

NETWORK OF TROPICAL AND SUBTROPICAL BIODIVERSITY RESEARCH IN OUTERMOST REGIONS (ORs) AND OVERSEAS COUNTRIES AND TERRITORIES (OCTs) OF EUROPE IN SUPPORT OF SUSTAINABLE DEVELOPMENT

1ST JOINT CALL – 2010

About ORs and OCTs

ORs and OCTs are characterized by three main features: (a) their marine and terrestrial biodiversity is exceptional, (b) their environments are particularly vulnerable to the impacts of climate change, natural hazards and pressures of human activities, and (c) biodiversity is fundamental to their economic development.

Background

The aim of the Era-NET Net-Biome project was to initiate and stimulate co-operation and coordination of research programs for the sustainable and integrated management of biodiversity, and in a way that it would address the needs of the threatened ecosystems of the ORs and OCTs. The Net-Biome Era-Net consortium (FP7 2007-2012) was composed of 11 partners linking bodies relating to the Overseas Entities from five European Member States.

Under the umbrella of this project, 8 project partners and 2 national research funding agencies have together decided to launch in 2010 the first Joint Call for trans-national and trans-regional research entitled “Towards Biodiversity Management in support of Sustainable Development in Tropical and Subtropical EU”

Topics of the call

A. The use, evaluation and valuation of biodiversity and the services and resources it provides, underpinning the sustainable use of natural resources (e.g. agriculture and fisheries) and including those with important cultural and aesthetic resonances;

B. Improving Spatial Planning and Coastal Zone Management in order to support the sustainable management and use of biodiversity (marine and terrestrial) in the context of human pressures and global change;

C. Characterizing biodiversity (from gene to ecosystem level and through to landscape) and the drivers of its evolution in a way that will enhance local capacity and improve policy decision-making.

Evaluation

In line with the practical aspirations and grass roots approach of Net-Biome, a thorough evaluation made through specialists’ peer-reviewing and an Evaluation Committee guaranteed the scientific excellence of the proposals; moreover, their potential to improve conservation management and the sustainable use of biodiversity at regional and local levels was also evaluated.

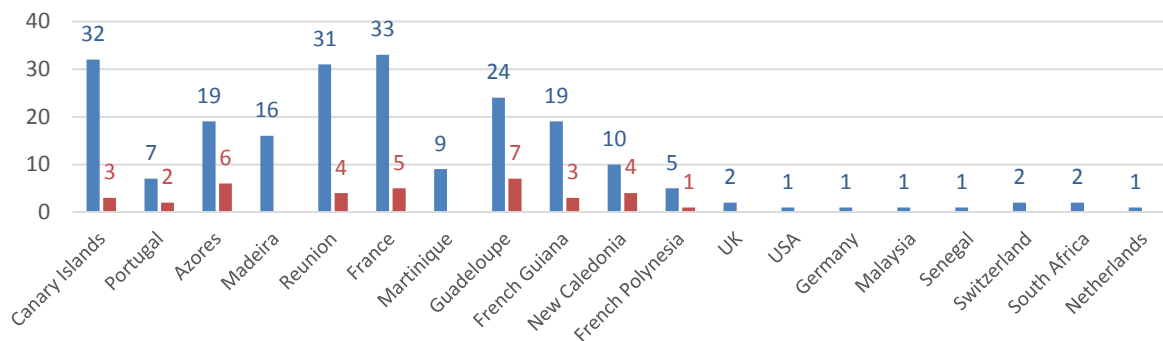
Participating Funding Agencies

- Agence Nationale de la Recherche (France)
- Regional Council of Reunion
- Regional Council of Guadeloupe
- Regional Council of French Guyana
- Regional Council of Martinique
- Government of New Caledonia/ADECAL
- Fundação para a Ciência e la Tecnologia (Portugal)
- Regional Government of Canary Islands
- Regional Government of Madeira
- Regional Government of the Azores

Main Call facts and statistics

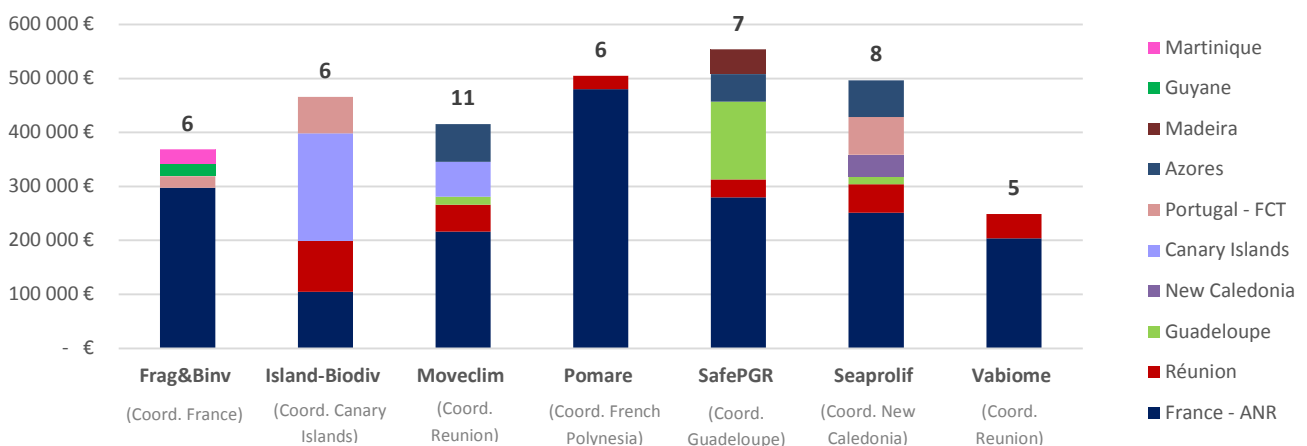
The total amount of funding available for this call was about 3.5 million Euros. Funding was provided for a maximum of a three-year period for collaborative projects. This first Joint Call received over 80 Manifestations of Interest. **35 projects were submitted**, and finally 32 were eligible. Statistically the 35 proposals initially received included a total of 210 applicants from 19 different regions and countries and territories, and the average number of partners per consortium was 6.6.

