

# Seabird monitoring

Monitoring techniques of the EcAp common indicators  
related to biodiversity and non-indigenous species  
Samos Island, Greece, 22-28 September 2017



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# Seabird monitoring

Money

People

Sites



# Proposed/Developed protocols (Italy)



## Marine Strategy



## “marine” National Parks & Marine Protected Areas

Scopoli's shearwater *Calonectris diomedea*

Yelkouan shearwater *Puffinus yelkouan*

Shag *Phalacrocorax aristotelis desmarestii*

Audouin's gull *Ichthyophaga audouinii*

Yellow-legged gull *Larus michahellis*

Lesser-crested Tern *Sterna bengalensis emigrata* (RAC/SPA protocol)

[Slender-billed Gull *Larus genei*, Little tern *Sterna albifrons*]

# Italy

## MSFD,MPAs

Scopoli's shearwater *Calonectris diomedea*  
Yelkouan shearwater *Puffinus yelkouan*

Shag *Phalacrocorax aristotelis desmarestii*

Audouin's gull *Ichthyophaga audouinii*  
Yellow-legged gull *Larus michahellis*

Little tern *Sterna albifrons*

Slender-billed Gull *Larus genei*

Lesser-crested Tern *Sterna bengalensis emigrata*

# EcAp Barcelona

Balearic shearwater *Puffinus mauretanicus*  
Yelkouan shearwater *Puffinus yelkouan*

Shag *Phalacrocorax aristotelis desmarestii*

Audouin's gull *Ichthyophaga audouinii*

Little tern *Sterna albifrons*

Gull-billed tern *Sterna nilotica*

Sandwich tern *Sterna sandvicensis*

## survey protocols (breeding)



# Seabird monitoring

- 
- A photograph of three seabirds, likely albatrosses, standing on a rocky, vegetated shore. The bird on the left is white with a red beak. The bird in the middle is a juvenile with mottled brown and white plumage. The bird on the right is an adult with grey and white plumage and a red beak. In the background, more birds are visible on the rocks under a cloudy sky.
- distribution
  - abundance/density
  - demography

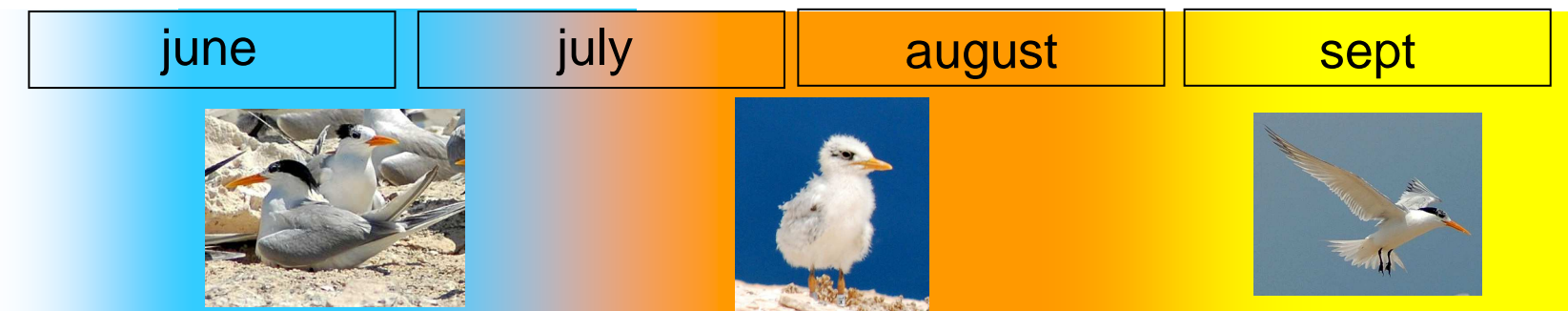
# Species distribution: where are they breeding?



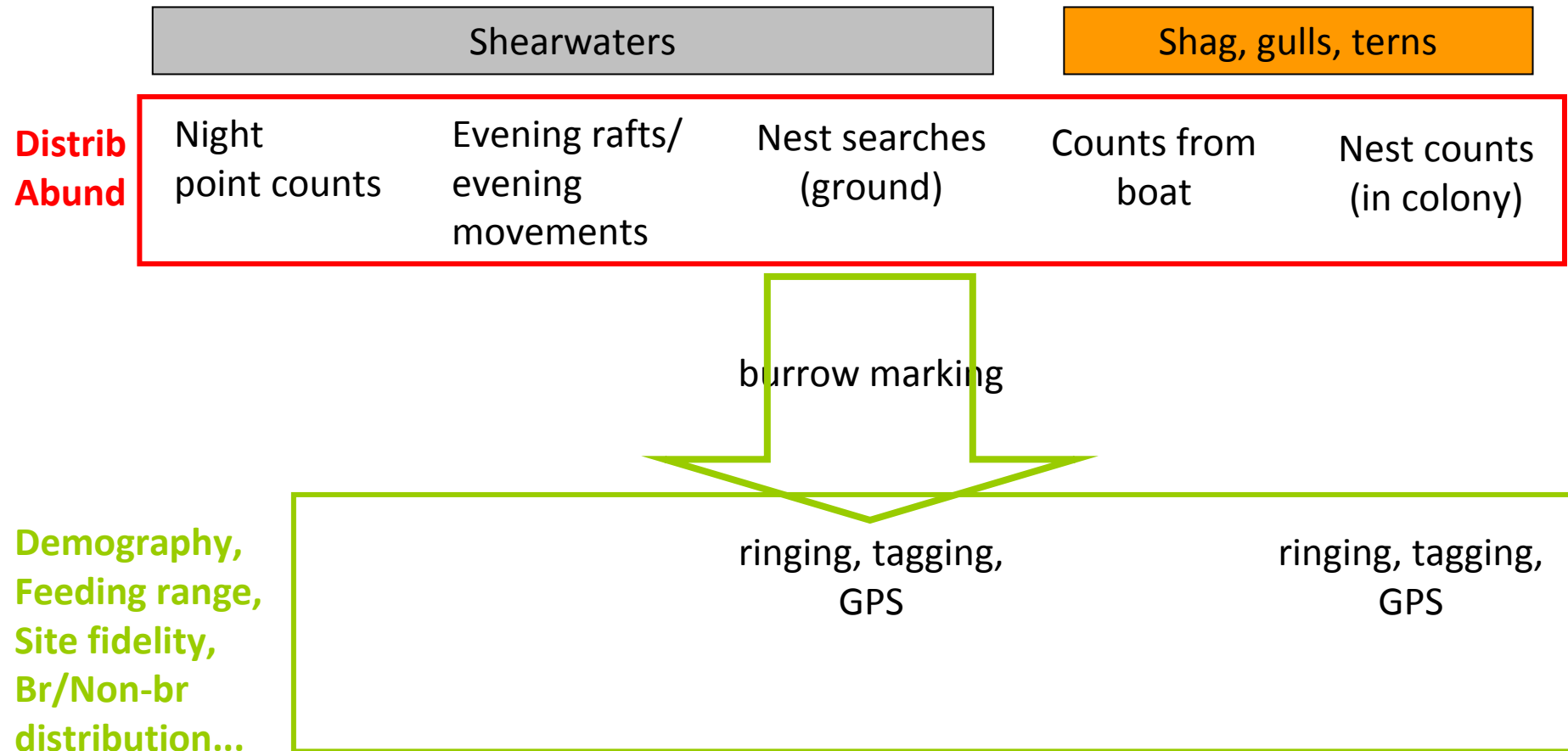
- *search literature & other info to build a “priority” list of sites (and a proper timing of activities)*
- **survey (all) potential breeding sites & habitats (islands, cliffs, coastal wetlands..)**
- **day and/or night, season changes according to species**



		dec	jan	feb	mar	apr	may	june	jul	aug	sept
CL	Shag										
CL	Cormorant										
IS	Yelkouan shearwater										
IS	Cory's shearwater										
IS	Storm petrel										
IS/LAG	Yellow-legged gull										
IS/LAG	Audouin's gull										
IS-LAG	Lesser-crested tern										



