THE WOLF IN THE LANDSCAPE OF THE ASPROMONTE NATIONAL PARK (ITALY): AN INVESTIGATION OF HIS PRESENCE

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Abstract. *The wolf is an important wild species characterising the habitat and the landscape of the Aspromonte National Park, in southern Italy. His presence has been documented since ancient times, although in recent times the continuous monitoring of the real presence of wolf populations and their condition has taken on a great importance, both for conservation purposes and in order to understand if man and wolf can coexist and find a common ground for their activities. This study was conducted with the aim of monitoring the presence of the wolf (Canis lupus italicus) in the Aspromonte National Park in 2017, utilising various different methods, namely searching for signs of wolf presence and collecting droppings for genetic analysis, wolf-howling, and camera-trapping. From the joint analysis of all the data collected, we can assume the presence of at least 3, or probably 4, wolf packs in the Park at this time.*

Keywords: *Wolf, Aspromonte National park, demography, wolf census.*

Introduction

A great amount of information is available concerning the presence, distribution, and history of wolf populations in Italy (Ciucci & Boitani, 1998; Marucco, 2010; 2014), although the data is mostly estimated due to the difficulty of monitoring this species. In Calabria, the presence of the wolf has been documented since ancient times (Lucifero, 1906; Aloise, 1997) and continues to today, albeit with fluctuating fortunes. By around 1970 the wolf was at risk of disappearing entirely from Italy, due to a number of factors. The forests were being cut down in large areas and the land was being increasingly devoted to crop cultivation, with the result that the wolf's habitat was shrinking more and more. The killing of wolves was encouraged because it was considered to be dangerous (Marucco, 2014). Men and wolves became competitors, not only for food (for example, the wild ungulates), but above all for living space. There were no laws to protect wolves and other wildlife. Furthermore, local communities were poorly informed, and did not understand that the natural world represented a complex ecosystem in which the loss of one species can generate very serious environmental problems. During

these years, wolves disappeared entirely from the Serre-Aspromonte massif and the central and southern part of the coastal chain, but in the 80s they returned, reaching as far as the southern end of the region and the Serre-Aspromonte massif (Mirabelli, 1985; Reggiani & Andreoli, 1989). Over the following decades their presence was consolidated throughout the Calabrian territory and traced even in very populated areas, thanks to more favourable conditions: the mountain and hill territories were abandoned by man and reclaimed by the forest; there was an abundance of wild prey; the sensitivity of local populations had changed, and new laws were implemented for the protection of the wolf and other wildlife. Nevertheless, continuously monitoring the real presence of the wolf population and its status has taken on a great importance, both for conservation purposes and in order to understand if, today, man and wolf can coexist and find a common ground for their activities, particularly in protected areas. The Aspromonte National Park is an Italian protected natural area hosting almost 8,000 animal species, representing about 15% of the national wildlife heritage (Vinceti, 2006; Siclari, 2017). Here, the presence of the wolf is considered an important characterising element of the food chain and of the landscape. This study was conducted with the aim of monitoring the presence of the wolf (*Canis lupus italicus*) in the Aspromonte National Park, both from a qualitative and quantitative point of view, within the scope of a larger project instigated by the Park, entitled "Coexist with the wolf. Know to preserve", under a Directive of the MATTM (Ministry of the Environment and the Protection of the Sea).

The monitoring was carried out using different techniques: searching for signs of wolf presence and collection of scat for genetic analysis, wolf-howling, and camera-trapping. The combined use of different methods gives more complete and reliable results (Ciucci & Boitani, 1998; Llaneza et al., 2005), although, predictably, there are inevitable intrinsic difficulties due, above all, to the harsh terrain of the Park. In any event, no single methodology can be considered optimal, that is, without limits and errors, when working with wolves or other wildlife.

The initial assessment of the presence of a specific wildlife species generally takes place through research, and the evaluation and interpretation of indirect signs (tracks, scat, urine, etc.), since, in the wild, sightings are very unlikely, even if not impossible (Kendall & al., 1992). Non-invasive genetic analysis allows the extraction of DNA from biological samples collected on the ground without the necessity to capture the animal. This technique, combined with other traditional methods of investigation, offers the best large-scale investigative method to study wolf populations, because it allows the recognition of individual members (Marucco, 2012; 2014). Wolf-howling allows us to certify the presence of breeding groups, in other words, packs with puppies (Boscagli, 1992). It is considered to be a very useful method of estimating the number of packs in small areas like the Aspromonte National park (Fuller & Sampson, 1988), but can have some limitations in that small packs may not respond, or adverse weather

conditions may reduce the possibility of locating packs. Using this method together with other methods such as the collection of signs of presence, however, reduces its limitations (Harrington & Mech, 1982). Camera trapping allows the numerical consistency of the packs to be verified and/or the presence of individuals with particular phenotypic characteristics to be detected.

