



BLUETONGUE E IN SARDEGNA

SITUAZIONE EPIDEMIOLOGICA ATTUALE

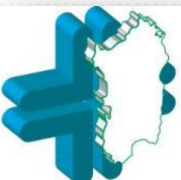
MISURE DI SORVEGLIANZA E CONTENIMENTO

BT

RISK

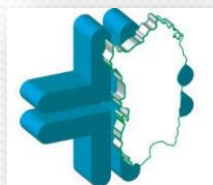
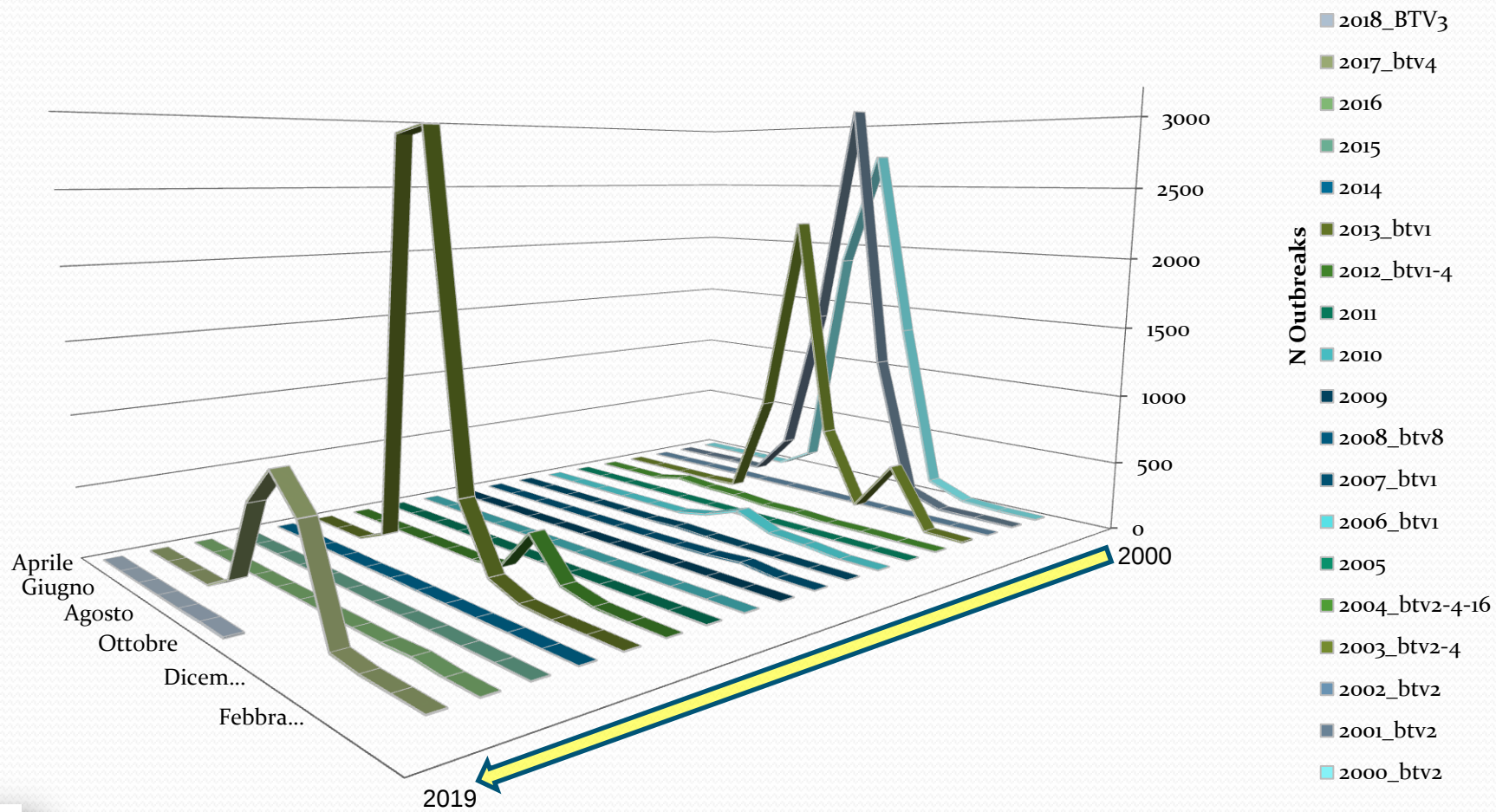
SANDRO ROLESU, OEVR-CDSE IZS SARDEGNA
SASSARI, 16-05-2019

LA BLUE TONGUE

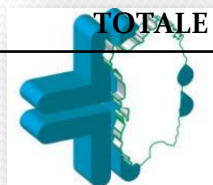


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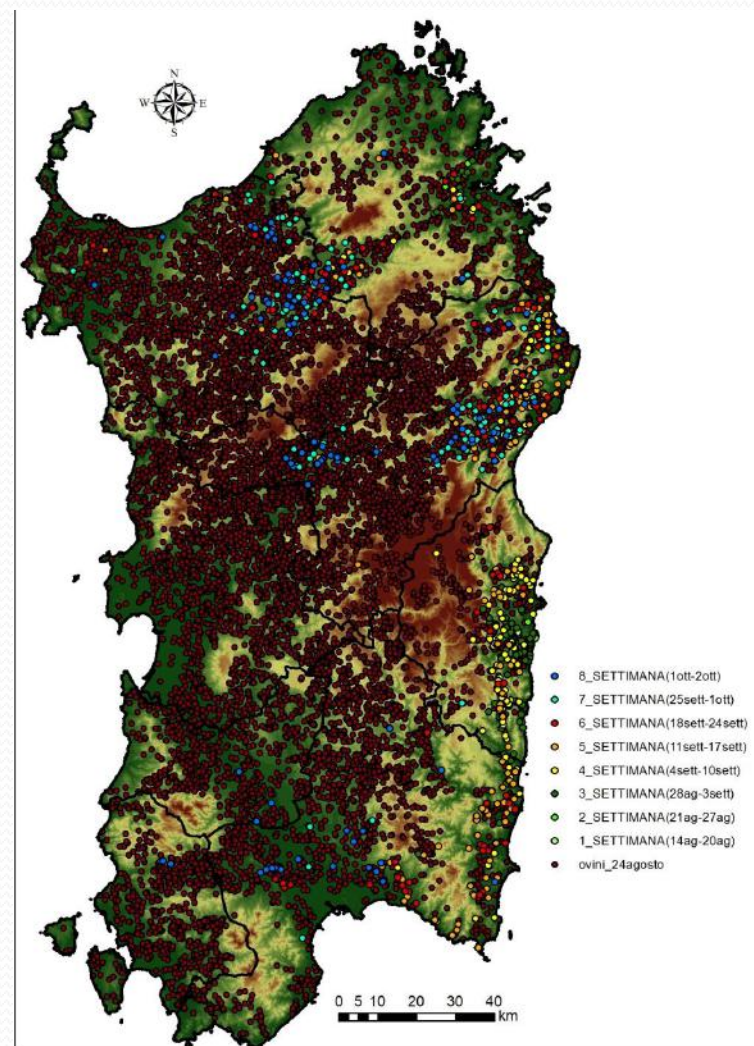
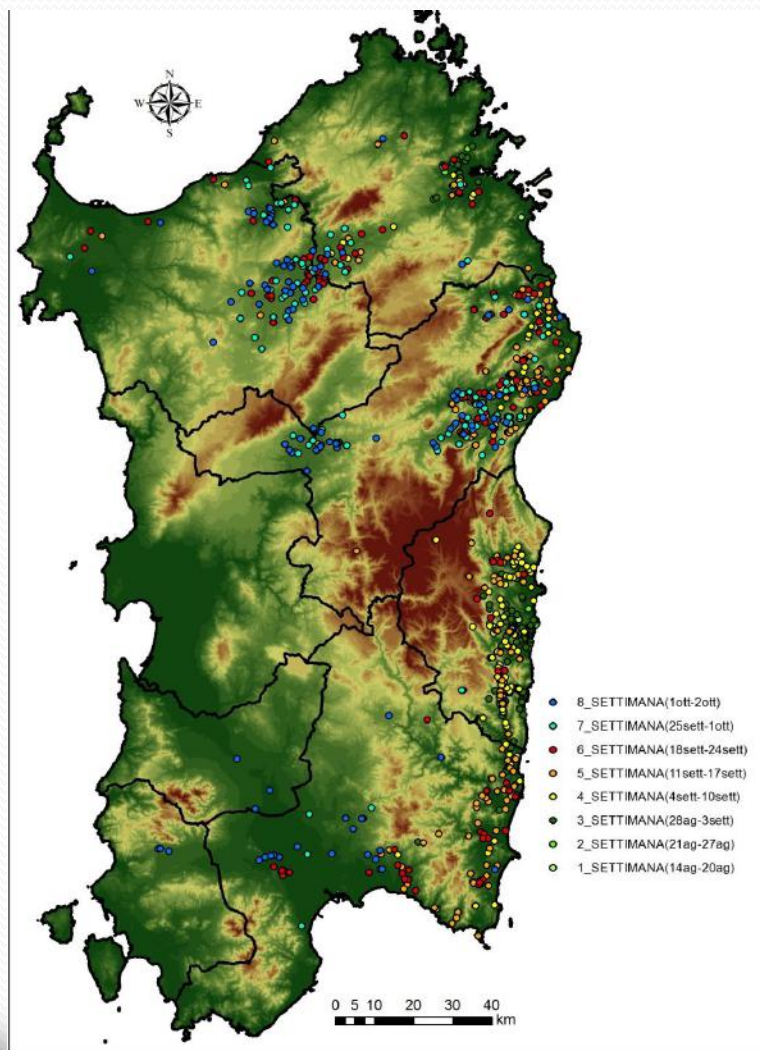
Epidemie

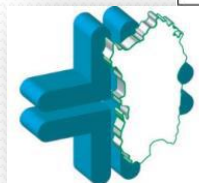
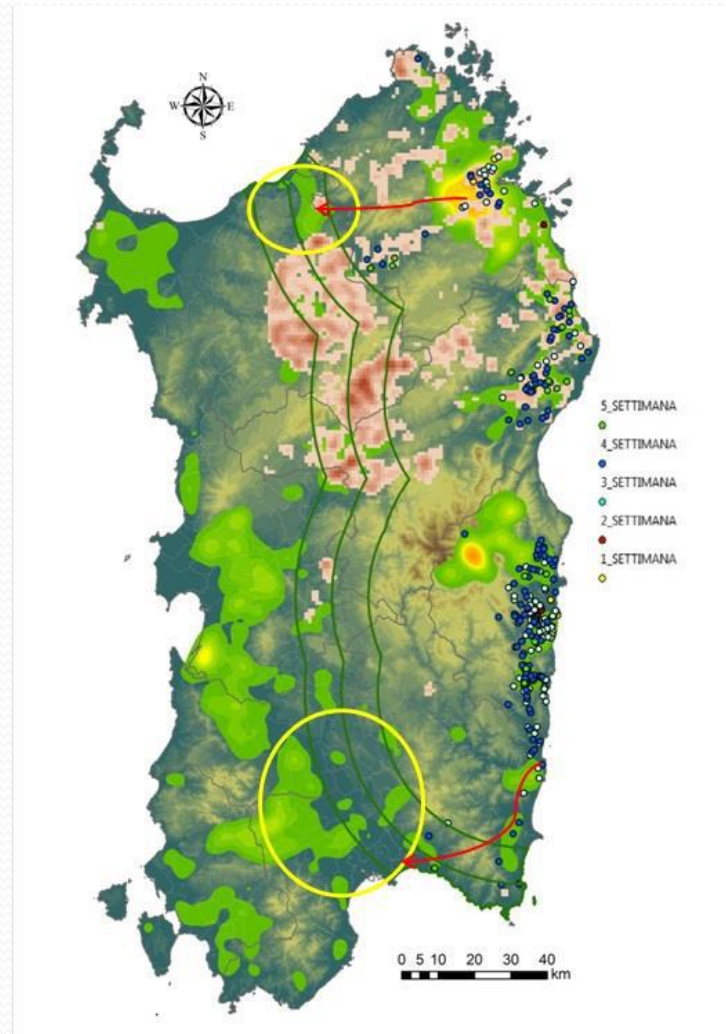
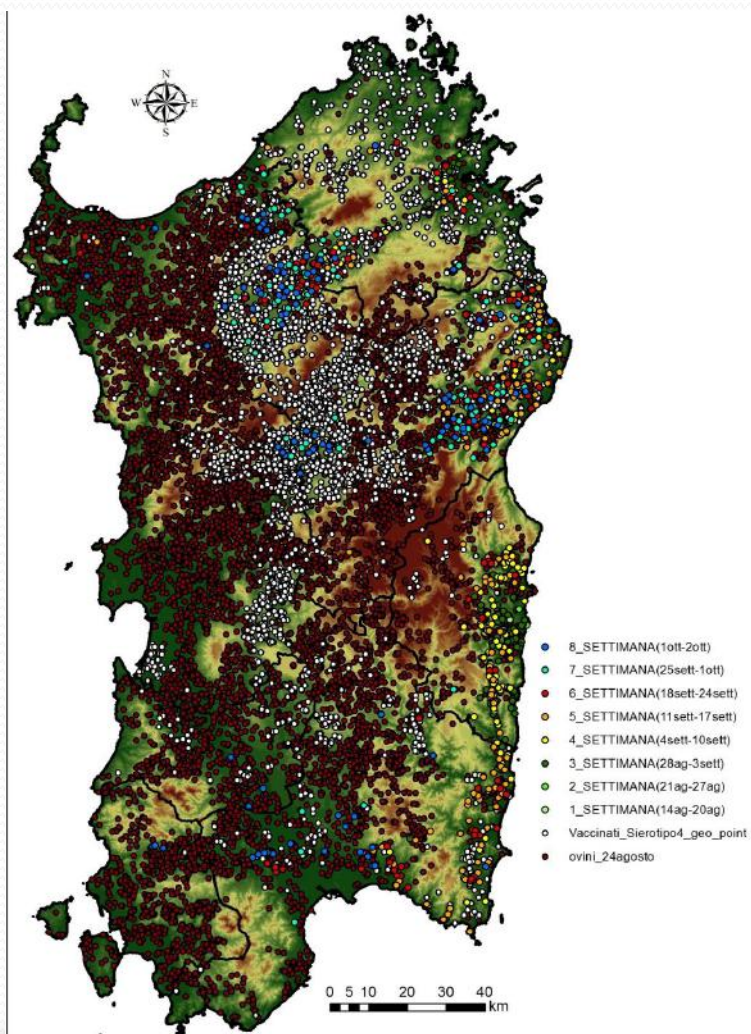


