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LARGE CARNIVORES REPORT 2023

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AUTONOMOUS PROVINCE OF TRENTO
WILDLIFE DEPARTMENT
Large Carnivores Division
FORESTRY DEPARTMENT

LARGE CARNIVORES REPORT 2023

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Back cover
Photo: Young wolf (A. Saddi, APT Wildlife Department archives)
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CONTENTS

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Our special thanks go to Giulia Bombieri (MUSE) and Enrico Ferraro (ACT) for their important assistance in collecting and managing the data relating to monitoring, to Luca Pedrotti for analysis and estimates relating to brown bears, and to the workers and technicians of the Forestry Department who contributed to the construction of wooden shelters for shepherds.

1. MONITORING

1.1 The Bear

Monitoring of the brown bear (Photo 1) has been carried out continuously by the Autonomous Province of Trento (APT) since the 1970s. Over time, traditional survey techniques in the field have been supplemented by radiotelemetry (a method first used in 1976 in Trentino, first time ever in Eurasia), automatic video checks by remote stations, camera traps and lastly, since 2002, by genetic monitoring.

Photo 1 - Brown bear caught by a camera trap in the Brenta Dolomites (M. Zeni - APT Wildlife Department archives)

Since the 1970s a group of volunteers (now called the **"Volunteer group for the monitoring of large carnivores"** coordinated by MUSE and PAT – see Box 2) has remained continuously active. Established to support the monitoring of the then relict population of **bears native to the Alps**, it gradually developed following the progressive appearance in the provincial territory of other large carnivores, represented, in chronological order, by the **lynx** (since the 1980s), the **wolf** (since 2010) and the **golden jackal** (since 2012).

Genetic monitoring

Genetic monitoring is based on the collection of organic samples (hairs, excrement, urine, saliva and tissues) and takes place using two methods, commonly described as **systematic** monitoring, based on the use of traps with scent bait, designed to "capture" hairs using barbed wire, and **opportunistic** monitoring, based on the collection of organic samples found in the area during routine activities, when ascertaining damage and by checking rub trees.

In 2023, genetic monitoring was carried out for the **21st year, coordinated by APT's Wildlife Department - Large Carnivores Section** and with the cooperation of the **Forestry Department**, the Sustainable Development and Protected Areas Department, the provincial agency for publicly-owned forests, FEM, ISPRA, PNAB, PNS, MUSE, ACT and volunteers.

Genetic testing was carried out by FEM's Conservation Genetics Research Unit, in conjunction with ISPRA's laboratories. **Vienna University's laboratory** also contributed to genetic testing of bear samples, in conjunction with FEM.

2023 saw the adoption of both **opportunistic monitoring** (carried out since 2002), and **systematic/intensive monitoring** (carried out every two years since 2019).

Specifically, in 2023, monitoring made it possible to collect **763 organic samples** attributable to **bears** in the province, of which **614** were **analysed**. It was not possible to successfully extract DNA for analysis from 189 of these (31%), whereas the remaining **423** were used for population estimates.

Other data were kindly provided by the **Lombardia** region, the Autonomous Province of **Bolzano**, the **Friuli-Venezia Giulia** region (radiotelemetry data), **Land Tirolo-Austria** (AMT der Tiroler Landesregierung) and **Bavaria** (Bayerisches Lande-

samt für Umwelt). In 2023, **there were no genetic reports of bears** in **Veneto, Piemonte** and **Switzerland**. **Our heartfelt thanks go to all these organisations.**

Changes in the genetic variability of the alpine bear population 20 years after their reintroduction (by FEM)

After the reintroduction of brown bears to the Alps, during the period between 1999 and 2019 there have been considerable changes in the genetic variability of the population. While seeing a numerical increase, **the population has remained isolated from the original Slovenian population**. The origin of the alpine population, initially made up of only 10 bears (of which only 7 involved in breeding), has underlined the importance of **maintaining an adequate level of genetic diversity** to guarantee future adaptation of the species to possible environmental changes.
A survey carried out twenty years after the reintroduction programme, based on a genetic database updated until 2019 and containing 174 genotypes belonging to the same number of bears, analysed several indicators of genetic variability, including heterozygosity, allelic richness and inbreeding coefficient. The analysis showed a gradual loss of genetic diversity over time, however, up to 2019, the **inbreeding values**, albeit increasing, **did not exceed particularly critical levels**. This suggests a need for careful monitoring of the population's vitality, also bearing in mind possible changes to environmental or physiological conditions.

Definitions

- **"Cubs"**: bears aged between 0 and 1;
- **"Young bears"**: males up to the age of 4 and females up to the age of 3;
- **"Adults"**: males aged 4 and over, and females aged 3 and over, considered to be sexually
- mature and capable of breeding;
- **"Detected bears"**: bears whose presence has been ascertained during the year, either genetically or on the basis of unequivocal information and repeated observations;
- **"Roaming"**: movement outside the core area where the females are present, coinciding essentially with western Trentino, by bears born in this area, without them reaching the territory habitually frequented by bears belonging to the Dinaric-Balkan population;
- **"Emigration"**: abandonment of the population present in the province by bears reaching the territory habitually frequented by bears belonging to the Dinaric-Balkan population;
- **"Return"**: return to the core area where the females are present, coinciding essentially with western Trentino, by roaming or emigrating bears;
- **"Immigration"**: arrival of bears from the Dinaric-Balkan bear population in the territory used by bears in western Trentino in a stable manner.

Results

All the **data** collected are processed on an annual basis, with reference to the calendar year (1/1 - 31/12), which effectively coincides with the "biological year" of the bear.
It is implicit that the monitoring techniques cited do not guarantee that **all the bears present** in the area will be detected. However, the application of **statistical methods** makes it possible to provide the overall **estimate** of the total population subsequently presented in the report, with the relative confidence intervals.
Processing of the **data** collected in **2023** has provided the information given below in relation to **births, deaths, population size, structure, trends, distribution** and **roaming** for the population.

Births

In **2023** it was estimated there were at least **13 new litters** (Photo 3), with a total of **22 cubs**. This estimate was made based on direct observation of females with cubs recorded during the year, and to a lesser extent on genetic data.

Photo 2 - female bear with two cubs born during the year photographed in the upper Val di Peio in summer 2023 (F. Michelon – APT Wildlife Department archives)

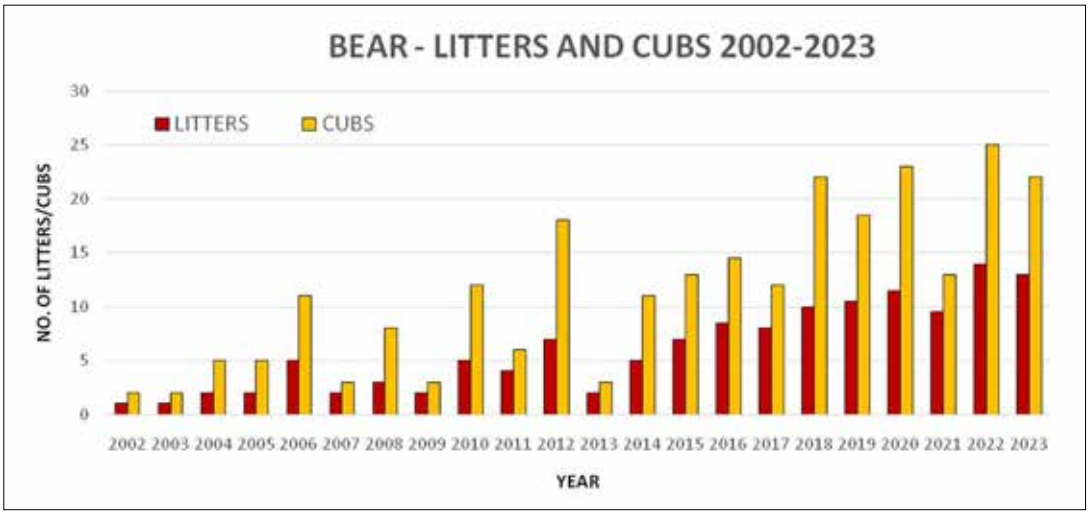
Graph 1 shows the number of litters and cubs estimated to be present each year, from 2002 to 2023. From 2016 onwards the data represent an average of the minimum and maximum number observed.

Deaths

In **2023, the deaths of 8 bears** were recorded.
In addition to these, **a further bear (M65) died** due to a **road accident** on 23 May 2023 in **Tyrol (AUST)**.
The relative **data** for bears found dead in the province is given below, supported by the results of toxicological tests and veterinary autopsies by the Istituto Zooprofilattico Sperimentale delle Venezie, **when available at the time this report was drawn up**.

- **21 April 2023**, at Porcaiola in the municipality of **Cavizzana, a cub born during the year**, subsequently identified as **M93**; the cause of death was not yet known when this report was drawn up;
- **30 April 2023**, at Busa de Lodrìn in the municipality of **San Lorenzo Dorsino, M62**, a male

Graph 1



aged 5; cause of death, **killed by another bear** during a fight taking place where the body was found (Photo 3);
- **1 June 2023**, at Fontana Maora in the municipality of **Ville d'Anaunia**, remains of an unidentified bear in an advanced state of decomposition; cause of death not yet known when this report was drawn up;
- **16 June 2023**, at Rime in the municipality of **Cavedago, F56**, female aged 3; cause of death: **killed by another bear**;
- **24 July 2023**, at Foje in the municipality of **Cimone**, remains of bear (bones) not genetically identifiable (genetic testing was unsuccessful); cause of death not possible to ascertain due to the scarcity of the remains;
- **27 September 2023**, at Val Bondone in the municipality of **Sella Giudicarie**, female bear **F36**, aged 6; cause of death not yet known when this report was drawn up;
- **10 October 2023**, at Poie in the municipality of **Bresimo, MJ5**, adult male aged 18; cause of death not yet known when this report was drawn up;
- **11 October 2023**, at Mondent in the municipality of **Ronzone**, remains of a bear not yet genetically identified; cause of death not known when this report was drawn up.

Photo 3 - M62, an adult male who died after a fight with another bear (E. Moncher – APT Wildlife Department archives)

Size and structure

Following the growth in the population and a partial increase in the distribution area, since 2017 the **size** of the population has been **estimated** in alternate years, making use of genetic "mark-recapture" models (MR). As described above, **genetic monitoring** is based on the collection of organic samples, taking place using two methods, with **systematic monitoring** and **opportunistic monitoring**.

Analysis of the DNA of the samples collected (genotyping) makes it possible to recognise individuals and "give a name" to each bear. In theory, if it were possible to carry out an extensive programme to collect samples throughout the whole alpine area where the bear population is present, we could collect samples for all the bears present and thus have a full census of the population.

As it is not possible to plan a sufficiently extensive programme enabling collection of samples and genotypes for all the bears present, it is thus necessary to base current and future population counts on **estimates**. These estimates are still based on analysis of genotyped samples (the DNA of the bears found) and corroborated by solid statistical data (genetic capture-mark-recapture – CMR - models). The method employed is based on the assumption that only a part of the population (in this case, their DNA) will be "contacted and counted", but that it is possible to reliably estimate the average probability of "finding" each individual based on the samples collected and the collection programme.

In this way it is thus possible to estimate the number of individuals present without necessarily "capturing" them all through genetic testing. The model starts with the **(minimum) number** of individuals whose DNA has been recorded and the probability of "capturing" them, to then consider

the **number of bears estimated to be present** in each year.
As an example, if the individual DNA of 60 different bears is collected during the year, and the probability "p" of capture is estimated as 0.8 (equivalent to an 80% probability of genetically capturing a bear in that year), using statistical genetic capture and recapture models, the estimate is given by N, the minimum certain number of bears "captured" / p, namely 60/0.8 = 75 bears estimated to be present.
One advantage of estimates obtained with these models is that a numerical estimate of population size can be associated with the so-called **confidence interval (CI)**, giving us information about the accuracy of the estimate. Again as an example, a figure of 75 bears with a CI of between 70 and 88 shows that the estimate very probably lies between the interval's minimum (70) and maximum (88) figures.
Carrying out systematic monitoring with a **grid of cells** distributed uniformly over the area, allowing the actions taken to be controlled over space and time, and the comparability of data, guarantees better accuracy and precision for the estimates. This is because appropriate planning of sampling, according to an established schedule and with homogeneous geographical distribution, allows more effective application of statistical models attempting to quantify the average probability that a bear will be "captured" genetically.
The 2023 survey analysed and used **276 samples** collected in an **opportunistic manner** (194 relating to males and 82 to females) and **147 samples** collected in the **systematic** monitoring grid (79 relating to males and 68 to females). Specifically, during 2023 systematic monitoring "captured" 27 females (including 3 cubs) and 18 males (of which 4 were cubs) and opportunistic monitoring 34 females (including 3 cubs) and 39 males (of which 4 cubs). Two males were excluded from the study as they are no longer present in the area of reference specified hereafter.
For the 2023 population estimate it was decided to limit the area of reference to the **province of Trento** and **neighbouring regions/provinces**. Genetic indicators for individuals sampled in Austria and Bavaria (where only two bears were identified: M65 in both **Austria** and **Bavaria**, who died in a road accident on 23 May 2023, and M73, only in Austria) were thus excluded. No genetic indicators arrived from **Friuli-Venezia Giulia, Veneto, Piemonte** or **Switzerland** in 2023.

M. Zeni - APT Wildlife Department archives

Population size
In **2023**, based on data from both types of monitoring, systematic and opportunistic, a **minimum certain number of 79 bears** over the age of one was sampled.
Given a **minimum certain number of 79 bears** over the age of one, it was possible to estimate a **population of 98 bears**, with a **Confidence Interval (CI)** of between **86** and **120**. The estimated number of **females** was **52** (CI 46-63), while the estimated **males** were **46** (CI 40-57).
The official data on population size in **2023**, processed using the genetic capture and recapture estimation models using data relating to the 2015-2023 period, is therefore **86-120 individuals**, without considering **cubs born during the year** (22, as reported above), with an **estimated figure of 98 bears.**
This figure is higher than that estimated (updated) for **2021 (N=85, CI 79-103)*** and indicates **further growth of the population**.
*NB: In 2021, the same model led to an estimate of 73-92 bears (see the 2021 Report, pages 8-10).

Structure

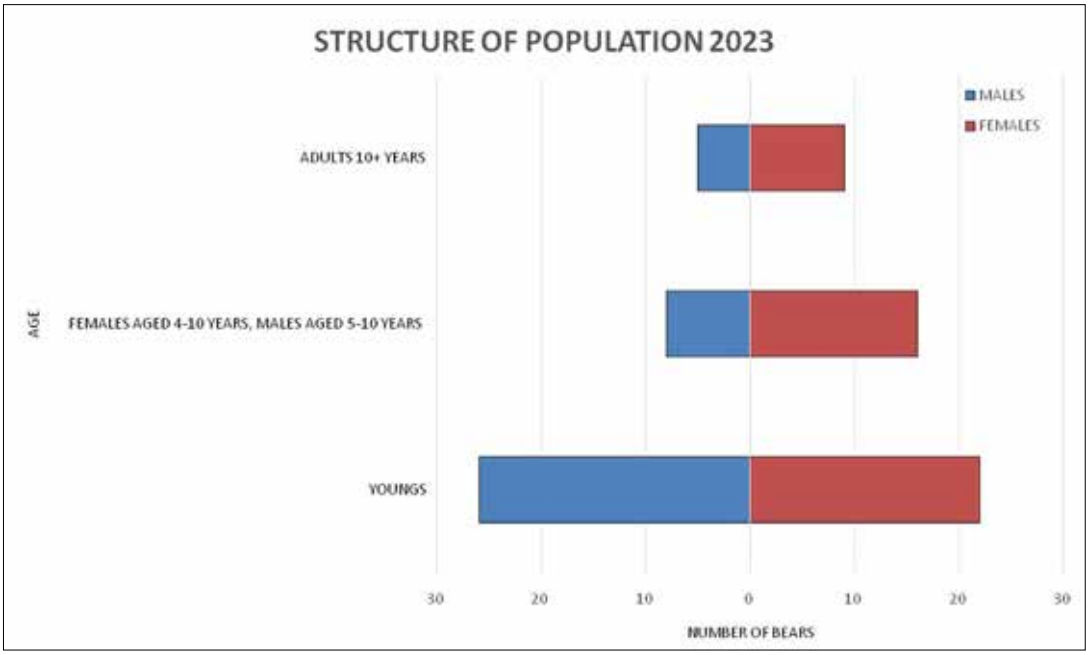
Graph 2 shows the **structure of the population** in 2023 on the basis of age groups. NB: It also includes some animals of uncertain age, which have therefore been distributed among the same age groups with the same proportions relating to bears of known age.

Trends

A **robust design** was used, with a model providing for diversity in terms of the "detectability" of individuals, analysing the overall data available for the 2015 - 2023 period and providing an **estimate of size** for each year available. Graph 3 thus summarises the results of estimates obtained using genetic MR (marking-recapture) models between 2015 and 2023 (average estimates and CIs), also showing the estimates for births each year, as reported above. In this way the **trend for population growth over the last 8 years** is shown, comparing estimates made using the same method.

In short, it can be seen that between 2015 and 2023 the bear population grew further, with different rates of increase depending on the year or 2-year period. The **growth rate** is positive in all periods, with an **average annual figure of 11%**, but with considerable annual variations (from 5% to 16% annually, moreover probably invalidated by the variance linked to the estimates). Specifically, the average annual growth rate in the population in the 2-year periods 2019-2021 and 2021-2023 went down from 11% to 7%.

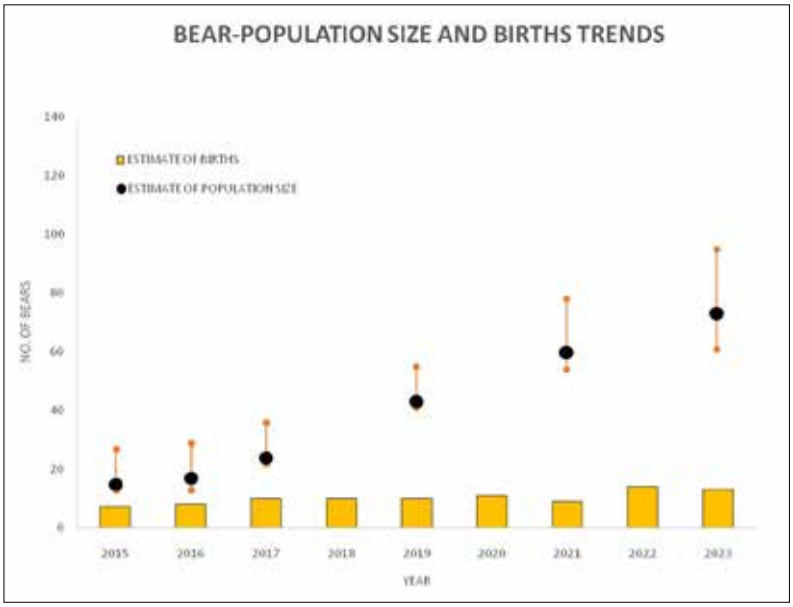
Graph 2



YEAR	N	IC-	IC+
2015	40	38	52
2016	42	38	54
2017	49	47	61
2019	68	66	80
2021	85	79	103
2023	98	86	120

Population estimates with genetic CR models are carried out on each occasion by considering the data for previous years. Hence the 2023 estimate also includes an updated (and more robust) population estimate for 2021, giving rise to the difference between the two figures for that year.

Graph 3



Trend for the population size of young and adult bears (excluding cubs) estimated using genetic marking-recapture (MR) models, (bars with dots representing the confidence intervals in orange) and trend for estimates of births (histogram with orange bars).

Distribution

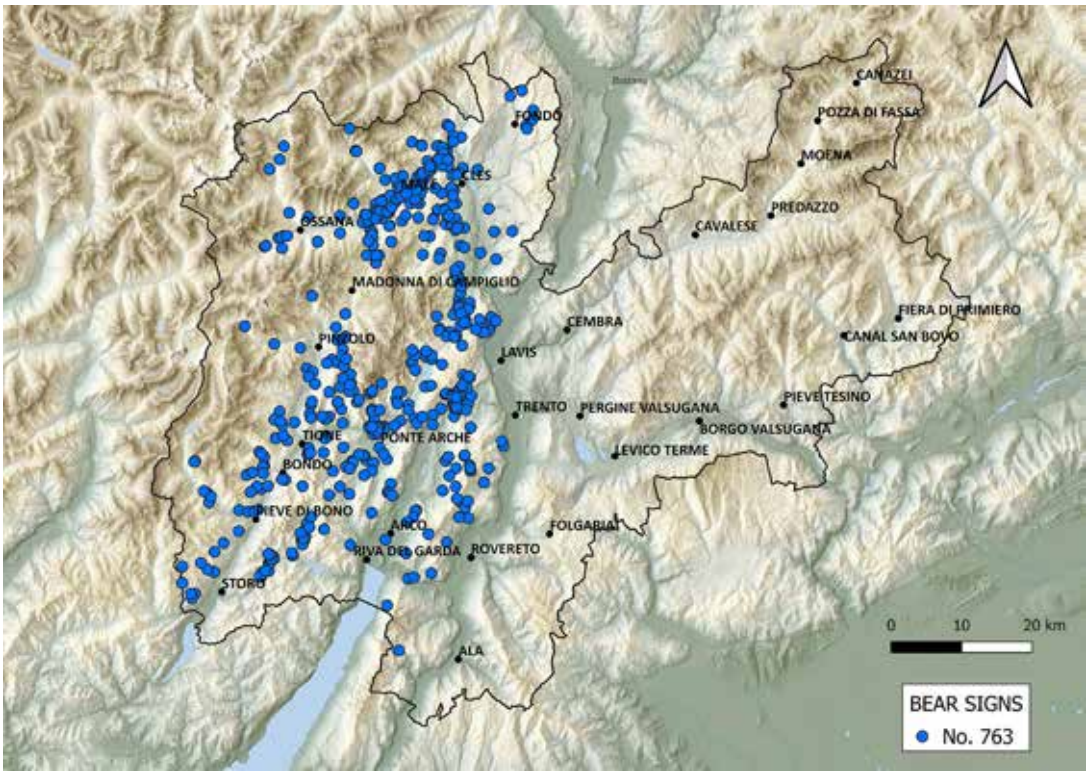
8 of the **92 bears** detected in 2023 were recorded **outside the territory of Trentino: M4** in Friuli Venezia Giulia, **M75** and **M107** in Alto Adige-Südtirol, **M74** and **M82** in the province of Brescia, **M88** in the province of Sondrio, **M73** in Austria and **M65** in both Germany and Austria.

