REPORT ON POGO WORKING GROUPS

Contractor's Report

Title of Working Group: CEODOS Chile: A consortium for surveying the coastal ocean in the eastern South Pacific

Name of Contractor: **Camila FERNANDEZ**

Names of Participants:

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Diego Narvaez (UdeC)
Matthew Mazloff (SIO)
Falk Feddersen (SIO)
Seth John (USC)
Veronica Molina (UPLA)
Carina Lange (UdeC)
Mireia Mestre (UdeC)

Total expenditure to be reimbursed (please attach a financial report with copies of receipts):

See information in annex.

1) Please provide a brief description of the activities undertaken by the working group.

During the duration of this WG we carried out several activities that gave a pathway for future collaborations:

- First workshop at Universidad de Concepción : This meeting was held at the COPAS center and was in Hybrid mode. The CEODOS Consortium met in order to establish a plan for future actions and sample analysis. A common declaration was signed and published after the workshop.
- Second Workshop in Universidad de Concepción- Between UdeC and Scripps Oceanographic Institution. Another aspect of cooperation in this WG touches the future observation programs in the ESP ocean. This was assessed during a workshop held at Universidad de Concepción. During this meeting we coordinated further actions for integrated experimental observation as well as programs for human capital training.
- Cruises for carbon fixation monitoring : Based on the engagement of the chilean community to map and observe the chilean coastal ocean in its integrity every 5 years.
- Metadata opening task force meetings : This smaller group has been meeting weekly for the last 4 months to work on the genomic and oceanographic data of the TARA MICROBIOME expedition. This data will be open upon the publication of a paper currently under preparation.
- Summer schools: Austral Summer Institute ASI at Universidad de Concepcion in January 2024; GOOD OARS CLAP COPAS Summer School at Universidad Catolica del Norte Coquimbo November 2023.

2) Please describe the milestones and deliverables achieved.

The WG worked closely with colleagues in CMM and COPAS (Chile) along with international partners (USA, France). We held three workshops in total and are currently working on the publication of the first set of data of TARA MICROBIOMES while continuing the CEODOS program of ocean observation at high latitudinal gradients.

-**First workshop CEODOS Chile at UdeC:** was organised at UdeC on April 21st 2022. Colleagues from the CEODOS Consortium met with the objective of releasing a declaration of interest for the continuation of the CEODOS project. This declaration was a consolidation of the program CEODOS Chile and marked the beginning of the second sampling effort for the Chilean coast (the first one being TARA MICROBIOMES). This was a critical milestone for the consolidation of this WG. (See annex, The signed declaration).

-**Second workshop Santiago de Chile and Valparaíso CEODOS Chile**. A second working meeting was held at Universidad de Chile and Valparaíso for the coordination of genomics and biogeochemical data in the frame of the first manuscript of TARA MICROBIOMES. The workshop was entitled "*Towards a modern analysis of omics data of the Ocean — Mission Microbiome: CEODOS and AtlantEco expeditions*" was held at Universidad de Concepción (Santiago headquarters) and institute of Complex Systems (Valparaíso) from 15 – 18 May 2023.During the meeting the different groups

interacted and presented advances to the WG. The program can be seen at https://eventos.cmm.uchile.cl/omicsceodos/program/.

- **Third workshop, UdeC, Scripps and CEODOS Chile:** This workshop was held 22 – 24 April 2024 at the UdeC campus in Concepción, Chile. The main goal of the workshop was to establish a program and planned schedule for collaboration through Joint projects, including field and lab opportunities, Joint manuscripts, Student exchange, Summer school (ASI).

The first day of the workshop was inaugurated by the Chancellor of UdeC, Dr. Carlos Saavedra. Dr. Leinen followed with an overview of the history of scientific activities between both institutions since the 2010 INSPIRE expedition on the Chile Margin (International Southeast Pacific Investigation of Reducing Environments), as well as the history of working together internationally through POGO (Partnership for Observation of the Global Ocean) and other activities such as the Conference of the Parties COP 25. The latter was hosted by Spain in 2019, under the Presidency of Chile. The Chilean Presidency of COP25 made the ocean a key theme of its presidency. The next presentation was by Dr. Lange who summarised educational activities since 2001 related to the Austral Summer Institute with SIO lecturers, as well as the outcomes of the first workshop of October 2019. Thereafter, the day was dedicated to short presentations from all registered participants with the purpose of showing current research and aspirations for collaboration. The second day was devoted to programming answers to funding calls and proposal writing for the next 12 months. It was decided that a first sequencing fund will be applied mid 2024 and an integrated field expedition to central Chile will take place in 2025. We present the program in an annex.

