

**THE EUROPEAN WILDCAT (*Felis silvestris silvestris*, SCHREBER, 1777)  
IN THE VENETO REGION (ITALY)**

**IL GATTO SELVATICO EUROPEO (*Felis silvestris silvestris*, SCHREBER, 1777)  
IN VENETO**

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**Abstract.** The European wildcat became probably extinct in the Veneto Region from the turn of the 19<sup>th</sup> and 20<sup>th</sup> centuries. The expansion of the wildcat Dinaric -Balkan population in the eastern Italian Alps has been well documented for many decades. In 1983, an adult male was illegally killed in the Cansiglio Forest, thus documenting his return for the first time. This paper is a summary of the knowledge gathered on the species over the last 37 years. To assess the current range of the felid we have used known, unpublished observations and carcasses recovered for accidental or illegal killings. A total of 124 objective findings have been documented, most of them 114 (92%), collected using the camera trapping method. Some surveys in recent years have considerably contributed to increase the knowledge on the species. One of these has demonstrated the presence of a vital population in the Eastern Venetian Prealps, confirmed by two reproductive events. Thanks to the analysis of all the data collected, it has been possible to delineate the current western limit of the European Wildcat distribution range in north-eastern Italy, placing it in the southern part of the province of Belluno.

**Riassunto.** Il Gatto selvatico europeo è scomparso probabilmente dal Veneto tra il 19° e il 20° secolo. L'espansione della popolazione dinarico-balcanica del felide nel nord-est Italia è ben documentata ormai da qualche decennio. Nel 1983 un maschio adulto è stato abbattuto illegalmente nella Foresta del Cansiglio, documentando in questo modo il suo ritorno. Questo lavoro è una sintesi delle conoscenze raccolte sulla specie negli ultimi 37 anni. Per valutare l'areale attuale del felide abbiamo utilizzato osservazioni note, inedite e carcasse recuperate per uccisioni accidentali o illegali. Sono stati documentati complessivamente 124 reperti oggettivi, la maggior parte dei quali, 114 (92%), raccolti utilizzando la tecnica del fototrappolaggio. Alcune ricerche negli ultimi anni hanno contribuito considerevolmente ad aumentare le conoscenze sulla specie. Una di queste ha dimostrato la presenza di una popolazione vitale nelle Prealpi Venete orientali, confermata da due eventi riproduttivi. Grazie all'analisi di tutti i dati raccolti è stato possibile delineare l'attuale limite occidentale dell'areale del Gatto selvatico europeo nel nord-est Italia, situandolo nella parte meridionale della provincia di Belluno.

## INTRODUCTION

This contribution is a synthesis of the current distribution knowledge of the European wildcat *Felis silvestris* in the Veneto Region. Some of the data presented here have been previously published, but many others are new and they are currently part of a database that was updated in May 2020.

In the last 37 years, from the first documented specimen in Veneto in 1983 until today, a considerable amount of information has been collected. Thanks to the strict and standardized criteria of coat traits, morphological and genetic analysis, that gives us a clear and objective picture of the population dynamics. Considering the summary nature of this work, we have also integrated the most recent data with the historical knowledge of the felid, although many of these are sometimes difficult to evaluate.

Currently, there are only two areas where the wildcat is monitored with a certain continuity; in the Eastern Venetian Prealps and within the Dolomiti Bellunesi National Park (DBNP). In the rest of the Veneto territory, data are obtained in a passive way, without a systematic approach, where the events collected are therefore completely random. Almost all the surveys carried out in Veneto have used the camera trapping (CT) method, a non-invasive approach that considerably contributed to increase our knowledge on the distribution of the species, improving the ability over time and space to monitor even very elusive animals.

The European wildcat *Felis silvestris* is a carnivore of conservation concern in Europe and has a wide and fragmented distribution, occupying a variety of different habitats. (DRISCOLL & NOWELL 2010, LOZANO 2010). The Italian population is

present from the Tuscan-Emilian Apennines to Calabria. To the Cispadane population also belong the specimens living in Sicily. (MATTUCCI *et al.* 2013, RAGNI *et al.* 2014). The species in the north-eastern Italy and Dinaric Alps (Slovenia and Croatia) are joined into a unique genetic cluster (Fig. 1), indicating recent shared ancestry (MATTUCCI *et al.* 2015).

The wildcat is one of the 96 mammals currently present in Veneto and also the only felid with a stable presence, as that of the Eurasian *Lynx lynx* can be considered occasional (BON 2017, CATELLO & MOLINARI 2017).