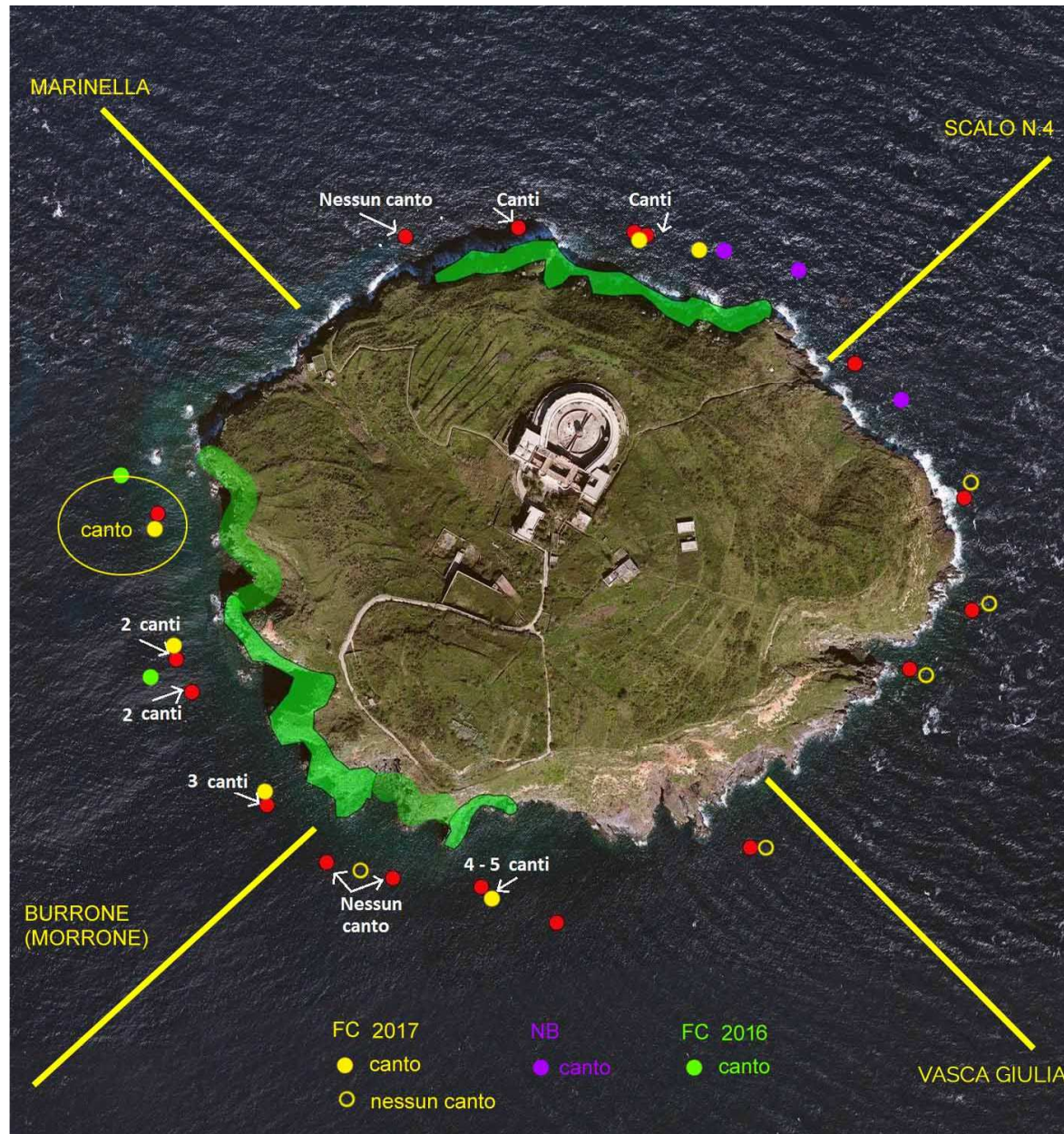
# Seabird (breeding) monitoring - summary





# Night point counts

Shearwaters (Storm petrel)



**When:** early night after total darkness until moonrise (ideally 5-8 days after full moon)

**Where:** coastal rocky areas, with sparse vegetation and boulders/debris, cliffs, caves and (as a rule) no artificial lights.

**Season:** early May to Sept for Scop Sh; early Feb to early June for Y Sh

**Tools:** map, gps, M & F recordings, form

**Results:** calls/time unit (e.g. 10min), approx location/absence of colonies



# Evening rafts

Shearwaters

**When:** 2-3 h before sunset to darkness  
(ideally 5-8 days after full moon)

**Where:** close to known/suspected breeding colonies

**Season:** soon before egg laying AND/OR close to the end of incubation: midApr-midMay or midJune-midJuly for SS; Feb or April for YS

**Tools:** map, gps, telescope, binocular, (compass), form

**Results:** n birds, approx location of colonies







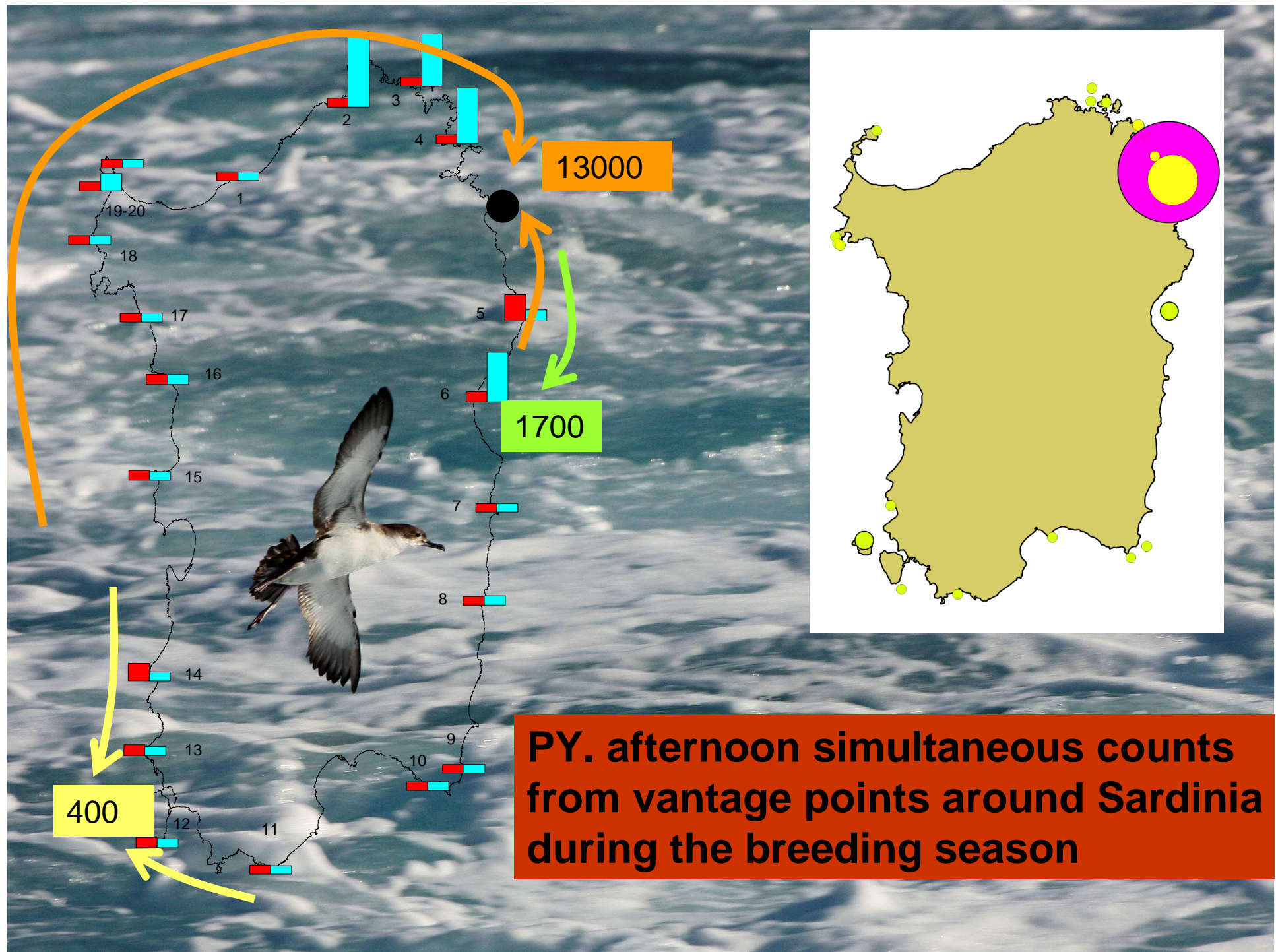
# The moon rise, moon set

- The time of the moon rise and set depends on its phase
- Rises in the East and sets in the West – due to Earth's rotation
- Remember: moon rises about 50 min later each day of the moon phase cycle (~ 25 to 75 mins)

Phase	Rise Time	Midpoint in sky	Set Time
New	Sunrise	Noon	Sunset
1 <sup>st</sup> quarter	Noon	Sunset	Midnight
Full	Sunset	Midnight	Sunrise
3 <sup>rd</sup> quarter	Midnight	Sunrise	Noon

- [http://aa.usno.navy.mil/cgi-bin/aa\\_rstablew.pl](http://aa.usno.navy.mil/cgi-bin/aa_rstablew.pl)







# Nest searches

Shearwaters

**When:** during daytime

**Where:** islands with known (accessible) colonies in burrows

**Season:** during breeding, from incubation to chick fledging: midJune-end Sept for Sc Sh; endMarch to late June for YS

**Tools:** map, gps, torch, “seesnake”, form



**Results:** total no. nests/nest density, (+nest&plot id)





# Tavolara is. YS Nest density

- years 2008-2010
- 10 plots of 0.4 Ha
- 0.6% of the island (flat 600, real 900 Ha)
- 1.3% of suitable area (flat 317 Ha)

*groups of 5-8 people each*  
*2 with gps at 50-80m distance, 1 writing,*  
*others searching along parallel lines*





*Solit da bolle del cannone*

28/4/2009 NB M2 MP 6A  
data rilev *1430* *max = sotto*  
*Pic = sopra*

TRANSETTO ☒ FUORI TRANSETTO ☐ n scheda *1*

EV. NIDI DI BERTA MAGGIORE O UCC. TEMPESTE VANNO SPECIFICATI ESPLICITAMENTE!