Upon the completion of all the evaluation steps **7 projects were finally selected for funding**, corresponding to a **success rate of 22.8%** of the projects evaluated. In Figure 1 it is shown that the partners carrying out research from France, Canary Islands and Reunion were the most represented, and Guadeloupe and Azores had the greater number of proposals coordinated by them.



Distribution of number of partners (blue) and number of project's coordinators (red) per OR/OCT in the 35 projects received.

For those projects the **total amount of funding was about 3.1M€** sourced from national and regional funds, **with an average of 448 000€ per project and a mean duration of 3 years**. These granted projects involved **52 partners from 7 different ORs/OCTs**, with an **average of 7.4 partners per project** and a range between 4 and 10. Among the 52 teams, 46 were from public institutions and 6 from private sector. The projects involved **an average of 6 different regions/territories per project**. It is also worth emphasizing that terrestrial ecosystems received more attention than the marine realm; in fact out of the seven projects granted, five addressed the terrestrial field and two focused on the marine environment. Figure 2 portrays the funds finally dedicated to the call by each funding bodies.



For each of the 7 projects: total funds per region/territory; number of partners (figure on top) and origin of coordinator (into brackets)

A preliminary synthesis of the 7 projects, which have been elaborated with the projects coordinators, is proposed in the following factsheets.



Frag&BinV

CONSEQUENCES OF FOREST FRAGMENTATION AND CONDITIONS FOR BIOLOGICAL INVASIONS: THE CASE OF CARIBBEAN BIRDS

Objectives

The transformation rate of natural ecosystems due to human activities has recently accelerated. Habitat fragmentation and biological invasions are 2 major human-induced threats to biodiversity which are both responsible for populations and species declines. This project aims at assessing the effects of fragmentation on several attributes of individuals/populations in a set of bird species showing a gradual specialization on forest habitat, addressing several main questions:

- How does forest fragmentation affect population genetic diversity (through demographic changes (e.g. population size and migration between populations))?
- Does forest fragmentation alter phenotypic (morphologic, immunologic...) quality of birds?
- How does forest fragmentation influence birds resistance or exposure to parasites?

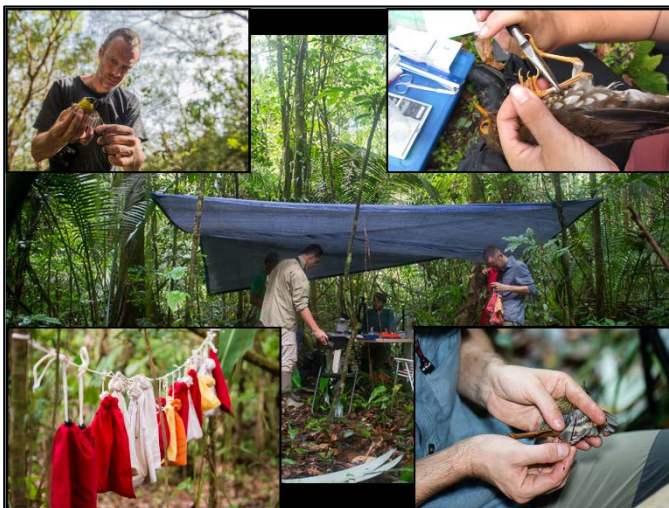


One of the studied species: the Blue-backed Manakin

- Are effects of fragmentation similar in all bird species?

In addition, a test focused on two recent hypotheses explaining the success of biological invasions (the so-called enemy release hypothesis and the hypothesis of different immune defense strategies in invaders), and their consequences for native species.

Approaches

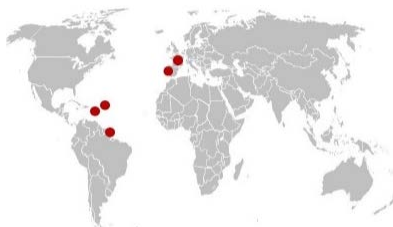


Birds are identified by the scientists after being trapped in nets.

This project led by 6 partners from 3 countries involves 4 territories: French Guiana, Guadeloupe, Martinique, and Montserrat. These territories are faced with real problems of forest loss and fragmentation as well as species introductions or invasions, threatening their high endemic biodiversity.

The descriptive approach used to address most of these questions was based on a large field sampling scheme. Data and samples collected on birds were analyzed in the laboratory using different methodologies (molecular biology and population genetics, morphometrics, immunology, spatial analyses...).

6 partners:

