

The Wolf, *Canis lupus* Linnaeus, 1758 (Mammalia Canidae): re-colonization is still ongoing in Southern Italy: a breeding pack documented through camera traps in the Salento Peninsula

Giacomo Marzano¹, Francesca Crispino², Michela Rugge³ & Giacomo Gervasio^{2*}

¹Consorzio di Gestione di Torre Guaceto - Riserva Naturale dello Stato e Area Marina Protetta, Via Sant'Anna 6, 72012 Carovigno, Brindisi, Italy

²Società Cooperativa Greenwood, Via Pozzillo 21, 87045 Dipignano, Cosenza, Italy; email: info@scgreenwood.it

³Associazione I.QE.JIA. Via delle masserie Fossa e Zundrano 7, 73100 Lecce, Italy

*Corresponding author, email: gervasiogiaco@scgreenwood.it

ABSTRACT

The authors report the presence of the wolf in the Salento Peninsula (southern Apulia) after more than a century of the absence of sightings. New data for this area resulted from the analysis of video-photographic material provided by various collaborators (referring to the three-year period 2014-2017), as well as from camera trapping activities carried out by the authors in 2017 which revealed the presence of a breeding pack. These data help to update our knowledge of the presence of the wolf in Apulia and they extend the distribution range of the species ca. 100 km southward, making this area the extreme eastern limit of the Italian populations. The investigations were also part of a project commissioned to the authors by the “Costa Otranto Leuca e Bosco di Tricase” Regional Natural Park in March 2016, whose subject was “A preliminary study of wildlife or stray animals potentially harmful to crops and breeding stocks in the Protected Area”.

KEY WORDS

Canis lupus; Distribution; Wolf; Puglia; Salento.

Received 11.09.2017; accepted 22.09.2017; printed 30.09.2017

INTRODUCTION

Up to the middle of the 19th century, the wolf was widely distributed throughout Italy, with the exception of Sardinia and the small islands where it was never present (Cagnolaro et al., 1974). At the beginning of the 20th century, the increasing human pressure due to the exploitation of natural resources deprived the wolf of important refuge areas and natural prey. Moreover, continued persecution by man caused a steady, progressive population decline that led to the disappearance of the species from the entire Alpine arc in the early 20th

century and then from Sicily in 1935. Until the 1950s, the presence of wolves continued to be recorded in most of the Apennine chain, but in subsequent years there was a rapid decline. The Italian wolf population reached its historical minimum in the 1970s, when the number of individuals was estimated at close to 100 (Boitani & Zimen, 1975).

There was a process of expansion in subsequent years thanks to a series of historical, ecological, environmental and legal factors (Boscagli, 1991; Aloise et al., 2017). The end of the 1980s saw the first recorded presence of the wolf in the pre-Alps,

indicating the beginning of recolonization of the Alps by means of natural dispersion of the Apennine population (Fabbri et al., 2007).

At present the wolf is stable in the Western Alps and to a lesser extent in the central-eastern part of the Alps where there are records of stable wolf pairs coming from both the Italian population and the Dinaric and Carpathian ones (WAG, 2014). In the rest of the Italian Peninsula, sporadic sightings have increasingly been recorded in medium and low hill zones. In spring 2017 the presence of the wolf was also documented in the Ticino Park in Lombardy, where there had been no sightings since the Middle Ages.

Regarding the presence of the wolf in Apulia, the official data updated to 2016 (Gaudio et al., 2016) indicate that the species is distributed over ca. 30% of the regional territory, including all of the north-west part, the Murge plateau and the ravines of the Ionian arc; the data also show the presence of nuclear families in the area of the Gargano National Park and Alta Murgia National Park.

