## 3<sup>rd</sup> NEWSLETTER - March 2021

**This is the third GEANS Newsletter**

Although the last year has been really challenging due to COVID-restrictions, GEANS has made great progress. We are proud to present two papers: one critically reviews the recent methods used for metabarcoding of marine bulk samples and indicates how potential biases can be introduced throughout the process, and the other presents the wider ARMS network and a common set of standards for field sampling, genetic analysis, data management, and legal compliance. The reference library has made a tremendous jump and now contains 3442 North Sea specimens, and 3584 sequences of 585 species! We designed a ringtest to increase our understanding of reproducibility and robustness of metabarcoding results. Different partners have processed identical samples both following an identical protocol and a protocol with small changes in certain steps. Preliminary results on reproducibility look very promising!

Our three main pilots are operational and are running in close contact with stakeholders. In order to further engage and consult a wide stakeholder public, a questionnaire has been broadcasted to even better take stock of the needs and wishes of our target group. Go to the link below and tell us what you need!

Read more about GEANS: www.northsearegion.eu/geans/

**August 2020**

**GEANS publication: 'Biases in bulk: DNA metabarcoding of marine communities and the methodology involved'**

DNA metabarcoding of bulk samples is increasingly implemented in ecosystem assessments and is more cost-efficient and less time-consuming than monitoring based on morphology. However, before raw sequences are obtained from bulk samples, a profound number of methodological choices must be made.

In a recently published Molecular Ecology paper, Luna van der Loos and Reindert Nijland critically review the recent methods used for metabarcoding of marine bulk samples (including benthic, plankton and diet samples) and indicate how potential biases can be introduced throughout sampling, pre-processing, DNA extraction, marker and primer selection, PCR amplification and sequencing.

Read the open access paper: https://onlinelibrary.wiley.com/doi/abs/10.1111/mec.15592
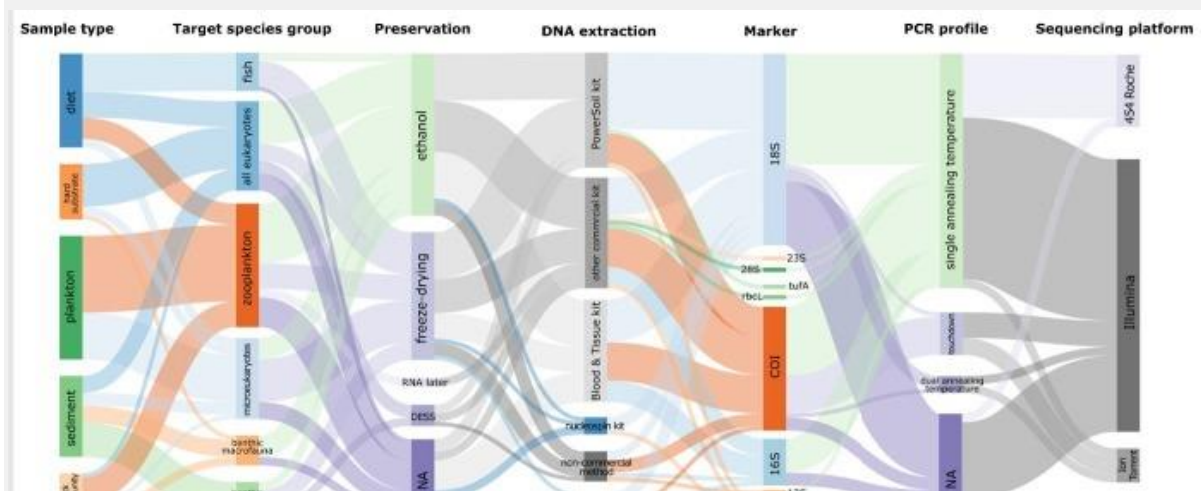


**November 2020**

**GEANS video runner-up in the North Sea video contest**

During the multimedia part of the North Sea Conference on 10 November, the two winners and runners up of the third North Sea Region video competition for ongoing projects were revealed.

