

Start	2024	02	27	Malaga, Spain
End	2024	03	17	Barcelona, Spain

SCIENTIFIC INTEREST & CAMPAIGN OBJECTIVES

The leg from Malaga (Spain) to Barcelona (Spain) in February/March 2024 was the first leg of the second phase of the **Tara EUROPA** expedition that focuses on the Mediterranean Sea in 2024 (April 2023 – July 2024; <https://fondationtaraoccean.org/en/expedition/tara-europa/>). **Tara EUROPA** is the ocean part of a larger program, **TREC** – Traversing European Coastlines (<https://www.embl.org/about/info/trec/>) –, whose main goals are to: (i) study the invisible biodiversity at the land-sea interface across 19 European countries from Finland to Greece, and understand the effect of environmental changes on the interactions and evolution within and between ecosystems (soil, sediments, air, water); (ii) understand the impact of human activities (pollution and global change) on marine coastal biodiversity and ecosystems; (iii) share systems bio/ecology knowledge and advanced technologies with scientists and the general public from all coastal European countries.

Within this framework, a team of 6 international researchers and engineers on board *Tara* realize the sampling of coastal waters and aerosols in synchronization with a team from EMBL that conducts sampling of shallow water, sediments, and soils. The sampling sites are pre-selected along the coastline or in estuaries and represent either pristine or human-impacted (agriculture, urban areas, ports, industry) environments. Usually, *Tara* samples a single station at regular coastline sites, and 2 to 3 onshore to offshore stations in estuarine settings to allow for the characterization of environmental gradients from brackish to marine waters, with a putatively decreasing impact from land biogeochemistry. The positions of the coastal stations are pre-adjusted based on historical remote-sensing (ocean color) and oceanographic (bathymetry, currentology) data, and can be slightly modified depending on real-time remote sensing data and weather/navigation conditions. Overall, the *Tara Europa* stations represent coastal water masses with varying degrees of land-sea connectivity and anthropogenic impacts.

At each *Tara Europa* station, the team onboard conduct a complex set of at least 50 protocols and collect ~ 100 samples that are stored in appropriate conditions for future analyses in land-based laboratories. The different methodological approaches focus on the characterization of the biological community composition and diversity present in the water (from viruses to animals, from genomes over expressed genes, metabolites, proteins, to cellular and organismal features), together with contextual physical, biophysical, chemical and biogeochemical properties.

PERSONNEL

Table 1: Crew and Scientific personnel onboard Tara from 27th February 2024 to 17th March 2024

ROLE		NAME, Surname, Affiliation
1	CREW - Captain	Samuel Chaffron
2	CREW - 1st Officer	Morgann Andrieux
3	CREW - Mecano	Dave Picaud
4	CREW - Deck	François Aurat
6	CREW - Cook	Sophie Bin
7	CREW - Media	Louise Cognard
8	GUEST - Artist	Enrique Ramirez, Yoichi Ochiai
9	GUEST - Observer	
10	SCIENCE - A - Oceano. Engineer	Thomas Linkowski
11	SCIENCE - B – Bio. Engineer	Morgane Guillam
12	SCIENCE - C - W-Lab genomics	Odette Beluche
13	SCIENCE - D – Deck Chemical profiling/ Chief Scientist	Jessika Füssel
14	SCIENCE - E – Deck	Marta Furia
15	SCIENCE - F - S-Lab sorting/imaging	Erwan Legay

REALIZED STATIONS



Figure 1: Satellite view of the geographical sampling locations of Tara EUROPA between Malaga, Spain and Medes Islands, Spain.

SUMMARY OF ACTIVITIES

Table 2: Dates, Station number, geographical Location and samples obtained during the Tara EUROPA leg of March 2024.

Date	Station #	Name	Latitude	Longitude	Cas t	Pump A20	Net 5 µm	Net 20 µm	Net 200 µm	Net 680 µm	Bow Pole	ASM	eDNA	HTSRB	SML	Mercury	Aliens in Port	# of samples
29/02/2024	100	Marbella	36.462	-4.815	1	1	1	1	1	2	1	1	1	0	1	1	0	124
01/03/2024	101	Marbella offshore	36.345	-4.715	1	1	1	1	1	2	1	1	1	0	1	1	0	126
02/03/2024	102	Motril	36.7139	-3.5290	1	1	1	1	1	2	1	1	1	0	1	1	1	123
04/03/2024	103	Almeria	36.7989	-2.4332	1	1	1	1	1	2	1	1	1	1	1	1	0	125
05/03/2024	104	Almeria offshore	36.6583	-1.5159	3	1	1	1	1	2	1	1	1	0	1	2	0	154
07/03/2024	105	Offshore Mallorca	38.7134	2.51	1	1	1	1	1	2	1	1	1		1	1	0	124
08/03/2024	106	Bassal de s'Estanyol	39.2441	3.0636	1	1	1	1	1	2	1	1	1		1	1	0	126
09/03/2024	107	Sa Coma offshore	39.5152	3.6895	1	1	1	1	1	2	1	1	1		1	1	0	115
11/03/2024	108	Mallorca/Portocolom	39.4203	5.2828	1	1	1	1	1	2	1	1	1		1	1	0	123
12/03/2024	109	Sa Coma shore	39.5487	3.5545	1	1	1	1	1	2	1	1	1		1	1	0	125
13/03/2024	110	Mallorca / Badia d'alcudia	39.8045	3.1714	1	1	1	1	1	2	1	1	1		1	1	0	123

