EXPEDITION REPORT

Expedition dates: 6 – 19 July 2019

Report published: July 2020

Love / hate relationships: Monitoring the return of the wolf to the German state of Lower Saxony

Picture courtesy of T. Berg

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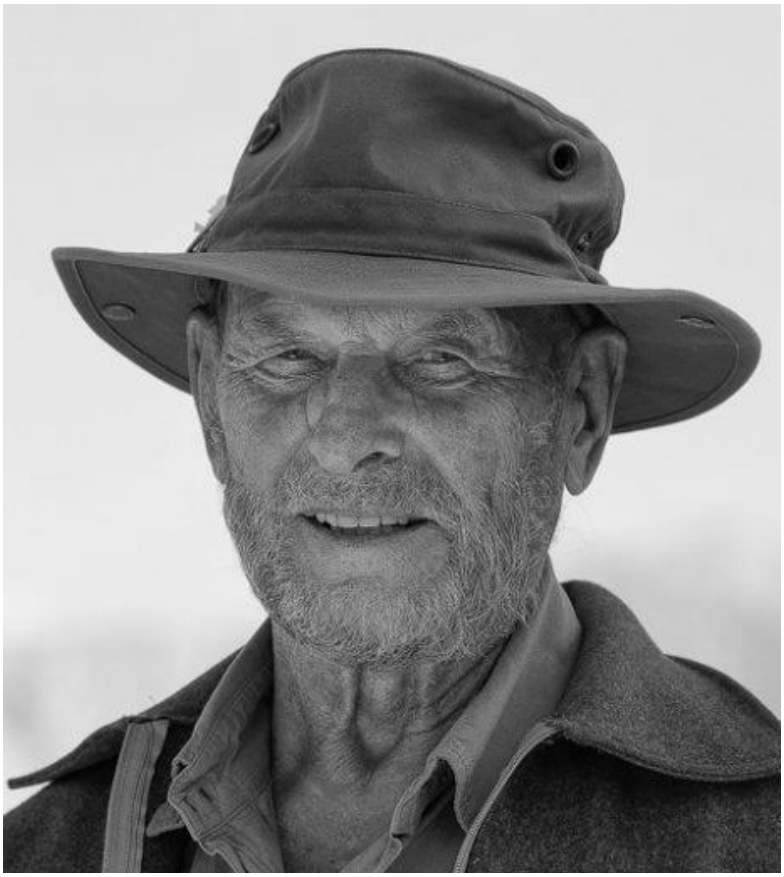
Authors:

Peter Schütte
Wolf commissioner

Charlotte Steinberg
Wolf commissioner

Matthias Hammer (editor)
Biosphere Expeditions



In memory of Wotsch

Ulrich Wotschikowsky

One of the first commentators
in Germany who understood the
value of citizen science expeditions
in wolf conservation and had the
courage to argue in their favour
in public

ABSTRACT

This report details wolf *Canis lupus lupus* active monitoring fieldwork by Biosphere Expeditions in collaboration with the State Wolf Bureau of the German state of Lower Saxony and local wolf commissioners. Field work was conducted from 6 to 19 July 2019 in two one-week long groups, each comprising twelve citizen scientists. The aim of the expedition was to collect samples for DNA and dietary analyses. This was done by sending small groups into the field to search for scat samples.

24 citizen scientists took part in the expedition, 18 from Germany or its immediate neighbour states (75%), three people from the United Kingdom (12.5%), two from North America (8.4%) and one person from China (4.1%). Before commencement of field work, which was exclusively conducted on public paths and bridleways, citizen scientists were trained for 1.5 days in sample detection, sampling and data collection techniques. The study area covered various priority areas in Lower Saxony as advised or requested by the State Wolf Bureau, wolf commissioners, hunters and the State Forestry Authority. Twenty-eight 10 km x10 km grid cells of the European Environment Agency (EEA) reference grid system and almost 750 km were surveyed on foot. Some grid cells were surveyed multiple times so that they were covered a total of 32 times.

241 wolf scat samples were identified during the field work, 157 of which were included into the official wolf monitoring programme. These 157 samples were frozen for dietary analysis and 28 of those were fresh enough for DNA analysis. A number of wolf tracks and possible wolf scats were also found, but did not pass quality assessment procedures directly after field work. Two teams actually saw wolves. The first sighting was two young wolves playing, and the other was an adult wolf on a forest trail only seen for a blink of an eye.

Twenty-five (16%) of the 157 scat samples collected were classified as C1 pieces of hard evidence on the SCALP classification system, 32 (20%) as C2 confirmed observation and 100 (64%) as C3 unconfirmed observations. The two sightings were also recorded as a C3 piece of unconfirmed evidence. Dietary analysis is ongoing.

The DNA analysis of 28 samples showed that 26 scats originated from wolf. 19 samples could be assigned to individual wolves. All in all, six male wolves and four female wolves were identified, of which two males and one female could be confirmed twice. Two other females could even be confirmed three times. For eight samples the species wolf, but no single individual, could be identified. Two male individuals were logged for the first time through the expedition.

Just like the 2017 and 2018 expeditions, the quantity and quality of samples collected by the active monitoring effort of the 2019 expedition is remarkable. Official monitoring efforts in 2017/18 yielded 501 scat samples of which 218 (44%) samples came from the 2018 expedition. In 2019 this two-week long citizen science expedition with 156 collected scat samples contributed more than 20% of scats available from the official wolf monitoring efforts. The expedition also produced a quality percentage of 35% of C1 and C2 records, which is roughly the same as the 40% quality ratio of the official monitoring programme outside the expeditions. All of this shows again that with 1.5 days of training, contributions of citizen scientists towards wolf research and conservation can be both high quality and high quantity.

ZUSAMMENFASSUNG

Dieser Bericht beschreibt die Geländearbeit von Biosphere Expeditions im Rahmen eines aktiven Monitorings des großen Beutegreifers Wolf (*Canis lupus lupus*) in Zusammenarbeit mit dem Wolfsbüro des Landes Niedersachsen und einigen Wolfsberatern. Die Geländearbeit wurde vom 6. bis 19. Juli 2019 in zwei einwöchigen Gruppen mit je 12 Bürgerwissenschaftlern durchgeführt. Ziel war es, aufgeteilt in Kleingruppen, Wolfshinweise, insbesondere Losungen für DNA-Beprobung und Nahrungsanalysen, zu finden.