Habitat prevalente Sottolineato=sondino, Riga sopra=cavità schermata da vegetazione, apice (1,2,3...) = per collegare nidi di stessa cavità, apice N = più nidi di quella tipologia

WP ORA DIST.	CAVITA' OCCUPATA (Adulto, Juv, Uova, Predato)	C. NON ISPEZIONABILE (TRacce, NoTracce)	CAVITA' IDONEA VUOTA (NO nido, TRacce, Nido Vecchio, N Predato)
SOPRA 217 14,30 405346,3-94152,5 <i>bosco cespuglioso</i> <i>Redo</i>	<i>U213</i>	TR NT NT NT MT MT <i>(M)</i> NT NT NT NT NT <i>PPP</i>	NO <i>NV</i> NO NO NO NO NO NO NO NO NO NO NO NO NO NO NO NO <i>NV</i> 44 NO 2 NV
WP 219 Sop 4053 43,1 <i>olivaceo</i> 941 50,5 <i>roccia</i> SOT <i>frase creta</i>	WP 220 / 405342,2-94150,5	TR TR NT <i>(TR)</i> NT NT TR	NO NO NO NO NO NO NO NO NO NV NO NO NO NO NO NO NO NO NO NO 19 NO 1 NV
Ritorno quota 465m WP 221 Sop SOT 405341,9/94151,8	<i>U</i> 405342,1/94152,1 <i>U</i> 405342,8/94152,6 Tar 25		
WP 222 405342,6/94152,4 <i>ceca gatto</i>			
WP 223 4053 444 94154,1 <i>causole trasv.</i>	<i>U</i> Tar 26 <i>nel causole</i>		
WP 224 4053 45,3 94155,1 <i>causole trasv.</i> <i>nel bosco</i> <i>fine</i> 4,25			



3 categories of  
"suitable" burrows

occupied

not fully  
visible

empty and  
suitable



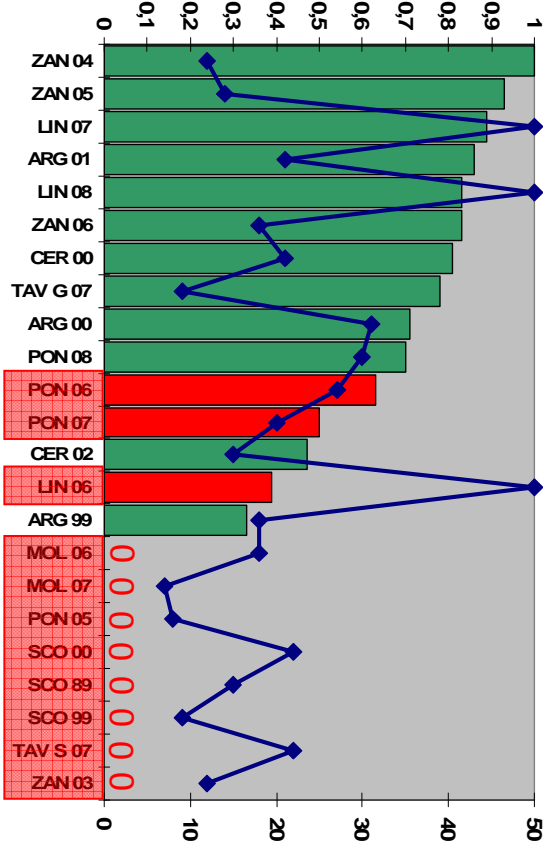
	densities		estimated totals		
	mean/Ha	range	mean TOT	min TOT	max TOT
occupied sites	43,3	5,7-95	<b>13726</b>	1806	30105
empty suitable sites	103,3	17,6-223,6	32746	5582	70881



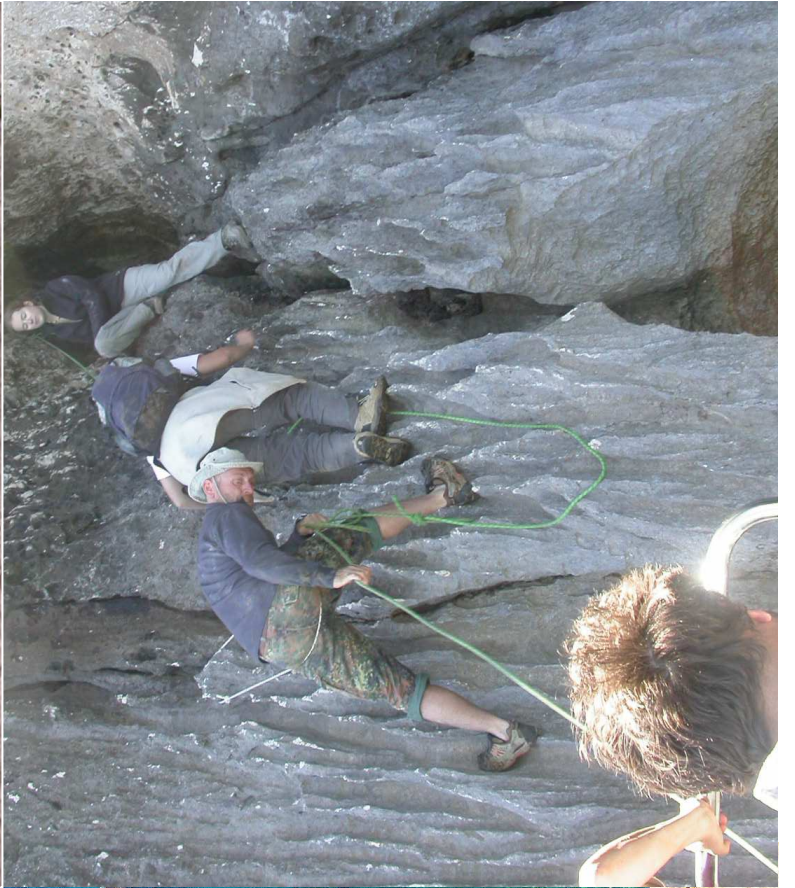


# Nest identification

**Results: breeding success,  
(population trends)**









# Counts from boats

Shag, gulls, LCT

**When:** during daytime

**Where:** islands/cliffs with known/suspected breeding colonies

**Season:** during breeding, from incubation to chick fledging: Jan-Apr=Shag; Apr-May=YLG; Jul-Aug=LCT

**Tools:** map, gps, binocular, (telescope), camera, form



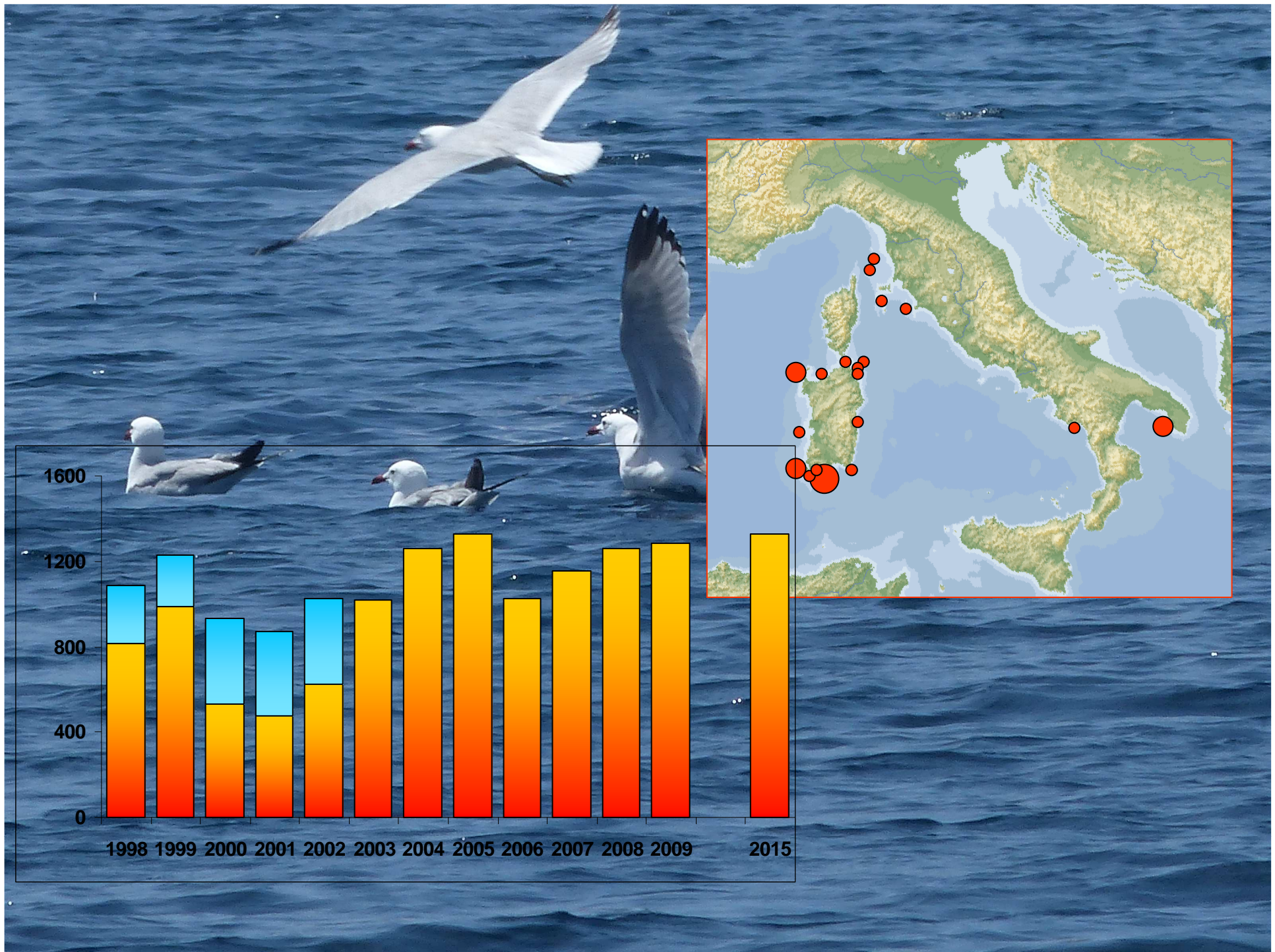
**Results:** total no. inds/pairs (nests)

## METHOD



- AG+YLG. Yearly boat census of ca. 90 islands around Sardinia (about 300Km coasts) in early June







# Counts of nests in colony

gulls, terns

**When:** early morning (late afternoon)

**Where:** known breeding colonies on islands  
(or wetlands)

**Season:** end-incubation: Apr-May=YLG; May:  
AG; Jul=LCT





# REQUIREMENTS

- (Map of colonies)
- one camera
- (3-5 m long coloured ropes)

- Proper dresses, water, mosquito repellent
- Agenda & (more than) 1 pencil
- Enough expert ornithologists...
- ...with an adequate strategy









