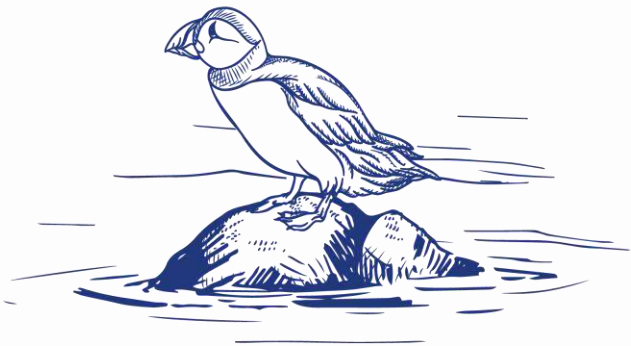


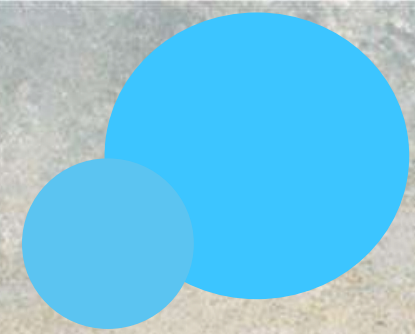
# Coastal Observing Systems

## Focus on biodiversity and coastal ecosystems



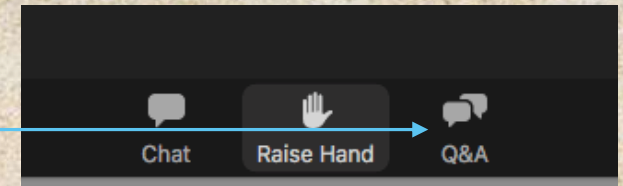
FONDS FRANÇAIS POUR L'ENVIRONNEMENT MONDIAL

# How to use the platform



## ❖ PARTICIPANTS

You can ask questions using the « question box ». The speakers will answer during the Q&R sessions.



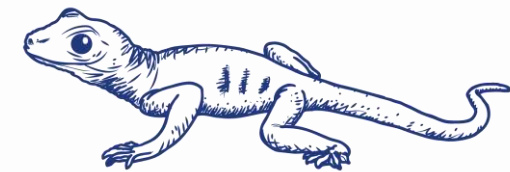
## ❖ TRANSLATION

If you need interpretation in french or in english, please choose the channel below...



## ❖ SPEAKERS

Remember that everyone can see and hear you...and that you are being recorded for future broadcasts! Please turn off your microphones when you are not speaking.



# Context & objectives

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## ICO SOLUTIONS

Islands, Coasts, Oceans Solutions : Identify and share good initiatives and practices all around the world with our partners



French public institution: acquire parcels of coastline in order to turn them into restored, developed and welcoming sites that respect the natural balance. The Europe & International Delegation works in cooperation projects, mostly in the Mediterranean, West African and Indian Ocean regions, to support local NGOs and institution in the management of coastal and island areas.

# Context & objectives

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## RECOS

Co-funded by AFD and FFEM, RECOS is a project implemented by IOC. Its objective is to strengthen the resilience of coastal populations to the effects of climate change by restoring coastal ecosystem services.



COMMISSION DE  
L'OcéAN INDIEN

## COI

Only intergovernmental organisation composed exclusively of islands in Africa, IOC comprises five member States: Union of Comoros, France/La Réunion, Madagascar, Mauritius, and Seychelles. It promotes regional solidarity through cooperation projects covering a wide range of sectors: preservation of ecosystems, sustainable management of natural resources, maritime safety, entrepreneurship, public health, renewable energy, and culture.

# Coastal Observing Systems

**Observing coastal ecosystems, from all perspectives**

2:00 - 3:00  
PM  
UTC +2

**Ep. 1**  
**June, 6th**  
Setting-up, facilitation  
and sustainability of an  
observing system

**Ep. 2**  
**June, 10th**  
Focus on coastal erosion  
and climate change

**Ep. 3**  
**June, 20th**  
Focus on biodiversity and  
coastal ecosystems

**Ep. 4**  
**June, 27th**  
Focus on coastal socio-  
economic dynamics

# Organizing team



**Fabrice Bernard**  
*Moderator*  
**Europe & International  
Head-Officer**  
**Conservatoire du littoral**



**Elisa Piat**  
*Organization / Question box*  
**RECOS Project**



**Anne Lemahieu**  
*Organization / Back Office*  
**RECOS Project MEL Officer**



**Bellarmin  
Rakotonirina**  
*Interpreter*

# Program Episode 2

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- ❖ **Introduction** – How to observe biodiversity ? – **G rard Rocamora** (10')
- ❖ **Case study**: Observatoire Martiniquais de la biodiversit  – **Christelle Beranger** (10')
- ❖ Questions and answers (10')
- ❖ **Case study**: MedTriX – **Gwenaelle Delaruelle** (10')
- ❖ Questions & Answers (10')
- ❖ **Closing**

# Speakers

---



**Gérard ROCAMORA**



**Christelle BERANGER**



**Gwenaëlle DELARUELLE**



# Speakers



**Gérard Rocamora**

Island Biodiversity Conservation Centre (Seychelles)

**Scientific Director and Chair**



# Speakers



**Christelle BERANGER**

Biodiversity observing systems of Martinique

**Manager of Biodiversity Enhancement and Natural Spaces at the Regional Natural Park of Martinique**



# Speakers



**Gwenaëlle DELARUELLE**

L'OEil d'Andromede

MEDTRIX: La plateforme de surveillance des eaux côtières et des écosystèmes de Méditerranée

**Marine Environment Project Manager**



L'OEil d'Andromede



*Liberté  
Égalité  
Fraternité*

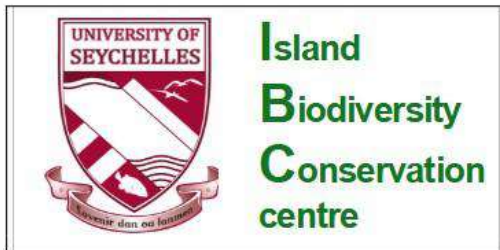


# Introduction

## Biodiversity monitoring in Seychelles : data collection, storage and use of data

### Island Biodiversity & Conservation centre

- A joint venture between a non-for-profit, non-governmental organisation (IBC) and the UniSey, active since 2015
- Part of the UniSey Research Unit, Anse Royale, hosted (but not financed) by UniSey
- Small team of resident conservation scientists, collaborating UniSey staff and associated foreign researchers contributing voluntarily, 3 staff + interns



# Introduction

## Restoring islands to save species & recreate biodiversity sanctuaries

### The potential of small islands for the conservation of (global) biodiversity

- **Refuges** : a significant number of rare and globally threatened species have survived in small islands
- Concentrations of marine wildlife of international importance: seabirds & nesting turtles.
- **Small size** : possibility to restore their ecosystems and recreate sanctuaries where ecological conditions are close to those that prevailed before humans arrived.



**Seychelles  
Magpie-robin,**  
1980: Frégate,  
c.12-20 ind.

# Introduction

## Human impacts

Extreme impact of IAS on islands around the world !

### ISLANDS REPRESENT



**5.3%**

Of the Earth's landmass

UNEP-WCMC 2015



**75%**

Of bird, amphibian, mammal, and reptile extinctions

Tershy et al. 2015



**41%**

Of all CR and EN terrestrial vertebrates

Spatz et al. 2017

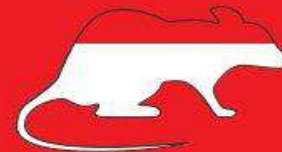


**19%**

Of avian biodiversity

Tershy et al. 2015

### INVASIVE ALIEN SPECIES



**86%**

Of recorded extinctions linked to invasives occurred on islands

Bellard et al. 2015

© Island Conservation 2017

# Introduction

## 60 eradications of rodents and cats in the Western Indian Ocean



High density of rats, over 100 rats /ha

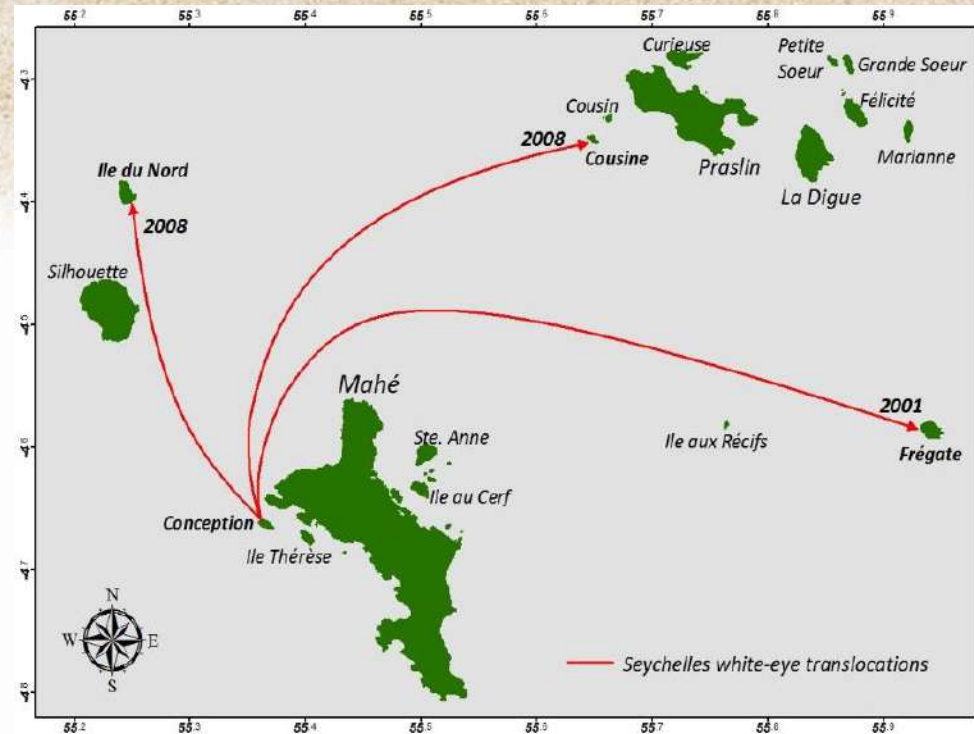
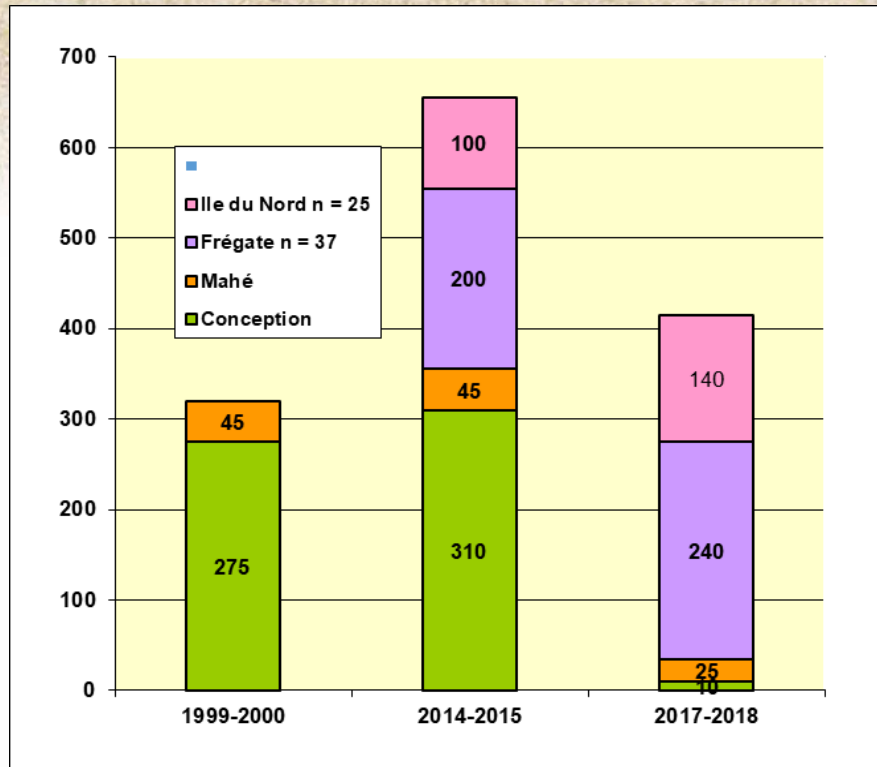
Many references on rat and cat impacts on biodiversity (e.g. Nogales et al.2013; Harper & Bunbury 2015 ; Saunier et al. 2022)



# Introduction

## Seychelles White-eye (CR → VU)

With the invasion of Conception Island by Black rats in 2016, our mother population was wiped out and the global population decreased by 33% !





# Introduction

## Collecting data to assess feasibility and monitor biodiversity

### MAIN CHALLENGES TO ACQUIRE DATA :

- Baseline data required previous to operations
- Access and transportation cost to remote islands
- Accomodation and logistics on site (support boat, satellite phone, etc.)
- Possibility of repatriation in case of accident (airstrip, helicopter) and cost of insurance
- Pre-operation data often limited to the year of the operation = problem to take into account 'year-effect'



# Introduction

## Thorough preliminary studies

- Biological justification for species translocation
- Availability of suitable habitat at destination island or area
- Availability of food (abundance of invertebrates, fruits, etc.)
- Availability of suitable sites for breeding
- Availability of stock to be transferred
- Health considerations (parasite & disease screening of animals to be transferred and in the destination island)



Sisters Ltd



ADVANCING ECOSYSTEM MANAGEMENT FOR THREATENED SPECIES RECOVERY THROUGH PARTNERSHIPS

A project also conducted in collaboration with

School of Biological Sciences, University of East Anglia, UK  
Ministry of Environment, Energy & Climate Change, Seychelles

Conservation introduction of the globally threatened Seychelles White-eye *Zosterops modestus* to Grande Soeur (Seychelles)

- Project proposal -



©Shlemov



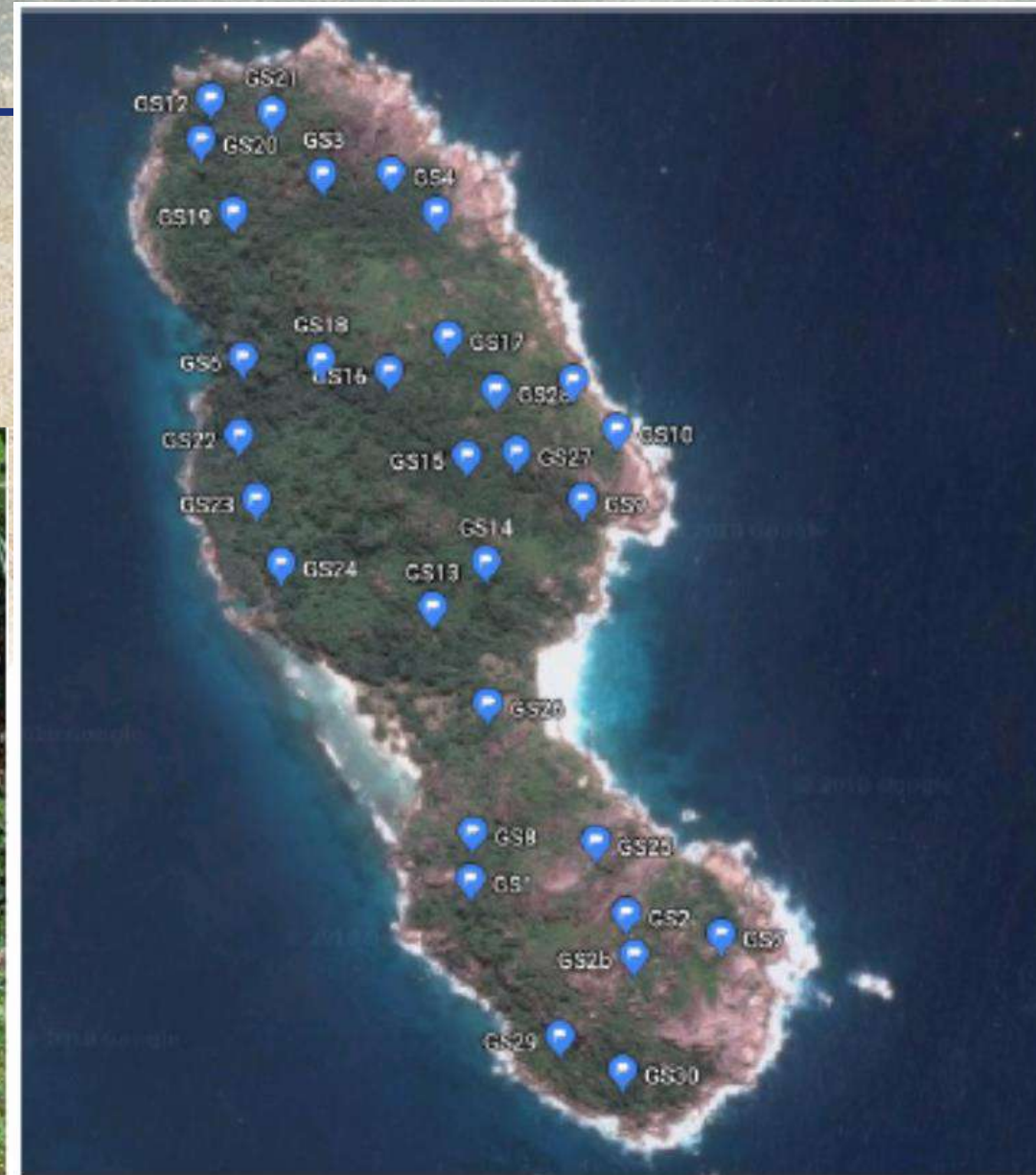
# Introduction

## Habitat suitability assessment

**Vegetation composition and structure; index of foliar volume; abundance of invertebrates and preferred preys**

Estimating plant species coverage (0 to 4) in vegetation strata within a 1m radius