An der Expedition nahmen 24 Bürgerwissenschaftler/innen teil, 18 davon kamen aus Deutschland oder seinen unmittelbaren Nachbarstaaten (75%), drei Personen aus Großbritannien (12,5%), zwei aus Nordamerika (8,4%) und eine Person aus China (4,1%). Vor Beginn der Geländearbeit, ausschließlich auf öffentlich begehbaren Wegen, wurden die Teilnehmer/innen 1,5 Tage im Erkennen von Wolfshinweisen, Probenahme und Datenerfassung im Gelände geschult. Das Untersuchungsgebiet umfasste verschiedene Gebiete in Niedersachsen, deren Auswahl in Zusammenarbeit mit dem staatlichen Wolfsbüro, örtlichen Wolfsberatern und Jägern sowie den Niedersächsichen Landesforsten geschah. Achtundzwanzig der 10 km x 10 km großen Rasterzellen des des EU-Gitternetzes und fast 750 km wurden zu Fuß abgesucht. Einige Gitterzellen wurden mehrfach begangen, so dass sie insgesamt 32 Mal abgedeckt wurden.

Im Rahmen der Expedition konnten insgesamt 241 Wolfslosungen im Gelände identifiziert werden, von denen 157 Proben in das offizielle Wolfsmonitoring aufgenommen wurden. Diese 157 Proben wurden für Nahrungsanalyse eingefroren, 28 Proben davon waren geeignet für genetische Untersuchungen. Eine Reihe von Spuren und möglichen Wolfslosungen wurden ebenfalls gefunden, konnten aber aufgrund der strengen Datenqualitätsvorgaben nicht als Wolfshinweise genutzt werden. Zwei Teams sahen tatsächliche Wölfe. Bei der ersten Sichtung handelte es sich um zwei junge Wölfe, die spielten, und die der zweiten war ein erwachsener Wolf auf einem Waldweg nur für einen Augenblick sichtbar.

Fünfundzwanzig (16%) der 157 gesammelten Losungsproben wurden im SCALP-Klassifizierungsverfahren als C1-Nachweis eingestuft, 32 (20%) als C2-bestätigte Hinweise und 100 (64%) als C3-unbestätigte Hinweise. Die beiden Sichtungen wurden als C3-unbestätigter Hinweis aufgenommen. Die Nahrungsanalyse der gesammelten Proben ist noch nicht abgeschlossen.

Die genetischen Untersuchungen der 28 eingesendeten Proben ergab, dass 26 Losungen von Wölfen stammten. 19 dieser Proben konnten einzelnen Wölfen zugeordnet werden. Insgesamt wurden sechs männliche und vier weibliche Wölfe identifiziert, von denen zwei männliche und eine weibliche zweimal bestätigt werden konnten. Zwei weitere Fähen konnten sogar dreimal bestätigt werden. Für acht Proben konnte die Art Wolf, aber kein einzelnes Individuum identifiziert werden. Zwei Rüden konnten zum allerersten Mal im Rahmen dieser Expedition überhaupt identifiziert werden.

Wie bereits im Rahmen der Expeditionen 2017 und 2018 ist die Anzahl und die Qualität der gesammelten Losungsproben, die durch dieses aktive Wolfsmonitoring der Expedition 2019 gesammelt wurden, bemerkenswert. Die offiziellen Monitoringbemühungen 2017/18 in Niedersachsen ergaben insgesamt 501 Losungsproben, von denen 218 (44%) Proben von unserer Expedition 2018 stammten. Im Jahr 2019 trug dieses zweiwöchige Bürgerwissenschaftlerprojekt mit 157 gesammelten Proben mehr als 20% zu den Loungsproben des offiziellen Monitorings bei. Die Geländearbeit trug einen Anteil von 35% der C1- und C2-Hinweisen bei, was ungefähr dem 40% Anteil des offiziellen Monitorings außerhalb der Expeditionen entspricht. All dies belegt wiederholt, dass Bürgerwissenschaftler mit eineinhalb Tagen Schulung einen quantitativ und qualitativ hochwertigen Beitrag zum Wolfsmonitoring leisten können.

Contents

1. Expedition review

M. Hammer (editor)
Biosphere Expeditions

1.1. Background & research area

Background information, location conditions and the research area are as per Schütte & Hammer (2018) and Schütte & Hammer (2019). The aim of the expedition was to actively monitor for wolf *Canis lupus lupus* and their signs such as scats and tracks so that wolf ecology and population dynamics (wolf and pack numbers, group sizes, movements, diet) can be elucidated to mitigate human-wolf conflict.

1.2. Dates & team

The project ran over a period of two weeks divided into two 7-day slots, each composed of a team of national and international citizen scientists, wolf commissioners and other helpers, and an expedition leader. Group dates were as shown in the team list below.

The expedition team was recruited by Biosphere Expeditions and consisted of a mixture of ages, nationalities and backgrounds. They were (in alphabetical order and with country of residence):

6 – 12 July 2019

Torsten Berg** (Germany), Jenny Day (USA), Sieglinde Dittmann (Germany), Sylvia Dittman (Germany), Chris Edwards (Netherlands), Lynn Heffron (UK), Rose Lewis (UK), Patricia Smith (Belgium), Christa Theunissen (Germany), Elaine Wilson** (UK), Luqing Yin (China) and an anonymous participant from Germany.

13 – 19 July 2019

Andrea Ahrens (Germany), Rudolf Dinkelacker (Germany), Sieglinde Dittmann (Germany), Sylvia Dittmann (Germany), Elisa Froese (Germany), Sigrun Kammans (Germany), Karin Leineweber (Germany), Kelsey Lotz (USA), Zak Mather-Gratton* (Germany), Claude Peffer (Luxembourg), Anna Urnova (Germany) and Veronika Yartseva (Germany) and an anonymous participant from Germany.

*local placement | **press

In addition for some or all of the time: Theo Grüntjens, Kenny Kenner, Volker Einhorn and Ulrike Kressel (wolf commissioners), Charlotte Steinberg (biologist, wolf commissioner and report co-author) and Lea Wirk (of Wildlife Detection Dogs e.V.).