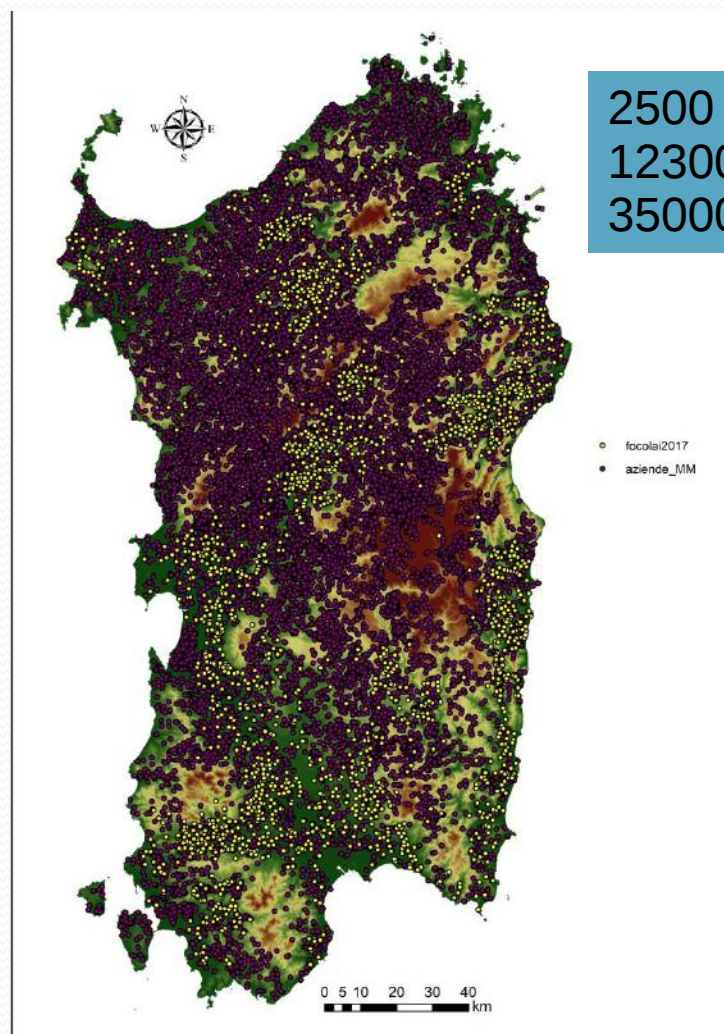
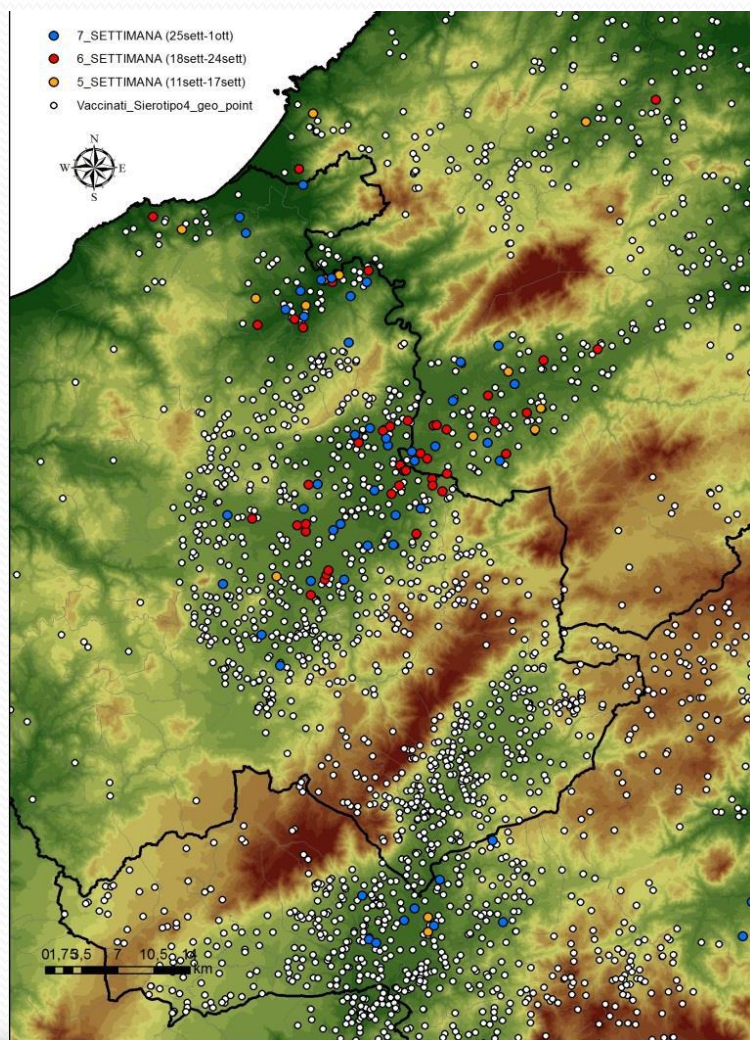
Stagione epidemica	N° focolai	Sierotipo coinvolto	Animali nei focolai	Morti/abbattuti
2000-2001	6.284	BTV ₂	1.360.614	260.856
2001-2002	6.093	BTV ₂	1.294.365	232.138
2002-2003	12	BTV ₂	2.120	9
2003-2004	3.708	BTV ₄ e BTV ₂	995.546	75.797
2004-2005	144	BTV ₂ ; BTV ₄ ; BTV ₁₆	33.656	710
2006-2007	237	BTV ₁	67.466	4.905
2007-2008	15	BTV ₁	4.537	608
2008-2009	43	BTV ₈	1.146 (bovini)	0
2012-2013	435	BTV ₁ e BTV ₄	147.148	11.393
2013-2014	5.765	BTV ₁	1.730.493	113.780
2014-2015	14	BTV ₁	4200	14
2015-2016	10	BTV ₁ -BTV ₄	3137	0
2016-2017	36	BTV ₁ -BTV ₄	6122	8
2017-2018	2727	BTV ₁ -BTV ₄	853.428	34.405
2018-2019	48	BTV ₁ -BTV ₃ -BTV ₄	11.082	140
TOTALE	25.571	BTV 1, 2, 3, 4, 8, 16	6.513.914	734.763



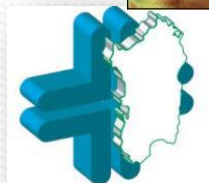
2017



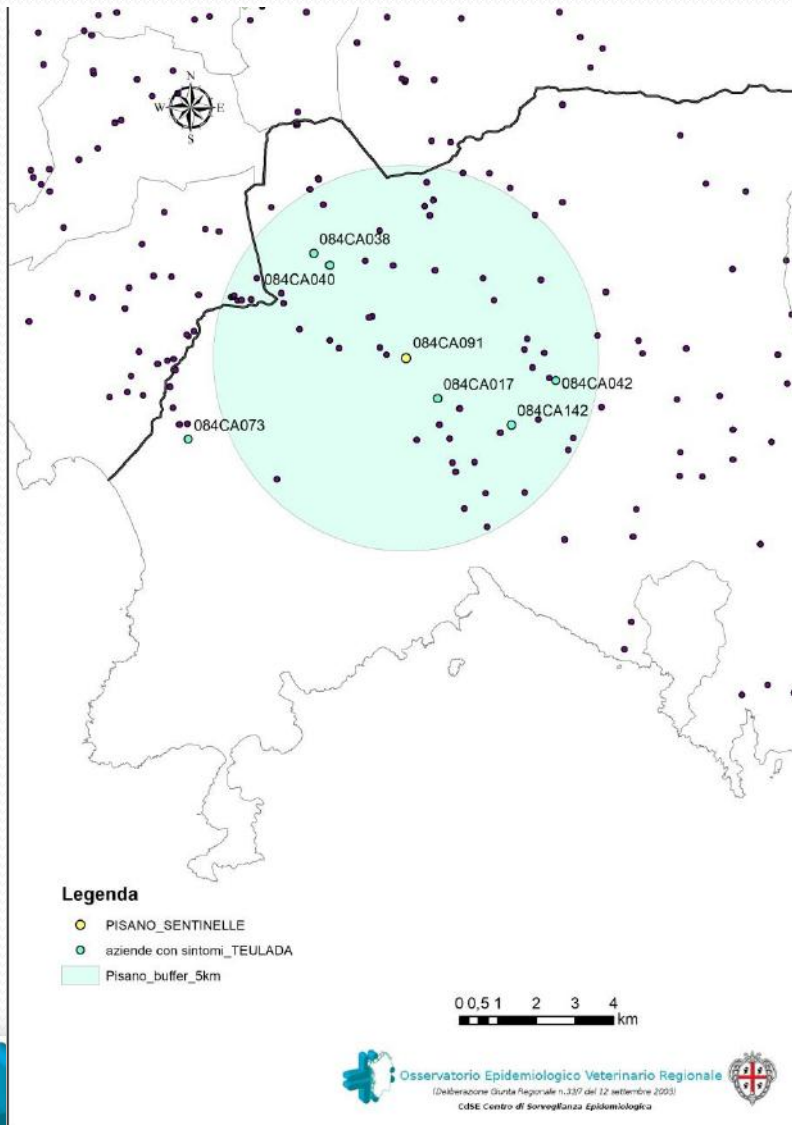




2500 focolai
 123000 casi
 35000 decessi



2018



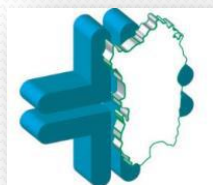
Prelievo 19/09
Esito 25/09

1 sentinella su 9 Elisa +
4 sentinelle su 9 PCR +

Sopralluogo 4/10/2018



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INDAGINE ENTOMOLOGICA

Azienda Marroccu (084 CA 073)

C. imicola 33; *C. newsteadi* 8; *C. circumscriptus* 6; *Obsoletus gr.* 3; *C. paolae* 2; *C. cataneii* 1; *C. jumeri* 1; *C. puncticollis* 1; altri insetti non *Culicoides* 536; Totale *Culicoides* 55; Totale insetti 591

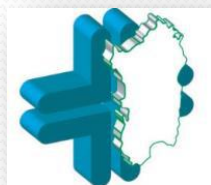
Azienda Pisanu (084 CA 091)

