

« Connaissance des espèces patrimoniales de la RNBB vers la mise en place de réseaux à large échelle : exemple des oiseaux marins et des cétacés »

“From knowledge of RNBB’s heritage species to the establishment of large-scale networks: example of seabirds and cetaceans.”



CORMORANS HUPPÉS DE DESMAREST
European Shag (Mediterranean)
Phalacrocorax aristotelis desmarestii

Puffins cendrés
Cory's Shearwater
Calonectris diomedea



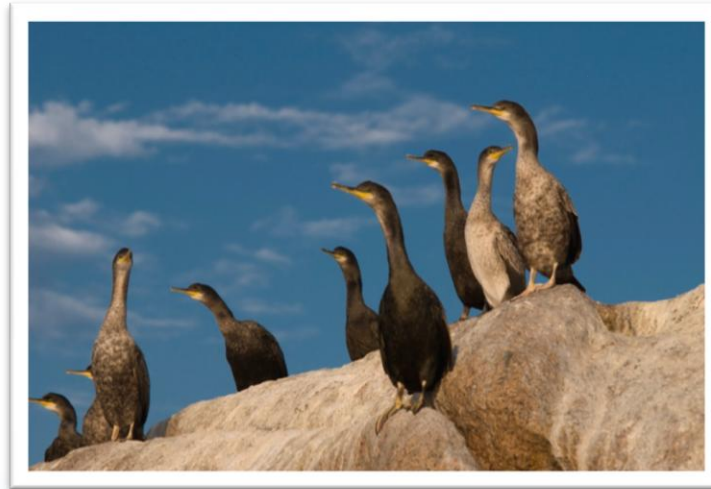
GRAND DAUPHIN
Bottlenose dolphin
Tursiops truncatus



SEABIRDS

ANNUAL MONITORING OF EUROPEAN SHAG (MEDITERRANEAN) POPULATIONS

Phalacrocorax aristotelis desmarestii



A protected sub-species, endemic of the Mediterranean and of the Black Sea

DISTRIBUTION OF THE BREEDING POPULATION IN THE STRAIT OF BONIFACIO.

2012 counting carried out on either side of the Strait of Bonifacio as part of the **P.M.I.B.B. Project**



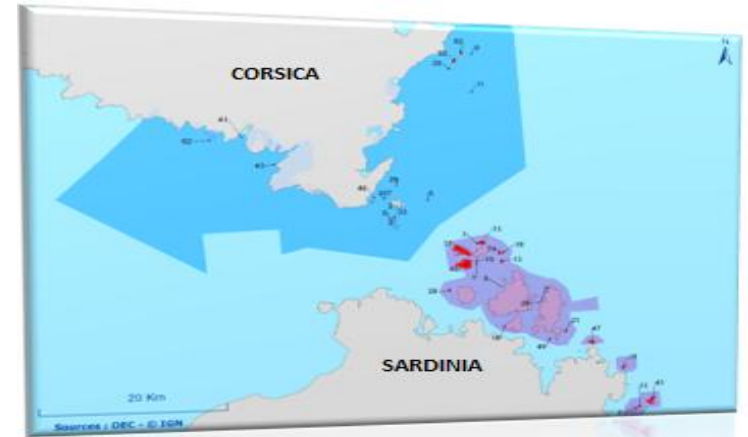
The control period is from mid-February to mid-March

R.N.B.B. 11 nesting colonies (islets)
Estimated population: **490 couples.**

P.N.A.L.M. 19 nesting colonies (islets)
Estimated population: **482 couples.**

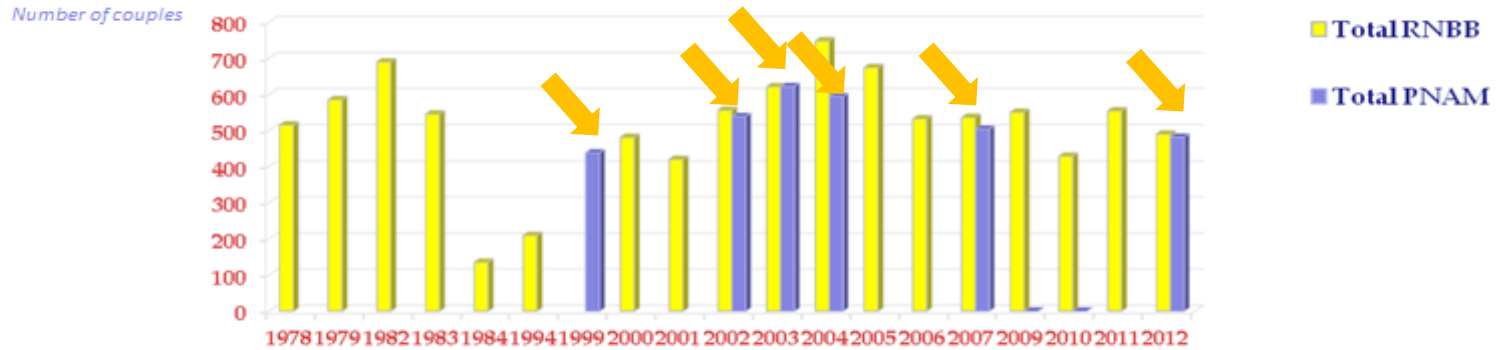
Breeding population progressing in the E.G.C.T.–P.M.I.B.B bio-geographical region: approximately **972 couples.**

That is **10% of the world population of breeding couples** (Estimated at approximately 10,000 couples according to Birdlife international, 2013)



Geographical distribution of the nesting sties in the R.N.B.B. and P.N.A.L.M. perimeter, as well as the headcount.(n° of couples, 2012 counting campaign).

INTER-ANNUAL PROGRESSION OF THE BREEDING POPULATION: LONG TERM DATA SERIES



-The studies were carried out via various **Interreg programmes**, leading to the establishing of **joint teams** across the two MAP (joint protocols). In particular between 2002 and 2004.

- Inter-annual variation of individual numbers** (fluctuation of food resources, disruption, adverse weather, etc.)
- Rising population** since 1994, approaching individual numbers recorded in the 1980s.

↳ An increase, over the last decade in mean densities of **benthic fish species** (wrasse, serranids and sparids) between 10 and 20 metres deep. Partial explanation of this increase.

↳ The implementation of **landing prohibition measures** on certain RNBB islets since the 1980s and those of the Maddalena (Ma zone) since the mid-1990s, has largely contributed to enabling the reproduction of this species.



-The Strait of Bonifacio is a **priority area** for European Shag (Mediterranean) conservation. France and Italy have a major responsibility when it comes to safeguarding the breeding populations which nest there.

-Interaction between nesting colonies and their neighbours hence the importance of **trans-national tracking** of this species in the Straits area.

-**Continued monitoring** to maintain the data series long term...

In Corsica, almost 80% of European Shag (Mediterranean) nest in protected and monitored areas.

Maintain management measures at nesting sites and monitoring.

SEABIRDS

Knowledge of breeding populations of
Cory's Shearwater *Calonectris diomedea* in the Strait of Bonifacio.



R.N.B.B.: 543 - 648 breeding
couples

P.N.A.M. : 615 and 1,545
breeding couples

The Corsican-Sardinian population in the Strait is
currently estimated between 1,158 and 2,193 breeding
couples.

Mediterranean breeding individuals, estimated between 44,000 and 76,000 couples according
to the authors.

REPRODUCTIVE SUCCESS

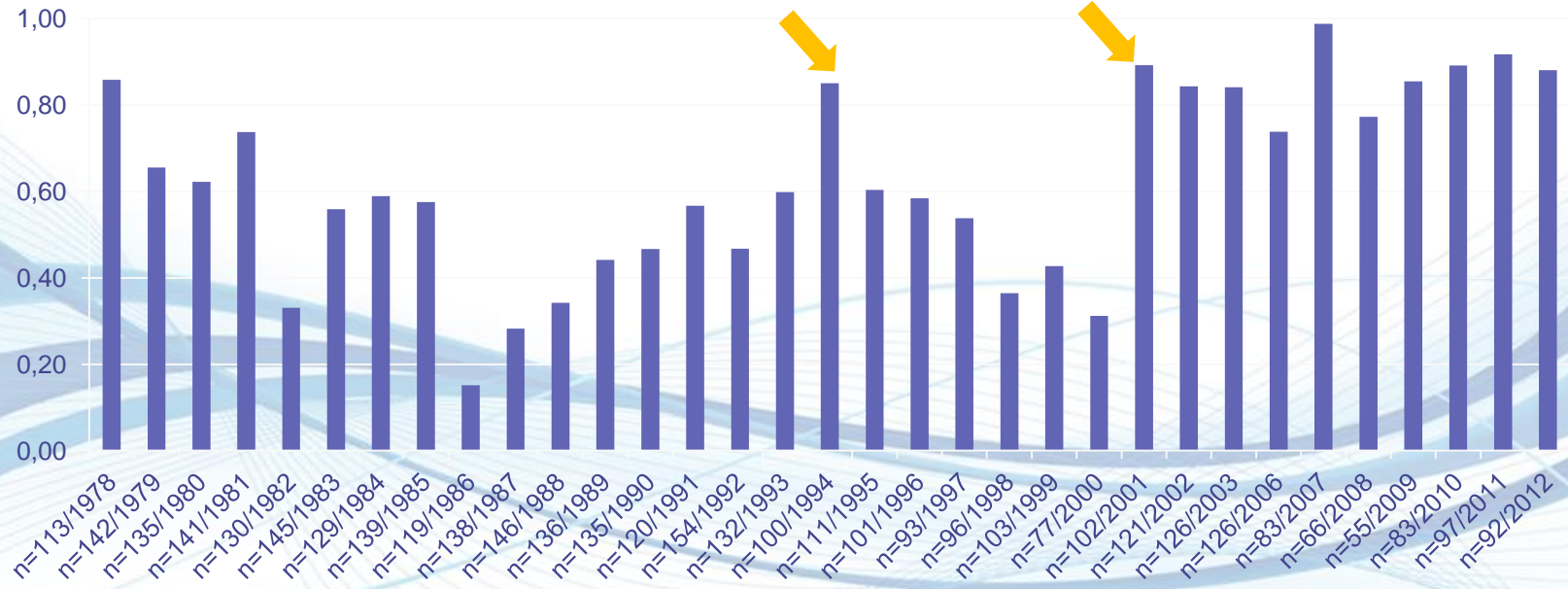
Evaluation of incubating birds in June and of the chicks in September for around one hundred nests each year.