A medical umbrella, safety and evacuation procedures were in place, but did not have to be invoked as there were no medical incidents.

In 2019, the expedition moved its base from NABU Gut Sunder to the nearby Herrenhaus Gut Sunder.

The expedition scientist was Peter Schütte who was born in Germany and studied geography and geoinformatics at the Universities of Bremen (Germany), Gothenburg (Sweden) and Salzburg (Austria). He has worked in this field for several international mapping and remote sensing projects, one of which involved him in wildlife conservation in Namibia, where he was a member of Biosphere Expeditions' team of local scientists. Starting in 2004, Peter led expeditions in Namibia/Caprivi, Altai, Oman and Slovakia for Biosphere Expeditions. Working on projects involving cheetahs, leopards and lions in Namibia for years, he gathered experience in the field of human-wildlife conflicts. Back in his native Germany, Peter is now working to gain acceptance for the return of wolves to the country. As one of more than hundred volunteer 'wolf commissioners' in Lower Saxony he is involved in the official wolf monitoring. As a specialist Peter is working on human-wildlife conflict solutions, such as livestock protection measures in his own project.

The expedition was led by Dr. Matthias Hammer, who founded Biosphere Expeditions in 1999. Born in Germany, he went to school there, before joining the Army, and serving for several years amongst other units with the German Parachute Regiment. After active service he came to the UK and was educated at St Andrews, Oxford and Cambridge. During his time at university he either organised or was involved in the running of several expeditions, some of which were conservation expeditions (for example to the Brazil Amazon and Madagascar), whilst others were mountaineering/climbing expeditions (for example to the Russian Caucasus, the Alps or the Rocky Mountains). With Biosphere Expeditions he has led teams all over the globe. He is a qualified wilderness medical officer, ski instructor, mountain leader, divemaster and survival skills instructor. Once a rower on the international circuit, he is now an amateur marathon runner and Ironman triathlete.

1.3. Partners

Biosphere Expeditions' main partner on this expedition was the state's environmental authority the NLWKN (Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz, Nature = Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency), which is officially responsible for the monitoring of all wildlife in the state. The authority's Wolfsbüro (wolf bureau) staff were closely involved in all expedition activities. Other partners included the Landesforsten (state forestry department), district and communal authorities, BIO-Hotel Kenners LandLust, Wildlife Detection Dogs e.V., Wolfcenter Dörverden and Herrenhaus Gut Sunder.

1.4. Further information & enquiries

More background information on Biosphere Expeditions in general and on this expedition in particular including pictures, diary excerpts and a copy of this report can be found on the Biosphere Expeditions website www.biosphere-expeditions.org. Enquires should be addressed to Biosphere Expeditions at the address given on the website.

1.5. Acknowledgements

We are very grateful to all the expedition citizen scientsts, who not only dedicated their spare time to helping but also, through their expedition contributions, funded the research. Thank you also to those who brought their own cars and supported the expedition in this way too. Thank you to all our partners mentioned above, especially those at the 'Wolfsbüro' at NLWKN and to all those professionals who provided assistance and information. Special thanks also go to all of the 'wolf commissioners' (Wolfsberater) and helpers working on a voluntary basis in support of the expedition. Their efforts and local knowledge were crucial to the success of our field work. Thanks also to the state forestry department (Niedersächsische Landesforsten) for their co-operation. Furthermore a special thank you to the WWF (World Wildlife Fund Germany), who kindly supported the collaboration with Wildlife Detection Dogs e.V. Finally, thank you to the staff of Herrenhaus Gut Sunder, led by Anja Rosenbrock, for being such excellent hosts and making us feel at home, and to anonymous reviewers for helpful comments on the manuscript.

1.6. Expedition budget

Each citizen scientist paid a contribution of €1,880 per person per seven-day period towards expedition costs. The contribution covered accommodation and meals, supervision and induction, special research equipment and all transport from and to the team assembly point. It did not cover excess luggage charges, travel insurance, personal expenses such as telephone bills, souvenirs etc., or visa and other travel expenses to and from the assembly point (e.g. international flights). Details on how this contribution was spent are given below.

Income	€
Expedition contributions	43,965
Expenditure	
Expedition base includes all food & services	10,717
Transport includes hire cars, fuel, taxis in Germany	1,472
Equipment and hardware includes research materials & gear etc. purchased internationally & locally	1,631
Staff includes local and Biosphere Expeditions staff salaries and travel expenses	9,852
Administration includes miscellaneous fees & sundries	1,623
Team recruitment Germany as estimated % of annual PR costs for Biosphere Expeditions	4,981
Income – Expenditure	**13,690**
Total percentage spent directly on project	**69%**

2. Monitoring wolves in Lower Saxony

Peter Schütte
Wolf commissioner

Charlotte Steinberg
Wolf commissioner

Matthias Hammer (editor)
Biosphere Expeditions

2.1. Introduction

The expedition's rationale, background, materials and methods, and training of citizen scientists are described in Schütte & Hammer (2018) and Schütte & Hammer (2019).

Wolf territories and population dynamics in Lower Saxony in 2019/2020

At the end of the monitoring year 2018/19 there were 105 confirmed wolf packs in Germany (DBBW 2020) (Figs. 2.1a & 2.1b).

In the federal state of Lower Saxony, prior to the 2019 expedition commencing, the numbers of wolves were 20 wolf packs, two wolf pairs and four single wolves (March 2019). In June 2019, before the 2019 expedition started, numbers had increased to 22 wolf packs, four wolf pairs and two single wolves (LJN 2019a). In December 2019, after the expedition in July, numbers increased to 23 wolf packs, six wolf pairs and one single wolf (LJN 2019b, Fig. 2.1c). At the moment (May 2020), Lower Saxony hosts 24 wolf packs, five wolf pairs and one single wolf (Fig 2.1a) (LJN 2020a). This development (Table 2.1) illustrates that Lower Saxony offers suitable habitats, which are still not fully occupied by wolves.

Table 2.1. Wolf population dynamics in Lower Saxony March 2019 – May 2020.

Time	Wolf packs	Wolf pairs	Single wolves
March 2019	20	2	4
June 2019	22	4	2
December 2019	23	6	1
February 2020	24	7	0
May 2020	24	5	1

Study site and 2019 focus areas

The study area in general is described in Schütte & Hammer (2018) and Schütte & Hammer (2019). Focus areas of the 2019 expedition are shown in Figures 2.1e (CORINE) and 2.1f (Google).