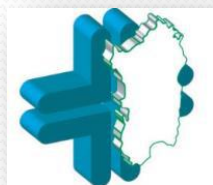
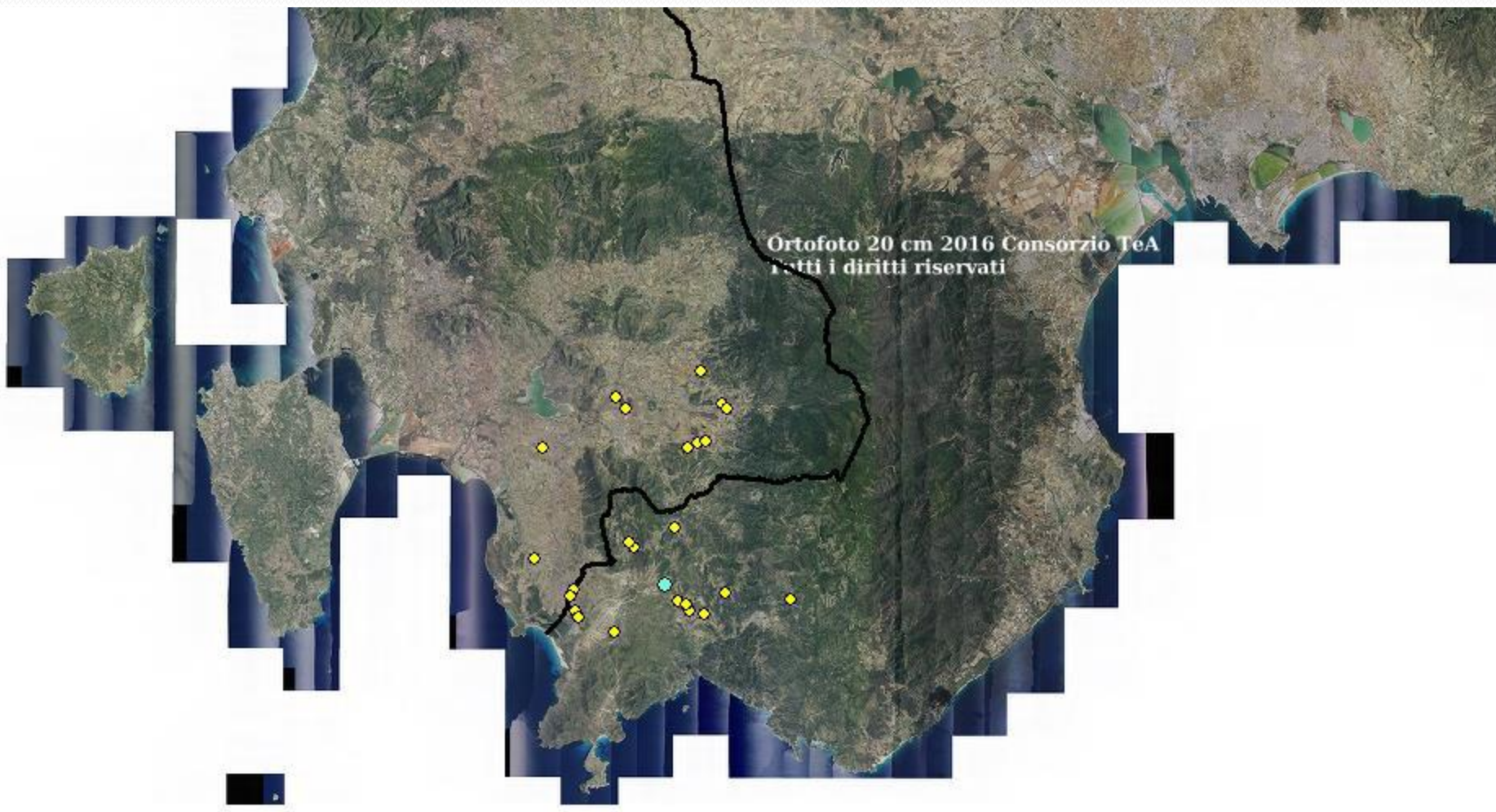
C. imicola 1224; *C. newsteadi* 99; *C. pulicaris* 27; *C. circumscriptus* 12; *Obsoletus gr.* 24; *C. cataneii* 15; *C. jumeri* 6; *C. maritimus* 15; altri insetti non *Culicoides* 1242; Totale *Culicoides* 1422; Totale insetti 2664

Sono stati costituiti 15 pool per *C. imicola*, 2 pool per *C. newsteadi*, 3 pool per *Obsoletus gr.*, 2 pool per *C. circumscriptus*, 1 pool per *C. pulicaris* e 1 pool per *C. jumeri* per la ricerca del virus.

Tutti PCR pos 084ca091
2 POOL PCR neg 084ca073

CESME: positivi SBT 3 pool 084CA091

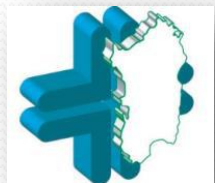




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DA DOVE È ARRIVATO E QUANDO?

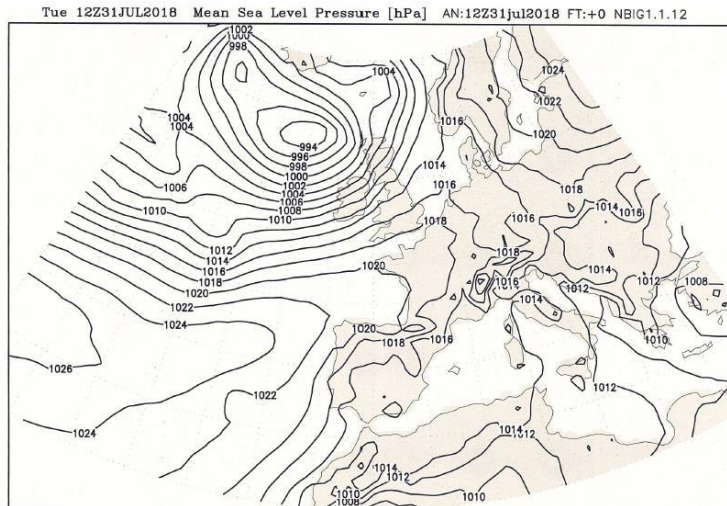
- ✓ CONDIZIONI IMMUNITARIE FAVOREVOLI
 - ✓ CONDIZIONI CLIMATICHE FAVOREVOLI
 - ✓ CONDIZIONI VETTORIALI FAVOREVOLI
- } Mappa



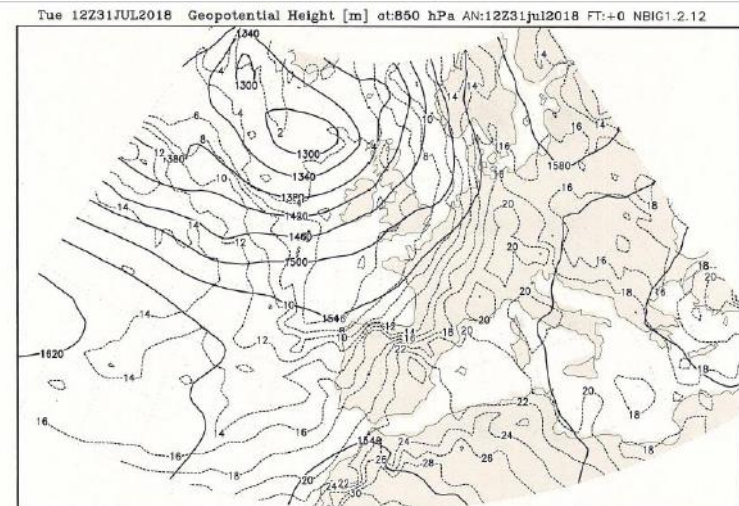
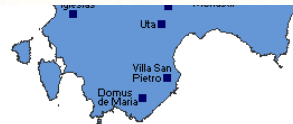
DA DOVE.....SardegnaArpa



DIPARTIMENTO METEOCLIMATICO



Overplot: 10 m Wind [m s⁻¹] AN:12Z31jul2018 FT:+0 NBIG1.1.12

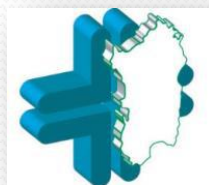


T-Aria
Umidità
Vento

Overplot: Temperature [C] ot:850 hPa AN:12Z31jul2018 FT:+0 NBIG1.2.12

T-Aria media
ore con calma di vento [ore]. **Diurno:** intensità media diurna [m/s]. **Notturno:** intensità media notturna [m/s]. **Sfilato:** vento sfilato giornaliero [km/giorno].
ND: dato non disponibile.
Nota: gli orari sono GMT (Greenwich Mean Time).

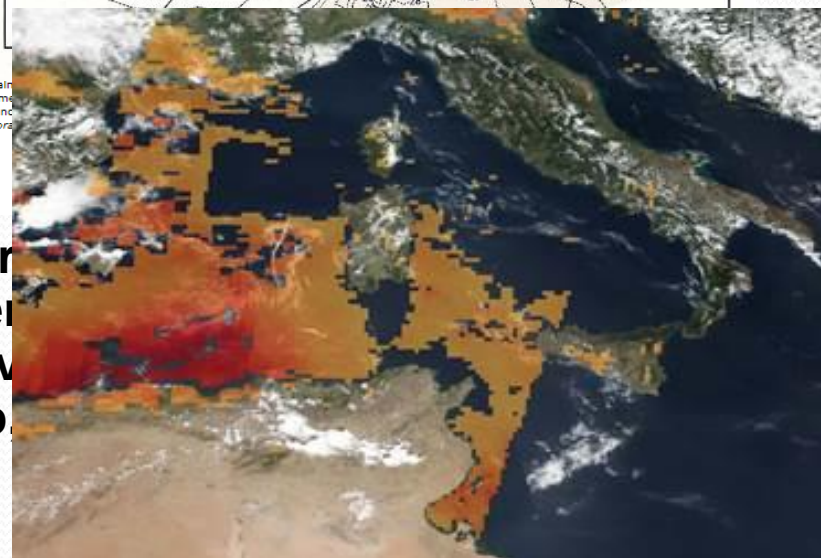
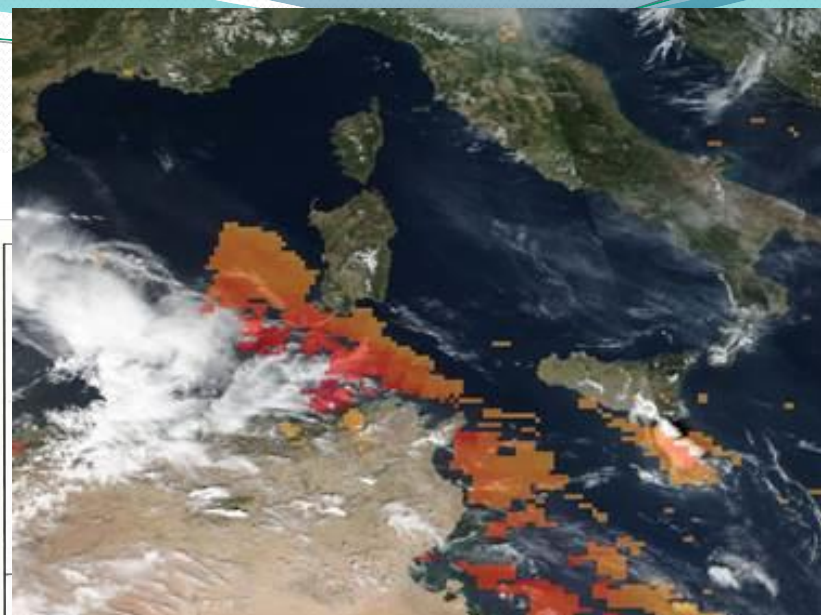
Assenza di spostamenti di grosse masse d'aria e di fenomeni meteorologici o di ventosità che possano aver in qualche modo coadiuvato il vettore nella migrazione a Giugno, Luglio, Agosto.