It has been included in the lists of the Bern Convention (App. II), Habitats Directive (App. IV) and CITES (App. II). In Italy the European wildcat is protected by L.N. 157/92. The IUCN Red List of Threatened Species considers the European wildcat least concern, but with a declining population trend.

Although the expansion of the species in the northeast of Italy is known and well documented for a few decades (RAGNI *et al.* 1987, LAPINI 2006), the European wildcat remains a poorly studied carnivore. Despite the considerable amount of data collected, many aspects of its dynamics are still unexplored and important biological parameters, in the Alpine environment, have not been sufficiently investigated so far. We therefore believe it is important to outline the current distribution area of the felid in Veneto, not only to update and complete previous publications, but also to assess the development of the population and possible directions of expansion, aspects that play a fundamental role in the conservation measures of the species.

## MATERIALS AND METHODS

We have briefly illustrated the main researches carried out in Veneto, remembering the most significant methodologies and results. The numerous data obtained from these surveys, also completed by those collected randomly (e.g. by hikers or CT enthusiasts) and all the carcasses recovered, were the basis for delineating the distribution of the species in the Region.

Veneto is the 8<sup>th</sup> largest region in Italy (Fig. 1), with a total area of 18,398.9 km<sup>2</sup>. It is located in the North-Eastern part of Italy and is bordered to the east by Friuli-Venezia Giulia, to the south by Emilia-Romagna, to the west by Lombardy and to the north by Trentino-Alto Adige/Südtirol. In its northernmost corner it also borders Austria.

By area, 29,1% of its surface is mountainous (Carnic Alps, Eastern Dolomites and Venetian Prealps), hills 14,5 % and plains 56,4%. The prevailing climate in the Veneto is the ‘temperate subcontinental’, covering the whole area of the plain, the pre-alpine valleys and the Valbelluna. Mountain areas are mainly located within the ‘cool-cold temperate’ and only the culminating Alpine areas within the ‘cold climate’.

All wildcats, whether run over or killed illegally, have been assessed on a phenotype-based taxonomic diagnosis; three of these were also morphologically examined and genotyped. During one hair trapping project it was possible to genotype a fourth specimen as well.

The many video-picture documents, obtained largely by camera traps, have been analysed for the differential diagnosis and only those that clearly



**Fig. 1** - (A) Approximate distribution range of the European wildcat (*Felis silvestris*) adapted from IUCN Red List of Threatened Species, version 2013.2 and the five European wildcat (*F.s. silvestris*) biogeographic groups (BGU) (adapted from MATTUCCI *et al.* 2015 and OLIVEIRA *et al.* 2018): BGU 1 (north-eastern Alps, Dinaric Alps, Bulgaria and Poland); BGU2 (peninsular Italy, Sicily); BGU3 (central Germany); BCU4 (south-western Germany, France, Belgium, Switzerland and Luxembourg); BCU5 (Portugal and Spain). The two introgressed populations (Scotland and Hungary) are excluded. (B) The Veneto Region (in black) in north-eastern Italy.

showed with sufficient quality the distinctive somatic features of the European wildcat, have been taken into consideration; we used two different classification systems based on Ragni and Possenti (1996) and on Kitchener *et al.* (2005). The pictures had clearly present at least two of the pelage characters (GÖTZ 2015), such as shape of tail tip and its distinct banding (*Caudalis*), stripes on nape (*Occipitalis-Cervicalis*), stripes on shoulder (*Scapularis*) and dorsal line (*Dorsalis*). The flanks & hindquarters somatic zone (*Lateralis*) have also been considered, even if, these together with just one of the above-mentioned identification criteria, were not considered sufficient to correctly perform the taxonomic analysis. Picture-video data that do not have these requirements have been removed from the overall analysis. Other somatic regions were objectively difficult to evaluate from the collected pictures. Moreover, since the quality of the documents obtained by the cameras is important to obtain reliable data, we evaluated for each picture how many diagnostic characters were visible. All the ones that showed distinct pelage characteristics of domestic cat (e.g. white extensive on paw and flank, tail bands absent etc.) have been discarded and are therefore not part of the wildcat database. Finally, in order to standardize the numerous data obtained by camera traps, we have retrospectively defined the single capture event (detection event), such as the picture or video with a time interval of at least 1 hour from the following event. With this information we have outlined the distribution of the species in the Veneto Region, using the UTM 10X10 km mapping system.

#### HISTORICAL DATA

The European wildcat disappeared from Veneto between the 19<sup>th</sup> and 20<sup>th</sup> centuries. The historical information is fragmentary and rather confusing. Catullo himself, the most important naturalistic historical source for the territory of Belluno, although confirming its presence in the 19<sup>th</sup> century did not define its consistency and exact distribution (CATULLO 1838). Also, for De Betta (DE BETTA 1863) the species would have been present in Cansiglio and in any case Dal Piaz considered it, extinct from the eastern Alps, in the first decades of the last century (DAL PIAZ 1928).