Material and methods

The study was conducted in the area of the Aspromonte National Park, in southern Italy (fig.1), within the scope of a long-term monitoring of the species. The Park represents the extreme southern edge of the Apennine chain, covering about 655.45 km^2, and includes 37 municipalities within the province of Reggio Calabria. Fieldwork was carried out between April and November 2017, except for the wolf-howling that was done in July 2018 by trained students, park employees, and researchers. Fieldwork procedures were specifically approved by the management of the Aspromonte National Park in line with their own wolf monitoring activities. No ethics approval was necessary to work with non-invasive samples and methods.

To investigate the wolf presence in the Park, four methods were used simultaneously:

- searching for signs of presence attributable to the species;
- collection of scat for genetic analysis;
- wolf-howling;
- camera-trapping.

Indirect signs of wolf presence in the area (tracks on the ground and on the snow, scat, urine, and hairs) were collected by following specific transects, i.e. a network of standardised paths identified in order to cover the study area as much as possible and intercept the marking points. A total of 46 transects were followed on foot, in the last year of the study (fig. 2). Many of these had already been used

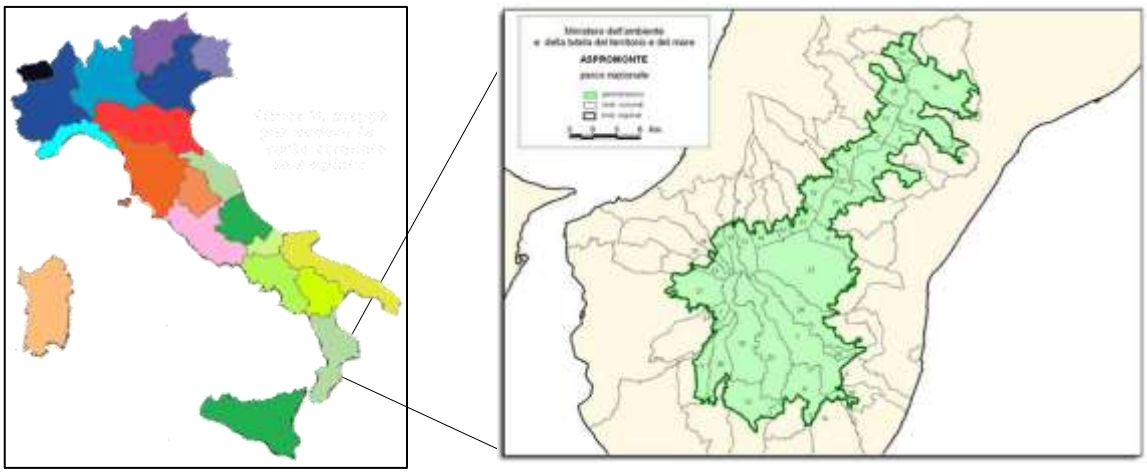

Figure 1. **Location of the study area in Calabria (Source: our elaboration)**

in previous monitoring campaigns, but others were identified *ex novo* in the northern and southern sectors of the Park. The identified and georeferenced transects ranged in length from between 2 and 7 km, for a total of about 180 km (tab. 1). Of the 46 total transects, 13 were in the northern sector (N), 20 in the central sector (C), and 13 in the southern sector (S) of the Park.

