



BIOFILM AND MICROBIOME
BLUE BIOTECHNOLOGIES



LBCM

Laboratoire de Biotechnologie
et Chimie Marines



THEME 1: BIOFILMS AND MICROBIOME

- ▶ Different actors of the biofilm (bacteria, microalgae)
 - ▶ Physical parameters of the adhesion
 - ▶ Cross-talk between organisms (bacteria/bacteria; bacteria / sponges)
- ▶ Microbiome of invertebrates (sponges and Holothuria)
- ▶ Formation of *Pseudoalteromonas* biofilms and interaction between microorganisms

THEME 2: BLUE BIOTECHNOLOGIES

- ▶ Upgrading of marine bioresources with eco-friendly processes
- ▶ Selection and development of probiotics for aquaculture
- ▶ Extraction of Bioactive Metabolites using eco-friendly processes
- ▶ Eco-friendly development of antibiofilm/antifouling surfaces
 - ▶ Bioremediation of aquatic environments
 - ▶ Formulation of antifouling coating
 - ▶ Bioremediation of aquatic environments

Applications in medical, cosmetic, food, and environmental area

Around **40** members including
19 professors and assistant professors
15 peer-reviewed journals / year
4 PhD defenses / year
1 technological platform

CLP

CLP project concerns new marine probiotic bacterial strain for shrimp feed applications.



LAB-COM SAFER

The **Lab-Com SAFER** is a shared laboratory between LBCM and Nautix company. The aim of Lab-Com SAFER is eco-friendly development of antibiofilm / antifouling surfaces in order to create new formulations of antifouling paints.