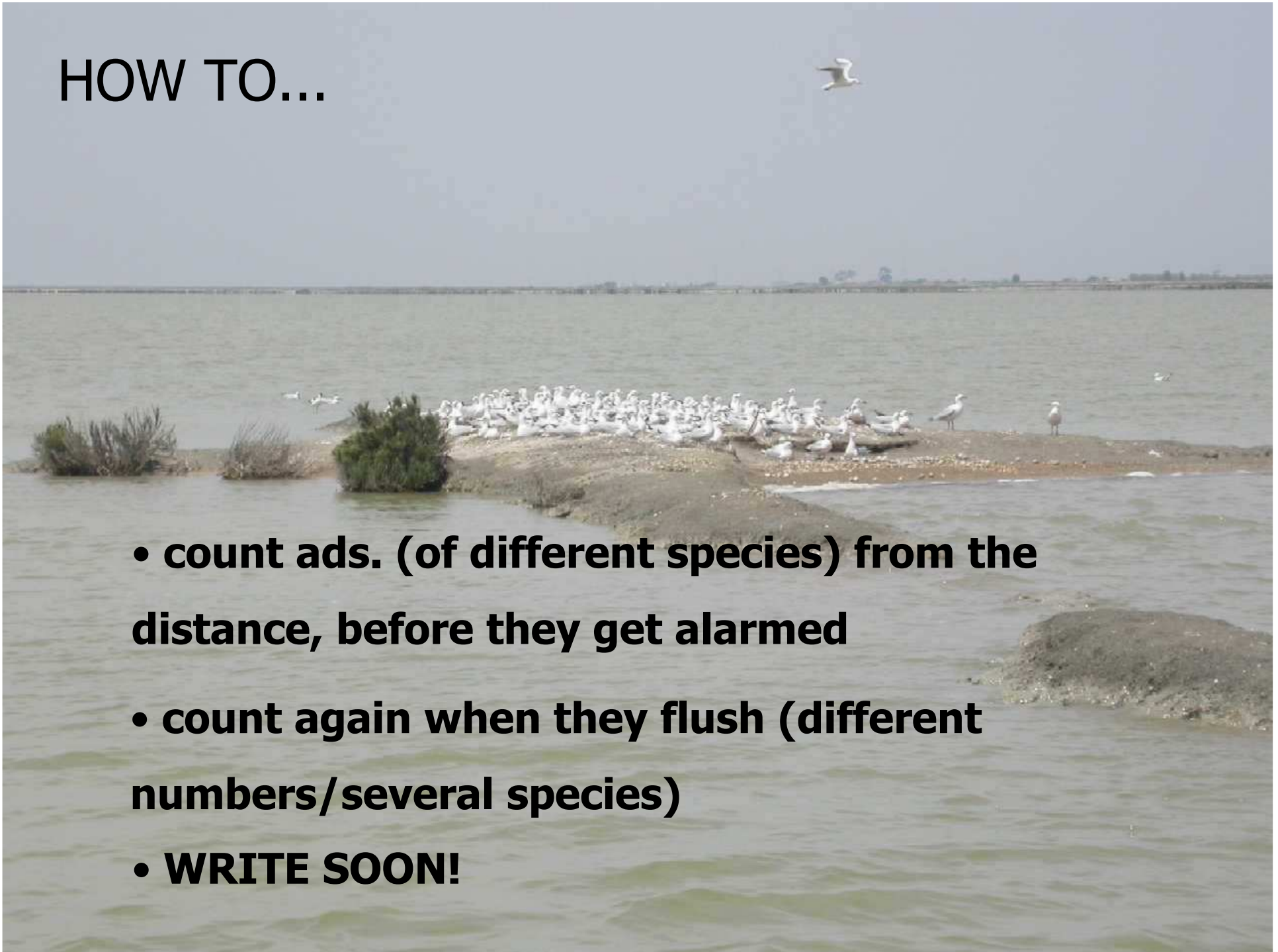
Which shoes?





# HOW TO...

- **count ads. (of different species) from the distance, before they get alarmed**
- **count again when they flush (different numbers/several species)**
- **WRITE SOON!**





## IN THE COLONY

- less than 30min (ideally 15')
- 1 person writes and coordinates the census
- 1-2 people count nests  
(or take pictures using ropes to mark sectors)
- mark each nest with flowers/leaves
- (check for traces of predation)
- check dead birds for rings, fishing ropes...

- ...run away quickly





**Correctly writing  
data is as important  
as correctly  
counting nests/eggs**

**Use adequate  
agendas/forms**

**Write properly**

**writer**

**counters**







Avocet: 1 nest with 3 eggs

B1 | *Erubia* *jullo* 3-5ss. B100 222

AVOCE 88A: ~~1x3~~ - 1x3 - 1x4

1x5 - 1x3 1x5 (+1 E<sub>0</sub>) 1x7 / 2x5 / 1x4 / 1x3

1x5 / 1x4 (+1 E<sub>0</sub> + 1 middle E<sub>0</sub>) 3x5 / 1x4 (+1 E<sub>0</sub>) / 2x4

1x3 / 1x5 / 1x4 / 1x3 / 2x4 / 2x4 / 1x5

1x7 (+1 E<sub>0</sub>) / 4x4 / 1x5 / 1x5 / 1x3 / 1x7 (+1 E<sub>0</sub> + 1 middle E<sub>0</sub>)

1x5 / 2x4 / 1x3 / 1x4 / 1x4 / 1x7 / 1x7 / 1x4 (+1 E<sub>0</sub>)

1x3 / 1x2

Little tern: 1 nest with 2  
eggs and 2 chicks

FRAT1 CELL6

Handwritten notes on a grid of circles containing mathematical expressions:

- Row 1:  $2 \times 2$ ,  $1 \times 3$ ,  $2 \times 2$ ,  $1 \times 3$ ,  $1 \times 1$ ,  $3 \times 1$ ,  $3 \times 3$ ,  $1 \times 1$  (with a circled '1')
- Row 2:  $1 \times 1$ ,  $1 \times 1$  (with a circled '1'),  $4 \times 1$ ,  $1 \times 2$ ,  $2 \times 2$ ,  $1 \times 1$ ,  $1 \times 2$  (with a circled '1'),  $1 \times 2$  (with a circled '1')
- Row 3:  $1 \times 2$ ,  $1 \times 1$ ,  $2 \times 3$ ,  $1 \times 6$ ,  $1 \times 1$ ,  $2 \times 3$ ,  $1 \times 3$ ,  $1 \times 2$  (with a circled '1'),  $1 \times 2$  (with a circled '1')
- Row 4:  $2 \times 4$ ,  $2 \times 3$ ,  $2 \times 3$ ,  $2 \times 3$ ,  $2 \times 2$ ,  $1 \times 1$ ,  $1 \times 2$ ,  $1 \times 1$

A large orange circle highlights the expression  $1 \times 2$  (with a circled '1') in the third row, eighth column.

SCHEDA PER CONTEGGIO NIDI IN COLONIA

[illegible]

pul.	X1 u.	pul.	X2 u.	pul.	X3 u.	pul.	X4 u.	pul.	X5 u.	pul.
	2+1		5+1		3		1+1		1+1	
	1+1+1		1 → 1		1 → 2					
	4+1+1		0 → 2		0 → 3					
	1+1		1 → 1		1+1					
			2+4+1		0 → 3					
			4+3+2		1 → 2					
			2+3+3		3+1					
			0 → 2		3+1+4					
			7		1+1					

E: <u>Avocelle</u>											
pul.	X1 u.	pul.	X2 u.	pul.	X3 u.	pul.	X4 u.	pul.	X5 u.	pul.	
	1		1		1+1		1+1		1+1		13
					1		1+1				
							1+1				

E:																	
pul.	X 1 u.	pul.	X 2 u.	pul.	X 3 u.	pul.	X 4 u.	pul.	X 5 u.	pul.							

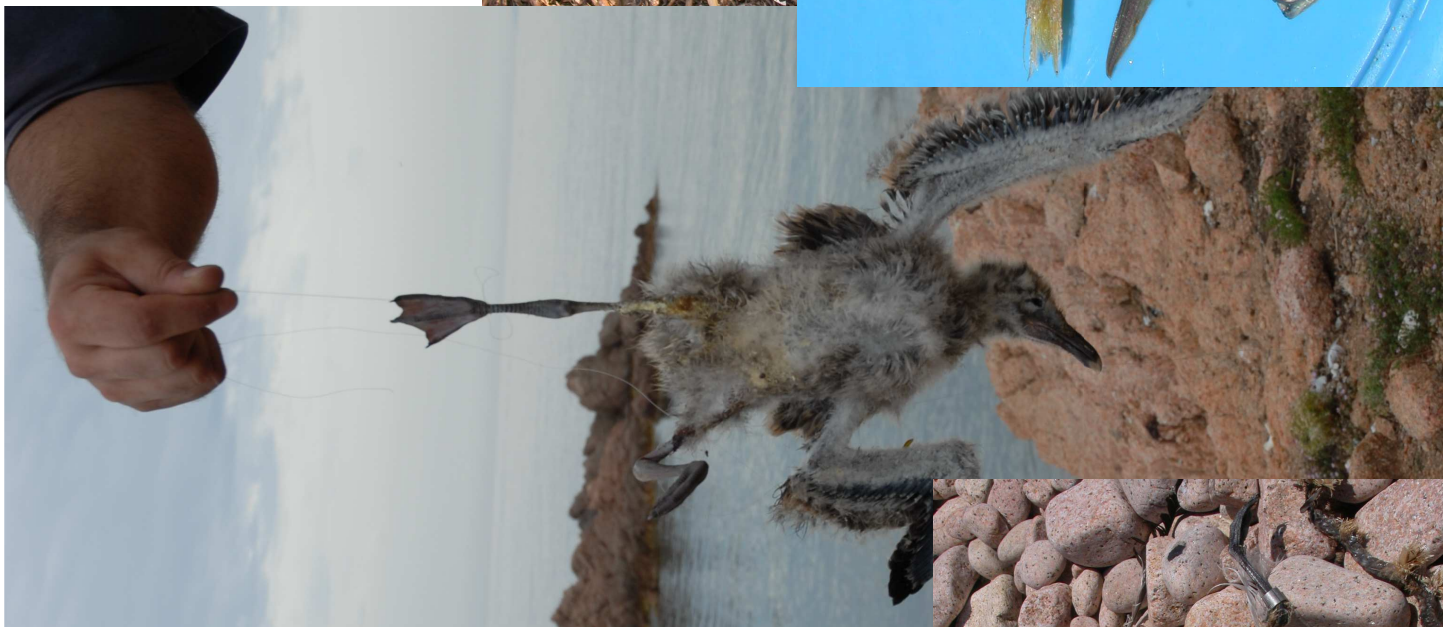
[illegible][illegible]





- come back during chick growth & count juvs (with telescope)
- check rings (and/or count how many birds you see with/without rings) → breeding success







## ...and what about ringing & tagging?

- > requires (very) specialised people (high risk of chicks/egg death)
- > non compatible with other monitoring: requires additional visits
- > visits to colonies must last <30' in early morning hours
- > expensive (tagging), time-consuming & stress inducing activity
- > requires strict evaluation of targets and of available time during the forthcoming years
- > feasibility depends upon species /age classes

extremely useful results (behaviour, foraging, site fidelity, longevity...)