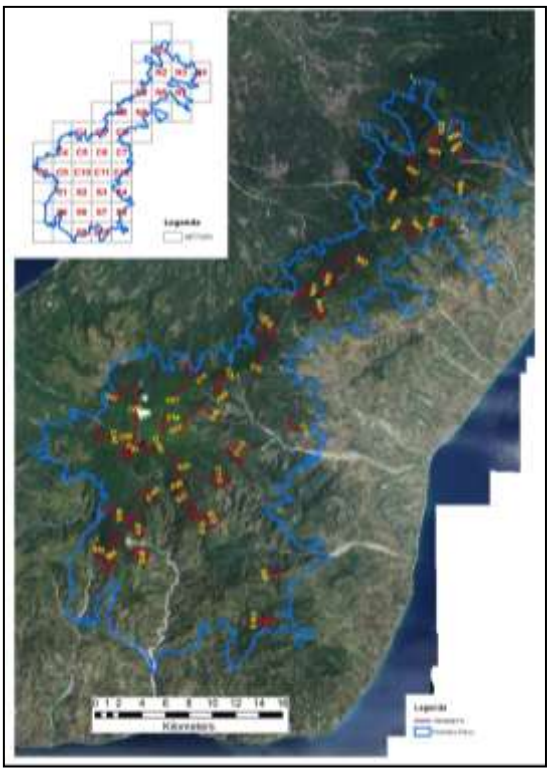

Figure 2. **Location of the transects in the Aspromonte National Park (Source: our elaboration from direct investigations)**

Sites for non-invasive genetic analysis sampling were chosen, opportunistically based on known or presumed wolf presence or on random direct observations. The sampling was carried out following the collection protocol indicated by ISPRA (the Italian Higher Institute for Environmental Protection and Research), which was responsible for carrying out the laboratory analysis. The scat samples were classified according to age, as:

1- one-day or less sample;
2- one-week or less sample;
3- more than one-week sample.

Only type 1 and 2 samples were collected, type 2 samples being re-hydrated before storage. Each scat sample was collected with a sterile cotton swab, stored in a 1.5 ml test tube with a preservative reagent (lysis buffer ATL, 275 ul), and marked with an identification code. The tubes were stored at room temperature until their arrival in the laboratory. All the information relating to the sample (date and place of collection, binder, coordinates, freshness of the sample, etc.) was recorded in a specific form.

Table 1.

Data of the transects (N= northern sector, C= central sector, S= southern sector)

Number	Code	Name	Length (m)	Sector
1	C102	Puntone Lappa	4.362	C
2	C104	Menta Cavaliere-Bocca del Lupo	3.570	C
3	C11	Carmelia-P. Mastrangelo	3.373	C
4	C111	Cascate Forgiarelle	2.333	C
5	C112	Croce di Dio sia lodato	3.329	C
6	C113	Acatti Afreni M. Antenna	5.354	C
7	C21	Fistocchi	2.611	C
8	C31	Misafumera	4.569	C
9	C32	Piani di Zillastro	4.722	C
10	C41	Laghetto Rumia	3.467	C
11	C42	Basilio	4.617	C
12	C43	Nino Martino	4.775	C
13	C51	Tabaccari-S.Pietra Tagliata	2.827	C
14	C53	Montalto	2.672	C
15	C54	Anello di Montalto	3.449	C
16	C61	Polsi	5.358	C
17	C62	Casello Vocale	2.717	C
18	C71	Pietra Castello	2.944	C
19	C91	Nardello Tre Limiti	5.469	C
20	C92	Serro Sgarrone	3.715	C
21	N31	Bardi-Mammola	3.834	N
22	N32	Bardi-Mammola	3.182	N
23	N51	Passo di Cancello	6.216	N
24	N61	Caldara	3.219	N
25	N62	M. Cacciagrande	3.401	N
26	N71	T. Maria	3.661	N
27	N81	Serro Pepe	6.471	N
28	N92	Moleti	4.288	N
29	N93	Aria del Vento – M. due Mari	5.113	N
30	N94	Piano della Limina	3.056	N
31	N95	San Nicodemo	2.370	N
32	N96	Passo del mercante	2.207	N
33	N97	Varca Martello	3.249	N
34	N98	Malafrina	3.902	S
35	S101	Staiti	5.704	S
36	S11	Piani di Amusa	5.005	S
37	S20	Schirifizio	2.747	S
38	S21	D. Menta – M. Vitale	3.745	S
39	S22	Punta d'Ato	4.397	S
40	S23	Menta Cavaliere–Bocca del Lupo	3.408	S
41	S25	Saguccio	6.839	S
42	S26	Starda dell'indiano	3.156	S
43	S31	Puntone la Chiesa	3.180	S
44	S32	Canido	3.097	S
45	S81	Portella di Ficara	3.159	S
46	MP	Monte Peripoli	4.530	S
		Total meters (C+N+S)	**179.370**	

