

ECOS: Microbenthos Ecology, Toxin characterization and Carbon balance in relation to *Ostreopsis* spp bloom dynamics

Elisa Berdalet¹, Rosa Trobajo², Emilio Soler-Onís³, Marta Estrada¹, Beatriz Fernández-Gómez³, May Gómez³, Sofía Ibáñez-Homedes¹, Josep Lloret¹, David Mann², Ico Martínez³, Ted Packard³, Magda Vila¹

¹Institut de Ciències del Mar (ICM-CSIC), Passeig Marítim de la Barceloneta, 37-49, Barcelona

²IRTA, INSTITUT DE RECERCA I TECNOLOGIA AGROALIMENTARIES, Carretera de Poble Nou, La Ràpita

³Universidad de Las Palmas de Gran Canaria, Grupo de Ecofisiología de Organismos Marinos, (Iu-ECOQUA), Campus Universitario de Tarifa, Las Palmas de Gran Canaria

Summary

The project ECOS is focused on the microalga *Ostreopsis*, a benthic dinoflagellate of tropical origin that seems to be expanding its biogeographic distribution towards temperate coastal areas. In these habitats, high biomass blooms of *Ostreopsis* spp. are related with respiratory and cutaneous irritations in beach users and with alterations in the biology of some marine fauna, including massive deaths (Berdalet et al. 2022). Concurrently, the presence and blooms of *Ostreopsis* have been documented in "pristine" areas such as certain beaches of the Canary Islands (Fernández-Zabala et al. 2022).

The general aim of the ECOS project is twofold:

- i) To evaluate for the first time the contribution of the high-biomass *Ostreopsis* spp blooms to the carbon balance of coastal ecosystems.
- ii) To progress in the understanding of the ecological processes involved in the proliferation and toxicity of the microalga *Ostreopsis*, with the ultimate goal of preventing harmful impacts of this microalga on humans as well as on the ecosystem health.

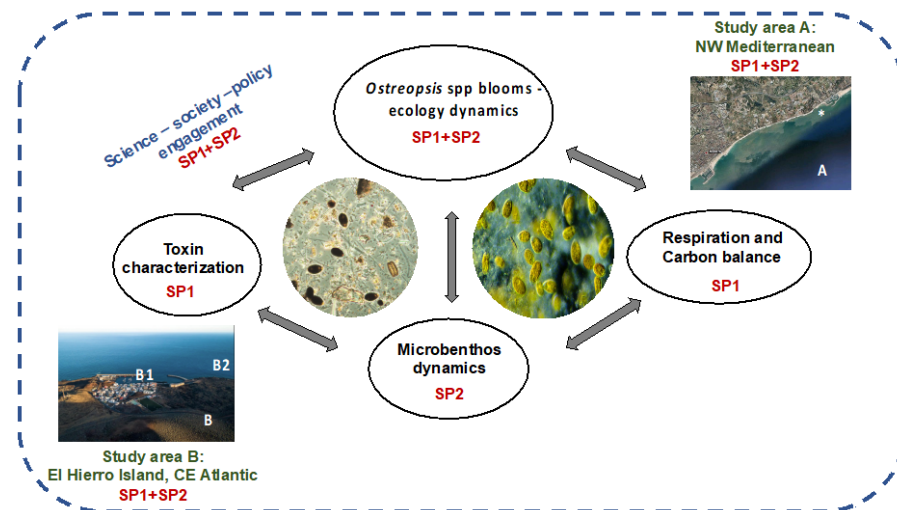
ECOS started in September 2023 and will last for three years. The research is organized into two linked subprojects: ECOS-TOXC, focused on *Ostreopsis* bloom toxicity and carbon balance, and ECOS-COM, addressing the biodiversity and ecology of the microphytobenthos associated with *Ostreopsis*, especially the dominant group, diatoms. Three research teams based at the ICM-CSIC, IRTA-La Ràpita and the ULPGC are coordinated under ECOS.

Methods

ECOS general objectives are addressed through studies in **two contrasting environments**:

- A. The beach of Sant Andreu de Llanerres, **NW Mediterranean**, affected by different human (coastal destruction, sewage and agriculture fertilizers runoff, harbours) and climate pressures (sea level rise and warming), a historical and reference site in the world.
- B. The **El Hierro Canary Island**, a climate change sentinel site in the Central-East Atlantic (Macaronesia) region, where *Ostreopsis* seems to be expanding and blooms occur in late autumn just off a pristine beach and an anthropogenically affected area (La Restinga harbour).

Samples will be collected along one year in El Hierro and two years in Llanerres, with different frequency (monthly, bi-weekly or weekly) depending on the *Ostreopsis* spp blooms events. Data will be obtained on physico-chemical parameters (temperature, salinity, nutrients), microscopy and metabarcoding characterization of the microbenthic communities (Pérez-Burillo et al. 2021), respiratory enzymes and carbon related compounds estimated in the total and smaller than 20 µm size fraction, toxins.



Expected results

The obtained data will contribute to:

1. Characterize the toxicity of the *Ostreopsis* spp. blooms in El Hierro and to compare it with the toxin temporal variability observed in the Sant Andreu de Llanerres hotspot.
2. Characterize the carbon balance (source or sink) of the *Ostreopsis* blooms at the local scale of the affected coastal areas.
3. Understand *Ostreopsis* dynamics in relation to the accompanying microbenthos (with emphasis on diatom and other benthic dinoflagellates) and environmental variables over the annual cycle at the two contrasting sites (Mediterranean vs Atlantic; anthropologically impacted vs more pristine; summer vs late autumn bloom).
4. Make a synthesis and comparative analysis of the *Ostreopsis* bloom dynamics in contrasting environments to discriminate the natural and anthropogenic factors driving them.
5. To transfer the knowledge obtained in the project to society, and in particular to policy makers, to explore science-based strategies to minimize (if possible) the occurrence of the *Ostreopsis* events and mitigate their impacts in the environment and human health.

Agradecimientos

The coordinated ECOS project, PID2022-138753OB-C21 (PI E. Berdalet) and -C22 (PI R. Trobajo) is funded by the MINISTERIO DE CIENCIA E INNOVACIÓN of Spain, with 391.250€ (total).

Bibliografía

Berdalet, E. et al. 2022. *Harmful Algae* 119: 102320; Fernández-Zabala et al. 2022. *Harmful Algae* 117: 102271; Pérez-Burillo, J., Trobajo, R. et al. 2021. *Sci. Total Env.* 798: 149029.