Average n° of chicks leaving the nest

Partial rat extermination in colonies

Total rat extermination in the Lavezzi Islands



Inter-annual evolution of reproductive success (average number of chicks per nest) of the *C. diomedea* colony on Lavezzu Island between 1978 and 2012.



BIRD BANDING



Since 1978, **3,052** Cory's Shearwater have been ringed on Lavezzu Island.

From 1986 to 1991, the average was **55 birds per year**.

Since 1979, 1,620 Cory's Shearwater have been ringed as chicks, 436 as breeding adults and 996 as prospectors.

Chicks represent 53% of all ringed birds, 41% is for scientific tracking purposes while the remainder is recaptures.

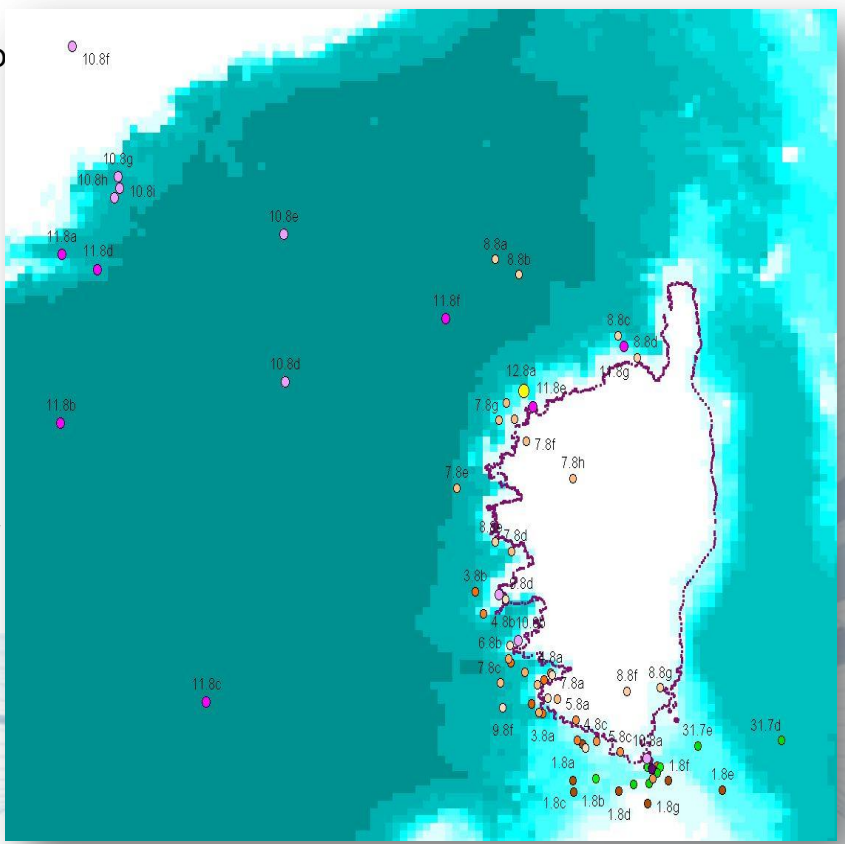
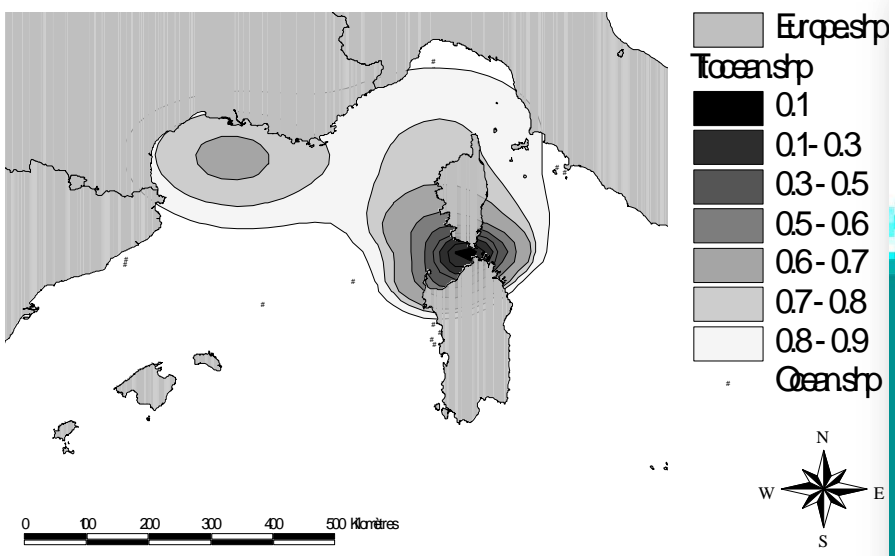
Illustration of the species' **Philopatric behaviour**. **Age** of the Data Base

MONITORING FEEDING TRIPS (GPS installation)

2003: First study carried out in the Mediterranean on the Lavezzi Islands breeding colony.

GPS: (12-20g) records the bird's position every 3 mn, accuracy +/-5m, for around 2 weeks.

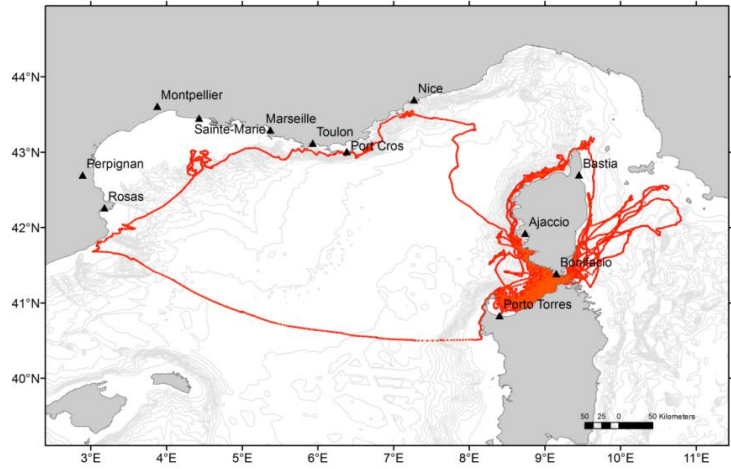
Synthesis of GPS data for breeding Cory's Shearwater from Lavezzu Island (2001-2003).



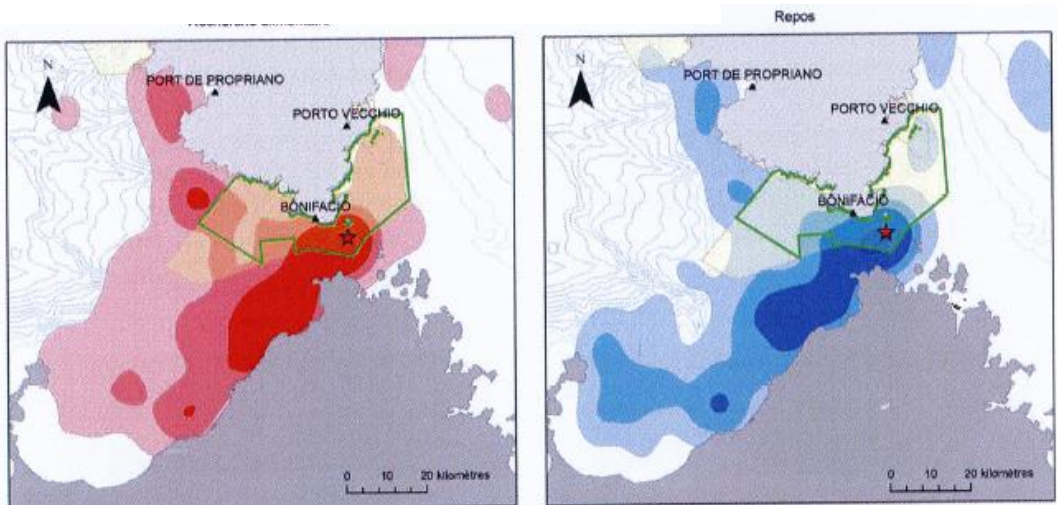
800 km travelled in 24h to feed young



P.A.C.C.O.M. Programme (Knowledge Acquisition Programme for Marine Birds and Mammals in Mainland France 2011–2014) involving studies of the **movements** of Cory's Shearwater from **nesting colonies** along the **French Mediterranean coastline**.



-Food trips of the 42 Cory's Shearwater tracked by GPS on Lavezzu Island while rearing their chick in July-August 2011. The bathymetric contours are highlighted in light grey.



-Distribution density in food hunting and rest areas.

MIGRATION PATH TRACKING (GLS Installation, light recorders)

2009: first campaign with the Lavezzu colony.

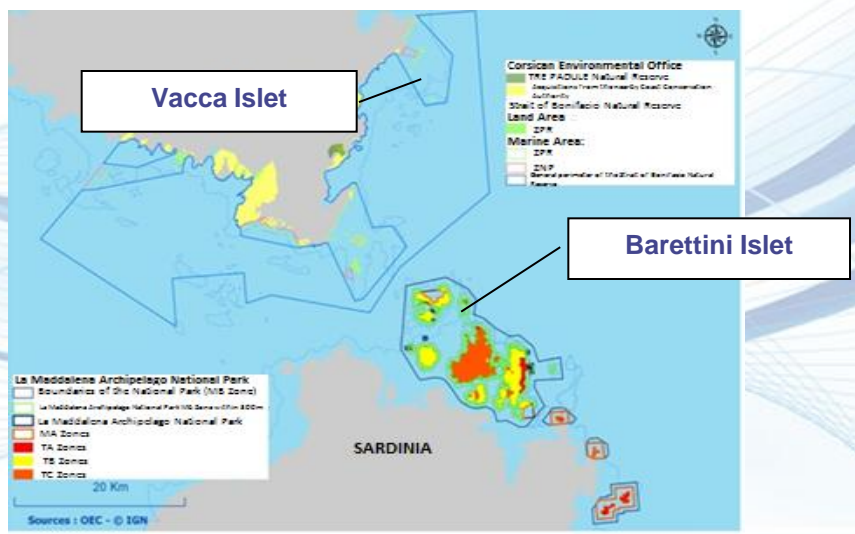
2011-2012-2013: P.A.C.C.O.M.

