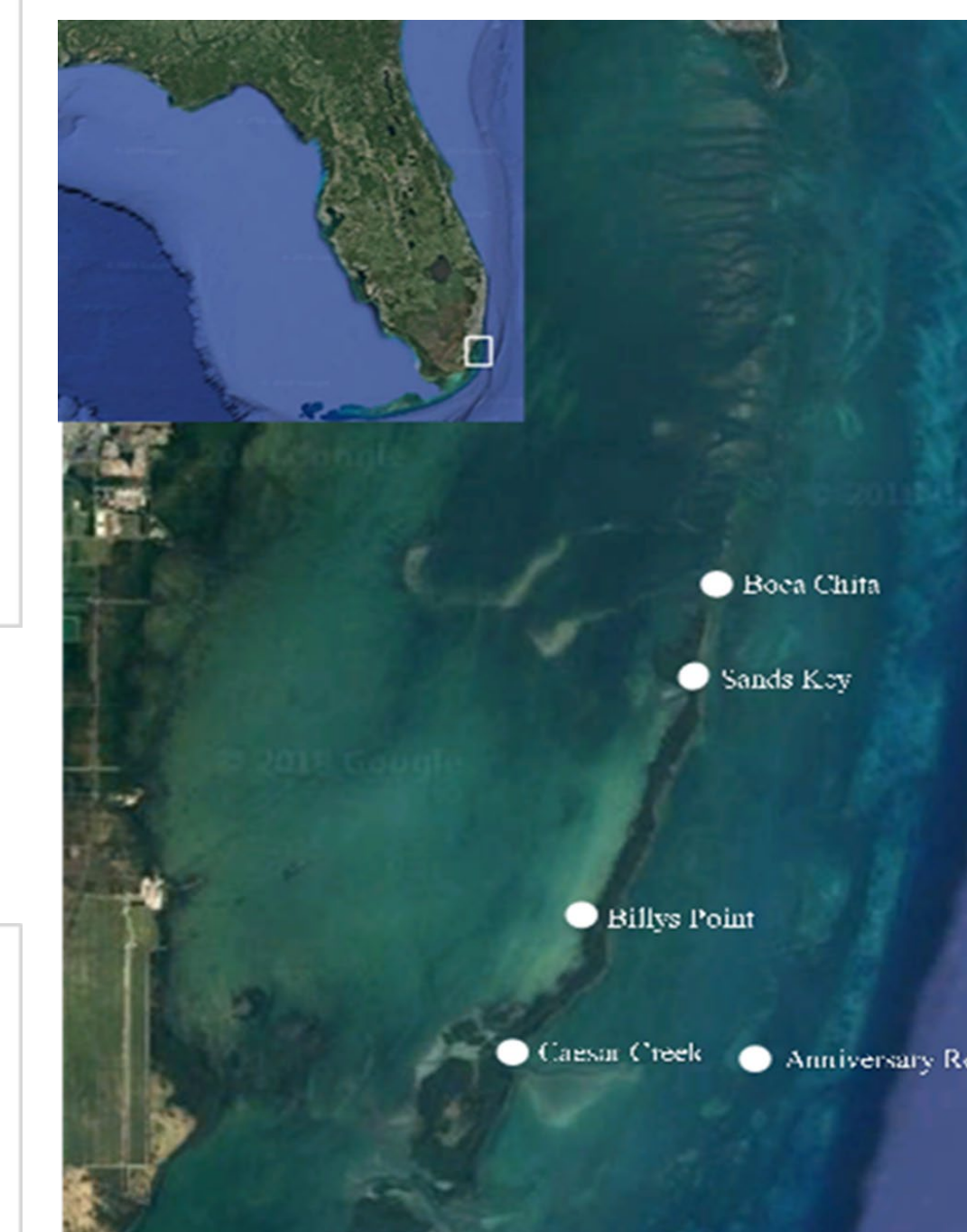


Figure 7. Map of sample sites at Biscayne National Park



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