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Title: Coastbusters-LANICE: Nature Inspired Designing (NID) by using the tube building polychaete *Lanice conchilega*, the sand mason.

Summary:

If you are searching in your nature inspired designing for an ecosystem engineer, stabilizing the sediment and increase biodiversity, the tube building polychaete, *Lanice conchilega* (or sand mason worm) is a perfect candidate. They tend to occur in dense, patchy aggregation from the intertidal to 1000m depth in the North-East Atlantic region, hereby slowing down the passing water flow, which locally causes sand to pile up and the sediment bed to stabilize. Additionally, the patch is oxygenated due to tube irrigation activity of the worms. These local changes induced by the sand mason worm create distinct micro habitats in an otherwise uniform landscape, which results in an increased faunal diversity and abundance associated with the patches. Therefore, this species is an interesting target species in nature inspired designing for several purposes. In the Coastbusters-LANICE project, we will mainly investigated its role in stabilizing and enhancing the biodiversity at the low water line to contribute towards an innovative resilient coastal protection. Nevertheless, the worm can be used in NID in offshore construction works as well or executing nature restoration works. This makes *L. conchilega* a crucial ecosystem engineer in temperate inter- and subtidal areas.

The main research challenge is that *Lanice conchilega* aggregations cannot be “planted” (as opposed to marsh plants or mangroves). The worms start their life as a motile, pelagic larva. The settlement process – as onset of the sessile phase - is facilitated by the presence of seafloor structures. These can be mimicked by artificial substrate mats, thereby enhancing larval settlement in a target area. However, this aggregation-inducing process needs to be refined and important research aspects need to be resolved prior to operability and industrial use.

The development and testing of an optimal artificial substrate with adequate characteristics is a crucial first step. This allows for the production/engineering of a substrate on an industrial scale. To this aim, the influence of a wide range of substrates on current velocity and larval settlement will be measured. This will be done in lab, flume tank and field experiments.

Secondly, the potential of an industrial application of *L. conchilega* as an appropriate nature-based coastal defense measure needs to be quantified. Hence, the effect of its aggregations on changes in water currents and sedimentation/erosion processes will be measured in the field. Results will be used to improve hydro-sedimentological models to evaluate its sediment stabilizing function.

Therefore, the Coastbusters-LANICE project aims to provide the industry with all necessary knowledge to successfully implement *L. conchilega* aggregations in areas, where sediment need to be stabilized and biodiversity enrichment is desirable (the protection of sandy shorelines; NID for offshore constructions), thereby increasing overall ecosystem health.

The consortium currently consists of:

- Flanders Research Institute for Agriculture, Fisheries and Food (ILVO)
- Flanders Marine Institute (VLIZ)
- KULeuven (Department of Civil Engineering)
- Flanders Hydraulics

For the user group, we are looking for companies involved in coastal and offshore engineering, developing artificial substrates or designing NID solutions. The user group will steer the project and deliver input to the LANICE project, so it's results can be tuned into your business.