2013: GLS installation with the Vacca colony (R.N.B.B.) and Barettoni colony (P.N.A.L.M.) as part of the **P.M.I.B.B. project**



-GLS: (3.5-2.6g) 2 locations per day with an accuracy of 200km during long periods (>1year)

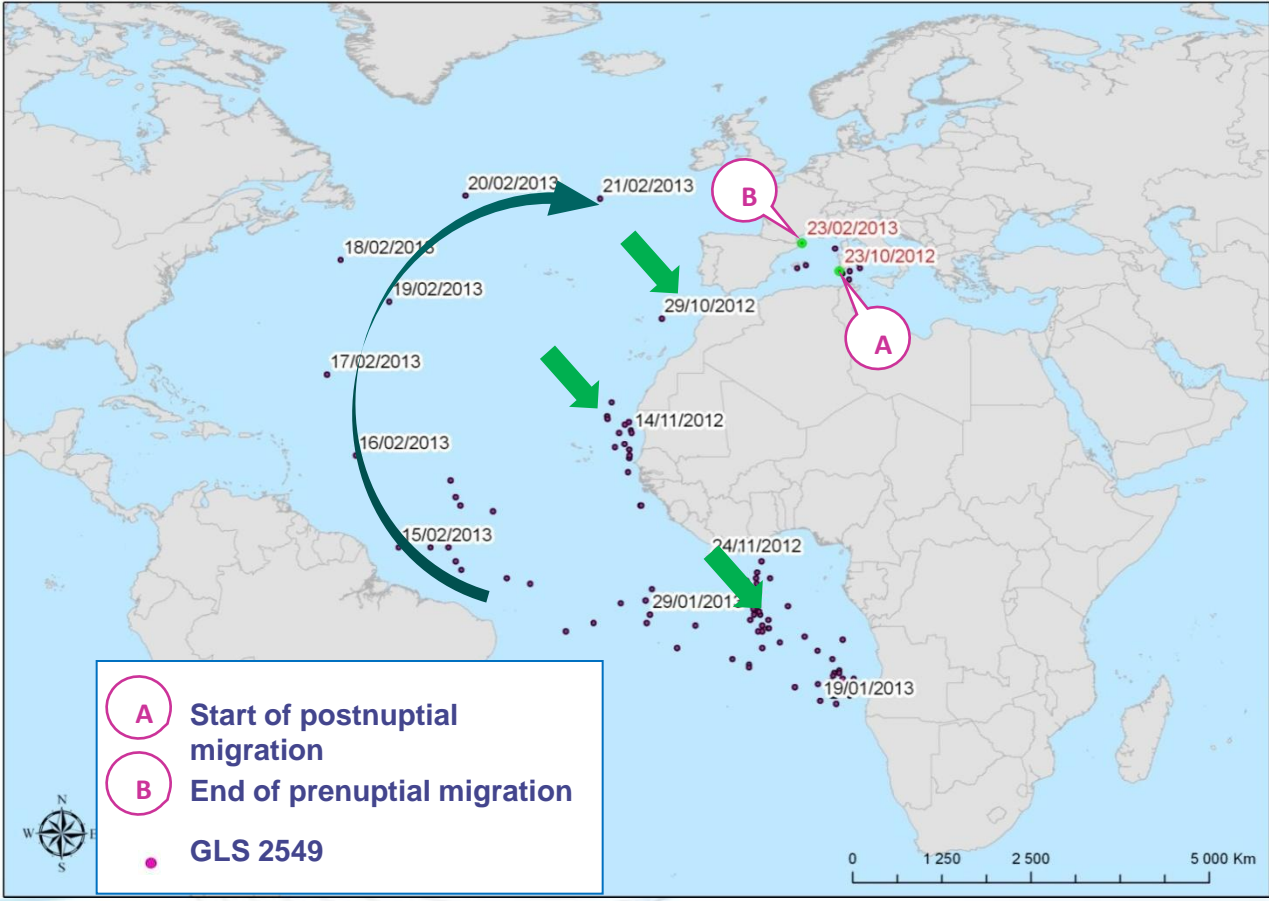
-20 adult individuals equipped, **10 on Vacca Islet** in the night of September 18, 2012 and **10 on Barettoni Islet** in the night of August 20, 2012.



GLS 2549: 700g adult female nesting on Vacca Islet (Corsica).

Ring N° EA679728

Ring fitted September 18, 2012 at her nesting site and collected on April 10, 2013



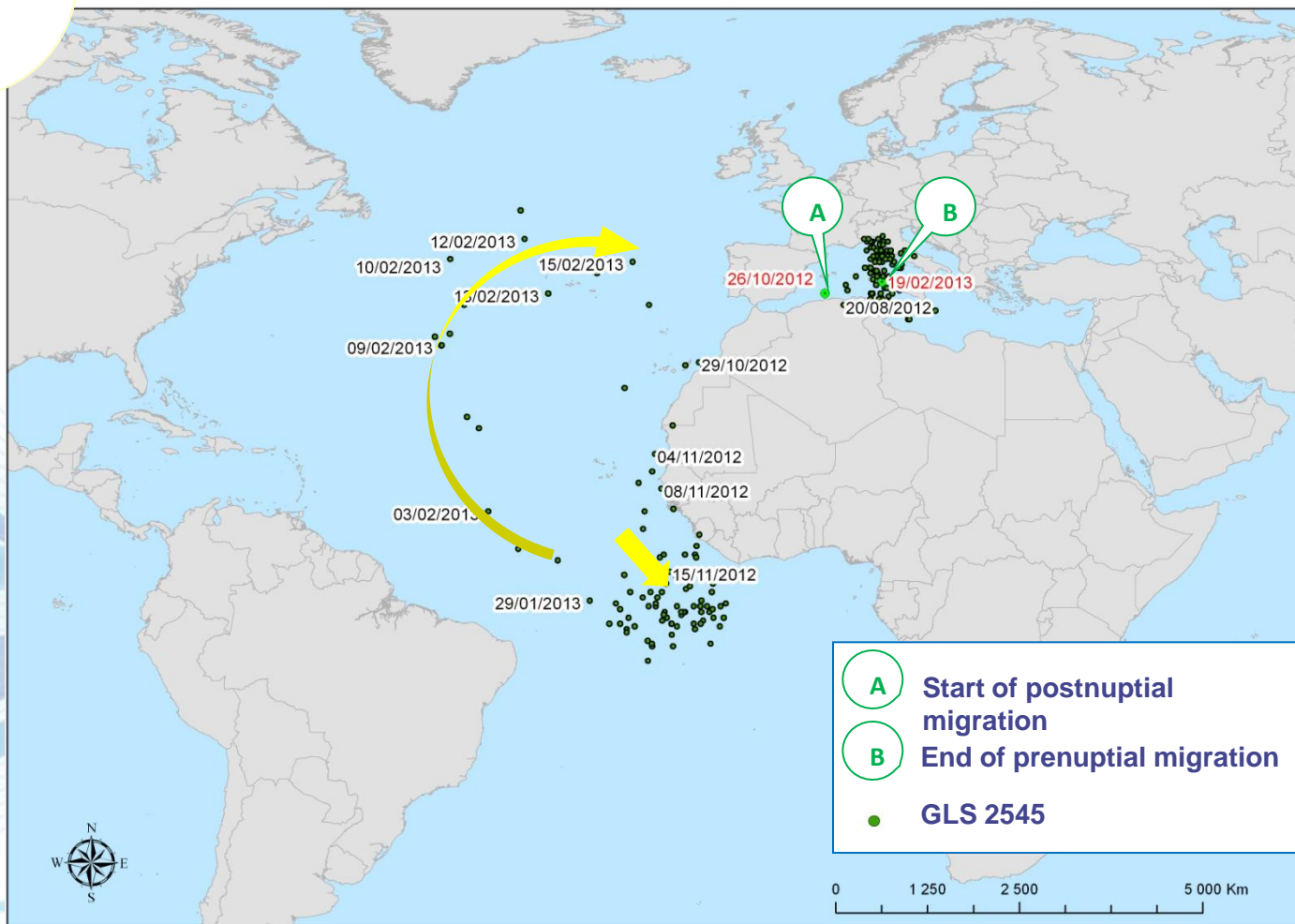
Mapping of movements recorded by the GLS 2549 between September 2012 and April 2013 (O.E.C.).



GLS 2545: Adult female nesting on Barrettiini Islet in Sardinia

Ring N° TJ8101

Ring fitted August 20, 2012 at 10.15pm at her nesting site and collected on June 18,