Invertebrate leaf counts on 5 clusters of 10 leaves on 5 dominant trees



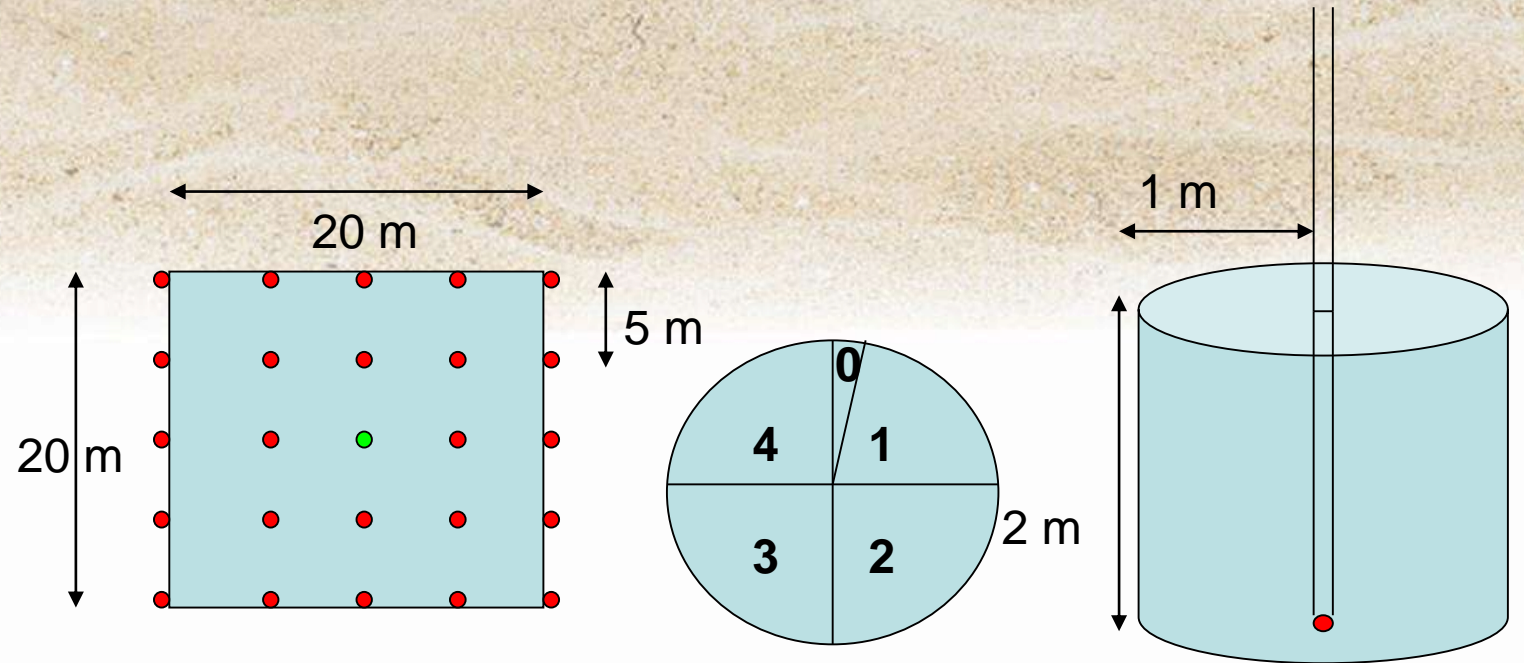
# Introduction

## The method

**A three-dimensional method to describe vegetation in a 20m x 20m plot (25 sub-plots of 1m radius on a 5m grid)**

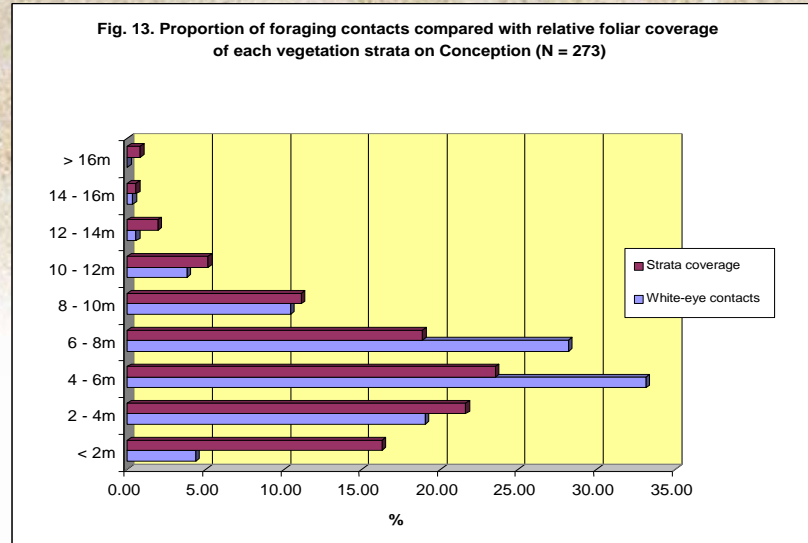
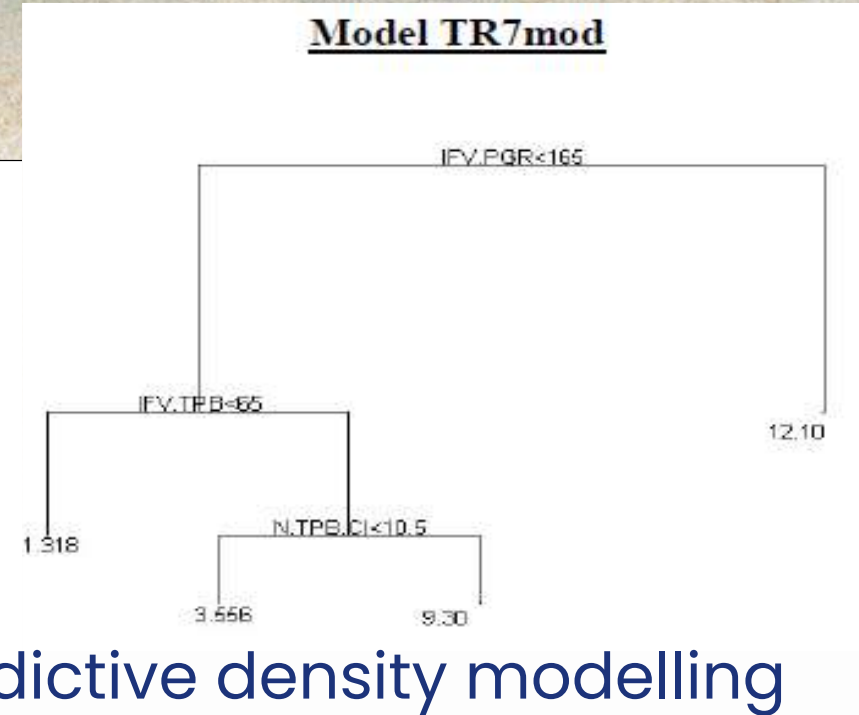
Foliar coverage codes given for each plant species at each subplot for each 2m strata using a telescopic perch and telemeter:  
**0 = less than 5 % coverage; 1 = 5 to 25 %; 2 = 26 to 50 %; 3 = 51 to 75 % and 4 = more than 75 %.**

**The Index of Foliar Volume (IFV<sub>x</sub>)** for a particular species x in a particular point it is the sum of the foliar coverage codes for that species in all the strata, added for each of the 25 subpoints. Measurements (height, first green branch, DBH ) made on all trees present in each plot.

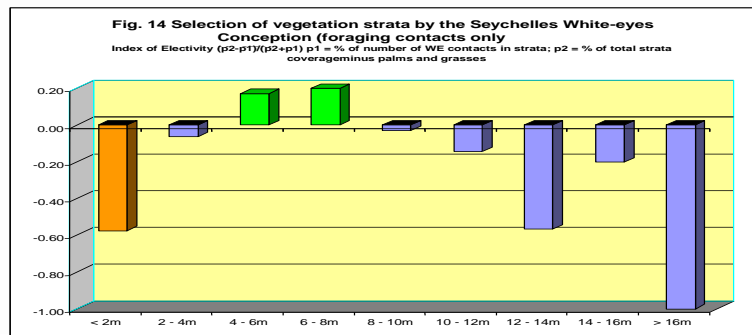
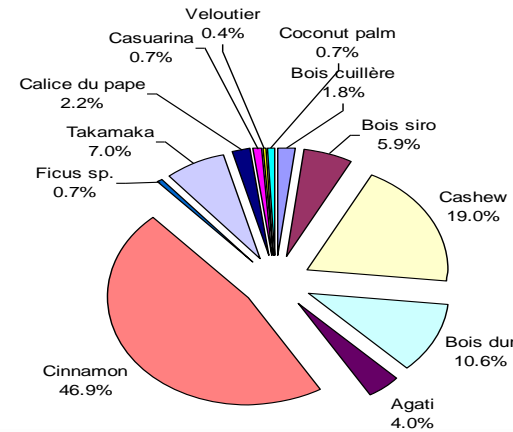


# Introduction

## Habitat selection of the SWE : Strata & plant species preferences



**Fig. 11 Plants species used by the Seychelles White-eye for foraging on Conception (N= 273)**



Mixed woodland (29 ha)	Population estimate Conception	Densities in Mixed Woodland Conception	Number of WEs/point (6 visits) Conception	Conversion rates	Predicted Number of WEs/point (6 visits) Grande Soeur	Predicted Densities Mixed Woodland Grande Soeur	Predicted SWE Population estimate Grande Soeur
<b>Average</b>	279	6.91/ha	6.65	1.04	12.10	12.57	<b>365</b>
<b>Minimum C.I. P&lt;0,05</b>	242	5.99/ha	5.11	1.17	12.10	14.18	<b>347</b>
<b>Maximum C.I. P&lt;0,05</b>	327	8.09/ha	8.18	0.99	12.10	11.97	<b>411</b>

# Introduction

## Monitoring methods

**13 scientific protocols before-after** (over 2 to 19 years):

- Seabird survey and census
- Landbird & reptile point counts (Distance Sampling)
- Invertebrate (pit-fall traps and leaf counts)
- Vegetation quadrats and point transects

**Empirical wildlife observations** on fauna and flora (qualitative, or concordant from several observers)



# Introduction

## Monitoring of individuals, breeding success & pop. size

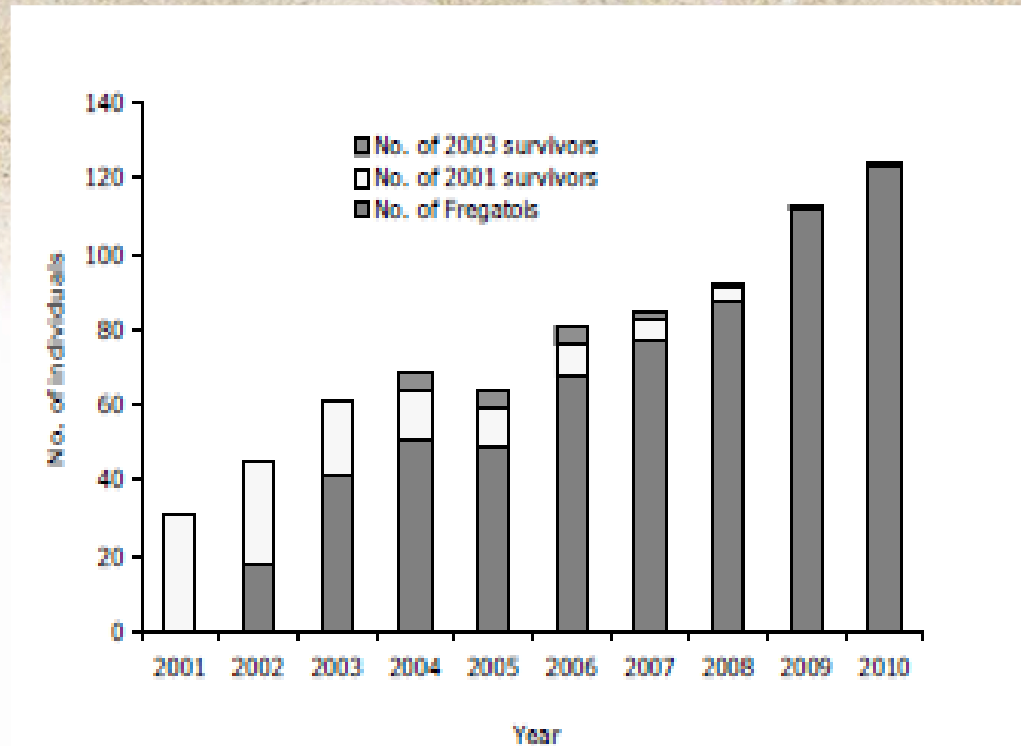


Figure 19b: Proportion of survivors (transferred birds of 2001 and 2003, and 'Fregatois') between 2001 and 2010.

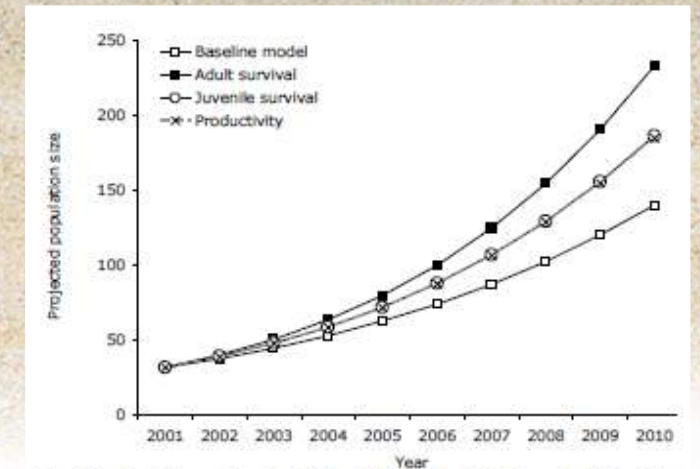
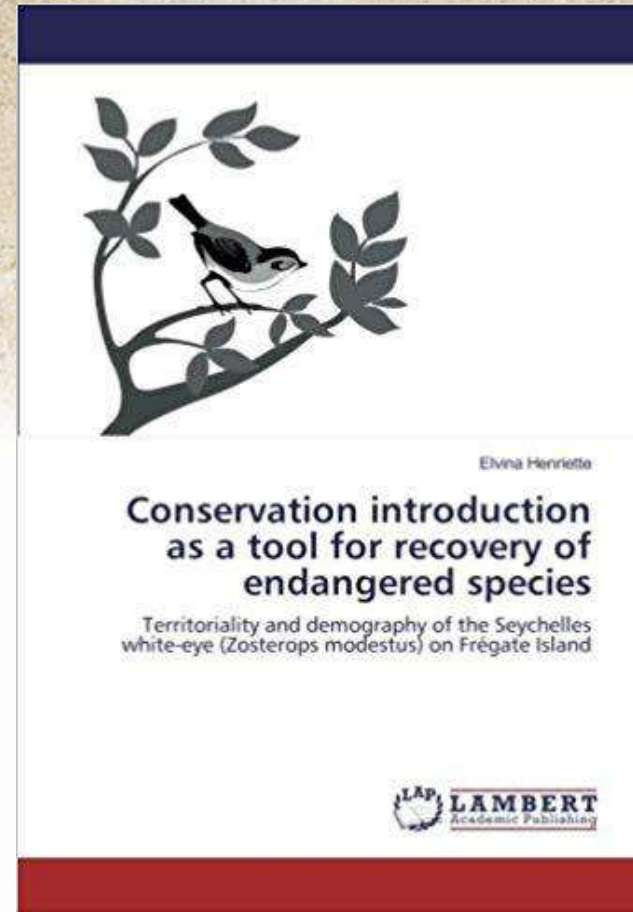


Figure 21b: Population projections from 2001 to 2010 based on a 10% increase in 2001 - 2010 average vital rates (1. adult survival, 2. juvenile survival, 3. productivity). Baseline model fits the observed 2001-2010 population growth.