MEXICAN ECOS NORTH

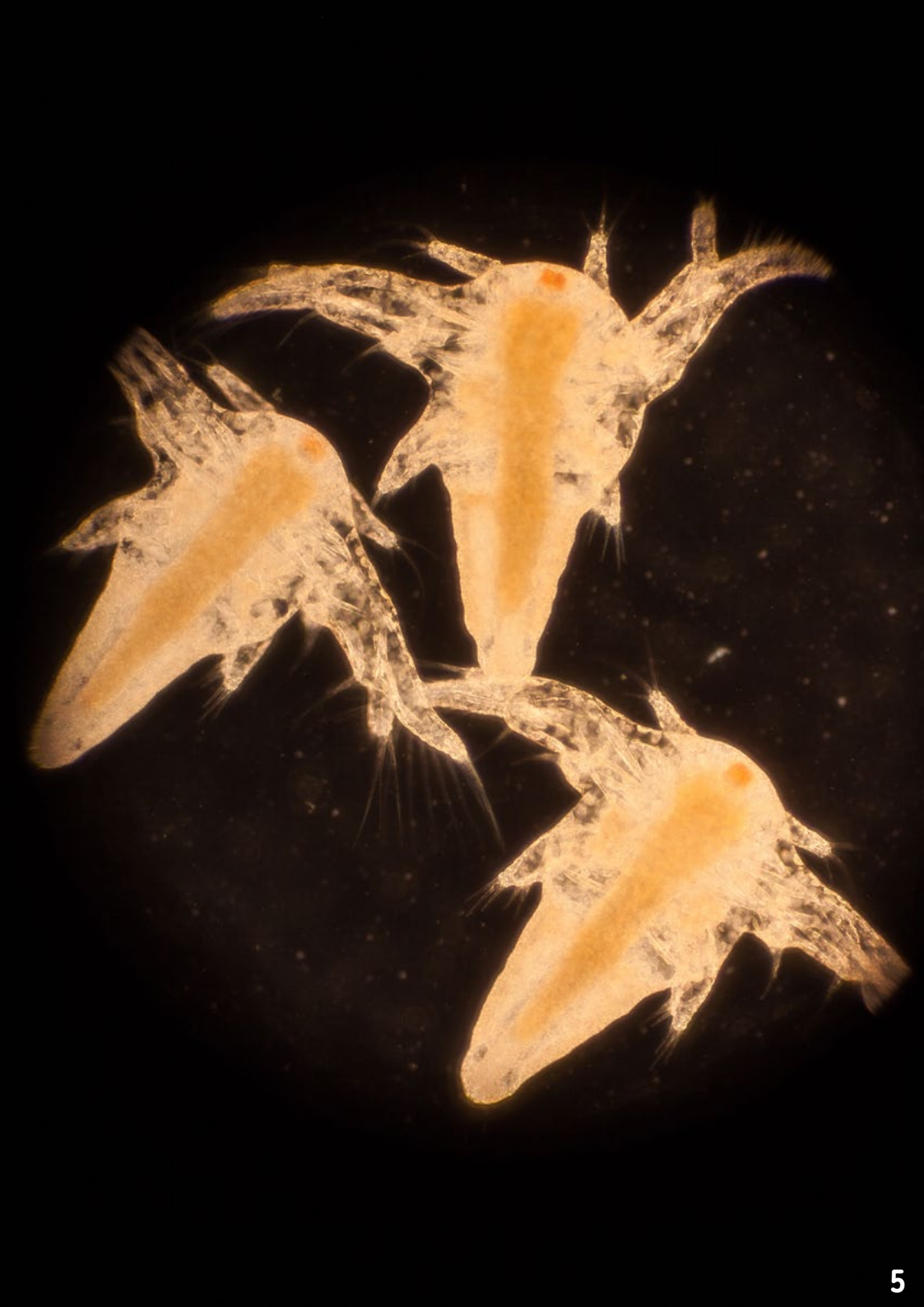
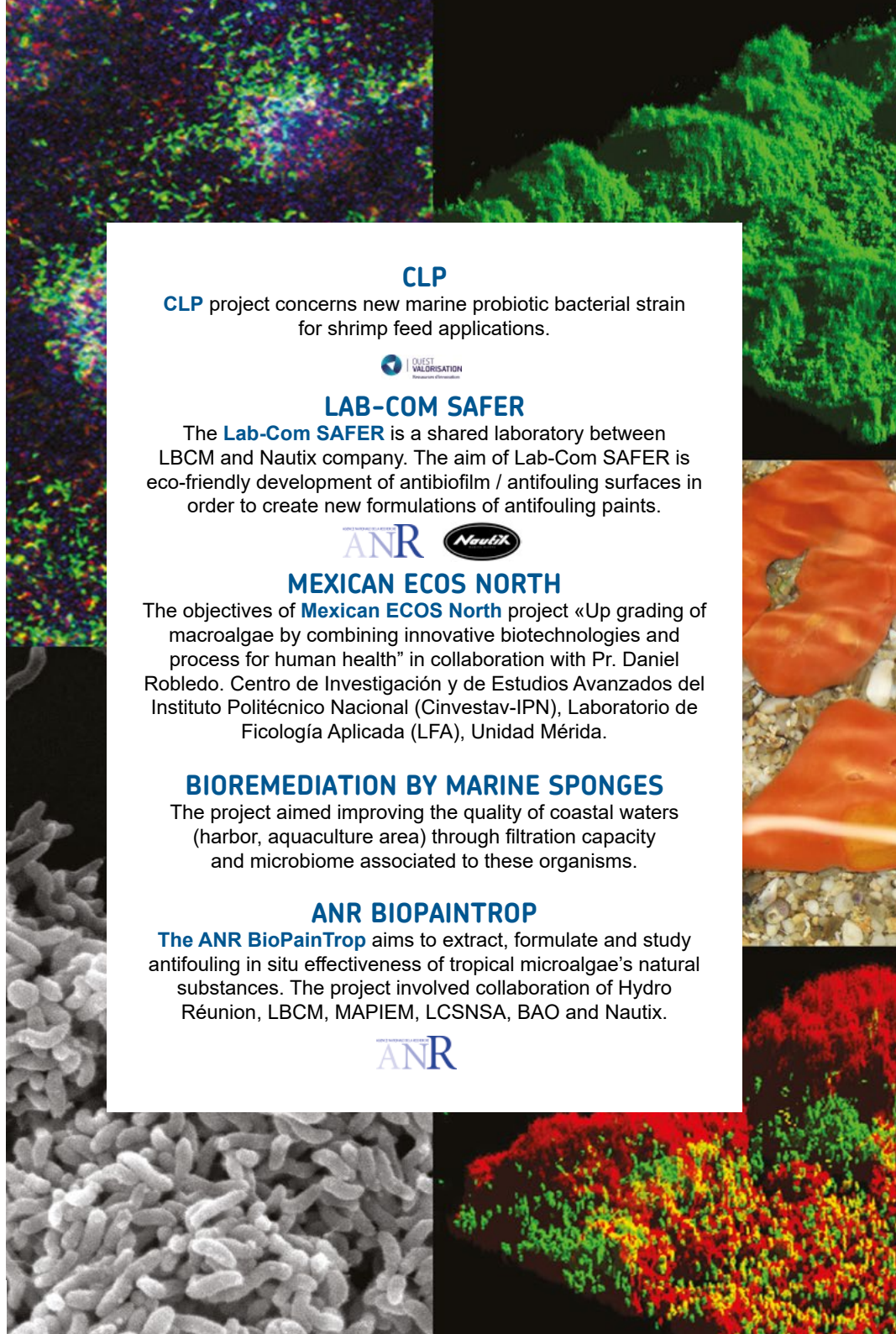
The objectives of **Mexican ECOS North** project «Up grading of macroalgae by combining innovative biotechnologies and process for human health” in collaboration with Pr. Daniel Robledo. Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (Cinvestav-IPN), Laboratorio de Ficología Aplicada (LFA), Unidad Mérida.