Focus areas were chosen in collaboration with local people (such as wolf commissioners, foresters, hunters) and authorities, such as the 'Wolfsbüro' at NLWKN (the wolf bureau at the state environment department). Such collaborations, especially with the wolf commissioners and the wolf bureau, are critical to the project's success. An additional and welcome side effect is that acceptance for the project, as well as citizen science projects in general and in the field of wildlife monitoring and research, are fostered.

Figure 2.1a.

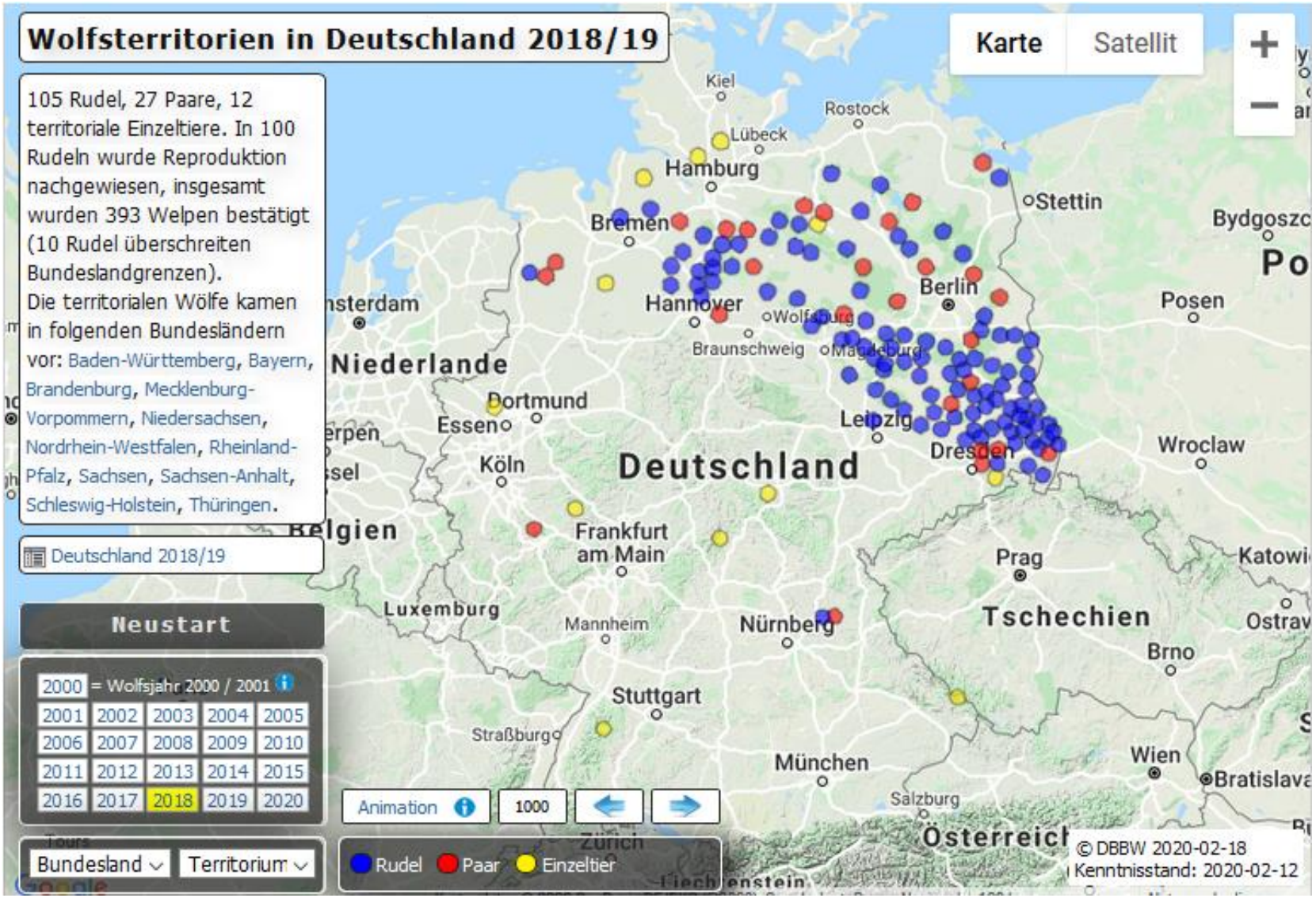
Wolf territories in Germany on 12 February 2020 (DBBW 2020).

Rudel (blue) = wolf pack

Paar (red) = wolf pair

Einzeltier (yellow) = single individual

The text reads “105 packs, 27 pairs, 12 territorial individuals are known, as well as 393 juveniles (10 packs crossing state boundaries). Territorial wolves are present in the states of Baden-Wurttemberg, Bavaria, Brandenburg, Mecklenburg-Vorpommern, Lower Saxony, North Rhine-Westphalia, Rhineland-Palatinate, Saxony, Saxony-Anhalt, Schleswig-Holstein, Thuringia”.