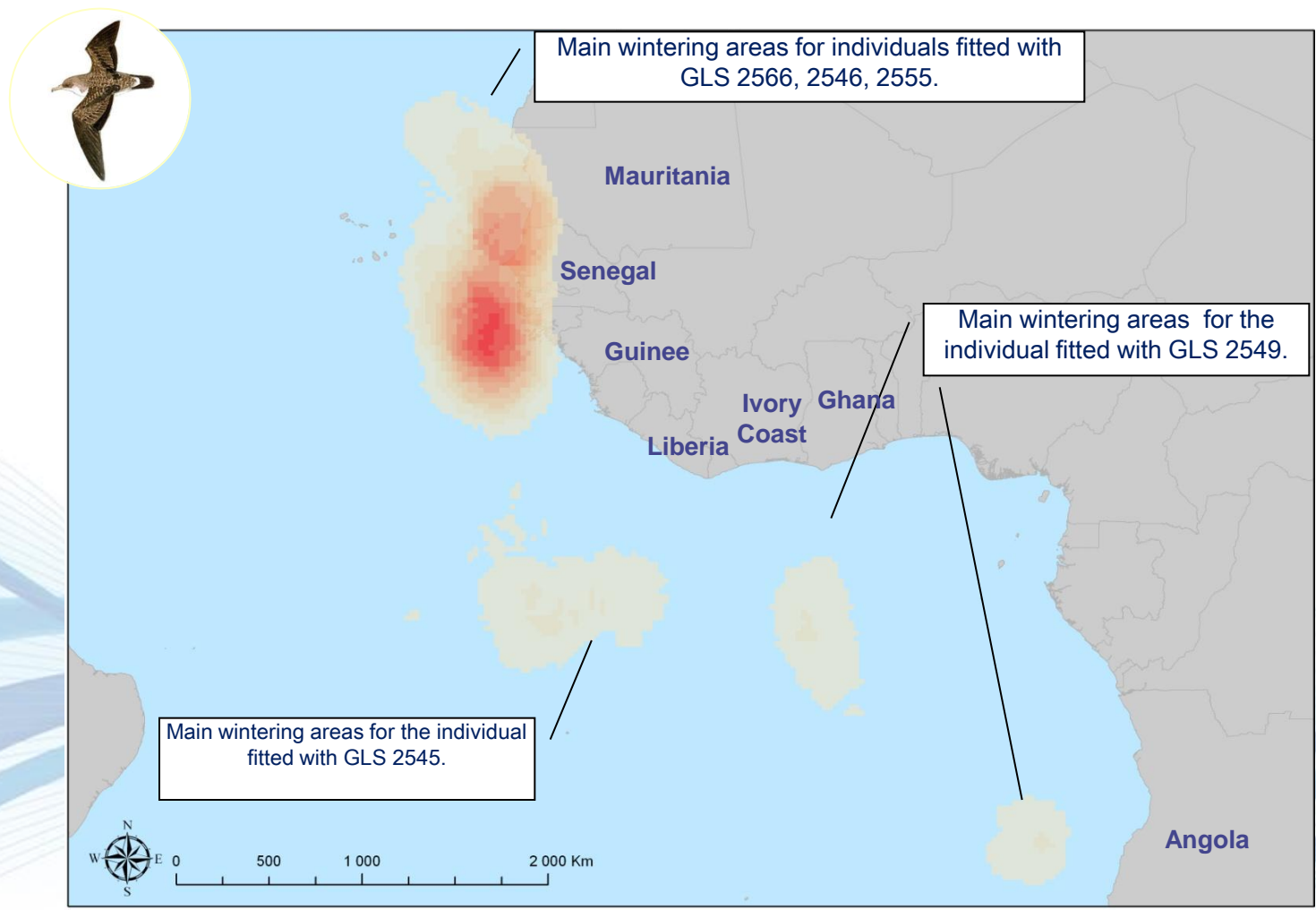


Mapping of movements recorded by the GLS 2545 between September 2012 and April 2013 (O.E.C.)



MAIN WINTERING AREAS RECORDED (2012-2013)

Corsican and Sardinian colonies. **P.M.I.B.B. Project**



Density raster obtained from the positions of the five GLS, highlighting the **residential areas representing the main wintering locations** (between October 2012 and February 2013) of fitted individuals. Calculation method: spatial analysis tool ESRI (O.E.C.) "Points density"



MAIN WINTERING AREAS RECORDED (2011-2012)

French Mediterranean Colonies. P.A.C.C.O.M. Project



Electronic monitoring devices are prone to various logistical and financial issues.

Guaranteeing the provision of care in the marine environment and protecting the functional areas in which they live, (feeding and rest areas, movement and reproduction sites) is indispensable for safeguarding these migrating birds' life-cycles.

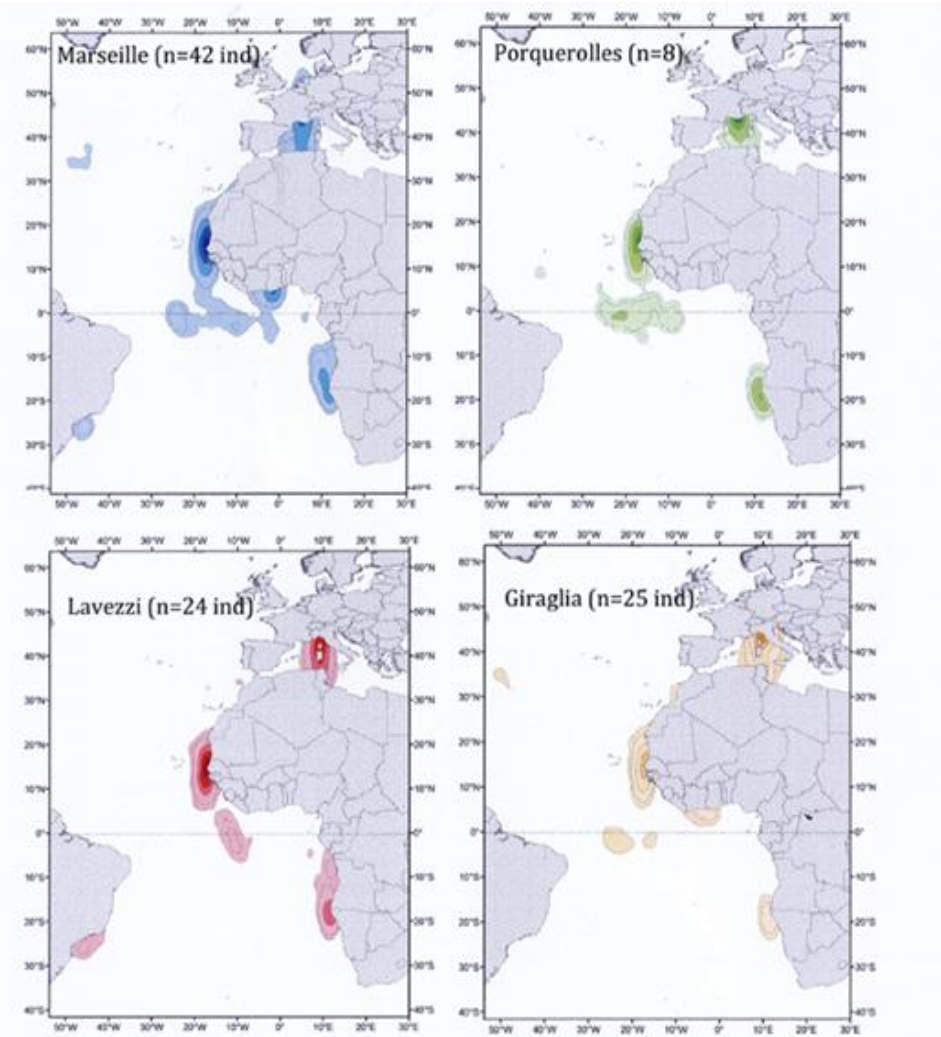


Figure 52: annual distribution of Cory's Shearwater in French Mediterranean islands. Localisation density estimated per kernel for the various colonies. The density contours 25%, 50%, 70% and 80% are illustrated with a gradient of colours.



CETACEANS: BIOLOGICAL INDICATORS

A LARGE BOTTLENOSE DOLPHIN POPULATION AND SPATIAL DISTRIBUTION IN THE GIONHA PROJECT TRANSBORDER AREA.



Regione Toscana



PHOTO-IDENTIFICATION

As a tool for the conservation of *Tursiops truncatus* in the Mediterranean.

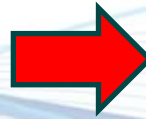
OEC: Responsible for **coordinating photo-identification campaigns** for *Tursiops truncatus* in the GIONHA project (southern Corsica, northern Sardinia, Liguria and Tuscany).



Implementation of a **common methodology** to involve all partners.

STATO DEL MARE (Scale Douglas)	CODICE	DESCRIZIONE	ALTEZZA MEDIA (DICE) (m)	VISIBILITÀ	CODICE	DESCRIZIONE	DISTANZA (m)
<input checked="" type="checkbox"/>	0	Calmo	-	<input checked="" type="checkbox"/>	0	Nettita	<1
<input type="checkbox"/>	1	Quasi calmo	0-0.10	<input type="checkbox"/>	1	Scarsa	1-2
<input type="checkbox"/>	2	Poco mosso	0.10-0.50	<input type="checkbox"/>	2	Discreta	2-10
<input type="checkbox"/>	3	Mosso	0.50-1.25	<input type="checkbox"/>	3	Buona	>10

COMPORTAMENTI EVIDENTI	ASSOCIAZIONI EVIDENTI
FEEDING <input type="checkbox"/>	PESCA <input type="checkbox"/>
TRAVELING <input type="checkbox"/>	RETI DA POSTA <input type="checkbox"/>
ALTRO <input type="checkbox"/>	STRASCICO <input type="checkbox"/>
	ACQUACOLTURA <input type="checkbox"/>
	ALTRE SPECIE <input type="checkbox"/>
	ALTRO <input type="checkbox"/>

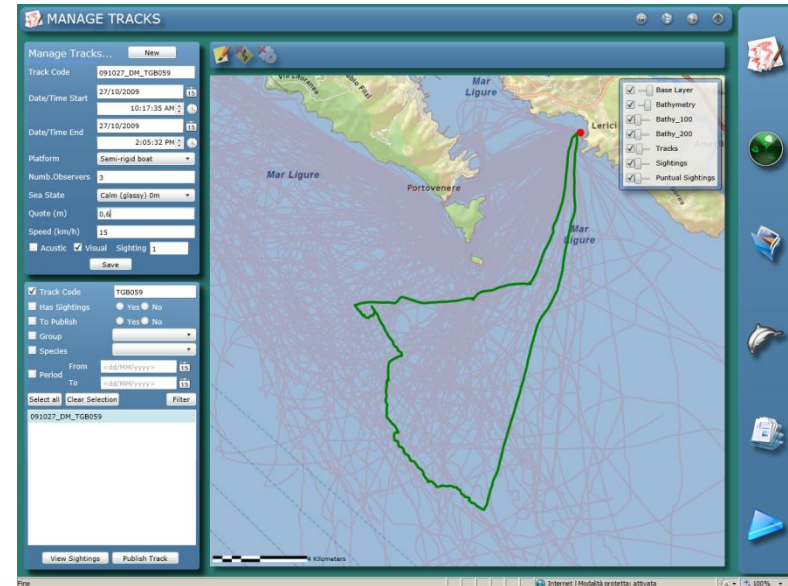


In partnership with the Aquarium of Genoa administrator of WEB GIS INTERCET.

1- Importation of tracks and observations allowing for their map viewing,

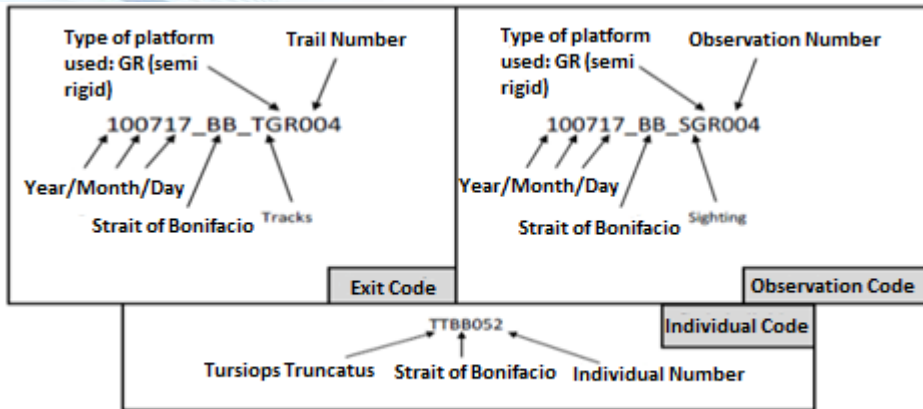
2- Insertion of photos of each photo-identified individual associated with the track corresponding to its observation,

3-Exportation possible (Access and Shape) only for the data's "owner".