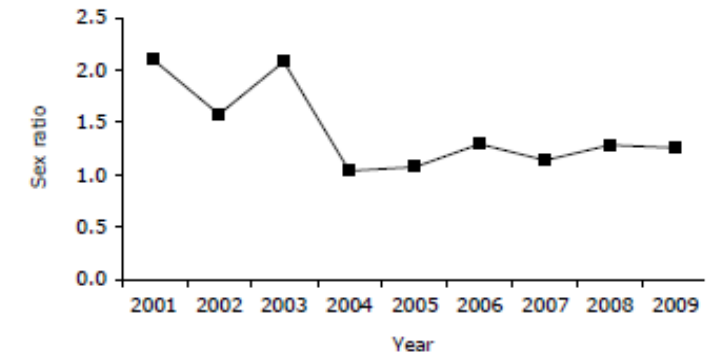
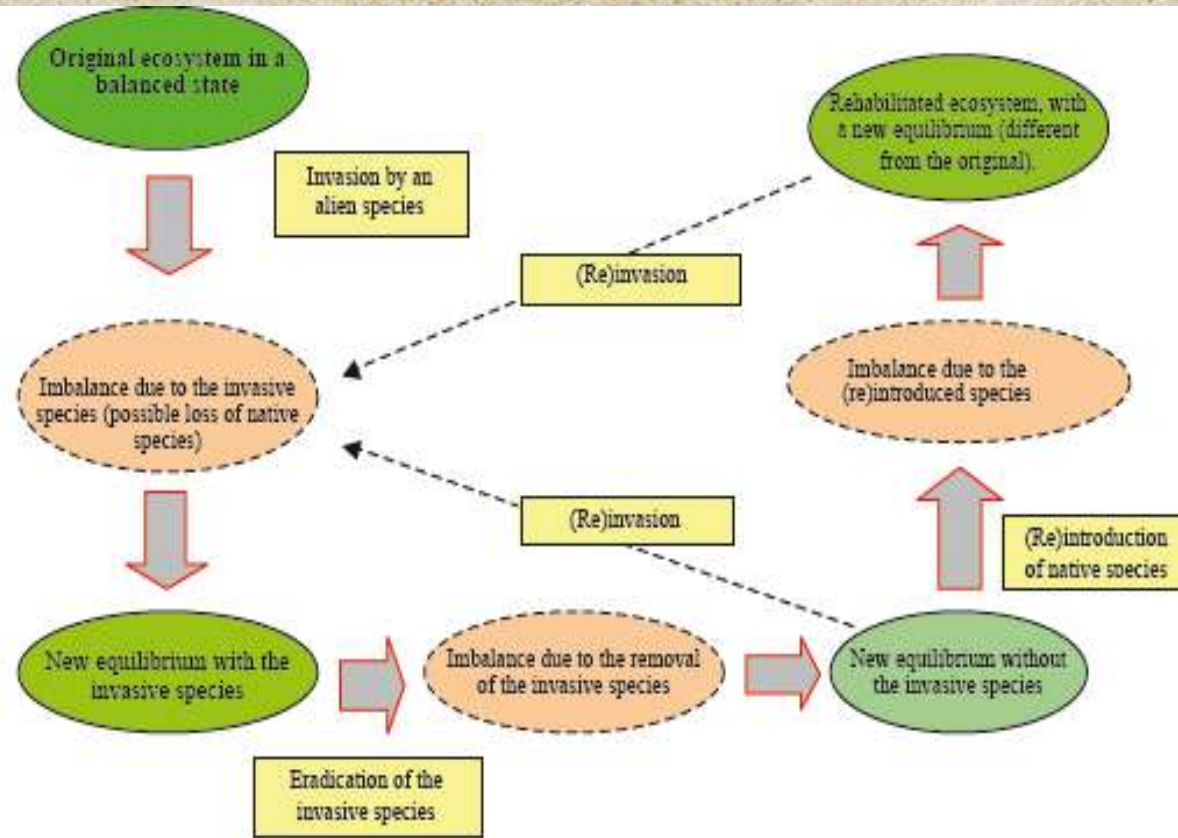


Figure 19a: Variation in the population sex ratio on Frégate, 2001 - 2009.

# Introduction

## Changes in ecosystem balances following restoration operations (in Rocamora & Henriette 2015)

Figure 21: Possible evolution of an ecosystem following invasion by an alien species and restoration actions such as the eradication of this species and the (re)introduction of native ones (adapted from Galman, 2011).





# Introduction

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How have the ecosystems of restored islands responded ?



Seabirds ?



Invertebrates ?



Landbirds ?



Reptiles ?



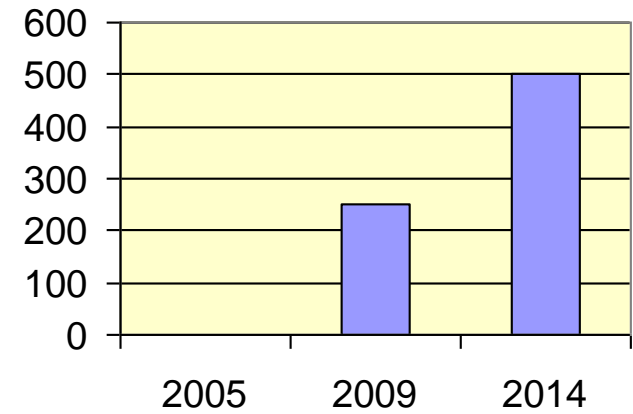
Vegetation ?

# Introduction

**D'Arros Island** (Data : Kappes et al. 2013 & D'Arros Research center)



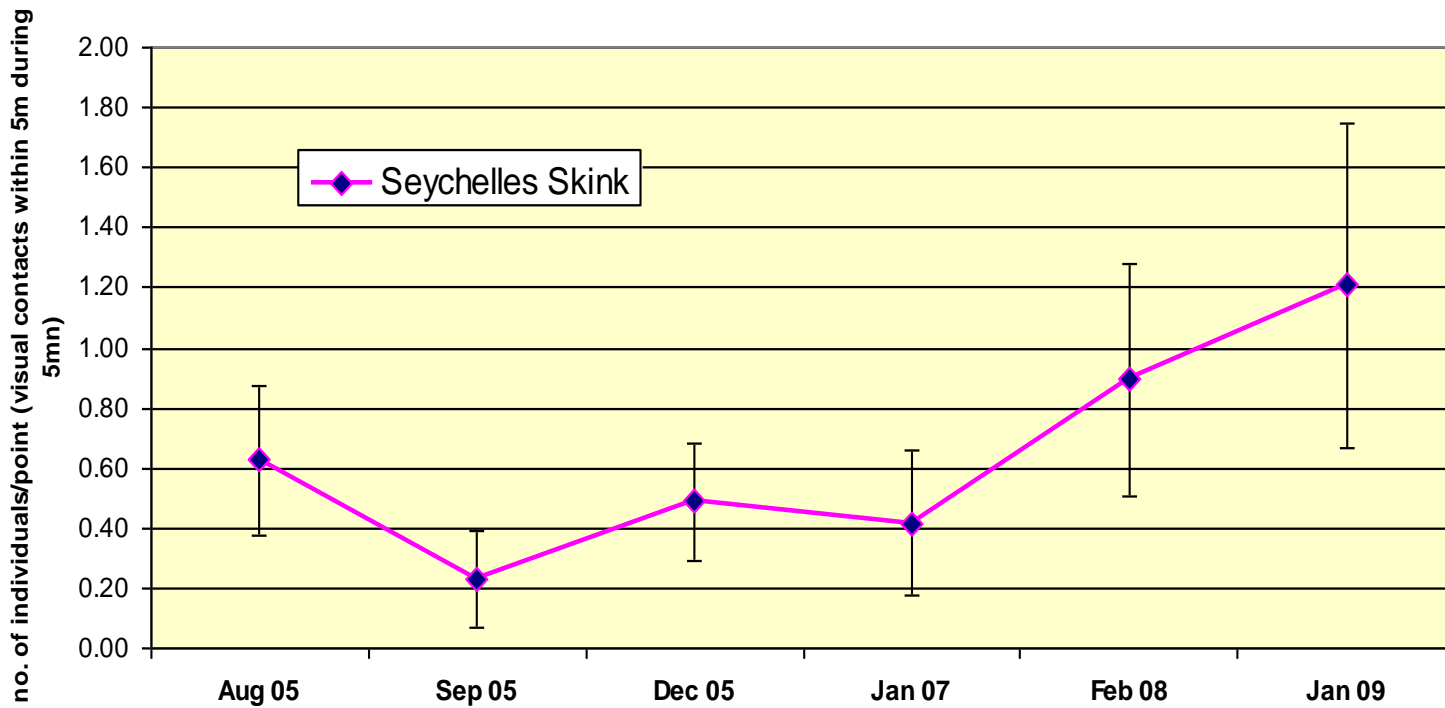
**Wedge-tailed Shearwater**



# Introduction

## REPTILES Ile du Nord (North I.)

Abundance variation of Seychelles Skinks on North Island during the 2005 rat eradication & for following NW seasons



Seychelles skink decreases during eradication, then increases ( $P < 0.01$ )

# Introduction

## Wildlife recovery recorded systematically for almost all biodiversity components

**Seabirds:** recovery of 23 populations of 9 different species (including 10 recolonisations) in 10 islands surveyed

**Landbirds:** most increased or recolonise after the eradications. A few initially declined but recovered well beyond initial abundances

**Reptiles:** geckos and skinks showed stable or increasing trends

**Large invertebrates:** snails, beetles, millipedes, crabs often recovered.



# Introduction

## Indirect impacts of rat eradication

Rapid development of *Pisonia grandis* woodland after rat eradication on Bird, Denis & Conception Islands.

**2014:** 10m canopy *Pisonia grandis* woodland →



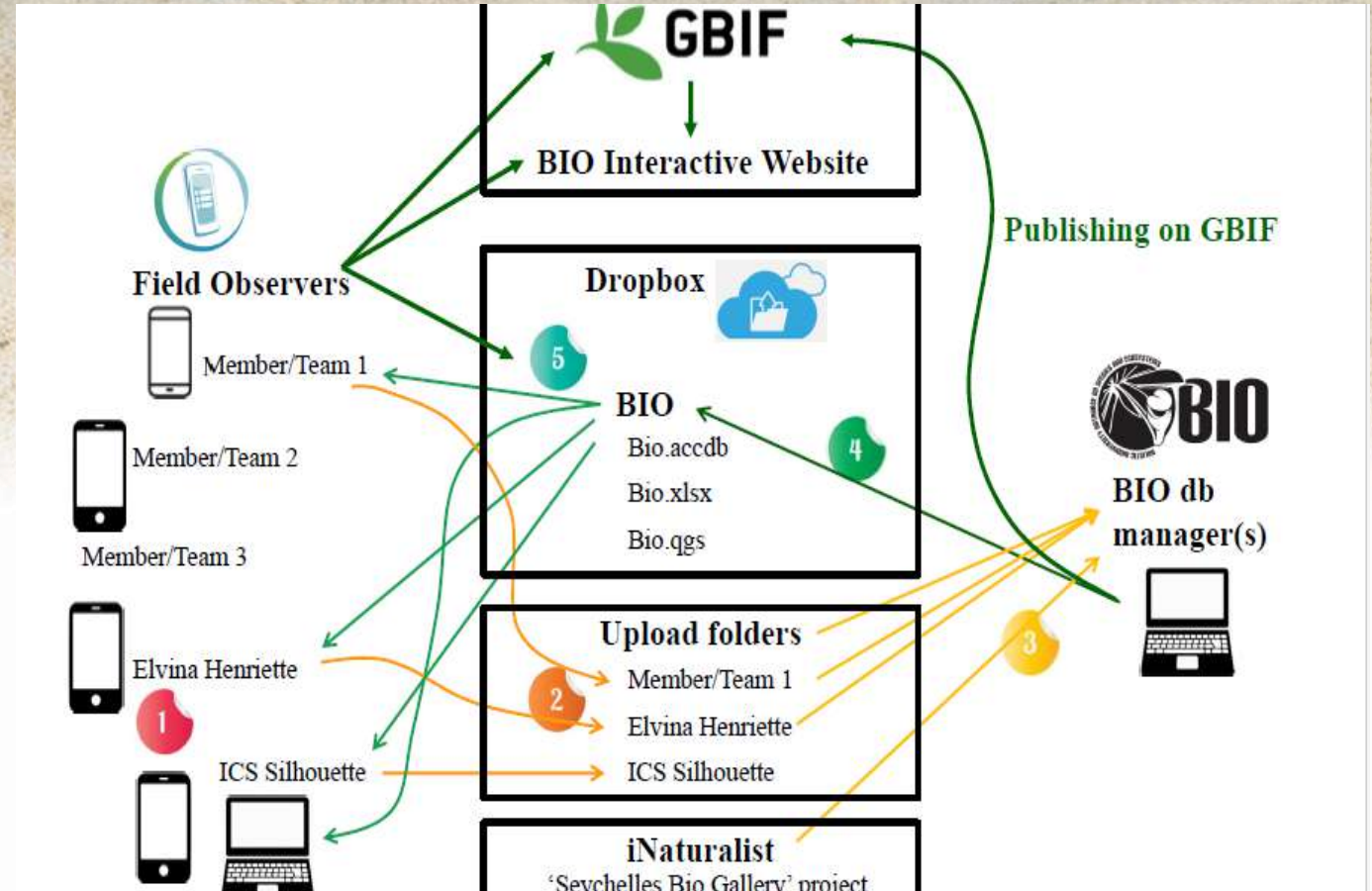
**1998 – 2007:** occasional seedlings →



# Introduction

## Storage and use of data

### The BIO database and the Global Biodiversity Information Facility (GBIF)



# Introduction

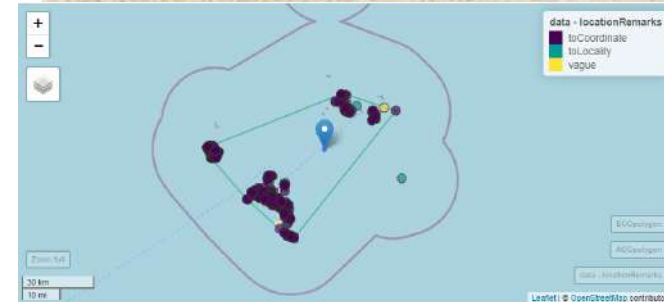
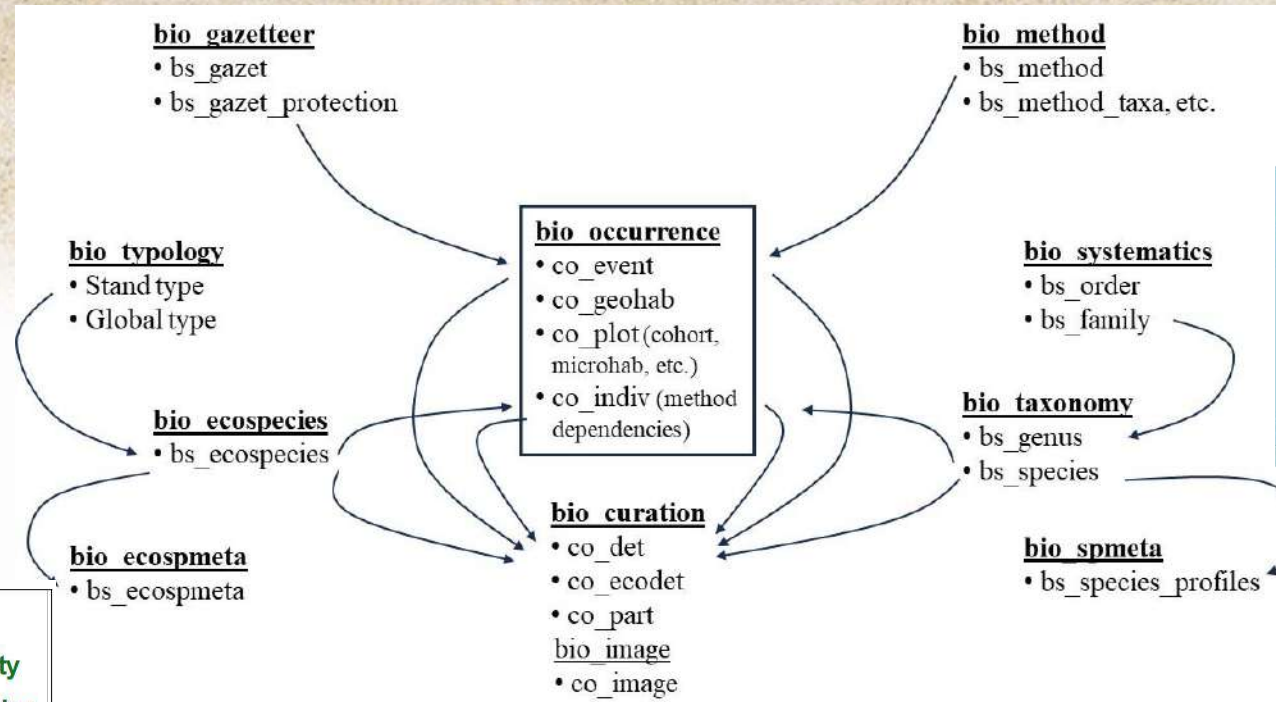
## 'BIO' holistic biodiversity database for species and ecosystems

