Photo credit: CIIMAR (EMBRC Portugal)

EMBRC service offer for research & innovation studies on micro- & macro- algae

EMBRC
EUROPEAN
MARINE
BIOLOGICAL
RESOURCE
CENTRE

Algae resources & services for academic & industry users

The European Marine Biological Resource Centre (EMBRC) offers its academic and industry users across Europe (and beyond) with various algae services/resources, including:

1. Access to **marine environments where algae thrive** (for collection of natural samples and/or *in situ* experimentation)

2. On-site or remote access to **biological resources** (living *ex situ* cultures of microalgae and macroalgae, fixed samples, extracts) and associated services (culture media, identification, cryopreservation)

3. On-site access to **experimental facilities** (culturing of micro- and macro-algae in controlled conditions at different scales) and associated **analytical services** (bioassays, sequencing, biochemical analyses, microscopy)

4. Training

This brochure provides an overview of some of the algae services offered at EMBRC 'nodes' across Europe[1]. You can find these services and others on the EMBRC service catalogue:

www.embrc.eu/services/service-catalogue

Photo credit: Wilfried Thomas, *Station Biologique de Roscoff* (EMBRC France).

[1] Note: As of 2022, EMBRC has 10 member countries; this brochure features algae services offered in 8 of them, as information was compiled before its latest member country (Sweden) joined the organisation, and information is not available for Israel. This information will be included in the EMBRC service catalogue when available: www.embrc.eu/services/service-catalogue.

EMBRC Belgium

Access to environments where algae thrive

The Belgian coast has no natural hard substrate, making **it an ideal habitat for seaweed**. Artificial substrates, however, abound. EMBRC Belgium offers access to seaweeds from harbour environments and other artificial substrates, as well as salt marsh-associated algae – areas in which it can also provide its expertise.

For microalgae, EMBRC-BE offers access to eutrophic coastal waters, coastal lagoons, and estuarine habitats.

Access to biological resources & algae for experimentation

The ISO 9001:2015 certified BCCM/DCG diatom culture collection (https://bccm.belspo.be/files/documents/Certificaat_BCCM_ISO9001.pdf) is the only culture collection worldwide specialised in diatoms, the most species-rich and ecologically important group of algae.

Additional microalgae, which are of interest from a scientific or applied perspective, are also included in this collection. Strains can be kept as safe deposits or public deposits. The latter are available worldwide as research or reference material for both scientific institutions and companies.

For multiple species and strains, extensive **genomic and transcriptomic resources** are available.

Photo credit: EMBRC Belgium.

Experimental services & equipment

EMBRC-BE has the facilities and know-how for isolating, culturing and experimenting with micro- and macroalgae, including automated liquid handlers for upscaling and high throughput applications. EMBRC-BE also offers **morphological and molecular identification services** (Sanger sequencing, high throughput sequencing, microsatellite characterisation, microbiome characterisation), including imaging, as well as **genetic and physiological analysis** and many other state-of-the-art laboratory facilities.

Photo credit: EMBRC Belgium.

Training

EMBRC-BE offers training on algae-related topics upon request.

Contacts

EMBRC Belgium Liaison Officer, Marleen Roelofs:
liaison_be@embrc.eu

EMBRC Access Officer, Davide Di Cioccio:
access@embrc.eu

EMBRC France

Access to environments where algae thrive

EMBRC France offers access to the natural ecosystems surrounding its three marine stations (operated by Sorbonne University and the CNRS[2]) located in the following regions:

- **Northeast Atlantic** (Roscoff): Temperate **megatidal zone** at the entrance to the English Channel with mixed rocky and soft substrates hosting an exceptional diversity of seaweed (>700 species), as well as coastal and estuarine plankton communities
- **Western Mediterranean** (Banyuls-sur-Mer and Villefranche-sur-Mer): Coastal locations close to **deep marine canyons,** providing access to Mediterranean seaweeds and very diverse plankton communities typical of **oligotrophic oceanic conditions**

All of the EMBRC-FR stations operate long-term ecological research (LTER) stations, providing valuable time-series knowledge on benthic and planktonic organisms.

Photo credit: Wilfried Thomas, *Station Biologique de Roscoff* (EMBRC France).