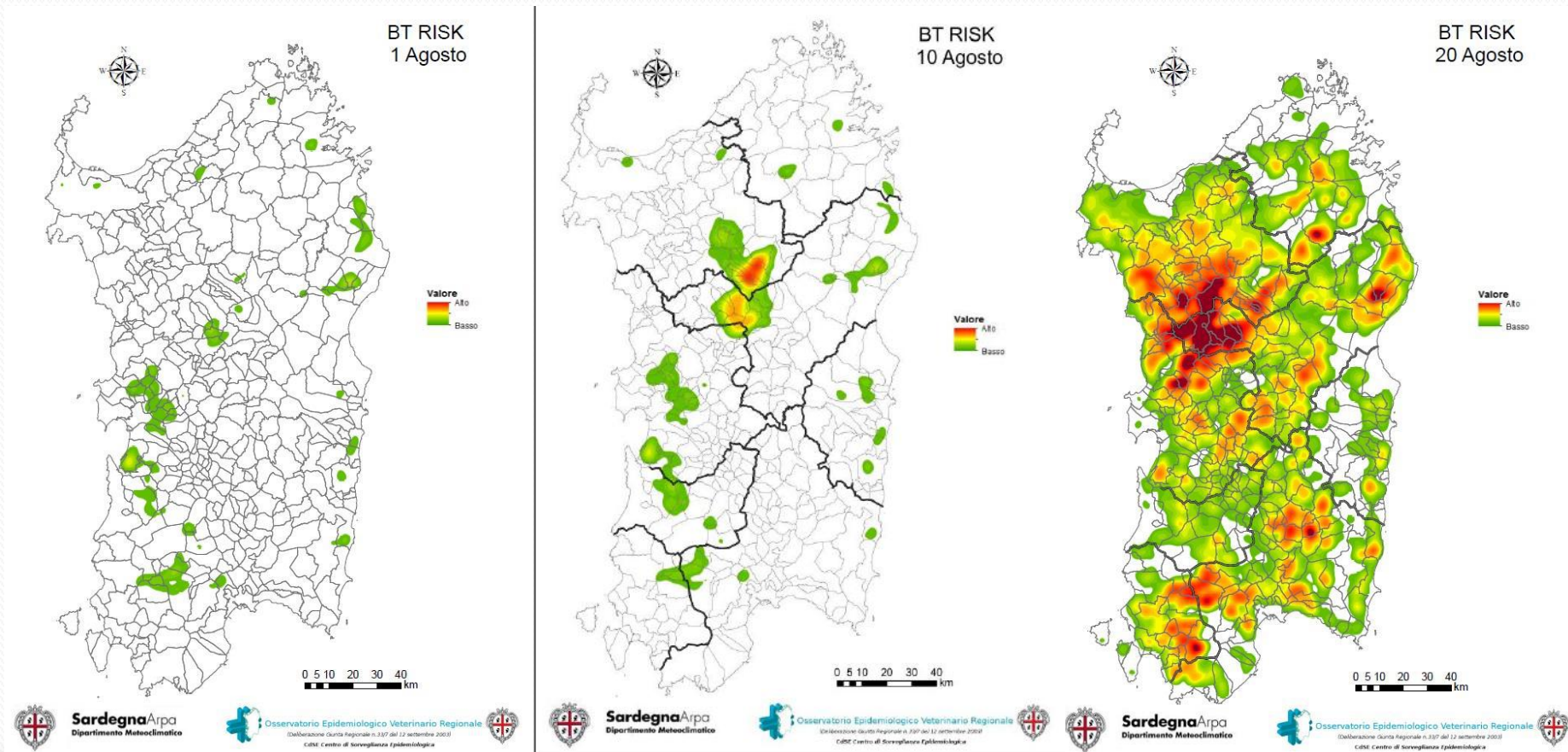


T-Aria
media
ore con calm
intensità me
ND: dato no
Nota: gli ora

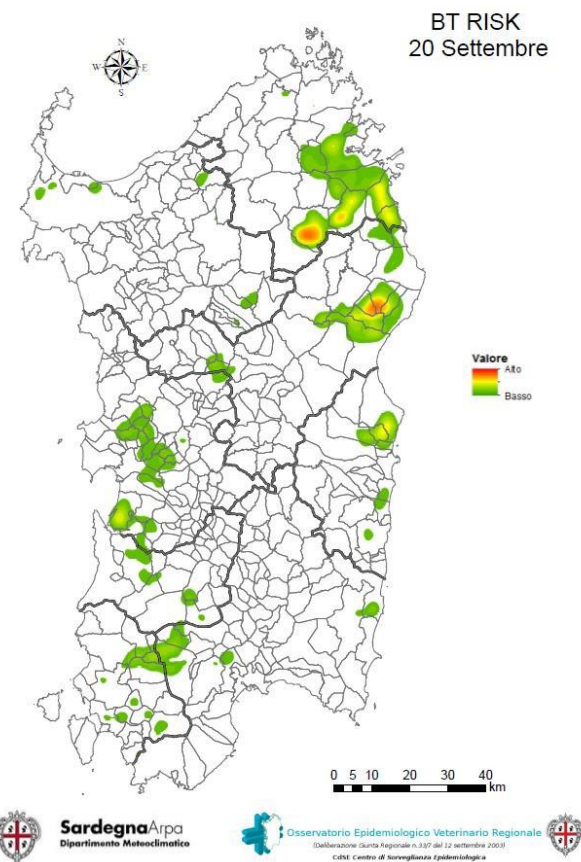
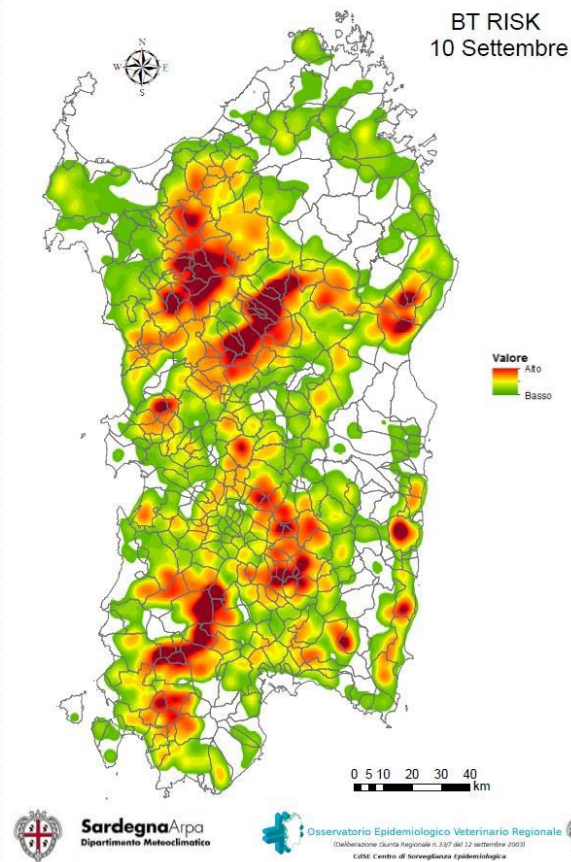
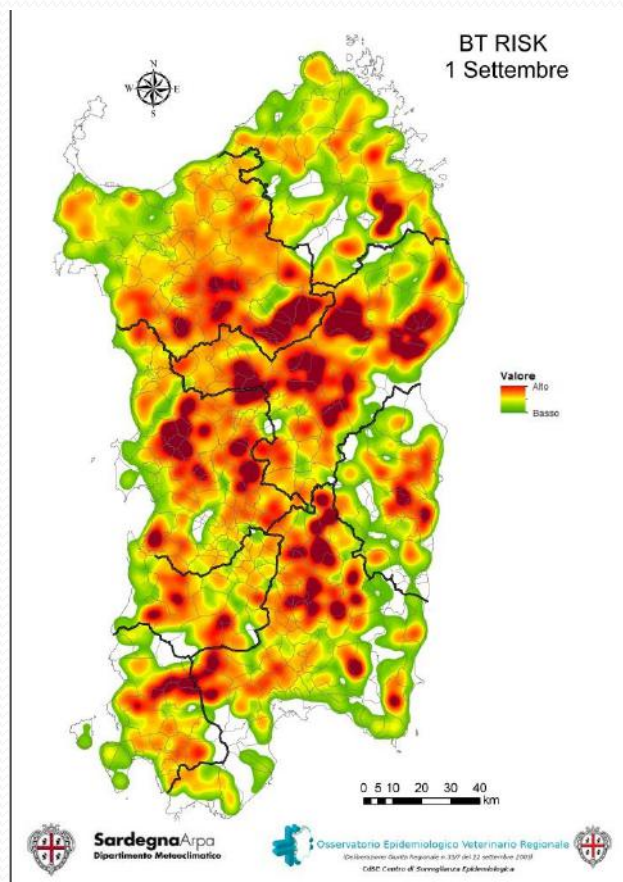
di gr
di ver
to il v
uglio

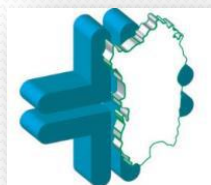
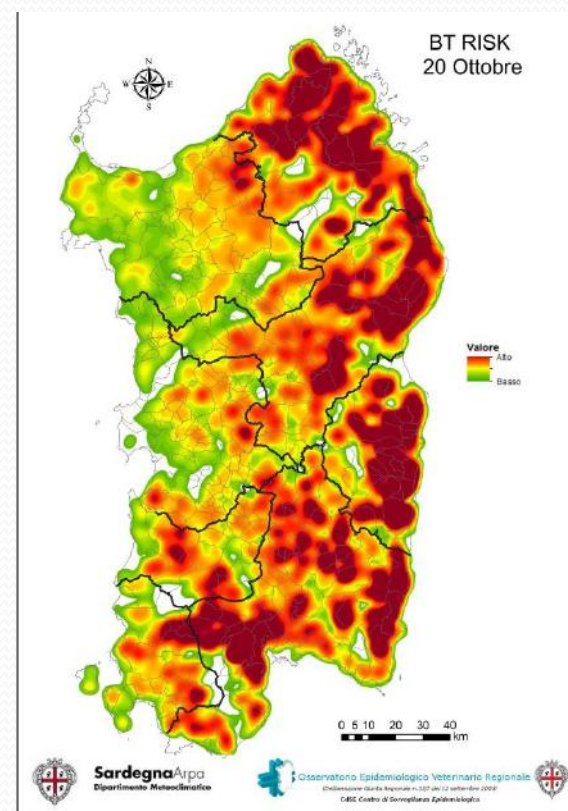
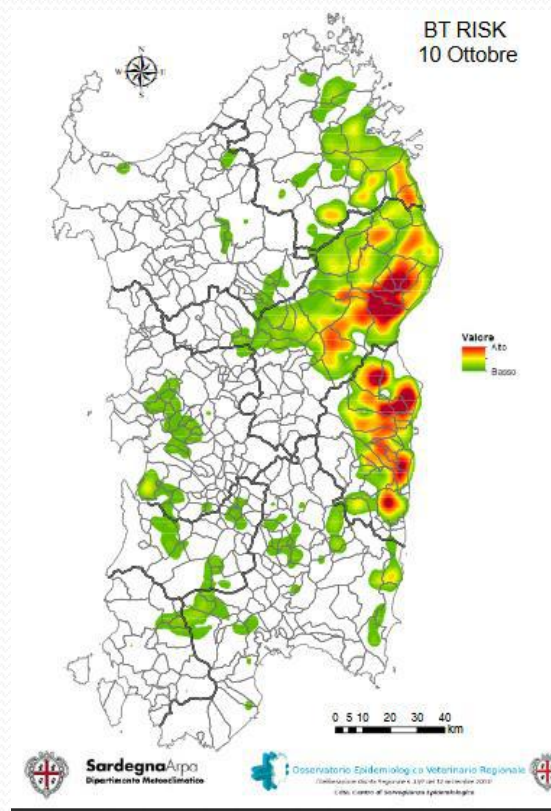
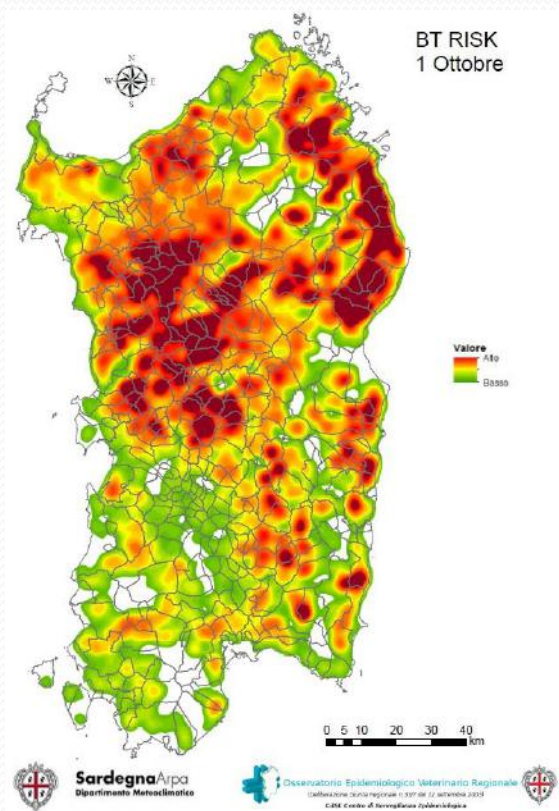


.....E QUANDO?