2 of the **bears** present in Trentino also frequented **neighbouring provinces/regions**, specifically **M84** also in the province of Bolzano and **M38** also in the province of Brescia.

The **763 signs of the presence** of bears collected in the province of Trento in 2023 (all those recorded, with the exception of those from satellite telemetry of 2 bears) are shown in Figure 1. NB: **The density of points does not necessarily correspond with the real density of the bears**, as opportunistic monitoring may be influenced by different levels of sampling in the different areas.

Considering also the longest journeys made by young males, on the basis of the data obtained, in 2023 the **bear population in the central Alps** was distributed over **a theoretical area of 40,025 km²** (Figure 2). In 2023, at the extremes of the polygon regarding male bears (Photo 4), there were reports from Tyrol/Bavaria (to the north), in the province of Sondrio (to the west) and in Friuli Venezia Giulia in the foothills of the Carnic Alps (to the east). Another interesting report regards a camera trap image of a bear dating to 1 August 2023 at Lasen-Feltre in the province of Belluno, without however any further confirmation either in the Belluno area or eastern Trentino.

Figure 1



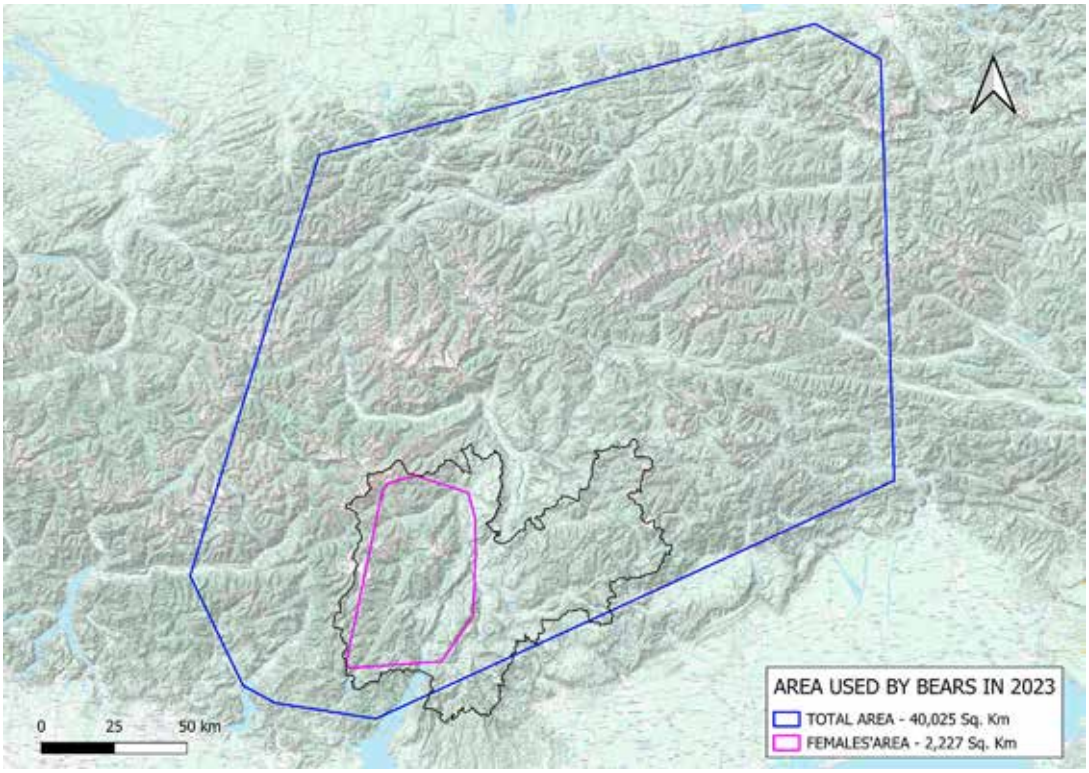
The area occupied by the females in a stable manner remains considerably **smaller (2,227 km²)** but has **increased** compared to 2021 (**+9.2%**).

The areas occupied were estimated using the **minimum convex polygon (MCP)** method, **applied to 100% of the validated signs of presence**. This also leads to the inclusion of vast areas which are not suitable and/or not actually used, especially within the macro-area including the movements of young males.

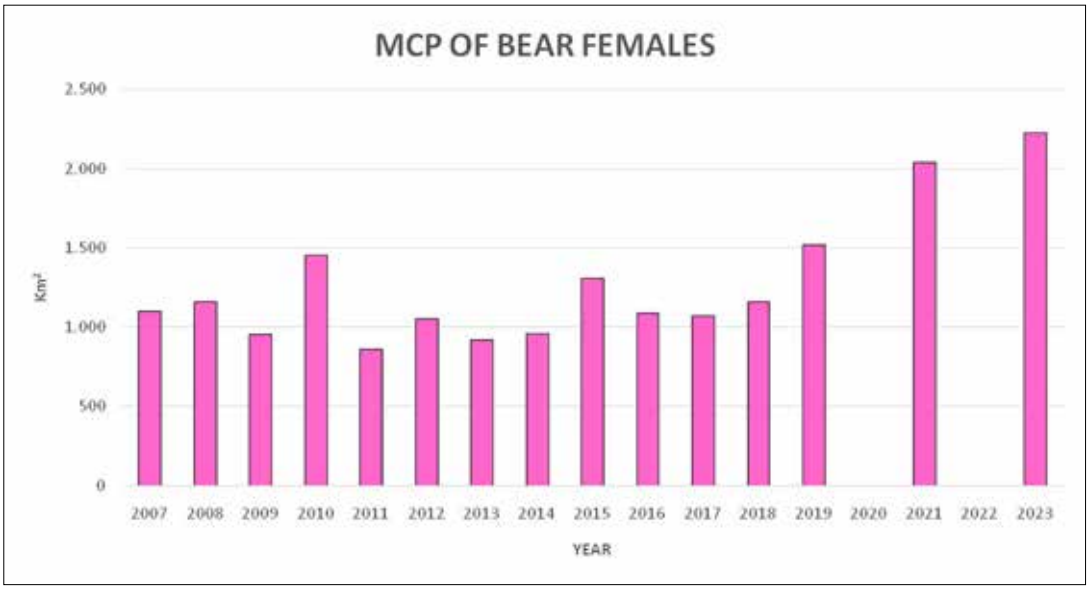
In 2023, the data again confirms the trend for **slow but constant expansion** of the area occupied by **females** in the last few years (Graph 4). As took place in 2021 and 2022, in 2023 some female bears accompanied by cubs again frequented marginal part of the females' historic distribution area in western Trentino, for example the left-hand side of Val di Non, the left-hand side of Val di Sole (Peio and Rabbi valleys), and the lower Chiese valley. The frequenting of areas in the territory of Lombardy (municipalities of Bagolino and Breno) neighbouring on Trentino (municipalities of Storo and Valdaone) for the third consecutive year by females with cubs is of particular significance.

Photo 4 - Adult male bear photographed in the Brenta Dolomites in 2023 (M. Vettorazzi – APT Wildlife Department archives)

Figure 2



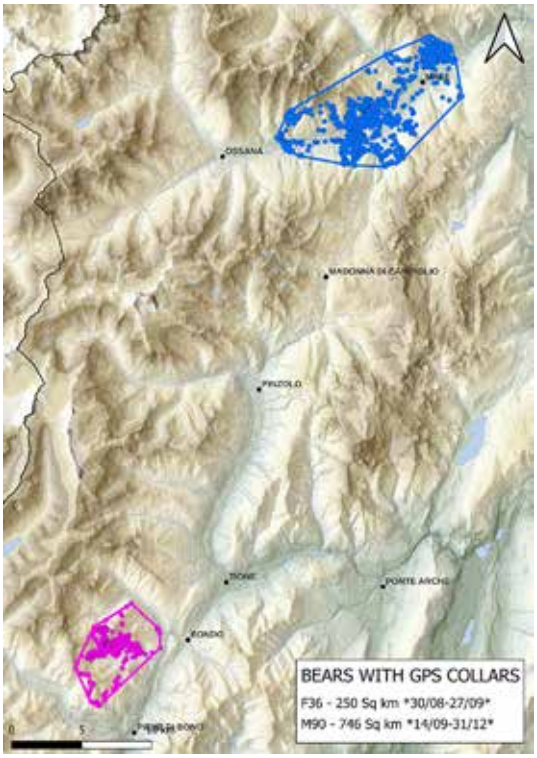
Graph 4 - Expansion of the area occupied by female bears



Use of the space by bears with radio collars

In 2023, **two bears** were monitored using **satellite telemetry**, the 6-year-old female **F36** and the male **M90**, around 3 years old. Their home ranges, calculated using the minimum convex polygon (MCP) method), are shown in Figure 3.

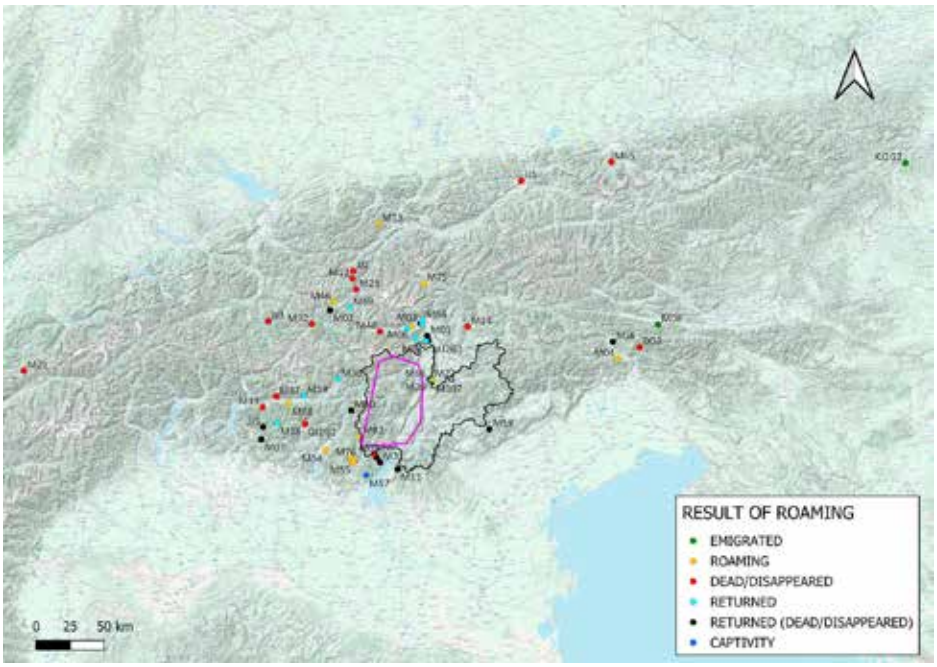
Figure 3



Roaming

In the **2005-2023** period it was possible to document **roaming** (namely bears leaving western Trentino, see the definition on page 6) involving **54 bears** (all males) (Figure 4). **15** of these (**28%**) **died** or **disappeared, 24** (**44%**) **returned, 2** (**4%**) **emigrated, 1** (**2%**) is in **captivity**, and **12** (**22%**) are **still roaming**.

Figure 4



Box n. 1 - Systematic monitoring of large mammals with camera traps – update in the ninth year of sampling

By Marco Salvatori, Valerio Amendola*, Emma Centomo*, Paolo Pedrini* and Francesco Rovero** (*MUSE – **University of Florence)*

Since 2015, the **MUSE** has systematically studied the community of wild mammals using camera traps, in cooperation with the **University of Florence, APT's Wildlife Department** and the **Adamello Brenta Nature Park**. The camera traps are positioned at **60 sites** that have not changed over the years, situated in a **220 km²** area in the southern part of the **Brenta mountains** and the neighbouring **Paganella-Gazza** massif, remaining operational for around 35 days between June and August each year. The project's goals include determining spatial and temporal changes in the **medium and large mammal** community, understanding how they react to the extensive and widespread presence of humans in natural habitats and the protected area, and comprehending trends in relation to the use of the area by these species over the course of the years.

In 2023 the presence of the **golden jackal** on the slopes of Monte Ranzo on the Gazza massif was confirmed, as previously recorded during sampling in 2022. This year a single individual visited the same site as the previous year and another neighbouring site, at a distance of around 1.5 km (Figure A, right-hand panel). As regards wolves, there was instead a clear **increase** in both the number of sites and passage compared to previous years, when only sporadic and occasional events were recorded. For the first time in nine years, the presence of the **wolf** in the study area thus appears to be assiduous and stable (Figure A, central panel). The map of passage sites shows two main geographical nuclei, probably attributable to two different couples or packs, one gravitating around the Paganella- Gazza massif and the other in the upper part of the Manez and Algone valleys. Comparison with the map regarding bears (Figure A, right-hand panel) suggests that wolves may avoid the spaces used most intensively by bears, a dynamic that will be studied in more depth with targeted statistical analysis and as regards which it will be possible to have more information by continuing sampling in the next few years. It will also be interesting to understand whether the new presence of an apex predator will lead to changes in the behaviour of ungulates.

The data regarding bears shows a stabilisation in the number of events, after the growth noted particularly in 2020 and 2021, while there was a further increase in the number of sites frequented, arriving at the maximum recorded to date, with 37 sites. This shows an increase in the part of the area occupied, currently equivalent to 62% of the sites sampled, in line with the **increase in the bear population** in the study area and in western Trentino in general.

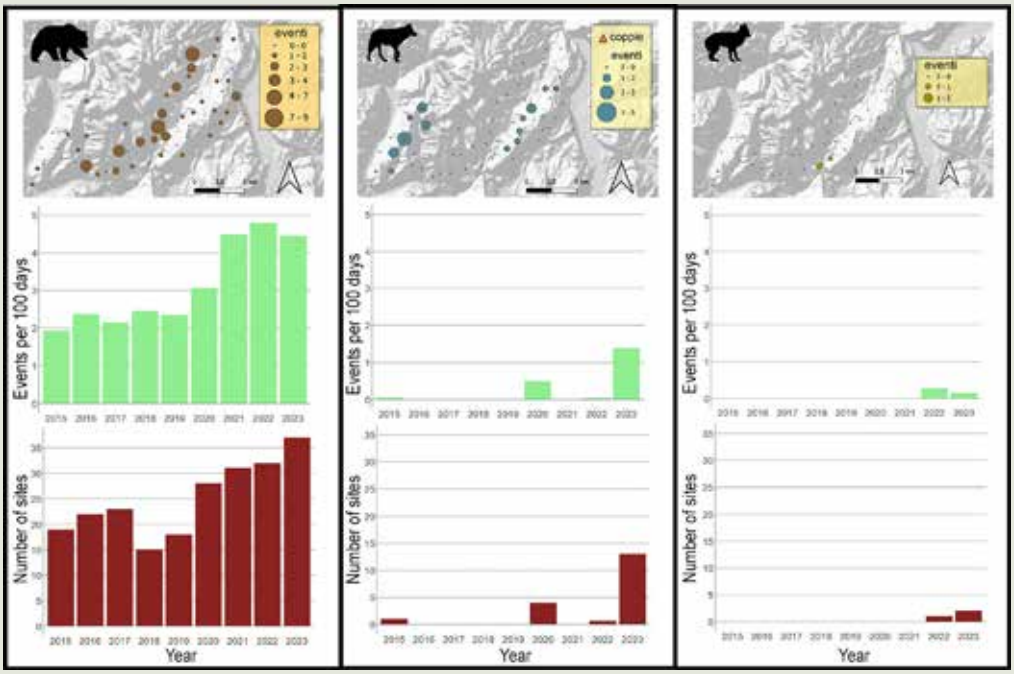
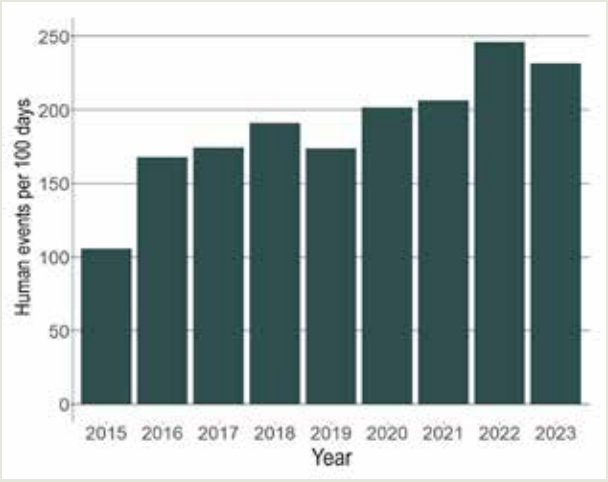


Figure A - The three panels above show the maps of events involving the passage of bears (left-hand panel), wolves (central panel) and jackals (right-hand panel) in the study area in western Trentino based on the 2023 summer sampling programme. The green bar chart shows the number of events (in this case normalised for every 100 days of sampling) recorded for each species in each year of the project, begun in 2015. Likewise, the red bar chart shows the number of sites where each species was recorded in the same period.



As regards **passage by humans**, although the 2023 figure is **slightly lower** than in 2022 (-5.9%), the trend is nevertheless for an increase over the course of time (Figure B).

Figure B - Bar chart showing the number of events (normalised for every 100 days of sampling) recorded for **human beings**, excluding vehicles, for each year of the project, begun in 2015.

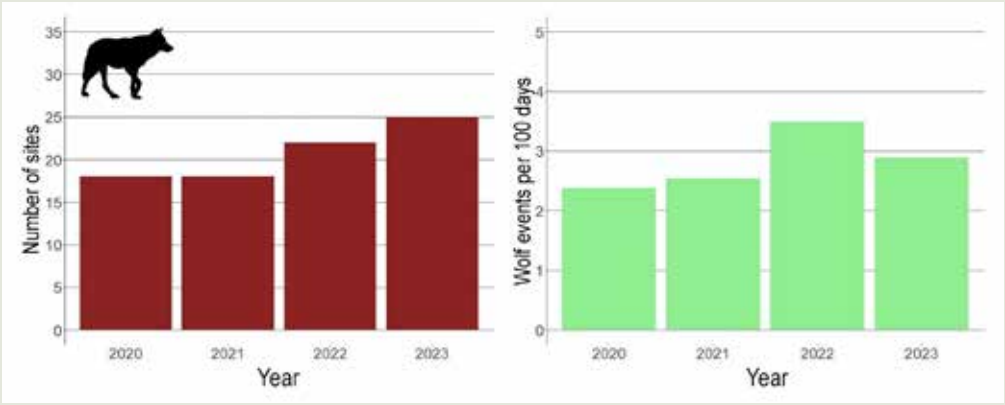


Figure C - Bar chart of the number of sites used (in red on the left) and the number of events (normalised for every 100 days of sampling, in green on the right) relating to wolves in the study area in eastern Trentino from 2020 to 2023.

Furthermore, in autumn 2023, for the **fourth consecutive year**, sampling of the mammal community was also carried out in **eastern Trentino**, in cooperation with the **Paneveggio Pale di S. Martino Nature Park** using the method applied in western Trentino. Of the 99,500 images of wildlife and human beings collected, those regarding the wolf in this area (Figure C) show the use of 25 sites, an increase compared to previous years, with the number of events being almost identical to those recorded in 2022.

The survey map (Figure D) shows marked variability in the zones used over the years, with the exception of right-hand bank of upper Val Cismon, used intensively by several individuals in all years. During sampling in 2023 it was interesting to note the presence of a **wolf with radio collar** in the pack orbiting around the Val Canali and Passo Cereda area. This individual was captured and fitted with a radio outside the province of Trento, in the territory of the **Dolomiti Bellunesi National Park**, as part of a research project headed by the University of Sassari, demonstrating the extensive mobility of this species.

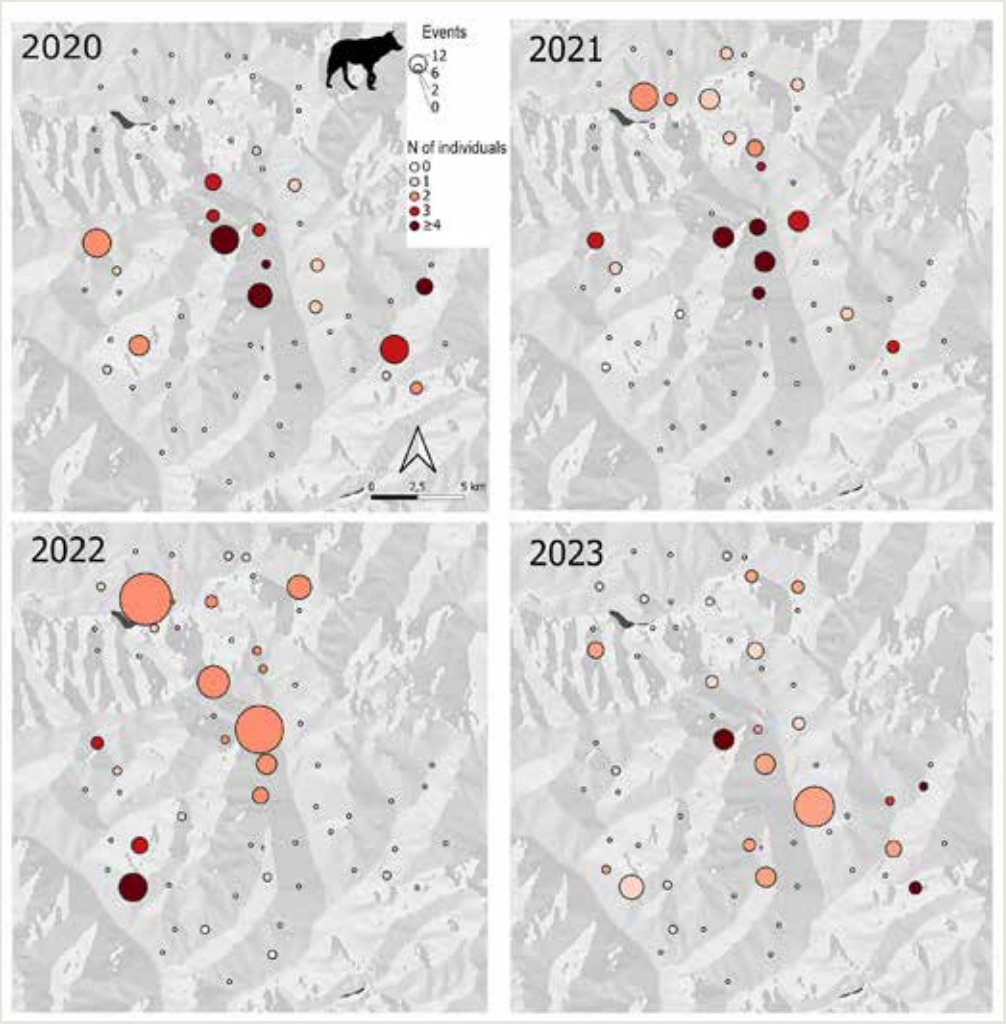


Figure D - Map of events involving the passage of wolves at systematic camera trap sites in the study area in eastern Trentino over the four years of the project from 2020 to 2023. Larger circles show a higher number of events, whereas the darkness of the red tone is related to a larger maximum number of individuals detected (the darkest red shows 4 or more individuals recorded during the same event).

