Sorveglianza e monitoraggio sanitario della fauna selvatica: quali priorità?

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Perché occuparsi della sanità della fauna selvatica

1. Wildlife species are **reservoir** or play a **relevant epidemiological role** for a zoonotic disease
2. Wildlife species are **reservoir** or play a **relevant epidemiological role** for an economically/socially important disease
3. **Pathogens** that are a potential **threat** for endangered species

Rabies

African Swine Fever

Distemper

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doi:10.4404/hystrix-25.1-10114

Commentary

Surveillance, monitoring and surveys of wildlife diseases: a public health and conservation approach

Vittorio Guberti[a,*], Laura Stancampiano[b], Nicola Ferrari[c]

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Società Italiana
di Ecopatologia della Fauna

Public health and veterinary services perspective:

- Definining the **epidemiological role** of
  - **Dead-end or incidental host:**
    - Low prevalence; cannot transmit to other hosts; may act as **sentinel**
  - **Carrier host:**
    - Variable prevalence; host with inapparent infection; can **transmit** to other hosts
  - **Maintenance host or Reservoir:**
    - Usually medium-high prevalence; host population allowing the pathogen to **persist** in a specific context, even in the absence of transmission from other host species

Wildlife species can play **different roles** in the **different context:**

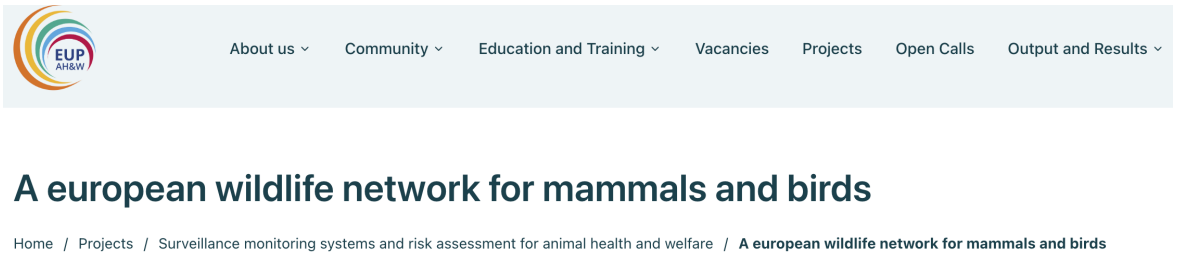
- How:
  - Determining the **Prevalence** (Abundance and Intensity)
  - …

Monitoraggio e sorveglianza

- Surveillance
  - **Systematic** ongoing collection, collation, and analysis of information related to (animal) health and the timely **dissemination** of information so that **action** can be taken
- Monitoraggio
  - (Systematic ongoing) collection, … and analysis of information related to (animal) health…
    - Monitoraggio attivo
    - Monitoraggio passivo
    - Indagini epidemiologiche

Il problema del denominatore

- Nel caso della **fauna selvatica** spesso ci mancano le adeguate conoscenze delle **dinamiche della popolazione**, a partire dal dato fondamentale, la **numerosità**



Il problema del denominatore

pathogens

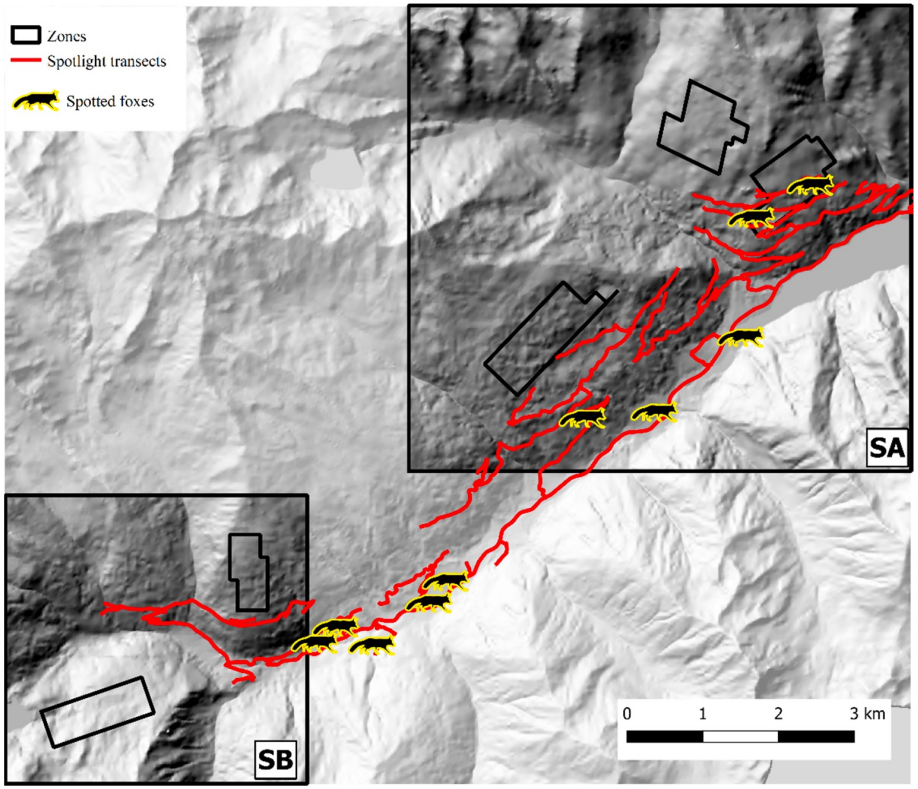
MDPI

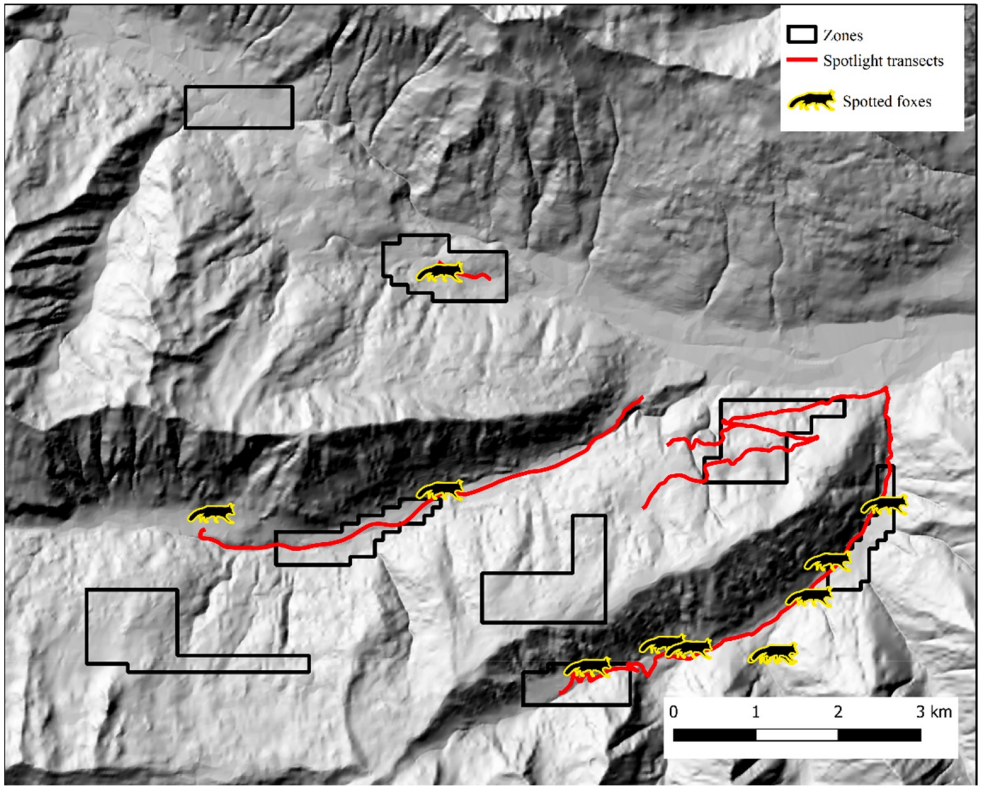
Article

Assessing Red Fox (*Vulpes vulpes*) Demographics to Monitor Wildlife Diseases: A Spotlight on *Echinococcus multilocularis*

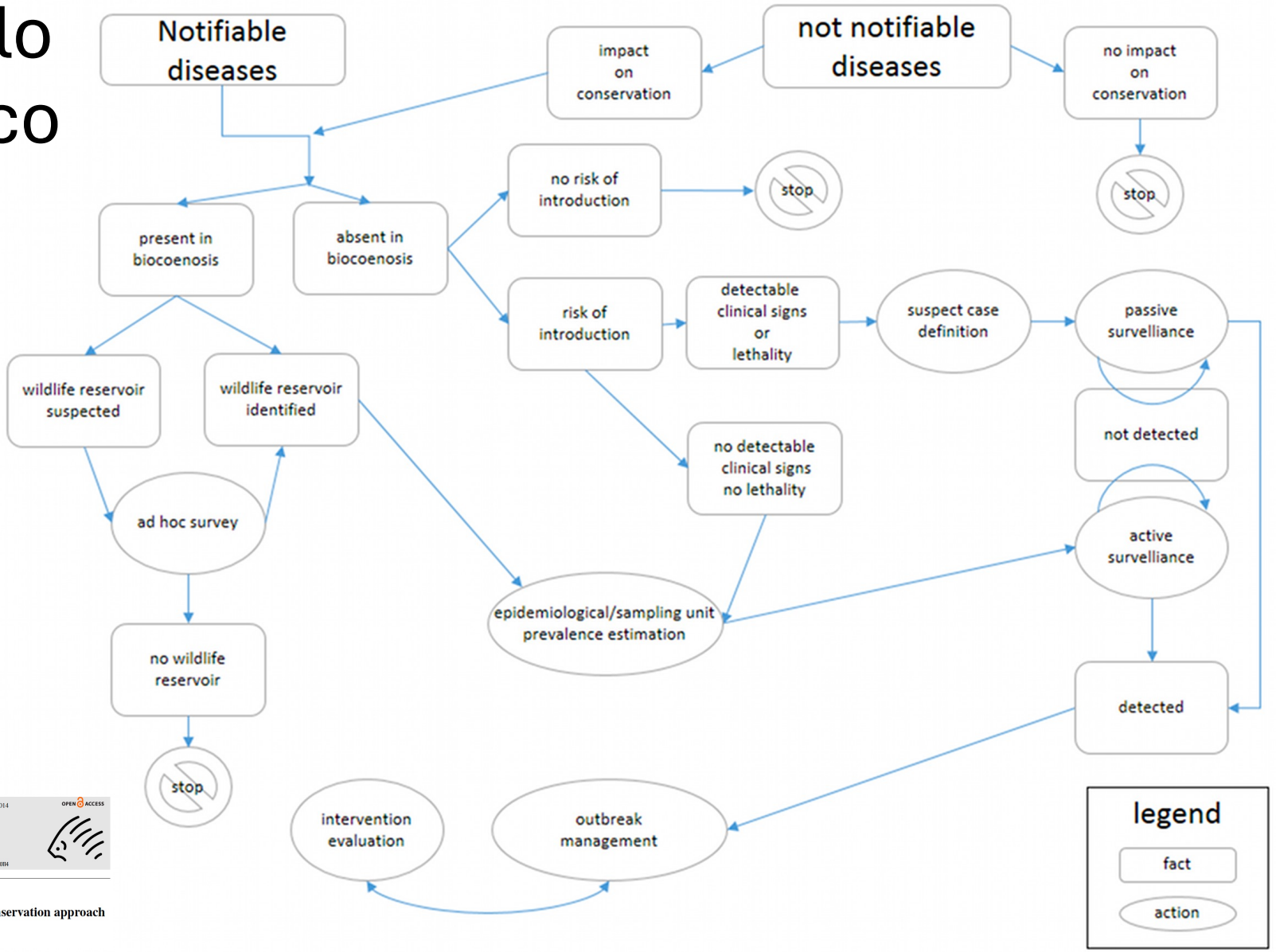
Roberto Celva [1,*], Barbara Crestanello [2], Federica Obber [1], Debora Dellamaria [1], Karin Trevisiol [1], Marco Bregoli [1], Lucia Cenni [3], Andreas Agreiter [4], Patrizia Danesi [1], Heidi Christine Hauffe [2] and Carlo Vittorio Citterio [1]