Access to biological resources & algae for experimentation

EMBRC-FR offers access to several microbiological strain collections, services for genetically transforming microalgae, and one sample collection:

- **Roscoff Culture Collection** (RCC: www.roscoff-culture-collection.org : >6000 strains of marine microalgae, bacteria, algal viruses and macroalgae from around the world. The RCC provides starter cultures and culture media, as well as morpho-molecular identification and cryopreservation services.
- **Mediterranean Culture Collection of Villefranche** (MCCV): ca. 400 strains, focussed on dinoflagellates
- **Banyuls Bacterial Culture Collection** (2B2C): ca. 2500 strains, primarily bacteria but also microalgae
- **Mutant collections:** Mutant strains of the pico-phytoplanktonic model species *Ostreococcus* and other microalgae can be generated on demand at Banyuls. The mutant diatom collection at the *Institut de Biologie Physico-Chimique* (IBPC) in Paris includes transgenic lines built by RNA interference (RNAi) with deregulated expression of each of the 220 Transcription Factors of *Phaeodactylum tricornutum*. Other diatom mutants (over-expression, knock-down or knock-out by CRIPSR/Cas9) can be generated on demand in the framework of scientific collaborations.

[2] CNRS: French National Centre for Scientific Research, *Centre national de la recherche scientifique*

Photo credit: Wilfried Thomas,
Station Biologique de Roscoff (EMBRC France).

EMBRC France strains/samples are available to public- and private-sector users and strain/sample deposit services are also offered.

Experimental services & equipment

Standard equipment for performing **experimental research with microalgae** (culture rooms, incubators, bioreactors, culture medium preparation and culture transfer facilities, microscopes, flow cytometers) is available at the three EMBRC-FR stations. A range of equipment for **macroalgae research** (from laboratory to pilot-scale, including column reactors, tanks, raceways and tidal simulation systems) is also available in Roscoff. In terms of analytical services, EMBRC-FR offers access to advanced **microscopy, sequencing, flow cytometry and mass spectrometry platforms** at all three stations.

Photo credit: Wilfried Thomas,
Station Biologique de Roscoff (EMBRC France).

Training

Through its Long-Life Learning programme, Sorbonne University offers training on algae, including basic and advanced microalgal culturing/identification and macroalgal taxonomy/ecology courses in Roscoff. Specific training on algal-related topics can be arranged upon request.

Photo credit: Wilfried Thomas, *Station Biologique de Roscoff* (EMBRC France).

Photo credit: Wilfried Thomas, *Station Biologique de Roscoff* (EMBRC France).

Contacts

EMBRC France Liaison Officer, Gemma Gimenez Papiol:
liaison_fr@embrc.eu

EMBRC Access Officer, Davide Di Cioccio:
access@embrc.eu

EMBRC Greece

Access to environments where algae thrive

EMBRC Greece (Institute of Marine Biology, Biotechnology and Aquaculture of the Hellenic Centre for Marine Research, IMBBC-HCMR) offers access to the coastal oligotrophic ecosystems of the Gulf of Heraklion (Eastern Mediterranean Sea).

Access to biological resources & algae for experimentation

EMBRC-GR offers **molecular identification** (PCR, Sanger sequencing, high-throughput sequencing, microsatellite characterisation, microbiome characterisation), including **imaging**.

Experimental services & equipment

EMBRC-GR offers numerous experimental services, including: Sanger sequencing, fragment analysis (microsatellite), real-time PCR, next generation sequencing (NGS), and laboratory analysis for environmental monitoring.

In terms of equipment, EMBRC-GR offers microplate spectrophotometer, centrifuges, and high-performance liquid chromatography (HPLC) for targeted **pigment analysis**.

Contacts

EMBRC Greece Liaison Officer, Panagiotis Kasapidis:
liaison_gr@embrc.eu

EMBRC Access Officer, Davide Di Cioccio:
access@embrc.eu

Photo credit: iStock.

EMBRC Italy

Access to environments where algae thrive

The National Institute of Oceanography and Experimental Geophysics (OGS) offers organisms collected in the wild: **microalgae and planktonic ciliates**, collected upon request.

The *Stazione Zoologica Anton Dohrn* (SZN) offers access to the **peculiar coastal pelagic system** of the Gulf of Naples. Here, more than three decades of studies at the long-term ecological research station (LTER) MareChiara (MC) provide valuable knowledge of planktonic organisms. SZN also offers the possibility to access an **acidified site** - cold near-pure CO2 seeps, see :