To conclude, we thank the staff of Vezzano Forestry Station, personnel from the Biology Department at MUSE, in particular Giulia Bombieri and Luca Roner, the staff of the Adamello-Brenta Nature Park, especially Michele Zeni, the staff of Paneveggio Pale di San Martino Nature Park, particularly Piergiovanni Partel, Enrico Dorigatti, Gilberto Volcan and PAT-MUSE volunteers for the monitoring of large carnivores, especially Renato Rizzoli for his precious assistance in the annotation of images.

1.2 The Wolf

Monitoring of the wolf **began** with the **natural return of the first individual** recorded in the province in **2010**, although the remains of a dead wolf were previously found in 2008 (see the 2009 Report, pages 57-60). The species had **disappeared** from Trentino around the **middle of the 19th century.**
From the beginning, **genetic monitoring**, traditional **surveys in the field, transects** and **camera traps** were also used for the wolf (Photo 5).

Photo 5 - Female wolf caught by a camera trap in the upper Val di Non at the end of June 2023 (I. Stocchetti - APT Wildlife Department archives)

As is well-known, the **return of wolves to Trentino is part of a phenomenon on a much larger scale** than the provincial territory. For at least four decades the wolf has been **expanding throughout Europe**. All the wolf populations present in continental Europe are effectively linked (except perhaps the population in north-west Spain), making up a single **European metapopulation of around 21,500 animals**, without considering Russia and Belarus (Source: LCIE, Large Carnivore Initiative for Europe 2022 - "Assessment of the conservation status of the Wolf - Canis lupus - in Europe").

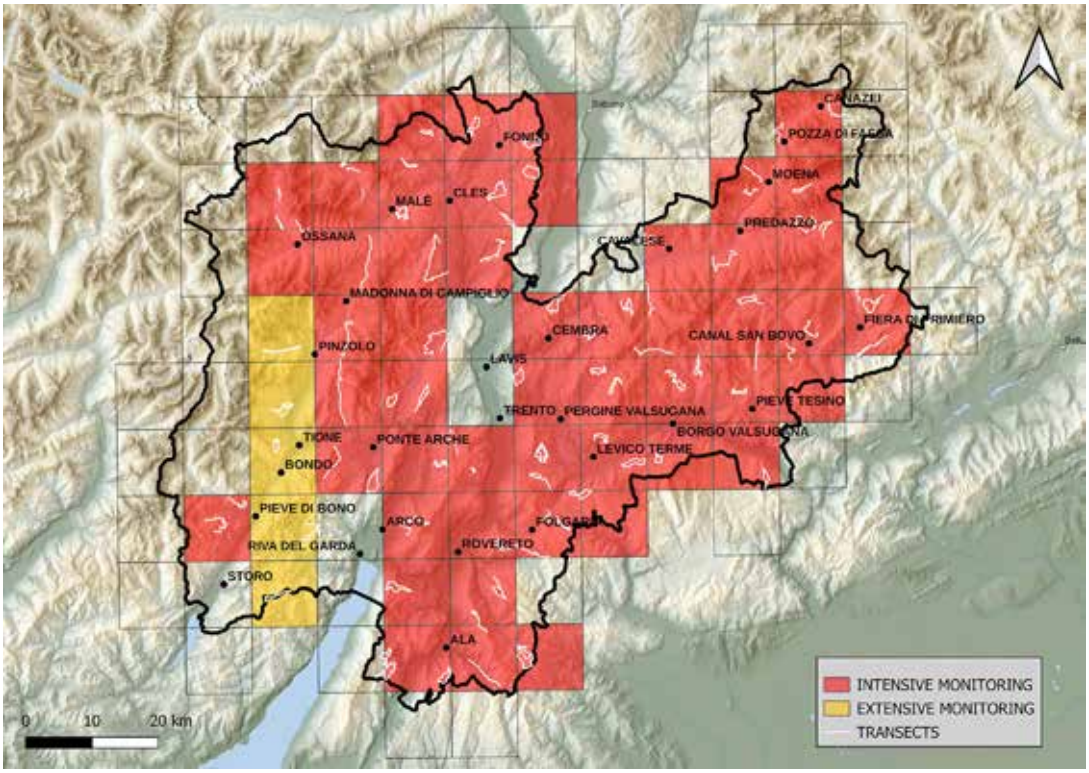
Genetic and camera trap monitoring

Intensive genetic monitoring activities at periodic intervals (every 4 years) are also provided for in relation to the wolf.
This helps to follow the evolution of the population present in the province in the **medium-long term** and **in association with other alpine areas**, given that as recalled above, the "Trentino wolf population" is simply a small part of a **single alpine**, or rather **European metapopulation**.
In **2022 and 2023 genetic monitoring** was **intensive**, with **around 270 samples collected** for genetic testing. Collection of organic samples is supplemented by the use of **camera traps**, helpful in ascertaining unequivocally the **presence** of the species in a specific area, assisting with **minimum estimates of the size of packs**, documenting **breeding**, identifying the formation of new **couples** and potentially **anomalous phenotypes**.
During the **winter of 2023-2024** activities for the collection of data in the context of **systematic monitoring of the wolf** were also carried out, coordinated by the **LIFE Wolf Alps EU project**, with the scope of updating the population estimate and the minimum area occupied by the species in the Alps, the last estimate dating back to sampling carried out at national level in 2020-2021. The **Autonomous Province of Trento** also participated in the initiative, involving several of its departments, and local bodies concerned by the presence of the species, together with **volunteers** associated with and trained by them: **MUSE, FEM, Associazione Cacciatori Trentini, Stelvio National Park, Paneveggio Pale di San Martino Nature Park and the Adamello Brenta Nature Park.**

G. Listorti - APT Wildlife Department archives

Activities for the collection of data in the field take place between November and April. To ascertain the presence of the species, 55 10x10 kilometre monitoring quadrants (cells) have been established. These are inspected by following **82 transects** (pre-established itineraries), examined monthly by operators searching for signs of the presence of the species, especially **genetic samples** to be used to update the population estimate (Figure 5). Systematic collection of the genetic samples in transects is supplemented by the use of camera traps, helpful in ascertaining the presence of the species, documenting new breeding and verifying the number of animals in the packs present in the area.

Figure 5



In 2023 the range of **information** made available by the **Large Carnivores Monitoring Volunteer Group** was again very important: as regards this see the following box.

Box 2 - Support for the monitoring of large carnivores by volunteers in 2023

By the MUSE-APT Large Carnivores Monitoring Volunteer Group

The Large Carnivores Monitoring Volunteer Group, currently working with MUSE in Trento and APT's Wildlife Department, **has been operational since the 1970s** and still continues its activities today (for further details see the 2022 Large Carnivores Report).

In 2023 the volunteers again dedicated many hours to activities in the field, working with commitment and enthusiasm. The data the group has gathered has been particularly important in relation both to **genetic monitoring of brown bears and wolves**, and as regards breeding.

As far as **bears** are concerned, in the period going from mid-April to mid-July 2023, 45 outings were dedicated to **direct observation from a substantial distance**: on 31 occasions bears were observed, for a total of 21 adults, 3 youngs (>1 year <2) and 7 youngs >2 years (not necessarily different individuals). The group's observations also made it possible to recognise some animals thanks to the presence of ear tags or other identifying marks.

As regards **wolves**, there were no less than 11 first reports of **litters**, along with significant individual observations. In particular, the group's work made it possible to identify new **breeding groups**, and to identify an animal that despite a serious injury to one leg (amputation of the rear left paw; see Figure 1) continued to maintain the dominant role in his pack and to raise his young until the beginning of the autumn. As took place in 2022, during 2023, in the Central Lagorai mountains (Lagorai range - Cima d'Asta) the transfer of six wolf cubs a few days old from one lair to another by the dominant female was filmed (Figure 2), occurring between 17 June and 20 June 2023. While the transfer of the cubs observed in 2022 was initially attributed to disturbance of the breeding site, following the observations in 2023 it can be surmised that the transfer of cubs is standard practice for this pack. One important report concerned the breeding male and female in the Bondone-Stivo pack, observed mating on 19 March 2023. It was also possible to document the moving of the rendezvous for the same nucleus, with the transfer

Figure 1 - the dominant male in the Destra Fiemme - Nova Ponente pack (G. Listorti)

Figure 2 - The Alpha female of the Campelle - Calamento pack captured by a camera trap while transporting one of her cubs (F. Romito)

Figure 3 - Mating of the breeding couple in the Bondone - Stivo pack (M. Vettorazzi)

of cubs on 16 September 2023. In the same area, in November, consumption of an ungulate carcass by both wolves and a bear was documented, taking place within a few hours of the animal's death (Photo 4).
As regards the **golden jackal**, thanks to the contribution of some of the group's members it was possible to confirm the presence of the species in the areas already noted in 2022.

These facts and other information acquired thanks to the participation of volunteers, make a fundamental contribution towards increasing knowledge of large carnivores within the provincial territory.

Figure 4 - brown bear and wolf prints on Monte Bondone (F. Romito)

Population, breeding, mortality rates, distribution and trends

In 2023, **2,093 data reports** belonging to categories **C1 and C2** (data defined respectively as "irrefutable" and "confirmed by experts", on the basis of Kora-CH criteria), such as sightings, photographs, prey, tracks, hairs, excrement, urine and damage, referring to the **wolf** were recorded in the province. Of these, **270** referred to organic samples, **261** of which were analysed by the Conservation Genetics Research Unit of **FEM**.
In **2023**, the overall data collected leads to **estimation** of a **minimum number of 27 packs** (or family groups) whose home range included at least partly the province of Trento. The **known packs** are listed in **Table 1**, with the name of the area identifying them, **the year the pack was first recorded, breeding** in 2023, if ascertained (26 cases this year) and the maximum number of animals ascertained from the summer onwards, when available.

In 2023, **1 new couple** in Val Algone-Val Manez was also recorded.

A. Saddi - APT Wildlife Department archives

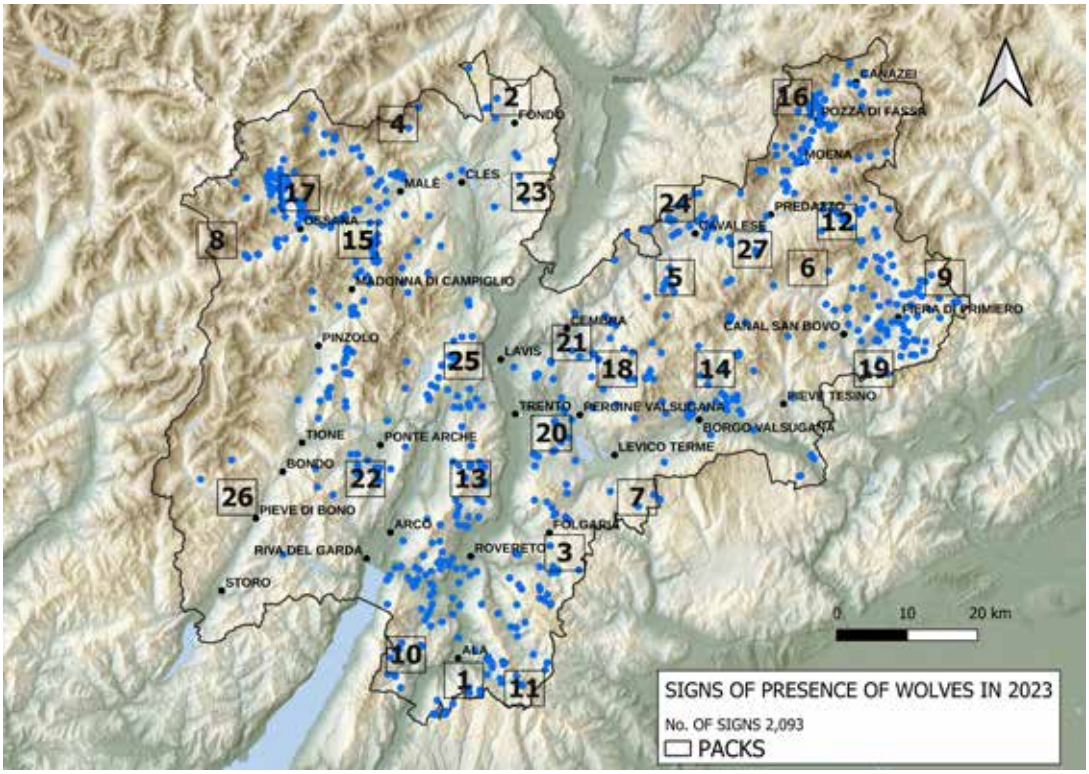
Table 1 - Packs recorded in the Province of Trento in 2023

No.	NAME	YEAR FIRST RECORDED	BREEDING IN 2023	MAX. NO. OF ANIMALS 2023
1	LESSINIA	2013	SI	6
2	ALTA VAL DI NON	2017	SI	3
3	PASUBIO-FOLGARIA	2017	SI	8
4	MADDALENE	2019	SI	5
5	VAL CADINO-VALFLORIANA	2019	SI	9
6	VANOI	2019	SI	8
7	VEZZENE	2019	SI	9
8	TONALE	2019	SI	6
9	AGORDINO-CEREDA	2020	SI	6
10	BALDO-NOVEZZA	2020	ND	6
11	LESSINIA ORIENTALE	2020	SI	11
12	PANEVEGGIO	2020	SI	3
13	BONDONE-STIVO	2021	SI	8
14	CAMPELLE-CALAMENTO	2021	SI	8
15	FOLGARIDA	2021	SI	8
16	LATEMAR	2021	SI	12
17	PEIO-OSSANA	2021	SI	7
18	PINÈ-MOCHENI	2021	SI	5
19	VETTE FELTRINE	2021	SI	7
20	VIGOLANA-MARZOLA	2021	SI	10
21	ARGENTARIO-CEMBRA	2022	SI	8
22	BLEGGIO-LOMASO	2022	SI	8
23	ROEN	2022	SI	7
24	DESTRA FIEMME-NOVA PONENTE	2023	SI	6
25	PAGANELLA-GAZZA	2023	SI	6
26	VAL BREGUZZO-DAONE	2023	SI	3
27	SINISTRA FIEMME-LAGORAI	2023	SI	4

The data given above do not take into consideration **wolves that do not belong to packs**, namely **solitary animals**, usually roaming in search of new territories and partners.
The **geographical location of the packs** is shown in Figure 6, together with the **location** of individual reports. This location should generally be considered approximate. Intensive genetic monitoring data will be able to guarantee greater and more precise knowledge regarding both the size and areas occupied by the packs. Specifically, in 2023 the **Destra Fiemme-Nova Ponente, Paganella-Gazza, Val Breguzzo-Val Daone** and **Sinistra Fiemme-Lagorai** areas were occupied by new packs.

V. Cozza - APT Wildlife Department archives

Figure 6



Graph 5

Graph 5 shows the **trend** for the number of **packs** recorded in the province of Trento, from 2013, the year the first pack was formed in the province, until 2023. **Packs** present in **Trentino** only **marginally** in 2023 are highlighted with a orange colour in the **relative column**.

Photo 6 - Female wolf hit by vehicle in Moena on 23 April 2023 (A. Felicetti - APT Wildlife Department archives)

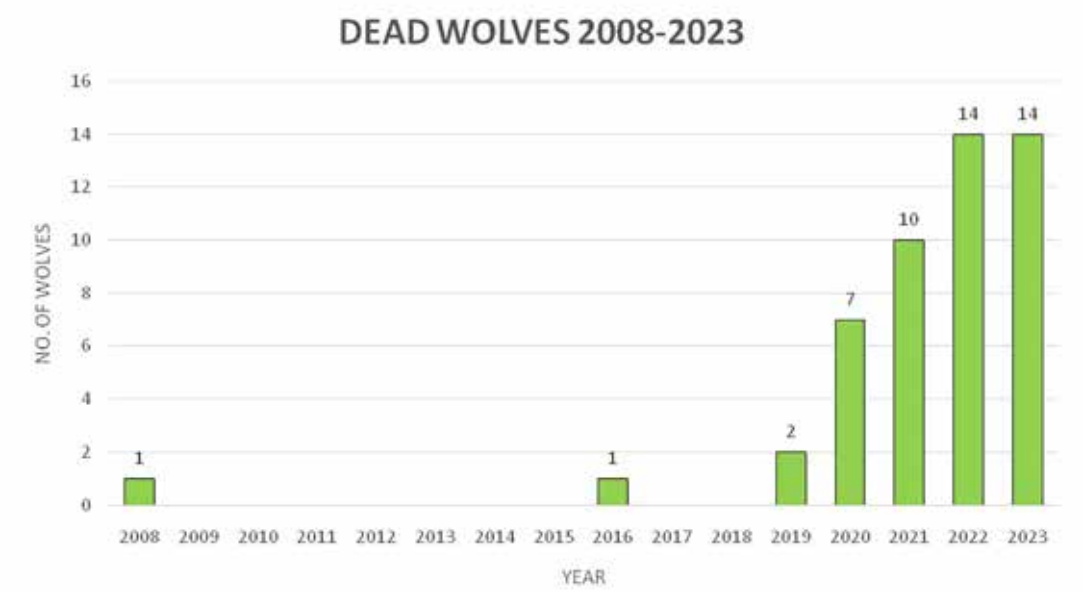
In 2023 the **deaths of 14 wolves** were recorded (**5 males and 9 females** – see Table 2). All the animals were handed over to the Istituto Zooprofilattico sperimentale delle Venezie for the relevant investigations.
In 11 cases the deaths were the result of **road/rail accidents** (1 train accident and 10 involving vehicles, see Photo 6), in 2 cases due to **poaching**, and in 1 case to natural causes.
A **further finding** (jawbone) of a canid, found in the upper Val di Non, **compatible with a wolf**, is currently being analysed.
The deaths recorded (Graph 2) represent only a part of the real number. In the context of what is by now a relatively large population, **death from natural causes** is in its turn relatively significant, but for evident reasons is **more difficult to detect**.

Table 2 -

No.	DATE	LOCATION	CAUSE OF DEATH	GENETIC IDENTIFICATION
1	4 January 2023	S.P 90, between Mori and Chizzola	Road accident	WTN-F026
2	17 January 2023	Loc. Roncogno, Pergine Valsugana	Rail accident	WTN-M073
3	16 February 2023	Nago-Torbole countryside	Poaching – pneumonia prob. resulting from a gunshot wound	WTN-M076
4	20 February 2023	S.S. 240, Mori	Road accident	WTN-F008
5	27 February 2023	S.S. 12, loc. Serravalle all'Adige, Rovereto	Road accident	WTN-F058
6	23 April 2023	S.S. 346, loc. Alochet, Moena	Road accident	WTN-F046
7	26 April 2023	S.S. 240, Mori	Road accident	Not yet known
8	29 April 2023	S.S. 47, loc. Serafini, Grigno	Road accident	Not yet known
9	15 August 2023	Loc. Croce di Bocche, Primiero SMC	Natural causes	Not yet known
10	24 August 2023	Loc. Padaro, Arco	Road accident	Not yet known
11	4 October 2023	S.S. 48, Moena	Road accident	Not yet known
12	10 October 2023	S.P. 31, loc. Malga Baessa, Telve	Road accident	Not yet known
13	16 November 2023	Loc. Raut, Croviana	Poisoning	Not yet known
14	14 December 2023	S.S. 45, loc. Vigolo Baselga, Trento	Road accident	Not yet known

Graph 6 shows the trend for wolves found dead since the reappearance of the species in Trentino.

Graph 6

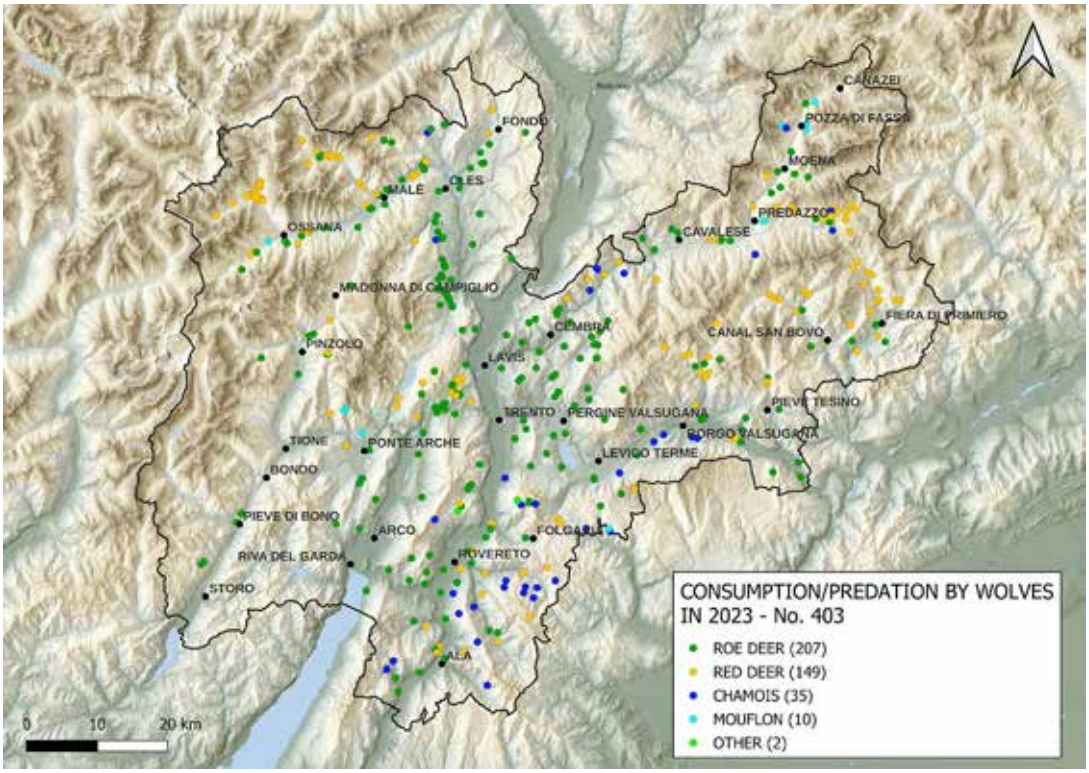


Preying on wild animals

403 cases of **preying/consumption of wild animals by wolves** (Photo 7) were found and recorded in 2023. The data is given in Figure 7, which shows the **distribution and the species preyed on/consumed**.
It should be recalled that the carcasses found represent **only a part of the real number** of animals preyed on, most of which remain undetected. Even the **different proportions of the various species recorded** do not necessarily reflect the real situation, given that the finding of prey by man can be influenced by different factors (for example the vicinity of the carcass to footpaths, roads or inhabited areas, altitude, level of anthropic development, size of the prey etc.), invalidating the real representativity of the data.

