



**1 November** Project proposal oral presentations

**8 November** Final written proposal due

**11/28-12/1** Thanksgiving break (*tempting as it is to take a longer break, we encourage you to confine your break to these dates*)

**9 December** Draft written paper

**KEN FOREMAN** Nutrients Pollution in the Coastal Zone.



**JAVIER LLORET** **Nutrient inputs, pollution and climate change in estuaries / Ecology of estuarine plants and algae / Microplastics in the environment.** Javier is interested in the biotic feedbacks that determine the response of marine organisms to excess nutrients and pollutants in estuarine ecosystems. He is also interested in how large-scale external drivers, including climate change, modulate that response. Possible projects related to this work could be:

- Forest land cover as a tool in estuarine water quality management The goal of this project is to quantify the potential of forested land cover management to reduce nitrogen loads to sensitive coastal waters. We would examine historical and current nitrogen inputs to Cape Cod watersheds with different degrees of forest cover (high, intermediate, and low) and associated nitrogen retention.
- Algal carbon stable isotopes as indicators of coastal eutrophication Coastal ecologists frequently use nitrogen stable isotopes to trace and monitor sources of anthropogenic nitrogen. When growing under nutrient-rich conditions, bloom-forming macroalgal species of the genus *Ulva* seem to display a very marked shift in carbon isotopic signatures, from relatively depleted values typical of marine macroalgae to heavier signatures that resemble those of C4 plants. To test this hypothesis we would survey *Ulva* specimens in different estuaries of Cape Cod subject to different nutrient loads, and characterize their isotopic signatures.
- Accumulation and effects of microplastics in estuarine organisms The goal of this project is to quantify the effect of urbanization on microplastic accumulation in estuarine organisms, particularly mollusks. We could also examine whether differences in

Loretta is interested in how organisms respond to changes in temperature, light, oxygen concentration, and contaminants. Sensitive species like corals can become stressed if water temperatures change by only a few degrees, leading to bleaching or death, and can leave a record of the stress event in their calcium carbonate skeletons. However, despite being well studied, the underlying mechanisms of many aspects of coral biology and physiology are unknown (e.g., calcification, bleaching, larval settlement). Similarly, seaweeds play an important role in ecosystems, but we do not know how they will respond to increasing temperatures and changing ocean chemistry. Some possible projects related to corals and seaweed include:

- The effects of temperature and/or hypoxia on coral growth and symbioses, or seaweed productivity
- Impact of symbionts and bioeroders on calcification in corals
- Impact of seaweeds on coral growth and survivorship
- Cultivation of seaweeds for water quality improvement
- Conservation and restoration methods to improve corals and seaweeds

### **EMIL RUFF** Microbial ecology and physiology

Emil works on the ecology and ecophysiology of microorganisms, their metabolisms and metabolites, and interactions with the environment. His research combines field experiments, lab cultivations, biogeochemical measurements, microscopy, multi-omics analyses and bioinformatics. He has three topics/projects that SES students can be involved in:

<https://www.nature.com/articles/s41467-023-38523-4> The team now wants to understand how widespread this process is locally and globally and has received funding to study groundwater aquifers. SES students could be involved by sampling aquifers on Cape Cod and analyzing molecular oxygen and nitrogen compounds as well as searching for the key gene in the microbiome. Methods can involve analyses of oxygen and nitrogen concentrations, O + N stable isotope analyses, DNA extraction, -omics, PCR, target gene analyses, bioinformatics. Field site: Cape Cod, MA.

**MIRTA TEICHBERG**