Analysis on the scientific cooperation and research projects on the *Tara Artic and Tara Oceans* expeditions as an innovative model for International scientific cooperation on marine biodiversity

André Abreu - Tara Expeditions

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2-3 May, New York

Tara Expeditions : A private foundation to promote public research and implement scientific expeditions with the Tara vessel

- The scientific cooperation is built on a project basis gathering different universities, labs and institutes from different countires mutualizing the Tara vessel structure on trans-disciplinary researches around a common expedition.
- The projects are built on a bottom up approach : scientists from different countries and disciplines define a collective project.
- The scientists and Tara Expeditions crew also define a strategy to build bridges with civil society.

OUTREACH and EDUCATION

Build concrete outreach and pedagogic tools to support educational projects

- The website *www.taraexpeditions.org* releases information and educational materials and connect with temporary blogs and partners
- *Tara Journal* – popularization of the scientific activities
- *Tara Junior* – periodic review for youth and schools
- *From the boat to the Lab*: bridging data collection and data analysis on land for young public
- Production of movies and books for the general public
- Organization of political forums and meetings to bridge the gap between scientists and politicians
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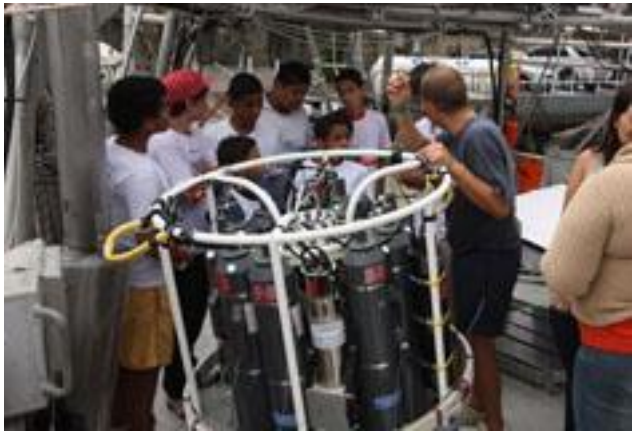


Important aspects related to sampling authorizations, access to the ZEEs areas and data sharing

- Access and freedom for sampling in ABNJs and ZEEs are a key issue concerning marine biodiversity research.
- Promoting International collaboration between different scientific fields and countries to overcome geopolitical constraints.
- Promote universal access to biodiversity samples and data, with public and common database of Marine Genetical Resources.

Tara Arctic

General Aspects

• From September 2006 to February 2008, Tara conducted a unique research mission over 507 historic days in extreme conditions.

•The schooner was the central platform for the DAMOCLES European scientific program during the International Polar Year. Embedded in and carried by the pack-ice, the schooner drifted through the Arctic sea with a dozen men and women on board.

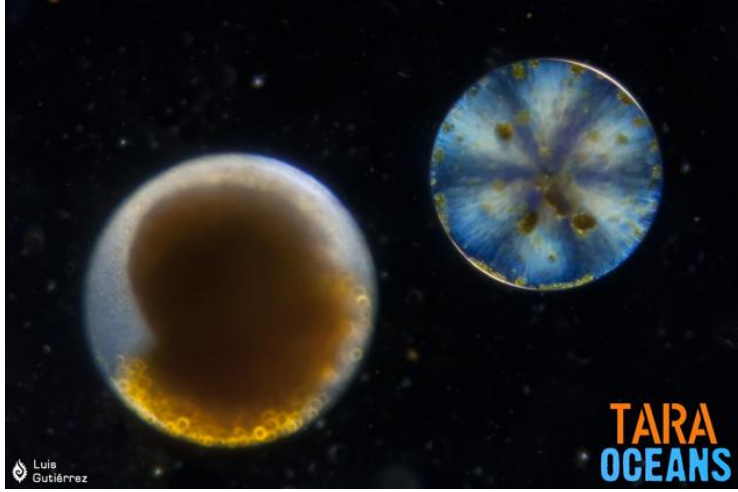
Tara Arctic

STEADY AS SHE FLOWS

In 1896, Fram became the first vessel to have ridden the Transpolar Drift Stream – one of the Arctic's ice currents. This year, Tara was the second, making the journey in less than half the time. The Transpolar Drift Stream is pushed along by westerly winds, while the other major ice current in the Arctic is the clockwise-circulating Beaufort Gyre, generated by the rotating winds created by a high-pressure atmospheric system

Tara Arctic

Tara Oceans Expedition



• Started in 2009, is the very first attempt to make a global study of marine plankton, a form of sea life that includes organisms as small as viruses and bacterias, and as big as medusas.