Red fox spotlight count data used to estimate the **index of kilometric abundance (IKA)** compared to non-invasive molecular **spatial capture-recapture (SCR)** approach





Definire il ruolo epidemiologico



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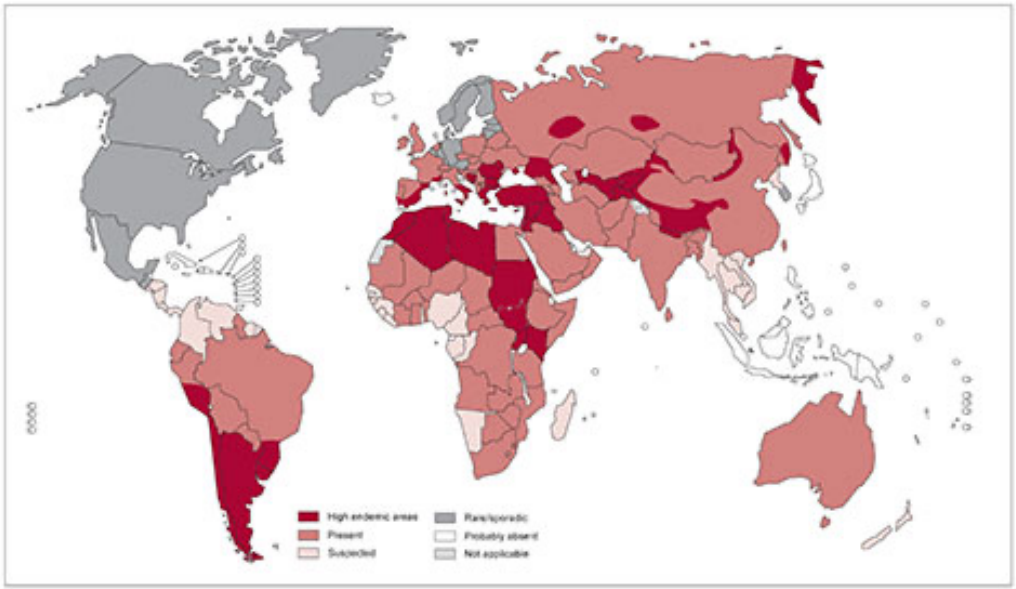
Caso studio 1 – echinococcosi

Sorveglianza e monitoraggio sanitario della fauna selvatica: quali priorità?

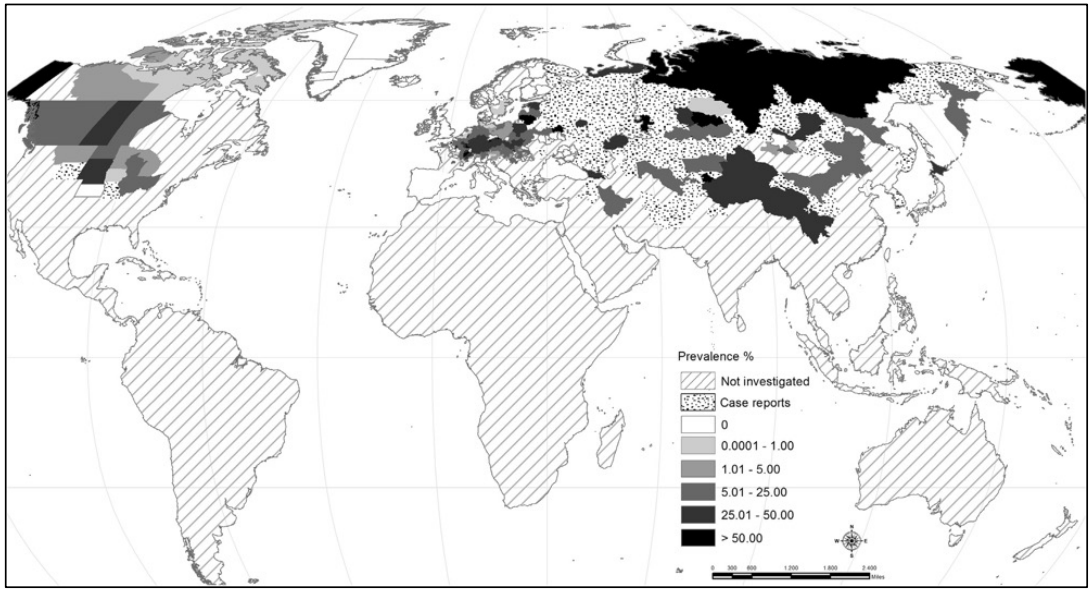
Echinococcosi – diffusione a livello globale

Distribution of *Echinococcus granulosus* and cystic echinococcosis, worldwide,2011



Data Source: World Health Organization
Map Production: Control of Neglected Tropical Diseases (NTD)
World Health Organization

World Health Organization



Advances in Parasitology, Volume 95
ISSN 0065-308X
http://dx.doi.org/10.1016/bs.apar.2016.11.001

Echinococcus granulosus
(**CYSTIC ECHINOCOCCOSIS**)

E. multilocularis
(**ALVEOLAR ECHINOCOCCOSIS**)

Echinococcosi – diffusione a livello EU

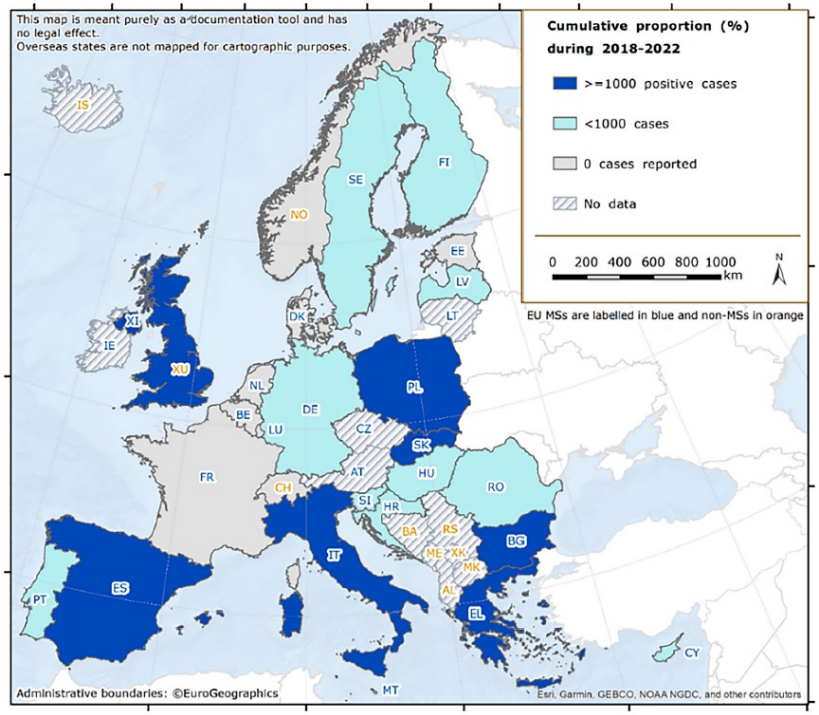


FIGURE 20 Map of the cumulative proportion (%) of test-positive animals for *Echinococcus granulosus sensu lato* in MSs and non-MSs, by country, 2018–2022.

Echinococcus granulosus
(**CYSTIC ECHINOCOCCOSIS**)

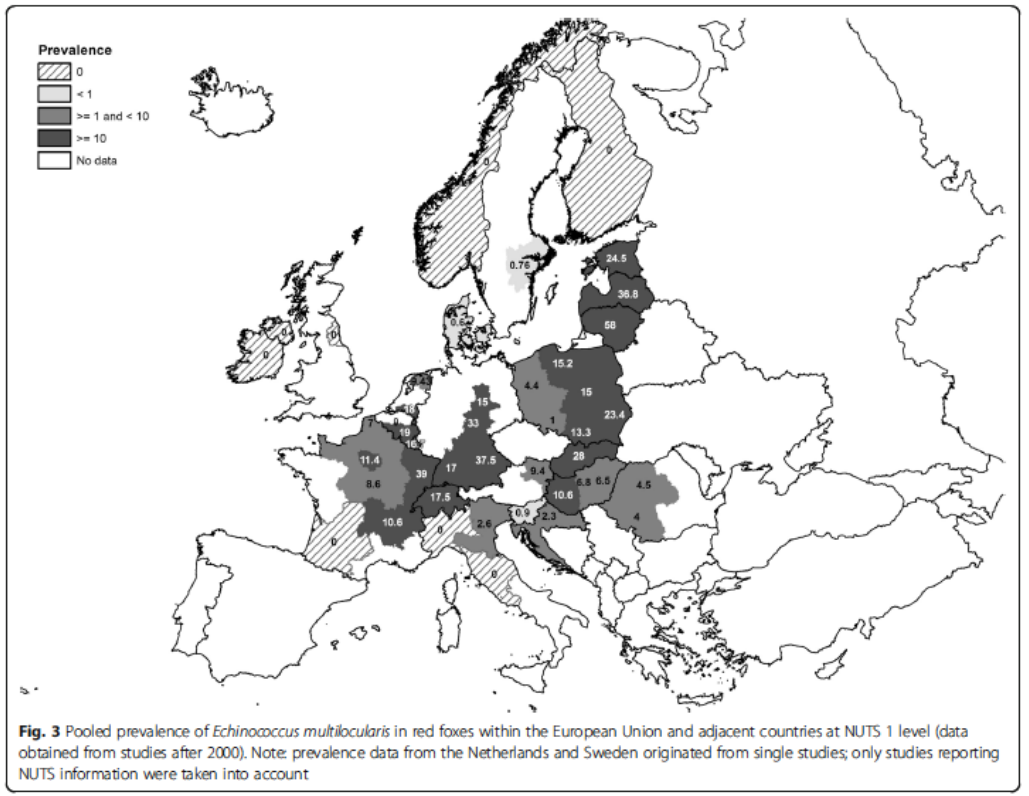
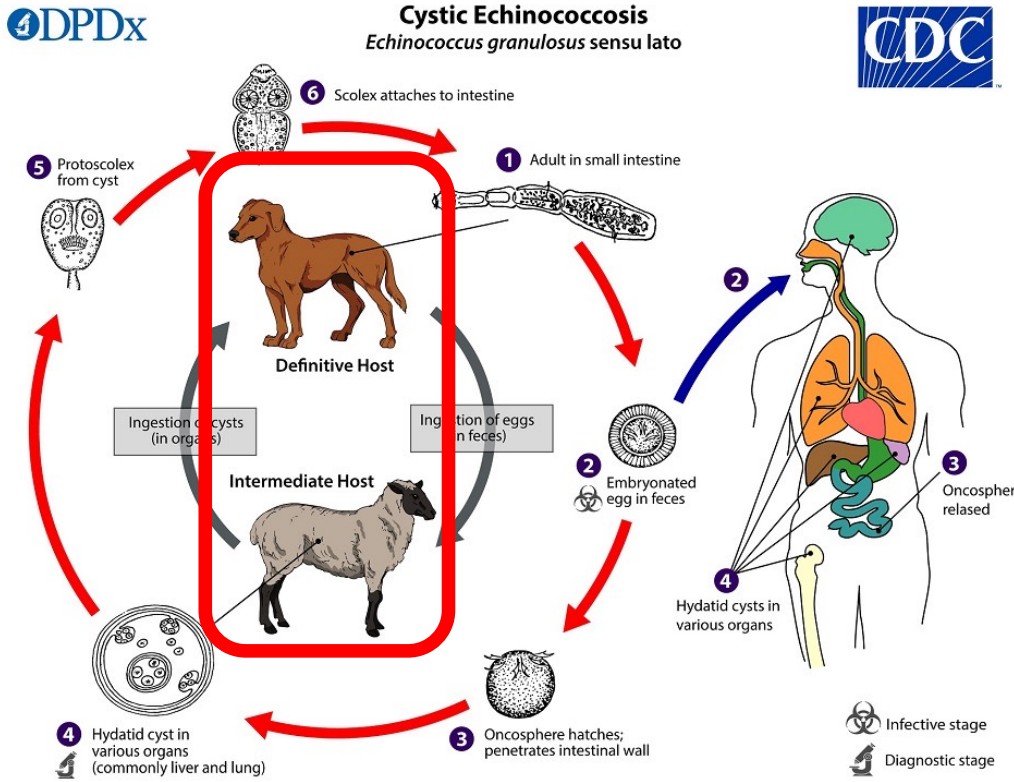