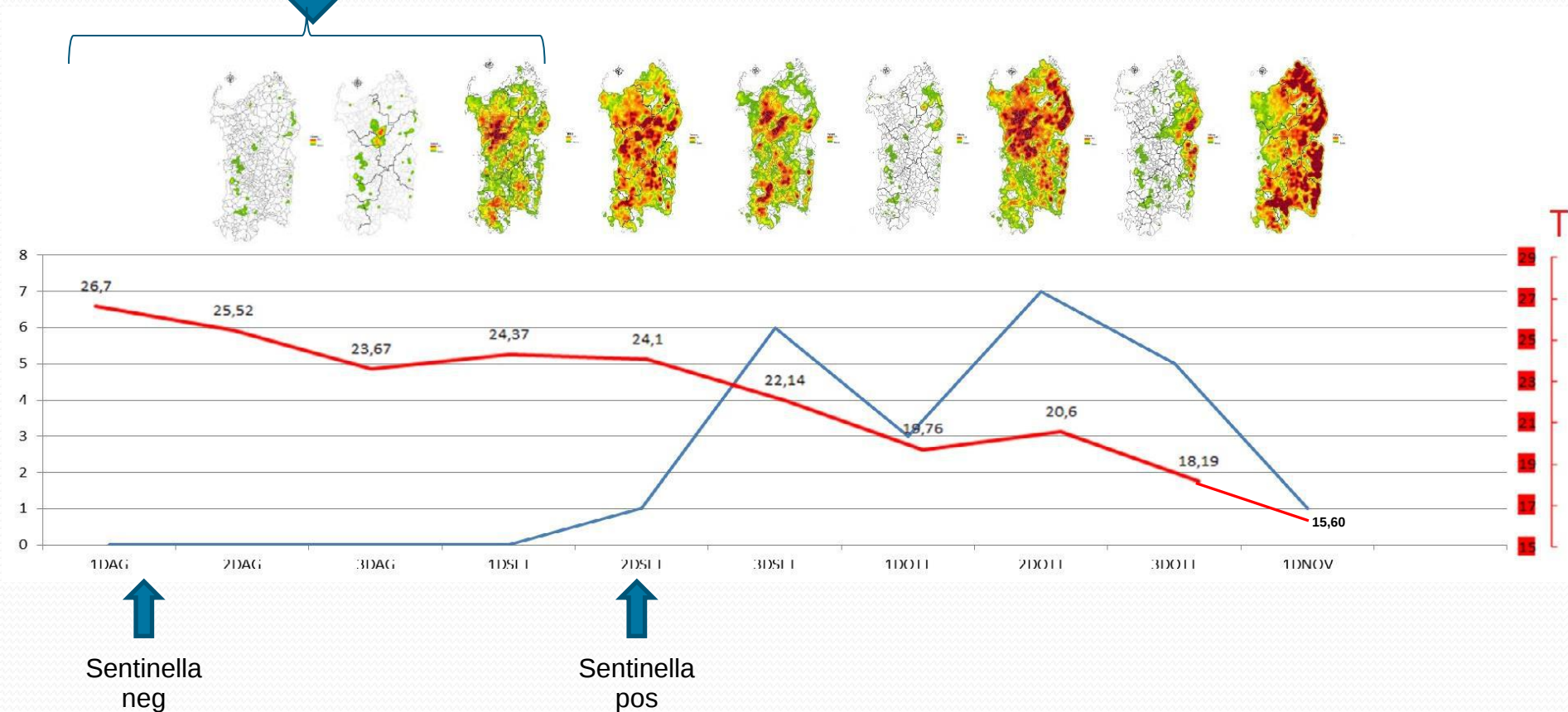
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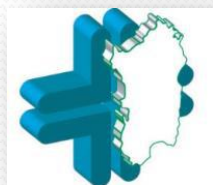
ARRIVO VIRUS?

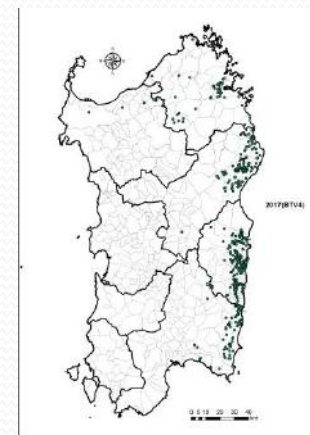
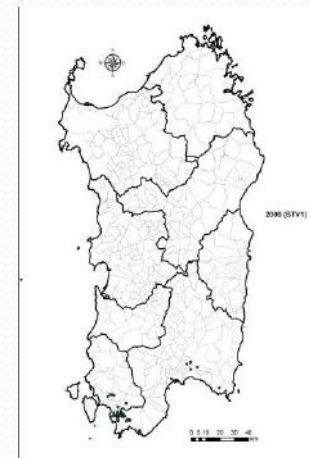
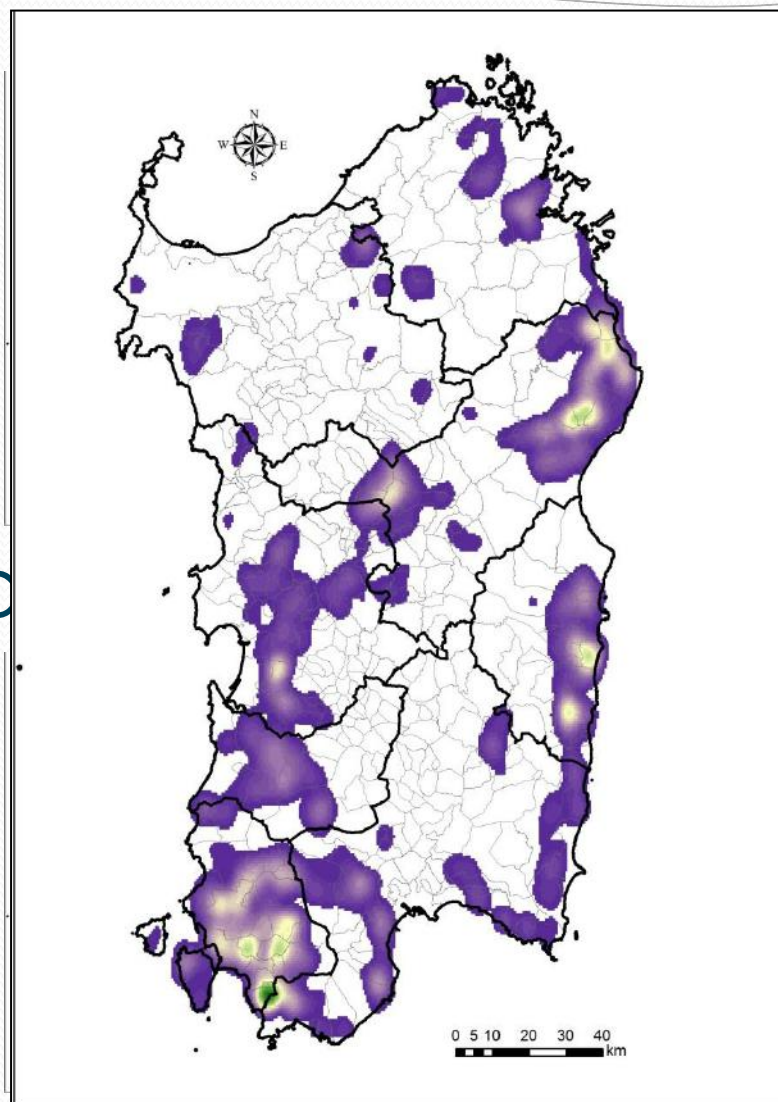
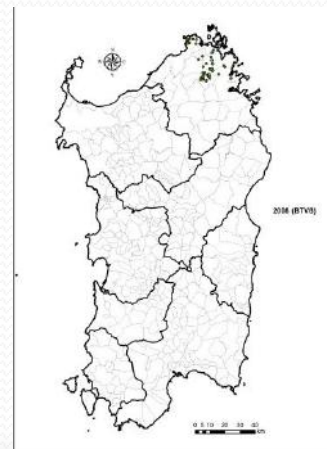
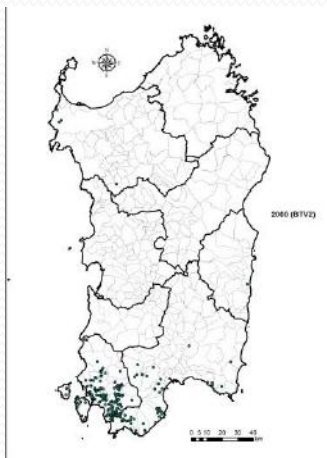
BTV 3



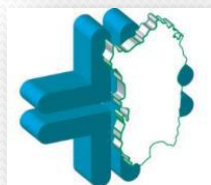
SEGNALAZIONI DI SINTOMI NEI PRIMI GIORNI DI AGOSTO

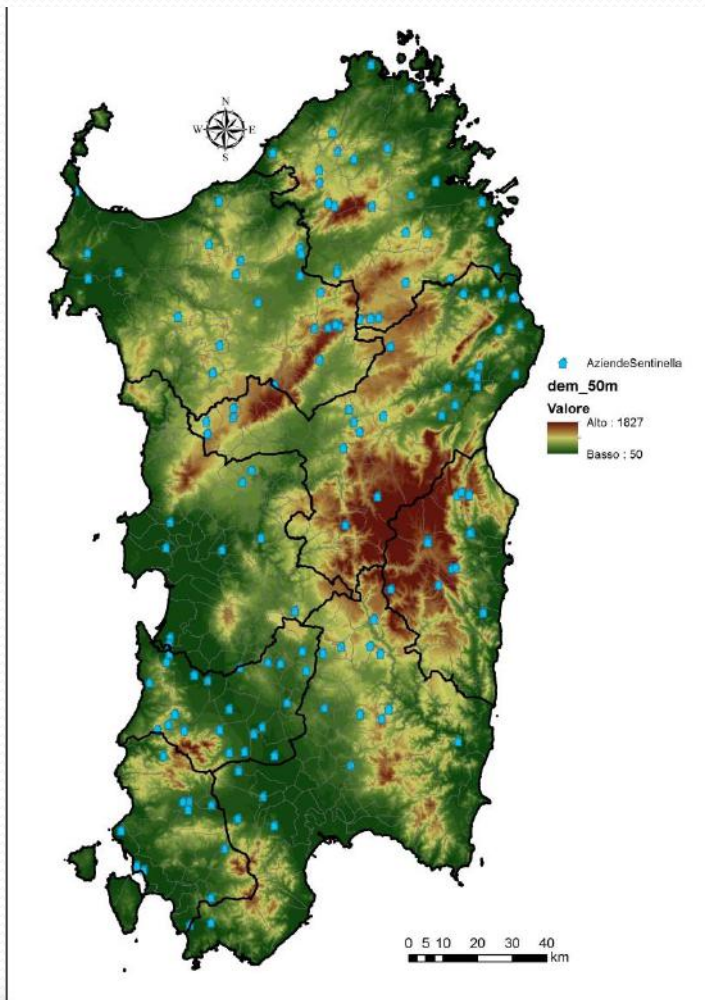
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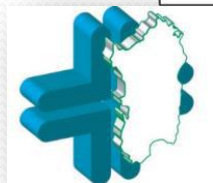


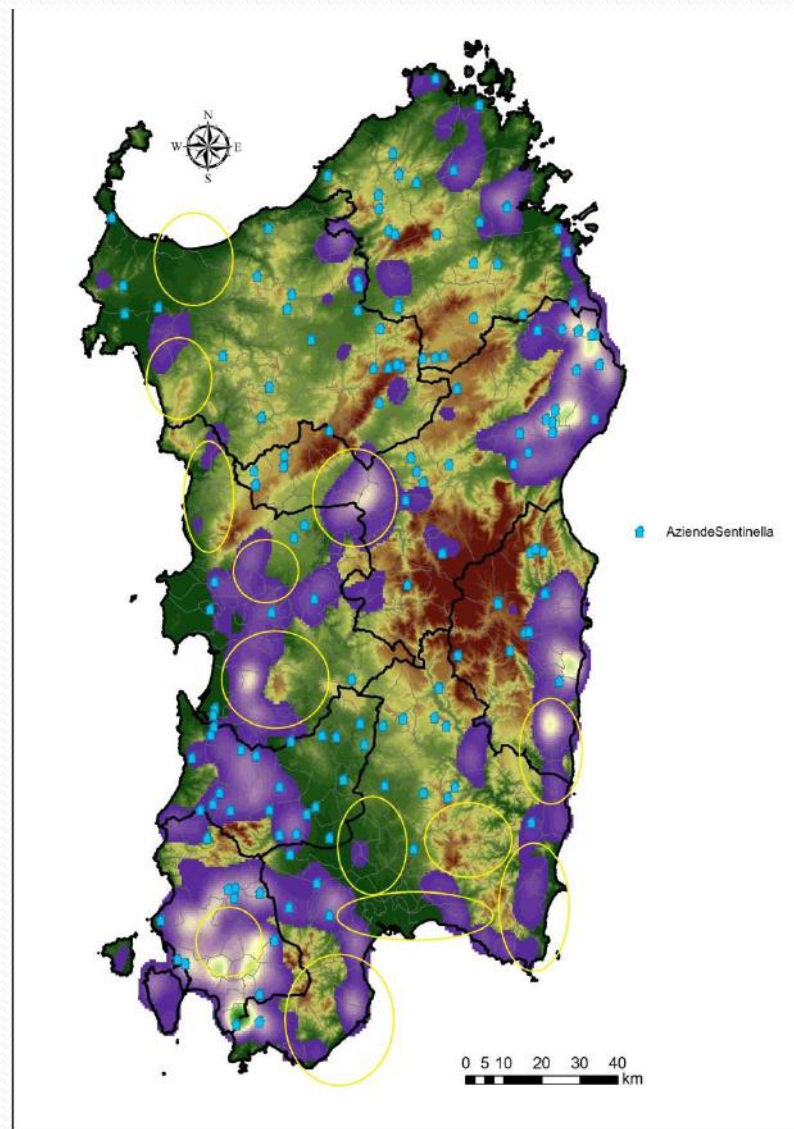
Da ... anni)



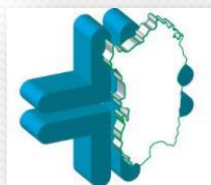


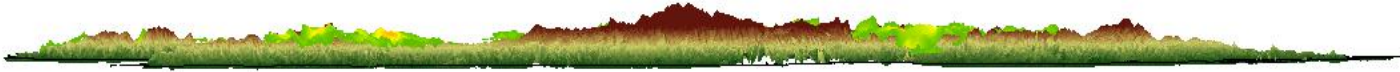
Focolai s.l.m	entro 700 m	98,4 %
Focolai s.l.m	entro 500 m	96,9 %
Focolai s.l.m	entro 250 m	81 %