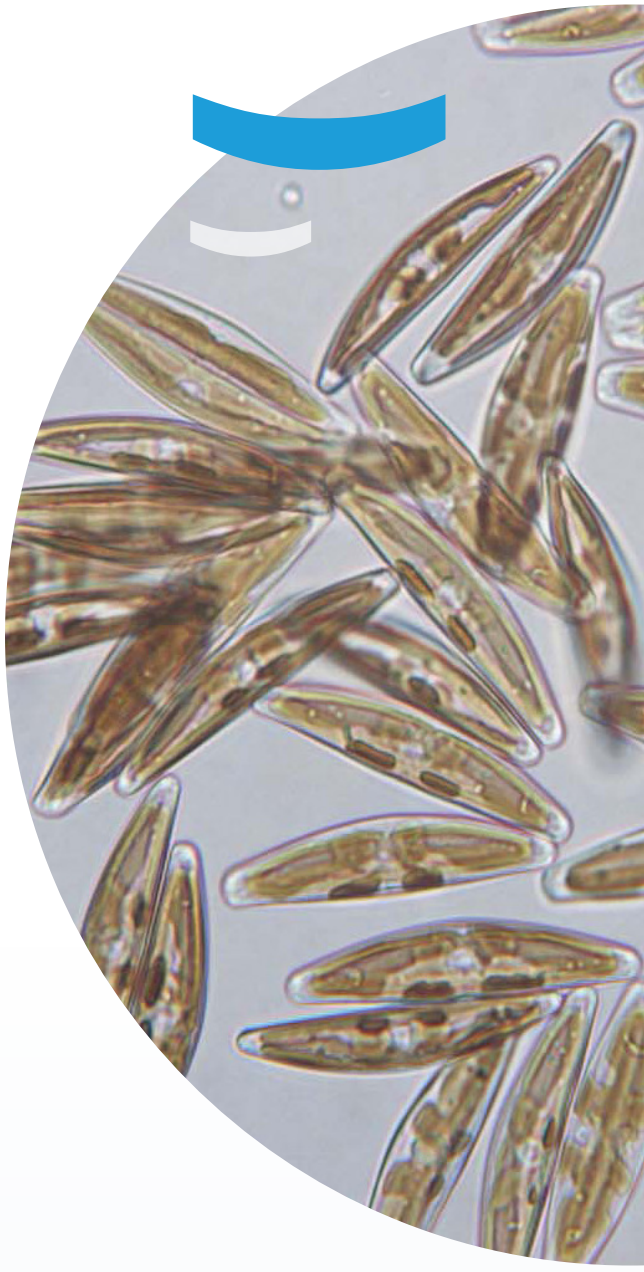
http://szn.macisteweb.com/ricerca-scientifica-en

Access to biological resources & algae for experimentation

Access to biological resources

OGS offers many species of unicellular (autothropic and heterotrophic) eukaryotes that belong to the broad categories of diatoms, flagellates and ciliates. The collection also includes microalgae used in **aquaculture and ecotoxicology.**

SZN's Marine Organism Taxonomy (MOTax) Unit is a specialised core facility that provides services for the **taxonomy and identification of marine organisms**. Merging traditional morphological approaches and modern technologies such as electron microscopy and molecular identification, MOTax provides a wide-ranging service that includes the identification of individual specimens, isolation and cultivation of target microalgal organisms, species identification and counting of phytoplankton samples in ecological and monitoring projects.



Seminavis culture.
Photo credit: EMBRC Belgium.

Access to algae for experimentation

Merging traditional morphological approaches and modern technologies such as **electron microscopy and molecular identification**, MOTax provides provide a wide-ranging service that includes the identification of individual specimens, isolation, and cultivation of target microalgal organisms, species identification and counting of phytoplankton samples in ecological and monitoring projects.

Experimental services & equipment

In terms of experimental services, SZN offers: scanning electron microscopy (SEM), wide-field and confocal microscopy, Sanger sequencing, fragment analysis (microsatellite), single nucleotide polymorphisms (SNPs), real-time PCR, next-generation sequencing (NGS), and laboratory analysis for environmental monitoring.

In terms of equipment, SZN offers full standard equipment for experimentation with micro/macroalgae.

Training

The MOTax unit provides individual training and organises advanced courses on the taxonomy of marine phytoplankton.

Contacts

EMBRC Italy Liaison Officer, Donatella De Pascale:
liaison_it@embrc.eu

EMBRC Access Officer, Davide Di Cioccio:
access@embrc.eu

EMBRC Norway

Access to biological resources & algae for experimentation

The Norwegian Culture Collection of Algae, NORCCA, is the largest algal culture collection in the Nordic countries and maintains and distributes **more than 2000 strains of cyanobacteria, microalgae and macroalgae** from marine, freshwater, and terrestrial habitats. It is owned and collaboratively maintained by the Norwegian Institute for Water Research (NIVA) and the University of Oslo (UiO). It is located at NIVA, Oslo in Forskningsparken and at UiO, Department of Biosciences at Blindern campus.