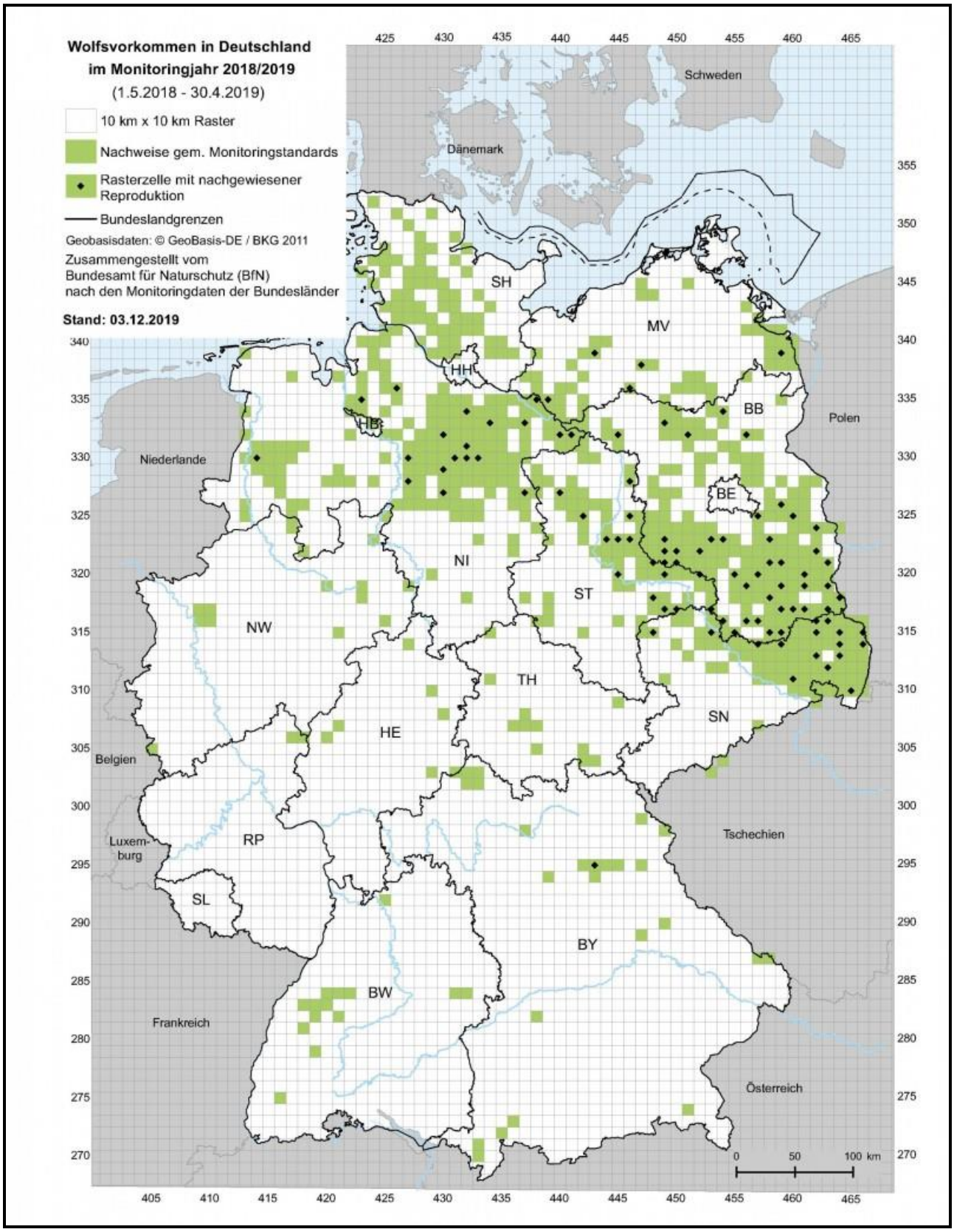


Figure 2.1b. Distribution of wolves in Germany in 2018/2019 on the EEA grid system (BfN 2019).
Green cell = wolf presence confirmed in accordance with monitoring standards.
Green cell with black dot = wolf presence and reproduction confirmed.

Figure 2.1c.

Wolf territories in Lower Saxony after the fourth quarter 2019 (LJN 2019b).

The reference reads:

Wolfsrudel (orange) = wolf pack

Wolfsrudel (Nachweis ausstehend)* (shaded orange) = wolf pack (to be confirmed)*

Wolfspaar (red) = wolf pair

Residenter Einzelwolf (green) = resident individual

Unklar (gray) = unclear

Unter Beobachtung (blue) = under observation

*) To be confirmed = pack existance through evidence of reproduction or more than two pack members has not yet been confirmed in the current monitoring season.