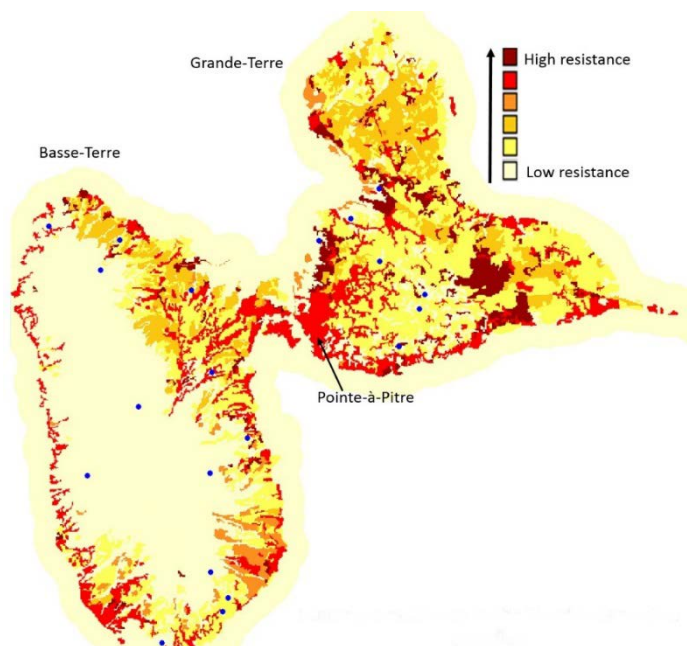


UMR CNRS Biogéosciences, Université de Bourgogne (Fr) / Office National de la Chasse et de la Faune Sauvage – Direction des Etudes et de la Recherche, CNERA Avifaune migratrice (Fr) / Office National de la Chasse et de la Faune Sauvage – Cellule Technique des Antilles françaises Martinique (Fr) / Groupe d’Etude et de Protection des Oiseaux en Guyane (GEPOG), Guyane (Fr) / CIBIO, University of Porto (Pt) / Department of Environment, Montserrat (UK)

Total budget: 792 300€ / Total Grant: 368 800€

Main outputs

- Significant inter-island genetic divergence revealed in 9 bird species (with an incipient species in one island of the Lesser Antilles), but patterns of genetic differentiation not always consistent with boundaries of subspecies previously described locally
- Detection of genetic differentiation at a very small geographical scale in several bird species, partly due to forest fragmentation. This discrepancy between potential and realized dispersal suggests that habitat fragmentation consequences may have been underestimated in a priori mobile organisms.
- At a regional level, discovery of a strong genetic differentiation within a single island in 2 forest bird species between the 2 parts of Guadeloupe (*i.e.* Basse-Terre and Grande-Terre). Ongoing identification of potential forest corridors to maintain connectivity within Guadeloupe
- Discovery of new strains and new records of blood parasites in the Caribbean region (DNA sequences deposited in GeneBank and MALAVI databases)
- Clear link between parasite abundance and diversity and forest fragmentation (though varying among parasite lineages, host species, and territory), independent of the influence of climatic variables. Ongoing analyses of the effect of forest fragmentation on immune ability of birds and body condition
- Evidence that habitat fragmentation has not the same effect in all species. In particular, forest specialist species are more sensitive to forest fragmentation than generalist ones



Landscape resistance to the Plumbeous warbler gene flow

- Empirical support of two hypotheses proposed to explain successful biological invasions: fewer parasites and different immunologic profile in invasive populations compared with native ones
- Set up of 170 molecular markers in 11 bird species for population genetics analyses
- Establishment of a shared methodology (writing of short manuals) in the 4 territories for capture of birds and data/samples collection and training of local stakeholders
- Numerous presence/abundance data (about 12000 birds captured, 150 species, 70 localities) provided to local stakeholders to increase local knowledge about species distribution and abundance
- Young researchers & capacity building – 1 PhD student, 2 Postdoc, 7 Masters students, 10 undergraduate students
- Web <http://habitat-fragmentation.cnrs.fr/fr/> and [video](#)

ISLAND-BIODIV

UNDERSTANDING BIODIVERSITY DYNAMICS IN TROPICAL AND SUBTROPICAL ISLANDS AS AN AID TO SCIENCE BASED CONSERVATION ACTION

Objectives

Understanding the geographic structure of fragile oceanic islands ecosystems and their constituent biodiversity is a first necessary step towards their long-term protection. The project aims to evaluate and value biodiversity to inform decision makers for spatial planning and the sustainable management of biodiversity.



Laurisilva forest in Terceira, Azores

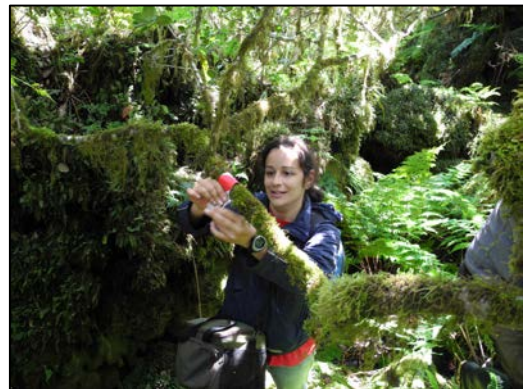
To overcome the coarse spatial resolution of existing datasets, which is often insufficient for management purposes within insular ecosystems, the goal of ISLAND-BIODIV was to develop and implement a pragmatic approach for the quantification of plant and arthropod biodiversity within insular forest ecosystems, and address the following research questions:

- (1) To what extent can biodiversity within a given ecosystem within an island be considered to be homogenous across the landscape of that ecosystem?
- (2) Are there predictable patterns in the spatial variation of biodiversity among different functional groups within the same ecosystem?
- (3) How well do existing management strategies within each OR protect biodiversity and what realistic changes could be incorporated to maximize biodiversity conservation?