DATA OWNERSHIP

INTERCET CODE: TTBB008



Select Individuals / Photos

Target Species **Tursiops trunc** Individual Code
 Side Sighting Code **091027_DM_SGB037**
 Only Unassociated Photos



Select Individuals / Photos

Target Species Individual Code **BB**
 Side Sighting Code
 Only Unassociated Photos

Individuals **Photos** **Details**

TTDM036

Individuals **Photos** **Details**

TTBB043



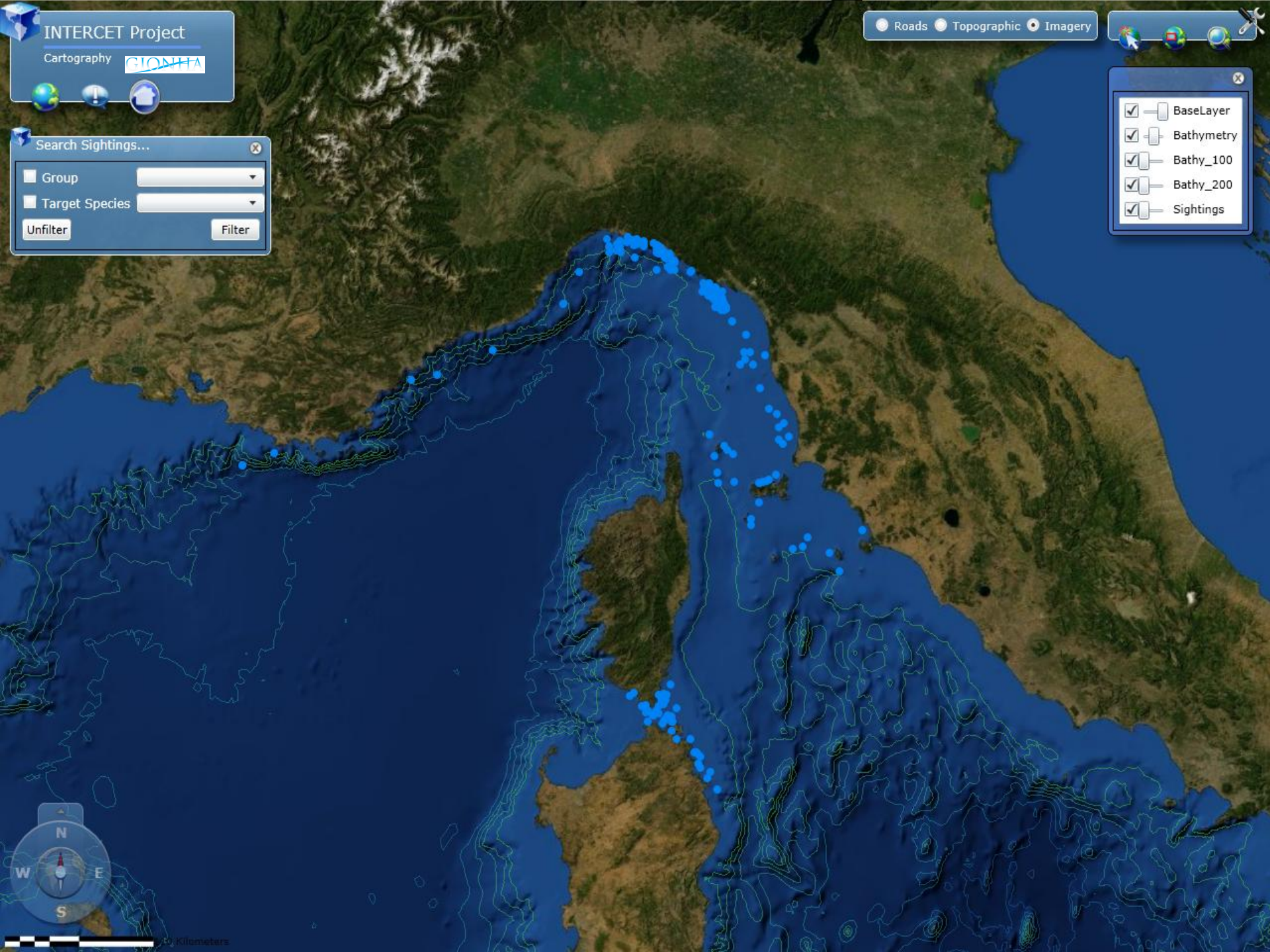
Search Sightings...

Group

Target Species

Legend

- BaseLayer
- Bathymetry
- Bathy_100
- Bathy_200
- Sightings



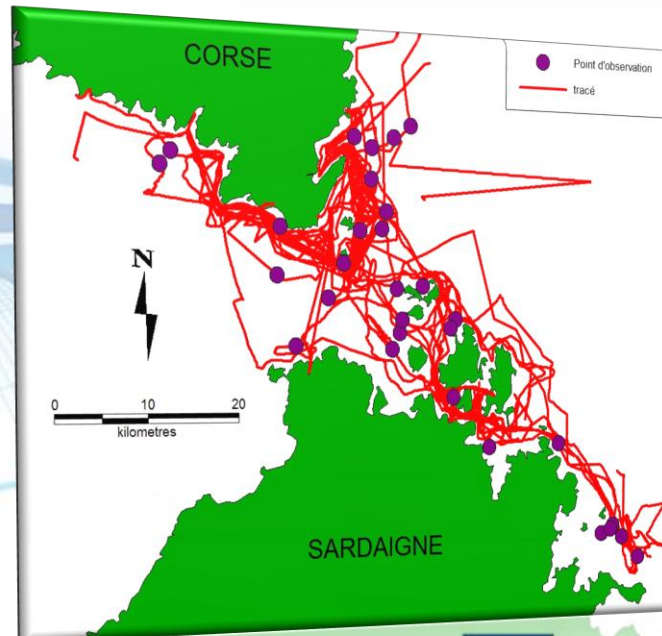
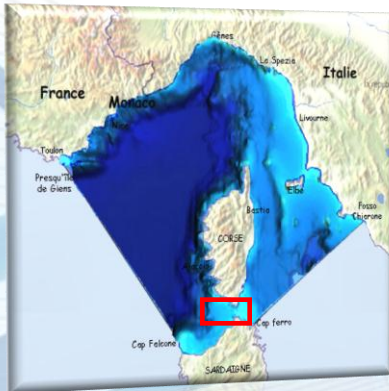
Compass rose showing North (N), South (S), East (E), and West (W). Below it is a scale bar labeled "Kilometers".

RESULTS IN THE STRAIT OF BONIFACIO REGION;

Scientific Unit of the Strait of Bonifacio Natural Reserve, with participation from Andrea Rotta, Mirco Hugo and Benjamin Gauchon



**Sampling effort
Southern Corsica/Northern
Sardinia
(2009-2010-2011)**



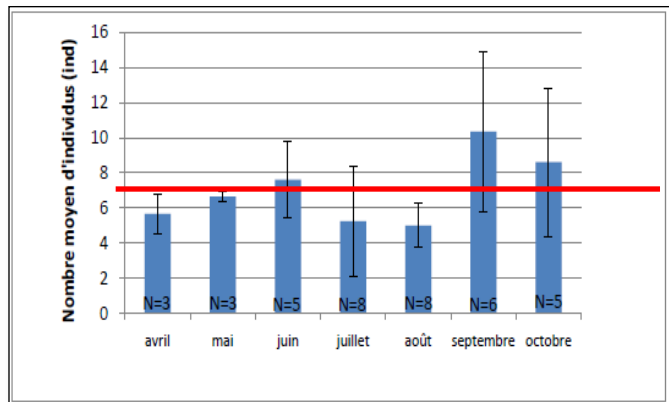
**•69 sea trips
(1,000 nautical miles)**

•38 observations

**•95 individuals photo-
identified**

•65 recaptures

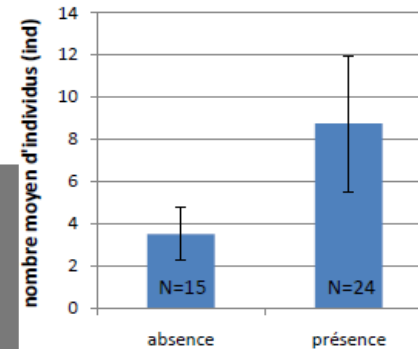
GROUP STRUCTURE



Average size of groups observed (2009-2010-2011)

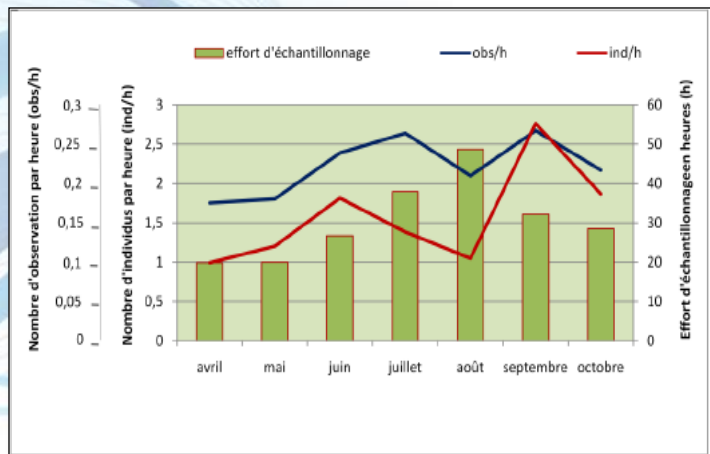


7 INDIVIDUALS



Presence/Absence of juveniles within the group.