# Shearwaters

## Ringling/tagging

Ads: Y ; Juv: Y;  
metal Y; colour: N (useless)  
GPS loggers/tags: Y (ads)

**Prerequisites:** nest id, nest choice  
(where catching and re-catching  
feasible)



**Possible results:** site fidelity,  
foraging range and behaviour, ad.  
mortality rates, recruitment rate...



# Tavolara island – YS annual nest/pair fidelity (metal rings)

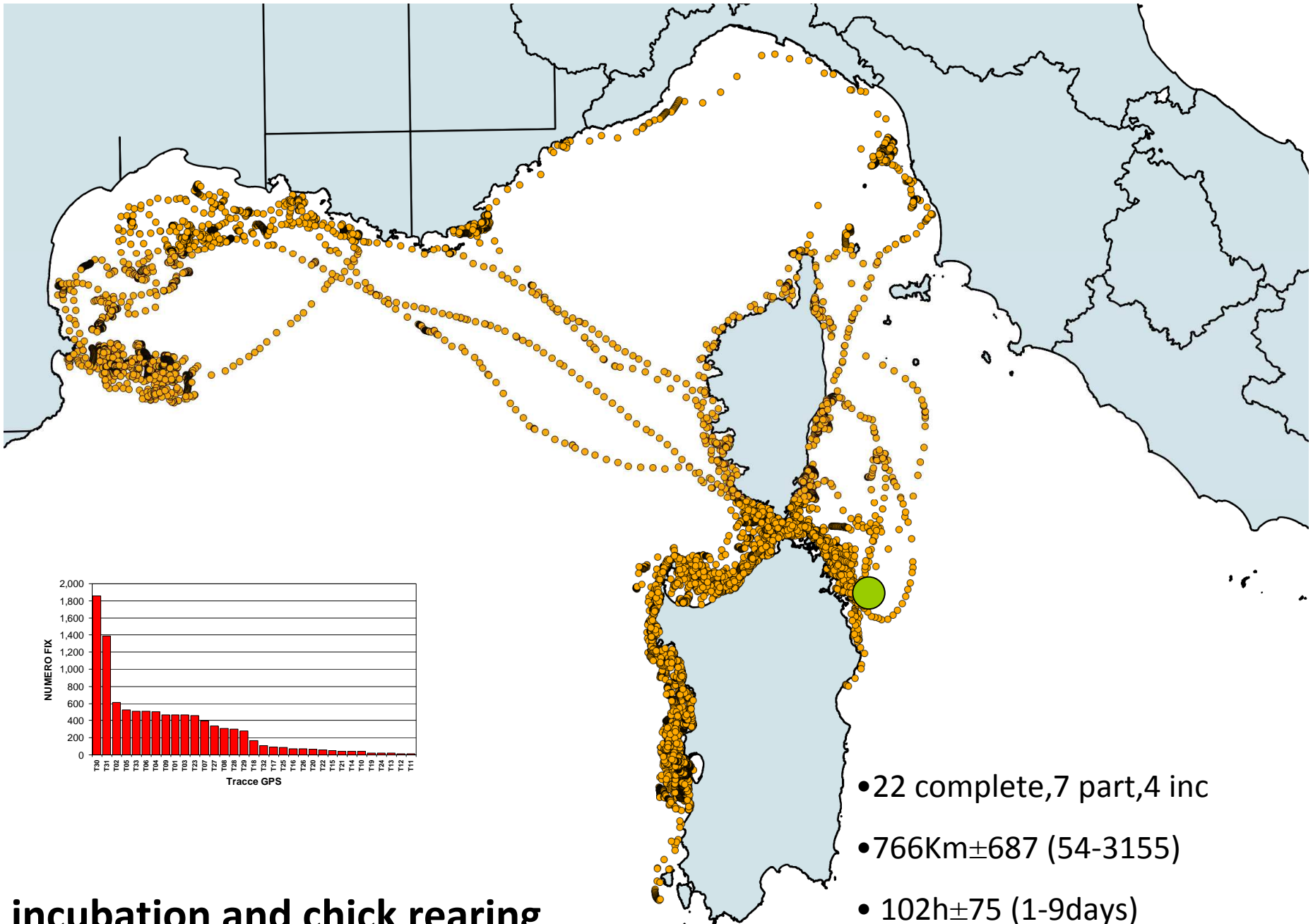
	NIDO	2013			2012			2011			2010		
				PULLO			PULLO			PULLO			PULLO
COLATA	A	T86753	TJ3290	uovo pred	(TA2261)	N	N	TA2234	TJ3258		TJ3254	?	
	B	TJ3255	TA2236	NO	TJ3255	TA2236	TJ3275	TJ3255	TA2236		TJ3255		TA2211
	C	TA2228	TA2233	SI	TA2228	TA2233	NO?	TA2228	TA2233		TJ3256		TA2212
	C2	TJ3300	TJ3274	TH4796	TJ3274	TJ3273	N	N	N	N	N	N	N
	C3	TJ3273	TJ3258	TH4797	N	N	N	N	N	N	N	N	N
	D	TA2229	TJ3260	SI	TA2229	TJ3257	TJ3276	TA2229	TJ3257			TJ3257	
	E	N	N	N				TA2224	TA2230		TJ3258		TA2213
	E2	TJ3288	TJ3291	NO	?	?	si	?	?	?	?	?	?
	F	TJ3259	TA2235	SI	TJ3259	TA2235	TJ3279	TJ3259	TA2235		TJ3259		TA2214
	G	TA2225	T86754	SI	TA2225	?	TJ3278	TA2225	TJ3260			TJ3260	
	H	TA2234	TJ3262	SI	TA2234	TJ3262	si	TA2231	TJ3262			TJ3262	
	H2	TH1332	?	Th4791	TH1332	TJ3269	si	?	?	?	?	?	?
	I	T86751	?	uovo pred	TA2223	TJ3263	TJ3277	TA2223	TJ3263			TJ3263	
	I2	TA2231	TJ3263	TH4789	N	N	N	N	N	N	N	N	N
	sopra I												
	L	N	N	N	N	N	N	TA2226	TJ3264			TJ3264	
	M	TA2232	TJ3261	TH4788	TA2232	TJ3261	TJ3280	TA2232	TJ3261			TJ3261	TA2215
	M2	TJ3266	TJ3287	TH4786	TJ3266	?	NO UOVO	N	N	N	N	N	N
	N	N	N	N	N	N	N	TJ3265	TA2227		TJ3265		
	N2	?	TJ3264	TH4787	TA2226	TJ3264	TJ3281	N	N	N	N	N	N
	DORME	T86752	TJ3272	UOVO PREL	TJ3267	TJ3272	TJ3282	N	N	N	N	N	N
	MAR			TH4700	TJ3270	TJ3271	TJ3283	?	?	?	?	?	?
								POSSIBILE					



Tavolara island – YS foraging range  
during breeding (GPS loggers)