Approaches

A coordinated program involving 6 partners from 3 countries was developed for the investigation of island forest ecosystems of 3 ORs (the Azores, Canary Islands and Mascarene Islands), in order to:

- Implement standardized procedures and establish permanent biodiversity sampling plots
- Investigate 3 ecologically interrelated communities of flowering plants, macroinvertebrates (spiders and beetles) and soil dwelling mesoinvertebrates (Collembola)
- Combine traditional ecological sampling and survey techniques with modern DNA sequence based technology to address the taxonomic impediment within biodiversity assessment
- Derive comparable biodiversity estimates through molecular phylogenetic analysis of phylogenetic diversity (PD), phylogenetic endemism (PE) and abundance weighted evolutionary distinctiveness (AED) metrics



Sampling on the most pristine sites of Terceira, Azores

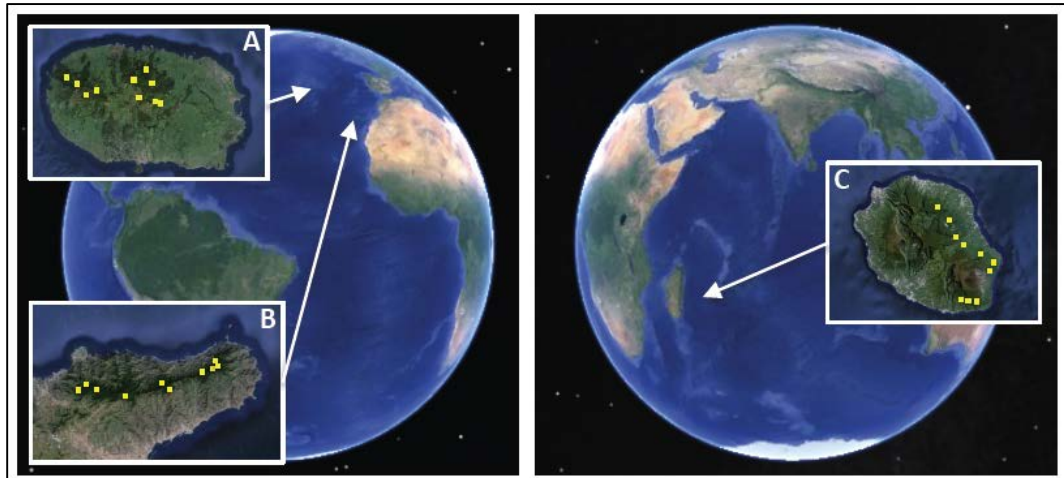
6 partners



Instituto de Productos Naturales y Agrobiología, Consejo Superior de Investigaciones Científicas - Canary Islands (Sp) / University of La Laguna - Canary Islands (Sp) / Université de la Réunion – Reunion Island (Fr) / Université Paul Sabatier (Fr) / Azorean Biodiversity Group (CITAA and CE3C) - Universidade dos Açores – Azores (Pt) / Jardín Botánico Canario “Viera y Clavijo” – Unidad Asociada CSIC, Canary Islands (Sp)

Total budget: 1 000 611€ / Total Grant: 483 891€

Main outputs



Geographic locations of the 30 biodiversity plots that comprise the sampling for ISLANDBIODIV. (A) The island of Terceira in the Azorean archipelago. (B) The island of Tenerife in the Canary Islands. (C) The island of La Réunion in the Mascarene Islands.

- Discovery and classification of new species and new records of species, families and genera in the 3 ORs. Molecular data also revealing cryptic species previously considered as single species after morphological sorting
- Island flora DNA stored in GeneBank of Reunion Island (Univ. Réunion and Paul Sabatier), Azores (Azores herbarium) and Canaria (JBCSIC)
- Development of a novel Illumina sequencing protocol for the mitochondrial metagenomic analysis of soil invertebrates, for which morphological taxonomy fails to delineate the boundaries of biological species
- Establishment of standardized sampling protocols and templates for data entry and curation that facilitate downstream data analysis and the cross referencing of DNA sequence data with source specimens
- Investigation of the integrity of ecosystems with regard to the non-native or invasive species : while above-ground communities of beetles and spiders are largely devoid of introduced or invasive species, the soil biomes of all three islands appear to be substantially perturbed by introduced species (at least 25% of all Collembola species sampled across the three archipelagos, with as yet unknown consequences for ecosystem function)
- At the regional level, ongoing assessment of the geographical structuration of biodiversity and of the probable drivers of structuration to identify areas of concern (unusually high or low biodiversity)
- Long term extension of the methodology to the laurel forests of La Gomera (Canary Islands) and Terceira Natural Park (Azores)
- Web: <http://island-biodiv.org/>

MOVECLIM

MONTANE VEGETATION AS LISTENING POSTS FOR CLIMATE CHANGE

Objectives

Beside their striking diversity, islands host a particular and restricted endemic flora. High mountains hosts in many islands the best remnant native vegetation fragments allowing comparisons and studying the driving factors affecting the environment – climatic, land-use, implementation of conservation areas, etc.

| Pico Azores | Terceira Azores | La Palma Canary Is. | La Réunion Mascareignes | Madagascar |
|--|--|---|---|--|
| 38°28' N 27°51' W | 38°43' N 27°19' W | 28°40' N 17°52' W | 20° 00' S 59° 40' E | 18° 54' S 47° 31' E |
|  |  |  |  |  |
| Area: 447.0 km ² Top: 2,350 m Pop.: 14,806 (35.3/km ²) Geol. age: 0.25 MY | Area: 400.6 km ² Top: 1,021 m Pop.: 56,437 (141/km ²) Geol. age: 1 MY | Area: 786 km ² Top: 2,426 m Pop.: 21,145 (30/km ²) Geol. age: 3 MY | Area: 2,511 km ² Top: 3,070 m Pop.: 840,974 (330/km ²) Geol. age: 2 MY | Area: 581,540 km ² Top: 2,876 m Pop.: 22,005,222 (35.2/km ²) Geol. age: 88 MY |

MOVECLIM study sites

Using a standardized methodology, MoveClim aims at making macro ecological comparisons of spore dispersing plants (ferns and bryophytes, thermally specialized to these environment) between islands-sites in order to:

- (1) Characterize the diversity of poorly known but species rich groups of plants
- (2) Elucidate the processes which govern species richness and its distribution along elevational transects and relate these to life history and functional traits of species
- (3) Link richness patterns to environmental and spatial predictors
- (4) Model the shift of species range with climatic scenarios
- (5) Establish permanent plots for long-term monitoring, managing responses for vegetation and raising directions for decision-making.