The latest records of the wolf in Salento date to the 19th century (Costa, 1871). The presence in this area is documented since prehistory not only by numerous skeletal remains from archaeological sites (Grotta Romanelli, Castro (Lecce)) (Tagliacozzo, 2003), but also by necklace pendants made of wolf teeth in the metal ages (Grotta dei Cervi Badisco, Otranto (Lecce); Roca, Melendugno (Lecce) (Rugge, 2015). Other sporadic skeletal remains from that period have been found at numerous sites (Cavallino (Lecce); Roca, Melendugno (Lecce); Egnazia, Fasano (Brindisi); Torre Guaceto (Brindisi) (Wilkens, 1998). Moreover, various stone artefacts in the territory, such as traps excavated in the rock at "Terenzano" near Ugento (Lecce) and "anti-wolf" walls for the protection of flocks inside the courtyards of farms, testify both to the presence of the wolf and to an already conflictual relationship with the species. Indeed, "rewards" for wolf kills were offered in 1400 (Ferrante Gravili, 2012), the amount varying according to the weapon used. At the end of the 18th century, Costa (1871), in "Fauna Salentina", considered the wolf: *"not rare in the mountainous and wooded localities of the province, from where it readily descends into the plains, not lacking in these lands in which it has been seen to approach and even enter the village."*

MATERIAL AND METHODS

The investigations were also part of a project commissioned from the authors by the "Costa Otranto Leuca e Bosco di Tricase" Regional Natural Park in March 2016, whose subject was "A preliminary study of wildlife or stray animals potentially harmful to crops and breeding stocks in the Protected Area". The sightings reported herein refer to video-photographic material from various sources collected over one year of research and from camera trapping carried out by the authors in spring-summer 2017. Analysis of the material was conducted in particular by two of the authors (GG and FC), qualified operators according to the wolf monitoring guidelines (Ciucci et al., 2002) and as codified in other protocols (Kaczensky, 2009; Marucco et al., 2014). After the analysis of the images, field inspections were carried out to determine the environmental context of the films/photographs and also to validate their authenticity. In this phase of the study, it was also possible to set up five camera traps, appropriately positioned in the areas considered most suitable to verify the presence of breeding packs. For the data analysis we used the information layers made available by the Regional Information System (SIT) of the Apulia Region, processed in digital form with QGIS software; further thematic cartography of the area was also consulted (Lavarra et al., 2014). To maintain homogeneity of the information, the wolf distribution is represented on a grid with 10 x 10 km cells according to the European standard.