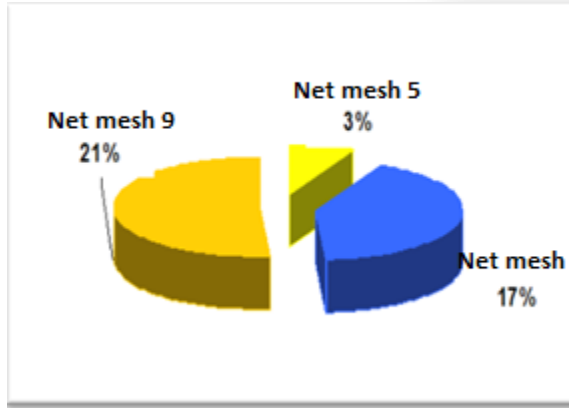
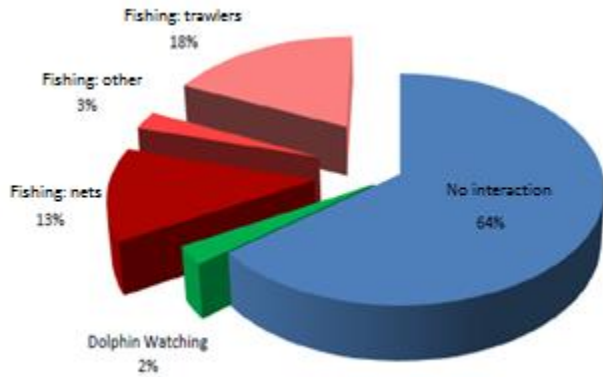
PRESENCE INDEX



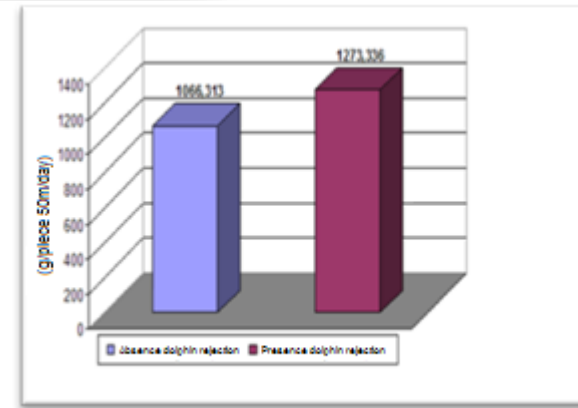
Modification of behaviour, (diving time, feeding, rest time and social interaction).

High boating frequency in the Strait of Bonifacio during the summer months could lead to the development of strategies to avoid disturbed habitats.

INTERACTION WITH HUMAN ACTIVITIES



Percentage of attacks according to netting



Deprecaation leading to a loss of biomass in nets not proven.

-34% of observations of *T.truncatus* in the Strait of Bonifacio are through fishing interaction. This highlights the species' **opportunistic behaviour**.

-Competition for resources and for space (continental shelf)

13% of sampled fishing nets attacked

Degradation of fishing equipment:

-35 attack days per year, (with an average fishing effort of 160 days per year in sectors where the LIFE LINDA programme is applied)

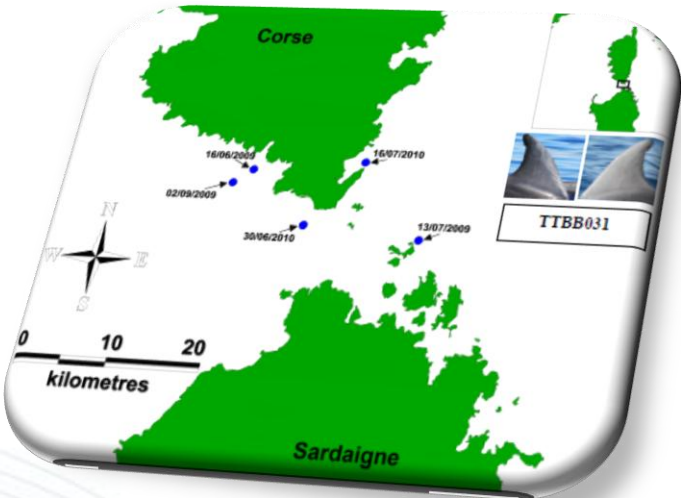
-Considering that a fishing net is degraded after 20 days of attack;

2 fishing nets landed during the fishing season



2004-2007

MOVEMENTS



Example of combining local data GECEM/OEC and GIONHA/OEC. Tracking of an animal for 9 years.



Example of movements between Corsica and Sardinia.

SPATIAL DISTRIBUTION

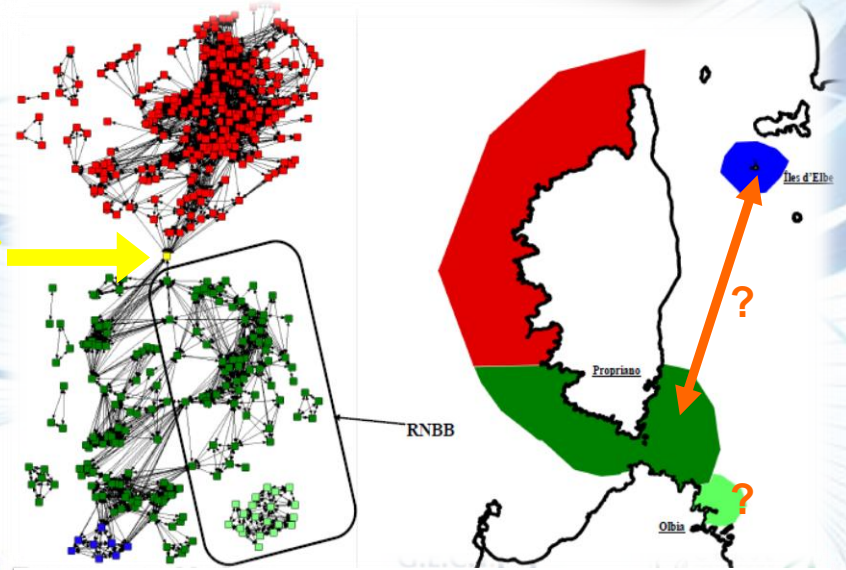
“Fission-Fusion” type social organisation.

The dots represent individuals.
The links: one or several observations in common.

Hypothesis of group structuring in terms of sub-populations (Gnone et al 2011).

Consider the behaviour of males, vectors of genetic exchange (Beazi et al 2011).

« Brokers »



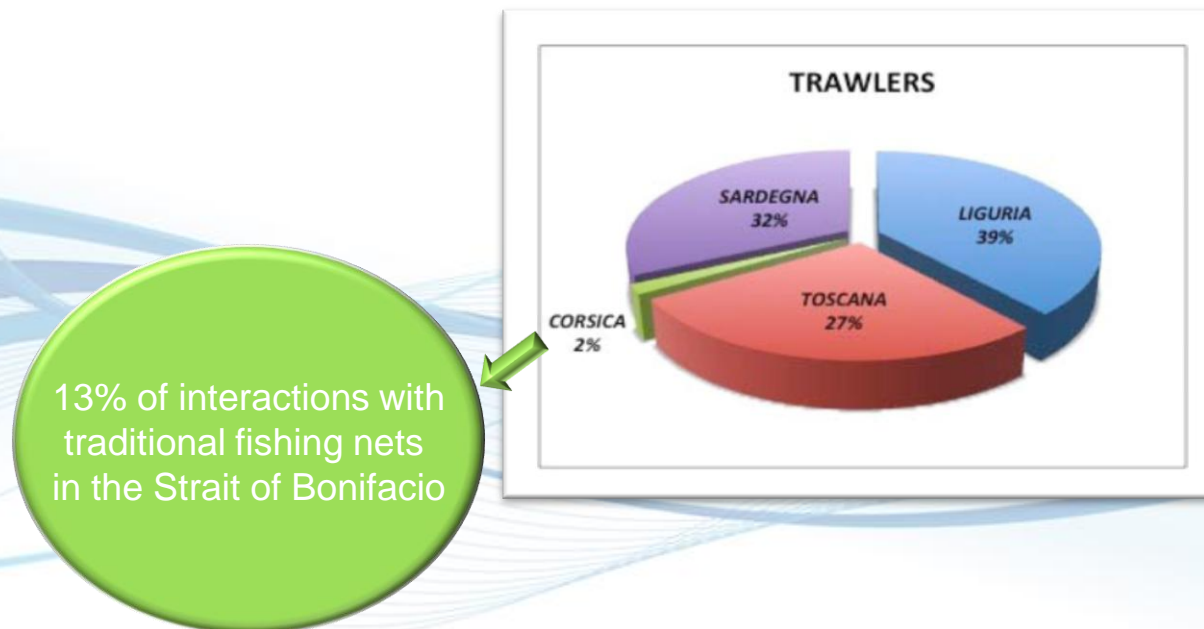
Software Netdraw 2.111

SYNTHESIS OF DATA INSERTED ON THE WEB-GIS INTERCET (2012)

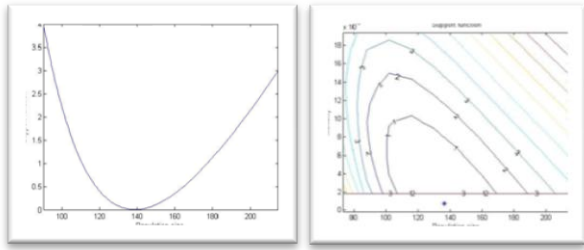
Compilation of data on the presence and distribution of bottlenose dolphins (*Tursiops truncatus*) in the waters of the Tuscan Archipelago, the Strait of Bonifacio and the Ligurian sea.
(ARPAT - Dip.Te.Ris. Genoa University)

Under the leadership of Mrs Cristina Fiori, Jessica Alessi (Dip.Te.Ris), Mr. Maurizio Würtz (Dip.Te.Ris), and Mehdi Aissi (APS MENKAB).

INTERACTION WITH TRAWLING ACTIVITIES



ESTIMATION POPULATION NUMBERS



“capture-recapture” technique using photo-identification.

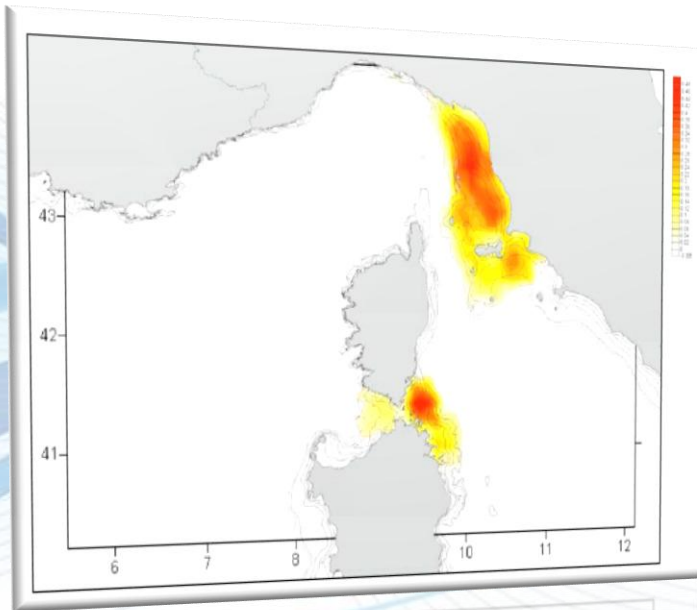
Knowledge of stocks, estimating population numbers and trends.