<https://shiny.bio.gov.sc/bio/flora/>

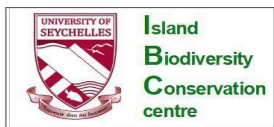
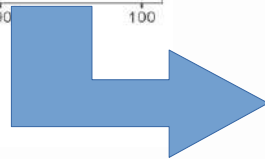
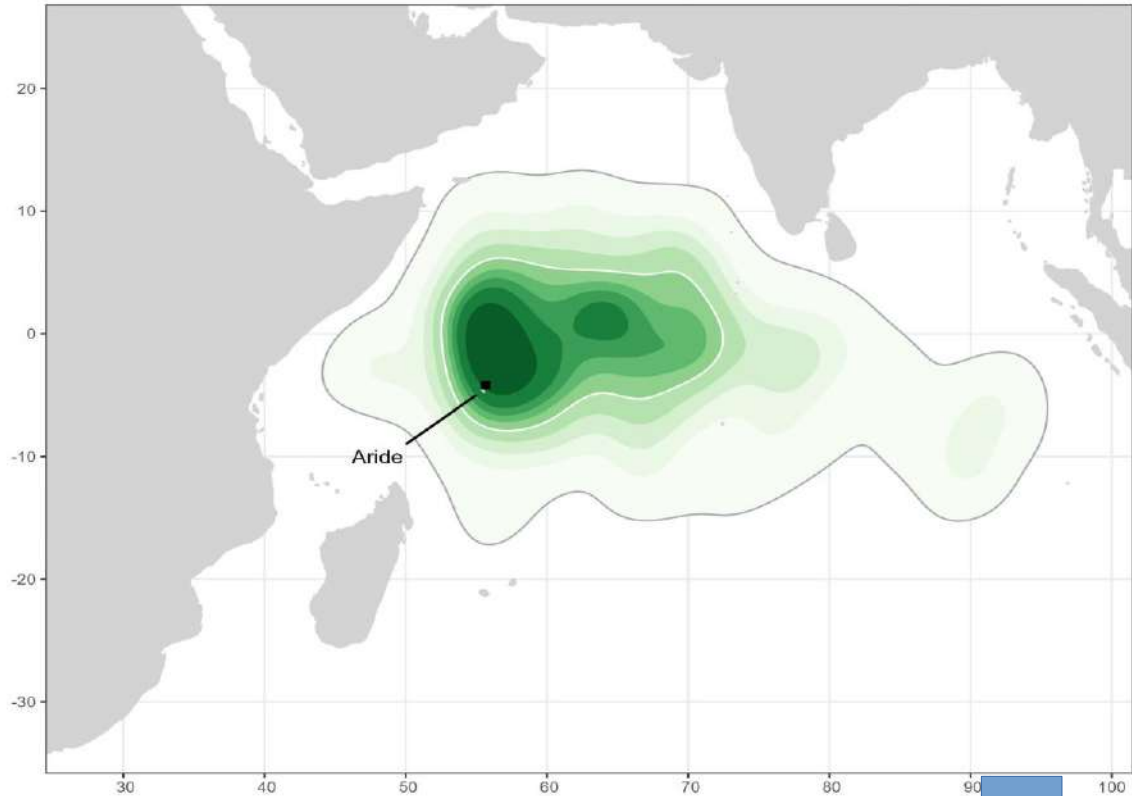
<https://shiny.bio.gov.sc/bio/distrib/>

<https://shiny.bio.gov.sc/bio/gallery/>

<https://shiny.bio.gov.sc/bio/eco/>



Island  
Biodiversity  
Conservation  
centre



**Seabird Tracking Database**  
Tracking Ocean Wanderers



**Coastal Observing systems : Focus on biodiversity and costal ecosystems – 3rd Episode June 20th, 2024**



# Introduction

## Promoting island restoration by showcasing biodiversity gains

- Chapter 6 in book IAS in Seychelles
- Poster
- Conference proceedings
- Scientific papers

## Eradication of invasive animals and other island restoration practices in Seychelles: achievements, challenges and scaling up perspectives

G. Rocamora

Scientific Director & Chair, Island Biodiversity & Conservation Centre, University of Seychelles, Anse Royale Campus, Box 1348, Victoria, Seychelles. <IBC@unisey.ac.sc>

In: C.R. Veitch, M.N. Clout, A.R. Martin, J.C. Russell and C.J. West (eds.) (2019). Island invasives: scaling up to meet the challenge, pp. 588–599. Occasional Paper SSC no. 62. Gland, Switzerland: IUCN.



Table 11: Observed major biodiversity changes and ecosystem recovery in Seychelles islands (> 10 ha) where rats have been eradicated. Years indicate period when indicated changes were noticed. **Bold:** major changes observed or measured from a monitoring protocol. Normal characters: non-significant changes or empirical observations. *Italic:* changes not necessarily related to the impact of rat or cat eradication (from Rocamora *et al.* in prep.).

Island	Year of eradication	Vegetation	Invertebrates	Reptiles (lizards/species)	Landbirds	Fish/CCA	
Bird Island (île aux Vaches)	1997	Expansion of <i>Pisonia grandis</i> despite being initially affected by Crazy ants, Phoenix had colonized after the abandonment of coconut plantation in the 1970s.	Expansion and explosion of density of invasive <i>Crazy</i> and after the eradication (1997), control of ants conducted in 1999-2000		Strong increase of moorhens, colonization by Seychelles blue pigeon, introduction and expansion of Seychelles sunbird	Body fern colony size stable (annual census 1973-2013). Increase in Lesser noddy (2002-09) and White-tailed tropicbird breeding numbers (2006, non fluctuating)	
Fraigate	2000	(continued re-creation of c. 10ha of native woodland through coconut removal and replanting)	Strong decline of endemic snails (2002) then recovery for <i>Pluchinella</i> (2010); stability or minor decline of Giant tortoise (2002) and Giant beetle (2002, 2011)		Increase in distribution and numbers of introduced Seychelles White-eye (2001, 2010)	Increase in ground-nesting White-tailed tropicbird (2008), increase in tree-nesting Lesser noddy and Fairy tern probably related to habitat restoration (2008, 2010, 2013)	
Demie	2002	Expansion of <i>Pisonia grandis</i> (2 to 3.6 ha) (re-creation of c. 30ha of native dominated woodland through coconut removal and replanting)			Strong increase of moorhens, increase in distribution and numbers of introduced Seychelles endemic (Warbler, Fody, Magpie-robin, Flycatcher) 2004-2012	Increase of Wedge-tailed shearwater and Fairy tern; decrease of Brown noddy in 2000-2002 (during of 2002/03)	
D'Arros	2003	(re-creation of c. 11 ha of native woodland through coconut removal and replanting)				Colonization and increase of Wedge-tailed shearwaters (2009, 2013). Colonization of Lesser noddy; increase also related to habitat restoration	
Anonyme	2003	(removal of <i>Coccoloba</i> and replanting of native woodland esp. <i>Sida</i> )		Increase sightings of bronze geckos (observed 2005-2020)			
North Island (île du Nord)	2005	Increase abundance of unmanaged areas (2008) (re-habitat restoration of c.40ha of native woodland through coconut removal and replanting)	Decrease in total ground invertebrates, robbers, diversity & evenness, spiders, earwigs, flies, hemipteran bugs and caterpillars on NE homopteran bugs, ants, beetles, waterbeetles and oederellans on CI (2009). No significant variations on leaf level decline of hopper bugs on HI. Decline of total leaf invertebrates, homopteran bugs, ants, beetles, coleopterae and caterpillars; rediversification of small <i>Stylopsis</i> and <i>Glant melleope</i> on CI (2009)	Immediate decline of <i>Trachylepis sechellensis</i> (2006) then recovery beyond initial abundance (2009); Fluctuation/stability for Green gecko. (2006, 2013)	Decline of moorhens followed by recovery (2007) and explosion in numbers (2008), recovery of Turtle-dove (2007), increase in Madagascar noddy (2007-2008); increase in distribution and numbers of introduced Seychelles White-eye (2006, 2013)	Increase in distribution and numbers of small Wedge-tailed shearwater colony (2005-2013)	
Conception	2007	Colonization of coastal plateau by <i>Pisonia grandis</i> (6.1 ha) and restoration of <i>Phorocarpus boissierii</i> (2015-2014)			Decline of <i>Trachylepis sechellensis</i> (2008) then recovery beyond initial abundance (2010-2014); Fluctuation/stability for Green gecko. Burrowing animals observed more abundant (2010-2014)	Increase of Seychelles White-eye, Blue pigeon and Sunbird; recovery of Madagascar turtle-dove, stability of Madagascar Fody, and extinction of Ground-dove (2006-2019); Myiias stable or decreased.	First breeding of Wedge-tailed shearwater and establishment of a small colony (2010-2014).
Grande Ile (Cosmoledo)	2007	Very high density of tall grasses <i>Dactyloctenium</i> sp. observed in 2014, unclear if partly related to rat eradication	Increase in total ground invertebrates, spiders, ants, beetles, ants (2008). Increase of Robber crab and hermit crabs abundance (2014)		Increase of <i>Soumanga eumitris</i> and <i>Madagascar distiloba</i> (2008).	Higher numbers of Fairy terns, Black-naped terns and Red-tigres (2003-04). Recolonization by breeding Masked boobies after c. 60 years of absence on Ode Ile.	
Grand Polyte (Cosmoledo)	2007				Increase sightings of Brown gecko on Ode Sour (observed 2010-2014)	Establishment of a small Wedge-tailed shearwater colony on "Pis" (year 2010-2012)	
Grande Sour & Petite Sour	2010						

**“a must-have for anyone, anywhere who seeks to manage invasive species”**  
J. Lookwood, *Biological Invasions* (2016) 18: 2117-2118.

**A book describing the extensive Seychelles experience in invasive species management, and how to tackle 44 invasive species including 22 of the world's worst ones**

Authors: Gerard Rocamora & Elvina Henrietta

Foreword by Prof. Daniel Bimberoff

To purchase the book, contact: ROCAMORA@unisey.ac.sc

Price: 20 €, 100 € (24000 maldivian) 18 € (paper) - 12 € (e-book) 40 pages, 19 tables, 40 maps

98 SPECIES ACCOUNTS

10 CASE STUDIES

MANAGEMENT RECOMMENDATIONS

MONITORING ECOSYSTEM RECOVERY

No book address: conservation practitioners, island managers, scientists, naturalists and any person willing to learn more about invasive species and how to fight them. Part one of the book provides information about invasive species and how they threaten ecosystems, habitats, and the natural resources it entails. The treatment of invasive species management to undertake ecological restoration on islands, and to the recovery of globally threatened species. It also shows the responsible impact of species, and management efforts and their outcomes. Part two is a required reference for invasion scientists... for managers in the Seychelles and beyond. It will be a very useful handbook of methods to attack particular invasive species - what worked and what did not. Foreword from Prof. Daniel Bimberoff, Institute for Biological Invasions, University of Tennessee, USA.

... the eradication of rat and other non-indigenous predators is preventing, or reducing, or eradicating, and being with invasive species on the islands. It is a very useful, using clear and concise language... To use the volume as a guide in the invasion ecology literature... a must-have for anyone, anywhere who seeks to manage invasive species. The authors so succinctly synthesize the collective wisdom of academic research and applied restoration in the region that it has tangible value and outside of the realm of island studies. Julie L. Lookwood, E.E.R.U., Rutgers University, New Brunswick, USA, in *Biological Invasions* (2016) 18: 2117-2118

# Introduction

## Long-term biodiversity monitoring is important

Jones et al. 2016

PNAS



### Invasive mammal eradication on islands results in substantial conservation gains

Holly P. Jones<sup>a,b,1</sup>, Nick D. Holmes<sup>c</sup>, Stuart H. M. Butchart<sup>d</sup>, Bernie R. Tershy<sup>e</sup>, Peter J. Kappes<sup>f</sup>, Ilse Corkery<sup>g</sup>, Alfonso Aguirre-Muñoz<sup>h</sup>, Doug P. Armstrong<sup>i</sup>, Elsa Bonnaud<sup>j</sup>, Andrew A. Burbidge<sup>k</sup>, Karl Campbell<sup>c,1</sup>, Franck Courchamp<sup>j</sup>, Philip E. Cowan<sup>m</sup>, Richard J. Cuthbert<sup>n,o</sup>, Steve Ebbert<sup>p</sup>, Piero Genovesi<sup>q,r</sup>, Gregg R. Howald<sup>c</sup>, Bradford S. Keitt<sup>c</sup>, Stephen W. Kress<sup>s</sup>, Colin M. Miskelly<sup>t</sup>, Steffen Oppel<sup>n</sup>, Sally Poncet<sup>u</sup>, Mark J. Rauzon<sup>v</sup>, Gérard Rocamora<sup>w,x</sup>, James C. Russell<sup>y,z</sup>, Araceli Samaniego-Herrera<sup>h</sup>, Philip J. Seddon<sup>aa</sup>, Dena R. Spatz<sup>ce</sup>, David R. Towns<sup>bb,cc</sup>, and Donald A. Croll<sup>e</sup>

Animal Conservation

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LET'S WORK  
FOR WILDLIFE

Animal Conservation. Print ISSN 1367-9430

FEATURE PAPER

### Seabird population changes following mammal eradications on islands

M. de L. Brooke<sup>1</sup>, E. Bonnaud<sup>2</sup>, B. J. Dille<sup>3</sup>, E. N. Flint<sup>4</sup>, N. D. Holmes<sup>5</sup>, H. P. Jones<sup>6</sup>, P. Provost<sup>7</sup>, G. Rocamora<sup>8,9</sup>, P. G. Ryan<sup>3</sup>, C. Surman<sup>10</sup> & R. T. Buxton<sup>11</sup>

Brooke (de) et al. 2017

# Speakers



**Christelle BERANGER**

Biodiversity observing systems of Martinique

**Manager of Biodiversity Enhancement and Natural Spaces at the Regional Natural Park of Martinique**



# Observatoire martiniquais de la biodiversité

## History and organization

- ✓ Multi-partner mechanism facilitated by the Regional Nature Park of Martinique, comprising 46 members (public organizations, scientifics, NGOs)
- ✓ Established in 2015 by the signing of an operational charter
- ✓ Annual budget : 80 000 to 150 000 euros