Photo 7 - Young chamois preyed on and consumed by wolves (A. Felicetti - APT Wildlife Department archives)

Figure 7


CANAZEI
POZZA DI FASSA
FONDO
MOENA
MALE
CLES
PREDAZZO
OSSANA
CAVALESE
MADONNA DI CAMPIGLIO
FIERA DI PRIMIERO
CEMBRA
CANAL SAN BOVO
PINZOLO
LAVIS
PIEVE TESINO
TRENTO
PERGINE VALSUGANA
BORGO VALSUGANA
TIONE
PONTE ARCHE
LEVICO TERME
BONDO
PIEVE DI BONO
ARCO
FOLGARIA
RIVA DEL GARDA
ROVERETO
STORO
ALA
0
10
20 km
CONSUMPTION/PREDATION BY WOLVES
IN 2023 - No. 403
ROE DEER (207)
RED DEER (149)
CHAMOIS (35)
MOUFLON (10)
OTHER (2)

Box n. 3 - Study of the effects of recolonisation by the wolf on the alpine ecosystem and the relationship between prey and predators – first year

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In the last few decades, human activities and climate change have radically changed the alpine landscape, particularly with the progressive expansion of forest coverage compared to meadows. The increase in infrastructures and socioeconomic changes have made the mountains increasingly more accessible and frequented for tourism and recreational activities in the open air. At the same time, the availability of habitats and the protection and management of species at national level while respecting international directives have created the conditions for the **recovery and expansion of populations of several wild mammals**, representing an example of successful wildlife management and conservation.

Enrichment of the mammal community represents a major opportunity for the ecosystem. Specifically, the recent **natural return of the wolf to the alpine area** can be considered extremely important for ecosystem relations, as the predator at the top of the trophic pyramid (known as the "apex predator") can indeed **regulate the number and behaviour of wild prey**, which in their turn influences the vegetation and habitats for other species. These complex cascade reactions within the ecosystem are known collectively as a "**trophic cascade**". To date, trophic cascades have been studied in relatively unspoilt environments, such as Yellowstone Park for example, but the potential in areas strongly affected by human activities, such as the Alps, is still largely unknown.

In **Stelvio National Park**, for example, the density of deer arrives at very high levels locally, leading to particularly high **grazing pressure** on plants, with negative repercussions on the composition and regeneration of forests and the undergrowth. Other herbivorous species, such as the chamois, could also suffer negative consequences, as they have to compete for the same resources. The return of the wolf, a natural predator of deer throughout its distribution area, could allow natural regulation of deer numbers, thus alleviating the pressure on vegetation. The presence of the predator could also lead to a **change in behaviour by ungulates**, and even by smaller carnivores such as the fox, for example, modifying the timing of their activities, in order to limit movement at the most dangerous times, or changing their use of space to avoid the areas most at risk. These behavioural changes could in their turn **modify and increase the variety of habitats** and create space for other species, such as birds nesting on the ground, for example, or other herbivores that are not the preferred prey of the wolf. The carcasses of deer preyed on can favour 'scavenger' species, such as the bearded vulture, recently appearing in the Trentino area of Stelvio in a stable manner.

This collaborative project between the Stelvio National Park, Fondazione Edmund Mach and the Universities of Trento and Siena, with the support of the Autonomous Province of Trento's Wildlife Department, set itself the objective of studying the new ecological relations emerging in the alpine ecosystem thanks to the return of the wolf and of **understanding the ecological mechanisms** leading to these changes. The study, recently started up in the Trentino section of Stelvio National Park, is taking place in four areas at different stages in terms of recolonisation by the wolf (from no to stable presence) and with different levels of anthropic pressure (protected areas, hunting districts/reserves, tourist areas; Figure 1A). Each study area is subdivided into a grid of 1.5 x 1.5 km cells, where the same study protocol is followed, providing total coverage for the monitoring of 355 km^2.

The Peio valley, situated in the Trentino section of Stelvio National Park, is one of the study areas (Figure 1B) where recolonisation by the wolf has taken place recently, and is therefore particularly interesting in terms of studying the trophic cascade.

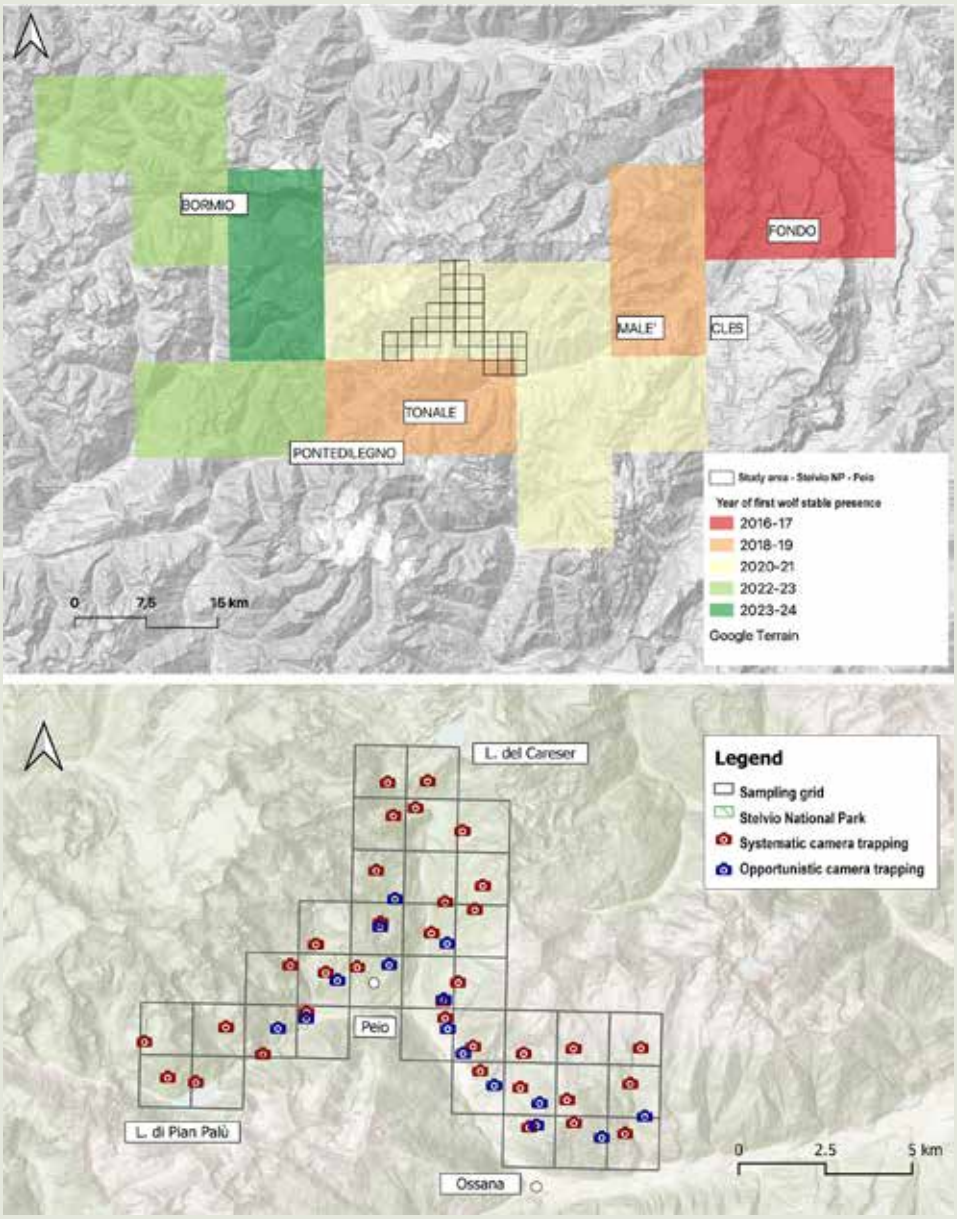

Figure 1 - A: Map of the presence of the wolf in Stelvio National Park and Val di Sole; the detail shows the years of first stable presence (10 x 10 km monitoring grid). B: Map of the study area in Val di Peio, showing the sampling grid (35 1.5 x 1.5 km cells, for a total of around 80 km^2. Each cell contains a camera trap positioned in a randomised systematic manner (in red), operational in the May-October period. The map also shows camera traps positioned in an opportunistic manner on forest roads and footpaths to increase the probability of photographing the passage of wolves.

To **describe and analyse** in quantitative terms any "cascade **reactions**" resulting from the arrival of the predator, the study protocol provides for standardised collection of information and data using camera traps, radio collars, surveys in the field and the collection of organic samples (soil, vegetation, excrement, hairs and saliva). Camera traps have been positioned randomly in each cell, to observe the whole mammal community, while other camera traps have been positioned strategically along routes used by passing wolves to monitor the activities of the pack. At the same time, the use of **satellite collars** to mark deer, with some individuals already captured and released, and wolves, planned for the next few years, will allow detailed study of their movements. In the summer **faecal samples** are collected from wolves, red deer, chamois, roe deer and foxes to study their diet (analysis of metabarcoding) and individual stress level (cortisol analysis), as well as the parasite composition and microbiota of the digestive tract (genetic testing). **The carcasses of animals preyed** on by wolves are sampled (by taking bone marrow and blood samples) to study the health of the prey selected by wolves. The **vegetation** has also been sampled, both to assess the availability of plants for herbivores, and to quantify the impact of grazing on the plant community. Lastly, using analysis of the **stable isotopes** in soil, vegetation and hair samples, it will be possible to trace nutrients, and their recirculation, in the overall ecosystem.

Although laboratory analysis is still underway (the first results are expected by the end of this year), the preliminary data obtained from systematic camera traps show an **extensive community of wild mammals** in the Peio area, made up of herbivores (red and roe deer, chamois, ibex, European and mountain hares), carnivores (wolves, foxes, pine marten and stone marten), omnivores (brown bears, badgers and boars) and rodents (marmots, squirrels etc.). There are also numerous domestic species, such as goats, horses, sheep and cows, as well as cats and dogs.

Figure 2 - Images of sampling using camera traps in the study area in the Peio valley.

Using analysis of the images collected by camera traps positioned in the different study areas, it is possible to highlight any changes to spatial behaviour (for example: deer using different areas or habitats) or temporal behaviour (for example: deer being active at different times during the course of the day) of the species present. Some preliminary results show that the **daily activities of deer over the course of 24 hours are affected by the presence of wolves and hunting activities**. Red deer are usually most active at dawn and dusk and more active at night than during the day, in almost direct contrast to human use of the woods (Figure 3A). However, **deer adopt more diurnal behaviour when wolves are present**, thus superimposing the timing of their activities with the period in which man is also more active (increase of 10% in superimposition; Figure 3B). This is probably to reduce the risks of predation by wolves, whose activities are decidedly more effective at night. Lastly, in areas and periods when there are hunting activities and wolves are present, deer show a clear preference for the time around dawn (Figure 3C), as a practical response to both risks.

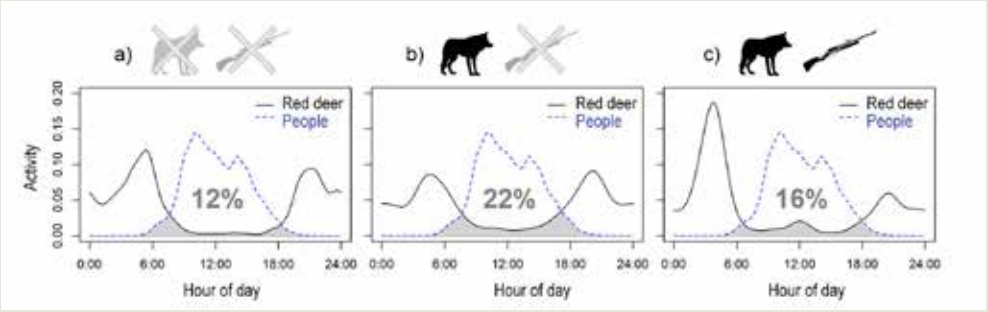

Figure 3 - Timing of daily activities for deer and man over the course of 24 hours during the summer (July-August), a) in the absence of wolves and hunting activities, b) in the presence of wolves but without hunting activities, and c) in the presence of wolves and hunting activities. The grey section shows the percentage of superimposition of activities by deer and man.

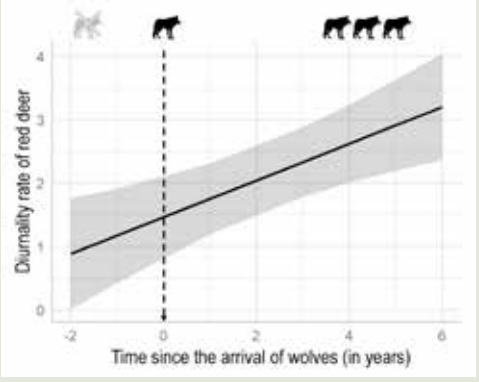

Figure 4 - Relationship between diurnality rate of deer during summer and wolf recolonisation times. As the time since the arrival of wolves increases, the deer in the study area become more diurnal.

The increase in diurnal activities by deer in response to the presence of wolves is also visible when analysed in relation to time since wolf recolonisation: the more stable the presence of wolves, **the more deer are active during the daytime** (Figure 4). This trend shows the wolf's ability to cause lasting behavioural changes in their prey, an initial requisite for the development of a trophic cascade. Indeed, behavioural changes (in the use of time and space) could, over the course of time, also have an effect on other ecosystem components. For example, one of the future objectives could be to verify how a decrease

in the local density of deer in certain areas during the

winter can reduce the impact of browsing on forest regeneration. The emergence of new ecosystem relationships such as these could thus have a cascade effect, allowing an increase in overall biodiversity.

Notes and bibliographical references

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The following box (Box 4) summarises the activities related to large carnivores carried out by the Adamello Brenta Nature Park in 2023.

Box 4 - Il Parco Naturale Adamello Brenta e i grandi carnivori Le attività 2023

By PNAB

- Training courses for seasonal workers at the park acting as cultural personnel in the valleys and at the park's Visitor Centres.
- Training courses dedicated to bears and wolves for organised groups (university master courses, CAI teachers, comprehensive institutes etc.).
- Educational activities in schools at all levels, with particular attention for primary schools.
- UTEdT and adult education sessions.
- Publication of brochures dedicated to bears and large carnivores, published at the web site and distributed in the valleys and at Visitor Centres (on biology, ecology, history, and advice on the behaviour to adopt).
- Meetings with Mayors from the park area to discuss the question of bears and possible approaches, with subsequent activation of a permanent help desk for all administrations requiring further information on bears and wolves.
- Support for forestry departments in the

context of standardised genetic monitoring activities for bears.
- Organisation of public meetings and debates dedicated to bears and wolves for both residents and visitors.
- Participation in television broadcasts and documentary films dedicated to the presence of bears.
- Publication of interviews dedicated to bears and large carnivores.
- Support for degree theses and work experience dedicated to large carnivores.
- Participation at conferences and workshops.
- Zoology-anthropology-sociology study in cooperation with the University of Sassari (Department of Sociology) and the Cà Foscari University in Venice (Human Science Department). The three-year study intends to investigate the approach of individuals and stakeholders to large carnivores, translating the results into concrete communication actions.
- Setting up and creation of the first 8 issues of the newsletter "I nuovi fogli dell'orso", reissuing a similar newsletter sent to over 1000 addresses until 2012. The target group for the initiative is mainly made up of administrators and technicians concerned by the issue of large carnivores. The articles will deal with subjects relating to management, scientific research and the human dimension linked to the presence of large carnivores.
- Setting up of 10 video tutorials available on the web that will explain the best behaviour for ensuring coexistence with large carnivores and minimising the possibility of being attacked, in the context of different activities carried out in the wild. The first two videos are planned for March-April 2024.
- Creation of a text (approximately 20 A4 pages) describing how to behave to avoid meeting bears and how to manage situations. The text will deal with several types of encounter (at close quarters, at
- greater distance, with dogs, with dogs on a leash etc.) describing in detail how best to behave to reduce the likelihood of aggression with physical contact. The main sports and activities that can be carried out in the midst of nature are described, suggesting actions and behaviour helpful in reducing the risks.
- Support for the wolf monitoring network with periodic implementation of two standardised transects, the data for which is sent to APT's Wildlife Department.
- Monitoring of wolves and bears with a grid of 50 camera traps positioned between the upper Val Rendena and the Val di Sole. The monitoring is also a preparatory stage in interpreting potential behavioural changes by prey.
- Monitoring of wolves within the park with opportunistic positioning of camera traps in the areas of greatest interest, with standardised collection of all signs of presence and reports.
- Verification of the possibility of a study designed to prevent damage by large carnivores using acoustic deterrent devices (the material for the survey was acquired in 2023).

1.3 The Lynx

Monitoring of the species began when the **lynx made its return to the province**, namely in the second half of the 1980s, with the appearance of a number of animals in **eastern Trentino in the Lagorai mountains** (present for around 15 years).
Traditional survey methods in the field, **camera traps, radio-tracking** and **genetic monitoring** were also used for this species from the beginning.
As is known, **the only lynx certainly present** in the province of Trento since 2008 has been the male known as **B132**, who came from the small Swiss population reintroduced in the St Gallen Canton (s**ee pages 45 and subsequent of the 2008 report**, along with the appendices and sections relating to the lynx in all subsequent reports). From November 2012, B132 established himself in the south-western part of the province, specifically in the mountains of Val d'Ampola (left-hand slopes of Storo, Tremalzo and Lorina, and right-hand slopes of Monte Stigolo) and the mountains on the right-hand bank of the River Chiese, above Darzo and Lodrone, on the border with Brescia.
In **2023 it was not possible to document the presence of the animal**. The last known information therefore dates back to **22 March 2022**, when B132 was filmed on the valley floor of **Val Ampola**, along the S.S. 240 road between Ledro and Storo, by the driver of bus company (page 23 of the 2022 Large Carnivore Report). **The lack of certain data for around two years** thus suggests that lynx **B132 (aged 16 in 2022)** has **died**.

1.4 The Golden Jackal

The **family groups** whose presence has been ascertained remain those in the **Lomaso** area and in **Val di Stava** (Tesero, Val di Fiemme).
Figure 8 shows the **territorial distribution** of data in 2023 (around 70 reports). Outside the areas of the two breeding groups, the reports relate to solitary individuals.

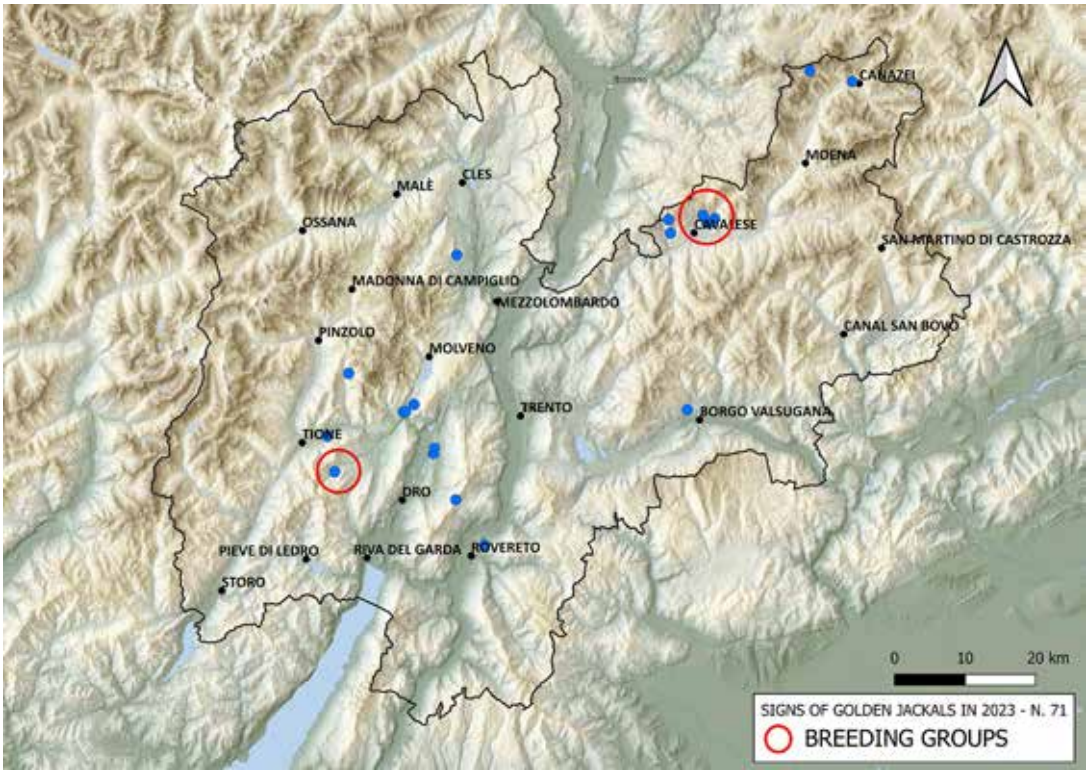


Figure 7 - Signs of presence relating to the golden jackal in 2023 (APT Wildlife Department archives)

Box 5 - The activities of the Associazione Cacciatori Trentini (ACT) to monitor large carnivores in 2023.