•Tara Oceans is a multidisciplinary programme with unique plankton sampling, including oceanographic, optical and genomic tools used to describe plankton (viruses, bacteria, archaea, protists and metazoans) in its physico-chemical environment with new and original methods.

•Various disciplines including oceanography, remote sensing, ecology, genomics, molecular biology of cells and systems, taxonomy, bioinformatics, data management and modeling are involved in processing data.

TARA OCEANS follow up:

OCEANOMICS project

Following the Tara Oceans Expedition, The OCEANOMICS project proposes a combination of sequencing protocols and high-rate imaging in order to extract information from this unique collection of samples, on several systemic levels: DNA, RNA, and phenotypes.

With a 8M€ funding from the “investissement d’avenir” french research funding, OCEANOMICS will also serve as a case-study to define a balanced legal model for the bio-prospection of marine plankton.

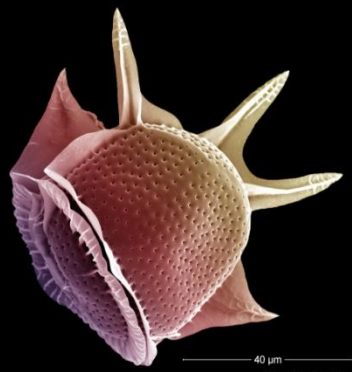
Involving several major French and international research centers (CNRS, UPMC, GENOSCOPE, ENS, EMBL), OCEANOMICS will operate at the crossroads of several national and European initiatives, and will act as a powerful catalyst for France’s important entry into the "Blue Revolution".

CNRS UPMC INSU
Station Biologique
Roscoff

To bring out specific structural features, the coloring was digitally added by Noan Le Bescot in 2010.

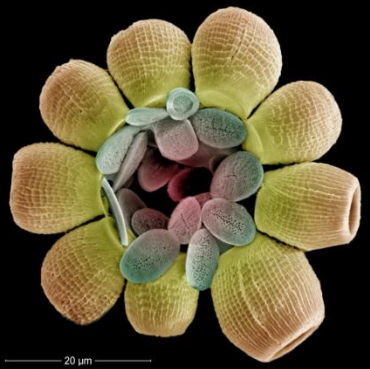
Protistan diversity — Tara Oceans

Adriatic Sea



40 µm

Ceratocorys gourreti

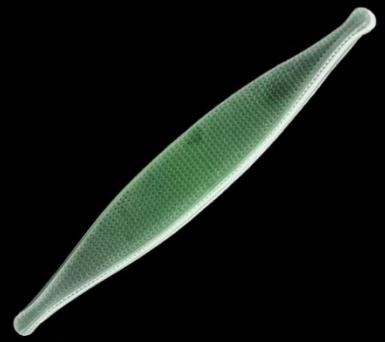


20 µm

Scyphosphaera apsteinii

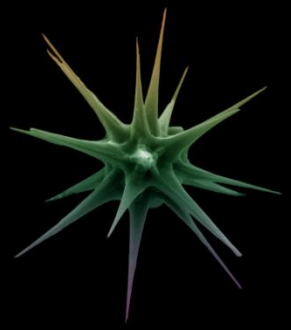
5 µm

Calcidiscus leptoporus



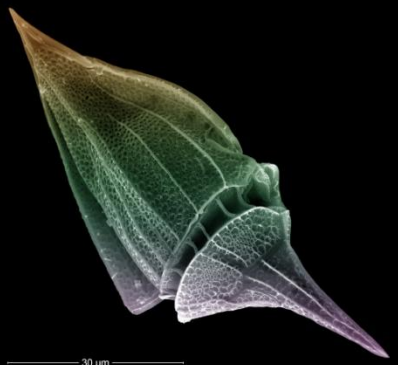
10 µm

Diatomée pennée



10 µm

Acantharea sp.