Approaches

The 11 partners of 6 countries and five small islands (Reunion Island (Mascarenes), Pico (Azores), La Palma (Canarias), Guadeloupe (West Indies) and Tahiti (French Polynesia)) did the first global scale and multi island biogeographic analysis for bryophytes and ferns using:



In situ lysimeters to record and follow cloud water interception and retention by liverworts

- A standardized methodology for collecting bryophytes and fern along elevational gradients of the 5 islands
- Climatic sensors every 200 m along these high mountains to record temperature and relative humidity hourly
- *In situ* experiments with a novel method (lysimeters) to estimate the role of cloud water in bryophyte water interception

11 partners



UMR PVBMT Université de La Réunion - Reunion Island (Fr) / Parc National de Guadeloupe – Guadeloupe (Fr) / Universidade dos Açores, Azores (Pt) / University of La Laguna, Canaria Islands (Sp) / Parc National de La Réunion – Reunion Island (Fr) / Conservatoire Botanique de Guadeloupe – Guadeloupe (Fr) / Délégation à la Recherche & ONG Te Rau Ati Ati A Tau A Hiti Noa - French Polynesia (Fr) / Muséum National d'Histoire Naturelle (Fr) / University of Cape Town (Za) / University of Zürich (Ch) / University of Marburg (De)

Total budget: 750 000€ / Total Grant: 419 000 €

Main outputs

- 14 species newly recorded bryophytes for some islands, 1 new species and a new genus of bryophytes for Science were reported in the project
- The key role of bryophytes in insular ecosystems services was quantified. In a tropical cloud forest of Reunion Island, the biomass of bryophytes recorded accounts for 34 560 l.ha⁻¹ of water intercepted
- For the regional endemic species of moss *Sphagnum tumidulum*, the analysis of genetic variation and population differentiation suggests sexual reproduction on Reunion island
- The study contributed to the understanding of the spatial organization of bryophyte diversity at multiple scales and the roles of spatial organization, climate and vegetation in shaping the natural diversity. A new pattern of species richness (double peak) along the elevational gradient was discovered with ground-dwelling communities of bryophytes along the Piton des Neiges gradient (Reunion, Mascarenes)
- The identification of elevational ranges of species enabled the modelling of future distribution. First species distribution modelling study under climate change scenarios was done for ferns of Tahiti (French Polynesia)
- Production of new collaborative tools (standardized methodology, manuals for production of standardized data, common R scripts, long term monitoring plots...)
- The investigation of bryophyte functional diversity brought useful results for conservation purposes, e.g. ground-dwelling bryophytes may be more robust than epiphytic bryophytes to disturbances in subalpine ecosystems



Enthostodon pertenellus (Funariaceae), Commerson crater, 2310 m, La Réunion: Ability of bryophytes to intercept water

- Young researchers & capacity building – 5 PhD candidates, 9 Masters students and 3 honors students.
- Web: <http://moveclim.blogspot.com/>

POMARE

POLYNESIAN, MARTINIQUE'S, REUNION'S MARINE BENTHIC INVERTEBRATES: INTERACTIONS AND CHEMODIVERSITY EVALUATION FOR A SUSTAINABLE USE

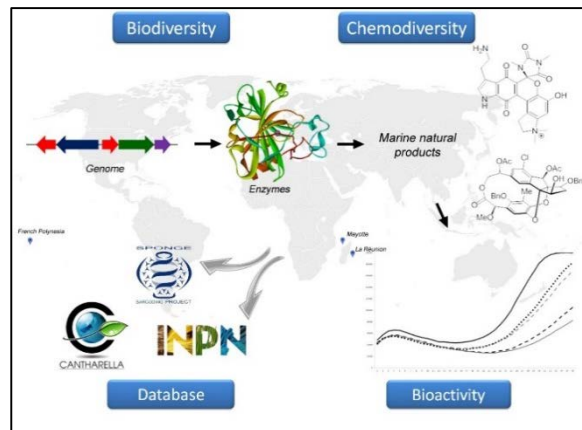
Objectives

The marine living resources from selected sites and habitat of three French OT's and OR's located in two oceans are a treasure box to be discovered and understood all around the world. The objective of the consortium was to explore marine invertebrates in order to act for their protection through chemical ecology studies and metabolites characterization leading to biotechnological applications in the fields of aquaculture, antifouling (biofilm inhibition), and medical applications.

Biomimetic pathways were explored to obtain synthetic and semi-synthetic analogs for a sustainable use. The project aimed to:

- Investigate biological properties of marine natural products as biofilms inhibitors and antibiotics (QSI, POI), anticancer agents (melanoma)

- Exploit highly innovative techniques to discover new original chemical entities of marine origin
- Develop chemical synthesis pathways for sustainable production of relevant compounds and explore their bioactivities



The POMARE approach

Approaches

The 6 partners from 3 countries chose to give particular emphasis to sponges, since these are considered most important in coral reef ecosystems and environment. Metabolomic studies of some selected organisms are adequate to fully target the understanding of the biosynthetic pathways in order to use them in biomimetic synthesis of challenging complex natural metabolites. The tasks were the following:



Diver looking for sea sponges

- 1- Prospection, collection of samples on field expeditions, identification, sequencing and databases
- 2- Extraction, metabolomics, isolation and structural determination, biomechanistic analysis
- 3- Biological evaluations
- 4- Sustainable synthesis of natural products and analogs exploiting effective methods and biomimetic strategies

The consortium built strong links with local universities on Reunion Island and in French Polynesia to emphasize participation of local researchers and students for capacity building and educational purpose.