NORCCA offers algal strains and growth medium used for research, education, innovation, and commercial use for both public and private laboratories, and schools. NORCCA can offer advice on **culturing and selection of strains**, and can connect you to algal researchers at NIVA and UiO for **expert advice or collaboration.**

Learn more:
https://norcca.scrol.net/

Training

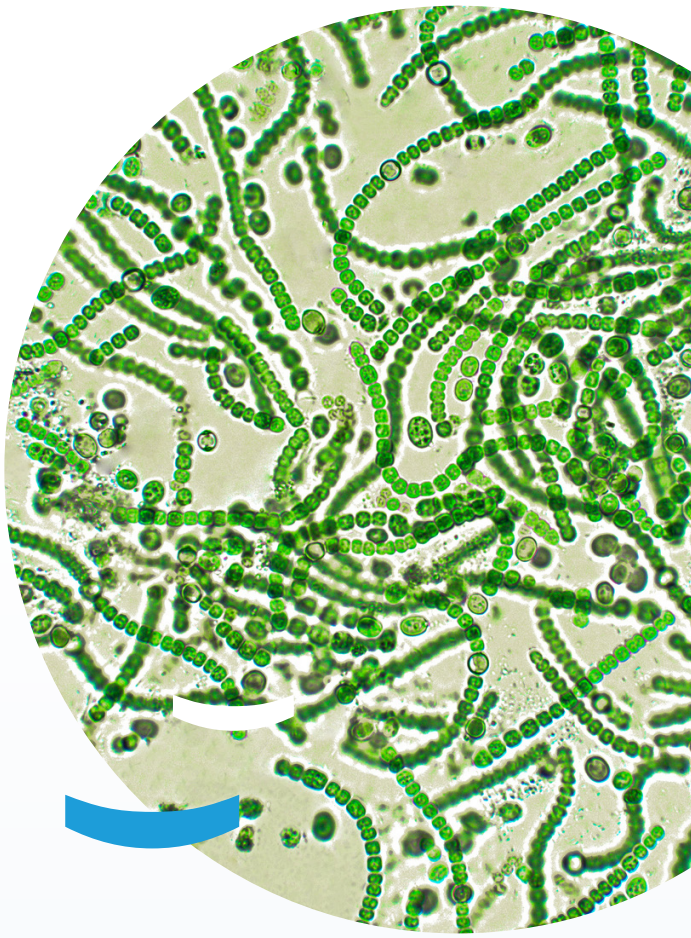
Training programmes are currently being developed in collaboration between NORCCA, UiO and NIVA's research facility Solbergstrand:

https://www.niva.no/en/contact/solbergstrand-research-facility.

Contacts

EMBRC Norway Liaison Officer, Henrik Glenner:
liaison_no@embrc.eu

EMBRC Access Officer, Davide Di Cioccio:
access@embrc.eu



Nostoc, a genus of cyanobacteria.
Photo credit: iStock.

EMBRC Portugal

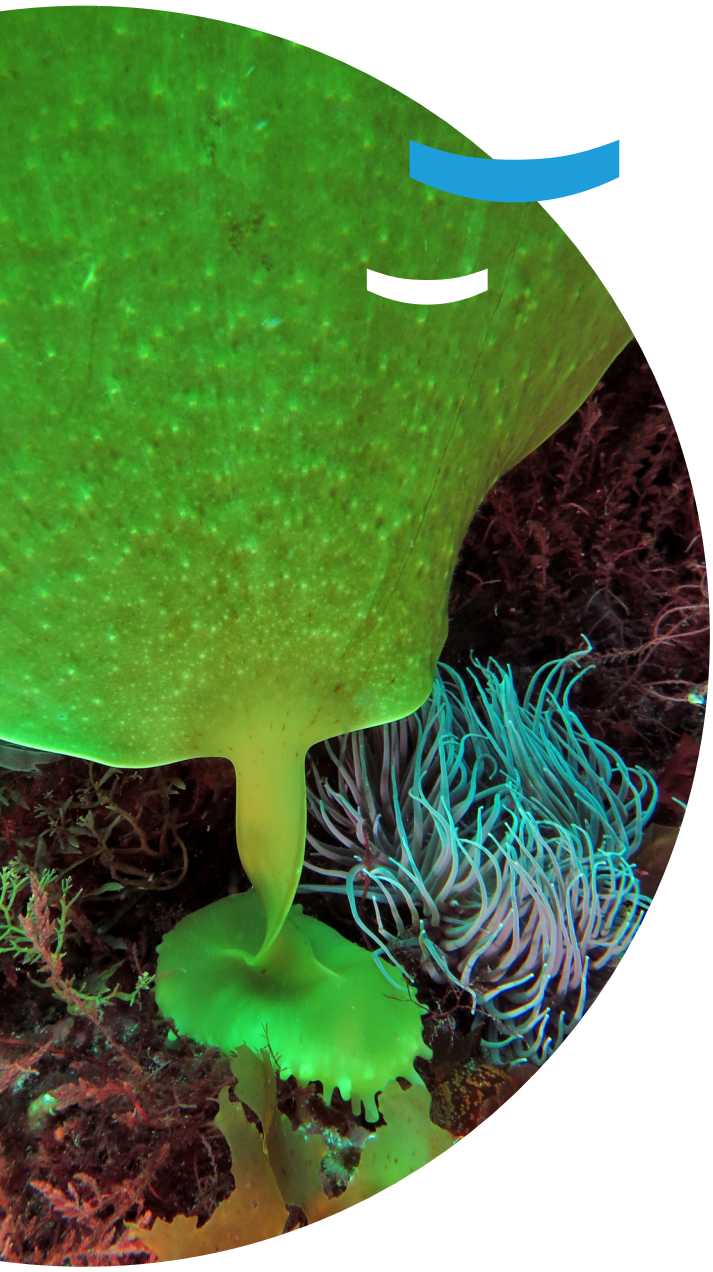


Photo credit: João Encarnação, *CCMAR* (EMBRC Portugal).