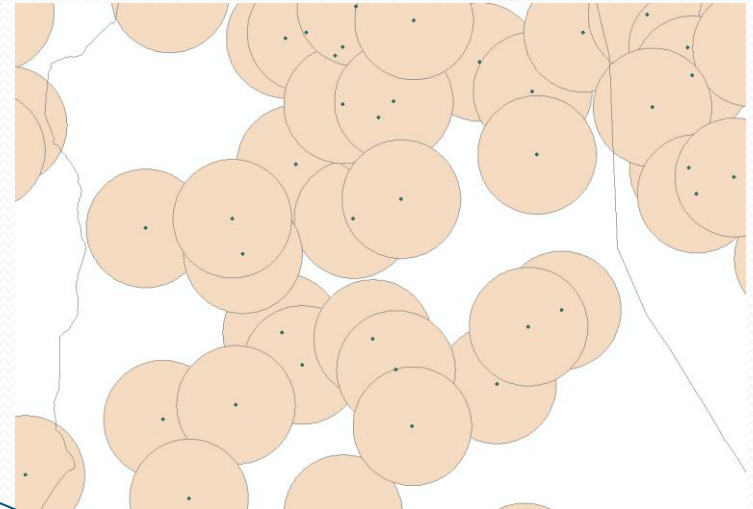
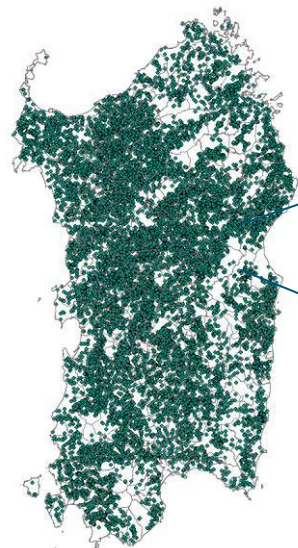


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Analisi retrospettiva dei fattori di rischio,
basata sui dati riguardanti TUTTE le aziende ovi-caprine presenti in Sardegna, negli anni in studio.
(dati estratti da **SIMAN**, **BDN**, **VETINFO**, **ARPAS**)



SAMPLE SIZE:

12.277 aziende osservate per 3 anni e analizzate in base all'evento di
focolaio BT (OB) o al non evento (NOB)

PERIODO DI STUDIO: Gennaio 2013 – Dicembre 2015



Retrospective analysis of Bluetongue farm risk profile definition, based on biology, farm management practices and climatic data

Stefano Cappai^a, Federica Loi^{a,*}, Annamaria Coccollone^a, Marino Contu^b, Paolo Capece^c, Michele Fiori^c, Simona Canu^c, Cipriano Foxi^d, Sandro Rolesti^a

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^c ARPAS, Agenzia Regionale per la Protezione dell'Ambiente della Sardegna, Dipartimento Meteorologico, V.le Porto Torres 119, 07100, Sassari, SS, Italy

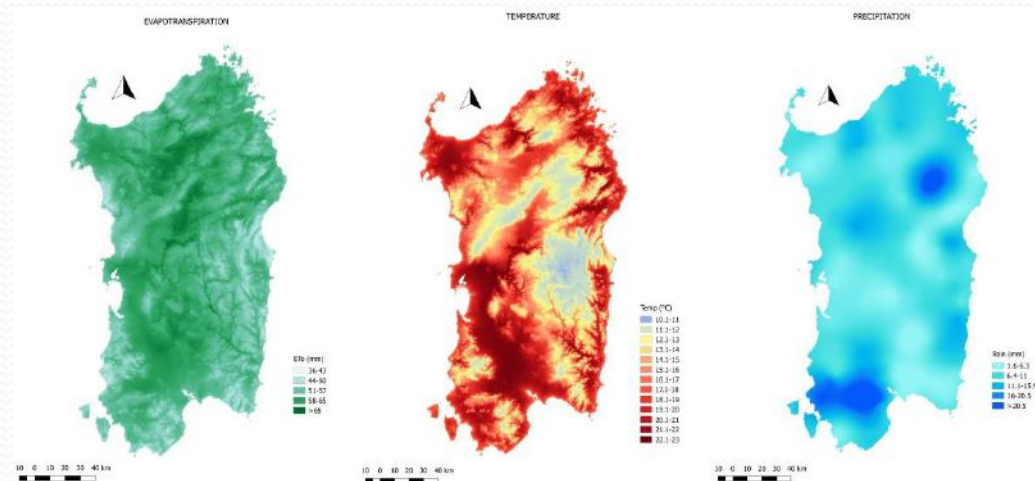
^d Istituto Zooprofilattico Sperimentale della Sardegna "G. Pegreffi" – Laboratorio di Entomologia e controllo dei vettori, Via Vienna 2, 07100, Sassari, SS, Italy

ARTICLE INFO

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Risk analysis
Logistic multilevel mixed model
Livestock management
Risk map
Sardinia

ABSTRACT

Bluetongue (BT) is a vector-borne disease transmitted by species of *Culicoides* midges (Diptera: Ceratopogonidae). Many studies have contributed to clarifying various aspects of its aetiology, epidemiology and vector dynamic; however, BT remains a disease of epidemiological and economic importance that affects ruminants worldwide. Since 2000, the Sardinia region has been the most affected area of the Mediterranean basin. The region is characterised by wide pastoral areas for sheep and represents the most likely candidate region for the study of Bluetongue virus (BTV) distribution and prevalence in Italy. Furthermore, specific information on the farm level and epidemiological studies needs to be provided to increase the knowledge on the disease's spread and to provide valid mitigation strategies in Sardinia. This study conducted a punctual investigation into the spatial patterns of BTV transmission to define a risk profile for all Sardinian farms by using a logistic multilevel mixed model that take into account agro-meteorological aspects, as well as farm characteristics and management. Data about animal density (i.e. sheep, goats and cattle), vaccination, previous outbreaks, altitude, land use, rainfall, evapotranspiration, water surface, and farm management practices (i.e. use of repellents, treatment against insect vectors, storage of animals in shelter overnight, cleaning, presence of mud and manure) were collected for 12,277 farms for the years 2011–2015. The logistic multilevel mixed model showed the fundamental role of climatic factors in disease development and the protective role of good management, vaccination, outbreak in the previous year and altitude. Regional BTV risk maps were developed, based on the predictor values of logistic model results, and updated every 10 days. These maps were used to identify, 20 days in advance, the areas at highest risk. The risk farm profile, as defined by the model, would provide specific information about the role of each factor for all Sardinian institutions involved in devising BT prevention and control strategies.



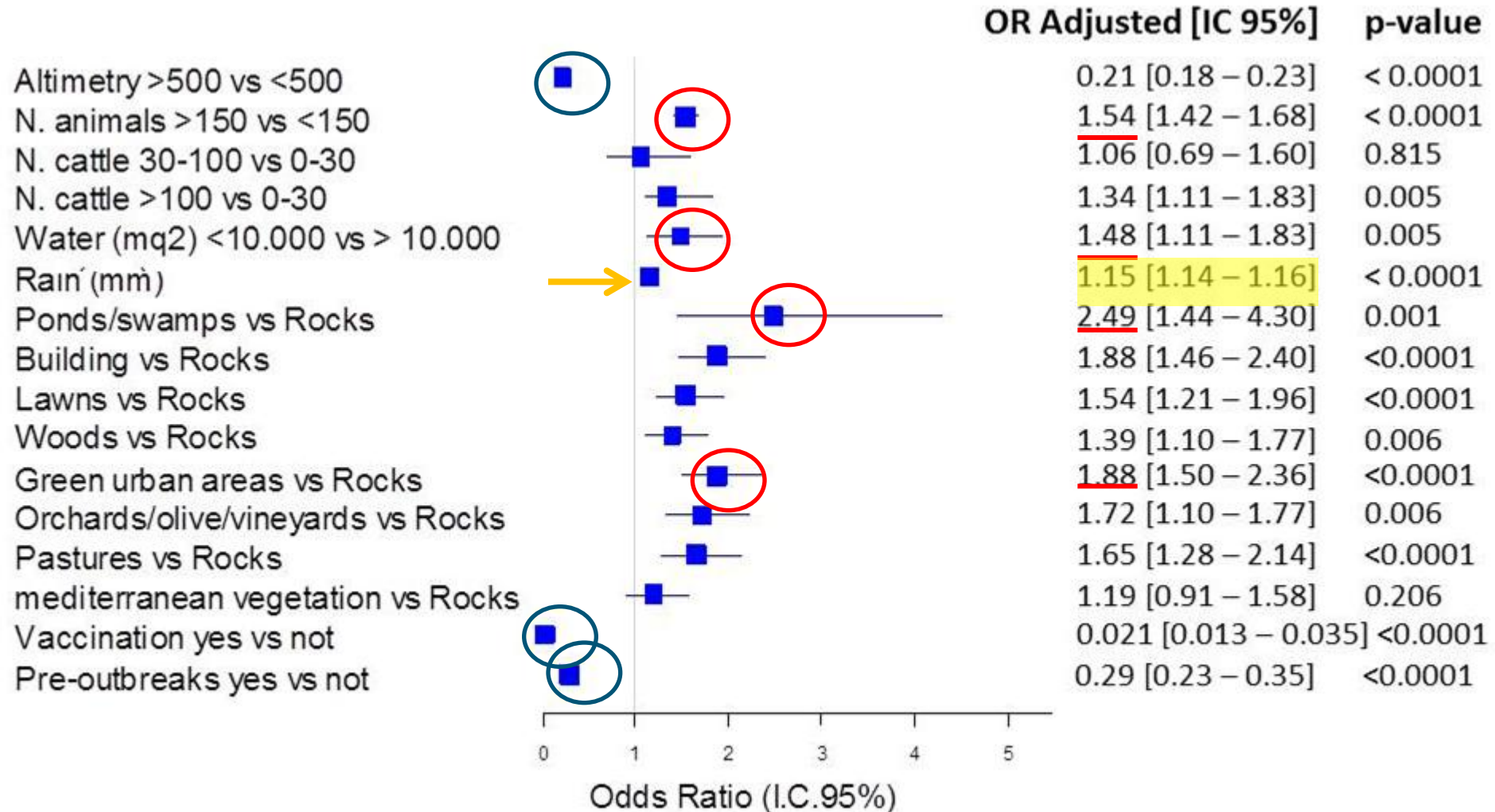
S. Cappai et al.

Table 3

Results of multilevel logistic mixed model produced by using 2011–2015 data from 12,277 farms in Sardinia (Italy). The data include the adjusted odds ratios (OR_{adj}), 95% confidence intervals [IC 95%] and p-values.

	OR Adjusted [95% IC]	p-value
Number of animals (by 10 animals)	1.033 [1.021 – 1.041]	< 0.0001
Number of cattles (by 10 animals)	1.008 [1.006 – 1.010]	< 0.0001
Vaccination		
Yes	0.076 [0.065 – 0.089]	0.001
Not	Ref.	
Outbreaks previous year		
Yes	0.379 [0.252 – 0.581]	< 0.0001
Not	Ref.	
Water (by 1000 m²)	1.378 [1.170 – 1.622]	< 0.0001
Altitude (by 150 MASL)	0.519 [0.455 – 0.563]	< 0.0001
Land type		
pond, marshes	1.812 [1.113 – 2.947]	0.018
building	0.806 [0.687 – 0.943]	0.008
rock, scrubland	0.561 [0.446 – 0.719]	< 0.0001
wood	0.685 [0.592 – 0.785]	< 0.0001
planted and green area	1.189 [1.066 – 1.314]	0.003
olive-grove, vineyard	1.201 [1.035 – 1.396]	0.017
pasture	1.438 [1.149 – 1.833]	0.005
mediterranean vegetation	0.702 [0.583 – 0.859]	< 0.0001
meadow	Ref.	
Storage of animals in shelter overnight		
Yes	0.752 [0.642 – 0.881]	< 0.0001
Not	Ref.	
Presence of mud and manure		
Yes	2.491 [1.443 – 4.305]	< 0.0001
Not		
Turnover of the ground		
Yes	0.071 [0.061 – 0.086]	< 0.0001
Not	Ref.	
Use of repellents		
Yes	0.628 [0.535 – 0.739]	< 0.0001
Not		
Rain 2 A decade prev. (millimetres)	1.021 [1.009 – 1.068]	0.001
Rain 3 A decade prev. (millimetres)	1.038 [1.010 – 1.068]	0.008
ET₀ (mm)	0.873 [0.852 – 0.907]	< 0.0001
Temperature (°C)	1.283 [1.223–1.308]	< 0.0001
Altimetry x ET₀	1.003 [1.002 – 1.005]	< 0.0001
Temperature x ET₀	1.025 [1.021 – 1.033]	< 0.0001

