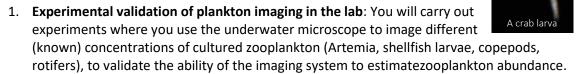## *Student projects 2021 - 2022*
An Ecosystem Perspective on Zooplankton

Zooplankton are mostly tiny animals that live in the water column, feeding on algae and other organisms and eaten by many fish species. Many bottom dwelling species have planktonic larvae that live in the water column. Hence, **zooplankton are a key component of the marine ecosystem**.

Traditionally, zooplankton is sampled using nets. This method has many limitations: the organisms are often damaged by the sampling, the sample is only a single measurement over a large volume of water and analysis is time consuming.

We are applying **imaging systems** to avoid these problems. A camera is pulled through the water and photographs organisms of 50 micrometres to 2 centimetres in size. We then use computers to automatically classify these images, saving an enormous amount of time and allows us to process many samples in a short time and sample at specific depths. Furthermore, with this technique, we can see the organisms "in action" in their natural environment, gaining an idea of the predator-prey interactions for example. We expect that these imaging systems will enable us to study the marine food web in new ways and want to invite you on this exciting journey through the following topics:

A crab larva

1. **Experimental validation of plankton imaging in the lab**: You will carry out experiments where you use the underwater microscope to image different (known) concentrations of cultured zooplankton (Artemia, shellfish larvae, copepods, rotifers), to validate the ability of the imaging system to estimatezooplankton abundance.
2. **Zooplankton production and grazing in the eastern Oosterschelde**: You will do lab analyses to determine biomass, nutrient content and isotope composition of zooplankton from samples collected in the Oosterschelde and use the data to develop models that quantify production and grazing of zooplankton in the Oosterschelde.
3. **Using imaging to investigate dynamics and distribution of the bloom forming algae *Phaeocystis***: In this project you will use images taken by our underwater microscope to analyze distribution and composition of the bloom forming algae *Phaeocystis* in Oosterschelde and Lake Grevelingen.
4. **Building and testing a frugal high-throughput microscope**: You will build the PlanktoScope (www.planktoscope.org), an open-hardware, open-software low-cost plankton imager and test its feasibility to sample phytoplankton and microzooplankton in Oosterschelde and Grevelingen.
5. **Study particle dynamics in the water column**. More than 90% of the images that the underwater camera takes is of 'marine snow', i.e. fluffy aggregates of detritus, which is of high importance for organic matter transport in marine ecosystems. You will write code (R or Python) to automatically analyse properties (size, 'openness' etc) of these particles to understand their dynamics.
6. **Come up with an idea and tune this topic to your specific interest!**

Projects take place at NIOZ in Yerseke, Netherlands where housing can be arranged. Depending on the project, remote work is possible. **For more information contact Dick van Oevelen (dick.van.oevelen@nioz.nl) or Lodewijk van Walraven (lodewijk.van.walraven@nioz.nl).**

Zooplankton from lake Grevelingen: rotifers, larvae from a sea urchin, worm and barnacle, and a copepod