A survey carried out between 1978-80 on the objective findings known at that time for the Friuli Venezia Giulia area, but also in that of Belluno (Veneto), allows us to ascertain the presence of the felid in the Trieste and Gorizia Karst up to the course of the Isonzo River (RAGNI 1981).

Among the historical data, although anecdotal

and without certainty that it was actually *Felis silvestris*, we would like to point out Fossa (FOSSA 1988), which reports about ten putative wildcat specimens caught in the Belluno area between 1938 and 1983.

The causes of its extinction were multiple and essentially due to the combination of direct persecution by man and at the same time, the drastic reduction of its elective habitat, the forest. At the turn of the fifties and sixties, with the abandonment of the medium-high mountains, the arboreal vegetation recovered the spaces of the past and this allowed its gradual return in a spontaneous way. But the slow and constant recolonization was made possible above all by the status of protected and not huntable species.

The European wildcat has recolonized the Italian Alps of the northeast thanks to the dynamic and consistent Dinaric-Balkan population, appearing for the first time in Friuli Venezia Giulia during the 60's. The expansion of the species' range has slowly, but constantly continued, as to reach, in 1983, the Veneto Region. In the second half of the 80's it was thought that the edge of the area of the wildcat was no longer on the Gorizia Karst, but about 60 km northwest, where geographically the Julian Prealps ended and the Carnic ones began. The Veneto figure was positioned, compared to this new margin, more southwest of another 40 km. In the survey conducted by Ragni, Lapini and Perco, no evidence of its presence was found in other areas of Veneto or in Trentino-Alto Adige (RAGNI *et al.* 1987).

#### OVERVIEW FROM 1983 TO 2015

The first data collected in Veneto territory is an adult male killed in the area of Monte Millifret in Cansiglio Forest in 1983 and was the only objective finding in 19 years. In October 2002 a second record is reported, a young female found on the side of the road near Serravalle (Vittorio Veneto - TV), run over (LOMBARDO *et al.* 2003). In Lombardo *et al.* (2003), it is also mentioned that specimens were often killed during fox hunts on the southern and western slopes of the Cansiglio Forest; on other occasions dead wildcats were found along the railway line from Vittorio Veneto up to the Fadalto Pass. These findings, however, have never been collected or photographed.

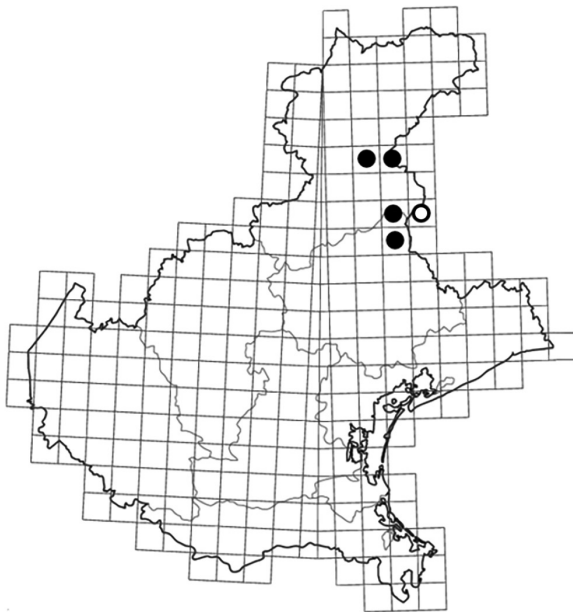
Between 2011 and 2012 the first survey with camera traps was carried out on small and medium-sized carnivores in the Eastern Prealps, in four areas between Cansiglio plateau and Monte Cesen, in the Eastern Venetian Prealps (SPADA *et al.* 2014). No wildcats were documented during this project, which took place from a minimum of 21 days to a

maximum of 30 days. For each study area 4 cameras with lures were used.

In 2013 a study with camera traps was started in the DBNP with the aim of monitoring mesocarnivores (SPADA *et al.* 2016). The survey, which ran for three years, ascertained the presence of the felid in the northern sector of the Park, municipality of Longarone, thus confirming the extemporaneous data previously collected in the same area (Sacchet C., Provincial Police Corps of Belluno). This research was also carried out using lures. During the study, the species was documented 11 times, demonstrating unequivocally its stable presence on the orographic right of the Piave River.

In 2015 a wildcat was recorded for the first time on the northern side of Col Visentin, Eastern Venetian Prealps, in the Faverghera area.