Access to environments where algae thrive

EMBRC Portugal offers access to algae in the Atlantic coasts of Algarve (south of Portugal), the coast of Minho (North), and Azores (mid-Atlantic). Users can access microalgal collections (fresh and seawater species); they can also use cell, biosensor and other assays to test for active products, and perform **structural and chemical analysis to identify compounds.**

Access to biological resources & algae for experimentation

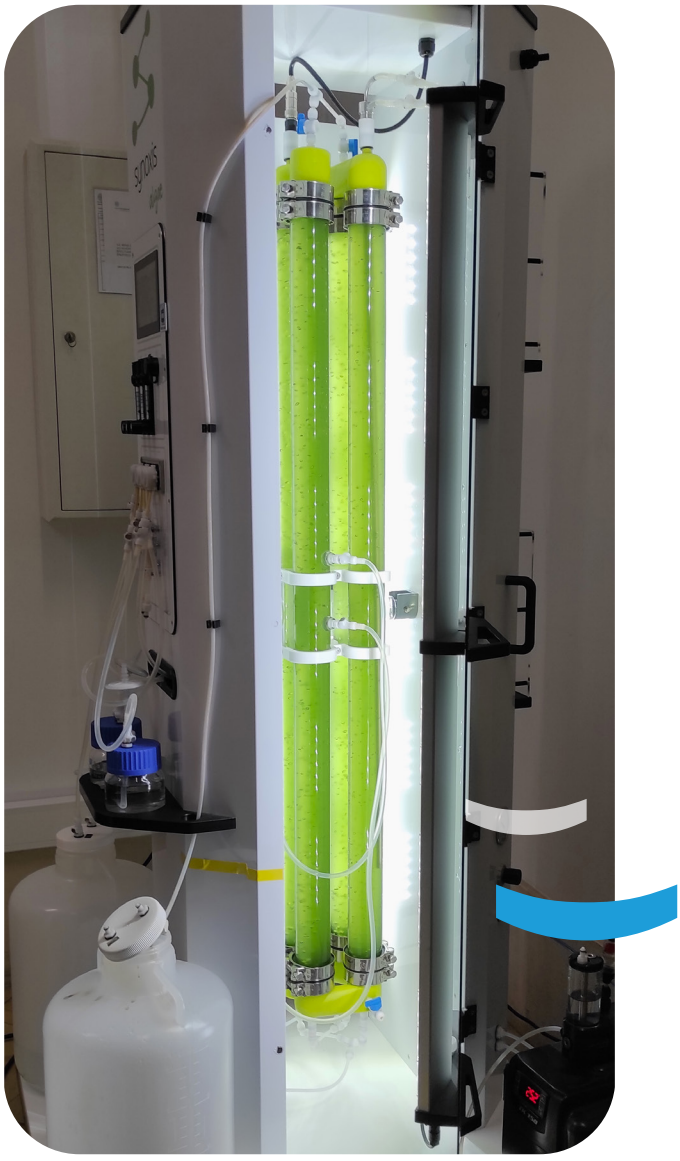
The Coimbra Collection of Algae (ACOI) offers multiple services for accessing biological resources and algae for experimentation:

Access to biological resources

- **Provision of microalgae and cyanobacteria from the ACOI collection (4000 strains):** https://acoi.ci.uc.pt
- **Taxonomic services**
- **Identification of cyanobacteria and microalgae**

Access to environments where algae thrive

- Climate controlled rooms: Access to acclimatised rooms and photobioreactors (PBRs) for microalgae and cyanobacteria cultivation
- Dry laboratories: Access to labs for isolation, maintenance and study of microalgae and cyanobacteria
- Wet laboratories: Access to labs for processing microalgae and cyanobacteria field samples



Photobioreactor. Photo credit: ACOI *Universidade de Coimbra* (EMBRC Portugal).