By Enrico Ferraro

From the beginning of the **LIFE Ursus** project (1997-2004) the **Associazione Cacciatori Trentini (ACT)** has actively contributed to monitoring the bears released, with its own staff involved in **radiotracking** activities. Over time, this has been followed by various forms of cooperation, culminating with a specific cooperation agreement with the Forests and Wildlife Department at the time, stipulated in February 2015 and dealing with matters related to **systematic and opportunistic monitoring of large carnivores** and the crucial issue of **communication**. Over the course of the last few years, coinciding with the return of the **wolf** to increasingly large areas of the province, the association's activities have increased, above all to obtain an up-to-date picture of the distribution of the species in the area.

During 2023, through its employees and members, the activities of ACT saw a large number of **reports of direct sightings and indirect signs of presence for the three large carnivores** most widely present (the bear, wolf and golden jackal), and collection of **over fifty genetic samples**, with the scope of identifying the individual. Specifically, a number of **bear litters** were reported, along with **breeding by some wolfpacks**, while the presence of a **pack of jackals** in the Bleggio area was confirmed.

The **informative evenings** begun in 2021 and directed at hunters continued, especially in relation to the wolf. There was extensive participation in particular at two events, organised for the management meeting in Tione (29 April 2023, for the Rendena, Giudicarie, Chiese and Ledro districts) and the management meeting at Canal S. Bovo (20 May 2023, for the Primiero district).

As regards **systematic monitoring of the wolf**, the association has again been involved in **alpine monitoring in 2023-24**, following its participation in the first National Monitoring programme in winter 2020-21, which saw the carrying out of surveys throughout the Alps, both in Italy and abroad (France, Switzerland, Austria and Slovenia). Specifically, with its own staff, ACT has taken part in surveying **10 transects** distributed uniformly over the area, to be checked monthly from December 2023 to April 2024, as well as continuing with opportunistic monitoring throughout the province.

In spring 2023, monitoring of the level of **frequentation of ungulate foraging sites by wolves in Val di Fassa** was repeated, having been initiated in 2022, thanks to an important cooperative project with the staff of MUSE, as part of the Stewardship initiative with MUSE and the LifeWolfalps.Eu project (https://www.cacciatoritrentini.it/il-lupo/32-85/).

Lastly, **cooperation with the Fondazione Edmund Mach (FEM)**, project leader, continued during 2023, with the **collection of wolf excrement** for subsequent analysis, in order to assess different aspects. Specifically, it is intended to investigate the main **species preyed on** by the different wolf packs situated in various areas of Trentino.

2. DAMAGE COMPENSATION AND PREVENTION

By now APT has gained over forty years' experience as regards compensation and the prevention of damage. Indeed, **since 1976** 100% of the material value of assets damaged by bears has been **reimbursed** and it is possible to acquire damage **prevention** works (mostly consisting of electric fences or guard dogs). The relative regulations, covered by article 33 **of provincial law no. 24/91**, have been revised and updated several times over the years, also on the basis of directives imposed by the provincial government with resolution no. 1988 of 9 August 2002. With Resolution no. 697 of **8 April 2011**, the provincial government further revised the regulations for damage compensation, also providing for compensation of ancillary expenses and extending 100% compensation to damage caused by **lynx and wolves**.
Preventive activities continue to take place mainly following two main lines of action: funding covering up to 90% of the cost of damage prevention works, or **gratuitous loans** of such works.

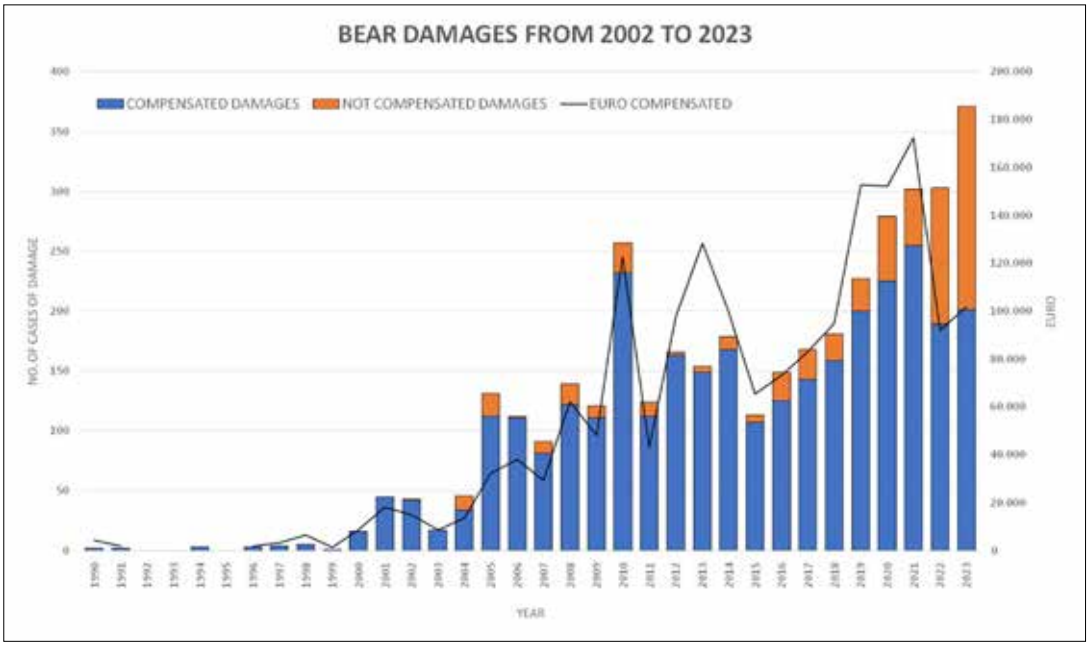
Damage compensation

In 2023, **563 possible cases of damage by large carnivores** were reported to the coordinators of the on-call wildlife and forestry service. In **92% of cases an inspection** was carried out by forestry staff, who drew up a **report** whereas in the other cases the procedure involved a **self-certification statement** by the damaged party. For **264** events the damage related to **livestock**, in **57** cases the damage concerned **beehives**, in **65** cases **crops** and in **177** cases **other assets**. Compared to 2022, there was a marked **increase** in damage to **other assets**, explained by the fact that in 2023, "damage" was also considered to apply to **organic waste bins** and domestic composting bins (over 100 and sometimes merely overturned).
There were no reports of damage by **lynx** or **golden jackals**.
373 applications for compensation were presented (337 accepted, 36 denied); in the other cases **the damaged party made no application for compensation**, as much of the damage was of a very limited nature and many others regarded organic waste bins (most of them simply overturned).
271 applications for compensation were presented by **businesses** (73% of cases), dealt with according to the de minimis principle, and **102** by **private individuals** (27% of cases).
At the time this report was drawn up **196,599.67 € of compensation** had been **paid**, of which **101,889.74 €** for **201 cases of damage by bears** and **94,709.93 €** for 1**36 events involving wolves**. The data regarding the 337 cases of damage, distinguished by predator and type of damage, are shown in detail in **Table 3**.
Graph 7 shows the **trend** for **damage by bears** and the amount of compensation paid.

Table 3 - (Damage by large carnivores compensated - 2023)

ASSETS	BEARS		WOLVES		TOTAL	
	No. CASES	AMOUNTS	No. CASES	AMOUNTS	No. CASES	AMOUNTS
BEEHIVES	29	26.479,72 €	0	0	29	26.479,72 €
CROPS	44	23.393,82 €	0	0	44	23.393,82 €
OTHER	54	13.812,95 €	0	0	54	13.812,95 €
LIVESTOCK	74	38.203,25 €	136	94.709,93 €	209	132.913,18 €
TOTAL	**201**	**101.889,74 €**	**136**	**94.709,93 €**	**337**	**196.599,67 €**

Graph 7



Graph 8

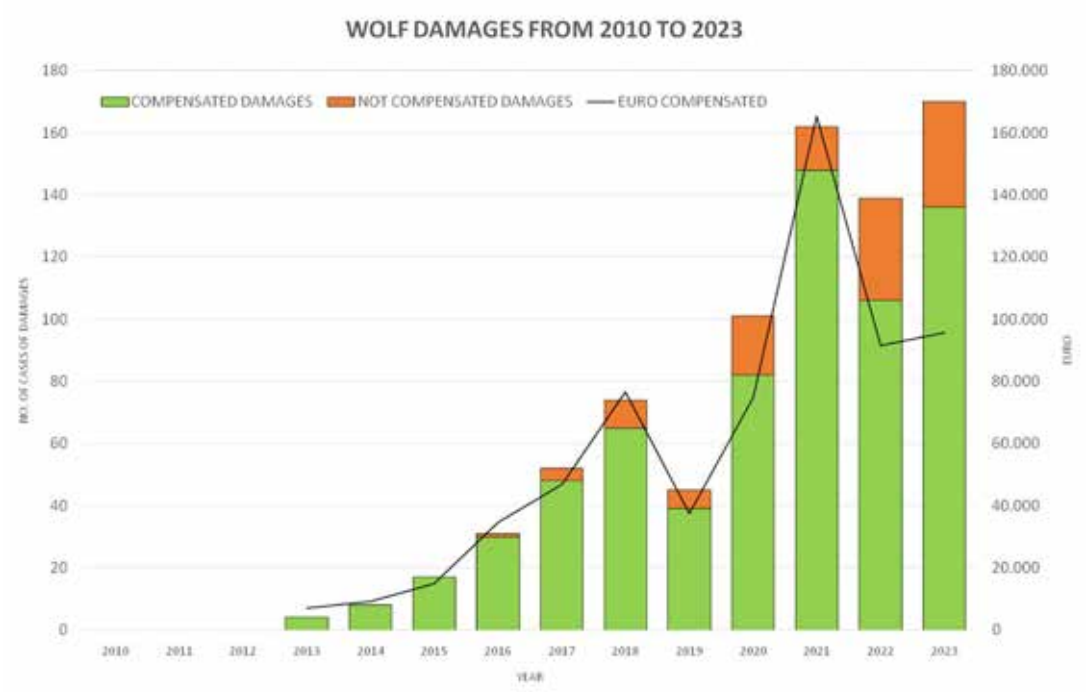


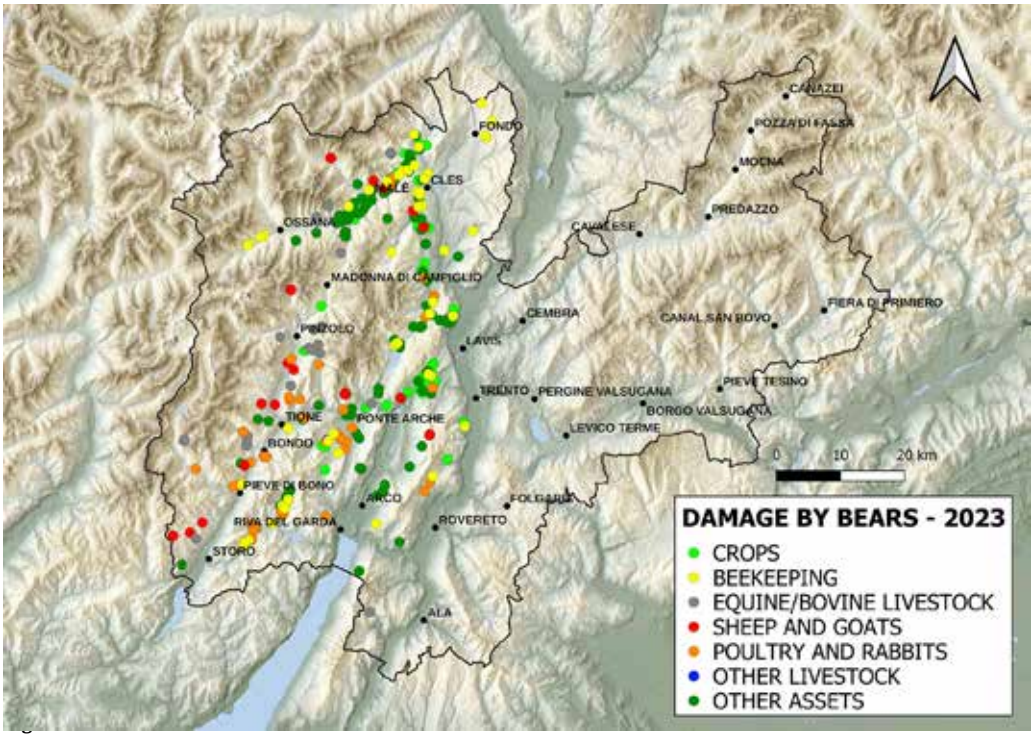
Table 4 - Damage to livestock - 2023

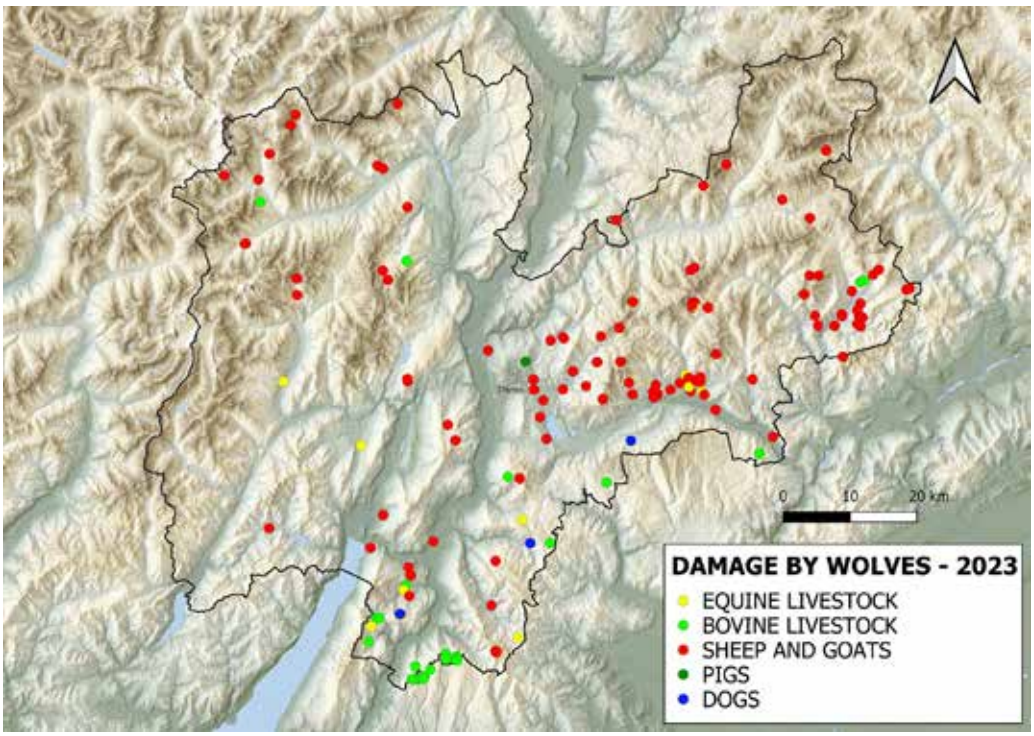
TYPE	BEARS		WOLVES		TOTAL
	DEAD	MISSING	DEAD	MISSING	
SHEEP/GOATS	33	11	235	32	311
EQUINES	12	1	12	0	25
CATTLE	11	0	34	0	45
PET DOGS	0	0	1	0	1
PIGS	0	0	1	0	1
TOTAL	**56**	**12**	**283**	**32**	**383**

With reference to bears, bearing in mind the importance of detecting any problematic animals early, 240 organic samples found at damage sites were analysed in 2023, making it possible to genetically identify 39 different animals (21 males and 18 females). Analysis of the 2023 data showed that males were on average more frequently involved in damage to livestock and food of anthropogenic origin (compost or organic waste bins), whereas females were mostly linked to damage to crops.

As regards the geographical distribution of damage, 70% of cases involving wolves took place in the eastern part of the province and 30% in the western part. All damage by bears was instead recorded in western Trentino.
Figures 9 and 10 show the distribution of damage caused in the area by bears and wolves, distinguished on the basis of the main categories.

Figure 9


CANAZEI
POZZA DI FASSA
MOENA
PREDAZZO
CAVALESE
FONDO
CLES
MALE'
OSSANA
MADONNA DI CAMPIGLIO
CEMBRA
CANAL SAN BOVO
FIERA DI PRIMIERO
PINZOLO
LAVIS
TRENTO
PERGINE VALSUGANA
PIEVE TESINO
BORGO VALSUGANA
TIONE
PONTE ARCHE
LEVICO TERME
BONDO
PIEVE DI BONO
ARCO
FOLGARIA
RIVA DEL GARDA
ROVERETO
STORO
ALA
0
10
20 km
DAMAGE BY BEARS - 2023
CROPS
BEEKEEPING
EQUINE/BOVINE LIVESTOCK
SHEEP AND GOATS
POULTRY AND RABBITS
OTHER LIVESTOCK
OTHER ASSETS


0
10
20 km
DAMAGE BY WOLVES - 2023
EQUINE LIVESTOCK
BOVINE LIVESTOCK
SHEEP AND GOATS
PIGS
DOGS

Box 6 - Predation by wolves on domestic livestock and prevention strategies in the province of Trento

By Giulia Bombieri, Francesca Roseo and Paolo Pedrini (MUSE)

In 2023, **an in-depth study of the cases of wolves preying on domestic livestock recorded between 2013 and 2022** was carried out (available at the following link: https://www.muse.it/contrib/uploads/2023/08/lupo_danni_09_08_2023-1.pdf). This was done to assess spatial and temporal **trends** for predation at provincial level, identify the recurring **characteristics of predatory events** in relation to type and management of livestock preyed on, and ascertain the presence/absence and type of protection measures present. The study also provides an overview of the **prevention strategies** most widely adopted in the province, and the characteristics of mountain dairies, in terms of management and strategies to protect livestock, to understand their vulnerability to large carnivores. In the province of Trento, **between 2013 and 2022**, there were **576 cases of wolves preying on domestic livestock**, involving a total of **2256 animals** (including dead, injured and missing animals). The predation documented is in line with the trend for expansion of the wolf population in the area, increasing over the years both in terms of numbers and the areas affected. The largest number of attacks takes place in August and at night. Sheep and goats are the type of livestock most frequently involved in recorded events of predation (64%), followed by bovines (26%), with animals under the age of 15 months making up the age group most affected (67% of cattle preyed on). On average, predatory events involve 1.2 animals in the case of cattle and 5.4 in the case of sheep and goats.

Overall, **72,687 animals are present at mountain pastures**, mostly consisting of sheep and goats (63.5%), bovines (31%) and equines (2.4%). On average, the livestock preyed on by wolves each year is around 0.6% of the overall livestock at summer pasture (0.8 for sheep, goats and equines, 0.1 for cattle. It follows that sheep, goats and equines (particularly donkeys) are the type of livestock most commonly selected by wolves and hence most vulnerable. Except in specific contexts, such as Lessinia for example, bovines are instead the category most rarely preyed on in relation to their availability at alpine pasture. Evaluation of the presence and functioning of prevention works at the site at the time of predation shows that in 38% of cases at least one prevention work was present at the dairy/pasture site (or other type of location). Most of the predation (81%) took place in the absence of functioning works to protect the animals preyed on, while in 19% of cases the livestock protection measure was functioning effectively. Spatial analysis made it possible to identify the geographical areas and mountain dairies most affected by predation, both over the overall study period (2013-2022), and in the more recent period, of greater interest in terms of management (2020-2022). This analysis has shown that in the last three years the areas at greatest risk have been Lessinia, Baldo, Bondone and Primiero (Figure 1). As regards mountain dairies, there are 30 that have been most badly hit by wolves in the 2013-2022 period. Specifically, 14 mountain dairies have been chronically affected (at least 5 events involving predation between 2013 and 2022), while 21 have experienced large-scale predation (at least 10 animals preyed on for each event). The report also describes the prevention works issued in different ways by the Autonomous Provincia of Trento, and provides information about the management characteristics of the dairies in the area.

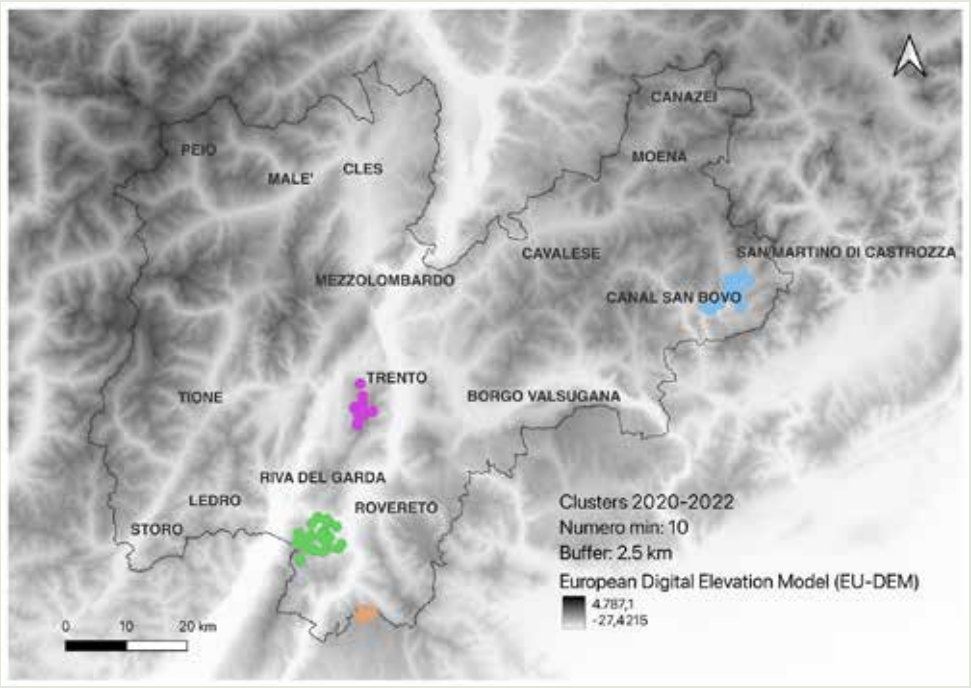


Figure 1. Clusters of events involving predation (at least 10 cases) by wolves on domestic livestock in Trentino in the last 3-year period (2020-2022).

