EMBRC: an innovative network that pushes the frontiers of ocean research

Coordinating over 70 prestigious marine stations, this European consortium is revolutionising our understanding of marine biology and ecology, and tackles global challenges such as climate change.

Who said that science had to be done in a boring lab? "From my office, I have a spectacular view on the Gullmarsfjord, the only real fjord in Sweden", says Sam Dupont, a marine biologist at the Kristineberg Centre. Beyond its picturesque landscape, this insular facility located on the Swedish west coast seems quite secluded at first sight. In reality, it is part of a massive and growing consortium of marine stations: the European Marine Biological Resource Centre, or EMBRC. This coordinated network, also referred to as a distributed European Research Infrastructure Consortium (ERIC) by the European Commission, is transforming how researchers do marine biology and marine ecology.

Marine stations are nothing new. Since the 19th century in Europe, they've provided ideal laboratories for scientists eager to study the ocean and its fauna and flora. But working in one of these marine labs usually means hoarding data and competing for funding and publication primacy against other marine stations. After several years of building its foundations, EMBRC was launched in 2013 specifically to break these barriers, and to promote collaboration, coordination, and the exchange of scientific expertise and technological resources in marine biology. Today, EMBRC is spread over more than 70 renowned institutions located in nine European countries and Israel.

Kristineberg Centre, a marine research station part of EMBRC Sweeden, located in the Gullmarsfjord in Sweden

Via the EMBRC website (www.embrc.eu), researchers from Europe and beyond, working in academia or in industry can browse a large catalogue of services and resources, go through an application process before requesting access to the facilities they need for their research. They can, for instance, go to a marine station and rent research vessels, sampling equipment or fish tanks, or purchase remotely biological materials – microorganisms, algae, invertebrates etc. – sampled at sea or lab-grown by qualified technicians. It is a lot more cost-effective to rent high-end scientific equipment with EMBRC than to buy it. "We also set best practices and standardised norms in all our stations, so our users can get a rigorous and reproducible science," adds Nicolas Pade, the Executive Director of EMBRC. Furthermore, EMBRC embraces the FAIR – which stands for Findable, Accessible, Interoperable and Reusable – data principles. All of EMBRC research data, protocols and data workflows are available for free and for all. This kind of open science initiative in marine biology was unthinkable just a decade ago.

"Climate change or biodiversity crises are international issues that are composed of global, regional and local challenges"
Sam Dupont

In the 1990s, marine biology went through a major shift when the field embraced Omics methods. Omics is an umbrella term that encompasses different science fields, including genomics, i.e., the study of living beings' whole genetic material, or genome. This novel way of doing biology was the foundation of EMBRC's inception.

At first, EMBRC focused mainly on biomedical sciences and the potential of marine organisms and their genomes to help produce new medicines or treatments for human beings.

Student collecting seaweed near the Kristineberg Centre

The research infrastructure quickly added an environmental component to its mission: studying the impact of human activity on our oceans and their resources, from climate change to fishing, aquaculture and more. "We need a deeper and more thorough understanding of marine organisms and their ecosystems if we want to exploit the oceans in a sustainable manner," says Nicolas Pade. For Sam Dupont, EMBRC plays a crucial role in advancing marine ecology because of its unique approach: fostering collaboration. "Climate change or biodiversity crises are international issues that are composed of global, regional and local challenges", explains the researcher, who witnesses first-hand these phenomena on Swedish coasts. "That's why we need local studies just as much as we need a worldwide coordinated effort to compare and extrapolate these studies at a global level."

The EMBRC initiative - EMO BON (European Marine Omics Biodiversity Observation Network) is a perfect example of this collaborative mindset. Co-designed by 17 EMBRC marine stations and international experts, it is the first coordinated network for ocean biodiversity observation in Europe.

Samuel Dupont and a student in a laboratory in Kristineberg Centre, Sweden

"By analysing the genetic material in a single sample of seawater, we get a lot of valuable information, such as the number of different species that live in a particular ecosystem", explains Ioulia Santi, EMBRC Observation, Data and Service Development Officer. "We get extremely fast and high-quality results: it's a modern and improved way to study biodiversity." EMO BON data are collected frequently in different European marine stations and, just like the rest of the EMBRC datasets, are quickly accessible to everyone. With them, scientists can observe how fast living organisms evolve under climate change pressure or survey parasite populations in mussel farms and prevent mortality events.

In the future, EMO BON could have concrete applications for the public. We will be able, for example, to quickly check the water quality on a beach and detect the presence of jellyfish or toxic algae blooms. EMO BON is also working on easy-to-use visualisation tools showing how biodiversity evolves in different regions and in time. They would be invaluable assets for policymakers who need this kind of evidence-based information to better protect our oceans.

Ioulia Santi
Marine biologist,
Observation, Data and
Service Development Officer at EMBRC

Samuel Dupont
Marine biologist,
Kristineberg Center, Sweden

Nicolas Pade
Marine biologist,
Executive Director at EMBRC

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