6 partners



IRD Institut de Recherche pour le Développement - French Polynesia (Fr) / Université de La Réunion - Reunion Island (Fr) / Naturalis Biodiversity Center (NI) / University of Portsmouth (UK) / CNRS-Institut de Chimie des Plantes Naturelles (Fr) / Université Paris Sud (Fr)

Project labelled by competitiveness cluster Qualitropic

Total budget: 5 457 414€/ Total Grant: 520 000€

Main outputs



Yellow Sponge Darwinella sp.

- Chemical communication importance of invertebrates with environmental *Vibrio* species was shown and environmental friendly ecosystemic services of relevant compounds as a treatment of aquaculture fish larvae is being further studied
- New bioactive compounds and new bioactivities for known compounds were discovered from either Indian or Pacific Ocean marine sponges
- The most impressive study of *Dactylospongia metachromia* in terms of number of samples and surfaces covered, and comprehension of an original diastereomeric ratio of ilimaquinones, the major natural substances
- Sustainable biomimetic semi-synthesis of minor natural compounds
- Drug discovery approach with ongoing local developments, major results in the field of diabetes (this target was lately chosen as challenging for Oceania OR's and OT's)
- Young researchers & capacity building – 5 PhD students, 1 Postdoc, 10 undergraduate students.
- Web: <https://pomare.ird.fr/> and [video](#)

SafePGR

TOWARDS SAFER PLANT GENETIC RESOURCES THROUGH IMPROVED VIRAL DIAGNOSTIC

Objectives

Plant Biological Resources Centers (BRCs) provide final users (farmers, extension officers) with genetic resources best suited to their needs. They also provide breeding programs with genitors that are critical for the development of crops adapted to environmental and societal changes. Their capacity to guarantee the sanitary status of the resources they conserve and distribute is essential to prevent the spread or emergence of diseases.

The main species conserved and propagated by the plant BRCs of Guadeloupe, Madeira, Azores and Reunion Island are vegetatively propagated and prone to virus accumulation.

Although sanitation methods exist for recovering virus-free plants from infected ones, only a small fraction of plant virus diversity is known and detection tools only exist for a limited number of viruses.



Cultivated biodiversity in Guadeloupe: a female yam genotype at flowering stage (Dioscorea alata)

The general objective of the SafePGR project was to improve the knowledge of the diversity of viruses infecting the crops addressed by the partner's BRCs, in order to develop or optimize diagnostic techniques, ultimately permitting the safe movement of plants between project partners and beyond.

Approaches



Training for metagenomic methods - Intermediate meeting in Cirad Montpellier, October 2013.

Six crops were targeted (banana and plantain, sugarcane, yam, sweet potato, garlic and vanilla) and 7 research groups from Biological Resources Centers and virology labs of France and Portugal were involved in:

- i) The analysis of the molecular diversity of the main viral families infecting the 6 targeted crops
- ii) The optimization of classical diagnostic methods taking into consideration data generated through the analysis of viral diversity
- iii) The development of new diagnostic methods based on metagenomics and deep-sequencing technologies

Stakeholders such as plant protection agencies, diagnostic laboratories and regional councils were associated to the transfer of the results and diagnostic methods generated by the project.

7 partners

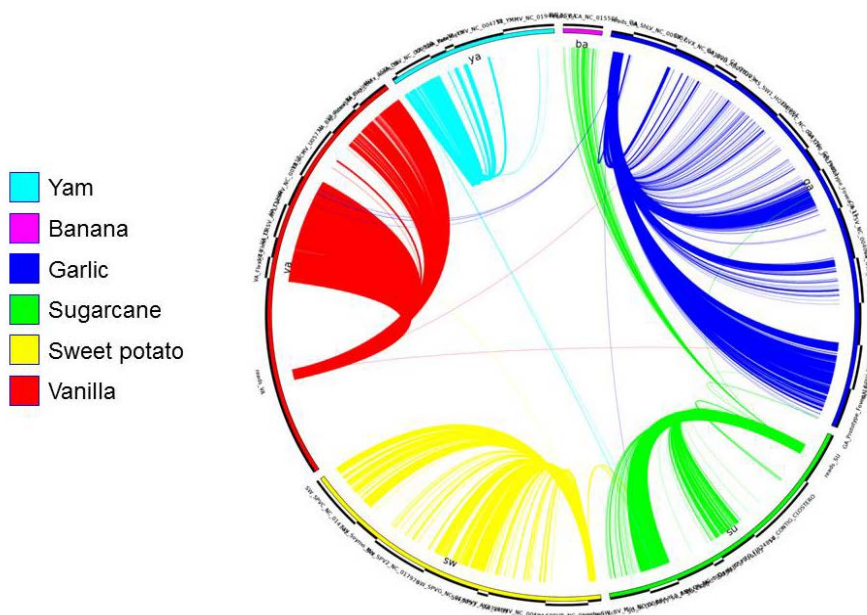


INRA (Institut National de la Recherche Agronomique), ASTRO Research Unit - Guadeloupe (Fr) / CIRAD (Centre de Coopération Internationale en Recherche Agronomique pour le Développement), AGAP Research Unit - Guadeloupe (Fr) / CIRAD, BGPI Research Unit (Fr) / CIRAD, PVBMT Research Unit - Reunion Island (Fr) / INRA, BFP Research Unit (Fr) / Biotechnology Centre, University of Azores – Azores (Pt) / University of Madeira, ISOplexis Gene Bank – Madeira (Pt)

Total budget: 1 444 121 € / Total Grant: 553 227 €

Main outputs

- 21 novel viruses discovered and characterized
- Overall presence of 40 viral species in the 6 plant species targeted by the project
- Complete genome sequences of 8 identified viruses of sugarcane and yam and 16 partial sequences of yam viruses deposited in GenBank
- Adaptation of a pipeline for bioinformatics analyses, which performs automatically the cleaning of the nucleotide sequences generated for each sample, their assembly and the identification of viral sequences among them through comparisons with international sequence databases
- A comprehensive approach was adopted combining bioinformatics, metagenomics and classical molecular methods for the characterization of known and novel virus species
- Viral diagnostic tools for the detection of all the novel viruses discovered throughout the project
- Optimized diagnostic tools for 10 already known viruses
- Safer exchanges of germplasm through improved efficiency of sanitation
- Significant contribution to the development of high throughput sequencing in plant virus diagnostics
- Transfer of sanitation methods to the yam and sugarcane sanitation programs carried out in Guadeloupe and Montpellier, respectively
- The results are now irrigating a project of a quality seed production sector, with economic actors



Outcomes of the analyses of viral nucleotide sequences generated by metagenomics approaches using next generation sequencing (NGS).