Prevention of damage

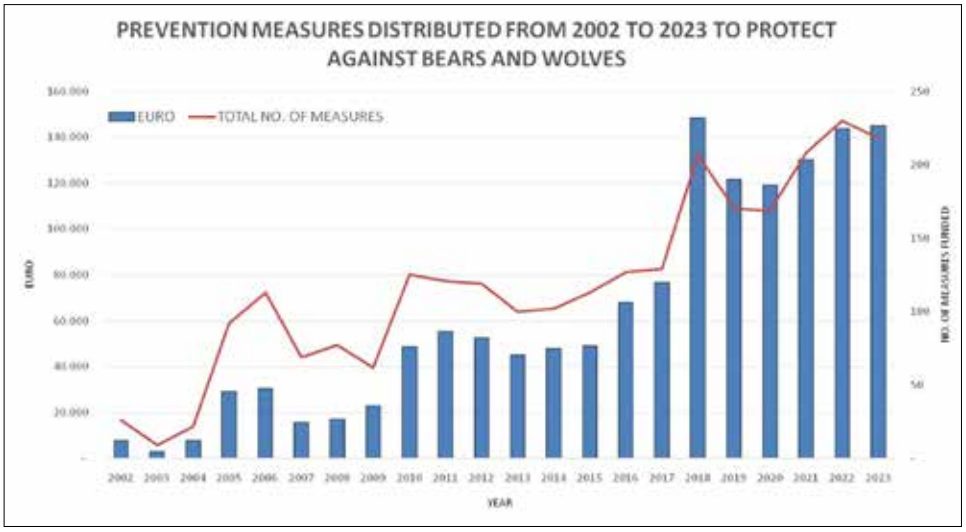
The management of **prevention measures** at provincial level is coordinated by the staff of the Wildlife Department, in association with the local **prevention coordinators**. The latter figure has the role of guaranteeing **technical support** for the prevention of damage by large carnivores and managing activities relating to the **supply of prevention measures** in the form of gratuitous loans (or short-term **loans for emergencies**). This takes place through dialogue, support and continuous liaison with users - managers of farms and mountain dairies, shepherds, beekeepers and hobbyists etc. - who manage assets in the area susceptible to damage by large carnivores. In order to respond promptly and effectively to these needs, the province has been subdivided into **10 zones**, generally corresponding to the Forest District Offices (FDOs), each of which is managed by a **contact figure** and their **assistant/stand-in**.
In 2023 **218 applications** were processed in relation to **measures to prevent damage** by large carnivores (electric fences and guard dogs), measures designed to protect livestock (Photos 8 and 9) or beehives.
Of these, **207** were dealt with by Forestry District Offices (FDOs) through **gratuitous loans** of works (mobile fencing and fixed enclosures), at a total cost of around **€124,200**, and **11** by the Large Carnivores Division through **capital funding** (mobile fencing, permanent enclosures and guard dogs), at a cost of around **€20,900**. In **2023**, a **total of €145,100** was thus invested in prevention.

The following graph shows the **trend** for the number of **prevention measures** distributed and the relative costs (Graph 9) over the years. It is pointed out that until 2012 the provision of preventive measures concerned only bears, whereas since 2013 there has also been a progressive increase in preventive measures requested and distributed to protect against wolves.

Photo 8 - Traditional wooden fence with anti-wolf electrification at Ziano di Fiemme (A. Felicetti – APT Wildlife Department archives)

Photo 9 - Electric fence to protect young cattle, Polsa di Brentonico (L. Mazzetti - APT Wildlife Department archives)

Graph 9



Guard dogs

Guard dogs (Photo 10) have been used effectively for thousands of years to **protect animals at pasture** from attacks by large carnivores. Due to the scarcity or disappearance of the latter, in the Alps the custom of using this form of assistance to prevent damage had been lost. With the progressive return of brown bears and wolves to Trentino, and starting from the first APT funding for the purchase of guard dog puppies (see page 43 of the 2014 Report), access to this type of public aid and the use of guard dogs in general has gradually increased.

In **2023, 9 further dogs** were funded, at a cost of around **€6,660**. When requested by users, the Wildlife Department provided support in searching for litters from reliable parents working in the field, availing itself of the cooperation and expertise of **CPMA - Circolo del Pastore Maremmano Abruzzese.**

The puppies, aged between two and six months and all belonging to the Maremmano-Abruzzese sheepdog breed, were purchased from ENCI (Ente Nazionale Cinofilia Italiana) breeders, also from Trentino, guaranteeing health standards and genetic lines with an aptitude for work. Indeed, from the beginning, the project to promote guard dogs has funded puppies born to parents effectively active and efficient in terms of defending livestock.

By the **end of 2023**, a total of **95 dogs had been funded** in the province of Trento. The dogs purchased with financial support from APT have been supplemented by direct purchases, dogs from farmers' home litters or exchanges between farmers.

These additional ways of acquiring dogs are a sign that the practise of using guard dogs is by now **well-established**, as the provincial administration expected and hoped.

With the widespread use of these dogs, over time there has been a predictable and inevitable increase in **conflict with other users of the mountains** (day-trippers, people doing sports, walkers accompanied by dogs etc.), usually relating to episodes when the guard dogs have defended the animals entrusted to them particularly strenuously. Given this issue, as requested by the provincial administration, since 2023 access to financial aid for the purchase of these dogs is subject to attending a **basic training course on the education and management of guard dogs**.

This is to provide future users of these dogs with better knowledge of the behavioural characteristics of guard dogs. Interested parties can organise this course independently, by contacting specialist vets or dog trainers with proven experience, or they can make use of courses organised by public bodies and associations.

In this context, as in 2022, the Wildlife Department organised a free 1.5 day course (Photos 11 and 12), once again hosted by the **Federazione Provinciale Allevatori di Trento**. The 2023 event was jointly organised with **MUSE**, which as partner in the ***Life Wolfalps EU*** project, actively encouraged the repeating of a specific course for guard dogs previously held in Piemonte with the endorsement of the Life project.

The Trentino course was also managed by specialists from the ASL in Piemonte (dott.ssa Silvia Dalmasso, dott.ssa Patrizia Morero, dott. Umberto Vesco, and dott. Mauro Moretta).

In 2023, the Forestry Dept. and Wildlife Dept. continued to distribute **information panels** to those using guard dogs funded by the Province, with the scope of making users of the mountains and pastures aware of the presence of **dogs protecting flocks**, and of advising them how to behave to avoid conflict with such dogs.

Photo 10 - Maremmano-Abruzzese sheepdog at Malga Tuena, Val di Tovel (M. Zeni, APT Wildlife Department archives)

Photos 11 and 12 - PAT-MUSE-Life Wolfalps EU

Photo 12

Meetings with representatives of economic stakeholders

In 2023, the dialogue already established for some time with the economic interest groups most affected by the presence of bears and other large carnivores continued.
The **round table with representatives of farmers and beekeepers** met on **22 March 2023**.

Support for animal husbandry

One of the provincial administration's objectives is to encourage herders and their flocks/herds to stay at alpine pastures. The presence of the shepherd and adoption of the most appropriate systems for preventing damage, along with fair compensation and constant liaison with local forestry service staff, are the strategic factors in **mitigating the impact of large carnivore**s on **animal husbandry in the mountains**.
Since 2018, the Forestry and Wildlife Department, now the Wildlife Department, has promoted **experimentation of electric fences** to protect bovines at high risk of predation by wolves (cattle under the age of 15 months) (see Box 5, 2018 Large Carnivores Report, pages 32-36).
In 2023, the **prevention coordinators** specifically followed the progress of a **total of 26 alpine pastures**, which were provided with damage prevention works in the form of **loans** for the summer grazing period alone (usually from June to September). When possible, this temporary and/or emergency measure was replaced with the **assignment of gratuitous long-term loans** (with the works being lent to the user for a duration of 8 years) or by **funding** to acquire such works.
In 2023 verification/support activities by the Forestry Department and the Wildlife Department (Photo 13) **continued**, with **monitoring of the experimental prevention works implemented from 2018** (see, most recently, the 2022 Large Carnivores Report, pages 32-33) and planning of further works having the same goal and similar characteristics.
The trials reported above have highlighted on the one hand a clear **increase in management activities and relative costs** for the managers of mountain dairies, but on the other, in certain contexts, also an **improvement in the pastures used by the animals**, with effects on the quality of the turf. In this context, it is hoped that in the future additional electrified enclosures will be set up at other alpine pastures in Trentino to protect livestock at risk of predation, particularly where there have been **repeated episodes of wolves preying on livestock**. The data indeed shows that **chronic attacks** on livestock at alpine pasture by wolves tend to take place more frequently at alpine pastures where **livestock graze unattended**.
The adoption of preventive measures, whatever they are, such as the adoption of management models that reduce the negative effects of predation, are strongly conditioned by the presence or absence of **shelters** for shepherds. In

Photo 13 - Checking of camera trap at an anti-wolf fence in Lessinia (M. Zeni - APT Wildlife Department archives)

this context, support for summer grazing activities also involved the **supplying and helicopter transport of 17 accommodation modules** (more than ever before), to encourage the constant presence and supervision of livestock by herders where there are no alternative shelters.

The construction of **permanent wooden shelters** also continued, to replace the accommodation units, which are considered to be emergency and temporary measures (for further details see Box 7, which follows).

Box 7 - Prevention of damage by large carnivores: wooden shelters for shepherds

By Stella Liberi, Forestry Department – Administration and Forest Works Office

Ancient history, and more recent events, have shown that protecting livestock from attacks by large carnivores at mountain pastures requires the **constant presence of shepherds**. For this reason, starting from **2008**, the Forestry Department and the Wildlife Department (formerly the Forestry and Wildlife Dept.) have organised and implemented the **transport** of small **portable cabins to alpine pastures** using the aircraft of **APT's Helicopter Unit**, to be used as shelters for shepherds where there are no permanent structures present.

However, over the years the use of such cabins has been shown to have some **limitations**, linked to their provisional nature. Transporting them to and from the mountains at the beginning and end of each season involves high **costs**, both financial and in terms of staff, but also from the bureaucratic point of view. Furthermore, the considerable **risks** linked to the safety of staff and the negative impact on the surrounding environment cannot be ignored. Last but not least, it is necessary to consider the **poor level of comfort** offered to the shepherds living there.

It was therefore decided, when possible, to replace these units with **small wooden shelters** built using the **Blockbau** construction technique, involving the use of logs stacked horizontally on top of each other, interlocked with notches in the wood. These constructions are more attractive in **terms of the landscape**, thanks to the use natural materials such as wood and stone.

Work to build **the first shelter for shepherds** began in **2020**, near the former **Malga Posta**, in the municipality of Ala in the **Piccole Dolomiti mountains**. The **work** was carried out in part **directly** by Rovereto and Riva del Garda Forestry District Office and in part by external firms. The shelter lies within an area affected by the presence of wolves (Carega pack) with pastures at an altitude of over 2000 metres and with no road access. The dairy's pastures are grazed by sheep protected at night with electric fences and during the day by guard dogs.

Subsequently, recourse to external firms was reduced or eliminated completely, in order to reduce costs to a minimum. This was made possible thanks to the organisation of specific courses (organised in 2019 and 2020), providing appropriate training for nine workers distributed among the forest districts.

In **2022**, the Borgo Valsugana Forestry District Office constructed a shelter at "**Sette Laghi**", in the municipality of **Torcegno**. In this case the shelter, constructed at an altitude of 1965 metres asl, serves an area of pasture near Malga Prima Busa, where young cattle graze.

Again in **2022**, the Primiero Forestry District Office began construction of a shelter at "**Socede di Sopra**", in the municipality of **Castello Tesino**, positioned on the remains of an

old mountain dairy (see Photo 1).
The shelter was built bearing in mind the by now stable presence of wolves, and to serve pastures situated at an altitude of over 1600 metres asl, used in the last few years by a flock of sheep (around 400/500 animals), protected at night by electric fences. Work concluded at the end of summer 2023.

In 2022, Tione Forestry District Office also began work to construct a shelter at "**Fontanelle-Prada**" in the municipality of **San Lorenzo Dorsino**, within the Adamello Brenta Nature Park. During the course of next summer, the internal furnishings will be completed, provided by the Park. The shelter is situated in an area affected by the presence of both wolves (only recorded in the last few years) and bears. The Malga Prada pastures are located at an altitude of between 1700 and 2000 metres asl and are used for grazing by a flock of sheep (around 1000 animals), protected at night by electric fences.
Furthermore, in **2023** work also started on the "**Val d'Ambiez**" shelter in the municipality of **San Lorenzo Dorsino**, again within the Adamello Brenta Nature Park. It is expected this will be completed in summer 2024. In this case too, the shelter situated at Prà del Vescovo will serve pastures at high altitude (between 1700 and 2200 metres asl), with no road access, used by a flock of sheep protected at night by electric fences.

Lastly, in **2023** a team from Borgo Valsugana FDO constructed a shelter at "**Cunelle**", in

the municipality of **Torcegno** (see Photos 2 and 3). The structure was built at an altitude of 2125 metres asl and is needed to supervise a flock of sheep (over 800 animals) protected at night with electric fences.
In total, **6 wooden shelters** have been built to date, allowing shepherds using the pastures to adopt prevention measures and better supervise grazing animals.
In **2024** the construction of a further three shelters is planned: the first at "**Busa dell'Orso**" in the municipality of **Roncegno Terme**, by Borgo Valsugana FDO, the second at "**Fornasa**" in the municipality of **Valfloriana**, by Cavalese FDO and the third near "**Malga Tenera**" in the municipality of **Tenno** by Rovereto and Riva del Garda FDO.
In **2025** it is expected that Borgo Valsugano

FDO will **renovate** an existing shelter in the municipality of **Bieno,** at "**Aia Bela Venezia**", while the construction of shelters at "**Orena**" in the municipality of **Castello Tesino**, and "**Pian dei Cavai**" in the municipality of **Telve di Sopra** has been taken on board by the **Comunità di Valle Valsugana e Tesino**.

Box 8 - The Pasturs Project

By Mauro Belardi, Pasturs Project - Cooperativa Sociale Eliante Onlus

For the second year running, in the **2023 summer grazing season** activities were carried out in the context of the ***Pasturs project*** (for further details see the website www.pasturs.org) in the province of Trento. As part of the Lifestock Protect European project (www.lifestockprotect.info), a number of young **volunteers** from all over Italy assisted **farmers** in Trentino with measures to prevent damage by large carnivores: maintenance, assembly and dismantling of mobile fences, accompanying animals to pasture, supervision and management of guard dogs. The volunteers spent variable periods (minimum one week) at mountain pastures, as guests of the farmers, also offering their services to help with day-to-day activities.

In 2023, **14 volunteers** were involved, trained and supported, offering their services for a total of **19 weeks' work** at two farms: **Malga Tuena**, in **Val di Tovel**, and **Malga Agnelezza**, in **Val di Fiemme**; two very different situations both in terms of geographical area and recent history regarding the presence of bears and wolves. For protection **Malga Tuena** relies above all on guard dogs. Malga Agnelezza instead focuses on active supervision of animals at pastures and a large enclosure with an electrified fence. In **2023 the two farms did not experience any attacks or predation**.

In addition to practical support, the declared scope of the project is also to **bring together** people from **different cultural backgrounds** – **farmers** who deal with the reality of life in the **mountains**, and **young people**, mostly **from urban environments** – with the conviction the everyone has something to learn from each other and that dialogue between worlds that do not usually mix can be one of main keys to **coexistence**.

The project will continue in 2024.

The photos show volunteers at Malga Tuena

3. MANAGEMENT OF EMERGENCIES

In the **province of Trento** the management of emergencies represents a field of action in which it has been necessary to operate for some time, given the presence of individual animals described as "problematic" on the basis of current legislation. The **PACOBACE (Interregional Plan of Action for the Conservation of the Brown Bear in the Central-Eastern Alps)** represents the document of reference for the management of emergencies in the province of Trento (as in Friuli Venezia Giulia, Veneto, Lombardy and the Autonomous Province of Bolzano), on the basis of which the Forestry and Wildlife Department has identified, trained and equipped special staff.

Controlling action (including killing of the animal) may be taken to deal with **problem bears** or bears in critical situations, in accordance with the provisions of European regulations (Directive 92/43/EEC – Habitat Directive). On the basis of **Provincial Law No. 9/18, the President of the Province is responsible for authorising exceptions to the ban on controlling actions such as the removal, capture or killing of bears or wolves, according to the aforementioned European regulations**, after having consulted ISPRA. This law has been deemed valid by the Constitutional Court.

In the event that safety and **public security** is at imminent risk, the capture or killing of an animal can be ordered **with an extraordinary emergency order of the President of the Province**, according to articles no. 52.2 of the Decree of the President of the Republic of 31/8/1972, no. 670 and no. 18.2 of the Regional Law of 4/1/1993 no. 1, as specifically also provided for by the **PACOBACE**.

Operational management is based on the use of specialist staff from the **Provincial Forestry Service (PFS)** making up of a **special unit on call**. The system of on-call availability involves weekly shifts and is operational from **1 March to 30 November.** The team is made up of a coordinator and two emergency staff (on call 24 h/day), along with **veterinary staff assigned by the Provincial Health Services (APSS)** whenever necessary. Veterinary support is indispensable for all activities providing for the manipulation of animals (wounded bears or wolves, capture operations etc).

Problematic animals

Bears

JJ4

JJ4 (female aged 17) caused the **death** of a young man, **attacking him on 5 April 2023** in the woods above **Caldes**, in **Val di Sole**. This is the first fatal accident recorded in Italy after 172 years.

The investigations ascertained that the incident took place when the man, on his own, was returning from a run in the mountains. It is believed that there was a sudden close encounter with the bear, at that time accompanied by three large cubs around 14 months old.

The **dangerousness** of JJ4, already ascertained on **22 June 2020** when she attacked and injured two people, had already led to the President of the Province issuing an **extraordinary emergency order** at the time, to remove the bear from the area for reasons of **public safety** (specifically in relation to the possibility of other attacks). It was not however possible to implement this removal **order**, as the provision was first suspended and then **cancelled** by the administrative court to which animal rights organisations had appealed.

On **22 June 2022**, the bear, accompanied by a new litter, also carried out a threatening **false charge** on a cyclist in the Monte Peller area in Val di Sole (page 40 of the 2022 Report).

Between 2020 and 2022 the provincial administration repeatedly informed ISPRA, via written reports, of **the risk** that further close encoun-

ters with JJ4 could lead to new **incidents**, therefore requesting **re-evaluation of the level of risk** and an advisory opinion for the purpose of **killing the animal**. On each occasion, the response of the institute was negative, while recognising the potentially dangerous nature of the bear, **not considering there was sufficient justification for removal of the bear** (see pages **44** and **45** of the **2020 Report**, page **37** of the **2021 Report** and page **40** of the 2022 Report).
The day after the new and very serious incident of **5 April 2023**, a new **order authorising the killing** of the bear for reasons of public safety was issued, subject to **consultation** with ISPRA. This too was immediately **contested by animal rights associations**, which once again requested its cancellation. The administrative court considered it appropriate to amend the order, transforming it into an order to **capture** the bear to take it into **permanent captivity**. JJ4 was therefore **captured** by the staff of Trentino Forestry Service on **17 April 2023** and transferred to the **Casteller** wildlife area.

MJ5
The first **attack on a human** in 2023 was carried out on **5 March 2023** by **MJ5** (an 18-year-old male bear) at the mouth of **Val di Rabbi**, where the bear assaulted a walker accompanied by a dog on a leash. The bear, sighted at a distance of 10-15 metres, charged the man, causing **injuries** to various parts of the body, then treated in hospital. **Identification** of the animal involved in the episode was possible thanks to **genetic tests** carried out on the **clothes** of the person attacked, where it was possible to recover the bear's DNA.
The authorisation to kill the bear for reasons of public safety issued by the President of the Province, subject to obtaining a positive opinion **from ISPRA**, was rapidly modified by the administrative court into an order to **capture** the bear, following the appeals presented by animal rights associations. It is generally more complicated to capture a bear than to shoot it down, especially in the case of adult males, which have very extensive home ranges. This was also the case for MJ5, meaning it was not possible to capture the animal (thus effectively prolonging the risk that further attacks might take place) until **10 October 2023**, when the bear was found **dead** in the municipality of **Bresimo**, in Val di Non. When this report was drawn up, the **cause of death** had not yet been made known by the **Istituto Zooprofilattico delle Venezie**.

F36
The third **attack on humans** recorded in 2023 involved the 6-year-old female bear **F36**, accompanied by a cub born during the year. On **30 July 2023**, in the mountains above **Roncone** in the Giudicarie area, she chased a man, pulling him down from a tree (a second person had fled towards the car), where he had sought refuge from the bear's aggressive behaviour. The fall from a height of several metres caused several injuries, requiring the man to be kept in hospital. In this case again, the **authorisation to kill** the bear for reasons of public safety issued by the President of the Province, subject to obtaining a **positive opinion from ISPRA**, was rapidly modified by the administrative court into an order to **capture** the bear, following the **appeals** presented by **animal rights associations**.
The animal was first **captured, fitted with a radio collar and released** on **29 August 2023** in order to make it recognisable. Applications to request authorisation for the removal of F36 were not successful, however on 27 September 2023 the bear was found dead in Val di Bondone (municipality of **Sella Giudicarie**). When this report was drawn up, the cause of death had not yet been made known by the **Zooprofilattico Sperimentale delle Venezie**.

The attacks carried out by **JJ4** and **MJ5** were classified by **ISPRA** and **PAT** as corresponding to **no. 18 in Table 3.1. of the Pacobace** (the most serious category listed there), whereas the incident involving **F36** was classified as **no. 15 in the same table**. In both cases, the **Pacobace suggests removing** the animals responsible for the attacks, either by **killing them** or **capturing them to take them into permanent captivit**y (in management terms, the two options have exactly the same effect, namely re-

sulting in removal of the individual from the natural environment).

M90

M90 was a young 3-year-old male bear repeatedly noted in central Val di Sole starting from summer 2023, with **markedly overconfident behaviour (entering towns** several times, also to feed from waste bins, item no. 13 in Table 3.1 of the Pacobace) and **intentionally following people** in two cases (item no. 16 in Table 3.1 of the Pacobace).

For this reason, the animal was fitted with a **radio collar** on 15 September 2023 in order to carry out intensive monitoring and facilitate deterrent activities designed to modify his behaviour and thus avoid having to remove him from the area (the Pacobace suggests removal for the aforementioned behaviour, nos. 13 and 16). However, this did not achieve the desired results, given that no less than **20 deterrent activities** carried out with rubber bullets, exploding darts and bear dogs **had no result whatsoever**.