Contacts

EMBRC Portugal Liaison Officer, Adelino Canário, Ana Amaral:
liaison_pt@embrc.eu

EMBRC Access Officer, Davide Di Cioccio:
access@embrc.eu

EMBRC Spain

EMBRC Spain offers various algae-related services thanks to its three partners:

- **Toralla Marine Science Station – Marine Research Centre, University of Vigo (ECIMAT-UVIGO)**
- **Research Centre for Experimental Marine Biology and Biotechnology *'Plentziako Itsas Estazioa'* (Plentzia Marine Station) (PiE-UPV/EHU)**
- **The Spanish Bank of Algae (BEA/ULPGC)**

Photo credit: *PiE-UPV/EHU* (EMBRC Spain).

Access to environments where algae thrive

- ECIMAT-UVIGO: access to different coastal environments in the Southern Galician Rías (rocks, beach, harbours or within the Rías environment (40 km offshore/ up to 100m depth)
- PiE-UPV/EPHU: access to different coastal environments in the Southern Bay of Biscay, especially **estuaries and depositional areas**, some with different **gradients of anthropogenic pollution**
- BEA/ULPGC: access to the coastal environment of the Gran Canaria (Canary Islands) located within the subtropical waters of the Macaronesian region

Photo credit: *ECIMAT* (EMBRC Spain).

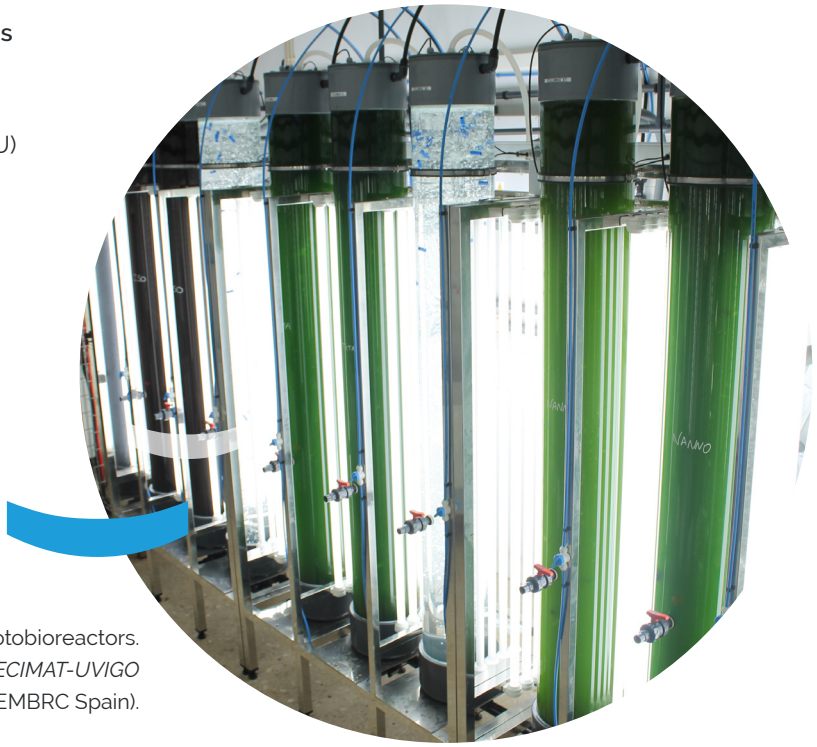
Access to biological resources & algae for experimentation

- **Algae strains:** >600 clonal strains of microalgae including cyanobacteria and different groups of eukaryotes (PiE-UPV/EHU); >2000 clonal strains microalgae (cyanobacteria and eukaryoties) isolated from tropical and subtropical regions (esp. Macaronesian region) (BEA-ULPGC); algae strains for aquaculture purposes (ECIMAT-UVIGO)
- **Taxonomic identification:** cyanobacteria, microalgae, macroalgae (all 3 stations)
- Services for **pigment analysis and identification of strains** (morphology and molecular characterisation) (PiE-UPV/EHU)
- Services for **bioprospecting** (macro-, microalgae and other marine organisms) in different environments and easy access to the Canary Islands
- **Cell isolation and culture maintenance** including -150°C (BEA-ULPGC)
- **Microalgae rearing** as feed or feed supplement for marine experimental animals, mainly bivalves, echinoderms and fish (PiE-UPV/EHU)