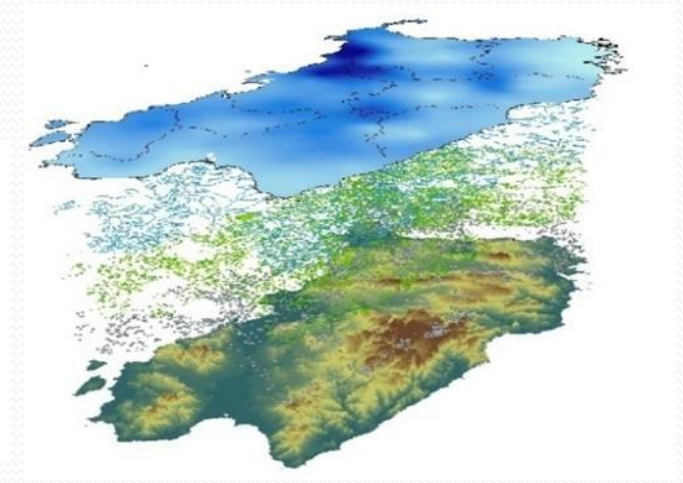
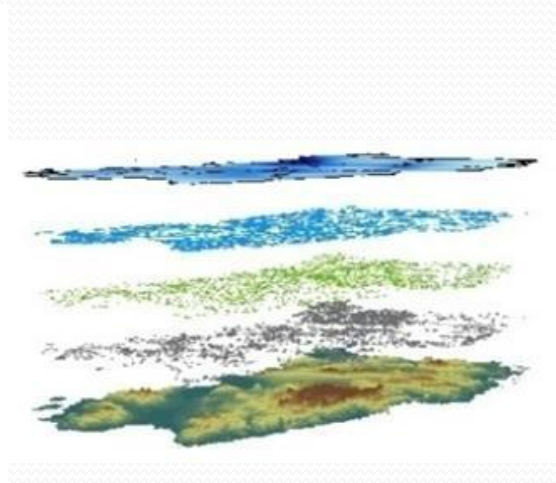
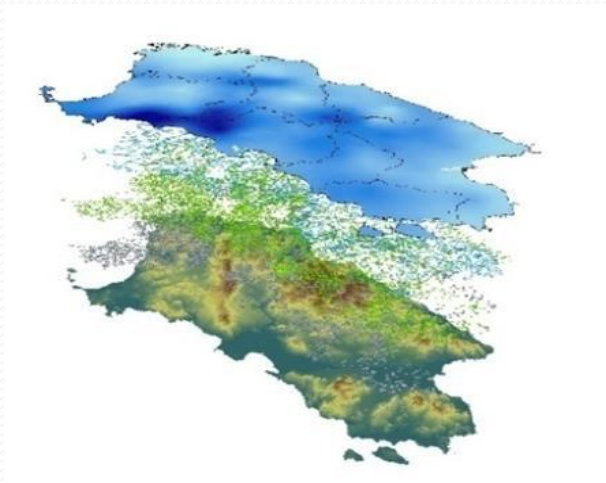
RANDOM LOGISTIC MODEL RESULTS



Model is adjusted for rain 40 and 10 days before outbreaks and two random effects (by farm and year).

3. PREDICTORS CALCULATION, by farm:
in order to obtain a risk values for each farm and use these
values to perform risk maps.

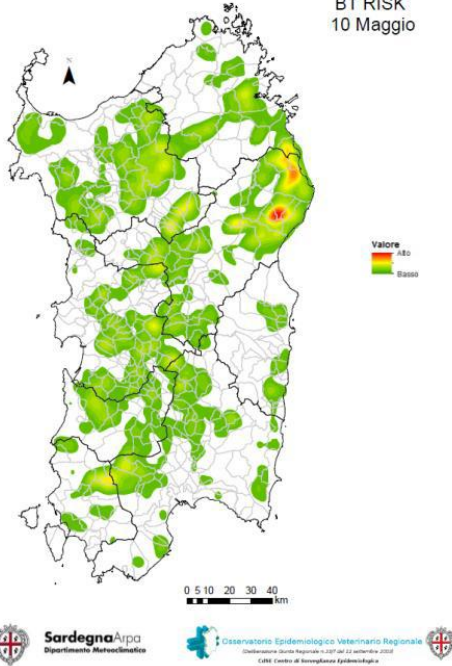
$$\hat{p} = \frac{1}{1 - e^{(\beta_0 + \beta_1 x_1 + \dots + \beta_8 x_8)}}$$



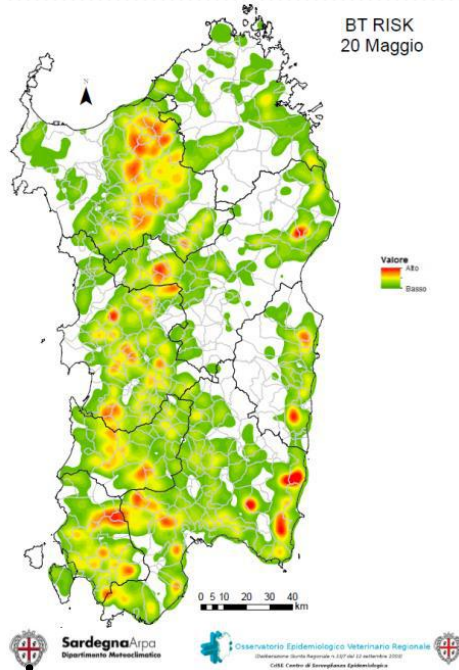
RISK MAPS by predictors

No point in the map is free from risk,
our risk scale (red to green) is reffers
to high risk level

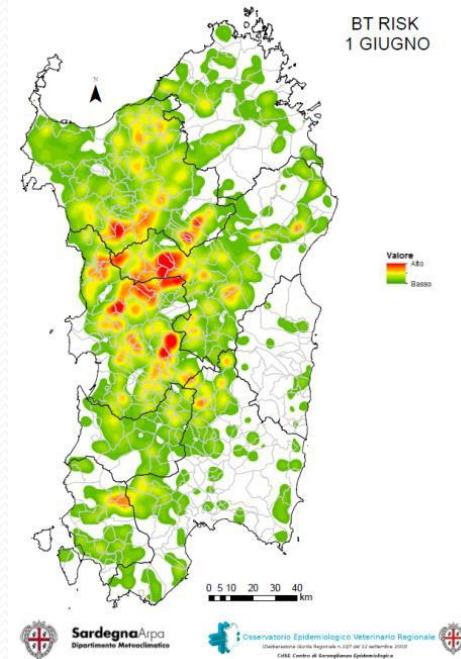
BT RISK
10 Maggio



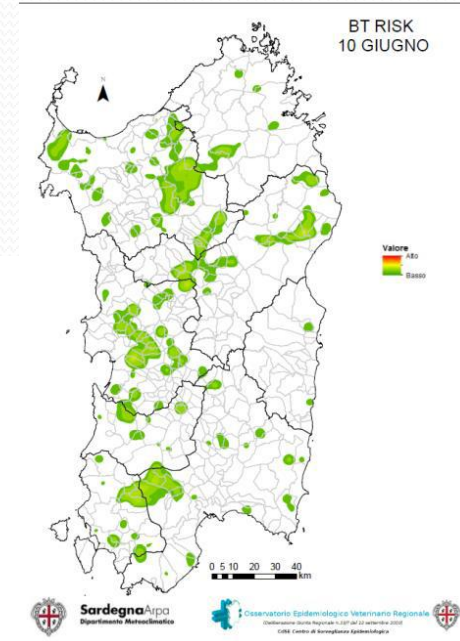
BT RISK
20 Maggio



BT RISK
1 GIUGNO



BT RISK
10 GIUGNO



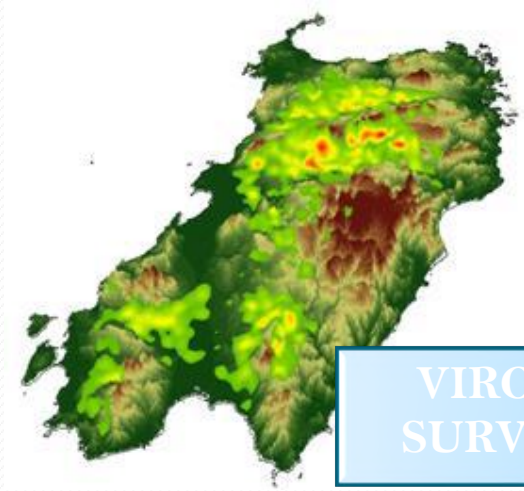
Maps are performed
every 10 days, with rains
data updated and other
dynamic variables
(e.i. animal density,
vaccination).

Maps are available at:

http://www.izs-sardegna.it/oev_rischioBT.cfm

<http://www.sar.sardegna.it/servizi/agro/bollettinolinguaabu.asp>

SIEROLOGICAL SURVELLIANCE



VIROLOGICAL
SURVELLIANCE

Official Confirmation

after 10 days (80%)
after 30, 40, 60 days

Surveillance
sample



ANTIBODY
detection

7-14gg p.i <> Long-times

Sheep
infected



V I R E M I A 6 - 24 gg

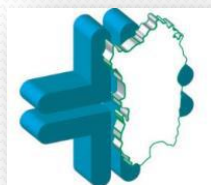
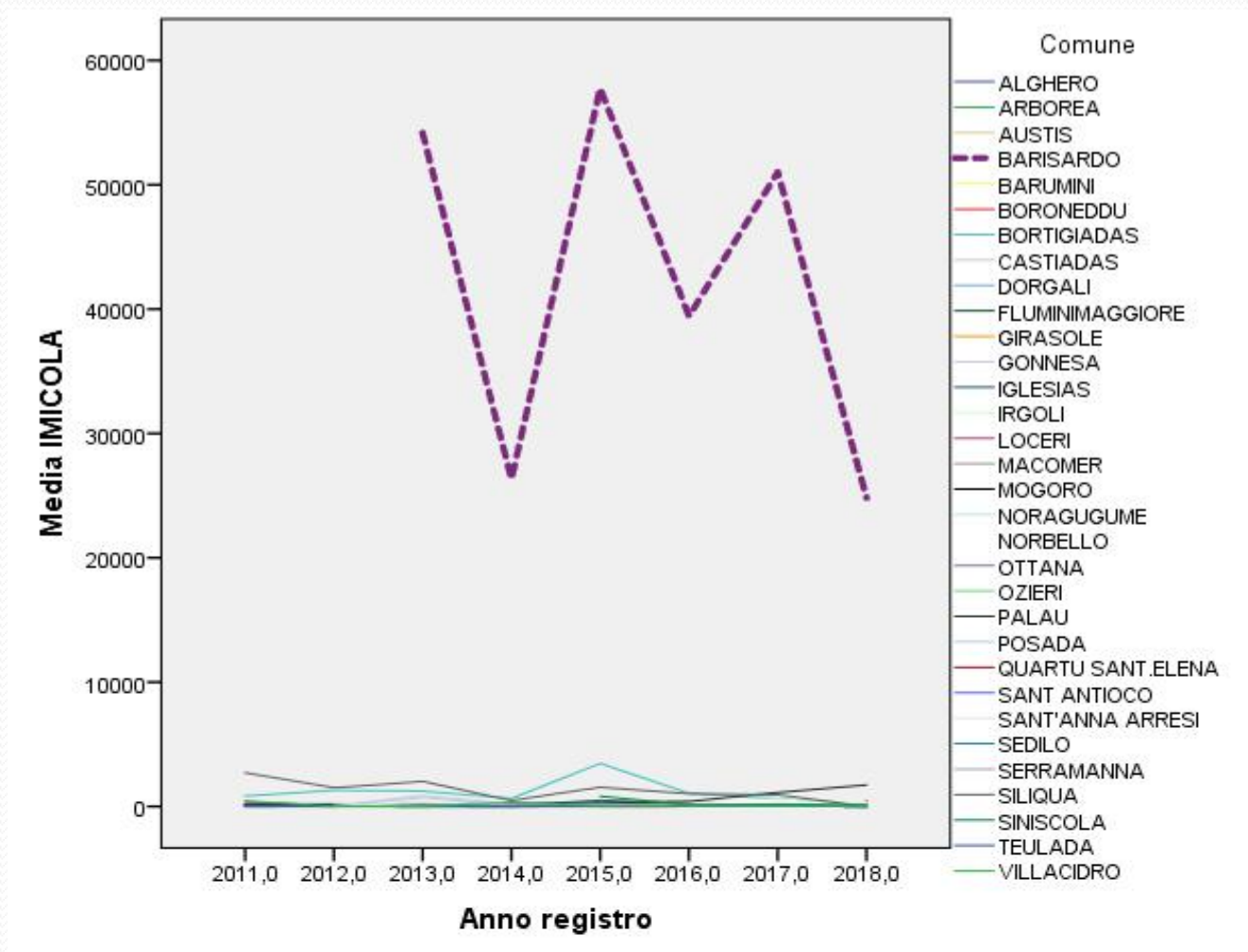
EGGS