The young bear, also remaining active in the winter, instead continued to display overconfident behaviour, culminating on 28 January 2024, when he **intentionally followed two people** for 10 minutes and around 700 metres along the road.

This led the provincial administration (mindful of the events involving another overconfident young male bear, M57, which culminated in a deliberate attack on a person, see the 2020 Report, pages 43 and 44) to **remove the bear to guarantee public safety**, applying the provisions of the **Pacobace**. After consultation

with ISPRA (which agreed with the assessment, classifying the animal as "**high risk**" and recommending its "**immediate removal**"), on 6 February 2024, the President of the Province issued a decree authorising the killing of the bear, put into effect a few hours later in the lower Val di Sole.

M62

M62 was a male bear born in 2018 that started to show **very overconfident behaviour from 2020** in the area around the Val di Non, Val di Sole and Paganella tableland. For this reason, he was captured to fit him with a **radio collar** on 28 June 2021 and then again on 4 November 2021 to replace this collar. Despite several **deterrent activities**, the bear also continued to display overconfident behaviour in 2022 (2022 Large carnivores Report, pages 39 and 40).

On **30 April 2023** M62 was **found dead** in the woods **above Lake Molveno, on the slopes of the Brenta**. Signs of a fight present on the ground and the type of fatal wounds made it possible to attribute the death to **aggression by another bear** (most probably a dominant adult male).

Wolves

As regards wolves, it is necessary to recall the case of **Malga Boldera** (Lessini mountains, municipality of **Ala**), where there were **repeated attacks on livestock at summer pasture** in summer 2023 (for a total of 2 donkeys and 16 young bovines, during 6 separate episodes of predation) with wolves from the western Lessinia pack **repeatedly succeeding in getting past prevention measures** installed for the protection of livestock (multi-strand electric fence).

This led to the provincial administration deciding on the one hand to improve the efficiency of the electric fence at Malga Boldera and **further encourage the use of prevention works** in the area with a specific programme, and on the other to make an **exception** to the system of special protection for wolves, with the **elimination of two animals** in the pack responsible for the repeated damage.

After having obtained a favourable opinion from ISPRA, on **24 July 2023** the President of the Province issued an order **authorising the killing** of a maximum of **two animals** from the pack present in the Malga Boldera area, in such a way as to also act as a form of negative conditioning for the other wolves.

The **operations** in the field by forestry staff designed to put the order into effect (in July and August) **did not lead to the elimination** of the animals; on **11 August 2023 the order was su-**

spended by the **Council of State**, following **appeals by animal rights associations**.
During **2023, a technical report** was drawn up by **ISPRA** and **MUSE** (on the request of the Ministry of the Environment and the Autonomous Provinces of Trento and Bolzano) on "**Wolves in the Autonomous Provinces of Trento and Bolzano: analysis of the context and management recommendations**". This has the scope, among other things, of establishing an **experimental plan for the management of wolves** in the two provinces, providing indications for assessing possible **exceptions to the ban on killing wolves**, both in the case of serious damage and in relation to possible threats to **public safety**.

Online maps

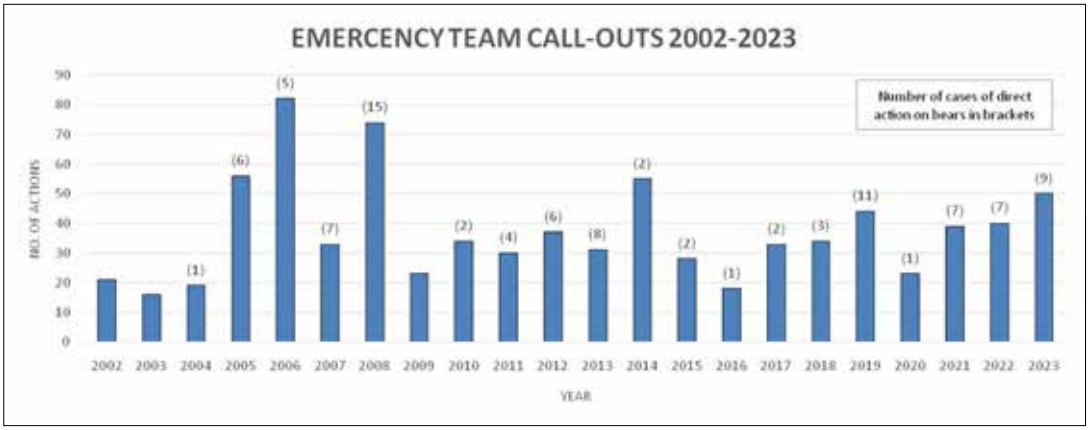
In 2023 the geographical position of **bears with radio collars** was again made available, through an **online map**:
(https://grandicarnivori.provincia.tn.it/Comunicazione/MAPPA-ORSI-RADIOCOLLARATI), which was **regularly updated** (without being excessively precise, in order to protect the animals), for the benefit of all those visiting the mountains.

Another online map contained reports of **female bears accompanied by cubs** (https://grandicarnivori.provincia.tn.it/Orse-con-piccoli/MAPPA-SEGNALAZIONI-2023), with the scope of raising awareness and offering an additional tool for preventing potential incidents following close encounters.

Activities of the emergency team

In 2023 the emergency response team was called out **53 times** (Graph 10), always in relation to the management of bears. Of these, **7** were given **code white** status (operations not requiring deterrents), **33 code yellow** (possible deterrents) and **13 code red** (operations providing for the possibility of directly manipulating bears). On 2 occasions the latter concerned reports of minor injuries (M89, subsequently recovered; see page 64), in 2 cases attacks on people and in the remaining cases road accidents involving bears.
On **9** occasions the team intercepted the bear and carried out a total of **21 deterrent operations** (1 with bear dogs, 9 with rubber bullets, 1 with an exploding dart, 2 with bear spray and 8 with lights and noise).

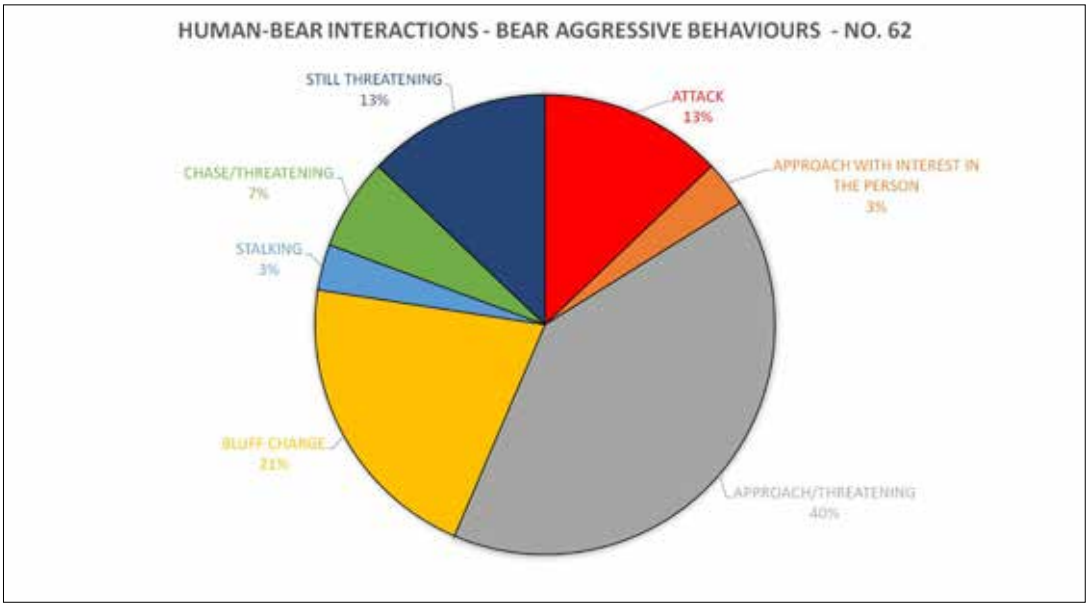
Graph 10



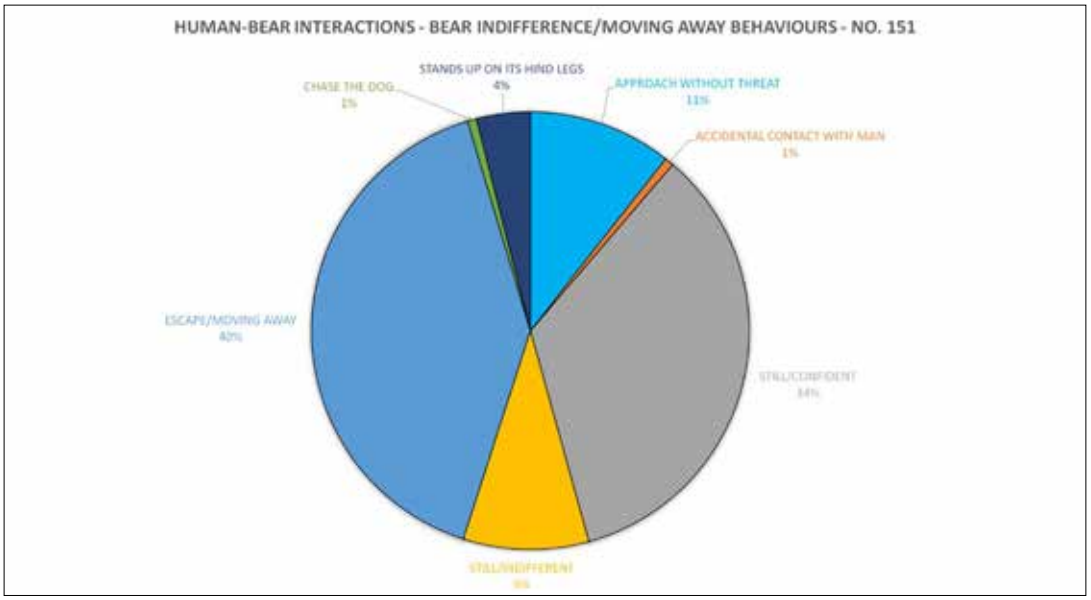
Interaction between humans and bears

During **2023, 41 events** involving **human-bear interaction** were recorded. Human-bear interaction is intended as any encounter when bears perceive the presence of man and change their behaviour accordingly; this excludes events when the people involved are in/on motor vehicles, buildings, on roof terraces etc.
From 2008 to the date this report was drawn up **213** events involving human-bear interaction have been recorded. In **151** cases (**71%**) the behaviour of the bear was characterised by **indifference/moving away**, in **62** cases (**29%**) the bear instead displayed **aggressive behaviour** (threatening, chasing, false charge, attack).

Graph 11



Graph 12



It goes without saying that these figures are **not necessarily representative of the real situation**, given that when interaction with bears takes place in a peaceful manner (when the person is calm and the bear is indifferent or moves away) the event is often not reported, whereas on the contrary, interaction where the people involved are more agitated (either by nature or due to effectively threatening or aggressive behaviour by the bears involved) is more likely to be communicated to forestry staff and therefore to end up in the database.
Graphs 11 and 12 show the behaviour of the bears in the 213 cases recorded to date.

Human-wolf interaction

The criteria used to record human-wolf interaction are the same used for bears. In the 2019-2023 period, **79** reports of **human-wolf interaction** have been recorded, in a standardised manner (Photo 14).
In 54 cases the interaction took place with a single wolf, 15 cases involved 2 wolves and in 5 cases with 4 or more wolves. In 32 cases (**41%**) there was **at least one dog present**, in 46 cases (58%) there were no dogs, while in 1 case data is not available.
As regards activities to **deter wolves** showing particular habituation to man or assiduously frequenting urban areas, reference is made to an **action protocol** that codifies undesirable behaviour, methods for authorising action, conditions for deterrent activities, staff involved, method and timescale for deterrent activities, safety conditions for staff and animals, procedures for action and archiving of data.
In **winter 2023/24** there were **4 operations** (20 and 21 December 2023 and 17 and 18 January 2024) targeted at deterring overconfident wolves. However, it was never possible to carry out the deterrent action because the team was unable to make contact with the animals.

Capture of bears

In 2023, 4 captures were carried out (Photo 15).

Photo 14 - A particularly confident wolf, photographed by tourists on cross-country skiing runs at Pozza di Fassa on 22 January 2024 (APT Wildlife Department archives)

Photo 15 - The young male bear M90 reawakening before his release after capture (M. Zeni, APT Wildlife Department archives)

1. On **2 April 2023**, in Val Algone, in the municipality of **Stenico**, a **bear cub seriously injured** following a fall from a rocky cliff was found and recovered. The animal, subsequently identified as **M89**, was transferred for the necessary treatment, initially to the Zoolife clinic in Mezzolombardo (affiliated with the health services for veterinary care involved in the management of large carnivores) and then to the **Belpark wildlife area at Spormaggiore**. The bear cub recovered and regained its health. However, given that the long phase of captivity necessary for treatment may have increased the risk of future behaviour characterised by excessive confidence with man, as a precaution the provincial administration did not consider it appropriate to release it into the wild. This took place in a particularly difficult context in 2023, already characterised by numerous highly problematic episodes involving danger to public safety.
2. As regards the fatal attack on a person, the female bear **JJ4** was captured with a tube trap on **17 April 2023**, in the municipality of **Caldes**, and immediately transferred to the Casteller centre. It was necessary to proceed with capture instead of elimination of the animal as authorised by the administration following the decision of the administrative court, after appeals by animal rights associations.
3. On **29 August 2023**, in the municipality of **Sella Giudicarie**, the female bear **F36** was captured with a tube trap; after fitting her with a **radio collar** she was released at the site. This took place as part of the procedure to identify, make recognisable and subsequently eliminate the bear that had attacked a person on 30 July 2023.
4. On **14 September 2023**, in the municipality of **Dimaro Folgarida**, the male bear M90 was captured with a tube trap; after fitting him with a **radio collar**, designed to facilitate intensive monitoring and the adoption of deterrent action in relation to an overconfident animal, the bear was released at the site, making use of deterrents (rubber bullets).

The number of **captures of bears (35 different animals)** taking place since 2006 has therefore risen to **55** (31 involving females, 22 males and two of undetermined sex). **37** of these **55** captures were carried out with **tube traps, 10** on **free-ranging bears**, **4** with an **Aldrich snare** and **4 manually** (for cubs born that year).

Road accidents involving bears

Road accidents involving bears represent **potential emergencies**, as injured bears remaining close to roads can be **dangerous**. For this reason, reports of accidents require immediate verification by the emergency response team and the dog unit.
In 2023, there were **9 cases** of **road accidents** involving **bears** in the province of Trento (Table 6), none of which would appear to have been fatal, bringing the total number of such events **recorded to date** to **59**.

The Dog Unit

The **Bear Dog Unit** has by now been active for **seventeen years** and in 2023 there were **23 operations** linked to the **management of large carnivores** in the province. Last year saw the arrival of **two new dogs**, Kali and Freja, assigned directly to their two handlers (Photo 16). The two females, sisters belonging to the **Jamthund breed**, arrived from **Sweden** in July 2023. **Training activities** are underway for the dog-handler teams, which will become fully operational in summer 2024, with support for basic training and tracking preparation from ENCI trainer Fausto Pizzedaz Trentini.
In 2023, **road accidents with bears** were again confirmed to be one of the most delicate problems to be managed by the dog unit. Last year there were **10 operations** to inspect and secure the sites of accidents involving vehicles and bears.
Organic samples sufficient for identifying the **animals involved** have often been found.

In all cases it was possible to ascertain that the injury was such that bear was able to move away autonomously from the place of impact,

thus making it possible to state that the area posed no threat to human safety.
In 2023, the dog unit also intervened on **three occasions** to reconstruct the dynamics of **human-bear interaction** in relation to **attacks on humans**. In this context, the operations were shown to be helpful in identifying the animals involved.
There were **8 operations to deter bears** in 2023, involving subadult bears.
The dog unit was also called out **twice** to support activities for the **capturing of bears**. In one further case there was a special inspection to check for the presence of wolves inside a large fenced area for grazing cattle.
In addition to the operations above, there were a further **16 anti-poaching inspections** regarding different species and **1** call-out to reconstruct the dynamics involved in the death of an adult bear.
The dog unit teams participated in routine outings for the purpose of **training** and a number of meetings, including a training day aimed at teaching the dogs to **look for organic samples along wolf trails** specially created by handlers. Furthermore, a **road accident involving a wolf**

Photo 16 - The two new dog-handler teams, with the Jamthunds Freja and Kali, sisters born in 2023 (APT Forestry Department archives PAT)

Table 6 - Road accidents involving bears in 2023

N	DATE	LOCATION	BRIEF DESCRIPTION OF EVENT AND RESULT OF ACCIDENT	GENETIC IDENTIFICATION OF BEAR HIT
1	18 May 2023	Torano, Villa Lagarina	Vehicle damaged; the bear hit moved away. Involved in another accident on 28 June..	M45
2	31 May 2023	S.S. 45 b at La Sega, Vallelaghi	Vehicle damaged; the bear hit moved away. Survived (sampled genetically in subsequent months).	M18
3	28 June 2023	S.S. 240 at Loppio, Mori	Vehicle slightly damaged; the bear hit moved away. Survived (sampled genetically in subsequent months).	M45
4	21 July 2023	S.S. 421 btw. Spormaggiore & Castel Belfort	Vehicle damaged; the bear hit moved away. Survived (sampled genetically in subsequent months).	F77
5	29 August 2023	S.S 45b at Vecchio Mulino, Vallelaghi	Vehicle slightly damaged; the bear hit moved away. Some traces of blood found.	M98
6	14 October 2023	S.S. 42, Mezzana	Vehicle damaged; the bear hit, fitted with a radio collar, moved away. Survived; after a couple of days' rest, it gradually recommenced its activities	M90
7	20 October 2023	S.P. 34 btw Tavodo & Sclemo, Stenico	Vehicle slightly damaged; the bear hit moved away.	Not identified
8	26 October 2023	S.P. 18/DIR btw Ciago & Covelo, Vallelaghi	Vehicle slightly damaged; the bear hit moved away.	F69
9	21 November 2023	S.S. 43, at Faé, Cles	Vehicle damaged; the bear hit moved away. It was probably a cub born during the year, which was following its mother.	Not identified

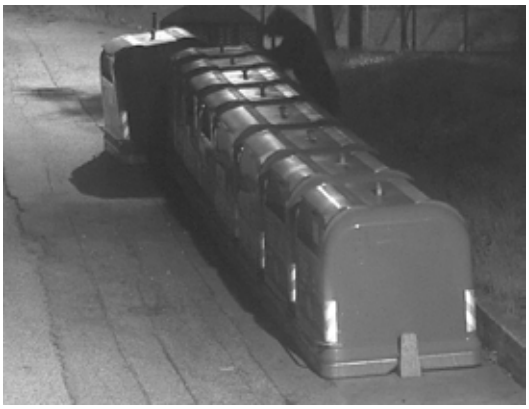
was simulated, with the resulting search for the wounded animal starting from the place of impact.

Waste management

Organic waste can be very **appealing** to brown bears. Due to the presence of remains of appetising and easily accessible food, bears may be encouraged **to approach inhabited areas**. Habituation to this trophic resource can lead to **food conditioning** that over time makes bears more **confident in relation to man**, resulting in higher risks for the bears involved and potentially also for humans.

Activities to progressively adapt the storage and collection of organic waste to the presence of bears **began** in **2009** (see pages 40 & 41 of the relative report) and have never ceased. These activities are **complex** from several points of view, given the large and varied **geographical context**, with **different systems of storage and collection** and **multiple organisations** involved. It will therefore take some time for the process to conclude.