From the data collected until 2015, it therefore seemed that the presence of the species, with temporal continuity, was limited in the northernmost part of the DBNP, in the Cansiglio Forest, Lapisina Valley and on the steep northern slopes of Col Visentin (BON & SPADA 2017) (Fig. 2).



**Fig. 2** – The known data of the European wildcat (*Felis silvestris*) in Veneto Region until 2015, using the UTM 10X10 km mapping system. The full black dot (●) represents at least one wildcat data. The black dot with white centre (○) represents the first data collected in 1983.

#### RECENT SURVEYS (2016 -2020)

After having documented the presence of the wildcat on the ridge of Col Visentin, some of the authors (DEON & TORMEN) started a short monitoring with camera traps and lures between January and May 2016. This is the first targeted, albeit short

and limited, survey of the species. This brief study not only confirmed the presence of the wildcat on this dorsal with 16 capture events of 5 different individuals (RAGNI 2016 pers. comm.), but above all documented the first reproduction in Veneto, when in May 2016 at least one kitten of about 2-2,5 months of age, was caught at the considerable altitude of 1500 m above sea level.

On the basis of previous data collected until spring 2016, the Venetian Prealpine Range was considered the most favourable area for a systematic research on the spread of wildcats. This mountains chain represents in fact, for the biogeographic dynamics of the species, a high value as a faunal corridor in the process of area expansion towards the west. From July 2016 to November 2018 a CT project was conducted on the north-western side of the Venetian Prealps. 23 camera traps were used in different stations without lures, in the municipalities of Belluno, Limana, Vittorio Veneto and Revine Lago. To determine the number of different recorded specimens, morphological criteria were used to distinguish between free-ranging domestic cat (*Felis catus*) and European wildcat (*F. silvestris*) (RAGNI 1981, RAGNI & POSSENTI 1996). Throughout the monitoring, 34 pictures of wildcats were obtained. A minimum of nine different specimens, excluding two kittens, were identified. The estimated wildcat annual density was 0,12 wildcats/100 ha. The rate of capture success for the European wildcats was 1 capture/199 trap-days. Nine stations out of 23 captured at least one wildcat (CATELLO *et al.* 2021a).

In December 2018 a pilot study of hair trapping was started in the prealpine area of Valbelluna (Limana), where each lure-stick was combined with a camera trap (CATELLO *et al.* 2022 (b), Catello *et al.*, this volume). The aim was to test this method on the population of north-eastern Italy and to match genotype to phenotype of documented individuals, trying in this way to increase the knowledge necessary to improve the analysis based on pictures and videos. A total of 10 rough wooden stick of European spruce (*Picea abies*) were used in front of which 10 camera traps were placed. The lure-sticks with their respective cameras were distributed over an area of 12,2 km<sup>2</sup>. They were sprayed with valerian tincture and controlled every 7-10 days. During the survey 5 samples of wildcat hair were collected and allowed the genotyping of a specimen.

Two other investigations are currently underway, within the DBNP and in the Eastern Venetian Prealps, both are applying the CT methods and other surveys are in the planning.

**Tab. 1** - m = male, f = female - Immature (IM) = 5-10 months, subadult (SA) = 11-24 months, adult (AD) = specimen over two years (GÖTZ 2015). \* Lack of distinction in one or more of the tail bands

	Date	Place	Coordinates	Altitude (m asl)	Cause of death	Gender	Age	Weight (gr)	Phenotype	Genotype
1	1983	M.te Millifret (Vittorio Veneto TV)	46° 03' 02'' N 12° 20' 36'' E	1490	shooting	m	AD	/	<i>Felis silvestris</i>	/
2	25.10.2002	Serravalle (Vittorio Veneto TV)	46° 00' 01'' N 12° 17' 23'' E	148	roadkill	f	IM	3100	<i>Felis silvestris</i>	<i>Felis silvestris</i>
3	02.04.2017	Poiatte (Farra d'Alpago BL)	46° 06' 18'' N 12° 21' 13'' E	411	roadkill	m	AD	3990	<i>Felis silvestris</i>	<i>Felis silvestris</i>
4	28.09.2019	Scalon (Vas BL)	45° 57' 03'' N 11° 55' 59'' E	216	roadkill	m	IM	2500	<i>Felis silvestris</i>	<i>Felis silvestris</i>
5	04.12.2019	Col Indes (Tambre BL)	46° 07' 36'' N 12° 27' 04'' E	1290	shooting	f	AD	4750	<i>Felis silvestris</i> *	ongoing
6	11.02.2020	Fener (Alano di Piave BL)	45° 53' 52'' N 11° 57' 09'' E	186	roadkill	f	IM	?	<i>Felis silvestris</i> *	ongoing

#### DATA COLLECTED BY ILLEGAL OR INCIDENTAL KILLING

A total of 6 wildcats have been run over or illegally killed in the Veneto Region in the last 37 years (Tab. 1). We describe them briefly in chronological order:

1) The first specimen for Veneto was an adult male shot down in 1983 (RAGNI *et al.* 1987) at Monte Millifret (Vittorio Veneto – Treviso), along the edge of the Cansiglio plateau, on the eastern side of the Lapisina Valley, opposite Col Visentin. The skin specimen is the property of a private collection.