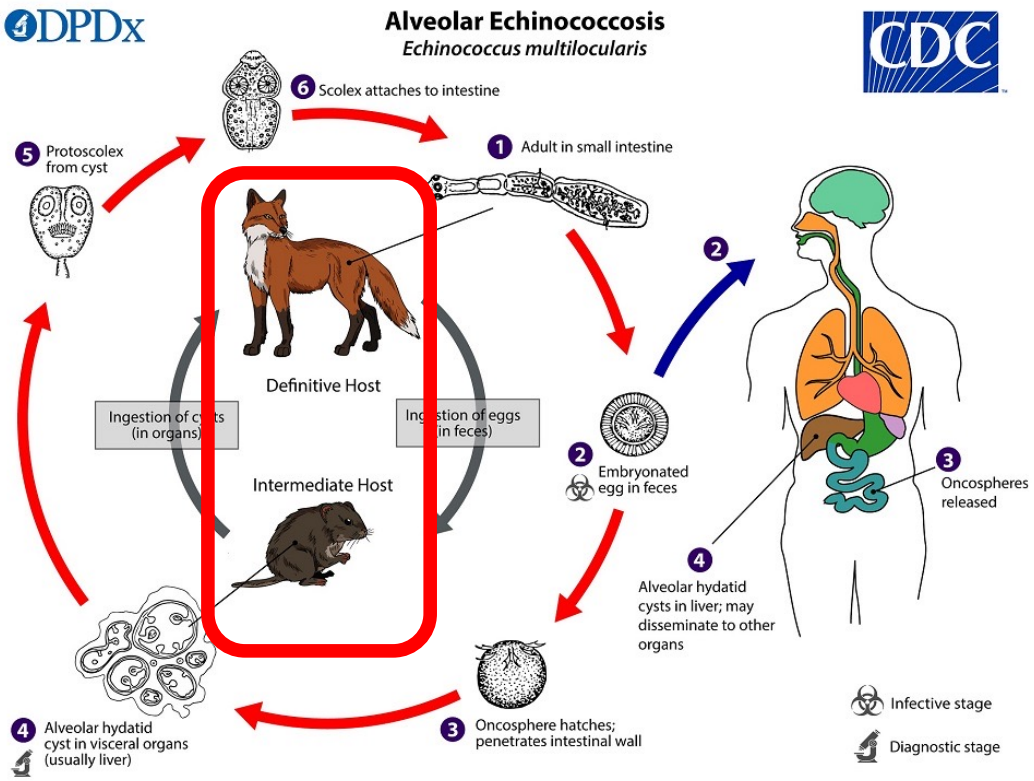
Fig. 3 Pooled prevalence of *Echinococcus multilocularis* in red foxes within the European Union and adjacent countries at NUTS 1 level (data obtained from studies after 2000). Note: prevalence data from the Netherlands and Sweden originated from single studies; only studies reporting NUTS information were taken into account

E. multilocularis
(**ALVEOLAR ECHINOCOCCOSIS**)

Echinococcosi – cicli biologici

E. canadensis **(G7, G8, G10)**





Alveolar Echinococcosis (*E. multilocularis*) in northern Italy

Red Fox

Available online at www.sciencedirect.com
SCIENCE DIRECT
International Journal for Parasitology 35 (2005) 1079–1083
www.elsevier.com/locate/ijpara

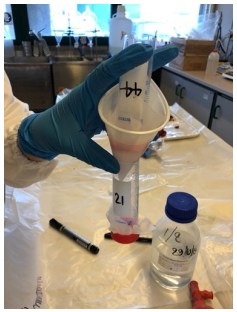
Echinococcus multilocularis in red foxes (*Vulpes vulpes*) of the Italian Alpine region: is there a focus of autochthonous transmission?

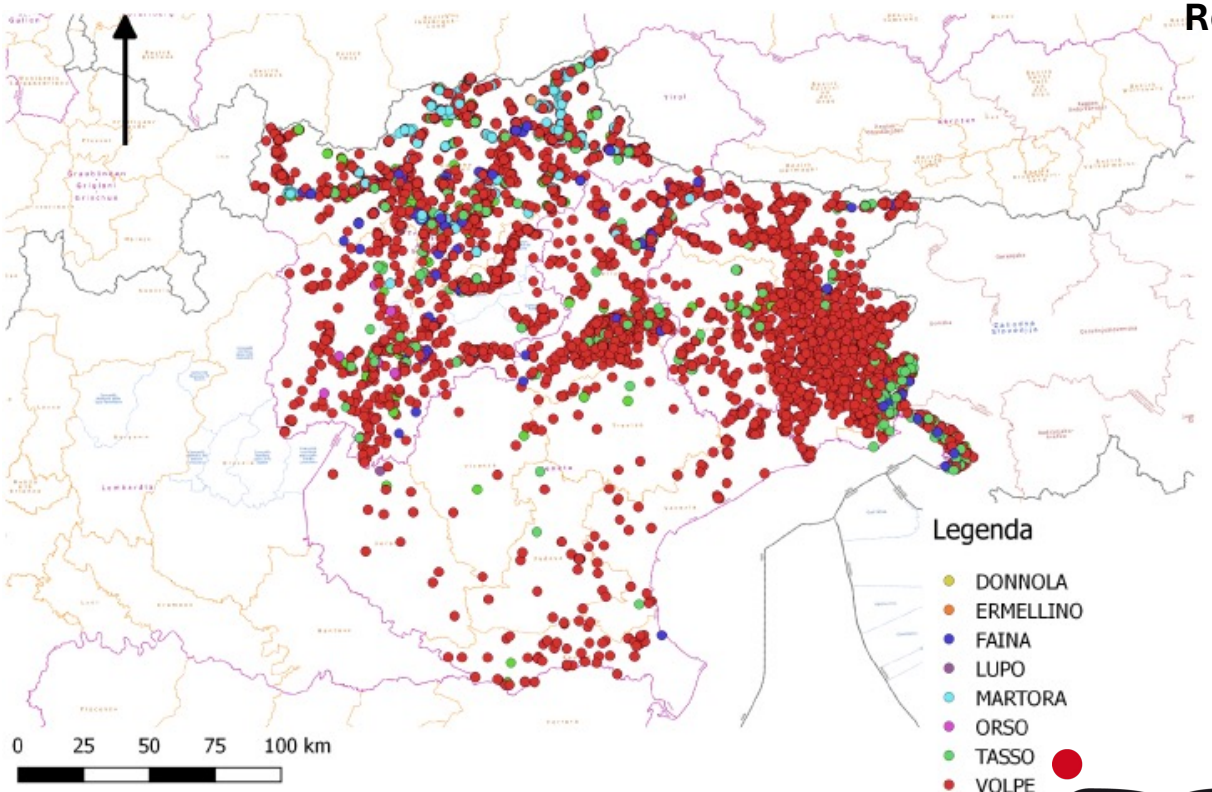
A. Casulli[a], M.T. Manfredi[b], G. La Rosa[a], A.R. Di Cerbo[b], A. Dinkel[c], T. Romig[c], P. Deplazes[d], C. Genchi[b], E. Pozio[a,*]

International Journal for Parasitology 39 (2009) 837–842
Contents lists available at ScienceDirect
International Journal for Parasitology
journal homepage: www.elsevier.com/locate/ijpara

Multi-locus microsatellite analysis supports the hypothesis of an autochthonous focus of *Echinococcus multilocularis* in northern Italy

A. Casulli[a,*], J.M. Bart[b], J. Knapp[b,c], G. La Rosa[a], G. Dusher[d], B. Gottstein[c], A. Di Cerbo[e], M.T. Manfredi[e], C. Genchi[e], R. Piarroux[b], E. Pozio[a]





Isolation + Multiplex PCR

Istituto Zooprofilattico Sperimentale delle Venezie

Monitoraggio decennale – bassa endemicità (?)

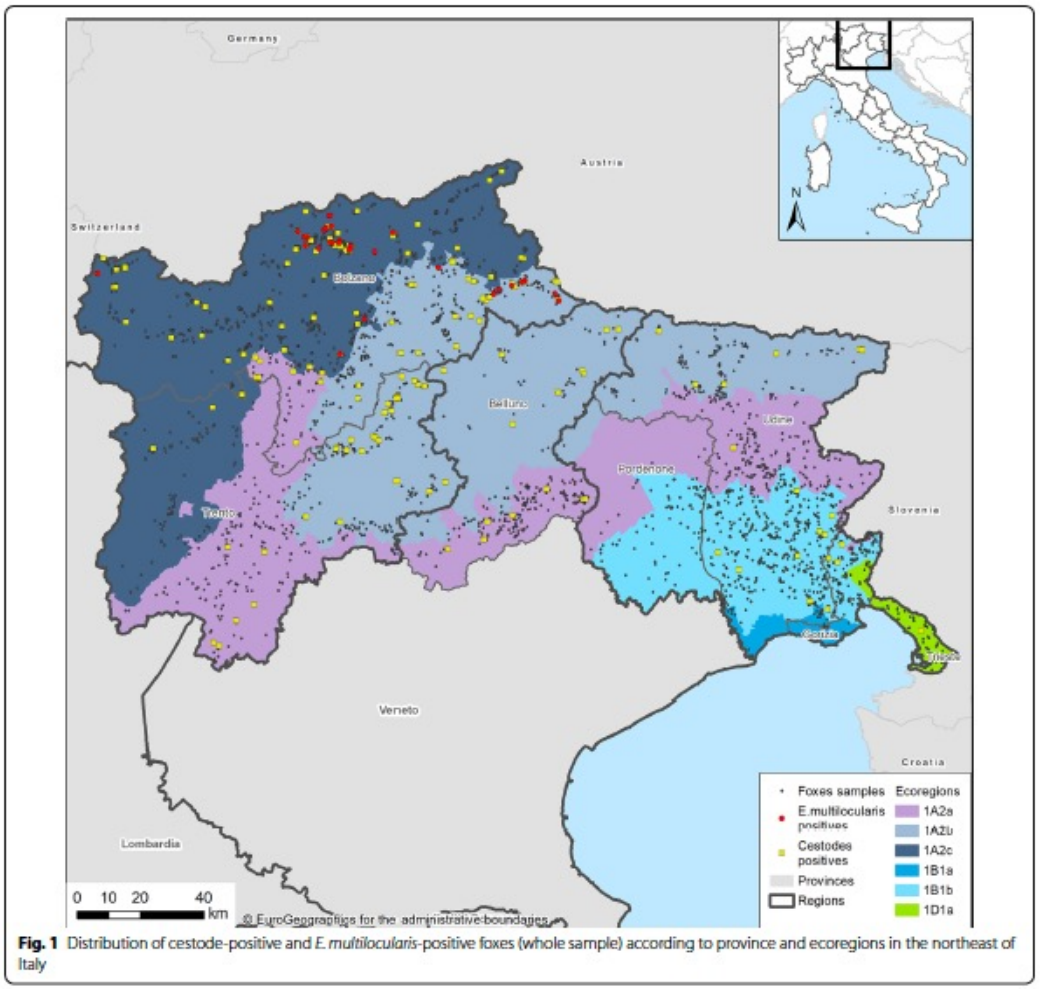


Fig. 1 Distribution of cestode-positive and *E. multilocularis*-positive foxes (whole sample) according to province and ecoregions in the northeast of Italy

