<u>Reconstructing Sea Level Using Coastal Lakes in Norway</u>
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The Lofoten Islands in northern Norway are known for their Viking history, the midnight sun and a dramatic mountainous landscape rising from the sea. This unique landscape and history of the Lofoten Islands provide a wonderful opportunity for geological research in the area. At William & Mary, every senior in the Geology Department completes a senior research project. Students conduct research around the world from Lake Matoaka to Oman to the Lofoten Islands where my research is focused. The Lofoten Islands, located above the Arctic Circle, have a number of coastal lakes which were connected to the sea in the past when relative sea level was higher. In northern Norway, relative sea level over the past 6000 years has been lowering due to isostatic rebound as glacial ice melted. Simply put, as the weight of the ice was removed from the land, the land mass rose, or rebounded. These coastal lakes which had previously been connected to the sea, became isolated lakes as the land mass rose and relative sea level lowered below the basin.

Although general trends of sea level lowering throughout the Holocene in northern Norway are understood, the details are not well defined. For my senior research, I am analyzing sediment cores from two coastal lakes in the Lofoten Islands to answer questions about the rate and magnitude of sea level lowering during the late Holocene (the past ~5000 years) and how this may have affected human activity in the Lofoten Islands. Reconstructing past sea level is useful in understanding how coastal environments evolve and how sea level is related to human history, especially since Vikings were active in this area of Norway.

Through an ENSP Summer Research Fellowship, I was able to begin my research this summer. In May, I traveled to the Lofoten Islands to conduct field work with my advisor, Professor Nicholas Balascio, and several of his colleagues. We collected sediment cores from seven coastal lakes, working off of small inflatable boats and using a percussion coring device to retrieve core tubes full of sediment. Having never cored a lake before, this was an amazing place to start!

I returned to William & Mary, where I spent the summer analyzing several biogeochemical markers in two sediment cores. In these sediment cores, lake salinity changes (due to relative sea level change) are recorded in biogeochemical markers in the sediment (ex. sulfur content, carbon isotopes, and diatoms). To measure these markers, I used a variety of techniques including measuring elemental percentages using an Element Analyzer instrument, sending samples to an outside lab for carbon isotope measurements, and visually identifying diatoms under the microscope. With this data, I am beginning to piece together a more detailed understanding of the late Holocene relative sea level history for this area. In my preliminary interpretations, both sediment cores show a similar sequence: potentially glacial marine sediment, followed by marine deposited sediment, followed by the most recent phase of freshwater lake sediment deposition. With my study lakes and these interpretations, I will be able to add two new sea level index points to an existing relative sea level history curve. Though I completed much of my data collection over the summer, my project will continue throughout the school year, culminating with my thesis in the spring.

Research team after successfully recovering a core from Lower Storfjordvatnet. Left to right: Leah Marshall, Stephen Wickler (Tromsø University), Billy D'Andrea (Columbia University), and Professor Nicholas Balascio (William & Mary). Photo Credits Ray Bradley.