Crédit photo : PNRM/ Autrevue

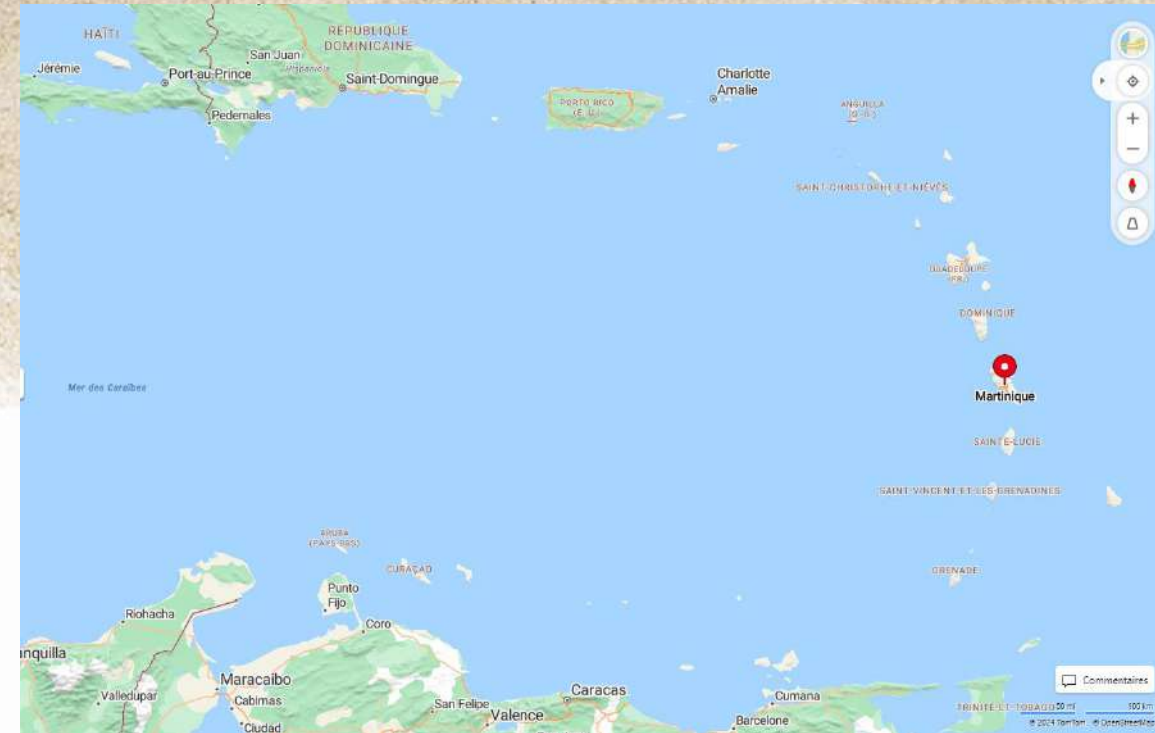
# Observatoire martiniquais de la biodiversité

## Purpose

- Biological diversity of Martinique (terrestrial, aquatic, and marine), all species (common, rare, invasive)
- Geodiversity
- Interactions between society and biodiversity

## Missions

- Collect and disseminate knowledge about the biodiversity of Martinique
- Monitor the state of biodiversity through indicators
- Support local stakeholders in considering biodiversity



# Observatoire martiniquais de la biodiversité

## Tools for collecting and disseminating information and data

### Website

[biodiversite-martinique.fr](http://biodiversite-martinique.fr)



Informations : resource center  
➔ over 2000 resources



Crédit photos : PNRM, JP BEAUGIER

# Observatoire martiniquais de la biodiversité

## Tools for collecting and disseminating information and data

**Platform MadiNati**  
[madinati-martinique.fr](http://madinati-martinique.fr)



Launched in november 2022



A decision-making tool

Natural heritage information system :  
SINP Martinique



Crédit photos : PNRM, JP BEAUGIER

Rechercher des observations

Recherche

Filtrer les taxons

Par nom Par attributs

Nom du taxon

- Taxons présents localement  
 Taxons présents dans la base

Icterus bonana (Linnaeus, 1766)

Quoi

Jeu de données

Quand

Depuis le 01 03 2004    
 Jusqu'au 30 03 2023

Où

Espace naturel APB BPM PNM PNR RAMSAR RBI RNN SCL ZNIEFF1 ZNIEFF2

Recherche spatiale

Réinitialiser Rechercher

Information

Voir la fiche complète Fermer

### Icterus bonana (Linnaeus, 1766)

Oriole de Martinique, Carouge

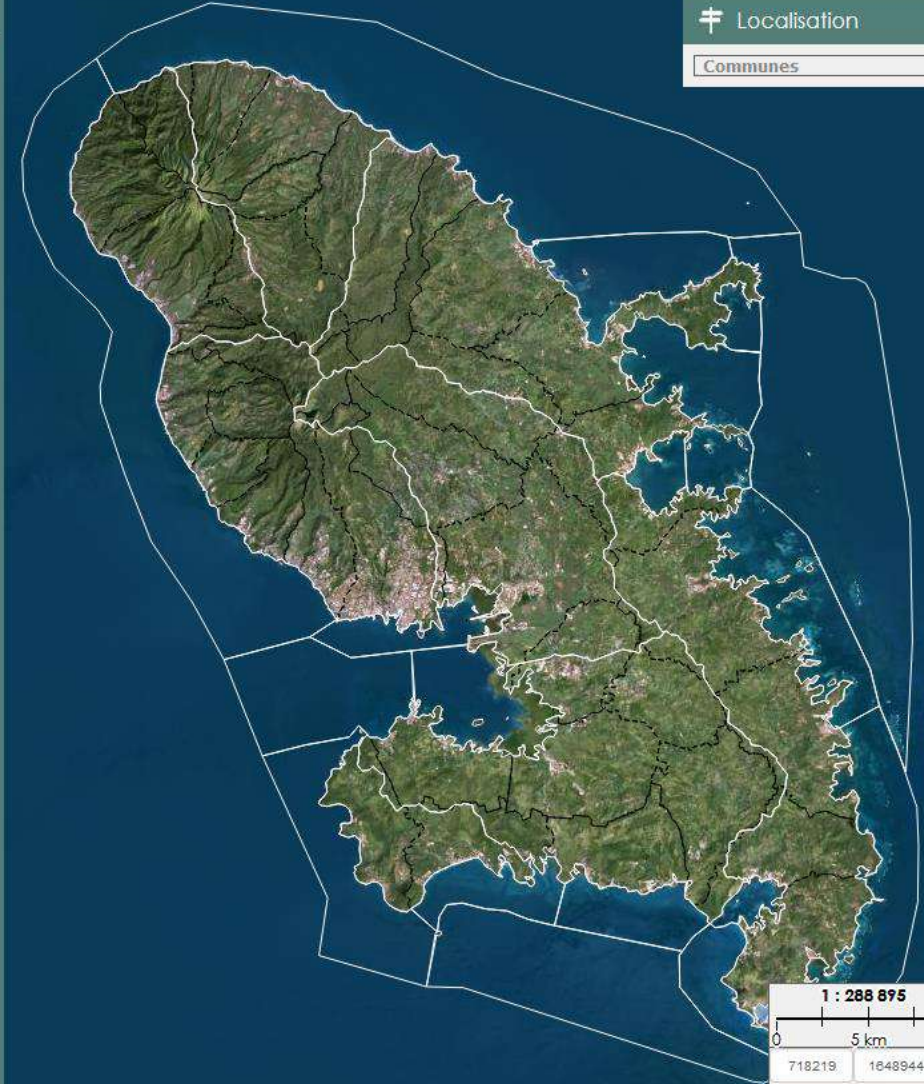


1/6 - S. Siblet

- **Liste rouge mondiale:** **VU** Vulnérable (France)
- **Liste rouge nationale (Nicheur certain):** **VU** Vulnérable (Martinique)
- **Protection:** Mesures de protection des oiseaux représentés dans le département de la Martinique : Article 1 (Martinique)
- **Réglementation:** Prévention de l'introduction et de la propagation des espèces animales exotiques envahissantes sur le territoire de la Martinique : Annexe 1 (Martinique)
- **Réglementation:** Liste des espèces animales et végétales à la protection desquelles il ne peut être dérogé qu'après avis du Conseil national de la protection de la nature : Annexe 1 (France)
- **Statut biogéographique:** Endémique (Martinique)
- **Statut biogéographique:** Absent (France métropolitaine)

Localisation

Communes



1 : 288 895  
 0 5 km 10 km  
 718219 1648944 Mètres



Rechercher des observations Aide ?

Recherche

Information sur la requête

Filtres actifs :

- Depuis le 1979-01-01

- Jusqu'au 2024-06-13

Résultat : 31,692 observations / 1,541 taxons

Certaines observations non validées ou concernant des taxons sensibles peuvent ne pas être retournées en fonction de la requête effectuée.

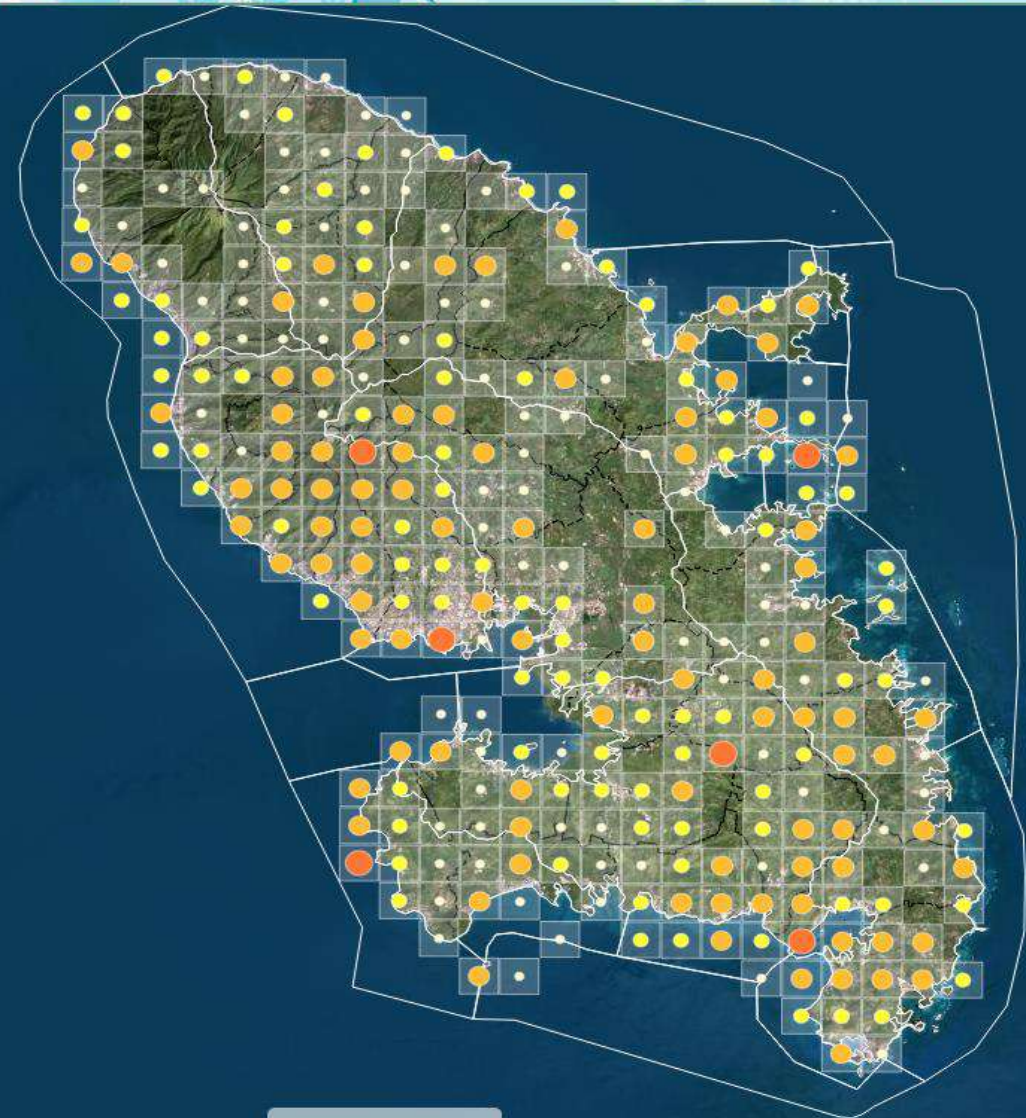
Modifier la recherche

Résultats

Statistiques Taxons Jeux de données Exporter

Affichage des groupes 1 à 12 sur 12 groupes taxonomiques

Groupe	Nb. obs.	Taxons présents	Taxons protégés
Angiospermes	1337	66	0
Arachnides	30	20	1
Autres	156	30	0
Crustacés	1	1	0
Fougères	32	6	0
Gymnospermes	1	1	0
Insectes	9784	1326	0
Mammifères	769	11	11
Mollusques	8	2	0



Légende des résultats

Mailles 2km

Mailles 10km

# Observatoire martiniquais de la biodiversité

## Tools for collecting and disseminating information and data

### Examples of data usage and valorization

- writing popular science articles, newsletters
- developing national IUCN Red Lists
- drafting territorial planning documents
- biodiversity Atlas



### Prerequisites for banking data / advices

- Create, animate, and train a network of contributors
- Adhere to a standard for structuring datasets
- Supporting and training contributors
- Reflect on the sensitivity of the data
- Understand and address potential barriers to data transmission



Crédit photos : C.DELNATTE (DEAL), M. DEWYNTER

# Observatoire martiniquais de la biodiversité

## Indicators to monitor and assist in decision-making

- work from the launch of the observatory
- state, pressure, and response indicators
- methodology of the national biodiversity observatory
- organizing workshops and identifying issues
- identification of regular biodiversity monitoring and surveillance



Crédit photos : PNRM/ AERODREAM, G.VISCARDI (CBNMQ)



**Perspectives :**  
**Identification of around**  
**thirty indicators**  
**to be monitored**

# Observatoire martiniquais de la biodiversité

## Dissemination of knowledge : different target audiences

- website
- newsletters and thematic seminars
- posters
- animations
- educational games



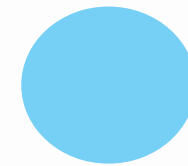
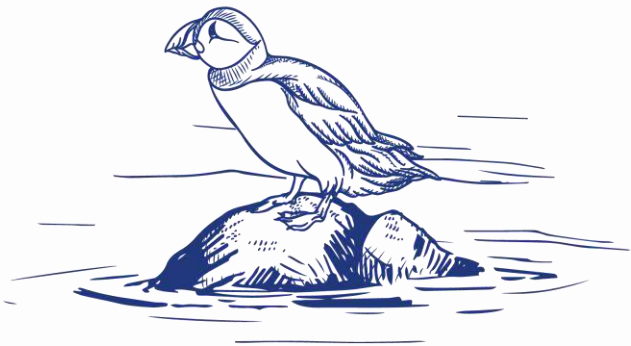
**Perspectives :**  
**To publish a panorama**  
**of Martinique's biodiversity**



Crédit photos : PNRM, Autrevue

# Introduction and first case study

## Questions & answers



# Speakers



**Gwenaëlle DELARUELLE**

L'OEil d'Andromede

MEDTRIX: La plateforme de surveillance des eaux côtières et des écosystèmes de Méditerranée

**Marine Environment Project Manager**



L'OEil d'Andromede



*Liberté  
Égalité  
Fraternité*



# MedTrix

## MEDTRIX : The platform for monitoring coastal waters and ecosystems of the Mediterranean

- A working and data exchange tool that has become a management tool since 2013
- Free and structured access to spatially organized long-term monitoring data (15 years)
- **French Mediterranean coasts** (and some areas in the Atlantic, Italy, Tunisia, Spain, Morocco, and the Philippines)
- **Cartographic platform:** <https://plateforme.medtrix.fr/>
- **Website:** <https://medtrix.fr/>
- **4000 users**