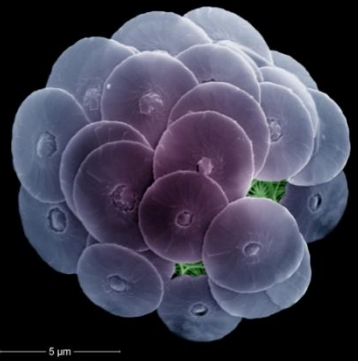


30 µm

Oxytoxum milneri

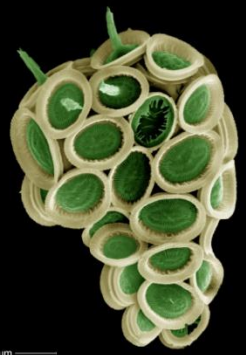
30 µm

Radiolaria nasselarida



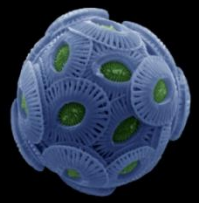
5 µm

Syracosphaera anthos



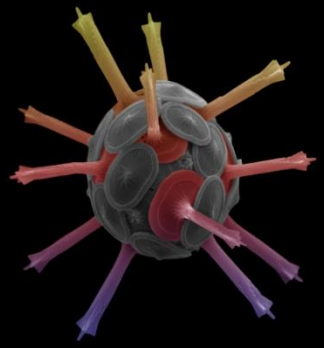
10 µm

Syracosphaera pulchra



5 µm

Emiliania huxleyi



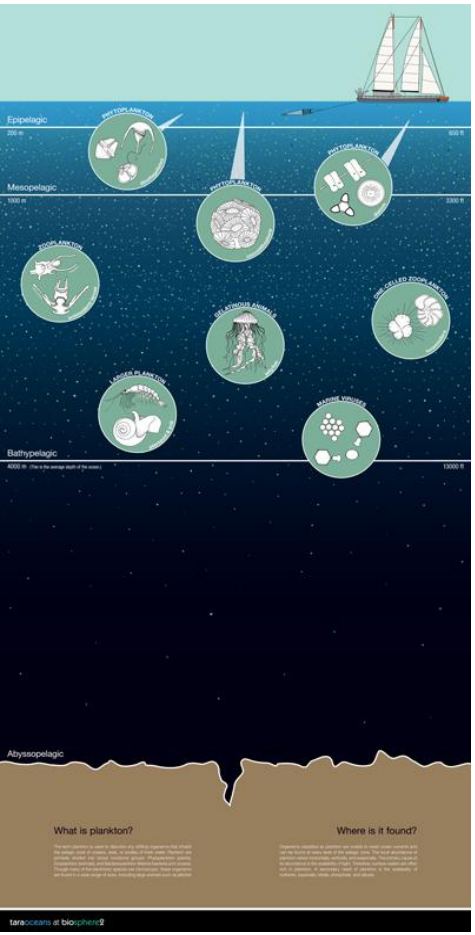
10 µm

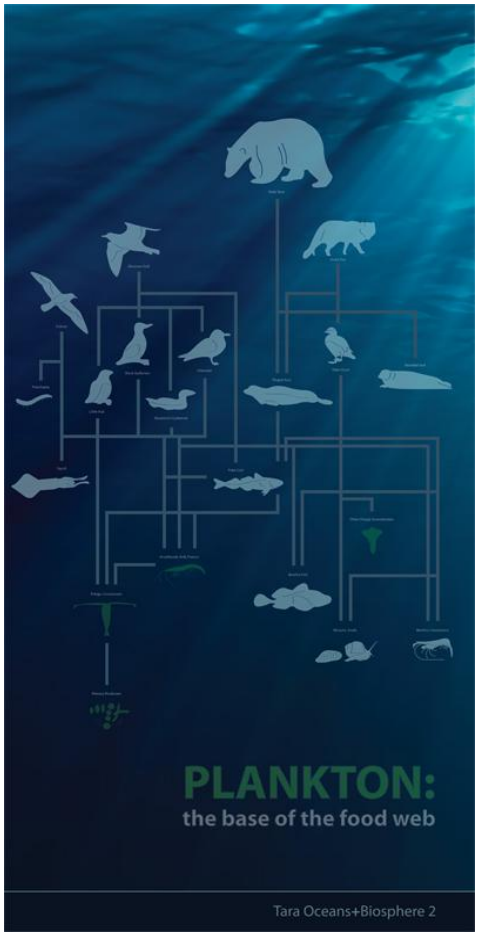
Rhabdosphaera clavigera

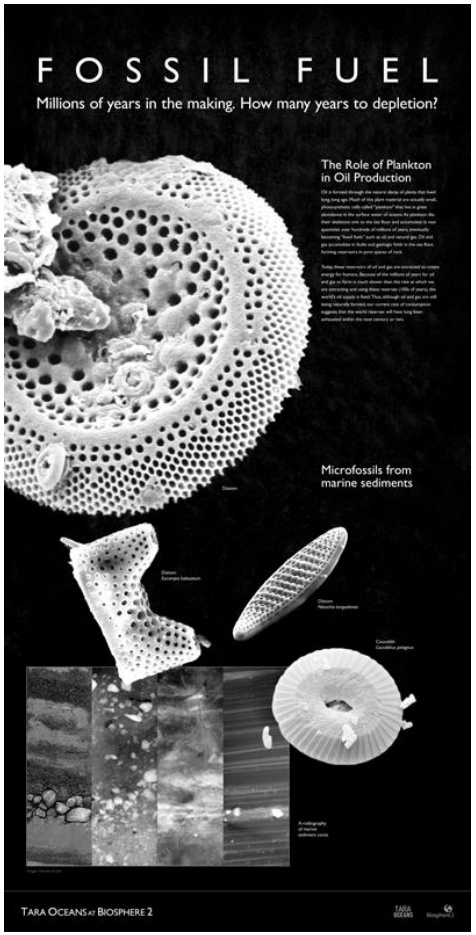
20 µm

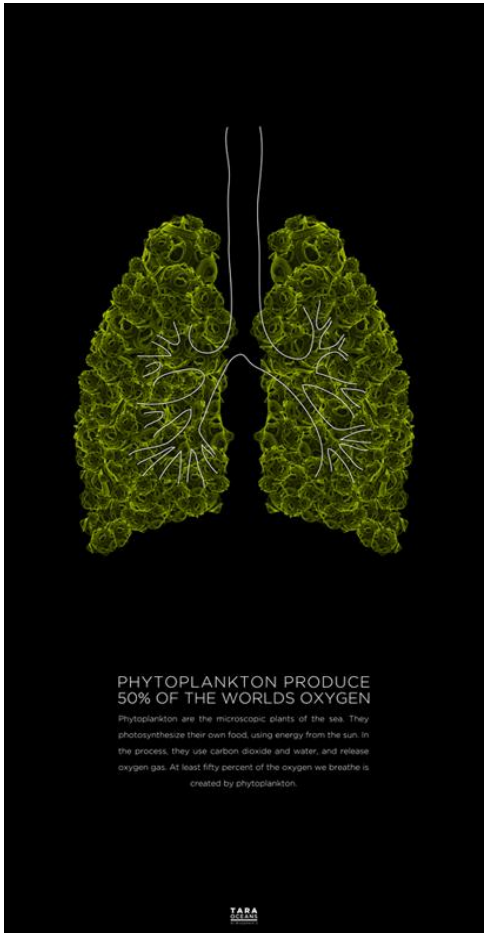
Dinoflagellé

Tara Oceans


Epipelagic
Mesopelagic
Bathypelagic
Abyssopelagic
What is plankton?
Where is it found?
taraoceans at biosphere2


PLANKTON:
the base of the food web
Tara Oceans+Biosphere 2


FOSSIL FUEL
Millions of years in the making. How many years to depletion?
The Role of Plankton in Oil Production
Microfossils from marine sediments
TARA OCEANS AT BIOSPHERE 2


PHYTOPLANKTON PRODUCE 50% OF THE WORLDS OXYGEN
Phytoplankton are the microscopic plants of the sea. They photosynthesize their own food, using energy from the sun. In the process, they use carbon dioxide and water, and release oxygen gas. At least fifty percent of the oxygen we breathe is created by phytoplankton.

TARA OCEANS POLAR CIRCLE

-Departure from Lorient on next May 19, for a expedition around the Arctic Ocean via the Northeast and Northwest passages.

- Same scientific consortium in Tara Oceans + new protocols specific to artic issues

- Important media coverage with outreach tools and production of documentaries