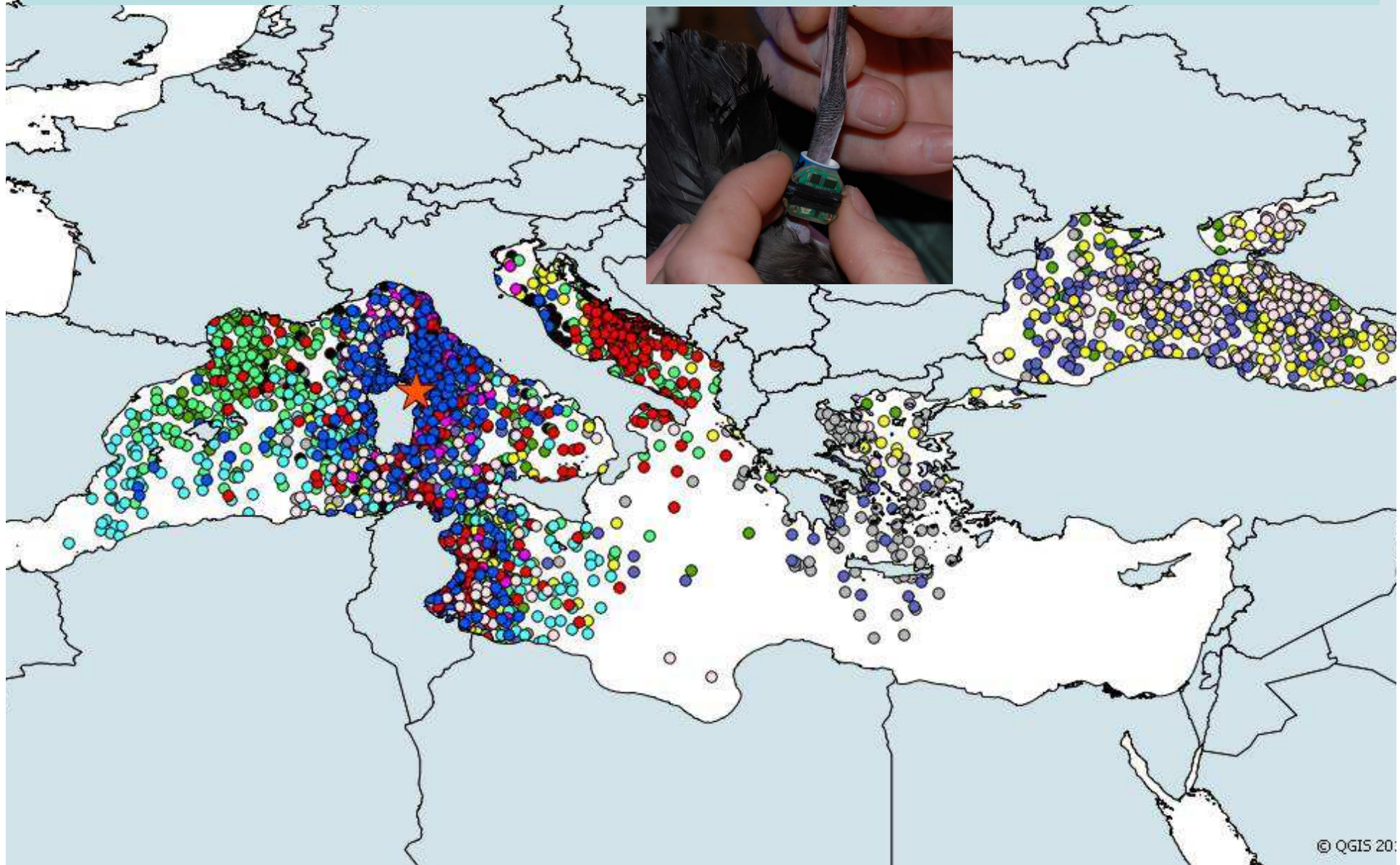


**incubation and chick rearing**

- 22 complete, 7 part, 4 inc
- 766Km±687 (54-3155)
- 102h±75 (1-9days)
- one trip > 13days!



# Tavolara island – YS year-round distribution (solar loggers attached to plastic ring)





# Shag

## Ringling/tagging

**Ad:** Nonbreeding only (traps); Juv: Y  
**colour:** Y  
**GPS loggers/tags:** Y (only non breeding)

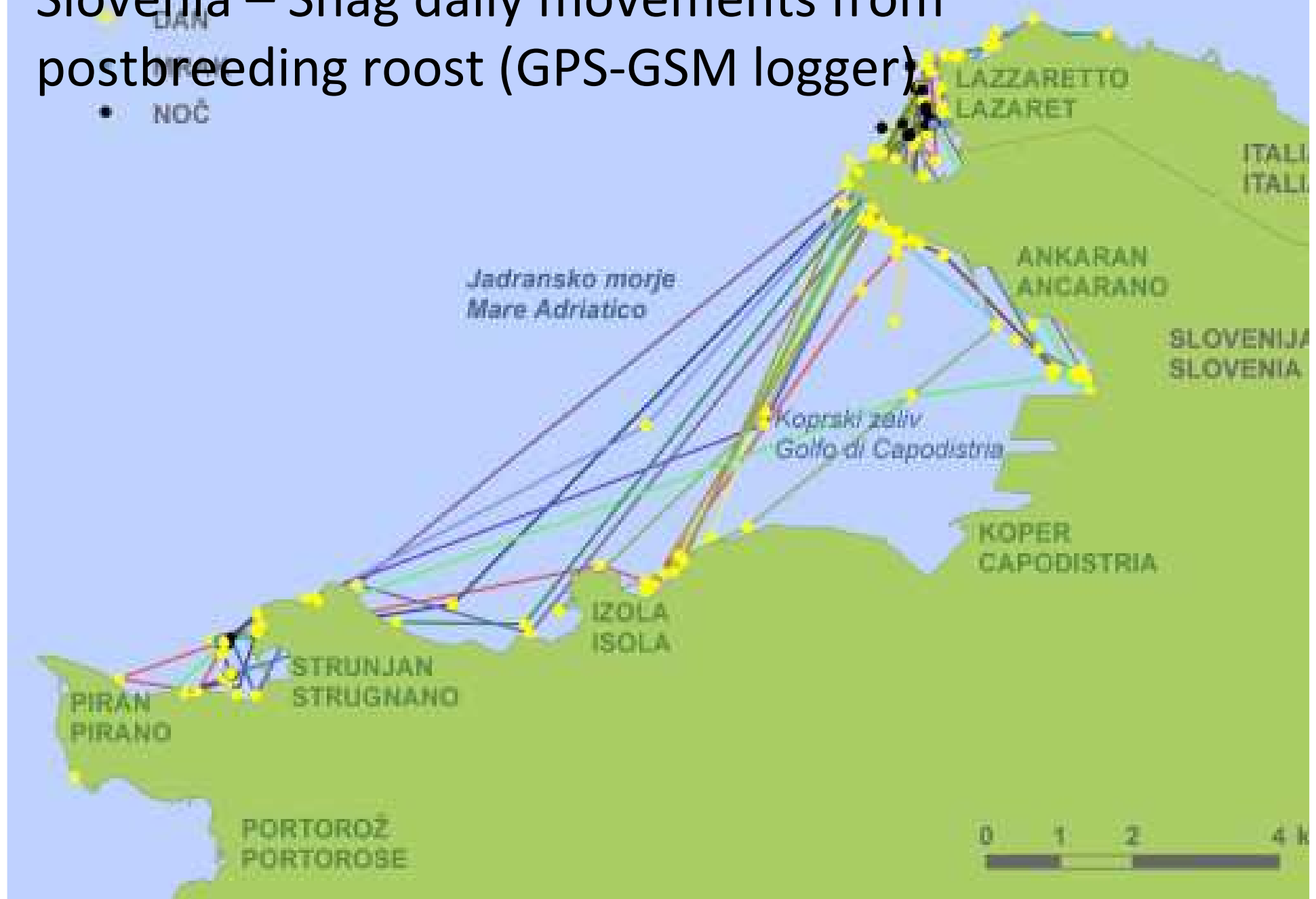
**Prerequisites:** nest choice (where juv catching feasible); roost choice



**Some results:** site fidelity,  
foraging range, ad. mortality rates,  
recruitment rate...



# Slovenia – Shag daily movements from postbreeding roost (GPS-GSM logger)





# Audouin's/YL gull+others

## Ringling/tagging

**Ad:** Y (traps); **Juv:** Y

**colour:** Y

**GPS loggers/tags:** Y

**Prerequisites:** choice of colony (where catching feasible)



**Some results:** site fidelity, foraging range, ad. mortality rates, recruitment rate...



Audouin's gull colour ring reading (site fidelity, age of first breeding, longevity...)

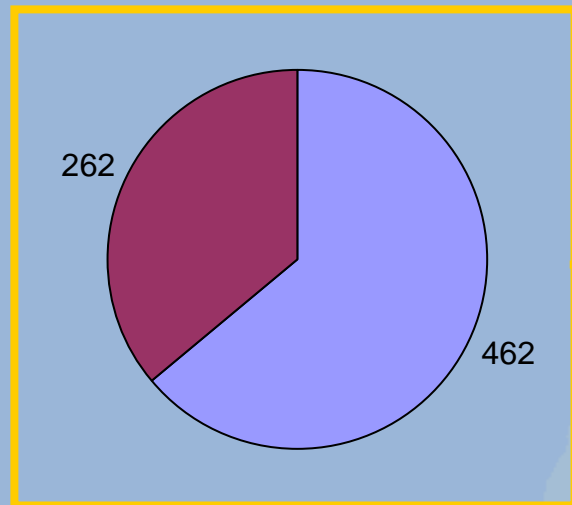






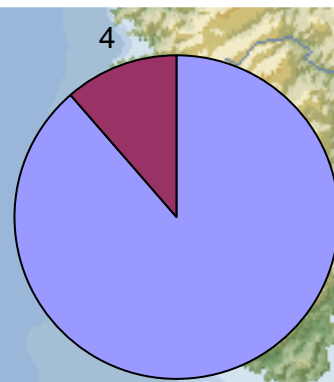
Gabbiano còrso <i>Larus audouinii</i>			Bianco ICLD	IAB (Ozzano) N0014514		
Ad.	ringed on (	15-05-01 Campo nell'Elba, Livorno	at )	Is. Pianosa - Porto Romano Italia	4237N1004E by Zenatello/Baccetti	
OBSERVATIONS:						
Date	Locality	Province details	Country	Coordinates	Remarks	Observer
17-05-01	Is. Pianosa - Porto Romano	Campo nell'Elba, Livorno	Italia	4237N1004E	Sul nido 13h	Zenatello
19-05-01	Is. Pianosa - Porto Romano	Campo nell'Elba, Livorno	Italia	4237N1004E	Su scogli vic. colonia 16h	Zenatello
19-04-02	Is. Pianosa -	Campo nell'Elba, Livorno	Italia	4234N1003E	In colonia	A. De Faveri
09-05-02	Is. Pianosa -	Campo nell'Elba, Livorno	Italia	4234N1003E	In colonia	M. Giunti
23-05-04	Is. Pianosa -	Campo nell'Elba, Livorno	Italia	4234N1003E	In colonia	Baccetti, A. De Faveri
18-06-05	Is. Pianosa -	Campo nell'Elba, Livorno	Italia		in colonia	Bini, De Faveri

# AG philopatry based on ring reading of breeders (n=464)

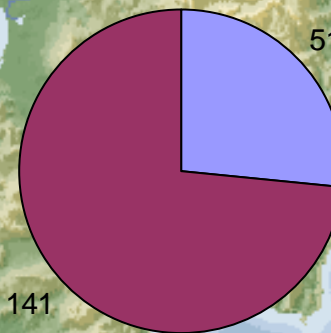
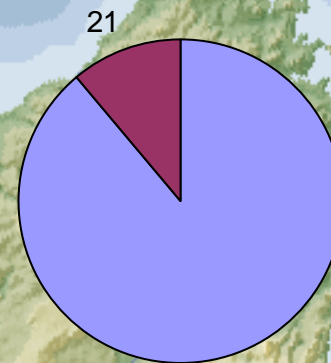
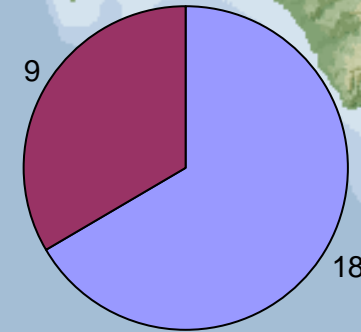