Experimental services & equipment

Experiemental services

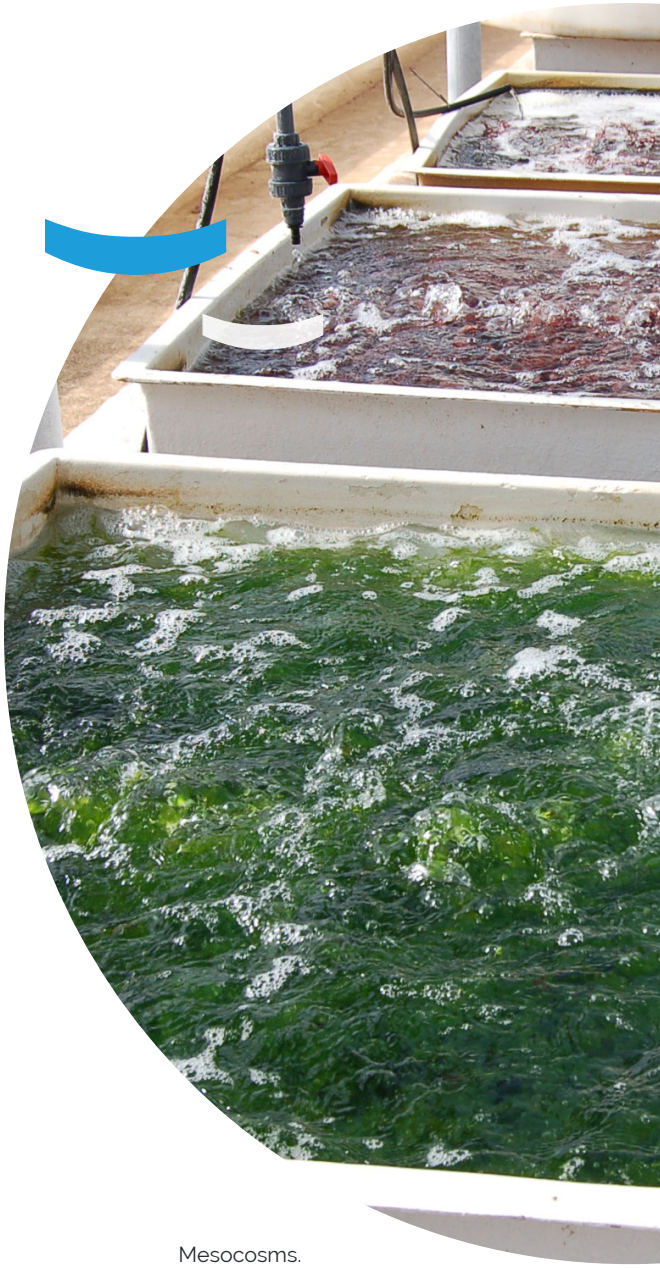
- **Culturing services** (ECIMAT-UVIGO, PiE-UPV/EHU, BEA-ULPGC), **cryopreservation** services (PiE-UPV), and **preservation** services (BEA-ULPGC)
- **Production of certain strains in larger volumes** (all 3 stations)
- **Imaging facilities** (all 3 partners)
- Standardised **ecotoxicological bioassays** (ECIMAT-UVIGO)[3] and **bioassays, biochemical and physiological (photosynthesis) analysis** (BEA-ULPGC)
- **Molecular analysis** for taxonomical determination; **flow cytometry** with sorting (BEA-ULPGC)
- **Genetic and phylogenetic analysis, transcriptomics** and **metabolomic** profiling; **environmental monitoring** (Bath Directive, aquaculture facilities, etc.); **toxicity testing** with microalgae (PiE-UPV/EHU)
- **Outdoor greenhouse** for experimental pilot **plant cultivation** of micro- and macroalgae (tanks, photobioreactors and raceways) (BEA-ULPGC)
- **Climate-controlled rooms:** acclimatised rooms and photobioreactors (PBRs) for microalgae cultivation (ECIMAT-UVIGO, PiE-UPV/EHU, BEA-ULPGC), cyanobacteria cultivation (PiE-UPV/EHU, BEA-ULPGC) and biomass processing (BEA-ULPGC)
- **Dry laboratories** for isolation, maintenance and study of microalgae (ECIMAT-UVIGO, PiE-UPV/EHU), cyanobacteria (PiE-UPV/EHU), and algae in general (BEA-ULPGC)
- **Wet laboratories** for processing cyanobacteria, microalgae and macroalgae field samples (all three sites)



Photobioreactors. Photo credit: *ECIMAT-UVIGO* (EMBRC Spain).

Equipment

- **Spectrophotometer, microplate spectrophotometer, spectrofluorophometer; centrifuge ovens, stove and muffles** (ECIMAT-UVIGO)
- Equipment to carry out **cultivation experiments** at different scales (from the laboratory to up to 50L and/or pilot plant) under controlled and semi-controlled conditions (ECIMAT-UVIGO, BEA-ULPGC); and **biomass processing** and **analysis for macro- and microalgae** (BEA-ULGC)
- **HPLC** for pigment analysis and other compounds; all equipment necessary for **experimentation with microalgae** (extraction hoods, spectrophotometers including Cytation cell imaging reader, flow cytometry); **molecular biology and metabolomic platform for analysis of microalgal strains** (PiE-UPV/EHU)



Mesocosms.
Photo credit: *BEA* (EMBRC Spain).