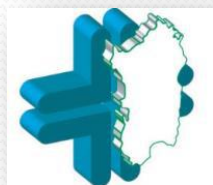
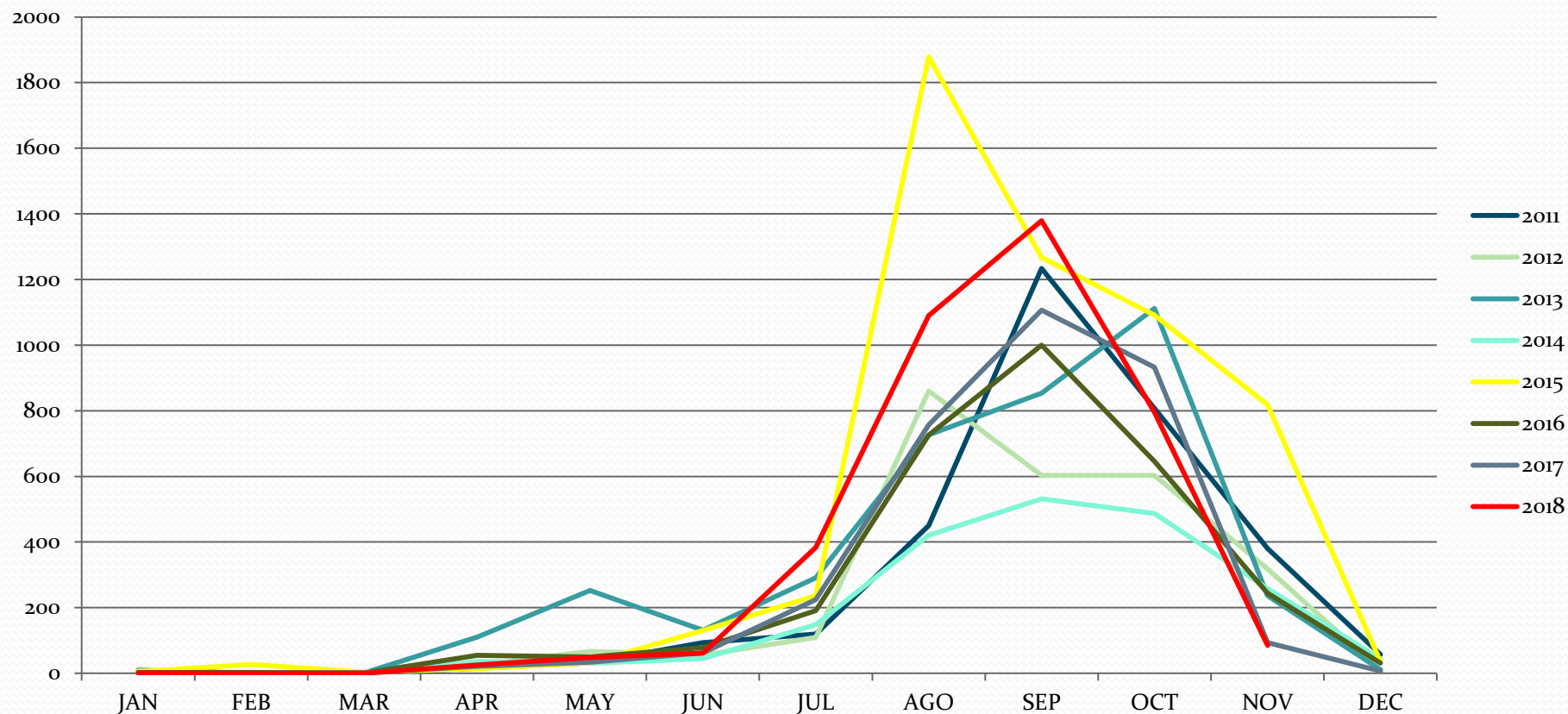
7-25gg



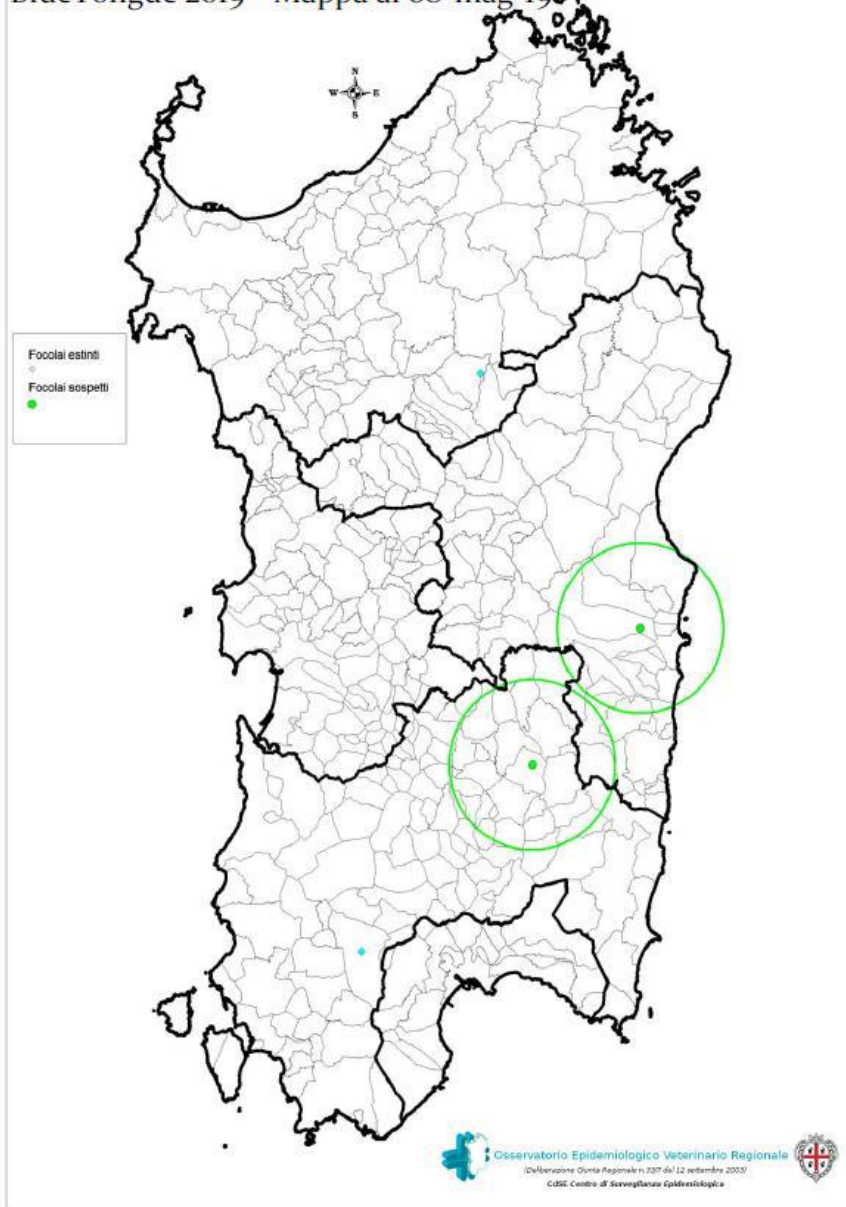
IMICOLA - ANNO



IMICOLA/MESE (SENZA BARISARDO)



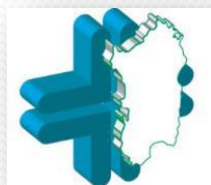
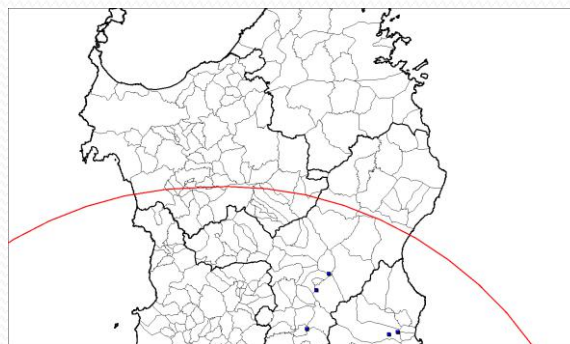
BlueTongue 2019 - Mappa al 08-mag-19



Istituto Zooprofilattico Sperimentale della Sardegna "G. Pegreffi"
Centro di Sorveglianza Epidemiologica

Misure di sorveglianza e contenimento

- Ricerca
- Vaccinazione 2019
- Collaborazione
- Rapidità (decisionale e di intervento)

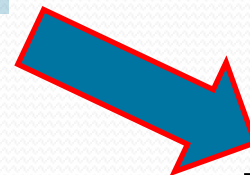


Protocollo Vaccinazione 2019

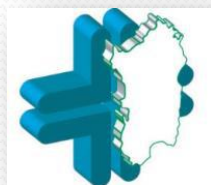
BTV 3

600000 dosi

??
BTV2



- RIMONTE ovine BTV4
- Movimentazione BTV1 e BTV4



Protocollo Vaccinazione 2019

BTV 3

600000 dosi

??
BTV2

BTV TUN 2018



BTV-3



BTV-2



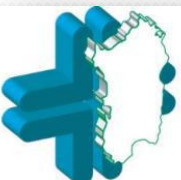
BTV-3 outbreak

- ✓ 5 in Nabeul
- ✓ 20 Sousse
- ✓ 3 Zagouan
- ✓ 5 Mannouba

BTV-2 outbreak

- ✓ 47 in Sidi Bouzid
- ✓ 7 in Monastir
- ✓ 3 in Mahdia
- ✓ 2 in Kairouan (at least 150 outbreak)

- RIMONTE ovine BTV4
- Movimentazione BTV1 e BTV4



Elementi che incidono nel successo delle vaccinazioni

A. Densità popolazioni

- % di animali vaccinati (Bovini, Ovini, Caprini), + Selvatici

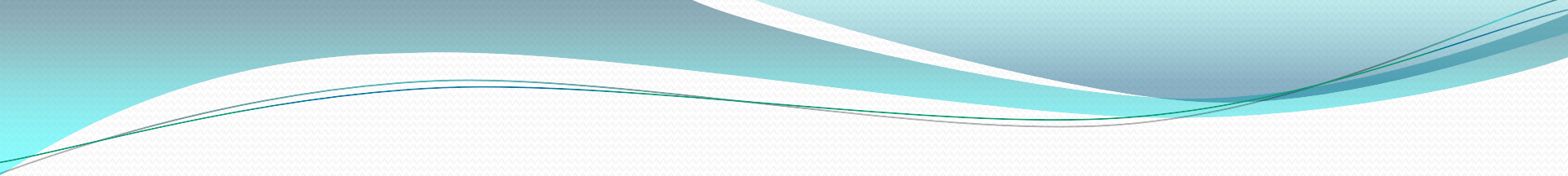
B. Densità insetti vettori

TIPO_VACCINO	NR_CAMPAGNA_VACCINAZIONE	1	2	4	8	2 4	2-4-16	1-2-4	1-8
vivo attenuato	2002								
vivo attenuato	2003		3836228				824		
vivo attenuato	2004					17462,00	1066325		
inattivato	2005		67454			23817,00			
vivo attenuato	2005		21271	46993		22278,00	109		
inattivato	2006		29178	29013		90728,00			
vivo attenuato	2006		10826	12554		23368,00			
inattivato	2007		5071	5071		170748,00			
vivo attenuato	2007	1184540	814	677		22077,00		7487	
inattivato	2008					248250,00			
vivo attenuato	2008	187256							
inattivato	2009	34162			113399	173603,00			
vivo attenuato	2009	108971							
inattivato	2010					186185,00			58906
inattivato	2011					49657,00			36645
inattivato	2012					66246,00			46323
inattivato	2013								229863
vivo attenuato	2013								165
inattivato	2014	1854072							1658411

Epidemia	Numero di focolai	Sierotipo	Capi presenti nei focolai	Capi morti e/o abbattuti
2000-2001	6.284	BTV ₂	1.360.614	260.856
2001-2002	6.093	BTV ₂	1.294.365	232.138
2002-2003	12	BTV ₂	2.120	9
2003-2004	3.708	BTV ₄ e BTV ₂	995.546	75.797
2004-2005	144	BTV ₂ ; BTV ₄ ; BTV ₁₆	33.656	710
2006-2007	237	BTV ₁	67.466	4.905
2007-2008	15	BTV ₁	4.537	608
2008-2009	43	BTV ₈	1.146 (bovini)	0
2012-2013	435	BTV ₁ e BTV ₄	147.148	11.393
2013-2014	5.765	BTV ₁	1.730.493	113.780
2014-2015	14	BTV ₁	4200	14
2017-2018	2.526	BTV ₄	851.402	35.591

***A FINE ELABORAZIONE VENGONO PRODOTTI I SEGUENTI
REPORTS:***

- 1. BT ATTIVI**
- 2. BT ATTIVI RIEPILOGO**
- 3. BT SOSPETTI**
- 4. BT SOSPETTI RIEPILOGO**
- 5. BT SOSPETTI TOT**
- 6. BT TOT SARDEGNA**
- 7. MAPPA**



Grazie per l'attenzione