Chicks ringed in  
Sardinia (n=724)

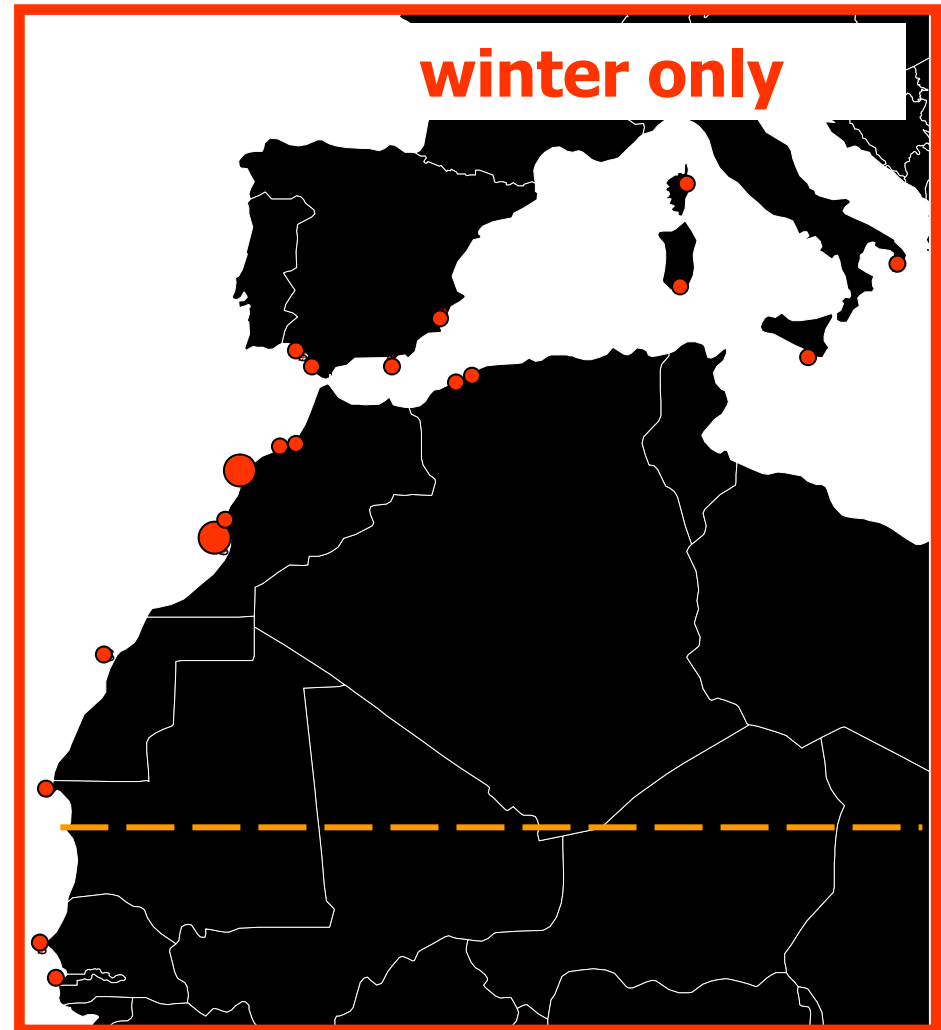
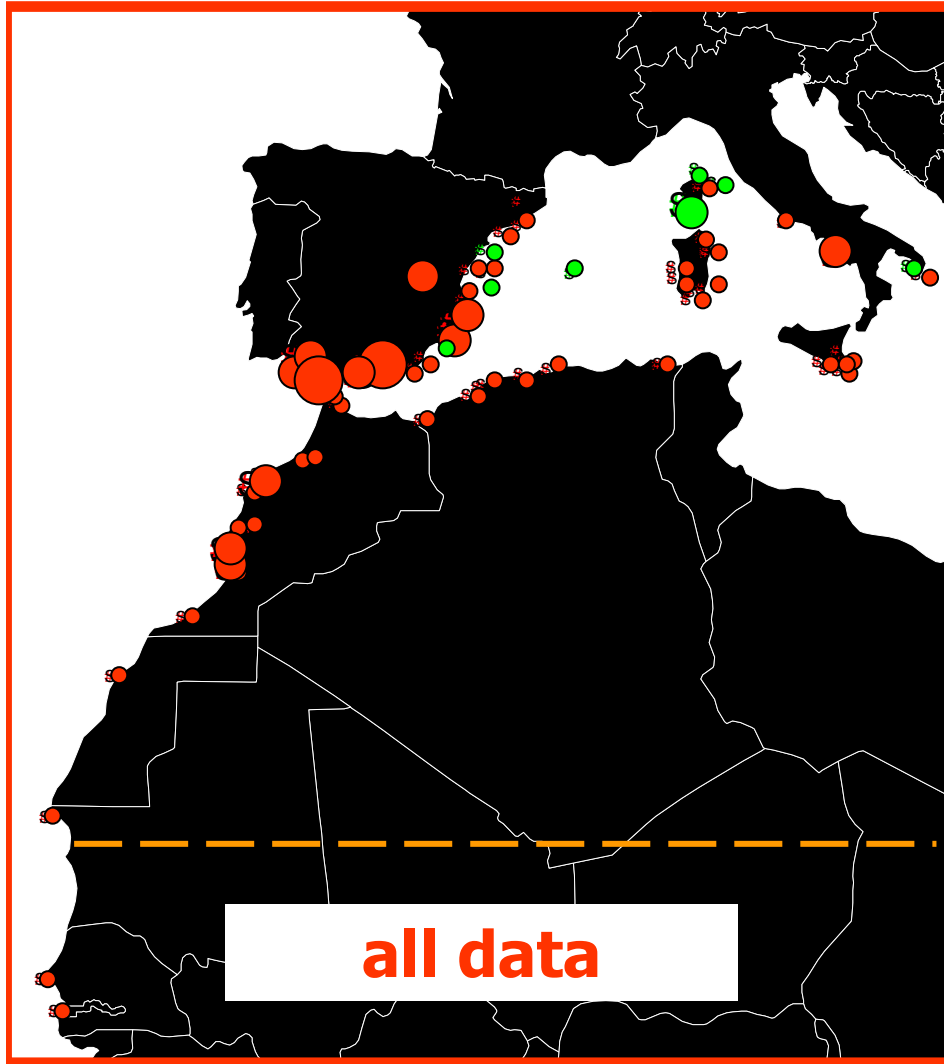
North  
South