International scientific cooperation Aspects

• Supported by the CNRS, CEA, EMBL and other private and public partners, this mission unites biologists and oceanographers. They will focus on plankton biodiversity in the Arctic and other specific issues in this region susceptible to climate changes.

Research at the sea-ice edge, where plankton activity is most important. All scientists and institutes involved in Tara Oceans working along with other laboratories specialized in Arctic research including the Takuvik laboratory (Joint International Research Unit, CNRS/Laval University), the Shirshov Institute of Oceanology (Moscow) and LOCEAN laboratory (CNRS/UPMC/MNHN/IRD).

Exemple of Specific programs on the scientific mission

- Study of plastic pollution, mercury and air pollutants in the Arctic by KAUST and OMP/IFREMER for mercury.

- Study of ocean "color", its composition and surface pigment particles for NASA by the University of Maine, USA.

- Specific study of spring phytoplankton blooms at the ice pack's edge, by the University of Laval, Quebec and the ENS, France

Scientific cooperation challenges on extreme conditions in the north pole

A Team of scientists united since 2009, with collective expertise on a global ecosystem approach

Full equipment from Tara Oceans, coupled with Tara Expeditions' logistical expertise in extreme environments are all key factors for success of the voyage.

All onboard for a healthy planet.

The Futur we want depends on a living Ocean !

Thankyou !

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