The demanding operation by ASIA - Agenzia Speciale per l'Igiene Ambientale, to replace (2020 - 2021) all the organic waste bins situated in **Valle dei Laghi, Valle di Cavedine** and the **Paganella tableland**, has been made thanks to the **financial support** from the provincial administration for the local waste management body, in order to purchase new bins, through an extraordinary emergency order (for further details see page 44 of the 2021 Report). Although not specifically designed to be "bear-proof" (there are no such bins on the Italian market or in Europe in general), thanks to their size and the particular opening mechanism the new bell-shaped containers were nevertheless shown to be **considerably more compatible with the presence of bears** than the dustbins previously in use. With one recent exception: in August 2022, and above all between May and June 2023, a 5-year-old male bear called **M52** – an animal that has not resulted otherwise problematic – learned that by pushing forcefully against the rear of the container, in some cases the bell-shaped bin could be detached from its base and overturned (Photos nos. 17, 18 and 19). Once he had learned how to do it, the animal **repeatedly overturned bell-shaped containers for organic waste** (and other waste) around Cavedago, Andalo and above all Fai della Paganella. Joint action by the Municipality of Fai della Paganella, ASIA, the forestry station at Paganella and the Wildlife Department made it possible to deal promptly with the problem at the end of June, through the installation of **metal barriers** with **electrified wires** on top, on three sides of the waste disposal sites most popular with M52 (photo 20). **The bear subsequently stopped accessing the sites**. It remains to be seen whether as a result of the prevention works at his favourite sites, the animal (whose presence was confirmed genetically several times during summer-autumn 2023) will give up these activities in the future. At all



Photos 17 and 18 - The bear M52 as he overturns an organic waste bin at Fai della Paganella

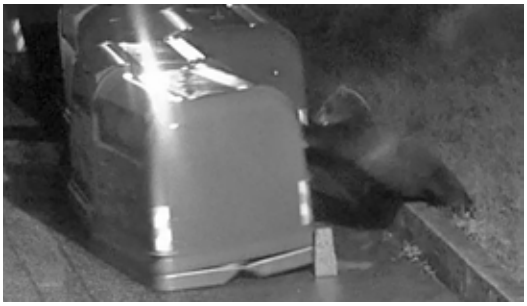


Photo 19 - Close up of the bear in action (by kind permission of the municipality of Fai della Paganella)

events, further works designed to prevent the phenomenon are planned in the local area.
However, in the last few years, the geographical area most concerned by episodes involving bears accessing organic waste has been the **Val di Sole** (see the 2020, 2021 and 2022 Large Carnivores Reports). In 2023, some bears (3 genetically identified individuals) were again attracted by waste disposal sites, highlighting the urgency of dealing with the problem in a systematic manner. In **2022**, the provincial administration **transferred 200,000 euro** to the local **Comunità di Valle**, in order to proceed with the **progressive protection of the 240 l bins for organic waste currently in use**, through the creation and installation of **bear-proof structures** (Photo 21), specially set up on the basis of a prototype in steel and larch wood previously developed and tested by the Forestry Department and Wildlife Department.
In 2023, the Comunità di Valle thus gave the individual **municipalities** the task of identifying priorities for action, and of constructing the **concrete bases** onto which to anchor the **70 bear-proof structures currently being constructed** by the company entrusted with the task. Some municipalities constructed the bases during the year, and **by the end of 2023 the first 25 bear-proof structures in weathering steel had been installed**, in their definitive version. Installation continued throughout the winter and will proceed in **spring 2024**, in the context of a demanding organisational framework, for example as regards large users. As in other valleys where bears are present, in the

Photo 20 - Fai della Paganella: the same waste disposal site shown in the previous photos, equipped with a physical barrier on three sides and electrified wires (M. Zeni - APT Wildlife Department archives)

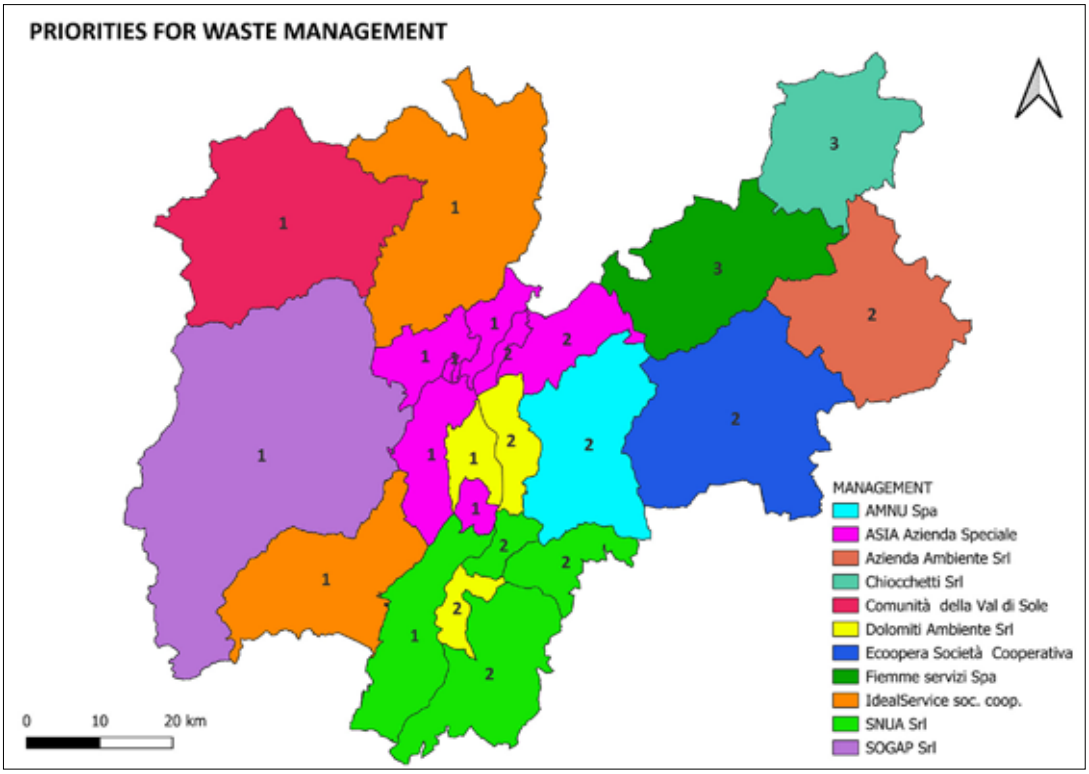
Val di Sole there are indeed numerous businesses linked to tourist facilities, along with some large residential complexes, used only seasonally, which present some intrinsic difficulties in terms of waste management.
In **August 2023**, the action outlined in the preceding report (see page 37 of the 2022 Large Carnivores Report) took shape: the question of **possible interaction between wildlife and organic waste management** was included within the **updated provincial waste management plan**. Specifically, the Province has provided for the need for all waste disposal managers to plan and implement **adaptation of the current systems for organic waste collection** in the

Photo 21 - The first bear-proof modules in weathering steel installed in the municipality of Dimaro Folgarida at the end of 2023 to protect organic waste bins (M. Benvenuti - APT Wildlife Department archives)

presence of large carnivores (and other wild species such as boars for example) within established timeframes, on the basis of a **map of priorities** (Figure 11) produced by the Wildlife Department. This will take place through the preparation of specific adaptation plans. In order to draw up such plans, the relevant bodies will be able to make recourse to technical support from the Wildlife Department.

The next deadlines are **August 2024** for the **adaptation plans** for each management area, and the **end of 2026** for **effective adaptation of the priority 1 area**, namely **western Trentino**. In practice, it is a question of adapting, **when necessary** and depending on the wildlife species present in the area (e.g. bears in western Trentino), **the types of organic waste containers** (for example going from standard waste bins accessible to wildlife, to bear-proof structures, waste disposal areas partially underground etc.) **and/or collection methods** (e.g. going from roadside collection to door-to-door collection). Between the end of 2023 and the beginning of 2024 ADEP - Agenzia per la Depurazione, responsible for managing the financial aspects of the operation, carried out a zone by zone check to provide a preliminary picture of the current situation, operational intentions and resulting needs.

Figure 11



Map included in the new provincial waste management plan, representing the areas of jurisdiction of the 11 management bodies operational in the province and the priorities (1-2-3) for intervention in relation to the presence of wildlife. The River Adige, in the centre of the map from north to south, subdivides western and eastern Trentino.

4. COMMUNICATION

The main **activities carried out during 2023** are summarised below.

Evening sessions and meetings

Table 7 lists the **meetings/evenings** organised by the Wildlife Department. The meetings were organised in response to local requests for information and dialogue.

Other communication initiatives

- 8 January: interview with Mi manda Rai3;
- 22 February 2023: presentation (lecture for students) at ENAIP in Tesero, on wolves and bears;
- 9 March: interview on bears with RTTR;
- 27 April 2023: guidance in the field and training on bears with students from the University of Bologna – Veterinary Science Department (Photo 22);
- 28 April 2023: guidance in the field with Professor Tom Smith, BYU, Salt Lake City (UT);
- 29 April 2023: presentation on bears at the CAI conference in Pontebba (Udine);
- 3 May: interview with Der Standard (Austria);
- 4 May: interview with Die Zeit (Germany);
- 20 June: interview with the BBC regarding bears;
- 23 August: interview with RSI (Radio Svizzera Italiana);
- 13 September: interview with the RAI on large carnivores;
- 17 September: interview with the RAI - TG3 on large carnivores;
- 2 September: participation at the Coexistence Festival in Val di Ledro (2 meetings with the public on large carnivores).

Table 7 - Communication initiatives in 2023

TYPE	DATE	PLACE	NO. OF PARTICIPANTS
Public meeting on bears at the MUSE (coexistence with brown bears in northern America)	10 May 2023	Trento - Muse	150 + live streaming
Public meeting on large carnivores at Villa Lagarina	24 May 2023	Villa Lagarina	160
Public meeting on large carnivores at Flavon (Contà)	1 June 2023	Contà	60
Public meeting on wolves at Giovo	7 June 2023	Giovo	70-80
Public meeting on wolves at Storo	12 June 2023	Storo	120
Public meeting on LCs at Andalo	19 June 2023	Andalo	60-70
Public meeting on LCs at Predaia	10 July 2023	Predaia	120
Public meeting on LCs at Molveno	10 July 2023	Molveno	70
Public meeting on LCs c/o Comunità Valsugana	17 July 2023	Borgo V.	100
Public meeting on LCs at Cavedago	17 July 2023	Cavedago	105
Public meeting on bears at Spormaggiore	16 August 2023	Spormaggiore	30
Meeting of administrators from the Municipality of Arco on bears	17 August 2023	Arco	20
Public meeting on bears at SOSAT	29 November 2023	Trento	50

Press releases and council questions

With the support of the Press Office, 102 press releases were issued, of which 66 concerning bears, 16 wolves and 20 large carnivores in general.
Furthermore, the necessary information was provided in order to reply to 13 provincial council questions (standard or with an immediate response), 9 regarding bears, and 4 regarding wolves.

Communication activities carried out by SAT (Committee for Protection of the Mountain Environment)

Società Alpinisti Tridentini

1. TRAINING COURSES

MIUR-CAI teacher training course on brown bears: the training programme saw the Committee, together with CAI's Large Carnivores Group, actively involved in organising a 4-day event (7-10 September) and coordinating the many organisations involved (Adamello Brenta Nature Park, UNESCO Biosphere Reserve, APT's Large Carnivores Department and MUSE). The 46 teachers attending the course, from 10 different regions, expressed their appreciation as regards the content and quality of the training. Presentation of the full programme can be seen at the following link:
https://caiscuola.cai.it/progetto-scuola/dal-vesuvio-alla-penisola-sorrentina-2-5-2-3/dolomiti-patrimonio-mondiale-unesco-3-un-racconto-di-paesaggi-uomini-e-rocce/.

2. DISSEMINATION AND ENVIRONMENTAL EDUCATION

The informative activities carried out during 2023 focused mainly on the subject of coexistence with large carnivores, as a direct result of the fatal incident at Caldes.
A list of the evenings organised follows:

- 22 February 2023: Trento branch of SAT;
- 2 May 2023: Malé branch of SAT, footpaths group;
- 2 May 2023: pupils of Liceo Maffei high school in Riva del Garda;
- 9 May 2023: Riva del Garda branch of SAT;
- 15 May 2023: webinar for the Scuole all'Aperto network;
- 25 May 2023: Cognola branch of SAT;
- 27 May 2023: Denno and Cadino branches of SAT;
- 28 May 2023: Arco branch of SAT;
- 9 June 2023: Municipality of Sfruz, in cooperation with the local SAT branch;
- 13 July 2023: Fondo branch of SAT;
- 26 July 2023: scout leaders and parents: preparatory meeting at camps in the Val Algone;
- 12 October 2023: pupils of Arco middle school;
- 14 September 2023: training at guard dogs course organised by the Livestock Protekt Life project, at Malga Tuena, Ville d'Anaunia.

Photo 22 - Training in the field for university students (M. Zeni, APT Wildlife Department archives)

5. TRAINING

Correct management of large carnivores is inextricably linked to the availability of **specially trained staff**, prepared to deal with any problems of a technical and non-technical nature that may arise during activities in the field, above all as regards the management of emergencies, management of damage and monitoring. Training represents one of the six programmes of action referred to in the previously mentioned provincial government resolution no. 1988 of 9 August 2002.
The following **training events** were organised during **2023**:

- 28 February: updating/training for **Forestry Department staff** at Casteller;
- 13 & 14 April: course on guard dogs c/o **Federazione Provinciale Allevatori**;
- 12 May: course on large carnivores for **journalists** (c/o Trentino Marketing);
- 16 May: training on bears for **forestry staff** (by the expert Tom Smith);
- 17 May: training on bears for **Civil Defence staff** (by the expert Tom Smith);
- 23 May: course on large carnivores for **hoteliers** (c/o Trentino Marketing);
- 24 May: course on large carnivores for **mountain refuge managers** (c/o Trentino Marketing);
- 31 May: course on wolves for **hoteliers in Val di Fiemme**;
- 7 June: course on wolves for **hoteliers in val di Fiemme**;
- 14 June: course on wolves for **hoteliers in val di Fiemme**;
- 25 August: course on bears for **military personnel** (at the Bolzano offices);
- 5 September: course on bears for the staff of **Terna - Rete Elettrica Nazionale SPA**;
- 5, 8 & 27 September: courses on the use of bear spray for **forestry staff**;
- 7 September: training course on bears for **teachers** at S. Lorenzo in Banale (organised by CAI-SAT);
- 13 September: **1st training session** on bears for the staff of **Dolomiti Energia**;
- 14 September 2023: **course on guard dogs** organised in cooperation with the Life Wolfalps EU project and MUSE;
- 11 October: course on large carnivores for **classes at the Istituto Agrario di S. Michele all'Adige;**
- 11, 13 & 25 October: three training sessions for **forest wardens and workers**;
- 24 October: course on bears c/o **University of Trento – Faculty of Economics**;
- 30 November: **2nd session** on bears for the staff of **Dolomiti Energia**;
- 4 December: course for **forestry service trainees** on large carnivores;
- 5 December: **3rd session** on bears for the staff of **Dolomiti Energia**;
- 5 December: training on bears for **colleagues at the Autonomous Province of Bolzano** (Bolzano I inspectorate) al Casteller (Photo 23);
- 7 December: **1st training session** on bears **for staff** of the **Mountain Basins Dept**;
- 12 December: **2nd training session** on bears **for staff** of the **Mountain Basins Dept**.

Photo 23 - Training activities at Casteller forest nursery centre. Photo: C. Groff - Wildlife Department archives

6. NATIONAL AND INTERNATIONAL NETWORKING

Networking with neighbouring regions and countries takes on strategic importance in the management of highly mobile species such as the brown bear, wolf and lynx. Bearing this in mind, relationships with other countries and regions have long been established and have been strengthened and consolidated over time.

The Alpine Convention Large Carnivores Platform

2023 also saw continuation of the activities of the Alpine Convention Large Carnivores Platform (WISO), set up in 2009, where the Autonomous Province of Trento is also represented within the Italian delegation. In 2023 the Platform was chaired by Slovenia and specifically by its Forestry Department. In 2023 the Platform met online with a videoconference call on 24 February.

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www.alpconv.org

The Arge Alp working community

In 2023, activities to share information and management methods for large carnivores between the 10 alpine regions continued in the context of Arge Alp. A meeting took place in the St Gallen Canton (CH) on 13 and 14 March 2023.

ARGE ALP
Die Alpen leben
Le Alpi vivono

Standardisation of genetic testing data for wolves in the context of Arge Alp (by FEM)

On 21 October 2022, the 53rd conference of the heads of regions in the Working Community of Alpine Regions (ARGE ALP) was held in Innsbruck on the subject of "Transfrontier management of wolves". Among other things, it was agreed to carry out the exchanging and annual comparison of data between the ARGE ALP regions, to provide an overall picture of the development of large predator populations in the Alps. As regards wolves, there are currently four laboratories charged by the ARGE ALP regions with genetic testing of samples for molecular monitoring: the Fondazione Edmund Mach (Italy), the University of Lausanne (Switzerland), the Senkenburg Institute (Germany), and the Research Institute of Wildlife Ecology (Austria).

This group aims to prepare a uniform method for genetic testing of wolf samples, with the scope of creating a database of genotypes that guarantees the efficient exchange of data regarding animals moving between different ARGE ALP regions, and therefore description of transnational wolf packs in the Alps, which may also lead to more rapid compensation for farmers in the event of damage to livestock and to a reduction in conflict between humans and wildlife.

To obtain this standardisation of data, a High Throughput Sequencing (HTS) method for the genotyping of wolves, starting from non-invasive samples (faeces, hairs & saliva), will be optimised in the different laboratories. The techni-

que provides for sequencing of microsatellite markers on new generation platforms, allowing more precise and in-depth discrimination of alleles compared to the methods currently in use. One fundamental issue is also the reproducibility of data, allowing the production of standard information at the various organisations involved.
In order to carry out this project most effectively, FEM recruited a Level A4 Technician, who started work at the CRI laboratories of Conservation Genomics on 24/11/2023. Furthermore, two tenured technicians undertook specific training at the University of Lausanne's molecular biology laboratory (Switzerland), from 24 to 26 October 2023, to present them with the HTS protocol chosen by the ARGE ALP laboratories. Here it was possible to observe all the phases of the protocol, from processing of the sample to the generation of data. The knowledge acquired was then shared with the research units and it was possible to proceed with the starting up of work.
In addition to training technicians, the transfer of the protocol from one laboratory to another will require different steps to optimise and adapt the instrumentation available. For example, an in-depth study of the protocol was carried out to establish the workflow within FEM laboratories and a list of the reagents and kits necessary, to be specially purchased or already present in the laboratory. Together with these it was necessary to establish the instrumentation to be used, which may require the development of specific programmes or staff training in the case of new machinery.
The subsequent phase of the project provides for the selection of wolf samples from FEM databases for trials of the protocol, useful for checking that each step functions correctly. Once the whole workflow has been optimised, initial testing of wolf genotypes already catalogued in the Foundation's databases can be carried out with the HTS protocol. Furthermore, there will be an exchange of samples between the four laboratories involved, which will represent an initial trial of the uniformity of the data obtained, to then move on to analysis of the samples using the HTS protocol and a standard protocol for final verification.

Activities with the Large Carnivores Initiative for Europe (LCIE) and the "Bear Specialist Group" of the International Union for the Conservation of Nature (IUCN)

In 2023, the staff of the provincial administration again participated in the activities of LCIE (1st conference on 20 January 2023 online, 2nd conference from 3 to 5 October 2023 at Ohrid in Macedonia) and IUCN's Bear Specialist Group.

Activities in the context of the Euroregion

In 2023, the staff of the provincial administration also participated in activities related to large carnivores in the context of the Euroregion. Specifically, a meeting dedicated to the subject was held in Rovereto and on the Lessini mountains on 3 & 4 July 2023 (Photo 24).

Photo 24 - The Euroregion meeting held in Rovereto on 3 & 4 July 2023. (C. Groff - APT Wildlife Department archives)

Other opportunities for networking beyond the province

- Annual meeting with **colleagues from the Autonomous Province of Bolzano at Malga Palazzo on 19 September 2023**;
- Participation at the **international conference** on the capture and anaesthesia of wildlife on **18-21 October 2023** in **Caramanico Terme** (Pescara);
- Annual meeting with **colleagues from Abruzzo, Lazio and Molise National Park on 14 and 15 December 2023 in Trento** (Photo 25).

Photo 25 - Meeting with staff dealing with bears at Abruzzo National Park (C. Groff - APT Wildlife Department archives).

7. SUMMARY

- **Status of the bear population: 13 litters** recorded in 2023, with **22 cubs. 8 bears died**, 2 of which from natural causes, 1 for reasons not possible to ascertain due to the scarcity of remains and 5 due to still unknown causes. **Population estimate: 98 animals, excluding cubs born during the year** (confidence interval **86-120**). The **trend for growth** continues.
- **Distribution of bears**: individual **males** over a vast distribution area (40,025 km^2) from Lombardia to Bavaria and Friuli Venezia Giulia. **Females** over 2,227 km^2; **the females' distribution area** is still **expanding slightly** (+9,2% compared to 2021).
- **Status of the wolf population: 27 packs** estimated to be present, with at least 26 breeding in 2023; **14 wolves** found **dead**, of which 11 due to road/rail accidents, 2 due to poaching and 1 for natural causes. The **trend** is apparently **stable** compared to the previous year; further spatial expansion recorded.
- **Distribution of wolves**: 16 packs in eastern Trentino and 11 in western Trentino; the area in south-west Trentino without ascertained packs has grown smaller.
- **Predation/consumption of wildlife by wolves**: 403 prey found (207 roe deer, 149 red deer, 35 chamois, 10 mouflons, 2 others).
- **Status of the lynx population: no animals** recorded in the province in 2023; B132 is very probably dead (aged 16 when last recorded in spring 2022).
- **Status of golden jackal population: reports increasing** and distribution over much of the province; **two breeding groups** currently ascertained (in the municipality of Tesero in Val di Fiemme and in the Fiavè/Lomaso area).
- **Damage by bears**: 201 cases with around 102,000 euro compensation.
- **Damage by wolves**: 136 cases with around 95,000 euro compensation.
- **Number of livestock preyed on**: 339, of which 283 by wolves and 56 by bears; a further 269 small courtyard animals were preyed on (chickens and rabbits).
- **Trend for damage by large carnivores**: increasing compared to 2022 both for bears and wolves.
- **Prevention works**: 218 new works distributed/funded, with an investment of 145,100 euro.
- **Guard dogs**: 9 new dogs distributed, with 6,600 euro invested; in total 95 have been provided by APT, in addition to several dogs provided by breeders; new training courses started up for the owners of guard dogs; new information panels about the dogs created and provided.
- **Support for animal husbandry**: 26 mountain pastures followed directly by the prevention coordinators, 17 accommodation units taken to the mountains for the summer and 2 further wooden shelters built, while others are planned for 2024.
- **Problem animals**: three attacks on humans recorded, one with a fatal result. The dangerous bears JJ4 and M90 were removed, the latter in February 2024; the dangerous bears MJ5 and F36 were found dead (causes as yet unknown); the overconfident bear M62 was also found dead (following an attack by another bear).
- **Activities of the emergency bear team**: 53 call-outs, 9 direct contacts with bears and 21 operations directed at deterring bears (with dogs and/or rubber bullets).
- **Bear captures**: 4 operations carried out to recover a small wounded bear (M89), remove the female bear JJ4 and capture F36 and M90 to fit them with radio collars.
- **Road/rail accidents**: 9 involving bears (all road accidents; the animals involved apparently survived) and 11 involving wolves (10 road and 1 railway accident; the animals involved died); no passengers were injured.
- **Activities of the bear dog unit**: 23 operations carried out, 10 of which to clear areas involved in road accidents with bears, 8 for

deterrent activities, 2 to assist with the capture of bears, and 3 during inspections at sites where humans were attacked; a further 16 operations were carried out to combat poaching of various species.

- **Bear-proof bins**: further distribution of bear-proof bins in the Val di Sole and approval of the revised Provincial waste management Plan, which provides for progressively equipping the whole of Trentino with management methods and/or collection devices taking into account interaction with wildlife. The plan is currently being applied.
- **Communication**: 13 evenings with the public, 102 press releases (66 on bears, 16 on wolves and 20 on large carnivores), replies to 13 provincial council questions (9 on bears and 4 on wolves); new informative material produced (several brochures and articles); SAT activities.
- **Staff training**: 25 initiatives/meetings organised.
- **National and international networking**: continuation of activities with the Alpine Convention (Large Carnivores Platform) and Arge Alp; cooperation with the Province of Bolzano and in the context of the Euroregion; third meeting in relation to the new cooperative agreement on bears with the Abruzzo, Lazio and Molise National Park. Further activities carried out with LCIE (Large Carnivores Initiative for Europe) and IUCN's Bear Specialist Group.

NOTES

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EMERGENCY NUMBER: 112