Citterio *et al. Parasites Vectors* (2021) 14:29
https://doi.org/10.1186/s13071-020-04520-5

Parasites & Vectors

RESEARCH Open Access

Echinococcus multilocularis and other cestodes in red foxes (*Vulpes vulpes*) of northeast Italy, 2012–2018

Carlo Vittorio Citterio[1], Federica Obber[1*], Karin Trevisiol[1], Debora Dellamaria[1], Roberto Celva[1], Marco Bregoli[1], Silvia Ormelli[1], Sofia Sgubin[1], Paola Bonato[1], Graziana Da Rold[1], Patrizia Danesi[1], Silvia Ravagnan[1], Stefano Vendrami[2], Davide Righetti[3], Andreas Agreiter[3], Daniele Asson[4], Andrea Cadamuro[5], Marco Ianniello[6] and Gioia Capelli[1]

Table 5 Cestode species identified by DNA sequence and relative prevalence (%) by ecoregion

Cestode species	Ecoregion					
	1A2a *n* = 680	1A2b *n* = 712	1A2c *n* = 798	1B1a *n* = 26	1B1b *n* = 609	1D1a *n* = 47
Echinococcus multilocularis	0	8 (1.12)	22 (2.75)	0	0	0
Taenia crassiceps	3 (0.44)	31 (4.35)	32 (4.01)	0	10 (1.64)	0
Taenia polyacantha	11 (1.62)	26 (3.65)	19 (2.38)	0	1 (0.16)	0
Taenia krabbei	0	0	2 (0.25)	0	0	0
Taenia serialis	0	0	0	0	0	1 (2.12)
Taenia taeniaeformis	0	2 (0.28)	0	0	0	0
Taenia spp.	1 (0.15)	0	2 (0.25)	0	0	0
Mesocestoides litteratus	3 (0.44)	0	1 (0.12)	0	1 (0.16)	0
Mesoceistodes spp.	2 (0.29)	3 (0.42)	6 (0.75)	0	0	0
Dipylidium caninum	1 (0.15)	0	1 (0.12)	0	0	0
Total	21	70	85	0	12	1

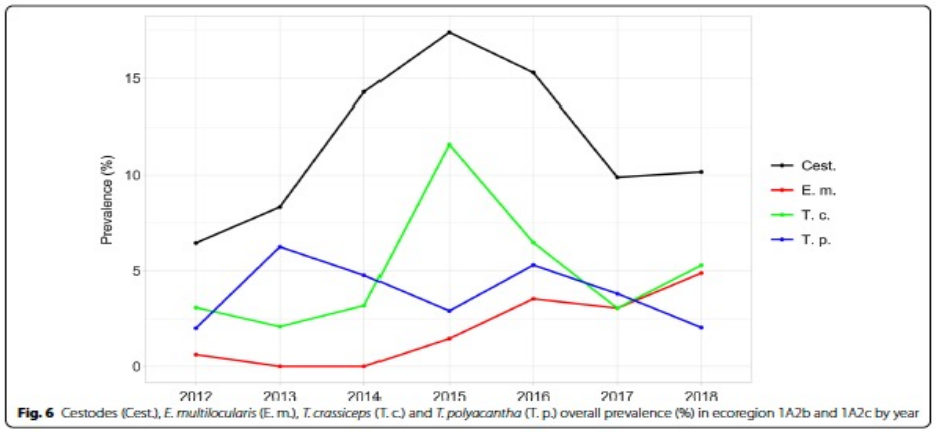
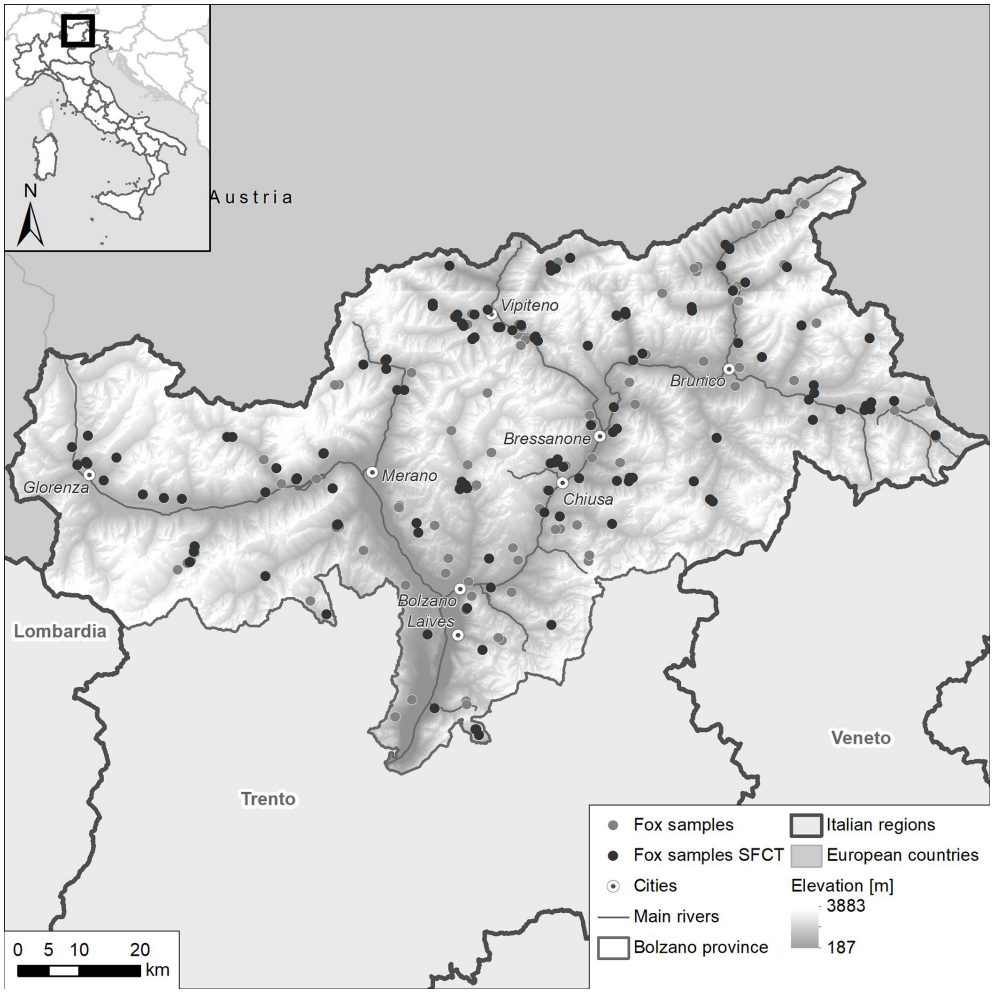


Fig. 6 Cestodes (Cest.), *E. multilocularis* (E. m.), *T. crassiceps* (T. c.) and *T. polyacantha* (T. p.) overall prevalence (%) in ecoregion 1A2b and 1A2c by year

Stiamo usando il giusto metodo diagnostico?



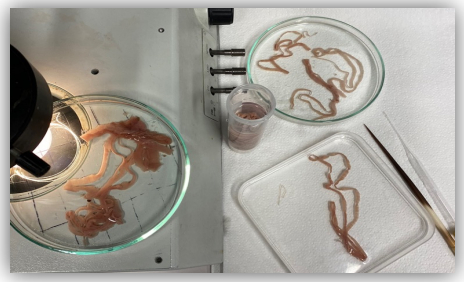
PLOS ONE

RESEARCH ARTICLE

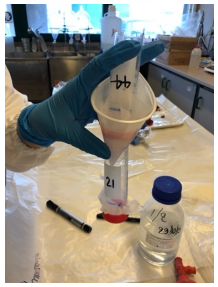
A highly endemic area of *Echinococcus multilocularis* identified through a comparative re-assessment of prevalence in the red fox (*Vulpes vulpes*), Alto Adige (Italy: 2019–2020)

Federica Obber[1☯*], Roberto Celva[1☯], Graziana Da Rold[1], Karin Trevisiol[1], Silvia Ravagnan[1], Patrizia Danesi[1], Lucia Cenni[2,3], Chiara Rossi[2], Paola Bonato[1], Katia Capello[1], Heidi C. Hauffe[2], Alessandro Massolo[3], Rudi Cassini[4], Valentina Benvenuti[4], Andreas Agreiter[5], Davide Righetti[5], Marco Ianniello[6], Debora Dellamaria[1], Gioia Capelli[1], Carlo V. Citterio[1]

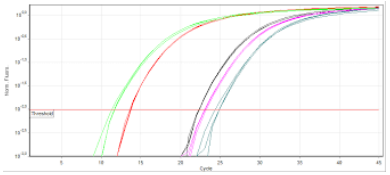
N=123



SFCT=Scraping, filtration and counting technique



CMPCR=Isolation + Multiplex PCR



qPCR=real-time quantitative PCR

Are we using the right diagnostic tool?

PLOS ONE

RESEARCH ARTICLE

A highly endemic area of *Echinococcus multilocularis* identified through a comparative re-assessment of prevalence in the red fox (*Vulpes vulpes*), Alto Adige (Italy: 2019–2020)

Federica Obber[1]*, Roberto Celva[1]*, Graziana Da Rold[1], Karin Trevisiol[1], Silvia Ravagnan[1], Patrizia Danesi[1], Lucia Cenni[2,3], Chiara Rossi[2], Paola Bonato[1], Katia Capello[1], Heidi C. Hauffe[2], Alessandro Massolo[3], Rudi Cassini[4], Valentina Benvenuti[4], Andreas Agreiter[5], Davide Righetti[5], Marco Ianniello[6], Debora Dellamaria[1], Gioia Capelli[1], Carlo V. Citterio[1]

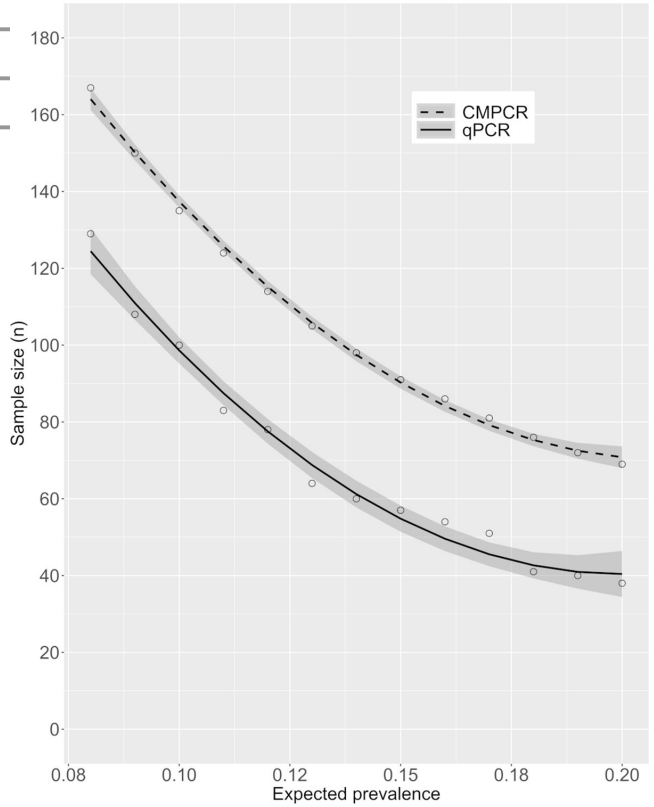
Table 2. Sensitivity, specificity and agreement (K) for two diagnostic methods (CMPCR and qPCR) for detecting *Echinococcus multilocularis* in fox fecal samples compared to the SFCT—reference standard.

Index	CMPCR versus SFCT (95% CI)	qPCR versus SFCT (95% CI)
Sensitivity (Se)	0.21 (0.07–0.42)	0.83 (0.63–0.95)
Specificity (Sp)	1 (0.96–1)	0.97 (0.91–0.99)

Table 1. Matrix of the results of the two faecal tests (CMPCR and qPCR) and the reference standard (SFCT) for the detection of *Echinococcus multilocularis* in 123 foxes.