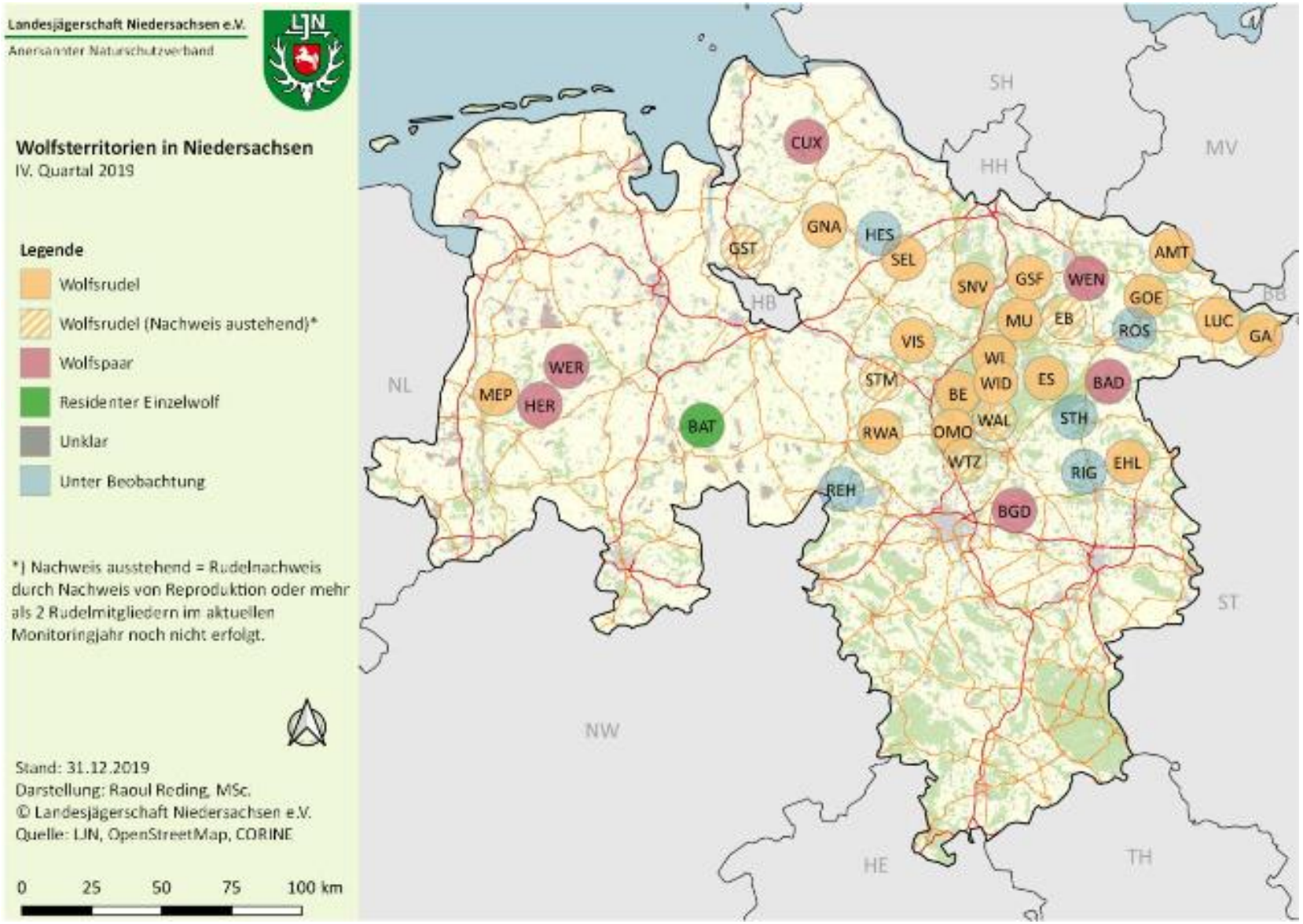


Figure 2.1d.

Distribution of wolves in Lower Saxony in 2018/2019 on the EEA grid system (source).

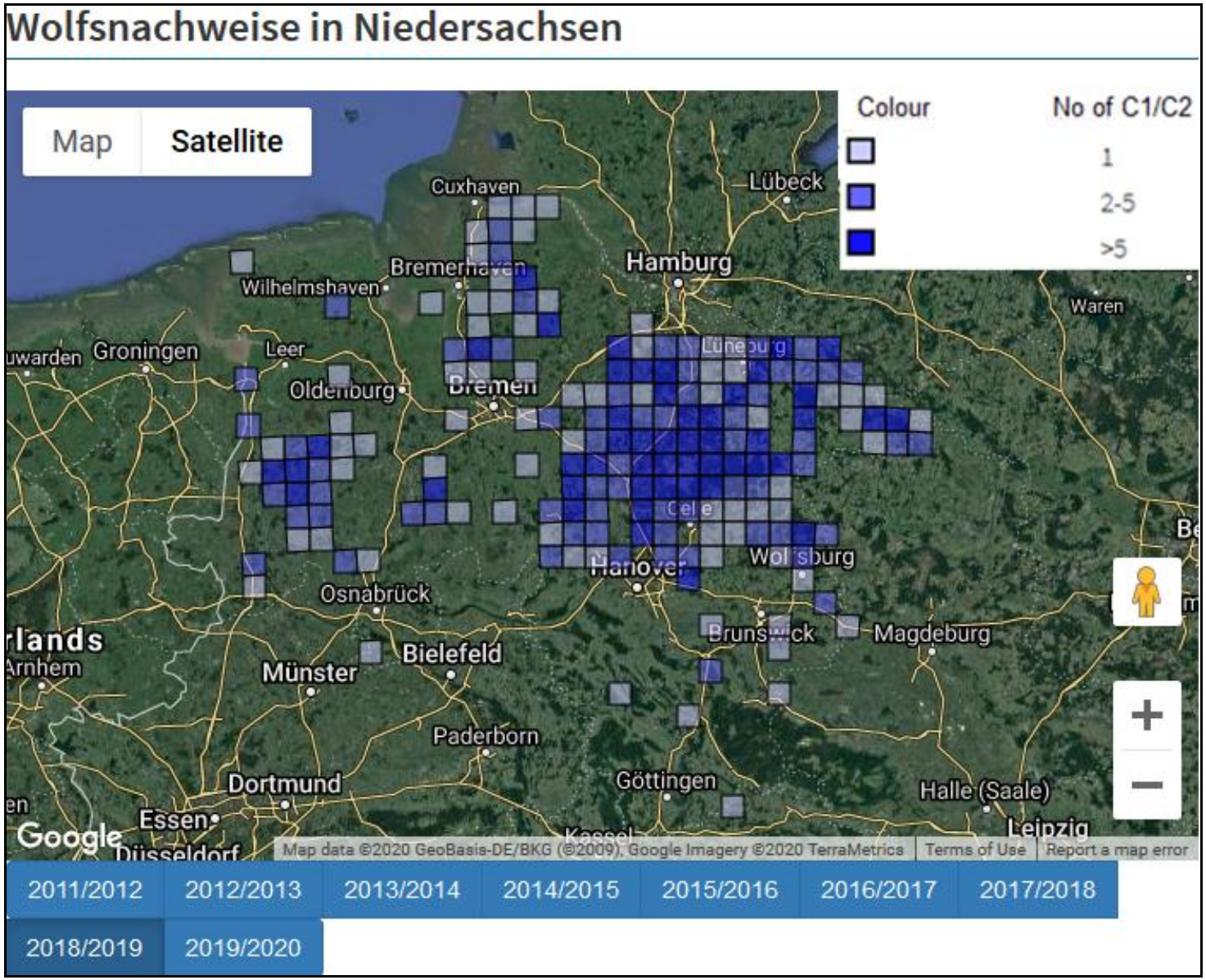


Figure 2.1e.

Land use cover in the study site and focus areas in 2019, map adapted from CORINE.