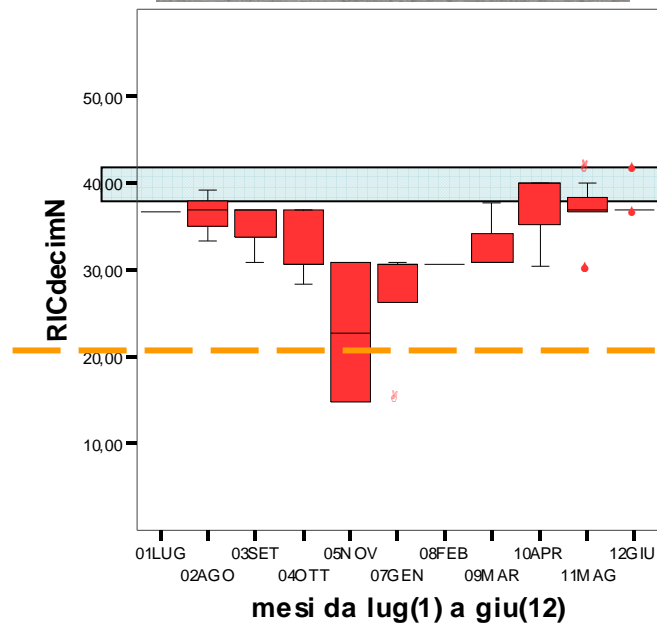
breeders  
outside Sardinia



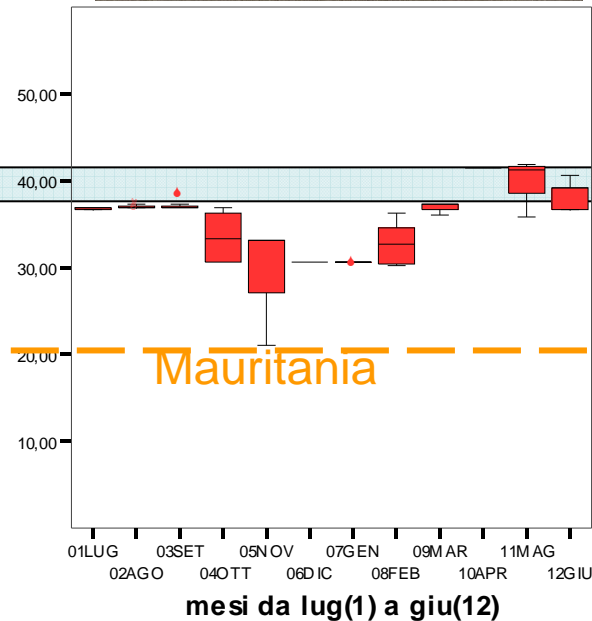




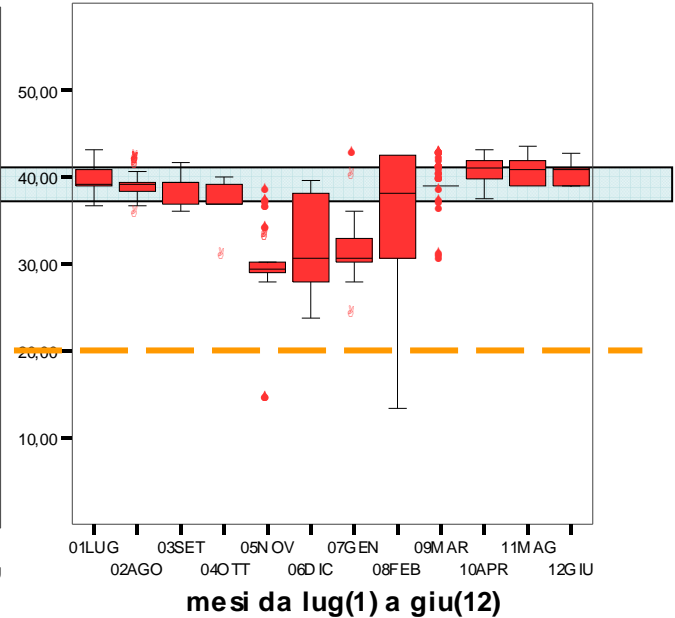
Audouin's Gull colour ring readings



1 cy: 2° summer  
close to wintering  
areas



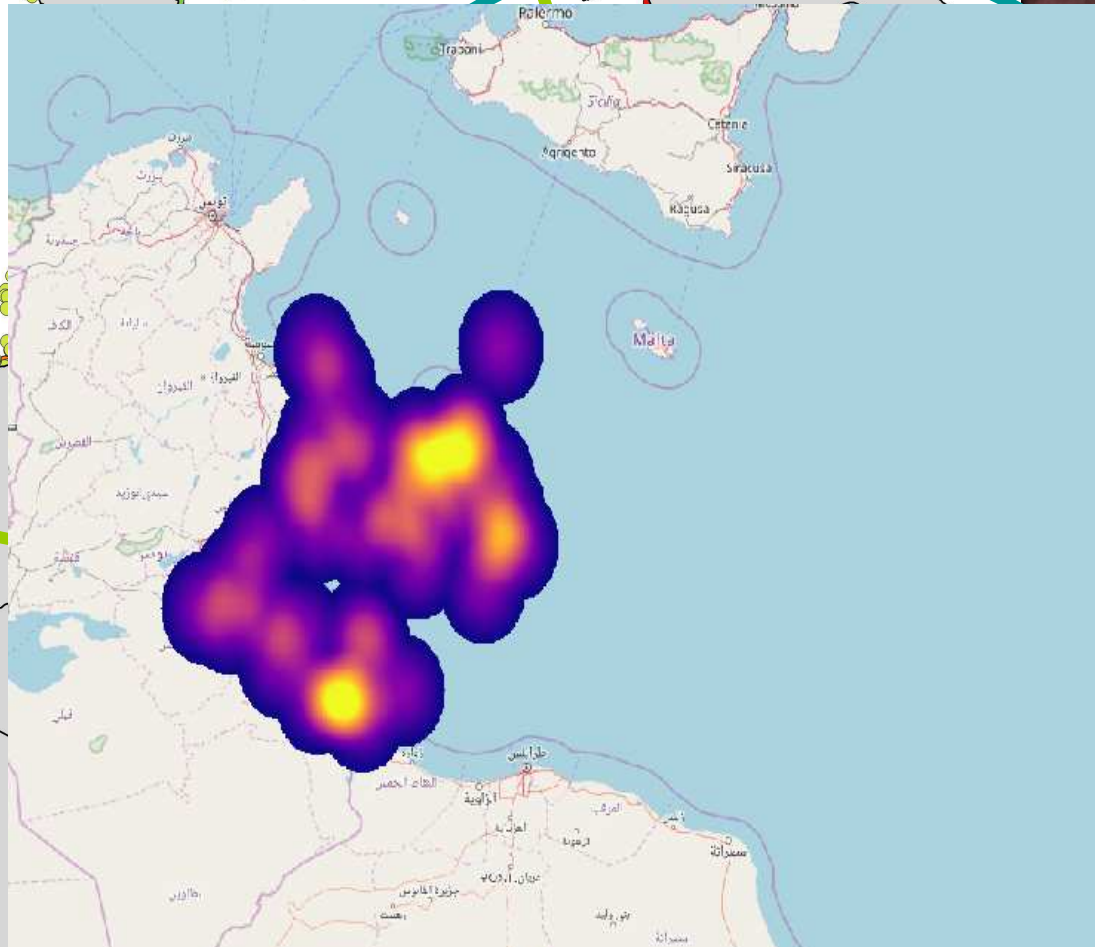
Immatures: late  
visits to breeding  
sites



Adults:  
northernmost  
wintering and  
early arrival at  
breeding sites



# AG year-round distribution (GPS-GSM loggers)



# Lesser crested tern

## Ringling/tagging

Ad: N; Juv: Y

colour: Y

GPS loggers/tags: N

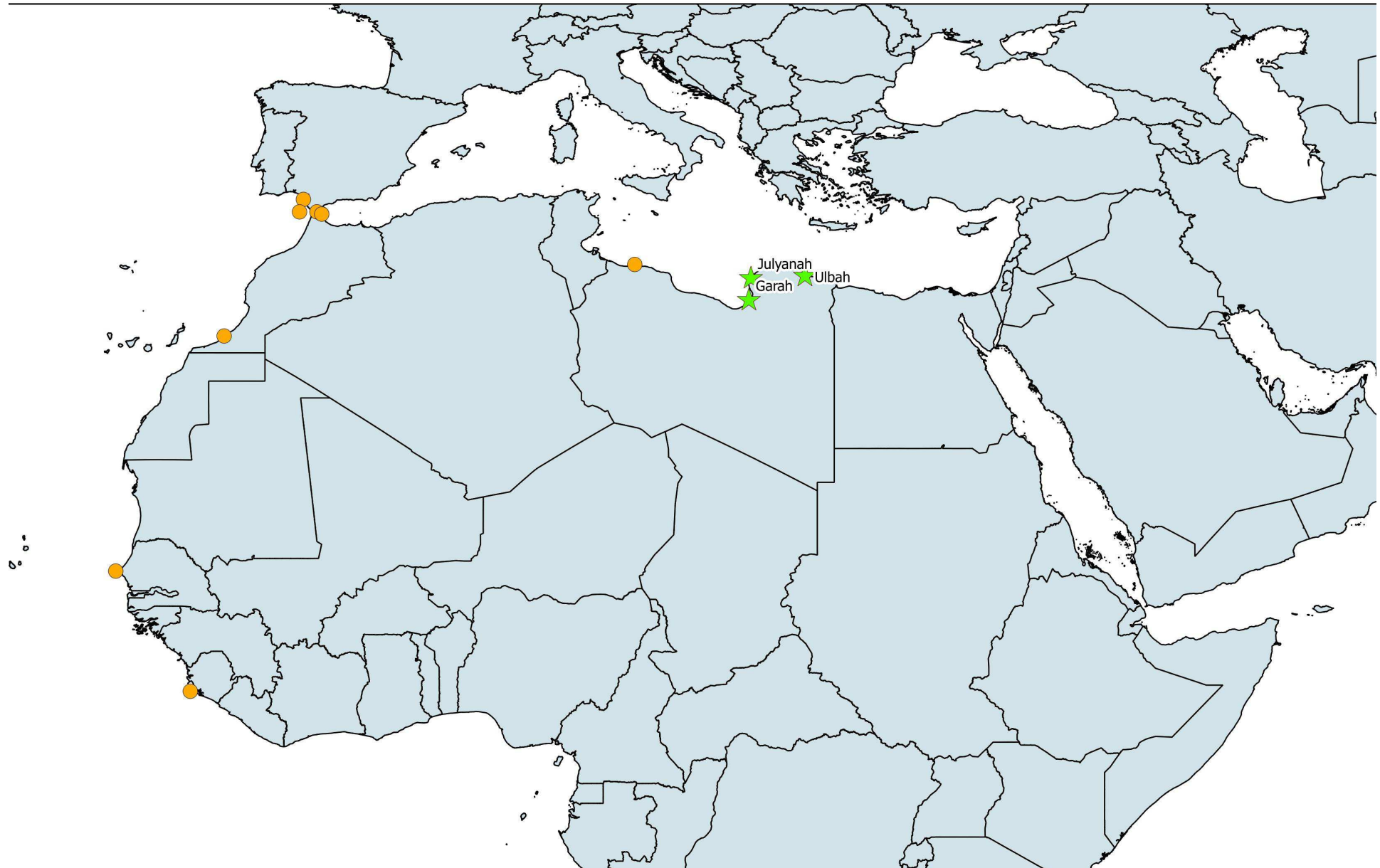
**Prerequisites:** choice of colony (where catching feasible)



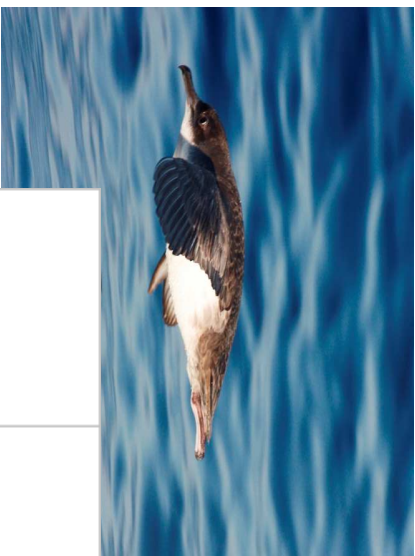
**Some results:** site fidelity, foraging range, ad. mortality rates, recruitment rate...



# Lesser crested tern non-breeding distribution



# Summary



		Point counts	Raft counts	Boat/tel escape counts	Nest density	Nest content	After fledging	Ringling	Tagging	
	Distribution	X	X					X (nbr)	X (nbr)	
Shearwaters	Abundance	X	X		X	X				
	Demography					X	X	X		
	Distribution							X (nbr)	X (nbr)	
Gulls/Terns	Abundance					X				
	Demography					X	X	X		
	Distribution									
Shag	Abundance			X				(X) (nbr)	(X) (nbr)	
	Demography			X		(X)		(X)		





THANK YOU