TEST	CMPCR		qPCR		SFCT	
	POS	NEG	POS	NEG	POS	NEG
CMPCR	**5 (4,1%)**	**118**				
qPCR	5	100	**23 (18,7%)**	**100**		
SFCT	5	99	20	96	**24 (19,5%)**	**99**

https://doi.org/10.1371/journal.pone.0268045.t001



- **reclassification** of the area **in highly endemic**
- use the **qPCR** to
  - **increasing** the chances of **detecting** *E. multilocularis* in areas previously considered free from the parasite
  - surveillance would be **more informative** of the actual **risk** of exposure **for humans**

Risk for humans

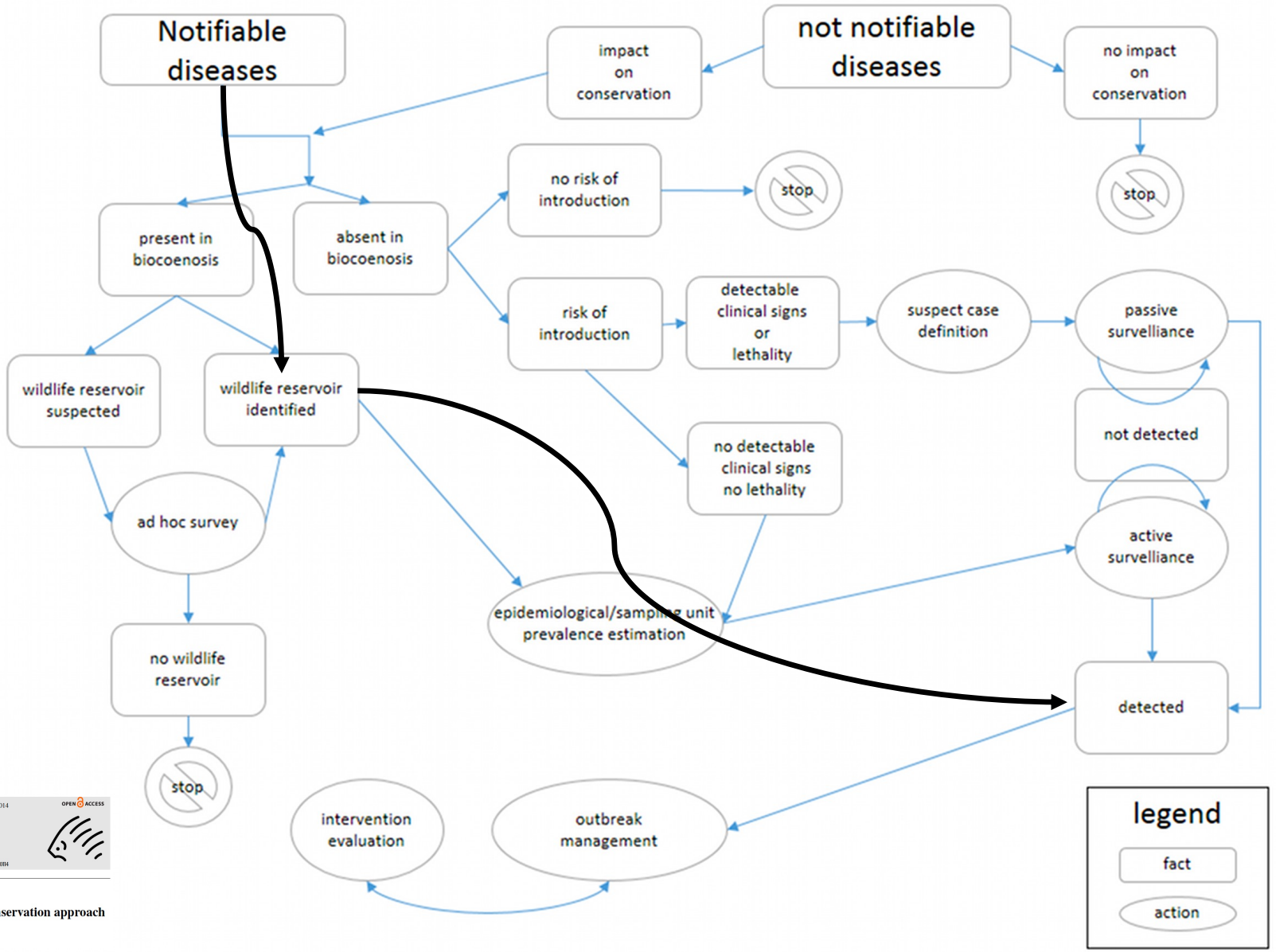
DISPATCHES

Confirmed Autochthonous Case of Human Alveolar Echinococcosis, Italy, 2023

Francesca Tamarozzi, Niccolò Ronzoni, Monica Degani, Eugenio Oliboni, Dennis Tappe, Beate Gruener, Federico Gobbi

The Study

In September 2023, a 55-year-old man in Italy was referred from his local hospital in Bolzano province, Trentino-Alto Adige region, to IRCCS Sacro Cuore Don Calabria Hospital, upon suspicion of CE. The patient was born and lived in Trentino-Alto Adige and had never traveled abroad; he worked in the tertiary sector and did not report contact with wild carnivores. He also did not report risk factors for *E. granulosus* infection.



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International Journal for Parasitology: Parasites and Wildlife

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

Italian wolves (*Canis lupus italicus* Altobello, 1921) and molecular detection of taeniids in the Foreste Casentinesi National Park, Northern Italian Apennines

Giovanni Poglayen [a, *], Francesca Gori [b], Benedetto Morandi [a], Roberta Galuppi [a], Elena Fabbri [c], Romolo Caniglia [c], Pietro Milanesi [c], Marco Galaverni [c], Ettore Randi [c], Barbara Marchesi [a], Peter Deplazes [b]

Table 2
Prevalence of different taeniid species found in the sampled population.

Total wolves n = 54	Taeniid species	Number of positive animals (Prevalence %)	Confidence interval (95%)
	Taenia hydatigena	22 (40.7)	27.6–53.8
	Taenia krabbei	12 (22.2)	11.2–33.2
	Taenia polyacantha	1 (1.8)	0.0–5.3
	Echinococcus granulosus (G1-G3)	3 (5.5)	0.0–11.5

2001-2008: Taeniids P= 61.1%

Echinococcus granulosus 5.5%

Taenia hydatigena 40.7%

Taenia krabbei 22.2%

Taenia polyacantha 1.8%

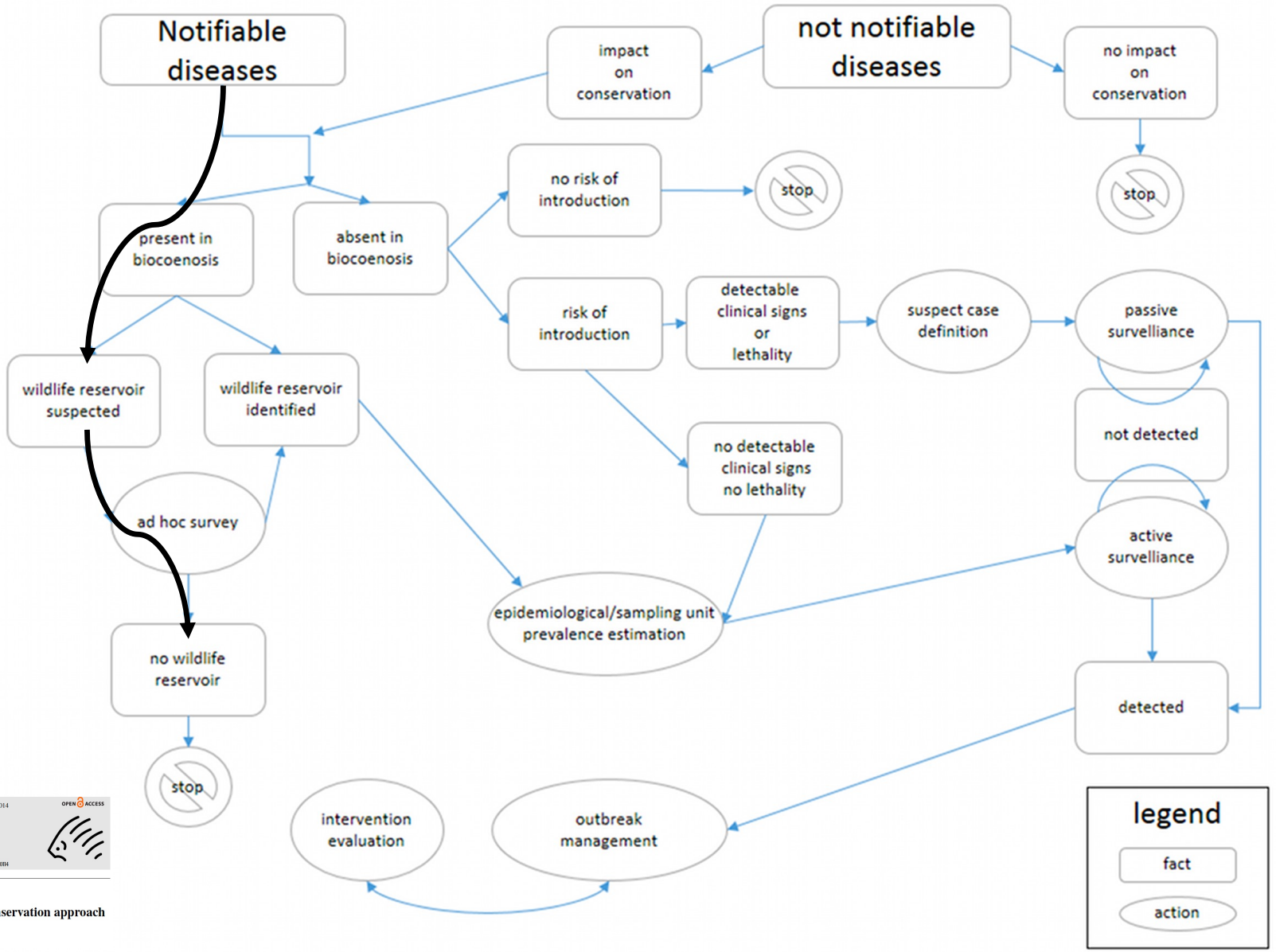
2019-2020: Taeniids P= 28.7%

E. granulosus P= 0% (negative)

This suggests that wolves in this area primarily prey on wildlife

↓

No evidence of a **sylvatic cycle** for *E. granulosus* in the park



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Commentary

Surveillance, monitoring and surveys of wildlife diseases: a public health and conservation approach

Vittorio Guberti[a,*], Laura Stancampiano[b], Nicola Ferrari[c]

Caso studio 2 – endoparassiti

Sorveglianza e monitoraggio sanitario della fauna selvatica: quali priorità?