The contest had two categories: Explainer video and people in focus. The decision about the winners and runners up in each category was jointly made by 14 judges, two from each of the seven North Sea Countries appointed by our Monitoring Committee. In the category Explainer Video, the winner and runner-up were Sullied Sediments and GEANS. They were chosen from 16 entries.

Watch the GEANS video again:
https://www.youtube.com/watch?v=6PiEHCmoNUc&feature=youtu.be
https://northsearegion.eu/geans/news/geans-video-launch/

Watch our GEANS video now:

ILVO GEANS: DNA barcoding of benthic organisms in th...

Using visual identification methods like these, it can take up to 5 days to process a sample.

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**December 2020**

**GEANS proud to be part of ARMS-MBON – a new network for genetic monitoring and early detection of non-indigenous marine species**

A 130 Autonomous Reef Monitoring structures (ARMS) form a global network that monitors changes in hard-bottom habitats. Curious? Read the new publication, watch the video and contact lead author and GEANS partner Matthias Obst.

As part of a global initiative originally developed by the Smithsonian Institute, a marine biodiversity observation network (MBON) has deployed more than 130 Autonomous Reef Monitoring Structures (ARMS) in the vicinity of marine sanctuaries as well as industrial locations (e.g. ports, and marinas)in Europe and the polar regions. This network is supported by the EU funded ASSEMBLE Plus project, the European Marine Biological Resource Centre (EMBRC), the Interreg program GEANS, and the Swedish Agency for Marine and Water Management (SwAM). The aim of the network is to monitor changes in hard-bottom habitats on a continental scale and provide data about the impact of climate change and human activities in these environments.

ARMS units are stacks of plates that mimic the complex structure of the sea bottom. Acting as hotels for marine species, they are colonised soon after being deployed. After a few months or years, they are collected, and replaced. Using genetic methods, image analysis and visual inspection methods, it is possible to identify the encrusting species (e.g. coral and algae) as well as motile organisms (e.g. crustaceans, molluscs) that have made the structure their home. Robust analyses, however rely upon a network of marine taxonomists and bio-informaticians, something that can be provided by the supporting infrastructure networks such as EMBRC.

The magic of the ARMS network is that each observatory adds a dot to a painting that shows the status of the hard-bottom communities across the regional seas. As our ARMS are continuously replaced, the paintings also change – they turn into a movie showing the dynamics of coastal ecosystems over time. For example, we are able to see how species slowly migrate in response to climate change, or how new species suddenly arrive in Europe from other parts of the world. As such the network can provide valuable services to national and regional authorities who often

run monitoring programs in the coastal zone. In Sweden, the national environmental authorities already use data from ARMS located at five observatories along then Swedish West coast to detect non-indigenous species at the earliest possible stage.

To find out more about the ARMS network or joining EMBRC as a member, please contact Matthias Obst ( matthias.obst@marine.gu.se).



*An Autonomous Reef Monitoring Structure (Photo by Joanna Norkko)*

**Links:**
Global ARMS Program: www.oceanarms.org
The European ARMS Programme: www.arms-mbon.eu
Full publication: www.frontiersin.org/articles/10.3389/fmars.2020.572680/full
Video: www.youtube.com/watch?v=sckV0FIAXd8&feature=emb_logo

**February 2021**
**GEANS researchers showcase new skills of online communication**

After a year of COVID restrictions, we have all discovered that online meetings and presentations require a different tack than "normal" presentations. GEANS researchers have discovered new tools and applied them in attractive online communication products. Laure Van Den Bulcke: "To pitch my research in one minute is one thing, to make a clear video of that is another. First, I made a script, thinking of the text, pictures and graphs I wanted to use. Second, I started filming, with multiple videos as a result. Finally, after selecting the best videos, I started editing with one of the available programs. As I didn't have a lot of experience, my editing skills greatly improved, thanks to several editing tutorials! Challenge accepted and I am happy about the result of my pitch video. I hope other people will enjoy it too."