L'OEil d'Andromède



RÉPUBLIQUE  
FRANÇAISE  
Liberté  
Égalité  
Fraternité

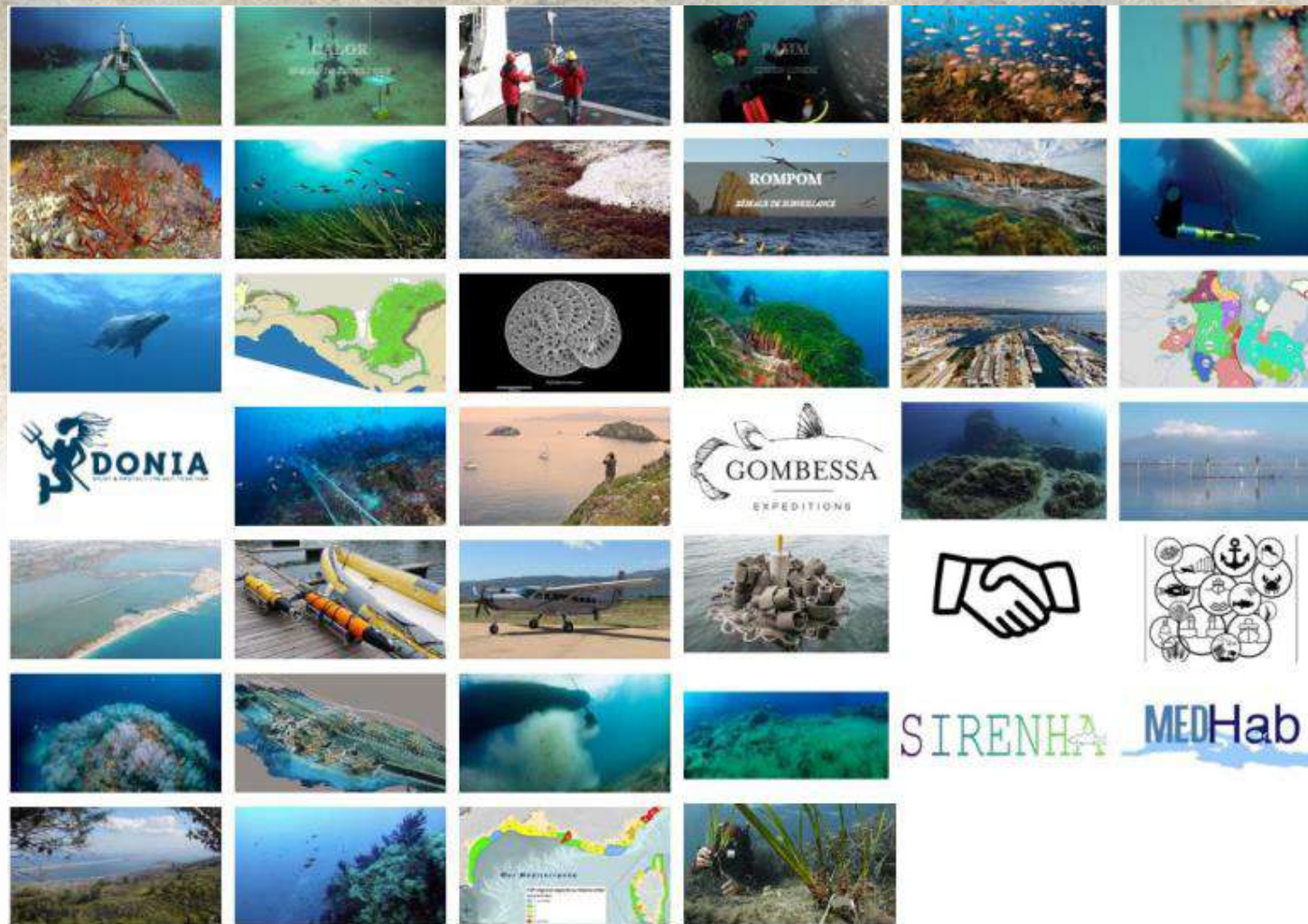


agence  
de l'eau  
RHÔNE  
MÉDITERRANÉE  
CORSE



# MedTrix

40 projects





# MedTrix

40 projects



The state of coastal and transitional waters

Coastal observing systems

Habitat mapping

Management of coastal zones

Citizen Science

Scientific expedition

Ecological restoration

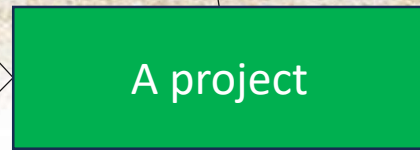
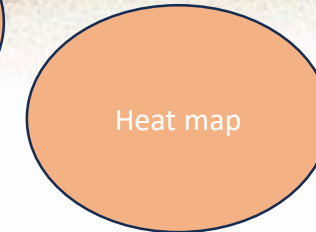
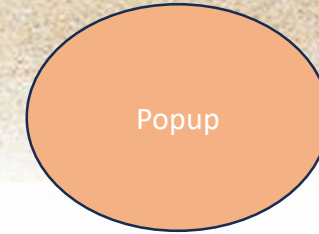
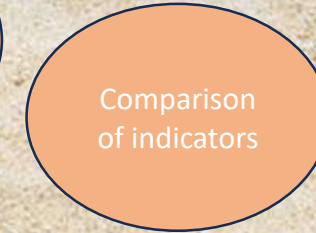
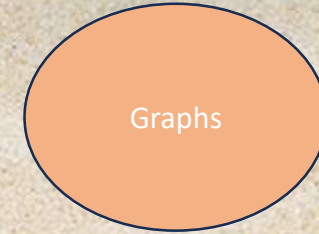
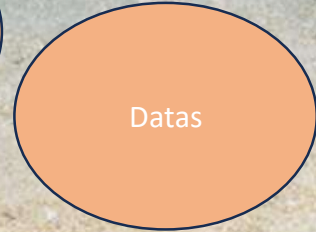
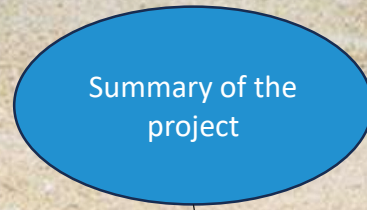
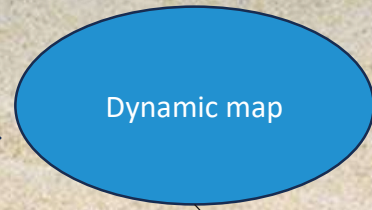
Monitoring network

# MedTrix

40 projects

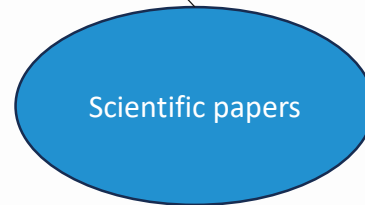
Mapping platform

<https://plateforme.medtrix.fr/>



Website

<https://medtrix.fr/>



# MedTrix

Update frequency:  
Multi-annual or annual

**MODEL**  
Application de la photogrammétrie à la surveillance des habitats sous-marins

HOME MEDTRIX PROJETS PUBLICATIONS HISTORIQUES CONTACTS

Couches

Légende

- Sites acquis par photogrammétrie
- Masses d'eau côtières
- Fond de carte

Fond de carte (Andromède Oceanologie)

Site(s) disponibles

En cliquant sur les différents sites ('berbier', 'Coralligène', 'épave' ou 'écrou artificiel'), vous pouvez afficher le modèle 3D du site dans la fenêtre 'pop-up' qui s'ouvre à gauche de la carte. Vous avez également la possibilité d'afficher en taille réelle le modèle 3D dans votre navigateur en cliquant sur 'ouvrir' juste en dessous du modèle.

→ Les données disponibles des descriptions plus guidé attribué

Les données de méditerranée:  
MEDTRIX - App  
Andromède de  
MEDITERRANEE

**PARAMETRES**

- Zoomer par rectangle sur la carte
- Zoomer sur l'étendue globale du projet
- Zoomer
- Dé-zoomer

**OUTILS CARTOGRAPHIQUES**

- **Revenir sur la page** d'accueil de la plateforme et afficher la liste des projets disponibles. Face au logo, l'onglet déroulant '+' fournit une brève description du projet.
- Afficher la **légende** du projet et gérer (rendre visible ou non) les différentes couches SIG du projet en cochant/décochant les données. Dans la légende, l'utilisateur a accès à de la documentation en cliquant sur l'icône «» (ex : accès aux rapports de missions sur le projet MAGMA) ainsi qu'en survolant avec la souris certains éléments.
- Afficher les **informations** relatives au projet (description, structure(s) partenaire(s), accès aux documents méthodologiques et rapports associés).
- **Comparer** des paramètres pour chaque site (PISCIS, RECOR, RESPIRE, TEMPO) ou masse d'eau côtière (LAGMED, SURFSTAT) et ce à différentes échelles de comparaison (Méditerranée, Région, Masse d'eau côtière). L'outil compare les sites/masses d'eau visibles sur la carte et exporte les résultats sous la forme d'un tableau.
- **Localiser une zone** en zoomant sur la masse d'eau côtière associée.
- **Géolocalisation** (ou positionnement via le navigateur web) de sa localisation géographique actuelle : 'Centrer' permet de centrer une fois sur la carte et 'Rester centré' permet de maintenir un recentrage régulier.
- **Imprimer la carte en format PDF** en choisissant l'échelle d'impression, la résolution de la carte (100, 200 ou 300 DPI), le titre de la légende (optionnel) et la zone d'impression. La carte s'ouvre dans un nouvel onglet en format PDF.
- **Afficher une fenêtre 'POPUP'** à gauche de la carte en cliquant sur les différents éléments de la carte (sites, images).
- **Mesurer** des distances, des aires et des périmètres sur la carte.
- **Permalien** ou partage d'une emprise et des couches actives de la carte en générant un lien internet. L'onglet **Géosignets** permet l'enregistrement d'un signet (= une emprise avec des couches affichées) pour un projet donné et de revenir dessus lorsqu'on se connecte de nouveau au projet – un signet est propre à chaque utilisateur.
- **Filterer la carte** de manière dynamique (en direct) à partir de la **base de données**. Il peut sélectionner, zoomer, centrer sur l'entité sélectionnée.
- **Récupération du flux WMS** (données géoréférencées sous forme de fichiers images) par l'intégration de l'URL WMS du projet sur medtrix dans votre Système d'Information Géographique.
- **Time Manager**, avec l'affichage d'une animation basée sur un attribut temporel d'une couche donnée.
- **Réaliser une recherche** approfondie dans la base de données en utilisant un **filtrage spécifique**.
- **Sélectionner** une zone d'intérêt sur la carte et n'afficher que les données relatives à cette zone.
- **Signaler** toute erreur d'affichage et de données et ainsi faire remonter l'information aux gestionnaires de la plateforme Medtrix.

# MedTrix

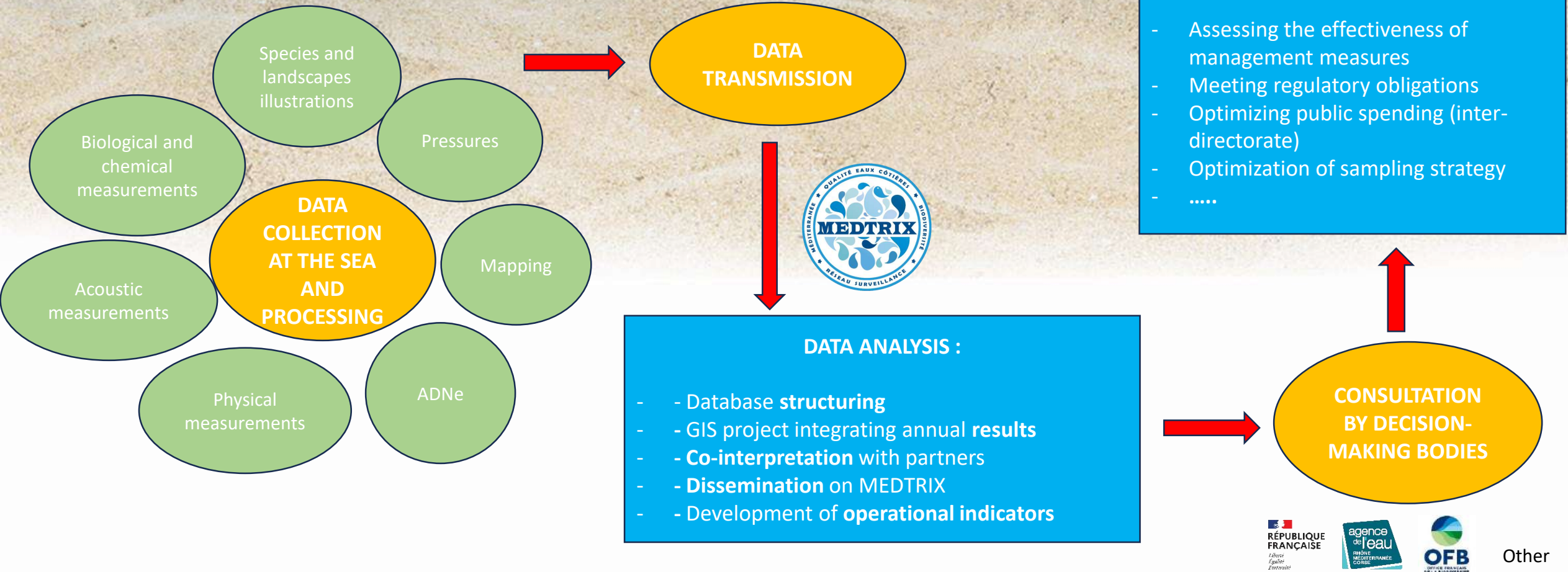
## 50 partners : private and public structures

- Integration of a diversity of stakeholders
- Collaborations among stakeholders, users, decision-makers
- Complementary data acquired in the same location enrich each other
- **Enhancement of global monitoring of coastal waters and Mediterranean ecosystems**



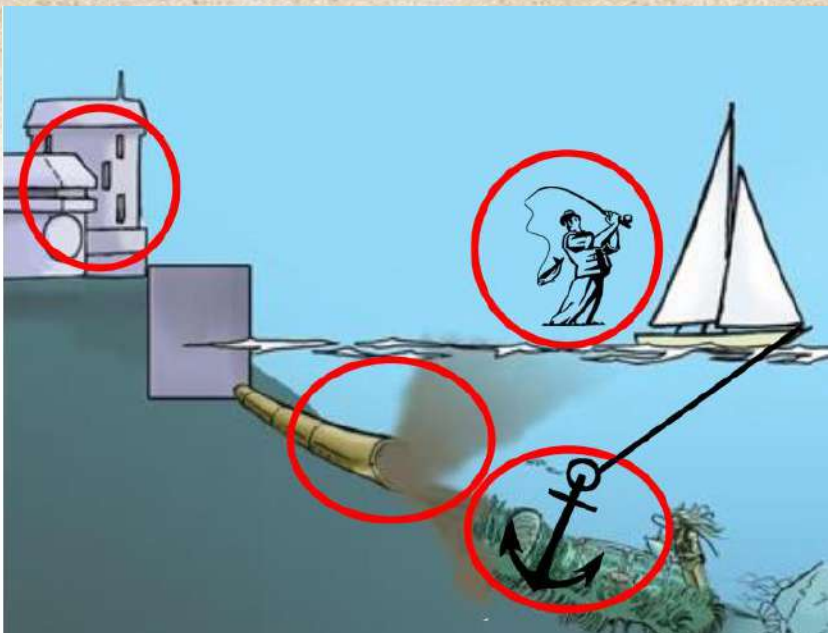
# MedTrix

## From data collection to data banking



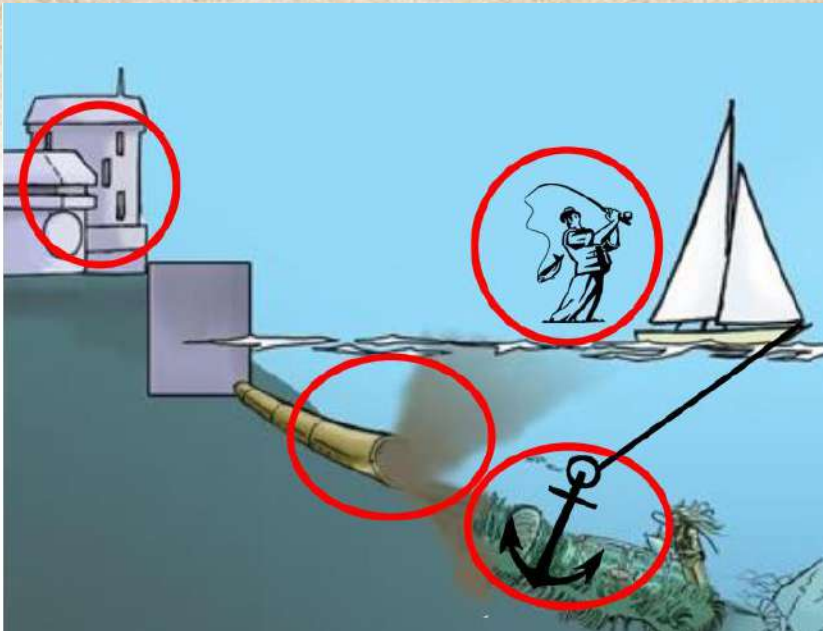
# MedTrix

## Posidonia preservation



# MedTrix

## Posidonia preservation



Marine Pollution Bulletin 123 (2017) 176–181

Contents lists available at ScienceDirect

Marine Pollution Bulletin

journal homepage: www.elsevier.com/locate/marpolbul

Boat anchoring pressure on coastal seabed: Quantification and bias estimation using AIS data

Julie Deter<sup>a,b,\*</sup>, Xavier Lozupone<sup>a</sup>, Adrien Inacio<sup>a,b</sup>, Pierre Boissery<sup>a</sup>, Florian Holon<sup>a</sup>

<sup>a</sup> ANR-10-SEVRI-0001, 7 Place Casass, 34290 Camon, France  
<sup>b</sup> IRE 5554 - 3200, Campus mistral de l'Université Montpellier, Place Eugène Bataillon, 34093 Montpellier Cedex 05, France  
<sup>c</sup> Agence de l'eau Rhône-Méditerranée-Corse, Immeuble Le Nivôler, 50 La Garenne, 13003 Marseille, France

**ARTICLE INFO**

**Keywords:** Moving impact; Recreational boating; Ship; Method; Habitat vulnerability; Resilience

**ABSTRACT**

Global shipping is economically important, but has many adverse environmental effects. Anchoring contributes greatly to this adverse impact, as it is responsible for mechanical disturbance of highly sensitive marine habitats. Recovery of these ecosystems is limited by slow regrowth. Anchoring pressure on coastal seabed habitats was estimated using AIS (Automatic Identification System) data along 1800 km of Mediterranean coastline between 2010 and 2015. A comparison with field observations showed that these results were most consistent for large boats (> 50 m). An analysis of AIS data coupled with a seabed map showed that around 30% of the habitats between 0 and –80 m exhibited anchoring pressure. *Posidonia oceanica* seagrass beds were the most impacted habitat in terms of duration. This methodology efficiently estimates spatial and temporal anchoring pressure principally due to large boats and should interest managers of marine protected areas as much as coastline managers.