Trasmissione interspecifica – ruminanti alpini

Table 1
Prevalence (P), abundance (A) and importance index (I) of the helminth species observed in the sample

Species family	*C. capreolus* (*N*=280)			*C. elaphus* (*N*=76)			*O. aries* (*N*=19)			*O. musimon* (*N*=29)			*R. rupicapra* (*N*=101)			*C. ibex* (*N*=155)		
	Cervidae			*Cervidae*			*Bovidae*			*Bovidae*			*Bovidae*			*Bovidae*		
	P	A	I	P	A	I	P	A	I	P	A	I	P	A	I	P	A	I
Spiculopteragia spiculoptera	85	189.3	37.800	70	66.9	94.770							8	3.1	0.274			
Ostertagia leptospicularis	86	223.4	45.177	34	5.4	3.765							12	3.4	0.448	1	0.1	0.000
Rinadia mathevossiani	28	7.3	0.478	17	2.6	0.900							1	0.1	0.001			
Ostertagia kolchida	69	71.5	11.514	13	2.0	0.538							3	0.4	0.013			
Teladorsagia circumcincta	12	13.0	0.372				74	244.5	72.698	100	83.3	90.598	66	67.9	49.737	79	365.7	55.901
Teladorsagia trifurcata	3	2.2	0.017				47	13.6	2.595	38	3.0	1.237	23	3.7	0.923	25	8.2	0.386
Teladorsagia pinnata	3	0.5	0.003				37	3.1	0.462	55	7.9	4.759	21	5.0	1.136	32	12.2	0.758
Marshallagia marshalli	1	0.2	0.001				5	11.9	0.253	24	1.7	0.444	56	66.1	41.154	86	204.2	34.010
Marshallagia occidentalis	1	0.1	0.000				5	2.9	0.063	3	0.2	0.008	29	12.1	3.847	53	33.4	3.407
Ostertagia ostertagi	10	6.3	0.152				5	0.1	0.001	7	0.3	0.026				5	1.3	0.012
Haemonchus contortus	24	43.4	2.440	3	0.2	0.011	47	41.4	7.916				18	5.6	1.106	1	0.1	0.000
Trichostrongylus axei	29	19.0	1.278	3	0.3	0.018	42	75.9	12.893	3	0.3	0.012	20	5.1	1.125	33	45.2	2.862
Trichostrongylus capricola	25	12.9	0.767							14	1.0	0.155	6	1.1	0.071	17	12.2	0.395
Trichostrongylus vitrinus	1	0.0	0.000				32	22.8	2.910	14	1.1	0.171	9	1.5	0.143	38	22.0	1.610
Trichostrongylus colubriformis	1	0.0	0.000				16	3.3	0.208	10	0.7	0.078	2	0.2	0.005	4	16.1	0.120
Nematodirus filicollis							5	0.1	0.001	38	6.1	2.503	4	0.4	0.017	9	1.6	0.027
Nematodirus helvetianus																1	6.3	0.016
Nematodirus abnormalis										3	0.3	0.010				17	5.6	0.180
Nematodirus davtiani alpinus																12	14.2	0.318
Ostertagia lyrata	1	0.1	0.000															

E. Zaffaroni et al. / Veterinary Parasitology 90 (2000) 221–230

Host specificity: generalist and specialist species

Trasmissione interspecifica – volpe rossa

Literature data
(Guardone, PhD thesis)

Table 4 Prevalence values (%) of intestinal helminths of red foxes (*Vulpes vulpes*) in Europe according to comparable surveys (2013-1993) (part 1)

Reference	This study	Bružinskaitė et al. 2012	Sikó et al. 2010	Borecka et al. 2009	Martinez-Carrasco et al. 2007	Bira et al. 2006	Saeed et al. 2006	Letková et al. 2006	Vervaeke et al. 2005	Segovia et al. 2004	Smith et al. 2003	Shimalov and Shimalov 2002	Rajković-Janje et al. 2002	Wolfe et al. 2001	Hofer et al. 2000	Gortazar et al. 1998	Lassnig et al. 1998	Papadopoulos et al. 1997	Pavlović et al. 1997	Pfeiffer et al. 1997 a,b
Country	IT	LTU	ROM	PL	ES	PT	DK	SVK	BE	ES	GB	BYEL	HVR	IE	CH	ES	AUST	EL	SRB	DE
N° of foxes examined	165	269	561	639	55	62	1040	302	219	399	588	94	85	77	388	81	516	314	532	1300
Nematodes																				
Uncinaria stenocephala	68.5	76.9	15.0	35.8	1.8	77.4	68.6	2.0	31.5	71.2	41.3	40.4	25.9	92.2	66.8	30.9	43.0	43.9	40	15.9
Ancylostoma caninum			18.2				0.6	5.6		0.5		3.2						5.1	6	
Toxocara canis	24.8	40.5	29.4	19.1	45.5	37.1	59.4	25.8	47.9	29.3	61.6	25.5	28.2	37.7	47.4	6.2	46.8	28.6	50	26.5
Toxascaris leonina	26.7		4.6		5.4		0.6	17.5		19.3	0.3	18.1				66.7	0.6	2.5		10.5
Toxocara cati					1.8					0.2		3.2								
Trichuris vulpis	20.6		27.2		9.1	8.1	0.5	6.9		8.3	0.3	3.2				12.3	0.2	8		
Molineus patens						4.8				2.3		3.2								
Pterygodermatites affinis	4.8				54.4	3.2				22.3						23.4				
Aonchotheca putorii	8.5	29.4								1.2		5.3								
Fam. Spiruridae														3.90						
Rictularia sp.						6.4												17.5		
Strongyloides vulpis												2.1								
Trichostrongylus sp.																		0.6		
Oxynema crassispiculum					5.4															
Cestodes																				
Echinococcus multilocularis		58.7	4.8	13.9			0.3	10.6	1.8			7.5			44.3		3.6			0.3
Echinococcus granulosus										0.2										
Taenia spp.	5.5			29.7			21.5	20.9	2.7	2.3	20.7		24.7	0.09	8.4		17.4	1.6		9.2
Taenia taeniformis		3.7	2.6			1.6	1.0			0.2		3.2								0.2
Taenia pisiformis			12.0		7.3	3.2	0.3			6.3	2.0	12.8				4.9	0.3		22	0.1
Taenia polyacantha		61.7	5.3							10.3		17.0			0.5	3.7	6.8		16	11.9
Taenia hydatigena			8.2				0.4			2.0		5.3						0.9	2	
Taenia multiceps			4.6													1.2				
Taenia serialis			0.9																	0.1
Taenia crassiceps		26.4	5.0				0.2			4.3		27.7			7.6		14.6	0.3	51	17.7
Taenia ovis			3.7																	

Endoparasites in golden **jackal** in north-eastern Italy

The species is currently expanding its range across the country

As mesocarnivores, they may act as reservoirs for a variety of pathogens

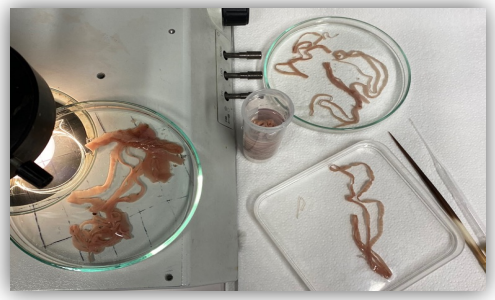
Health monitoring is currently based on passive surveillance

Golden jackals (*Canis aureus*) in Italy:

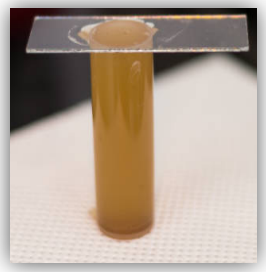
Copromicroscopic techniques are widely used for parasite detection, but how reliable are they for estimating helminth prevalence?

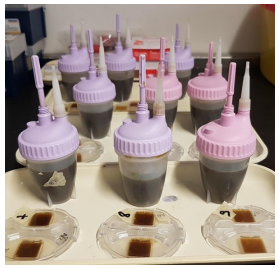
- 109 road-killed golden jackals (*Canis aureus*)
- Collected in Friuli Venezia Giulia (2009–2025)
- Necropsy performed; intestines stored at –80°C for 72h
- Feces collected from rectum, when available

Reference Technique:
Scraping, Filtration, Counting Technique (SFCT)
Applied to intestinal contents to detect helminths



Copromicroscopic Analyses
1) Flotation Technique (FT)
2) Mini-FLOTAC® (MF)
with a $ZnSO_4$ solution (s.g. 1.350).





Performances of copromicroscopic tests (red fox)

frontiers | Frontiers in Veterinary Science

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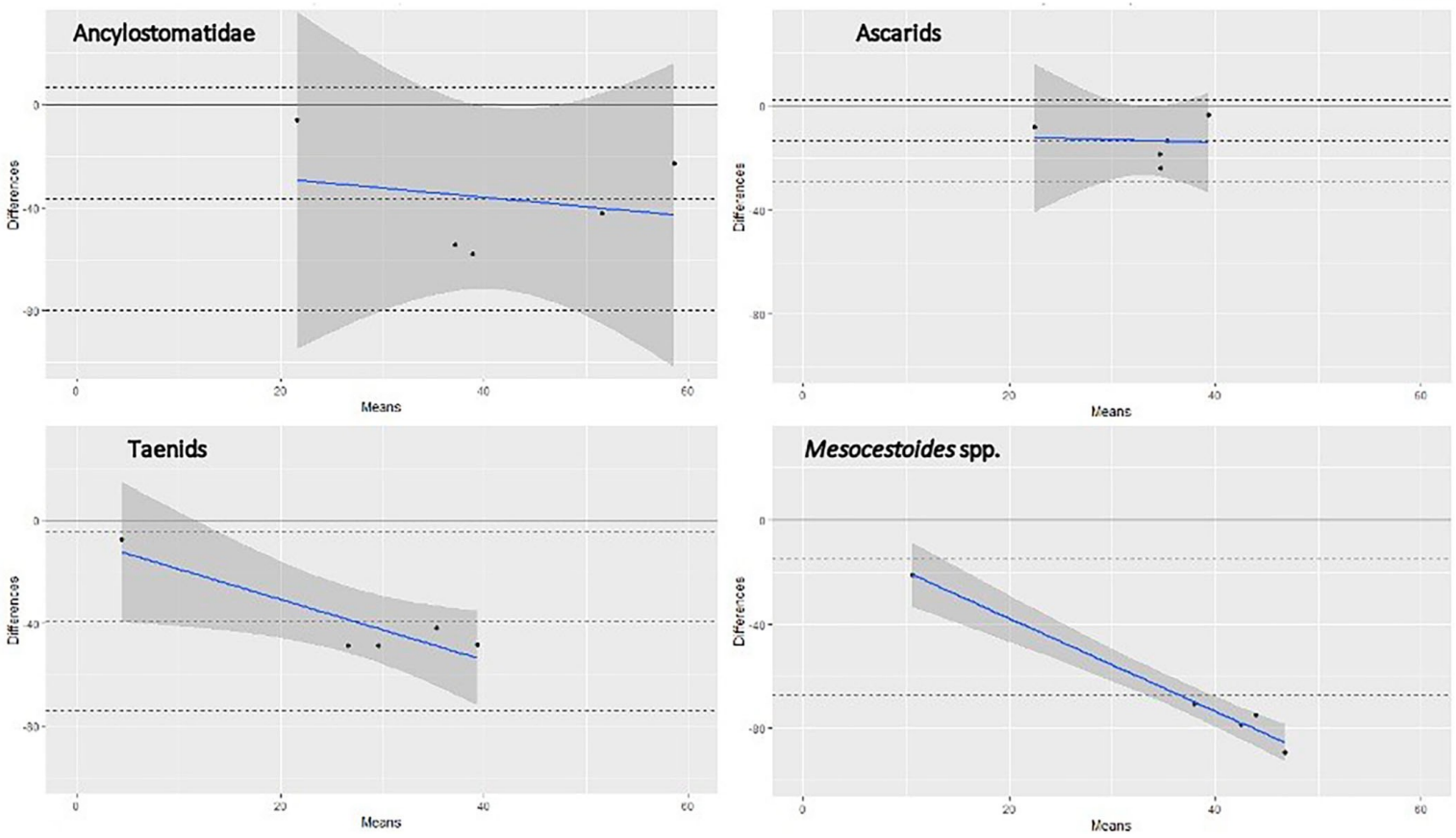
Comparing copromicroscopy to intestinal scraping to monitor red fox intestinal helminths with zoonotic and veterinary importance

Erica Marchiori[1]*, Federica Obber[2], Roberto Celva[2], Federica Marcer[1], Patrizia Danesi[2], Anna Maurizio[1], Lucia Cenni[3], Alessandro Massolo[3,4,5], Carlo Vittorio Citterio[2] and Rudi Cassini[1]



Bland-Altman graph representing the **agreement** between **SFCT** (reference test) and **copromicroscopy**,

Each **dot** represents one **pair of prevalence values** (scraping and copromicroscopic)