BIOREMEDIATION BY MARINE SPONGES

The project aimed improving the quality of coastal waters (harbor, aquaculture area) through filtration capacity and microbiome associated to these organisms.

ANR BIOPAIN TROP

The **ANR BioPainTrop** aims to extract, formulate and study antifouling in situ effectiveness of tropical microalgae’s natural substances. The project involved collaboration of Hydro Réunion, LBCM, MAPIEM, LCSNSA, BAO and Nautix.



MICROSCOPY

- Epifluorescence (normal/inverted)
- Confocal Laser Scanning (CLSM)
- Scanning electron (SEM-shared)
 - Atomic force (AFM-shared)

ANALYTIC CHEMISTRY

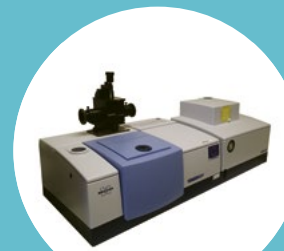
- Chromatographs: HPLC, HPAEC, HPSEC, GC MS, UPLC MS
- Mass Spectrometers (ESI-ionic trap, MALDI-TOF, Q-TOF)
 - Infrared Spectroscopy with HTS-XT module and ACP
 - Spectrofluorimeter, Goniometer
 - Downfield NMR
 - Karl-Fisher coulometry

MICROBIOLOGY, BIOCHEMISTRY, CELLULAR AND MOLECULAR BIOLOGY

- Microbiological area and Laboratory P2
 - 1D/2D Electrophoresis
 - Classic and real time PCR
 - Microplate reader UV-Visible
 - Photobioreactors

FORMULATION

- Emulsifier Rayneri • Viscosimeter
- Automatic paint applicator • Steri-cycle incubator



PLATFORM DEVELOPED FOUR MAIN ANALYSES

- *In situ* static/dynamic antifouling/fouling release effectiveness study
- Leaching assay (AFNOR normative assay)
- Ecotoxicological assays on marine microorganisms
 - Metals ions detection

ECOTOXICOLOGICAL ASSAYS

- **Crustacean - Fish acute toxicity:** *Dicentrarchus labrax* (fish) and *Artemia salina* (crustacean) FD ISO 14669 - *Artemia* / Guideline OECD 203 - *Labrax*).
- **Bivalve semi-chronic assay monitoring of embryony abnormalities** *Crassostrea gigas*: XP T90-382 AFNOR's standard.
 - **Microalgae growth inhibition:** *Phaeodactylum tricornutum* model following NF EN ISO 10253 AFNOR's standard.



• Leaching assay:

The leaching assay is mainly used to study the substances released in artificial sea water. Leachates are analysed by polarography to determine free metal ions concentration.

• Metal ions detection:

The evaluation of metal ion concentration (copper II and zinc II) is performed using voltamperometry (VA 884 Professionnal - Metrohm).

COMPLEMENTARY STUDIES

- **Eco-friendly processes of extraction and Biomolecules characterization**
 - Evaluation of anti-adhesion. anti-biofilm, anti-viral, anti-bacterial activities
- Evaluation of cosmetic potential of marine molecules
- Synthesis of biological molecules and analogs, polymers.
 - Formulation of antifouling paints.



Diponegoro University, Fakultas Perikanan dan Ilmu Kelautan
Kampus Tembalang, Semarang, **Indonesia**.



Centro de Investigación y de Estudios Avanzados del Instituto
Politécnico Nacional (Cinvestav-IPN), Laboratorio de Ficología
Aplicada (LFA), Departamento de Recursos del Mar,
Unidad Mérida, **Mexico**.

Ireland
NUI National University Ireland - Galway

Canada
Faculty of Agriculture Dalhousie (Truro)

USA
A&M (TAMU) University in the Department
of Biomedical Engineering

Tunisia
National Engineer school Sfax

Marocco
Tétouan University

Malaysia
Institut of Marine Biotechnology,
University Malaysia
Terengganu

CONTACT US

Laboratoire
de Biotechnologie
et Chimie Marines

Pr. Nathalie BOURGOUNON
Campus de Tohannic
56017 VANNES CEDEX

☎
02 97 01 71 55

✉
nathalie.bourgougnon@univ-ubs.fr

Website :
www-lbcm.univ-ubs.fr

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