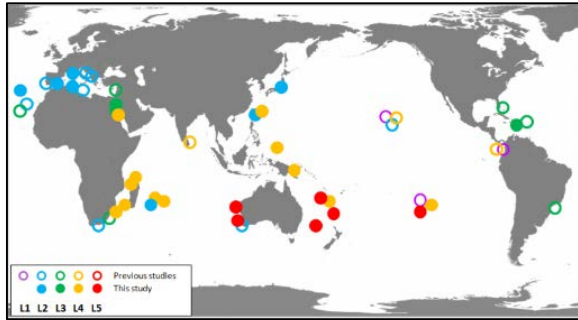
- Young researchers & capacity building: 3 MSc trained, 3 temporary staff now have permanent positions
- Web : <http://www2.antilles.inra.fr/safepgr/>

SEAPROLIF

DIVERSITY AND FUNCTIONING OF COASTAL MARINE BIOMES UNDER SIEGE: IMPLICATIONS OF SEAWEED PROLIFERATIONS ACROSS THREE OCEANS

Objectives

Macroalgae proliferation is perceived as a serious threat to biodiversity, in particular in coastal ecosystem including coral reefs.



Geographical distribution of Asparagopsis taxiformis mitochondrial lineages at worldwide scale based on previous published data and data from this project

The genus *Asparagopsis* (Rhodophyta), have been identified among 100 of the worst invasive species

observed in subtropical and temperate regions with in particular the species *Asparagopsis taxiformis* and *Asparagopsis armata*.

Following recent reports of proliferation *Asparagopsis* in New Caledonia, French Polynesia and Reunion Island, the consortium aims to:

- Characterize the algal populations along its distribution range
- Establish the algal proliferation status and to monitor *Asparagopsis* populations and their interaction with coral (cnidarian) assemblages
- Properly document the status of the species in each region, its potential invasiveness
- Establish the impact on natural species, to support management and policy making

Approaches

The 8 French and Portuguese partners involved in the project developed an interdisciplinary approach that was implemented in 8 regions of both hemispheres and 3 oceans, to describe *Asparagopsis* lineages and populations using 3 complementary approaches rarely applied together in marine systems:

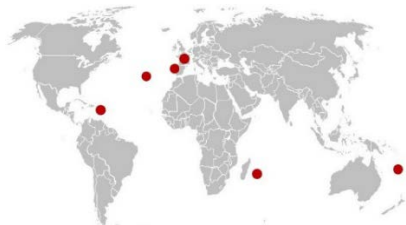


Asparagopsis in the Azores

- Phylogeographic analysis to identify clades and determine their native vs introduced status in the targeted areas
- Metabolomic approach to test the relevance of chemical signatures to differentiate taxa/clades
- Assessment of the microbial communities associated with algae using new-generation sequencing

The existence of specific mechanisms promoting *Asparagopsis* proliferation and its harmful ecological effects on cnidarians dominated benthic assemblages was tested experimentally, in situ and in aquariums.

8 partners



IRD Institut de Recherche pour le Développement - New Caledonia (Fr) / Agence pour la Recherche et la Valorisation Marines – Reunion Island (Fr) / Université des Antilles et de la Guyane – Guadeloupe (Fr) / Centre for Marine Sciences (Pt) / Station Biologique Roscoff (Fr) / Université de Nice-Sophia Antipolis (Fr) / UMR CNRS "Diversité, Evolution et Ecologie fonctionnelle" (Fr) / Department of Oceanography and Fisheries of the University of the Azores – Azores (Pt)

Total budget: 1 494 472 € / Total Grant: 496 518 €

VABIOME

CHARACTERIZATION, PROTECTION, SUSTAINABLE USE AND VALORIZATION OF VANILLA BIODIVERSITY IN TROPICAL EU

Objectives

Vanilla is an emblematic patrimonial and endemic resource for tropical regions that combines a high socio-economic value with a natural image due to its traditional and sustainable mode of production and process.

Tropical EU regions offer a unique opportunity to study the genus in its global biodiversity, in order to better know, preserve the diversity and improve sustainability of vanilla production. The Vabiome project aimed to:

- Inventory genetic diversity (field & forest) at the macro and micro-evolutionary scale for the preservation of endangered wild Vanilla species present in tropical EU

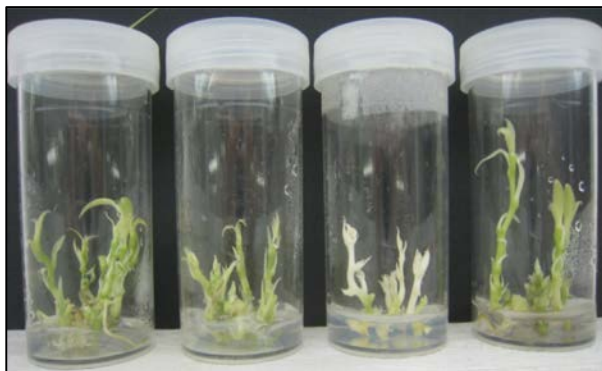
- Assess the potential services wild species can offer for the improvement of cultivated species and the sustainability of vanilla crop production



A flower of Vanilla humblotii

Approaches

Five partners from French ORs and OCTs in the Pacific, Caribbean and Indian Ocean set up a consortium in order to:



Vanilla hybrids grown in vitro

- Inventory and characterize (genetic, phenotypic and mechanisms of evolution and diversification) the wide range of vanilla genetic resources both cultivated and natural in tropical EU,
- Assess their important agronomical traits (aroma, resistance to viruses and to root and stem rot (RSR) caused by Fusarium),
- Test and develop crop improvement strategies such as hybrid breeding.