View the poster and video pitch: Reproducible are DNA Metabarcoding Data for Marine Macrobenthos? VLIZ Marine Science Day

**March 2021**

**We want to hear your views, so engage with us on our GEANS questionnaire**

Technology is moving at a fast pace for monitoring and assessment of benthic systems. Under the GEANS programme we are very excited with the current developments, methods and ongoing case studies. However, as we advance our current knowledge, we wish to hear you telling us, what are your current needs for this type of DNA- information, do you need targeted details (e.g. costs, methods reference collections)? The GEANS project has also developed several examples and have tested different ways to apply DNA techniques, so we wish to capture how you as a stakeholder will benefit from knowing more about these approaches and could inform your future benthic monitoring?

The GEANS team have designed a simple questionnaire to canvas your interest and needs in this exciting area of research. We will be grateful if you could complete (the overall set of questions will take you no more than 9 minutes of your time!) and let us know what type of information and products will help you to make decisions on this journey!

Please follow the link to this survey:
https://www.surveymonkey.co.uk/r/GEANS

We will appreciate if you could complete **by 2nd April 2021**.
Contact: silvana.birchough@cefas.co.uk



16. What would be needed for you in order to adopt DNA-based analyses/results in your work?

○ Reliable and repeatable protocols that are easy to use

○ Similar outcomes as traditional methods

○ When it is imposed by European Directives, national legislation

○ Improved knowledge (pros and cons)

○ Other, please specify

## Partner in picture: Nord University

Nord University is a multi-campus university in Norway, with a main campus in Bodø north of the Arctic circle. Research at the Faculty of Biosciences and Aquaculture (FBA) focuses on sustainability in the face of anthropogenic impacts to the environment, and the distribution dynamics of marine organisms in the north, including benthos. One of our research aims is to combine classic marine ecology with molecular ecology to address scientific questions that could otherwise not be answered. Associate Prof. Henning Reiss (Ecology Division) and Prof. Truls Moum (Genomics Division) are representing Nord University within GEANS. Henning Reiss studies benthic communities in coastal habitats, food web dynamics and anthropogenic impacts on sea floor ecosystem.

In his research, Truls Moum studies genetic diversity, population structures, and molecular evolution of aquatic organisms, using molecular tools. Together with Irina Smolina and Amalia Mailli, who belong to the GEANS team at NORD, and several PhD and master students, we study the dynamics of marine ecosystems using molecular tools in combination with experimental or field investigations.

*Sampling of ARMS in a Norwegian fjord. Photo by Eric J. Molina*

The DeepSeq facility at Nord enables high throughput sequencing of genomes, transcriptomes, and community samples, and bioinformatic processing of big data. Nord University contributes to the optimisation and further development of field and laboratory protocols for biodiversity monitoring in GEANS. It involves the development of protocols for DNA extractions, DNA markers targeting, and bioinformatics, to improve the representativeness of DNA barcoding in qualitative and quantitative terms.
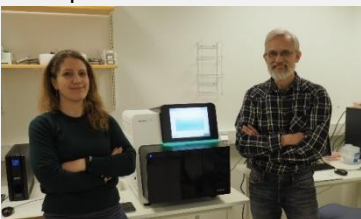
The application of these monitoring protocols is tested in the field i.a. using artificial reefs, so called ARMS, as a recruitment platforms. This research on hard substrate benthos by using photo observations and morphological samples for species identification in addition to sequencing bulk samples, is probably representing best the ambition of Nord to combine classic field investigations with molecular tools.

*Truls Moum and Amalia Mailli in the lab*

## Upcoming events
**September 2021:**
**Special session** 'Application of DNA-metabarcoding for ecosystem health assessment' during ECSA58 (Hull, UK). The session will be hosted by GEANS partners and by Angel Borja of AZTI. The deadline for abstract submission is April 9th. **http://www.estuarinecoastalconference.com/**

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