Legend Table 2:

Pump A20: Deployment of a tubing system in sub-surface waters, connected to a peristaltic pump installed in the wetlab on *Tara's* deck. Water is then filtered through large membranes to concentrate plankton biomass for genetic analyses.

Net: Deployment of various types of plankton nets with specific mesh-sizes (5 µm, 20 µm, 200 µm or 680 µm), either on *Tara's* deck (Decknets, 5 µm, 20 µm) or overboard (200 µm or 680 µm).

Cast: Deployment of the Rosette water sampler equipped with a CTD (holding 5x12L and 8x8L Niskin bottles and sensors) to collect a suite of biophysical data and water samples along the water column.

Bow pole: Manual handling of a long stick for clean, contamination-free collection of small volumes of surface water stored for laboratory analyses of trace element analysis.

ASM (Aerosol Sampling Mast): Pumping system installed on *Tara's* mast to collect and concentrate aerosols.

HTSRB (Hyperspectral Tethered Spectral Radiometer Buoy): Deployment of a floating device equipped with sensors to measure optical properties (hyper-spectral radiometry) of surface seawater.

SML (Surface Micro-Layer sampler): Deployment of a screen sampler to collect 1L of surface microlayer water.

Mercury: Specific filtration protocol to measure mercury from a Niskin bottle, performed at estuarine sites.

Aliens in port: Deployment of an *in-situ* pumping system (*Watera* capsules) to concentrate biomass from 30L of subsurface water for eDNA analyses.

16/03/2024	111	Medes offshore	42.0015	3.4431														154
15/03/2024	112	Medes middle	42.0432	3.2561	1	1	1	1	1	2	1	1	1		1	1	0	124
17/03/2024	113	Medes shore	42.0422	3.2066	1	1	1	1	1	2	1	1	1		1	1	0	124

INVENTORY OF SAMPLES COLLECTED DURING THE CAMPAIGN

Table 3: Total number of samples preserved and storage conditions for each of the 64 protocols performed during the scientific stations onboard Tara.

protocol name	Protocol category	Storage T°	TOTAL of samples
PM	Oceanography/Bigeochemistry	- 20°C	49
FOI	Oceanography/Bigeochemistry	- 20°C	42
PA	Oceanography/Bigeochemistry	- 20°C	14
S023-L (long read)	Nucleic Acids/Sequencing	- 20°C	16
S320-L (long read)	Nucleic Acids/Sequencing	- 20°C	16
E20	Nucleic Acids/Sequencing and imaging	- 20°C	14
MB320	Chemical profiling	- 20°C	14
MB033	Chemical profiling	- 20°C	14
PPL	Chemical profiling	- 20°C	56
HLB	Chemical profiling	- 20°C	56
S20-L	Nucleic Acids/Sequencing	- 20°C	14
S200-L	Nucleic Acids/Sequencing	- 20°C	14
S680-L	Nucleic Acids/Sequencing	- 20°C	14
MB20	Chemical profiling	- 20°C	14
NUT	Oceanography/Bigeochemistry	- 20°C	42
ASM	Aerosol	- 20°C	14
pMeHg	Oceanography/Bigeochemistry	- 20°C	0
pTHg	Oceanography/Bigeochemistry	- 20°C	16
Hg-20	Oceanography/Bigeochemistry	- 20°C	14
Hg-200	Oceanography/Bigeochemistry	- 20°C	14
Hg-680	Oceanography/Bigeochemistry	- 20°C	14
NAT	Oceanography/Bigeochemistry	- 20°C	52
PPN2	Oceanography/Bigeochemistry	- 20°C	39
fMeHg	Chemical profiling	4°C	16
fTHg	Chemical profiling	4°C	0
ufTHg	Chemical profiling	4°C	2