2) In October 2002 a young European wildcat female was found on the side of a road on the northern outskirts of Vittorio Veneto (Serravalle). The cause of death is attributable to the roadkill (Lombardo *et al.* 2003). The specimen was subjected to both genetic and morphological analysis.

3) In April 2017 a specimen of a wildcat was found run over along the edge of the road along the Santa Croce Lake near Poiatte (Farra d'Alpago). The death occurred following the crushing of the ribcage and liver caused by an investment.

The specimen collected (COMIOTTO D.) and preserved by the Provincial Police Corps of Belluno, was later examined by Prof. Bernardino Ragni. Two

biological samples of muscle tissue were also sent to the Institute for Environmental Protection and Research (ISPRA) which conducted the genetic analysis for the genotype determination. The subject, an adult male of 3/4 years of age (weighed 3990 gr) and was found to be in perfect health on necroscopic examination.

3) In September 2019 at the edge of the Provincial Road near Scalon (municipality of Vas), a young male was found (weight: 2500 g). The specimen had traumas on the head compatible with car accident, that plausibly represents the cause of death. The individual was recovered by the Provincial Police Corps of Belluno and then taken to the Institute for Environmental Protection and Research (ISPRA) for the morphological and genetic analysis.

5) An act of poaching killed on December 4<sup>th</sup>, 2019, an adult female (4750 g). The killing took place at the edge of the Cansiglio Forest (Col Indes), in the municipality of Tambre d'Alpago. The presence of the female wildcat was documented by a camera trap only a few days before, a few meters from the place where she was killed later. In this case the specimen was also recovered by the Provincial Police Corps of Belluno. To date the

\* Shortly before the review phase of this paper, we received 6 new videos of wildcat caught by camera traps placed in the study area of Col Visentin.

results of the genetic and morphological analysis have not yet been received.

6) The first roadkill for 2020 it is a young female and was collected near Fener (Alano di Piave) along the Piave River, in the Venetian Prealps on the border between the provinces of Belluno and Treviso. The carcass has been recovered in order to determine the genotype and to conduct the morphological analysis (BISSONI 2020, pers. comm.). In this case as well, their results are not available at the moment.

## RESULTS

Overall, the data collected in Veneto, from 1983 to May 2020, are 137, of which 9,5 % (13 findings) were discarded for a lack of the requirements established during pre-analysis. Out the 124\* data, most of them, 93 (75,1%), were collected along the Col Visentin - Monte Cesen Ridge, due to the intensive research effort carried out in this area in recent years. On the orographic right side of the Piave River there are 17 (13,7%), most of them in the northernmost valleys of the DBNP, such as the Costa dei Nass and Ross Valley. Eleven data (8,8%) came from the area that has the Cansiglio Forest and the Alpago Basin as its fulcrum. The remaining 3 data (2,4%) were collected between Monte Cesen and Monte Grappa.

In recent years, some cameras have documented the presence of the species in new areas, considerably widening the margins of the known range: two data

from January 2018, the first in the Cordevole Valley, near Salet, the second on the southern slopes of Monte Serva (CANAL 2018, pers. comm.) and in June again in 2018, when a camera trap located in Monte Grappa (FERRARO 2018, pers. comm.) documented a wildcat that currently represents the most southwest biogeographic station in the Veneto Prealps. If compared with the known data up to 2015, these have increased significantly in recent years (18 vs. 124; + 588%), certainly thanks to the considerable research effort, but also due to the greater general attention to species by the hunting world, simple hikers, etc. (Fig. 3).

Altogether 114 (92%) capture events were collected by camera traps (Fig. 4). Of these, 107 events have been viewed by us, a small part of the data collected and already published were not accessible.

Overall, 38 pictures (35%) have 5 diagnosable coat patters (shape of tail tip and its distinct banding - *Caudalis*, stripes on nape - *Occipitalis-Cervicalis*, stripes on shoulder - *Scapularis*, dorsal line - *Dorsalis* and flanks & hindquarters - *Lateralis*), 21 pictures (20%) have 4 visible criterions, 30 (28%) have 3 visible characters and the remaining 18 (17%) only two. It's worth noting that 89 (83%) have at least 3 diagnosable coat patters.