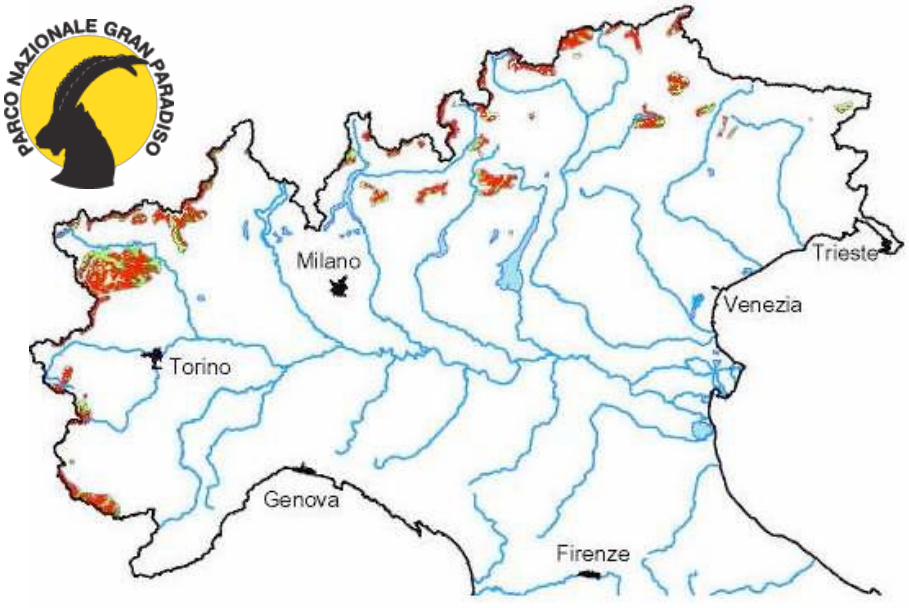
Caso studio 3 – rogna sarcoptica

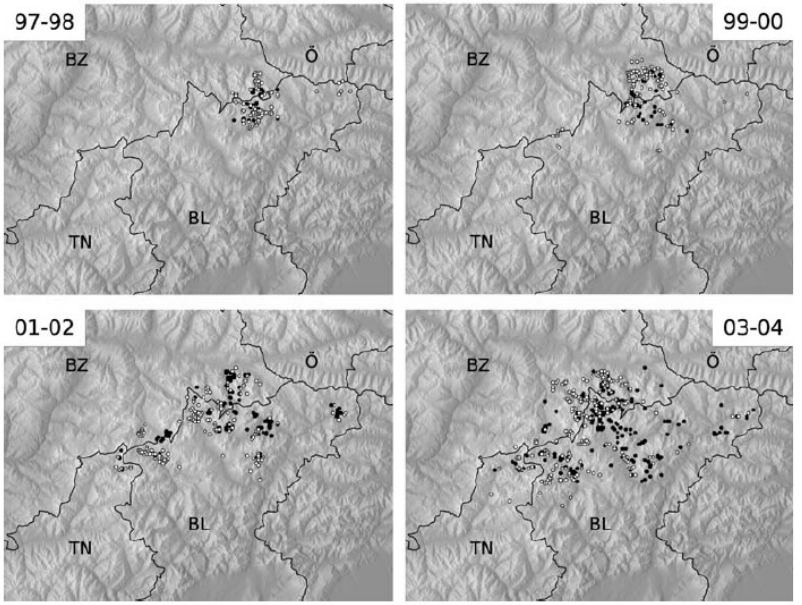
Sorveglianza e monitoraggio sanitario della fauna selvatica: quali priorità?

Sarcoptic mange (*Sarcoptes scabiei*) in Alpine ungulates

- **infestazione cutanea** parassitaria contagiosa
- colpisce più di **40 specie di mammiferi**
- ciclo vitale **breve** (poche settimane)
- trasmissione per **contatto diretto** e indiretto
- tipico **andamento ciclico** nel tempo
- **mortalità** variabile, ma potenzialmente **<u>elevata</u>**

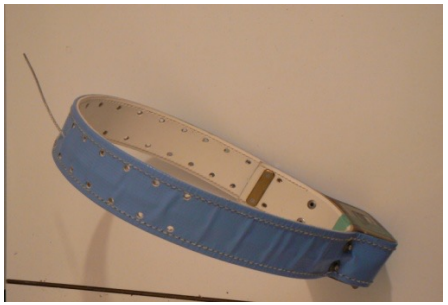
Intervento farmacologico (Marmolada)

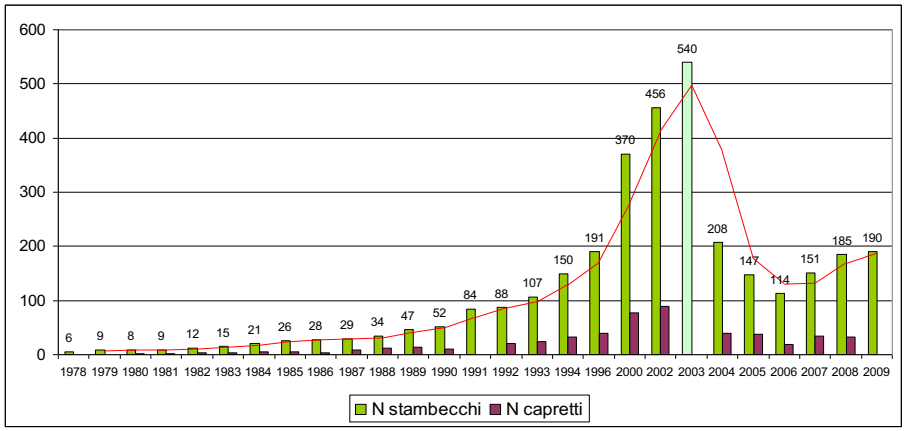




MONITORAGGIO GESTIONALE

- RADIOTRACKING
  - Radiocollari e monitoraggi con presenza fisica
  - Collari satellitari
- CENSIMENTI
  - Svolti in contemporanea sul versante trentino e su quello bellunese





MESE/ ANNO	BL + TN	TOT BL	maschi	femmine	yearling	capretti	ind.
ago-02	498	319	147	80	24	50	18
2003	N.E.						
ago-04	208	155	37	88	1	29	0
ago-05	147	96	25	36	8	22	5
set-06	114	93	36	27	12	13	5
ago-07	151	126	28	53	12	28	5
lug-08	185	141	46	48	16	25	6
lug-09	190	134	58	32	23	13	8

CATTURE E TRATTAMENTI

- PERIODO:
  - giugno-agosto
- MODALITÁ DI CATTURA:
  - preparazione e gestione
  - teleanestesia: avvicinamento e uso fucili lancia-siringhe
  - anestetico (Rompun, 1 mg/kg p.v.)
- TRATTAMENTO:
  - trattamento antiparassitario con Ivomec®, 1ml/50kg p.v.
- RISVEGLIO
  - risveglio con Antisedan, 1mg ogni 10 mg di xilazina impiegata.

SOPRAVVIVENZA ALL'EPIDEMIA DI ROGNA

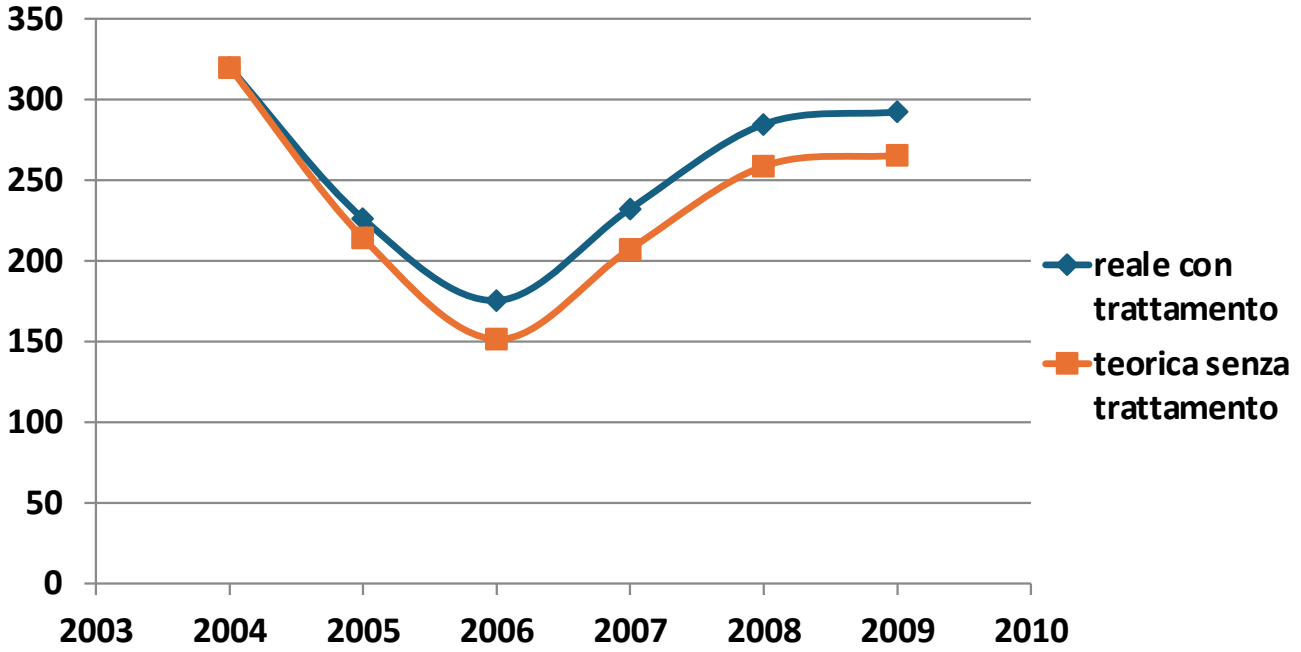
ANNI 2004 -2005

	TRATTATI	NON TRATTATI	TOTALE
TOTALE individui	54	35	89
Vivi dopo 12 mesi	48	14	62
Morti entro 12 mesi	6	21	27
Sopravvivenza	89,9%	40,0%	p<0,001

ANNI 2006-2008

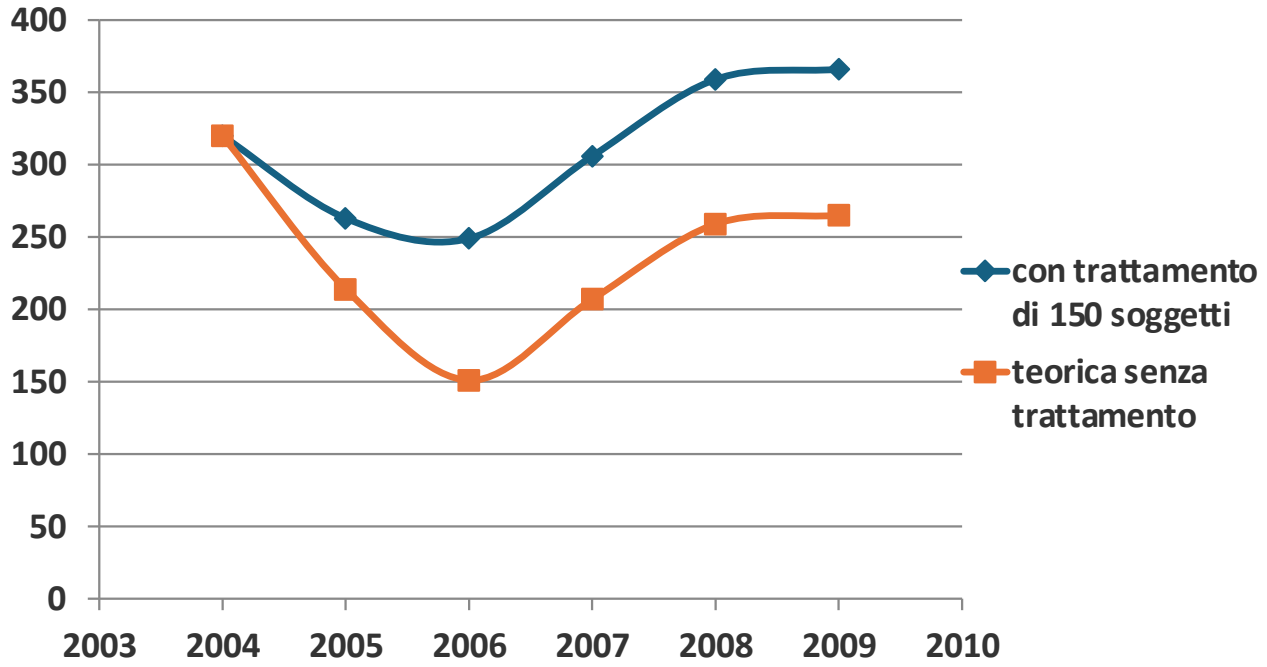
	TRATTATI	NON TRATTATI	TOTALE
TOTALE individui	16	19	35
Vivi dopo 12 mesi	16	16	32
Morti entro 12 mesi	0	3	3
Sopravvivenza	100,0%	84,2%	p>0,05