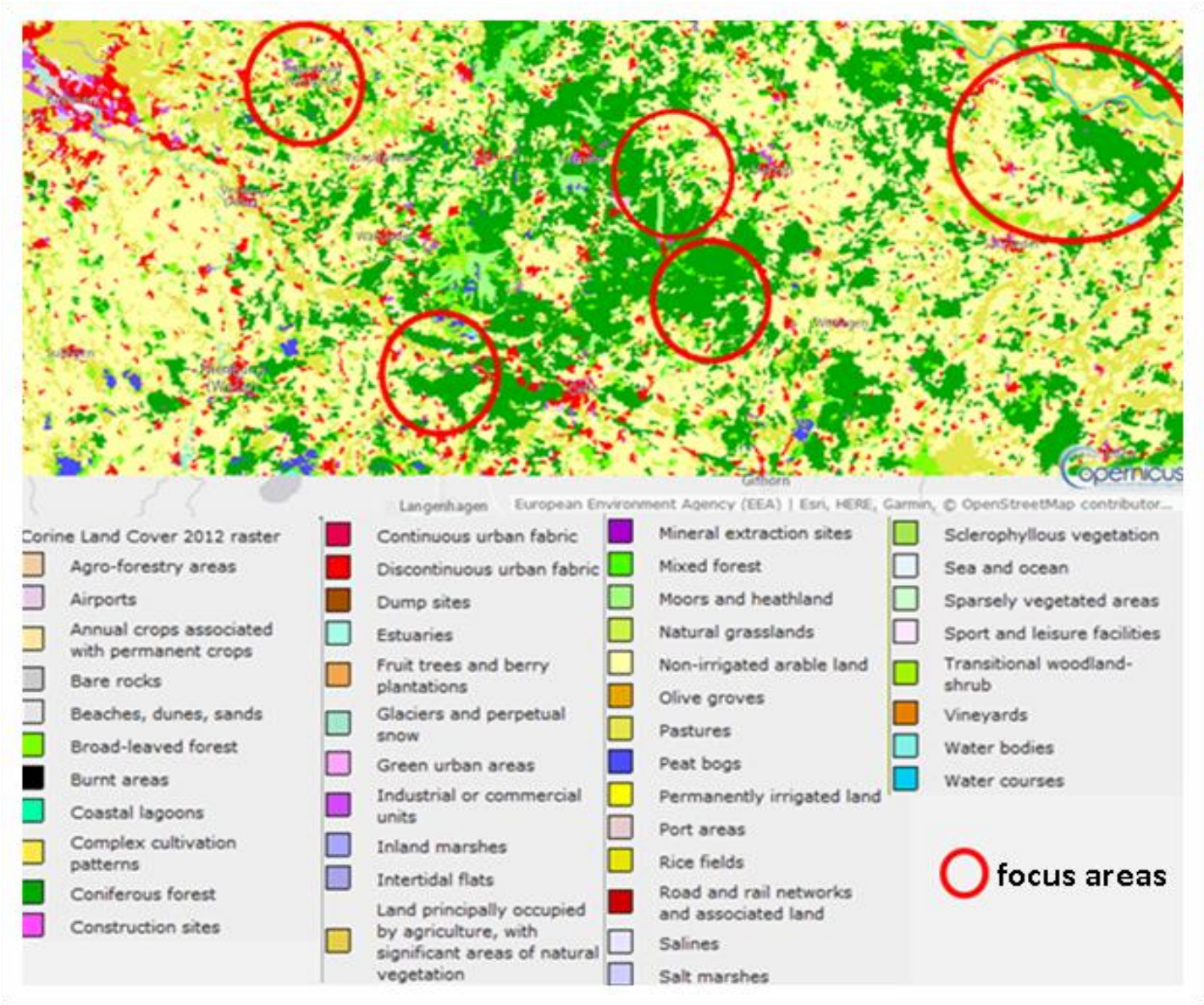
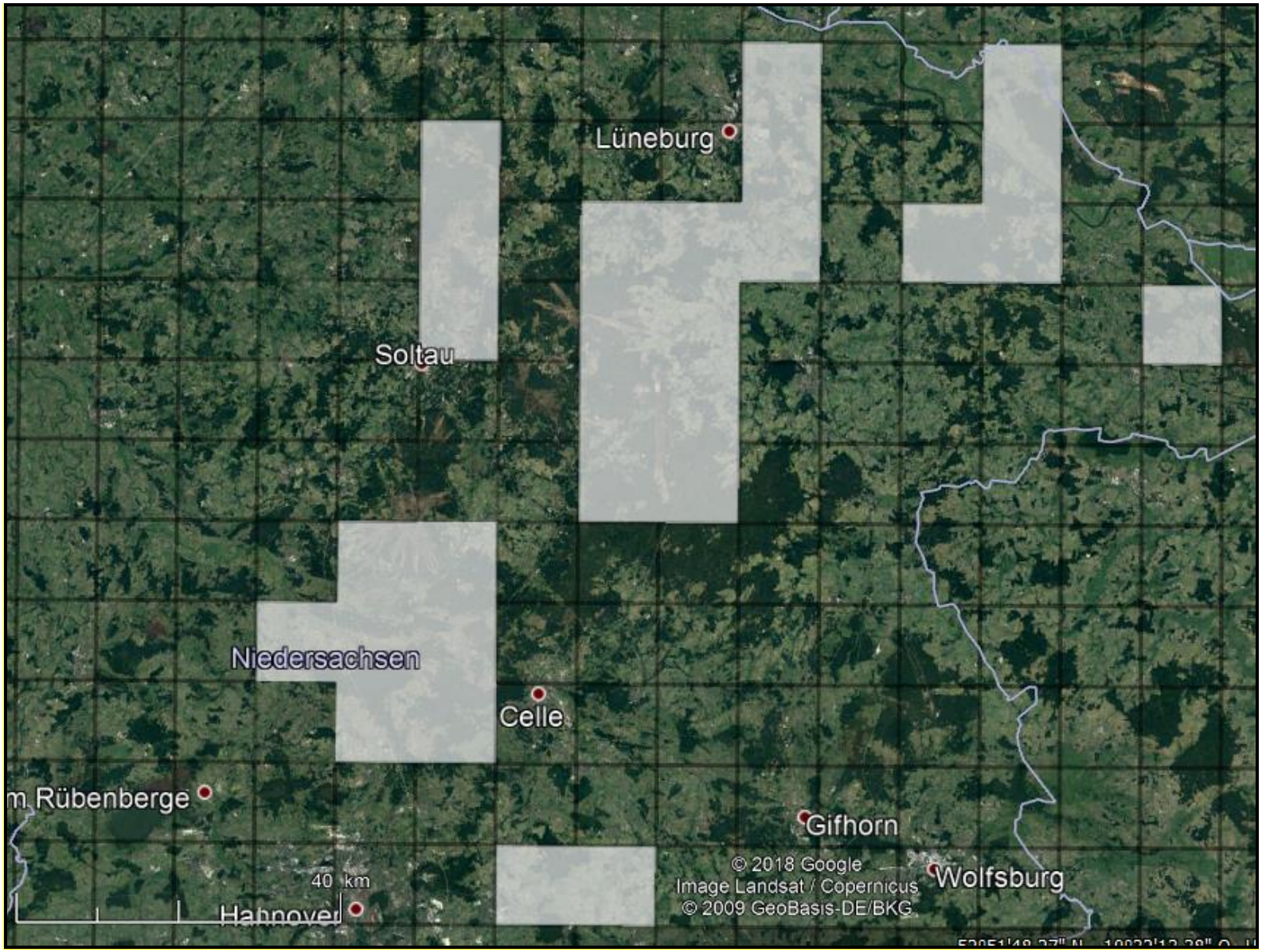


Figure 2.1f.