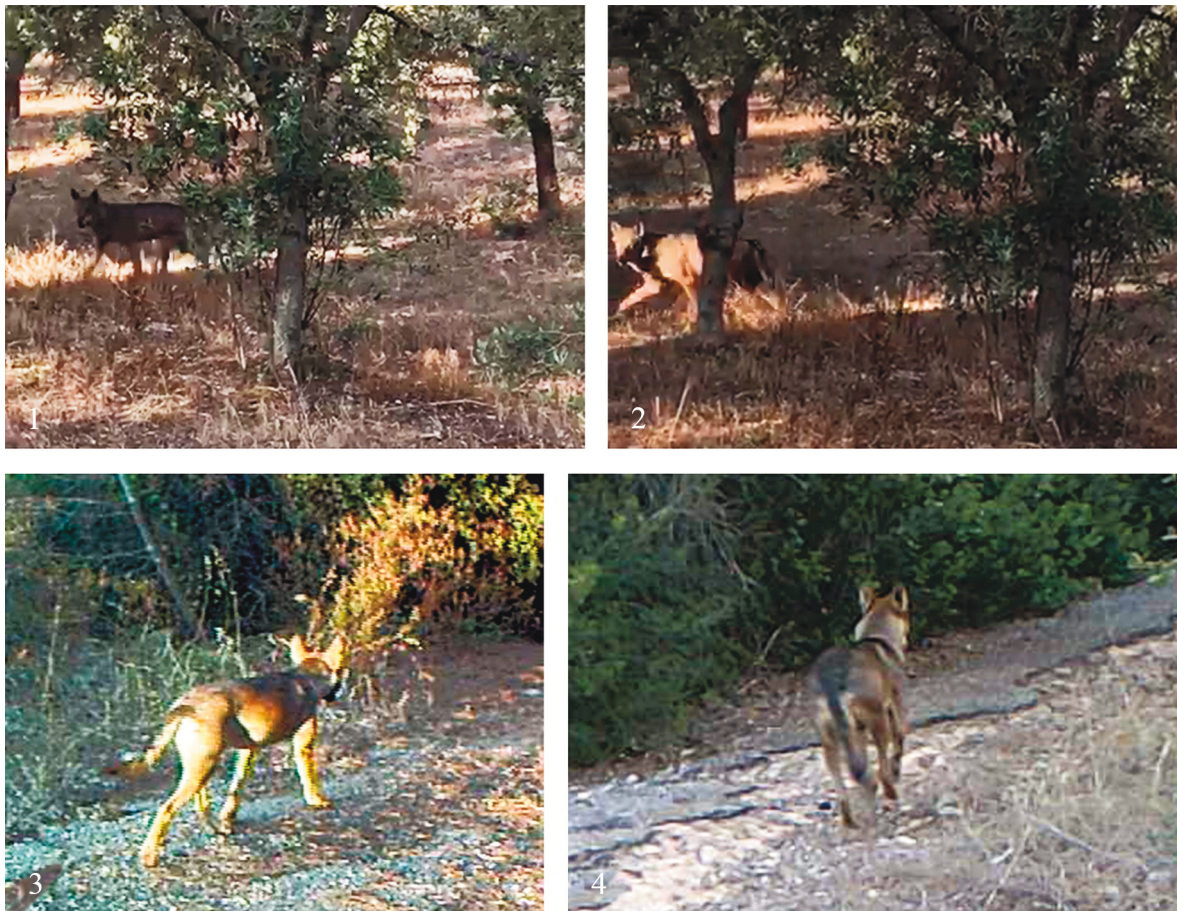
RESULTS

Table 1 schematically reports the data of the images provided to the authors, with indication of the date, environmental context and type of event observed.

The films and photographs show single individuals (Figs. 1, 2), for which it was possible to identify the sex in only one case. No specimens with abnormal phenotypic characteristics or any diagnostic elements useful for subsequent individual recognition were detected. However, in some cases the location and dates of the sightings suggest the presence of different individuals.

Date	Environmental context	Type of event
December 2015	Pseudosteppe	Predation on a domestic animal (film)
December 2016	Olive grove	Crossing an unpaved path in an olive grove (film)
April 2016	Olive grove	Passage of a male wolf in an olive grove at the edge of an unpaved path (film)
May 2017	Vineyard	Passage of a wolf in a vineyard at the edge of an unpaved path (film)
September 2016	Uncultivated land	Wolf on the edge of a quarry (photograph)
September 2016	Garrigue	Wolf on the edge of shrubland (photograph)

Table 1. Analysed video-photographic material from various sources.



Figures 1, 2. Photograms from some of the analysed videos. Figures 3, 4. Camera trapping results (spring/summer 2017).