- **TARA MICROBIOMES**: This expedition generated unprecedented data along the Chilean Coast. A first exercise was to gather all samples analysed and generate a database that could describe the efficiency of the carbon pump.We identified 4 areas along the latitudinal gradient and discovered that the extent of suboxic waters is beyond the commonly accepted limit of 37°S but reaches 40°S and 400 m depth levels. First assessment shows a potential expansion of the oxygen minimum zones which reached 40°S in early autumn, contrary to previously published data. This clearly indicated an overlooked importance of the transition zone between central Chile upwelling areas and the beginning of Austral conditions.

Continuous measurements were also performed for temperature, salinity, fluorescence, and FCDOM. Edson Gomez was selected for starting exploitation of FCDOM data in collaboration with Emmanuel Boss (USA). This is the first study of FCDOM data in Chilean waters and it will generate a PhD thesis and also a postdoctoral publication for Valentina Valdés (all in prep).. Because of the role in climate processes that the upwelling region has, this can be relevant for future public policies.

In 2023, the implementation of the PlantEco project, which is a derivative of CEODOS Chile program was submitted and accepted for funding by the FFEM fund in France (Ministry of the environment) is based on the case study in the austral Magallanes region. The idea of the project is to implement and identify marine protected areas based on plankton diversity and services associated (carbon pump) therefore complementing the common approach of macrodiversity criterion.

-Summer courses: We carried out 2 summer courses, in Concepcion (Austral Summer Institute XX; https://www.instagram.com/p/Cv-_oBJMICs/?img_index=1) and GOOD OARS CLAP COPAS course in Coquimbo (https://www.solas-int.org/publications/publicatios-reader/issue-36-international-good-

oars-clap-copas-summer-school.html). In both instances we received students from an average of 10 different countries. A total of 46 students were selected for both instances (26 for ASI and 20 for GOOD OARS). Topics in both courses were linked to climate change and the anthropocene, namely deoxygenation and long term changes in oceanographic variables.

- Ocean observation, we report a joint cruise with IFOP covering the latitudinal range 34°S to 42°S in September 2023. In this instance, we monitored phytoplankton diversity with the Flowcytobot with the objective of mapping variability in functional diversity along with the evaluation of the carbon pump. The cruise lasted 15 days and covered ⅓ of the Chilean coast. Two new cruises will be added soon to our observation network. Data from phytoplankton diversity will be available at copas-coastal.cl by the end of 2024.

Figure 1 shows the cruise track followed and the coverage achieved for this attempt to remap the Chilean coast.

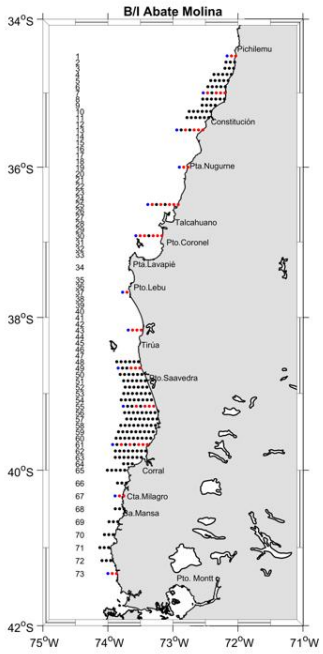

Figure 1: Track of CEODOS II cruise on board of Abate Molina (joint cruise IFOP-COPAS).

3) Is this Working Group likely to continue to meet beyond the dates outlined in the original proposal?

This working group has continued its activity in three fronts:

1) Student and young researcher training: Currently there is one ongoing PhD thesis on the subject of FCDOM distribution, oceanographic factors influencing its role in biological productivity. Also, a young researcher of the COPAS centre (Valentina Valdes) is making the liaison between CMM, CNRS and COPAS teams for the first paper of the CEODOS expedition.

2) The continuing of the carbon pump monitoring in cruise opportunities along the Chilean Coast. Since 2023, CEODOS Chile has covered more than 3000 km of coastal ocean in a latitudinal gradient. This was achieved by obtaining ship time funds from ANID and using two continuous instruments focused on carbon cycle parameters as well as phytoplankton diversity.
3) PLantEco project. Funded by the FFEM in France, the project is focused on proposing marine protected areas based on plankton diversity in order to preserve carbon fixation areas. This project is set to continue for 2 more years.

4) Please provide your comments on the POGO-funded Working Group Initiative (e.g. has the funding made a significant difference in the progress of this Working Group?).

The POGO-Funded Working group initiative is a good platform for enhancing collaboration and consolidating joint projects. In our case, planning the workshops had to be harmonised with sample analyses and sequencing. Therefore, the flexibility of the program was helpful in organising our cooperation.

Please return completed form by e-mail to pogoadmin@pml.ac.uk and enclose a copy of the Workshop report, if applicable.