**1. Introduction**

Global shipping (maritime transport and recreational boating) is an important sea use and has significant economic value. A recent review of maritime transport reported that “around 80 % of global trade by volume and over 70 % of global trade by value are carried by sea and are handled by ports worldwide” (United Nations Conference on Trade and Development (UNCTAD), 2015). The studied ships comprise commercial vessels (passenger and/or goods transport, service and assistance, professional use such as fishing, or research) and recreational vessels. Recreational boating represents a large number of users with 29% (34.2 million) of U.S. households having at least one member who boated in 2011 (USCG boating, 2011), and Europe having 36 million boaters and six million boats in its waters (European Boating Industry, 2010). There are numerous adverse environmental effects from this high number of boats: collision, pollution (e.g., ballast, oil, antifouling products), devoted buildings on land (harbours) and anchoring (Gappato, 2011). Anchoring is defined as the short-term deployment of a physical device to hold fast to the substrate by a vessel (Kinlanmonth et al., 2014). Anchoring is responsible for mechanical disturbance of highly sensitive marine habitats like seagrass meadows (Short and Wyllie-Echeverría, 1996) and biogenic reefs (Ballintinos, 2006; Davis, 1977), whose recovery is limited by slow regrowth. Concentrated in shallow waters by its very nature, anchoring causes direct and indirect damage to some of the most valuable marine ecosystems (Costanza et al., 1997; Forrester et al., 2015) through deployment and retrieval of the anchor and the movement of the attached chain/rope (Ollivier et al., 2004; Waller et al., 2012). Concentrated on shallow waters by its very nature, anchoring causes direct and indirect damages to some of the most valuable marine ecosystems (Costanza et al., 1997; Forrester et al., 2015) through deployment and retrieval of the anchor and the movement of the attached chain/rope. These ecosystems have already suffered serious decline from man-made coastline, land-based pollutants and climate change (Gall et al., 2012; Forrester et al., 2013; Hughes et al., 2003; Waycott et al., 2009). Locating and quantifying areas of anchoring pressure is an essential, basic step in a multiple-use zoning approach, avoiding conflicting use of zones and facilitating impact management. Anchoring pressure has been the subject of local studies based on direct observations (Francour et al., 1999), aerial photography (Bonhomme et al., 2013; Holon et al., 2015, 2015) or models combining geophysical, ecological, and social components (Kinlanmonth et al., 2014).

Automatic identification systems (AIS) can help to locate and quantify anchoring pressure. AIS are designed to provide information about the ship to other ships and to coastal authorities automatically. Since 31th December 2004, the regulation requires “AIS to be fitted

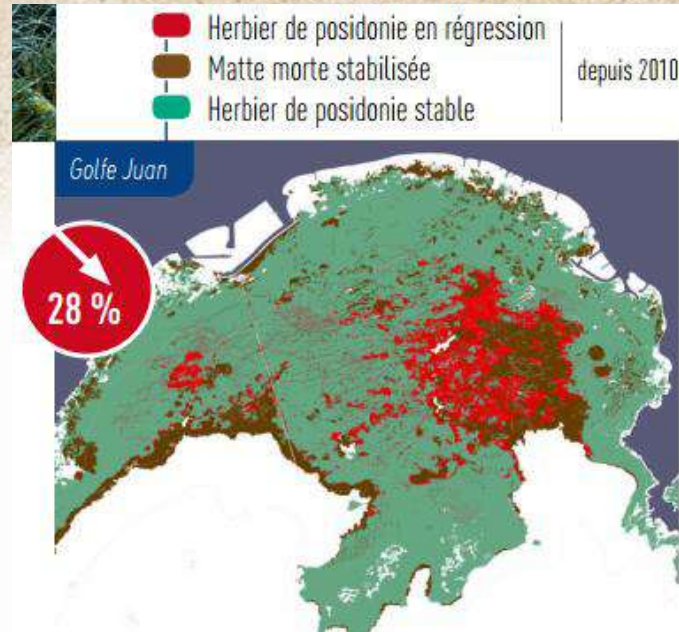
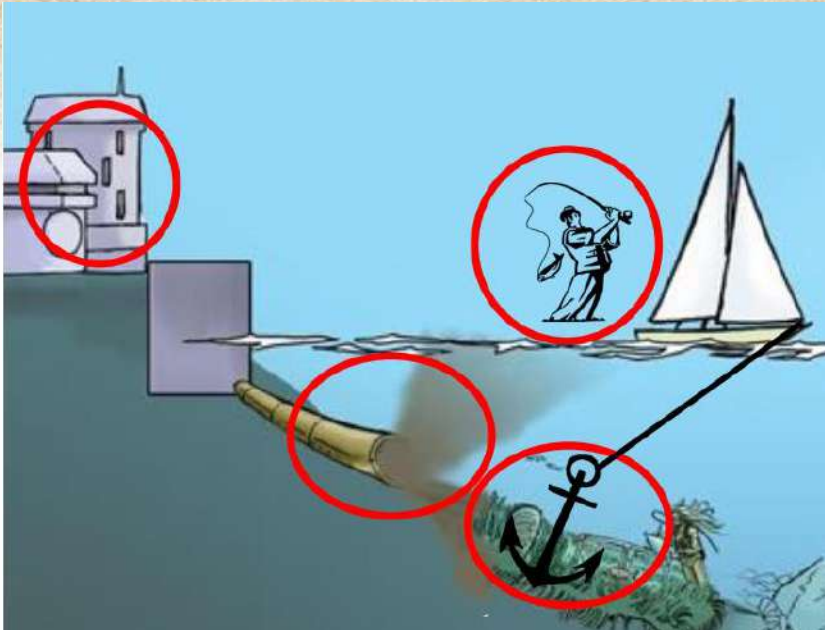
\* Corresponding author at: ANR-10-SEVRI-0001, 7 Place Casass, 34290 Camon, France.  
E-mail address: julie.deter@posidonia-oc.com (J. Deter).

http://dx.doi.org/10.1016/j.marpolbul.2017.06.045  
Received 12 June 2017; Received in revised form 23 August 2017; Accepted 25 August 2017  
Available online 12 September 2017  
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# MedTrix

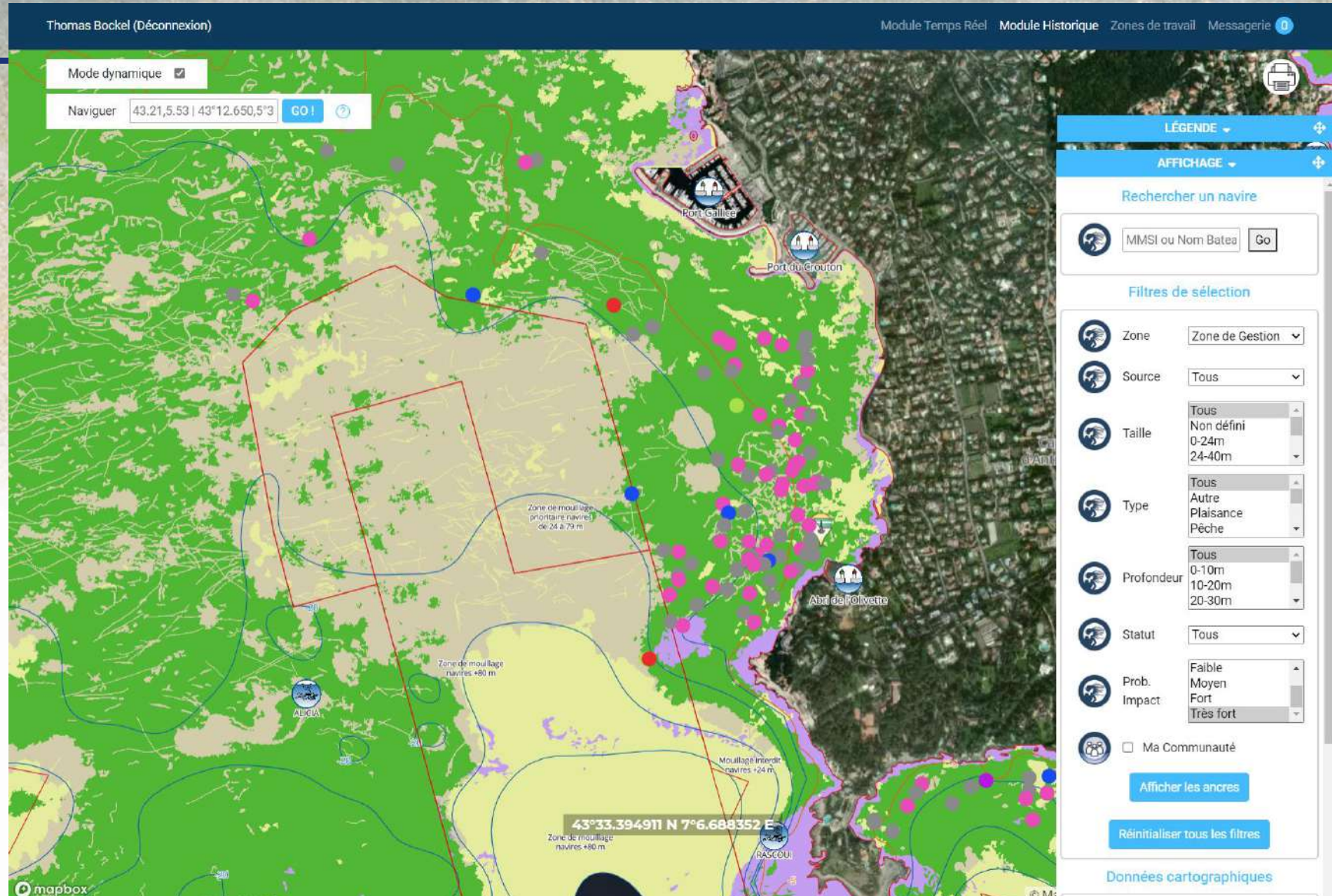
## Posidonia preservation





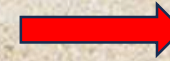
# MedTrix

## Posidonia preservation

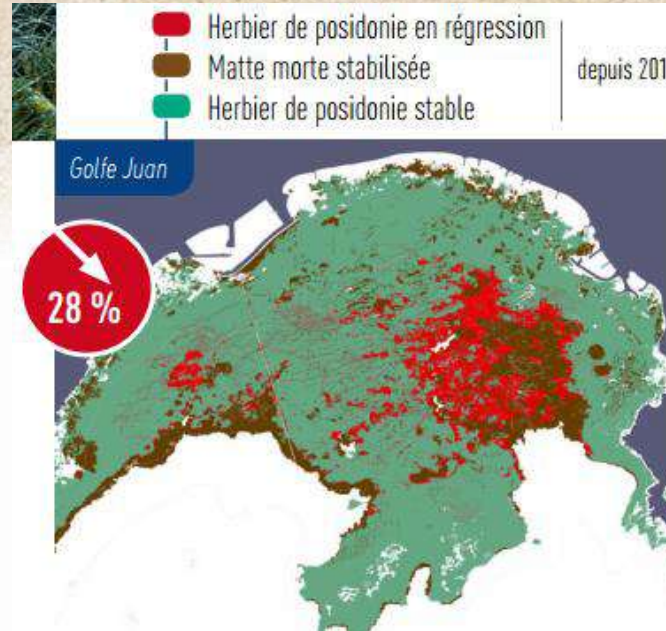
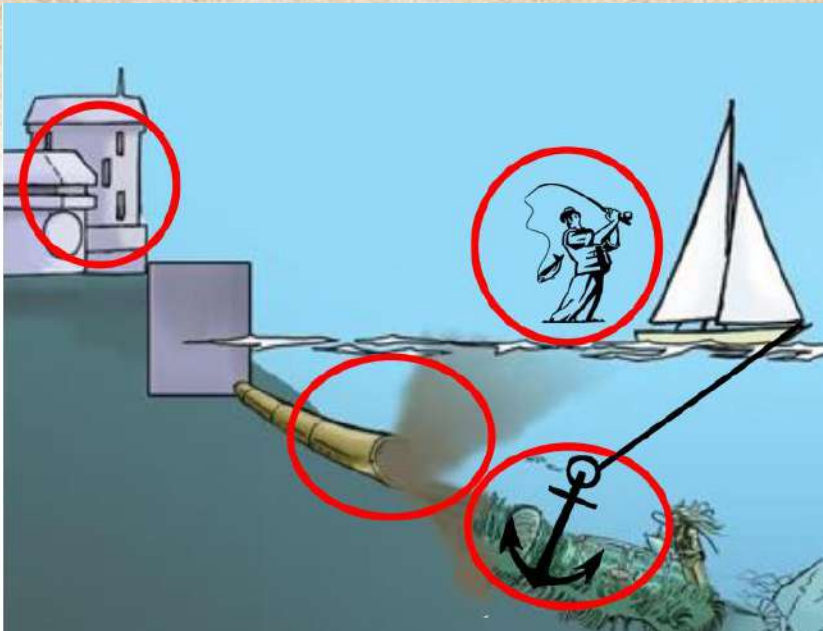


# MedTrix

## Posidonia preservation



Cooperation between local players based on **recent factual quantitative data**



■ **L'arrêté n°123/2019**

- Chain of actions leading to a **historic reduction** in the impact of anchors
- → **Preservation of an endangered habitat**