Training

PiE-UPV/EHU can prepare **courses on culturing techniques, pigment analysis and taxonomy**. A postgraduate international course (4 European Credit Transfer and Accumulation System, ECTS) is offered on 'Eutrophication and toxic algae'. BEA-ULPGC organises training courses on algae culture techniques from the lab to the pilot plant scale.

Contacts

EMBRC Spain Liaison Officer, Maria Huete-Ortega:
liaison_es@embrc.eu

EMBRC Access Officer, Davide Di Cioccio:
access@embrc.eu

[3] Standard ecotoxicological bioassays at ECIMAT-UVIGO include: marine microalgae growth test of *Phaeodactylum tricornutum, Isochrysis galbana*; Embryogenesis test on sea urchins *(Paracentrotus lividus)*, bivalves *(Mytilus, Venerupis spp., Ruditapes spp.)*; acute toxicity test with copepods *(Acartia clausi e Tisbe battagliai)* and *Daphnia magna*; survival tests on amphipods *(Corophium)*; bioluminescence inhibition test *(Vibrio fischeri)*, Microtox test; TPT: Previous toxicity test in CEDEX Guidelines.

EMBRC United Kingdom

Access to environments where algae thrive

EMBRC-UK offers access to **macroalgae and planktonic species** in both shelf ecosystems and deep-water systems (to the west of the UK).

Access to biological resources & algae for experimentation

Access to biological resources

Marine Biological Association (MBA)

The main MBA Cultures Collection consists of some 400 strains from 80 genera of marine phytoplankton. Many Plymouth strains are not held by any other collection in the world. Within the collection there is a large number of *Emiliania huxleyi* strains and *Dunaliella* species.

Learn more:
https://www.mba.ac.uk/facilities/culture-collection#b7

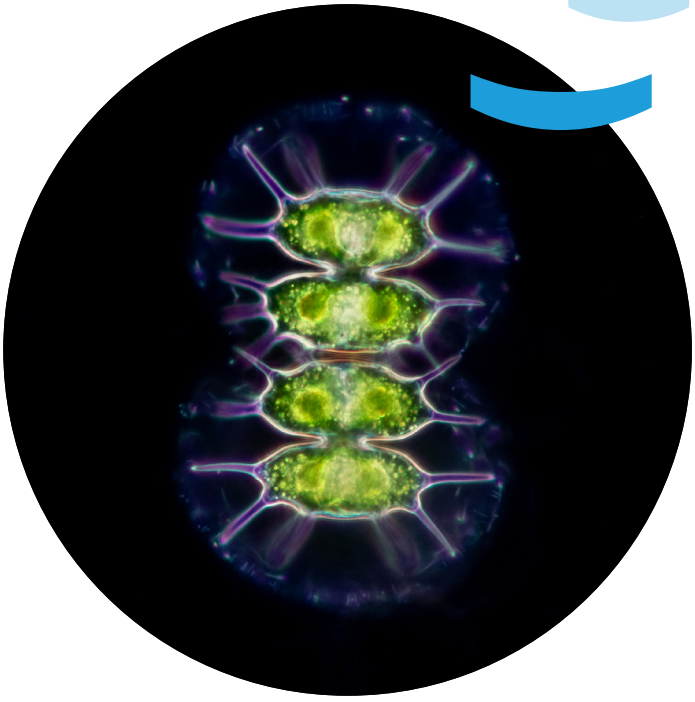


Photo credit: iStock.

Access to algae for experimentation

MSS

Archive of phytoplankton samples in Lugol's and ethanol from Scottish coastal waters, suitable for molecular analysis, available on request.

Contacts

EMBRC UK Liaison Officer:
liaison_uk@embrc.eu

EMBRC Access Officer, Davide Di Cioccio:
access@embrc.eu

Contacts

EMBRC national node contacts

EMBRC Belgium: liaison_be@embrc.eu

EMBRC France: liaison_fr@embrc.eu

EMBRC Greece: liaison_gr@embrc.eu

EMBRC Israel: liaison_il@embrc.eu

EMBRC Italy: liaison_it@embrc.eu

EMBRC Norway: liaison_no@embrc.eu

EMBRC Portugal: liaison_pt@embrc.eu

EMBRC Spain: liaison_es@embrc.eu

EMBRC Sweden: liaison_se@embrc.eu

EMBRC UK: liaison_uk@embrc.eu

General inquiries

EMBRC Access Officer: access@embrc.eu

View & apply for EMBRC services:

https://embrc.eu/services/service-catalogue

EMBRC-ERIC
4 Place Jussieu
BC 93 75252 Paris Cedex 05
France

www.embrc.eu
Tel: +33 (0)1 44 27 63 37
info@embrc.eu

linkedin.com/company/embrc
youtube.com/c/embrc
@EMBRC_EU