Source: our elaboration from direct investigations

The wolf-howling was carried out in an area of 480 km^2, representing 74.9% of the Park's territory. The howling points were largely selected in the previous three years, while three new points were added in the southern sector; 34 points were used in total. Every point was geo-referenced and identified by a unique code; for

the points located at Moleti and Polsi, a letter indicating the membership circuit, the letters WH, and a progressive number were used. This code was used for points in the southern sector. The fieldwork was carried out in July 2018, when it was easier to detect packs as they remain with the puppies in the rendezvous sites at this time of year. Wolf-howling was performed according to the method indicated by Harrington and Mech (1982). Each howling point was approached with the utmost discretion, and 10 minutes of silence were kept before the howling. Wolf response was elicited via human imitation of howling. The researcher howled with increasing volume at 2-3 min intervals until either there was a response or three to four series had failed to elicit a reply. A single series consisted of 3 to 5 howls, each of 5-8 seconds duration, separated by a pause of 1-2 seconds. Sessions started at sunset and were repeated during the early night-time hours. Howling points were spread throughout the area, at sites that offered good conditions for simulated howling and for receiving responses over the entire area, and that were thought to be possible breeding areas based on the results of the other methods utilised. No attempts at simulated howling were made on rainy or windy nights, as wolf response and howl audibility would have been reduced. As wolf packs tend to change rendezvous point and, in any case, may not always respond, we spent 3 consecutive nights howling over each possible breeding area. Where no response was obtained, we sought other information, such as signs of concentrations, to assess possible pack presence and breeding. A file was kept for each session, recording data and general conditions (point code, researcher, times, weather conditions), and data relating to any responses attributable to wolves (characteristics of the howling, duration of reply, time lapse between the end of the trial and the response, bearings to the North, the estimated distance between the point and the wolves, the minimum estimated number of individuals in the pack, the presence/absence of puppies, and the duration of the reply).

Camera trapping was not considered to be a priority in the last year of study because the Park already had a specific project in place for this activity. Thus, we placed only 2 camera traps in November 2017 in order to certify the presence of a known pack. The camera traps used were a Cuddeback Ambush® with a white flash (to take photos) and a Boskon Guard BG-529 (to take videos).

All the data were archived and processed on a PC, and the database provided by ISPRA was compiled for the scat samples. The GIS elaborations were carried out starting from the Calabria Region cartography. Vectorialisations were made of transects, wolf-howling points, scat sampling points, and camera traps points. The GIS program used for cartographic processing was the Open Source QGIS (version 2.18) software.

Results

Collection of signs on transects

The transects were covered by the operators in 4 different sessions (tab. 2): in April (N=29), June (N=22), July (N=5), and November (N=34); each transect was travelled 1, 2, or 3 times. In the summer, the routes were limited due to the high possibility of finding fewer and easily degradable samples. In the winter, it was not possible to carry out samplings due to the environmental conditions (high and permanent snow) that made both the transects and the approach roads to them impassable. A total of 115 signs of wolf presence were identified and geo-referenced during the period of fieldwork (fig. 3).

Among these, there were 103 scats, 1 urine marking (therefore a total of 104 biological samples), 7 tracks on ground, 3 tracks on snow, and 1 hair (tab. 3). Eight of the signs were found in the northern sector transects (n = 8, 8.3%), twenty-eight in those of the central sector (n = 28, 29.1%), and sixty-eight in the southern sector (n = 68, 70.7%).

Table 2.

Repetitions made on transects

Transect Code	April	June	July	November	Total Repetitions
C102	1	1		1	3
C104		1		1	2
C11	1				1
C111		1			1
C112		1		1	2
C113		1		1	2
C21	1	1		1	3
C31	1				1
C32	1	1			2
C41	1	1		1	3
C42	1	1		1	3
C43		1		1	2
C51	1			1	2
C53		1		1	2
C54		1		1	2
C61		1		1	2
C62	1	1		1	3
C71		1			1
C91		1		1	2
C92	1	1		1	3
N31	1		1		2
N32	1		1	1	3
N51	1			1	2
N61	1		1		2
N62	1		1		2
N71	1				1
N81	1	1			2
N92	1	1			2
N93	1	1		1	3
N94	1			1	2
N95	1			1	2