Closed population model (Petersen and Schnabel).

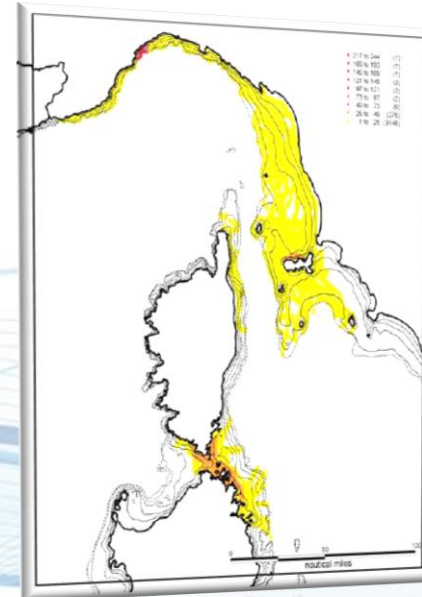
The highest estimation in this sector.

LIGURIA-TUSCAN ARCHIPELAGO: Approximately 431 individuals (confidence interval at 95% 379.2–493.1)

SOUTHERN CORSICA–NORTHERN SARDINIA: Approximately 139 individuals (confidence interval at 95% 101.6–197.3)



Distribution map for the species, *Tursiops truncatus* through application of the KRIGING algorithm



Sampling effort



GIONHA project perspectives:

- To extend the distribution map for the species on a Sanctuary level (Identify critical habitats in order to preserve the species)
- To develop a broader network and consolidate data exchange on a Pelagos Sanctuary level
- To perpetuate the **WEB GIS INTERCET**, making this platform into a reference tool for international agreements such as the **Pelagos Sanctuary or ACCOBAMS**.

Post GIONHA:

- To continue photo-identification campaigns according to a **joint protocol** and to upload data into the **INTERCET platform**.
- To implement a **partnership agreement** entrusting management of the INTERCET platform to the Aquarium of Genoa ONLUS Foundation and making the tool **accessible to all research bodies**, working on this theme in the Pelagos Sanctuary but also throughout the Mediterranean Basin.



First network study of the macrostructure of the bottlenose dolphin population on a large scale (Carnabuci *et al* “as we go to press”)

Network structure of *Tursiops truncatus* in the Pelagos Sanctuary (NW Mediterranean Sea)

Sea)

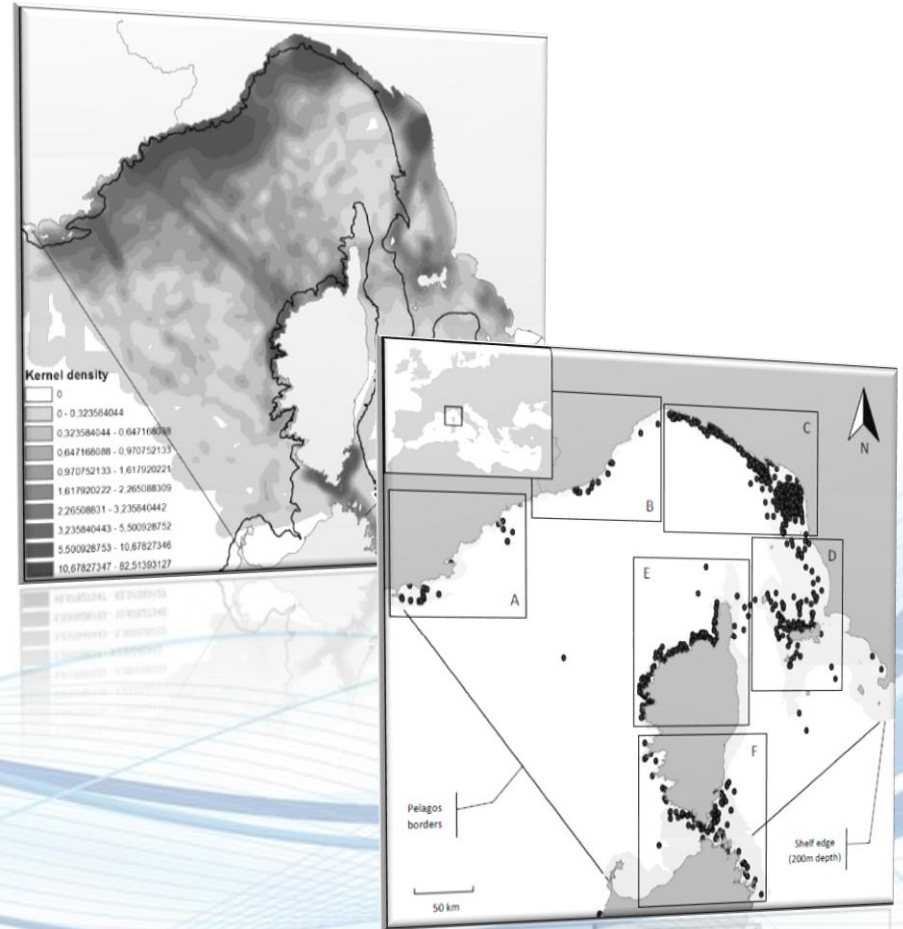
Massimiliano Carnabuci¹, Giulia Schiavon², Michela Bellingeri³, Fulvio Fossa³, Guido Gnone³

¹Università degli studi di Messina, Dipartimento di Biologia Animale ed Ecologia Marina, Salita Sperone, 31, 98166 Messina, Italy

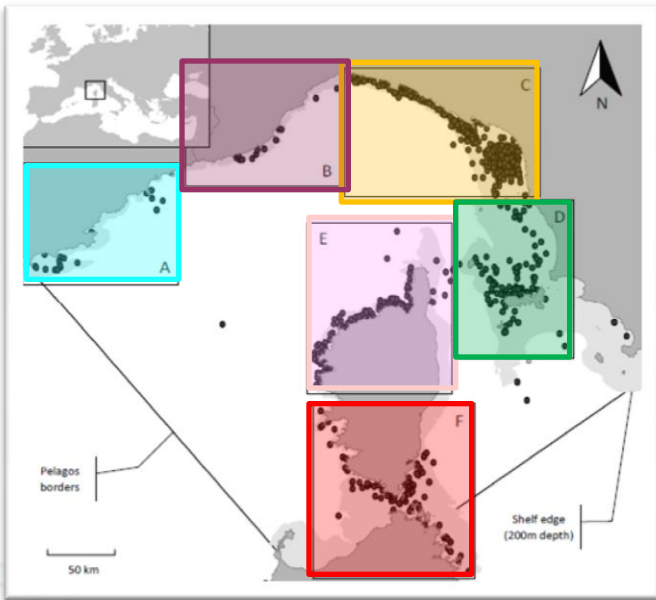
²Università degli studi di Genova, Via Balbi 5, 16126 Genova, Italy

³Acquario di Genova, Area Porto Antico, Ponte Spinola, 16128 Genova, Italy

Research group name	Study area	Research period	Total sightings	Sightings with photo-ID data
¹ CE.T.U.S.	C-D	1997 - 2011	326	184
² GECEM	E-F	1996 - 2008	281	160
³ DELFINI METROPOLITANI	C	2001 - 2011	186	137
⁴ NURC	Entire Pelagos	2000 - 2006	50	0
⁵ OEC	F	2009 - 2011	39	32
⁶ PROVINCIA DI LIVORNO	C-D	2011 - 2011	35	27
⁷ ARPAT	C-D	2010 - 2011	27	24
⁸ AMBIENTE MARE	D	2004 - 2007	18	22
⁹ TETHYS	A-B-E	2000 - 2007	18	11
¹⁰ REGIONE SARDEGNA	F	2011 - 2011	6	6
¹¹ EOI	A-E	1994 - 2006	4	0
¹² CRC	A	2007 - 2007	3	2
¹³ WWW Liguria	B	2005	1	0
TOTAL		1994 - 2011	994	605



Sampling effort and geo localisation of observations recorded between 1994 and 2011.



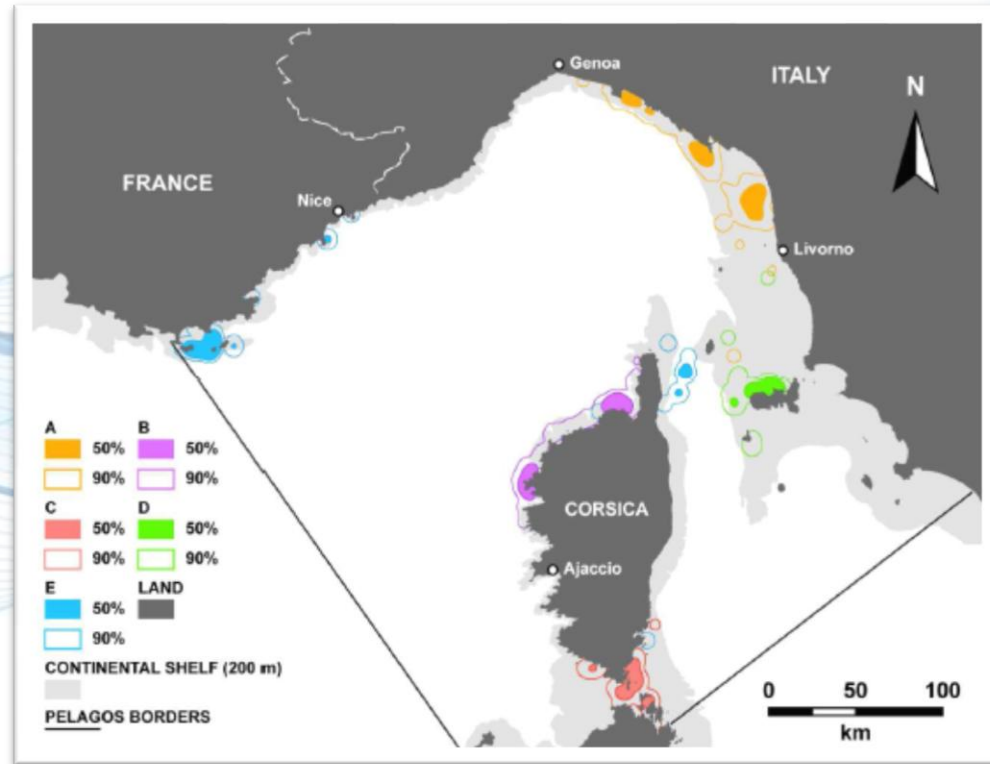
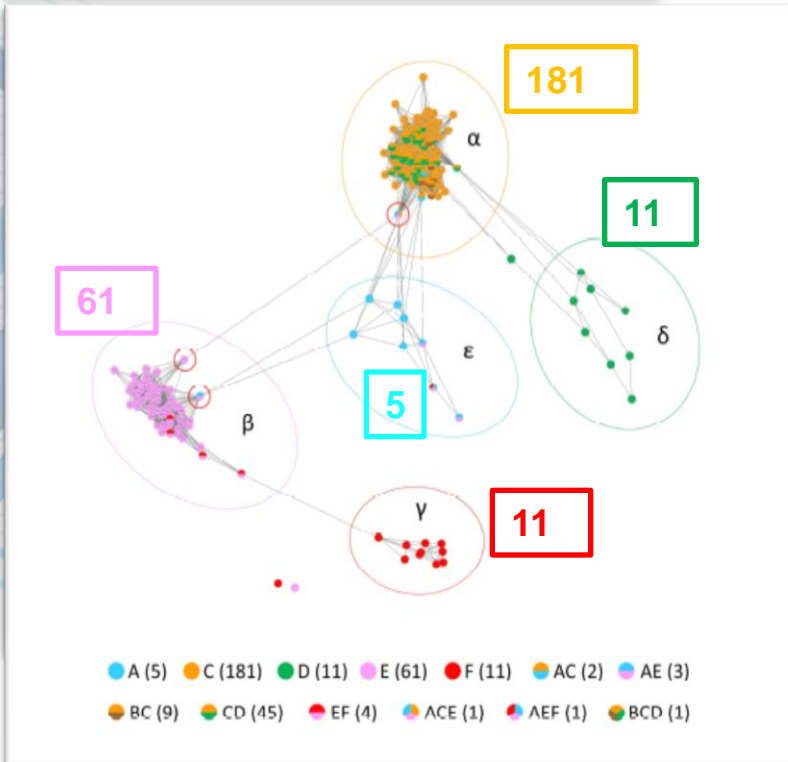
-Highlighting of **sub-populations** living preferentially in 6 sectors of the continental shelf.