# MedTrix

## Summary atlas of the biological monitoring of mediterranean waters

426 recent biological data

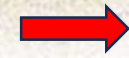
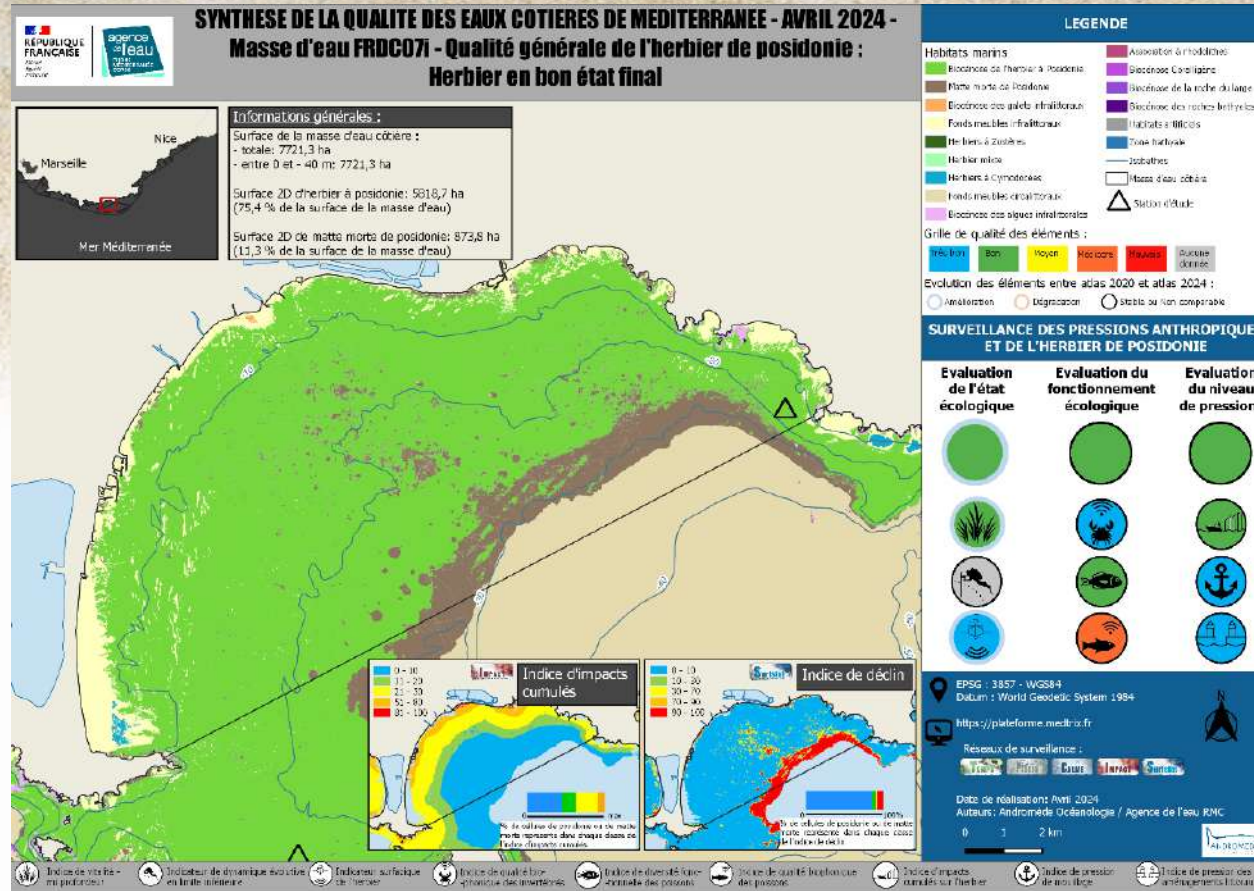
13 anthropogenic pressures

Detailed habitat mapping

6 monitoring networks

Triplet qualification:

Evaluation de l'état écologique	Evaluation du fonctionnement écologique	Evaluation du niveau de pressions



**Establish a new diagnostic (monitoring of each water body)**

## Reappropriation of biodiversity and coastal ecosystem data by users :

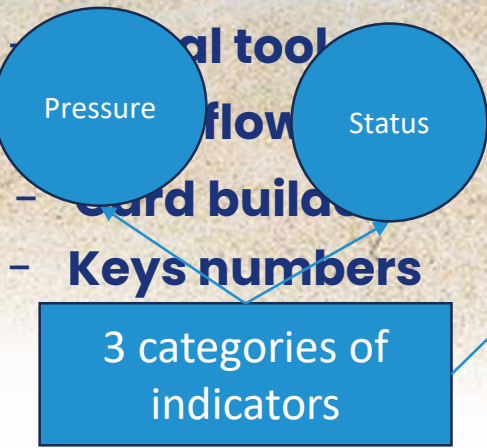


Tableau de bord Accueil

Synthèse des indicateurs de biodiversité en Méditerranée

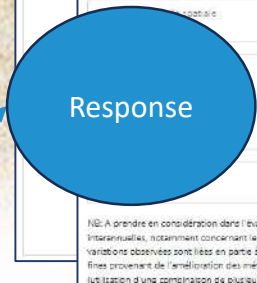
Réalisation: Andromède Océanologie Méditerranée Corse.

Plus d'informations sur MedTrix: [www.mediterranean-coastal-zones.com](#)

Indicateurs :  
OCCITANIE

Surface d'herbier	91.8907 ha
Surface de matie morte	1283.9413 ha
Surface de coralligène	343.1315 ha
Surface d'herbier protégé *	91.8507 ha
Indice de régression	90.6 %
Indice de cohésion	42.9 %
Nombre de stations de surveillance (TEMPO)	6
Nombre de mouillages totaux	1980
Nombre de mouillages de la petite plaisance	1549
Pourcentage de mouillages dans l'herbier	0 %
Durée cumulée des mouillages dans l'herbier	41 min
Surface cumulée des mouillages dans l'herbier	1369 m <sup>2</sup>
Surface cumulée des mouillages de la petite plaisance dans l'herbier	1369 m <sup>2</sup>
Nombre d'utilisateurs de l'application Donia	111

\* Surface d'herbier protégé de l'ancrage des grands navires (> 24m)



Choisir une échelle spatiale

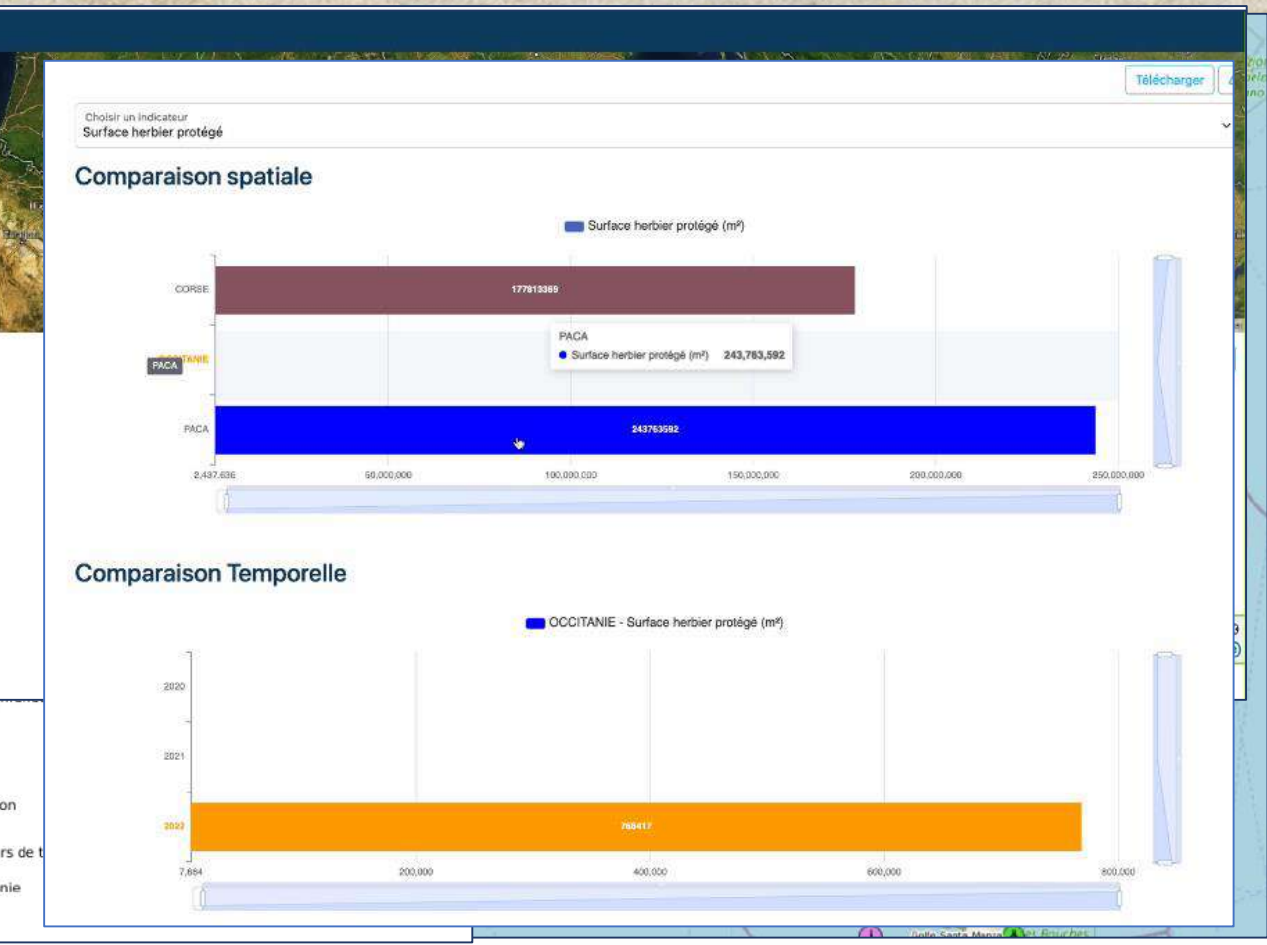
- Choisir une échelle spatiale
- Région
- Masses d'eau
- Zone

Stations d'épuration

- Stations d'épuration

Localisation des capteurs de t

- Herbier de posidonie
- Récif coralligène



# MedTrix

## Data enhancement and communication

– **Tools available on the website:** <https://medtrix.fr/>

- Methodology guide
- Tutorials Videos
- Scientific publications



### ADN environnemental

- L'ADN environnemental, fascinante technique pour découvrir des espèces marines, Magali Reinert (Reporterre)
- Benchmarking bioinformatic tools for fast and accurate eDNA metabarcoding species identification (Mathon et al, 2021)
- Uso de ADN Ambiental en la Evaluación de la Diversidad Funcional y Filogenética de los Peces (Marquez et al, 2021)
- Environmental DNA metabarcoding reveals and unpacks a biodiversity conservation paradox in Mediterranean marine reserves (Boulianger 2021)
- GAPeDNA: Assessing and mapping global species gaps in genetic databases for eDNA metabarcoding (Marques et al, 2021)
- Ecological indicators based on quantitative eDNA metabarcoding: the case of marine reserves (Sanchez et al. 2022)
- Global Ecology and Biogeography – The distribution of coastal fish eDNA sequences in the Anthropocene (Mathon et al, 2023)
- An environmental DNA assay for the detection of Critically Endangered angel sharks (*Squatina* spp.) (Faure et al., 2023)
- Benchmarking fish biodiversity of seaports with eDNA and nearby marine reserves (Manel et al., 2024).
- The Tree of Live eDNA metabarcoding reveals a similar taxonomic richness but dissimilar evolutionary lineages between seaports and marine reserves (Macé et al., 2024).



### Herbiers à Posidonie

- Underwater acoustic positioning systems as tool for Posidonia oceanica beds survey (Descamp et al., 2005)
- Ecological status assessment using *P. oceanica* (PREI) (Gobert et al., 2009)
- Acoustic telemetry for monitoring *P. oceanica* (Descamp et al., 2010)
- A biotic index using *P. oceanica* (BiPo) (Lopez Y Royo et al., 2010)
- An Ecosystem-Based Approach to Assess the Status of a Mediterranean Ecosystem (EBQI) (Personnic et al., 2014)
- Impact of 85 years of coastal development on seagrass beds (Holon et al., 2015)
- Posidonia ecosystem services economical value (Campagne et al., 2015)
- Monitoring Marine Habitats With Photogrammetry (Marre et al., 2019) et al., 2020)
- Impact des pressions anthropiques et de l'environnement sur les herbiers de *Posidonia oceanica* en Méditerranée française (Houngnandan, 2020)
- Développement de la photogrammétrie et d'analyses d'images pour l'étude et le suivi d'habitats marins (Marre, 2020)
- Fine-scale automatic mapping of living *Posidonia oceanica* seagrass beds with underwater photogrammetry (Marre et al., 2020)



## Data enhancement and communication

### Un des derniers refuges pour l'ange de mer commun, en BD !

● Merci aux illustratrices Aline FAURE et Nadia FAURE pour les dessins et les textes de cette bande dessinée.

### Des poissons ordinaires dont la reproduction est extraordinaire, en BD !

● Illustrations Aline FAURE, Textes Andromède Océanologie

L'ange de mer commun (*Squatina squatina*) vit sur des fonds sableux entre 0 et 250 m de profondeur.

C'était une espèce de requin commune des côtes méditerranéennes.

Mais elle a progressivement disparu...

...jusqu'à devenir rare dans les années 1950.

Depuis 2006, cette espèce est classée en danger critique d'extinction d'après l'UICN\*

Au milieu de la Méditerranée... La Corse est une île qui semble être le dernier refuge de l'ange de mer commun, dans les eaux méditerranéennes françaises.

Quelques individus, dont des juvéniles, sont encore observés par les pêcheurs locaux le long de la côte Est.

O'est pourquoi nous avons décidé d'aller en Corse pour mieux connaître la répartition géographique de cette espèce.

Avec une méthode passionnée...

**Le codage à barres de l'ADN environnemental !**

Cette technique s'appuie sur les traces d'ADN laissées par les organismes dans le milieu, tels que des écailles, du sang ou encore des excréments par exemple.

C'est l'ADN environnemental (ADNE)

Nous avons donc filtré l'eau de mer le plus proche possible du fond pour maximiser les chances de récolter de l'ADN d'ange de mer commun dans nos filtres d'échantillonnage.

capsule d'échantillonnage

SORTIE D'EAU

Pompe péristaltique

ENTRÉE D'EAU

40 mètres

Ceci est une capsule d'échantillonnage.

à travers laquelle 30 L d'eau de mer ont été filtrés en 30 min.

Cahier de surveillance #17 - Mai juin juillet 2023

AU DÉBUT DU PRINTEMPS, UN PHÉNOMÈNE PARTICULIER A ÉTÉ OBSERVÉ...

DE CURIEUSES ALVÉOLES SE FORMENT DANS LE FOND DE LA MER.

CHAQUE ALVÉOLE EST UN NID. LES PICARELS (*SPICARA SMARIS*) COMMUNÈMENT APPELÉS « JARRET », CONSTRUISSENT LEUR NID CÔTE À CÔTE ET EN MÊME TEMPS.

LES MÂLES, HABILLÉS DE LEUR LIVRÉE NUPCIALE, PARADENT AFIN D'ATTIRER LES FEMELLES À VENIR PONDRE DANS LEUR NID.

DURANT LES JOURS SUIVANTS, ILS PROTÈGERONT LEURS ŒUFS.

CETTE ACTIVITÉ SAISONNIÈRE ATTIRE DE NOMBREUX PRÉDATEURS TELS QUE LES SAINT-PIERRE, LES BRUOÏQUES, LES RAIES ET LES REQUINS COMME L'ANGE DE MER.

Cahier de surveillance #16 - Janvier février mars 2023

# MedTrix

## Data enhancement and communication

### Symposiums: four editions (2016, 2018, 2021, 2023)

- Facilitate exchanges between users
- Highlight work using MEDTRIX data
- Raise awareness and understanding of new tools and methods for monitoring the marine environment
- Enhance understanding and use of the MEDTRIX platform by presenting its latest news and features.



4ème Edition du colloque :  
« La Méditerranée, une mer sous surveillance »

Actes du colloque Medtrix -  
Décembre 2023



Tombant des Ardet Lakes  
(Goubaux S, 2019)

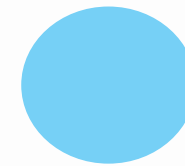
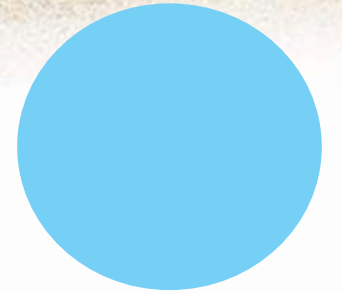
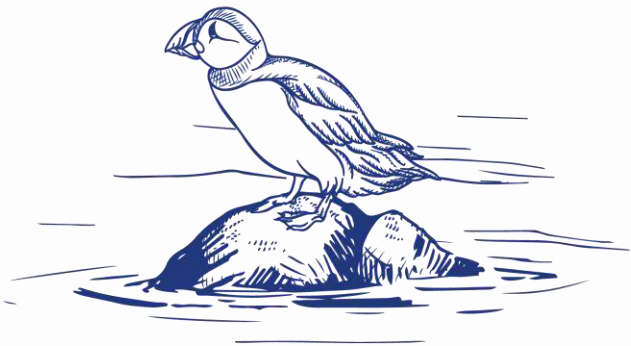


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# Second topic

## Questions & answers





**Thank you for your attention!**  
**See you soon for the last episode of the serie.**



**Ep. 4**  
**June, 27th**  
**Focus on coastal socio-economic dynamics**

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**ICO Solutions Calendar :** [www.ico-solutions.eu](http://www.ico-solutions.eu)