N96	1				1
N97	1		1	1	3
N98	1			1	2
S101				1	1
S11		1		1	2
S20	1			1	2
S21	1			1	2
S22	1	1		1	3
S23				1	1
S25				1	1
S26				1	1
S31	1			1	2
S32	1			1	2
S81				1	1
MP				1	1
Total	**29**	**22**	**5**	**34**	

Source: our elaboration from direct investigations

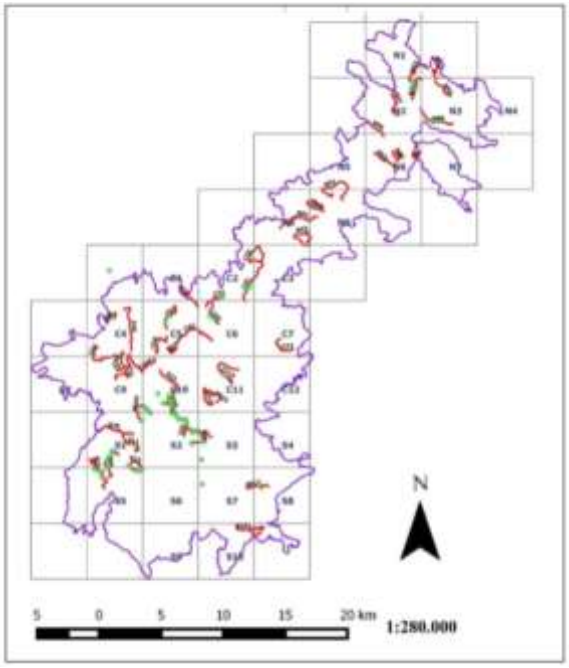

Figure 3. **Location of the signs of wolf presence in the Aspromonte National Park**
Source: our elaboration from direct investigations

Table 3.

Distribution of the signs of wolf presence in different areas of the Aspromonte National Park

Sign	N	C	S	Total
Scat	8	27	68	**103**
Urine	/	1	/	**1**
Track on ground	5	2	/	**7**
Track on snow	/	3	/	**3**
Hair	1	/	/	**1**
Total	**14**	**33**	**68**	**115**

(N= northern sector, C= central sector, S= southern sector)
Source: our elaboration from direct investigations

Non-invasive sample collection and genetic analysis

In total, we collected 104 biological traces; all were identified and georeferenced, although only a few of these were sampled for analysis because they were fresh enough. In April, 45 biological traces were discovered, of which 8 were sampled (7 scats and 1 urine); in June, 18 scats were found, of which 1 was sampled; in July/August 5 scats were found, of which 1 was sampled; and in November 36 scats were discovered, of which 8 were sampled (tab. 4). The results obtained from the genetic analysis by the ISPRA laboratory (tab. 5) enabled the identification of 3 distinct individuals belonging to the Italian wolf population: 2 females and 1 male (in the southern sector, in transects S21 and S31). Another sample (ID = Asp183) was also identified as belonging to a female wolf, but it was not possible to identify the genotype. In addition, three dogs were identified, 1 male and 2 females, and one individual (male) which was identified as a hybrid, possibly the first in the Park. It was not possible to obtain any result from eleven other samples. None of the genotyped individuals had previously been identified, i.e. no resampling occurred.

Table 4.

Biological traces sampled in 2017 in the Aspromonte National Park

ID	Date	Sector	Sign	Sample
1	04/04/17	N	Scat	ASP181
16	06/04/17	C	Urine	ASP188
17	06/04/17	S	Scat	ASP187
20	06/04/17	S	Scat	ASP182
25	06/04/17	S	Scat	ASP183
26	06/04/17	S	Scat	ASP184
33	06/04/17	S	Scat	ASP185
34	06/04/17	S	Scat	ASP186
49	27/06/17	C	Scat	ASP189
64	27/07/17	C	Scat	ASP190
69	01/08/17	C	Scat	ASP191
78	08/11/17	S	Scat	ASP192
80	08/11/17	S	Scat	ASP193
82	08/11/17	S	Scat	ASP194
99	09/11/17	S	Scat	ASP195
100	09/11/17	S	Scat	ASP196
103	12/11/17	S	Scat	ASP197
104	12/11/17	C	Scat	ASP198

Source: our elaboration from direct investigations

Table 5.