-**Social organisation appears very dynamic**, with “fission-fusion” type societies

-**806 photo-identified individuals** living in this part of the Pelagos Sanctuary (994 sea trips and 605 “efficient” observations).

-**Highlighting of 5 groups** (2 large: $\alpha\beta$ and 3 smaller: $\gamma\delta\epsilon$)

-**Group geographical distribution** in the study area (kernel density)



Fixed kernel density distribution for the five-bottlenose dolphins clusters visualized

Enhancing knowledge of Mediterranean individuals

In Corsica, three population censuses of the bottlenose dolphin carried out by the GECEM in 1993, 2000 and 2003 point to around **200-250** individuals.



Abundance and distribution of *Tursiops truncatus* in the Western Mediterranean Sea: An assessment towards the Marine Strategy Framework Directive requirements (Lauriano *et al* 2014)

Geographical area	Surface(k m ²)	Estimation	Source
Alboran Sea (Spain)	11,821	278 - 744	Cañadas & Hammond 2006
Almeria (Spain)	4,232	146 – 461	Cañadas & Hammond 2006
Balearics and Catalonia (Spain)	86,000	1,608 - 15,766	Forcada <i>et al.</i> 2004
Valencia (Spain)	32,270	739 – 2,407	Gomez <i>et al.</i> 2006
Asinara National Park	480	22 – 27	Mackelworth <i>et al.</i> 2002
Corsica	-	368-429	Gnone <i>et al.</i> 2011
Pélagos Sanctuary	87,500	884-1,023	Gnone <i>et al.</i> 2011
Liguria, East Coast (Italy)	-	160 - 187	Manfredini <i>et al.</i> 2007
Liguria, West Coast & North Tuscany (Italy)	-	252 - 225	Nuti <i>et al.</i> 2006

Estimation of the Mediterranean population: 10,000 individuals
 (Biarzi & Fortuna 2006)

➔ 1676
(CI= 804-3492)
Aerial survey



**“Animal species of Community interest”
HABITAT Directive (92/43/CEE) – Annex II and IV**

The bottlenose dolphin requires a specific conservation plan due to the countless anthropic stress factors.

The spatial distribution map of animals is therefore a useful tool as it assists governance and allows a more accurate identification **of the Special Conservation Areas** for bottlenose dolphins.

It could be used as a quality indicator in the framework of **Directive 2008/56/CE Marine Strategy (D.C.S.M.M.)**.



Cooperate

To better understand and better preserve these species whose territory stretches well beyond man's borders...

No social interaction observed between the “sub-population” in the Strait of Bonifacio and in Tuscany: No matching

Possibility of a more sedentary group, which has probably found favourable conditions in terms of nutriment and reproduction, within the perimeter of the **International Strait of Bonifacio Marine Park** project.

Study to be extended...

Gnone et al 2011

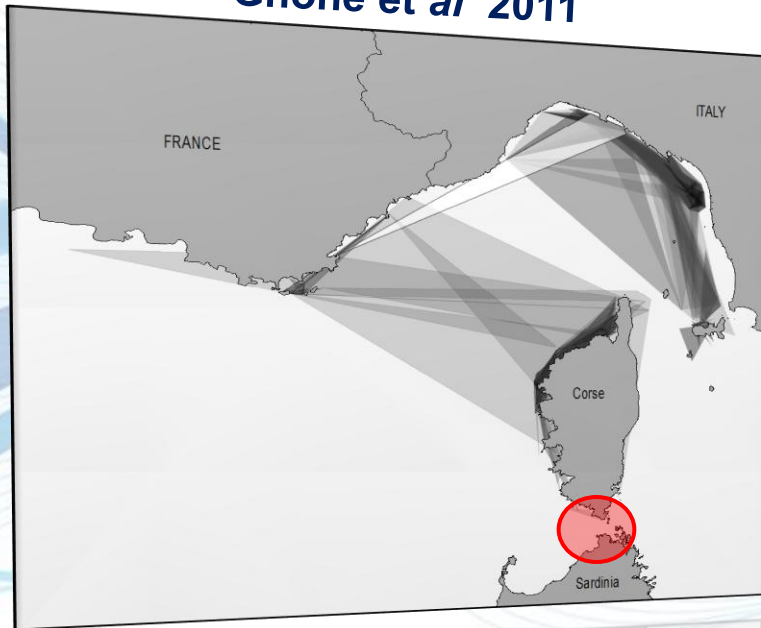
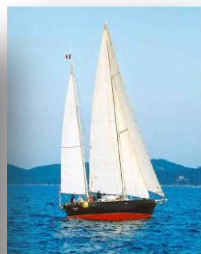


PHOTO-IDENTIFICATION CAMPAIGN IN THE LIGURIAN SEA AND THE TUSCAN ARCHIPELAGO ARPAT-DipTe Ris

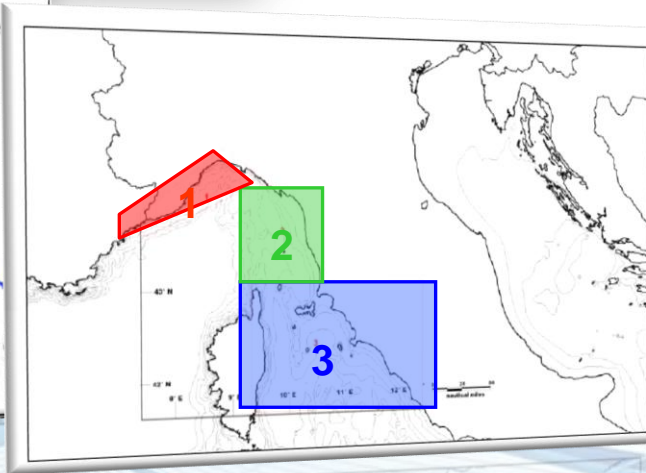
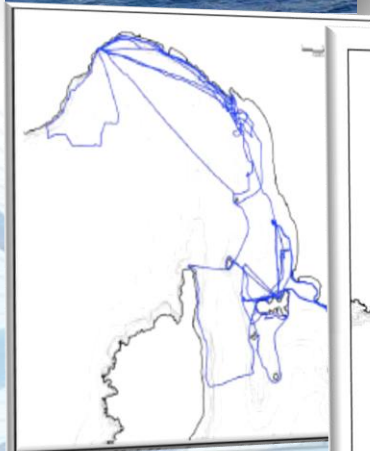
Under the leadership of Mrs Jessica Alessi (DIBIO), M. Maurizio Würtz (DIBIO), Mme Cristina Fiori and Mr Mehdi Aissi (APS MENKAB)



(Genoa University)

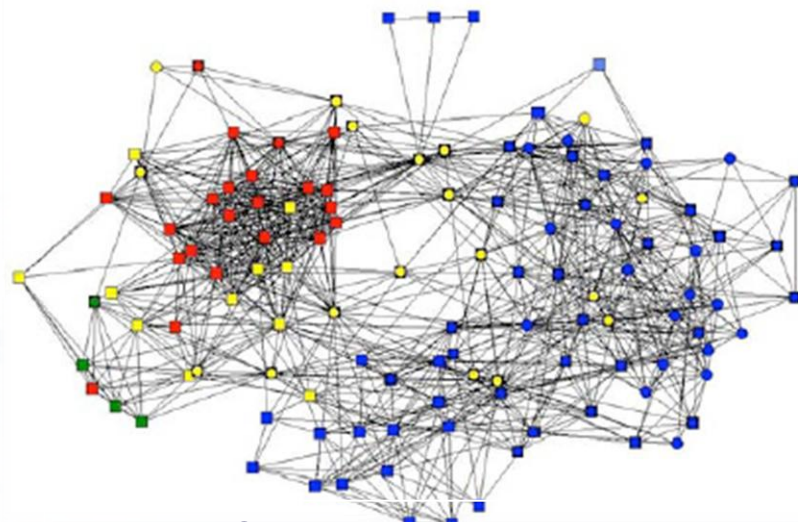
Sampling effort
(ARPAT-DipTe Ris
2010-2011)

- 27 observations
- 159 individuals photo identified
- 39 recaptures



(Menkab: GIONHA Campaign 2010-11,
Additional Data 2005-09)

3 sub-zones defined with regards the extension of the continental shelf and the oceanographic characteristics.



UCINET6 and NETDRAW
Programmes