EFFETTO DEL TRATTAMENTO SULL'ANDAMENTO DEMOGRAFICO DELLA COLONIA DI STAMBECCO

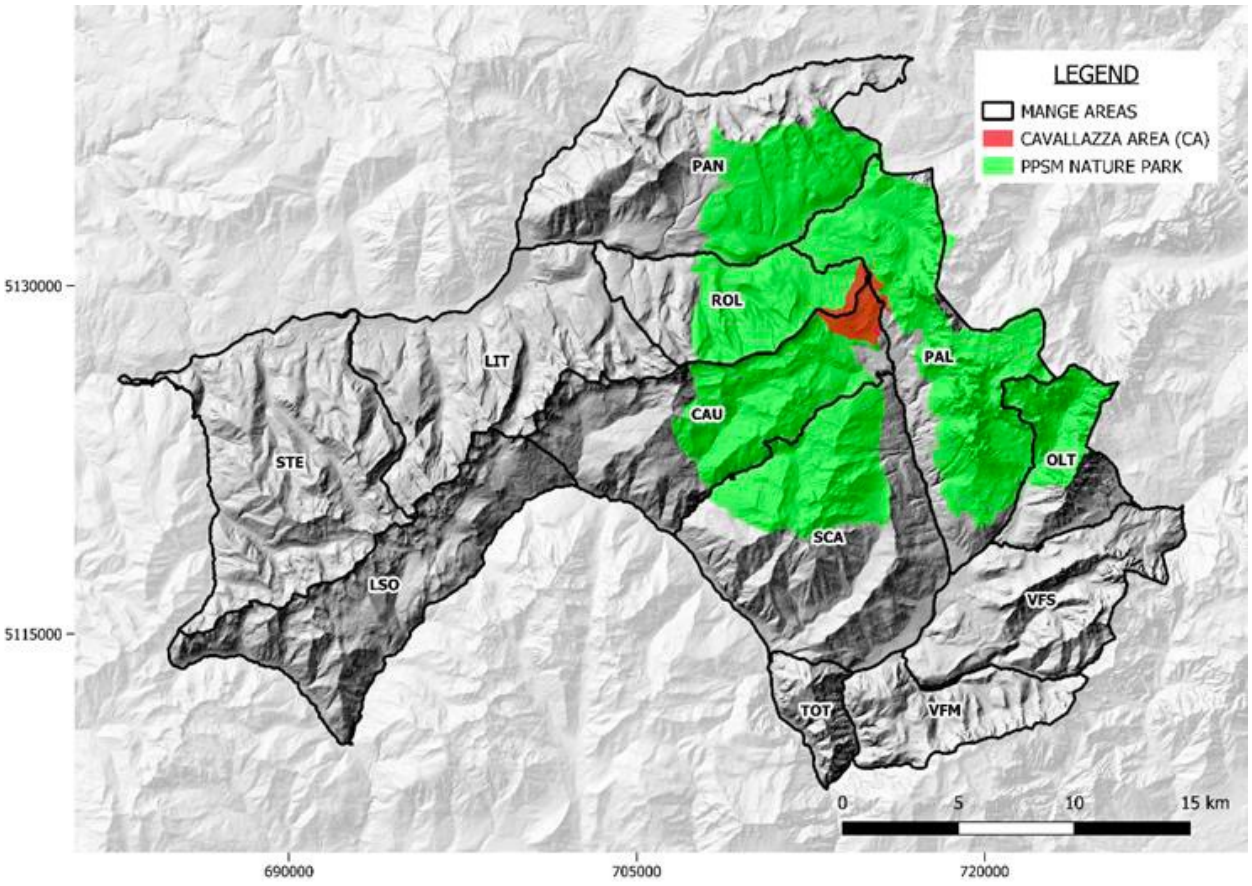


Andamento numerico della popolazione reale e teorico senza trattamento

STIMA ANDAMENTO IPOTIZZANDO IL TRATTAMENTO DI 150 CAPI



Monitoraggio intensivo (Parco Paneveggio)



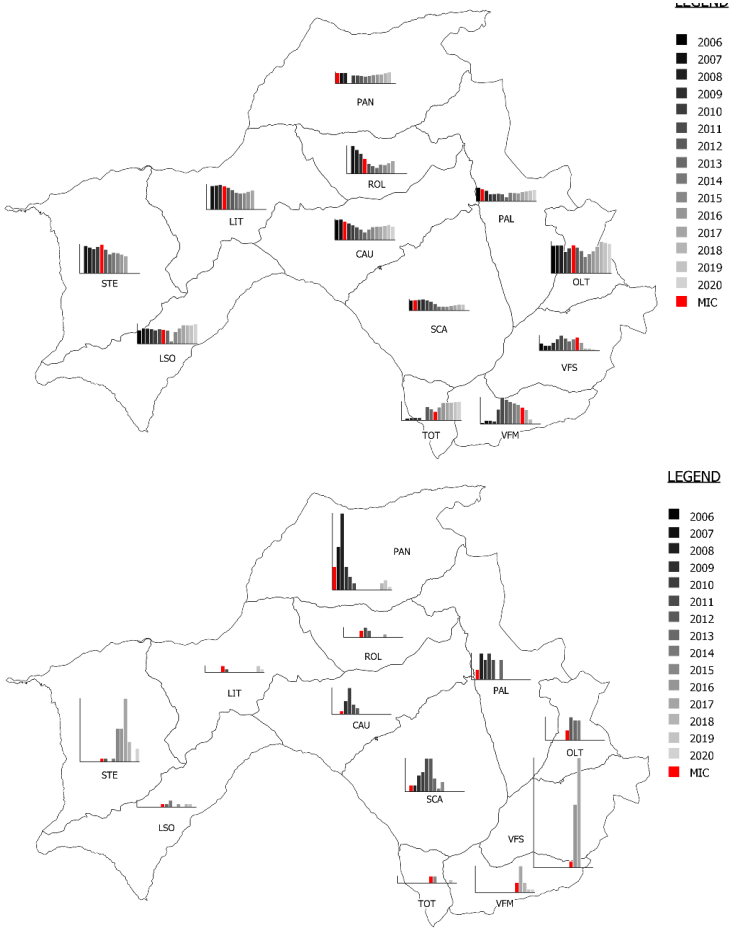
animals

MDPI

Article

Description of a Sarcoptic Mange Outbreak in Alpine Chamois Using an Enhanced Surveillance Approach

Federica Obber [1,*], Roberto Celva [1], Martina Libanora [1], Graziana Da Rold [1], Debora Dellamaria [1], Piergiovanni Partel [2], Enrico Ferraro [3], Maria Santa Calabrese [4], Lia Morpurgo [5], Simone Roberto Rolando Pisano [6], Carlo Vittorio Citterio [1] and Rudi Cassini [5]



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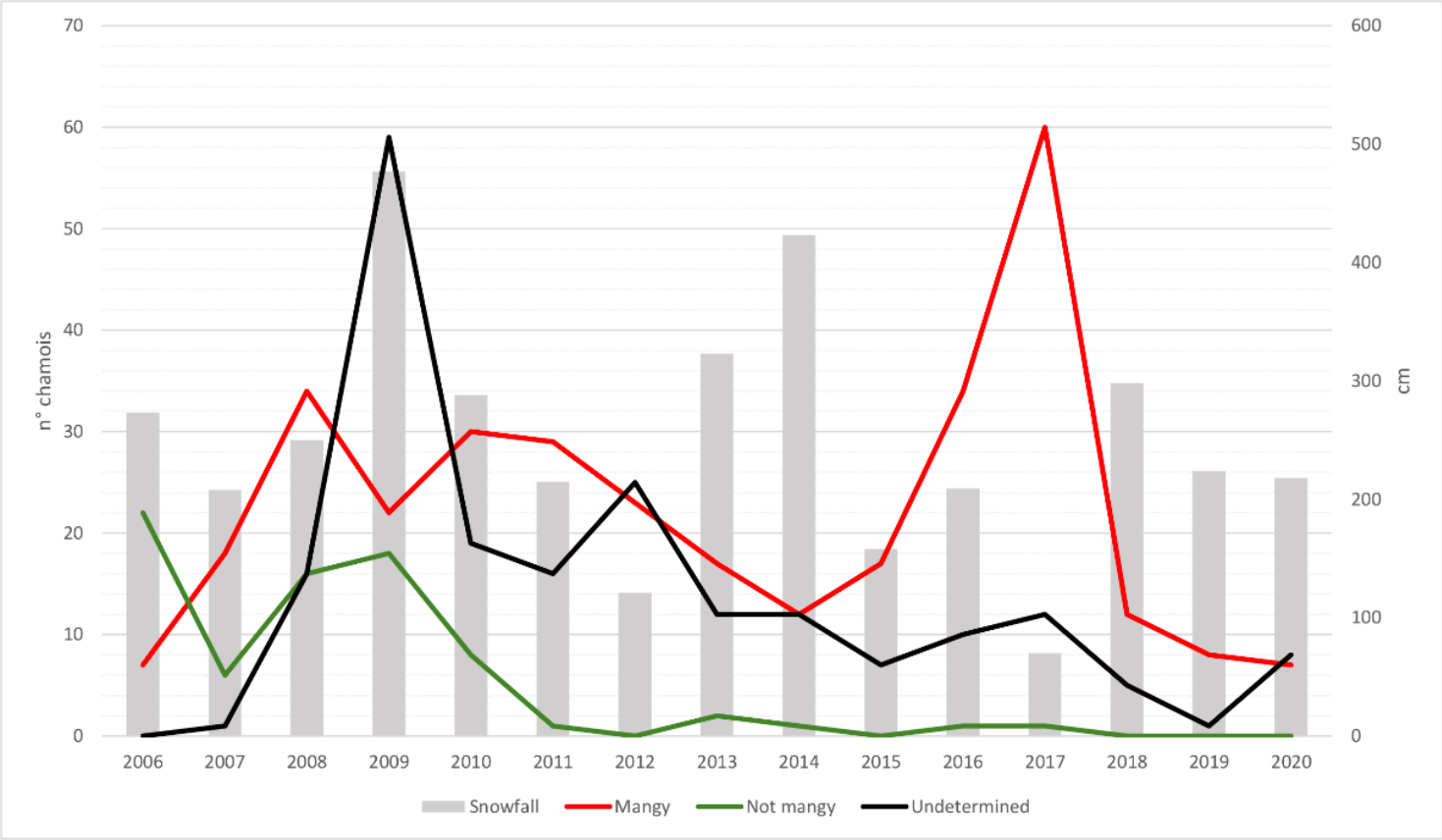

Number of dead chamois collected from 2006 to 2020, classified by the **cause of death**. Bars represent annual total **snowfall** in centimete

Take-home messages

- **Prioritizzazione** delle malattie, ma in generale applicare un approccio **eco-patologico** per **tutte la malattie/infezioni**
- **Definire** bene gli **obiettivi** (sorveglianza, monitoraggio, indagini epidemiologiche)
- Conoscere e utilizzare i **metodi** più **appropriati**
- Interagire e collaborare con chi si occupa delle popolazioni di fauna selvatica con altri scopi (il **denominatore**!)