Genetic analysis results from the ISPRA laboratory

N	ID	Sample	Location	Species	Sex	ISPRA ID
1	Asp181	scat	Malafrina	Dog	F	DASP8F
2	Asp182	scat	Diga del Menta – Monte Vitale	Wolf	M	WASP34M
3	Asp183	scat	Diga del Menta – Monte Vitale	Wolf	F	ND
4	Asp184	scat	Diga del Menta – Monte Vitale	Wolf	F	WASP35F
5	Asp185	scat	Punto la Chiesa	Wolf	F	WASP36F
6	Asp186	scat	Punto la Chiesa	ND	ND	ND
7	Asp187	scat	Punto d'Alto	ND	ND	ND
8	Asp188	urine	Serro Sgarrone	ND	ND	ND
9	Asp189	scat	Gambarie	ND	ND	ND
10	Asp190	scat	Monte Schirifizio	Dog	F	DASP9F
11	Aso191	scat	Case sparse (out of the Park)	ND	ND	ND
12	Asp192	scat	Monte Peripoli	ND	ND	ND
13	Asp193	scat	Monte Peripoli	Hyb	M	HASP1M
14	Asp194	scat	Monte Peripoli	ND	ND	ND
15	Asp195	scat	Portella di Ficara	ND	ND	ND
16	Asp196	scat	Portella di Ficara	ND	ND	ND
17	Asp197	scat	Diga del Menta	ND	ND	ND
18	Asp198	scat	Carrà	Dog	M	DASP10M

(ND = not detected)

Source: our elaboration from direct investigations

Wolf-howling

In total, 34 points were covered: 9 in the Amendolea alta-Africo circuit, 6 in the Amendolea-Roccaforte circuit, 10 in the Polsi circuit, and 9 in the Moleti circuit (tab. 6 and fig. 4).

Table 6.

Total length of wolf-howling circuits and number of emission points per circuit

Circuit	Code	Length (Km)	N° Stations
Amendolea alta - Africo	AA	24	9
Amendolea – Roccaforte	AR	25,6	6
Polsi	P	30	10
Menta	M	37,4	9
Total		**117**	**34**

Source: our elaboration from direct investigations

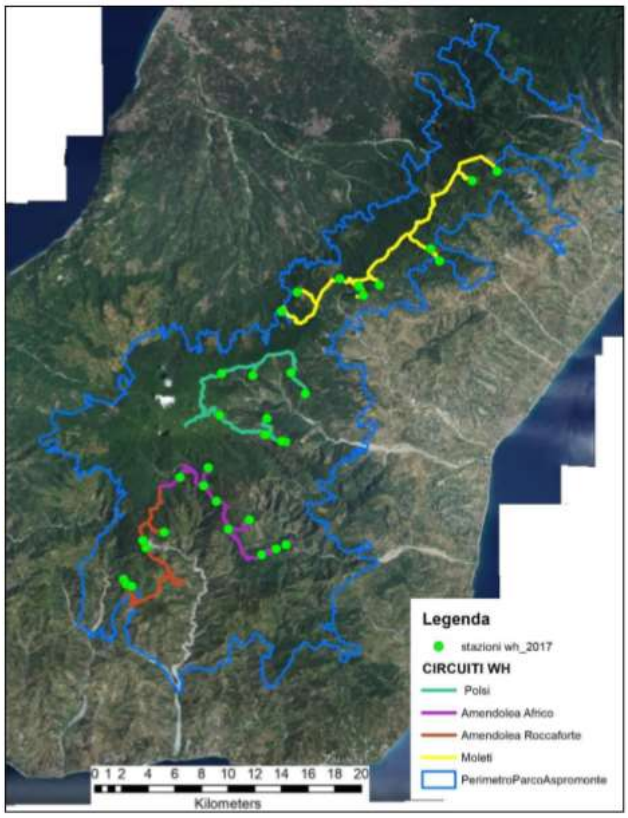

Figure 4. **Location of the wolf howling circuits and points used in summer 2017**
Source: our elaboration from direct investigations

Since the auditory capacity of an operator is effective at a distance of 1.5 km (Harrington & Mech, 1982), the total listening area was estimated at 0.17 km^2. The survey area was covered in the period 27th-31st July, over 5 consecutive evenings. Eleven howling sessions were carried out, for a total of 56 issuing sessions and 157 acoustic trials, around 70% of which were planned. Due to bad weather conditions (excessive wind) during the first and second evenings, it was possible to carry out the planned activities only in the southern sector of the Park. In total, 5 responses were obtained of which 4 were chorales (adults and puppies) and 1 was a single adult wolf. Responses were obtained in all three areas of the Park (tab. 7). From the AWH9-Frana Zumbello emission point (in the southern sector and in the Amendolea Roccaforte circuit), the choral response of a family group was obtained; this response enabled the identification of one adult and 3 puppies. To better determine the location of the rendezvous area and to be able to triangulate it, a further trial was carried out from point AWH9.1, to which an additional response was obtained (again 1 adult and three puppies, surely the same).