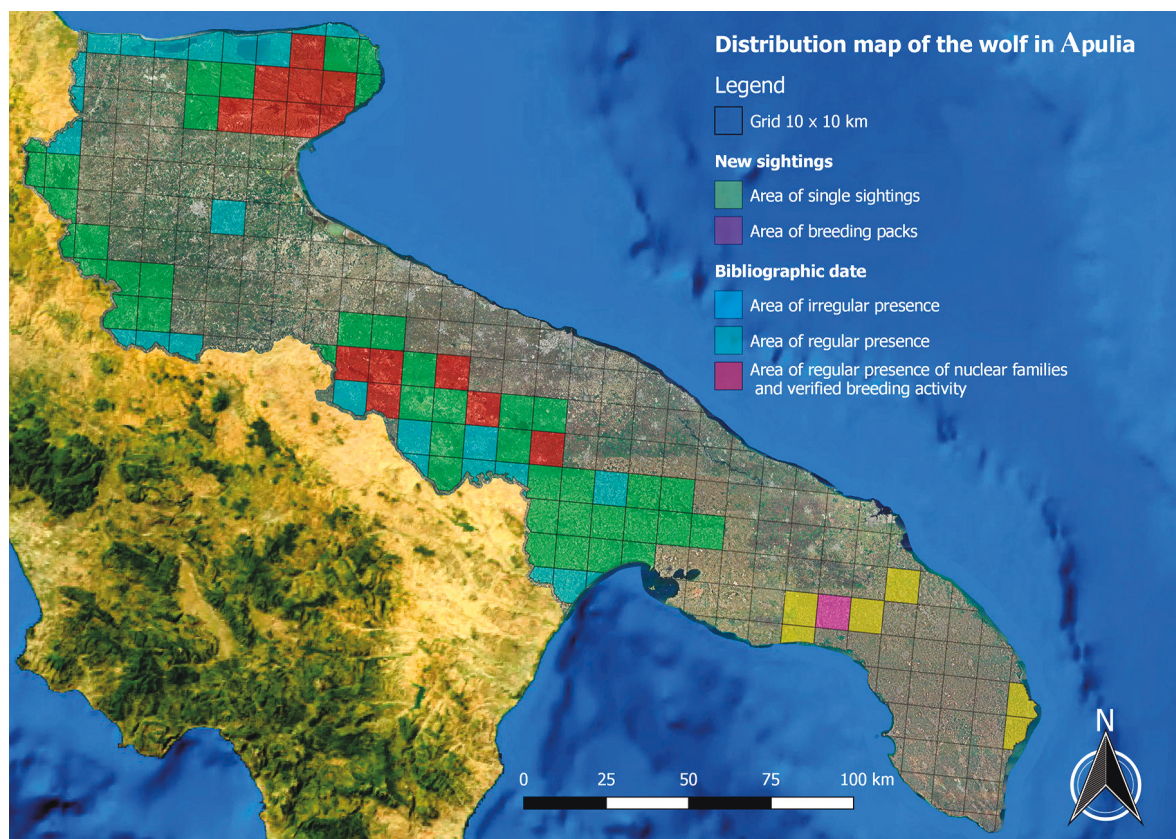


Figure 5. Updated distribution of the wolf in Apulia.

All the images refer to agro-ecosystems, a typology which together with urban centres accounts for almost 80% of the regional territory.

The camera traps set up in spring-summer 2017 yielded a positive result in one case, recording the presence of at least one first-year pup and two adult individuals, of which one a male (Figs. 3, 4); this attests to the stable presence of the species in the area.

The new findings extend the distribution range of the species in Apulia ca. 100 km southward, making this area the extreme eastern limit of the Italian populations. Figure 5 shows the distribution of the wolf in Apulia in the light of the present sightings. The bibliographic data are from Gaudiano et al. (2016).

CONCLUSIONS

The reported data are the first evidence of the

presence of the wolf in the Salento Peninsula after more than a century of the absence of sightings. In addition to the verified presence of single individuals in various parts of Salento, probably due to natural dispersion of the species, the identification of a breeding pack indicates a certain degree of territorial stability and the effective return of the species to the area. Besides being part of the wider context of the wolf distribution dynamics in Italy, this finding is particularly important in light of the territorial marginality of Salento with respect to the known distribution range and it confirms the presence of the species even in areas considered not ecologically ideal. The phenomenon can be attributed to the natural expansion of the population, which in recent years has recolonized medium and low hill zones and has even moved close to large cities and into areas recently considered not particularly suitable. In Salento, the environmental context of the sightings and the potential areas of connection with already known

stable populations in the rest of Apulia are heavily influenced by human activities. In this regard, the presence of the wolf is of significant management interest in view of the potential implications for animal husbandry. The ongoing recolonization by the wolf is further fuelled by the scarcity of natural prey in the area south of Lecce and this brings the risk of increasing conflict with local breeders. Therefore, it would be advisable to monitor the process in order to assess the real impact on animal husbandry activities, to evaluate possible hybridization events and to conduct correct, efficacious management and conservation of the species.

ACKNOWLEDGEMENTS

We thank the following collaborators who provided video-photographic material and other valuable information: Michele Balloi (Otranto, Lecce, Italy) Dario Cedra (Otranto, Lecce, Italy), Giuliano Cirfeda (Leverano, Lecce, Italy) Oscar Conte (Avetrana, Taranto, Italy), Massimiliano De Padova (Avetrana, Taranto, Italy), Flavio Maglio (Nardò, Lecce, Italy). We are also grateful to Antonio Panzera del C.F.S., Gaetano Aloise of the Natural History Museum and Botanical garden of the University of Calabria and Francesco Minonne of the “Costa Otranto Leuca e Bosco di Tricase” Regional Natural Park.