The participation of vanilla growers, vanilla conservation bodies and technical services facilitate the uptake of the results for long term international conservation of the genus diversity as well as the sustainable aromatic exploitation.

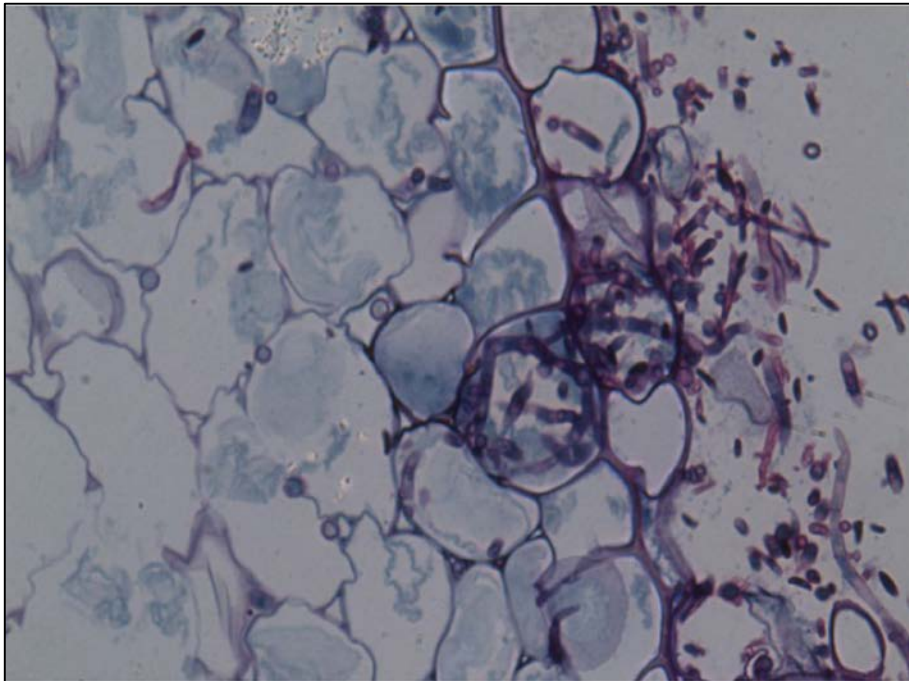
5 partners



UMR PVBMT Université de la Réunion-CIRAD – Reunion Island (Fr) / Etablissement Vanille de Tahiti - French Polynesia (Fr) / UMR Institut de Biologie des Plantes, Université Paris 11-CNRS (Fr) / CBNM (Conservatoire Botanique National de Mascarin) - Centre Permanent d'Initiatives pour l'Environnement (Fr) / Parc National de la Guadeloupe – Guadeloupe (Fr).
Project labelled by competitiveness cluster Qualitropic

Total budget: 888 194€ / Total Grant: 259 020€

Main outputs



Fusarium penetrating through the epidermis of vanilla plant.

- Important knowledge on the ecology and the evolution of species of the genus *Vanilla* (reproduction biology, ecology, genetics, cytogenetics, floral scents, *Fusarium* resistance)
- Development of tests (in laboratory and in green-houses) to assess resistance to root and stem rot (RSR) and detection of diagnostic molecular markers for further marker-assisted selection
- Demonstration that the root and stem rot (RSR) of vanilla is present worldwide and have the same causal agent that is associated to the fungi named *Fusarium Oxysporum f.sp radices vanillae*
- Technical guidelines for the management of vanilla diseases were given to 51 growers in Raiatea (French Polynesia) following 4 years of survey of the sanitary status in shadehouses
- Successful hybridization between the species cultivated in Polynesia *V.xtahitensis* and the wild *Fusarium* resistant species *V.pompona*, from which 10 resistant hybrids are presently assessed on agronomical criteria
- A new variety of the species cultivated in La Reunion, *V. planifolia*, named 'Handa' has been selected for its resistance to *Fusarium*. A COV application (Certificat d'Obtention Végétale) has been deposited
- For the native and endangered *Vanilla* species from Mayotte *V.humboldtii*, creation of an ex-situ collection and establishment of a conservation action plan

- Young researchers & capacity building – 2 PhD Thesis, 12 Masters students
- Web : www.vabiome.blogspot.com and [video](#)

1ST NET-BIOME JOINT CALL - 2010
**“Towards Biodiversity Management in support of Sustainable
Development in Tropical and Subtropical EU”**

Funded projects

Frag&Binv - Consequences of forest fragmentation and conditions for biological invasions: the case of Caribbean birds

ISLAND-BIODIV - Understanding biodiversity dynamics in tropical and subtropical islands as an aid to science based conservation action

MOVECLIM - Montane vegetation as listening posts for climate change

POMARE - Polynesian, Martinique's, Reunion's marine benthic invertebrates: interactions and chemodiversity evaluation for a sustainable use

SafePGR – Towards safer plant genetic resources through improved viral diagnostic

SEAPROLIF - Diversity and functioning of coastal marine biomes under siege: implications of seaweed proliferations across three oceans

VABIOME - Characterization, protection, sustainable use and valorization of vanilla biodiversity in tropical EU