Table 7.

Results of howling (summer 2017)

Location and code	Circuit	Sector	Date	Type of response	Estimate n. of individuals
Frana Zumbello AWH9+AWH9.1	Amendolea-Roccaforte	S	28/07/17	choral	1 adult and 3 puppies
Monte Schirifizio AWH3	Amendolea alta- Africo	C-S	30/07/17	single	1 adult
Puntone la Croce PWH9	Polsi	C	30/07/17	choral	2 adult and 2 puppies
Aria del vento MWH10.2	Moleti	C-N	31/07/17	choral	1 adult and 2 puppies

Source: our elaboration from direct investigations

In both cases, the response occurred only at the second trial, without further response on the third attempt. In the first case, the response was 60", and in the second, 50". From the AWH3-Monte Schirifizio emission point (central sector, in the high-African Amendolea circuit), one adult wolf was identified that responded to all three trials (15", 10", 60"). From the PWH9-Puntone la Croce emission point (central sector, in the Polsi circuit), the choral responses of 2 adults and at least 2 puppies were obtained to all three trials (15", 20", 20"). The choral response of one adult with two puppies was obtained from the MWH10.2 emission point (northern sector on the border with the central sector, in the Moleti circuit); they responded only to the first trial (10"), probably owing to disturbance by anthropic factors. For the 3 family groups whose reproduction was ascertained, the probable breeding areas were located through cartographic processing with GIS. The data detected at the time of the response (direction and approximate distance) were then processed. The three reproductive groups were then identified (fig. 5): one in the upper part of the Platì river (acoustic stimulation carried out by the MWH10.2 point), in the Centre-North sector of the Park; one in the upper part of the Fiumara Bonamico (acoustic stimulation carried out from point PWH4), in the central sector; and one in the area between the upper part of the Fiumara di Melito and the Pisciato Torrent (acoustic and triangulation stimulation performed by the AWH9 and AWH9.1 points).

Therefore, responses were obtained at 5 stations, being 14.7% of the total number of stations used (n = 34). The response rate, calculated as a percentage of the stimulation sessions with a response (n = 5) compared to the total of the sessions performed (n = 56), was 8.9%. Among the 5 positive sessions, in 2 cases the answer was obtained in all three trials, and in 3 cases in only one. The duration of the response varied from a minimum of 10" to a maximum of 60".

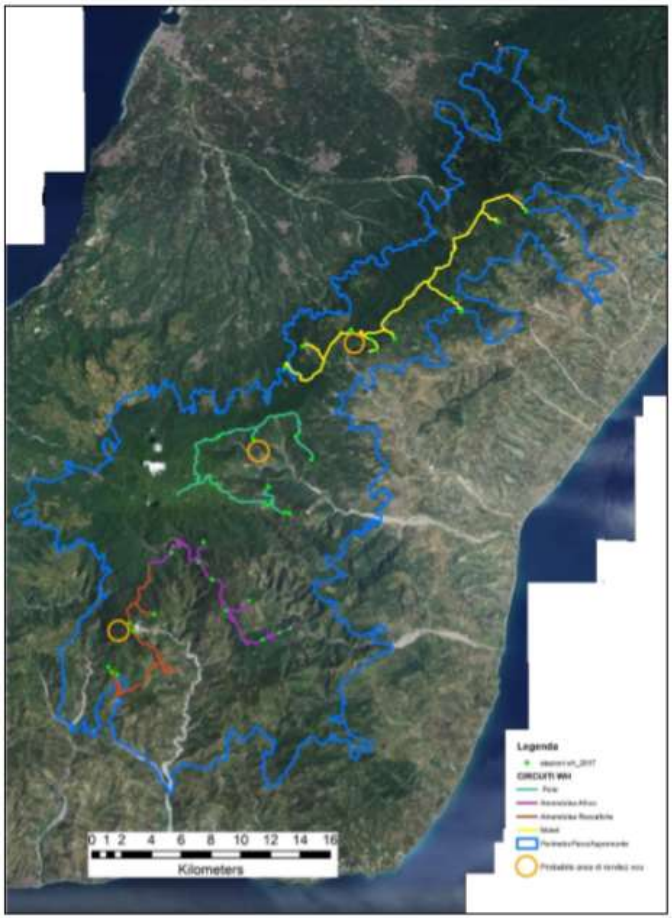

Figure 5. **Locations of the identified rendez vous used in 2017**
Source: our elaboration from direct investigations

Camera trapping.