protocol name	Protocol category	Storage T°	TOTAL of samples
DGAS	Oceanography/Bigeochemistry	4°C	132
DGAS-EXE	Oceanography/Bigeochemistry	4°C	39
FC-P	imaging	LN2	32
SML-FC	imaging	LN2	28
FC-G	imaging	LN2	32
HPLC	Oceanography/Bigeochemistry	LN2	18
SML-320	Nucleic Acids/Sequencing	LN2	42
SML-023	Nucleic Acids/Sequencing	LN2	42
HC	Nucleic Acids/Sequencing	LN2	112
HC-G	Nucleic Acids/Sequencing	LN2	112
CP-G	Nucleic Acids/Sequencing	LN2	48
SG	Nucleic Acids/Sequencing	LN2	32
S023-S	Nucleic Acids/Sequencing	LN2	32
S320-S	Nucleic Acids/Sequencing	LN2	32
S20-S	Nucleic Acids/Sequencing	LN2	28
S200-S	Nucleic Acids/Sequencing	LN2	28
P023	Nucleic Acids/Sequencing	LN2	16
P320	Nucleic Acids/Sequencing	LN2	16
SG5	Nucleic Acids/Sequencing	LN2	32
S02-2000 QN	Nucleic Acids/Sequencing	LN2	0
SML-CP	Nucleic Acids/Sequencing	LN2	42
DICTA	Oceanography/Bigeochemistry	RT	16
SAL	Oceanography/Bigeochemistry	RT	9
MTE	Chemical profiling	RT	14
F200	imaging	RT	14
F680	imaging	RT	14

THg (from bow pole)	Chemical profiling	4°C	14
CDOM	Oceanography/Biogeochemistry	4°C	42
DOC	Oceanography/Biogeochemistry	4°C	42
TOC	Oceanography/Biogeochemistry	4°C	42
S<0.2 (Virus)	Nucleic Acids/Sequencing	4°C	32
FM5	imaging	4°C	32
FM20	imaging	4°C	28
eDNA	Nucleic Acids/Sequencing	4°C	14

F2000	imaging	RT	1
Flowcam	imaging	Data	14

TOTAL SAMPLES Tara Europa Malaga-Medes

1779

Table 4: Total number of samples preserved for each of the 4 protocols performed underway during the Tara Europa navigation. The details of the number of samples per protocol per stations can be found [@here](#).

protocol name	Protocol category	Storage T°	TOTAL of samples
AF	Aerosols	- 20°C	31
AS	Aerosols	LN2	31
HPLC underway	Oceanography/Biogeochemistry	LN2	1
FC-P underway	Imaging	LN2	1
FC-G underway	Imaging	LN2	1
SAL-underway	Oceanography/Biogeochemistry	RT	1
AI	Aerosols	RT	31

TOTAL SAMPLES UNDERWAY Tara Europa Malaga-Medes

97

STATION COMMENTS

Tara Europa Station #	Comments
100	First station of 2024! We started the station at sun rise and took about 6 h for all protocols. The station was long as we had to instruct the Operators E/F who had no experience with the work yet and we also included some new protocols.
101	Offshore station without the land team. The weather is grey and windy. We decided to use the 5- μ m decknet again instead of filtering water through a 5 μ m filter, which didn't work well as we had received the wrong filters.
102	Station started in the early morning (5:40 UTC) and we deployed the CTD rosette before sunrise. Wind and waves increased during the station. The 200 μ m net broke during the tow. Too much drift to deploy secchi disk.
103	Station is located very close to shore. There are a lot of greenhouses along the coast and we expect to detect some pollutants in the water samples. We sampled close to a small river output. A clear oxygen minimum between 8 and 10 m water depth, the oxygen saturation drops from 90 to 72%. We see a slight DCM at 10 m and relatively stable salinity and T°C.
104	We are sampling a 2nd depth for the first time during this mission! We deploy the second CTD to >1000m to record a profile and then sample at the base of the mix layer (MLD), as there is no DCM. The only Chl a peak is within the mixed layer at about 10 m. At stations with two depths, we do vertical tows for the large nets from 200 m rather than horizontal tows. To obtain enough water for all protocols that are performed at both depths we require to CTD rosette casts. The sea is calm, there is no wind and the sun is shining. 3 measures of salinity (at surface, 60m, and 1500m).
105	A lot of mucilage in the 680 and 200 μ m nets. Thomas had to rinse them very thoroughly much longer than usual. There is little wind.
106	Strong wind today with waves. The MilliQ system failed, ~16M Ω instead of 18.2 M Ω . We are still using the water for rinsing but we will need to change the filter pack.
107	We started the station directly at sun rise. Everything went smoothly.
108	The weather is excellent, no wind and sunshine. The land team is sampling in a bay while we are located just behind the cliff that forms the barrier on one side of the bay.
109	For the first time we observe slight thermal stratification with a thermocline between 4-5 m, the salinity remains constant throughout the water column. There is an interesting oxygen peak at 45m that we can't explain but that we can observe

	in both down- and up-cast. There is hardly any chl-a fluorescence at the surface and no DCM. Good weather, calm sea
110	Station in a bay close to a small river. Again developing thermal stratification with the thermocline at 6-7 m and no change in salinity throughout the water column.
111	Offshore station. We are sampling a 2nd depth again at the base of the mixed layer at the depth of the oxygen minimum at 75 m. There is no thermal stratification in the upper water column.
112	Very calm sea. We are at Medes Islands and sample the site of the Medes Island time series that is classified as pristine.
113	We are sampling along the land-sea transect between the shore and the Medes Island benthic time series station The area is beautiful and we are very close to the shore and the land team