Of the four pictures/videos collected not by camera traps (i.e. other, Fig. 4), three clearly have 5 visible diagnostic characters, while one has three.

The six recovered carcasses in the last 37 years come from the of the Eastern Venetian Prealps chain,

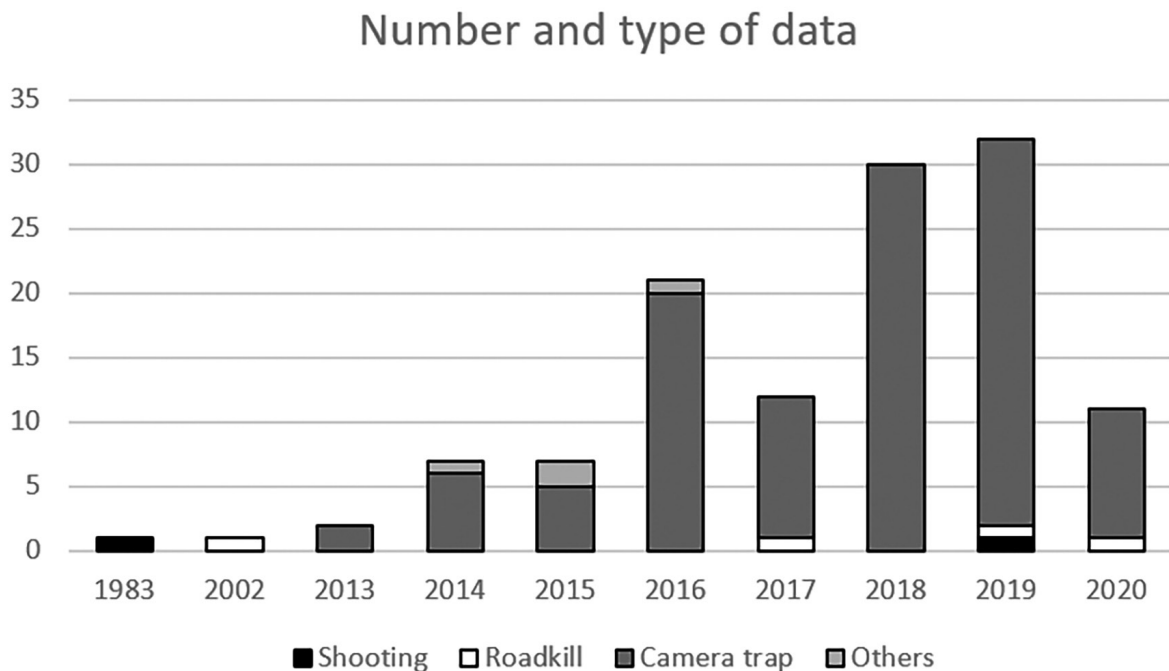
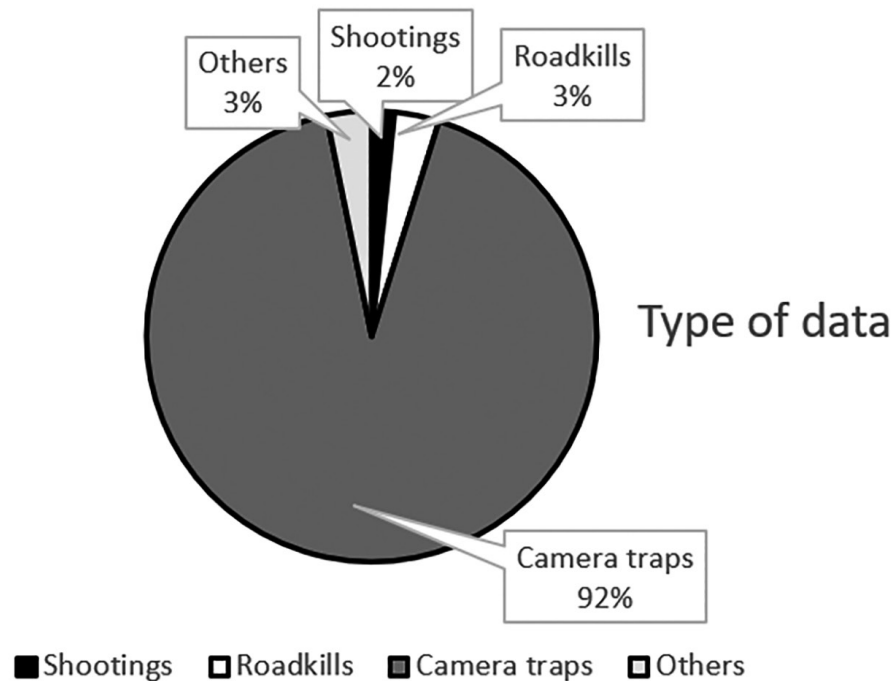


Fig. 3 - Number and type of European wildcat *Felis silvestris* data recorded in Veneto from 1983 until May 2020.