The survey was carried out with an opportunistic criterion for the choice of places; the camera traps were placed after the reporting of a probable dark/black wolf in a well-defined area of the southern sector. The recordings were made from the 10th to the 20th November. Through camera trapping, we were able to ascertain the presence of two adults, possibly a new family nucleus (fig. 6). Moreover, individuals which appear to be wolf-dog hybrids owing to their phenotypic characteristics (Ciucci, 2012) were recorded (fig. 7-8). These individuals with atypical phenotypic features could represent the first discovery of hybrids in the Aspromonte National Park.

Figure 6. **Two adult individuals of Canis lupus italicus trapped inside the Park, November 2017**

Figures 7-8. **Probably hybrids trapped inside the Park, November 2017**

Conclusions

At this time, according to the results of the surveys carried out, the presence of at least 3 reproductive family groups is assumed in the territory of the Aspromonte National Park: one in the south-western sector of the Park, a second in the central sector, and a third in part of the northern sector bordering the central sector. From the first results of the genetic investigations, moreover, we can highlight the presence of a grouping of individuals (1 male and two females) in the central southern and eastern sector of the Park, which mark the same sites and which could indicate a fourth pack in formation. Based on the results of genotypic analysis, we also found that in no case was there a resampling of individuals already genotyped, suggesting a high population turnover. Finally, we found evidence of a wolf-dog hybrid; this means that in the future we will have to closely monitor the phenomenon of hybridisation, which could have dangerous consequences for the conservation of the wolf.

It is very important to ensure that the wolf continues to live and reproduce in the

Park, since its presence is not only a characterising element, but can also act to modify and protect the entire landscape, as the wolves of Yellowstone have done. Following their reintroduction in 1995, the wolves brought a new balance to the entire ecosystem of Yellowstone National Park, modifying even the physical geography of the park itself (WWF, 2017).
Further investigations will be necessary, although the territory of the Park, owing to its orography, vegetation, and climate does not make this task easy.

Summario

Il lupo è una specie selvatica presente in quasi tutta l'Italia ed importante particolarmente nelle regioni meridionali, dov'è sopravvissuta anche negli anni '70, in cui la popolazione nazionale era ridotta al minimo. Nel Parco Nazionale dell'Aspromonte, un parco che ospita il 15% del patrimonio nazionale di animali selvatici, la presenza del lupo è documentata sin dall'antichità e, seppur tra alterne vicende, si è conservata fino ad oggi. Diventa quindi di fondamentale importanza monitorare continuamente la sua presenza e lo *status* della popolazione, sia per scopi conservazionistici, sia per capire se oggi uomo e lupo possono coesistere e trovare una "casa comune" per le loro attività.
Questo studio è stato condotto con lo scopo di monitorare la presenza del lupo (*Canis lupus italicus*) nel Parco Nazionale dell'Aspromonte nel 2017, utilizzando diversi metodi: ricerca di segni di presenza e raccolta di campioni per l'analisi genetica non-invasiva (su 46 transetti), tecnica dell'ululato indotto (da 34 punti di ascolto) e foto-video trappolaggio (con due foto-videocamere che venivano spostate periodicamente ed in maniera opportunistica). Abbiamo raccolto ed identificato 115 segni di presenza; abbiamo identificato geneticamente 8 individui (4 lupi, 3 cani ed un ibrido); con l'ululato indotto abbiamo attestato la presenza di 3 gruppi familiari in riproduzione ed un individuo singolo; col fototrappolaggio abbiamo registrato la presenza di un nucleo familiare e di alcuni individui apparentemente ibridi. Dall'analisi congiunta di tutti i dati raccolti, possiamo attestare la presenza di almeno tre branchi di lupo nel Parco, con probabile esistenza di un quarto branco in formazione, e di un individuo ibrido che potrebbe essere il primo presente nel Parco.

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