REFERENCES

- Aloise G., Crispino F. & Gervasio G., 2017. La nuova vita del lupo. Stringhe- Rivista di Divulgazione Scientifico-Culturale dell'Università della Calabria, 7, Numero 1/2017: 18-34.
- Boscagli G., 1991 Evoluzione del nucleo di lupi appenninici (*Canis lupus italicus*) in cattività nel parco Nazionale d'Abruzzo e situazione della popolazione italiana di lupo. Situazione della popolazione di orso (*Ursus arctos marsicanus*) in appennino centrale. In Randi E. & Spagnesi M. (Eds.), Genetics and Wildlife Conservation. Ozzano dell'Emilia, Italy, pp. 219–225
- Cagnolaro L., Rosso D., Spagnesi M. & Venturi B., 1974. Inchiesta sulla distribuzione del lupo in Italia e nei cantoni Ticino e Grigioni (Svizzera). Ricerche di Biologia della Selvaggina, 59, Istituto Nazionale per la fauna Selvatica.
- Ciucci P., Genovesi P. & Guberti V., 2002. Linee guida per il monitoraggio del lupo. In: Genovesi P. (Ed.), Piano d'azione nazionale per la conservazione del Lupo *Canis lupus*. Quaderni di Conservazione della Natura, 13, Ministero dell'Ambiente - Istituto Nazionale Fauna Selvatica.
- Costa G., 1871. Fauna salentina ossia enumerazione di tutti gli animali che trovansi nelle diverse contrade della provincia di terra d'Otranto e nelle acque de' due mari che la bagnano, contenente la descrizione de' nuovi o poco esattamente conosciuti. Editrice Salentina.
- Fabbri E., Miquel C., Lucchini V., Santini A., Caniglia R., Duchamp C., Weber J. M., Lequette B., Marucco F., Boitani L., Fumagalli L., Taberlet P. & Randi E., 2007. From the Apennines to the Alps: colonization genetics of the naturally expanding Italian wolf (*Canis lupus*) population. Molecular Ecology, 16: 1661–1671.
- Gaudio L., Sorino R., Corriero G., Frassanito A.G., Strizzi G. & Notarnicola G., 2016. Stato delle Conoscenze del lupo *Canis lupus* in Puglia. The Italian journal of Mammology, 27 (Suppl.): 115.
- Ferrante Gravili G., 2012. Il codice di Maria D'Enghien, nella versione della lingua italiana corrente. Il Parametro Editore, Lecce.
- Lavarra P., Angelini P., Augello R., Bianco P.M., Capogrossi R., Gennaio R., La Ghezza V. & Marrese M., 2014. Il sistema Carta della Natura della regione Puglia. ISPRA, Serie Rapporti, 204/2014.
- Kaczensky P., Kluth G., Knauer F., Rauer G., Reinhardt I. & Wotschikowsky U., 2009. Monitoring of large carnivores in Germany. BfN-Skripten 251.
- Marucco F., Mattei, L., Papitto G., Bionda R., Ramassa E., Avanzinelli E., Pedrini P., Bragalanti N., Martinelli L., Canavese G., Sigauda D., Pedrotti L., Righetti D., Bassano B., Agreiter A., Stadler M., Groff C., Fattori U., Tironi E., Malenotti E., Calderola S., Potokcnik H. & Skrbinsek T., 2014. Strategia, metodi e criteri per il monitoraggio dello stato di conservazione della popolazione di lupo sulle Alpi italiane. Progetto LIFE 12 NAT/IT/000807 WOLF-ALPS - Azione A2.
- Rugge M., 2015. Studio dei reperti relativi al sito di Grotta dei Cervi e Porto Russo (Badisco) con allestimento di mostra stabile in una sezione del museo del castello di Otranto (LE). Det. N°117 del 2015 Città di Otranto. P.O. FESR 2007–2013.
- Tagliacozzo A., 2003. Archeozoologia dei livelli dell'Epigravettiano Finale di Grotta Romanelli (Castro - Le) “strategie di caccia ed economia di sussistenza in Grotta Romanelli nel centenario della sua scoperta (1900–2000) atti del convegno Castro 6–

- 7 ottobre 2000 a cura di Pier Francesco Fabbri, Elettra Ingravallo e Antonio Mangia. Congedo Editore.
- Wilkens B., 1998. Le risorse animali in documenti dell'età del Bronzo, Schena editore.
- Wolf Alpine Group, 2014. Wolf population status in the Alps: pack distribution and trend up to 2012. 6 p. (<http://Www.Lcie.Org>. 2014 June).