**Fig. 4** - Type of data collected about the European wild cat *Felis silvestris* in Veneto from 1983 to May 2020.

four from the Cansiglio Forest, Alpago, Vittorioese and the remaining two from the narrow valley of the Piave River between Feltre and Pederobba. The phenotype analyses of all these specimens indicate the subjects as belonging to the species *Felis silvestris*.

For three of them, Serravalle (2), Poiatte (3) and Scalon (4) there are also genetic and morphological analyses that confirm the taxonomic diagnosis based on the pelage characters. For the specimens of Col Indes (5) and Fener (6), genetic investigations have been started, but at the time this paper was written, the results have not yet been available. In spite of some discrepancies in the *Caudalis* somatic region of two subjects (Col Indes and Fener), we have considered, waiting for more detailed analysis, to classify them both as *Felis silvestris* (Tab. 1). The adult male shot in 1983 in Cansiglio (1), a skin specimen, the only given indications of the pelage characters do exist.

#### DISCUSSION

All these figures suggest that the distribution range of the species at the moment only concerns the northern part of the Region, with the provinces of Belluno and Treviso. These data, however, considerably expand the known range until 2015 (Fig. 2 and Fig. 5).

The new finds demonstrate the presence of the felid with a vital deme (the two documented reproductions, in 2016 and 2017, have to

be considered very important events for the recolonization of the species) along the entire ridge of the eastern Veneto Prealps, on Monte Grappa, in the lower Cordevole Valley, Monte Serva, the Longarone side of the DBNP, Gallina Valley, Alpago-Cansiglio-Vittorioese.

It is predictable, therefore, that the expansion of the species from Friuli Venezia Giulia towards the southwest, after having crossed the ecological corridors of the pre-Alpine forests, with prevalence of broad-leaved trees, of the Eastern Veneto Prealps, can reach the Asiago plateau, the Vicenza Prealps and then the Lessinia. The four wildcat carcasses found after roadkill were recovered along the Cansiglio Forest-Col Visentin-Monte Cesen route, demonstrating the importance of this corridor in the south-western expansion of the species.

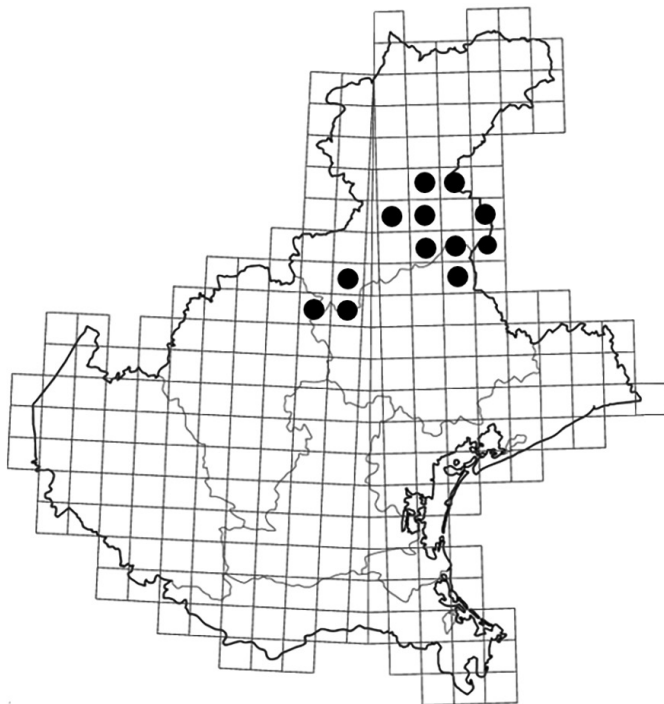
An interesting record, from a biogeographical point of view and which probably shows how the Valsugana is an interesting junction between Veneto and the Adige Valley, is given by a wildcat documented by a camera trap on December 5th, 2017, not far from Trento, on the eastern slopes of Monte Bondone, on the orographic right of the Adige River. This is the first data of presence of this species in Trentino and at the moment, the westernmost in the Italian Alps. Its origin is most likely linked to the present population in the province of Belluno. With this new record so far to the west we are faced with an apparent lack of data for about 55 km from the nearest known station, wildcat of Monte Grappa

(municipality of Seren del Grappa - Belluno), while it is about 80 km compared to that of Cordevole Valley (municipality of Sedico - Belluno).

Compared to the biogeographic limit of the species located in 1987 on the westernmost side of the Julian Prealps (RAGNI *et al.* 1987), we now have sufficient evidence to say that the current geographical boundary of the species seems to have moved southwest of 80-90 km, in the southern part of the province of Belluno (Fig. 5). On the other hand, already from the data indicated by Lapini (2006), it was clear that the margin of the species had shifted further west, as the specimens were constantly reported in the pre-Alpine area on the border with Veneto.

The vitality of the wildcat in the Carnic Prealps of Pordenone (Friuli Venezia Giulia) is also indicated by a recent survey conducted with the CT method, which estimates the average annual density in 0.47 individuals/100ha (FONDA, 2015), almost four times (0,47 vs. 0,12) the density found in the Veneto Prealps (CATELLO *et al.* 2021 (a)).

In any case, considering the dynamics of the species, the current margin in Veneto is considered to be completely provisional, as demonstrated by the specimens documented on Monte Grappa and Monte Bondone in the province of Trento.



**Fig. 5** - The known data of the European wildcat (*Felis silvestris*) in Veneto Region until May 2020, using the UTM 10X10 km mapping system. The full black dot (●) represents at least one wildcat data.

## CONCLUSION

The data collected shows the presence of the European wildcat in two provinces of Veneto; In the southern part of the province of Belluno and in the northwest of the province of Treviso. The southernmost data we know is located about 1 km from the province of Vicenza. The medium-low density (0.12 wildcats/100ha) found during a three-year CT survey in the Venetian Prealps (CATELLO *et al.* 2021 (a)) is coherent with the density of a population on the fringe of the distribution area. The expansion of the European wildcat *Felis silvestris* in Veneto territory towards southwest is still believed to be taking place.

The main factors limiting the survival and conservation of the wildcat are road mortality and poaching, habitat fragmentation and potentially hybridization with the domestic cat.

In north-eastern Italy, Friuli Venezia Giulia and Veneto numerous wildcats have been killed accidentally (roadkill), or illegally (shooting). Hybridization, on the contrary, even if it has been documented, does not seem to represent a problem at the moment. All the genetic and biometric analyses, until 2006, performed on 50 specimens from Friuli Venezia Giulia (LAPINI 2006) and the four from Veneto, the Vittorio Veneto specimen of 2002, the one from Poiate (Farra d'Alpago) of 2017, Scalon (Vas) 2019 and the wildcat genotyped during the hair trapping pilot project (Valpiana – Limana) (CATELLO *et al.* 2022 (b), Catello *et al.*, this volume), exclude the presence of DNA sequences typical of the domestic form. These data are also supported by recent study (TIESMEYER *et al.* 2020) which confirms that hybridization is for the time being a marginal aspect in the population in the Eastern Alps. Hybridization is often observed in expanding marginal micro populations (CURRAT *et al.* 2008): this phenomenon could even facilitate the colonization process of new territories, since the less mobile specimens, the females in the case of the European wildcat, can, at least temporarily, be replaced by the females of domestic cat (PETIT *et al.* 2004).

During the research carried out in the Eastern Veneto Prealps, the results showed some phenotypic anomalies in at least five specimens, suggesting that this could be the result of the introgression of domestic cat (*Felis catus*) genes into the genotypes of the population. But we also have to consider that the origin of this population can only be from the one present in Friuli Venezia Giulia, therefore with traits more variable than the Apennine/Sicilian population (RAGNI *et al.* 1987, RAGNI B. 2017 pers. comm.).



Since most of the data (92 %) were collected using camera traps, it is important to underline that even if coat patterns can serve as a good surrogate of genetic markers during taxonomic diagnosis (BALLESTEROS-DUPERÓN *et al.* 2014, KITCHENER *et al.* 2005, KRÜGER *et al.* 2009 and RAGNI & POSSENTI 1996), in some cases, where the quality of the document is not high, there is a concrete possibility of misinterpretation between European wildcat and domestic cat with striped-tabby pelage. For this reason, this type of data, although fundamental, still has a lower degree of validity than the morphological/genetic analyses. However, we have to emphasize that in 83% of the data collected with the camera traps at least three diagnostic characters of the coat are visible, thus facilitating the differential diagnosis and making it unambiguously. Our data thus indicated that the camera trapping method is a valuable technique for monitoring an elusive carnivore with low population density such as the wildcat. Therefore, we believe that our results can reliably represent the current distribution of the species in the Veneto Region.

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