The 28 EEA grid cells covered during the 2019 surveys (indicated by pale shading).



2.2. Methods & results

The data gathered by this study form part of the official wolf monitoring programme of Lower Saxony. All relevant data were integrated into the official database (LJN 2020b) and as such were reviewed by the official wolf monitoring programme and assessed by SCALP categories (see Schütte & Hammer (2018) and Schütte & Hammer (2019) for a description of these). Since our data form part of the official wolf monitoring programme, they were published in the official LJN annual monitoring reports 2017 and 2018.

Over two weeks (i.e. two groups) of surveying, participants walked 743 km, covering 28 cells of the EEA10 km x 10 km grid in total, some of them multiple times so that grid cells were covered a total of 32 times (Fig. 2.1e, Table 2.2a).

Table 2.2a. Number of grid cells and length of routes surveyed by the 2019 expedition teams during the two expedition weeks. Note that the team split into four or fewer groups each day.

Week	Grid cells (N)	Routes total (km)	Routes day 2** (km)	Routes day 3 (km)	Routes day 4 (km)	Routes day 5 (km)	Routes day 6 (km)
1	15	356.37	7.80	85.70	80.62	81.61	100.64
2	17	387.10	25.40	101.80	104.20	97.00	58.70
Total	**32***	**743.47**					

*As all surveys took place within 28 grid cells, some grid cells were surveyed multiple times
** Day 2: training day, survey in one group

Scats, sightings and their SCALP status

The expedition found a total of 241 (putative) wolf scats in 24 EEA grid cells. 84 scats were too old and/or rotten for any further analysis and discarded. 156 were admitted for SCALP assessment. These 157 samples were frozen for dietary analysis and sent to the laboratory at the University of Veterinary Medicine Hannover (UVMH) Foundation (Institute for Terrestrial and Aquatic Wildlife Research) and LJN for analysis of wolf diet. 27 of the 156 samples were fresh enough (less than 48 hours old) to yield material for DNA analysis, so a small sample of these 28 scats was put in ethanol and sent to the Research Institute Senckenberg for genetic analysis & SCALP assessment (Fig. 2.2a & Table 2.2b). Two genetics samples were taken from one of these 28 scat samples, because it was not clear whether it was a single or two scats.

Samples shown to be from wolf by genetic analysis were scored as a C1 piece of hard evidence. Samples with typical content such as bones, hair and teeth, as well as the right size and location in which they were found so that there was a high probablility that they originated from a wolf, were scored C2 – confirmed sign. Old, rotten or bleached samples, which in appearance were likely to be from wolf were scored C3 (or C3a for those which were very likely to be from wolf). In addition to these data, two incidences of a wolf sighting during the expedition were recorded. 95 and 61 scat samples were collected during weeks 1 and 2 respectively and one was found during a pre-expedition survey by staff.

Table 2.2b. Samples gathered by the expedition and submitted for analysis.

	Scat samples total	Scat samples for diet analysis	Scat samples for genetic analysis	Wolf sightings
Pre expedition	1	1	1	0
Week 1	151	95	18	2
Week 2	89	61	9	0
Total	**241**	**7**	**8**	**2**

In total, 25 (16%) of the 156 samples collected were classified as C1 pieces of hard evidence, 32 (20%) as C2 confirmed observations and 100 (64%) as C3 unconfirmed observations (Fig. 2.2a), of which 89 (57% of the total) were scored as C3a (very likely to originate from wolf). For two samples no DNA could be identified.

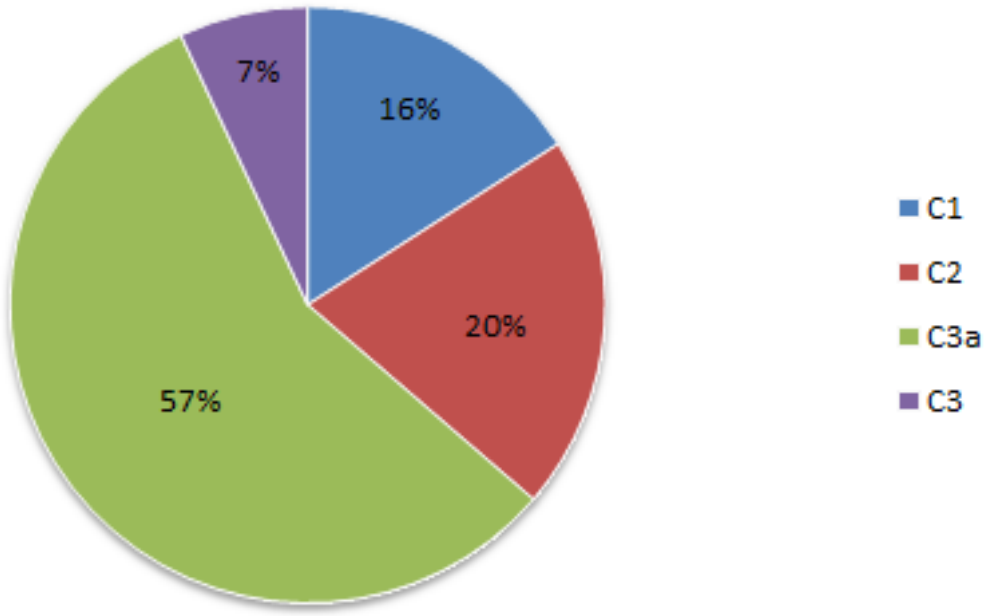


Figure 2.2a. The 156 scat samples collected by the expedition by their SCALP classification.

On two occasions, two expedition participants each had a direct sighting of the target species. The first encounter was one wolf at approximately 200 metres distance. During the second encounter two wolves were spotted in a forest clearing at about 200 metres distance. Both sightings were classified as a C3 unconfirmed observation, as there was no photo or video taken (because the encounters came as a surprise and only lasted a few seconds).

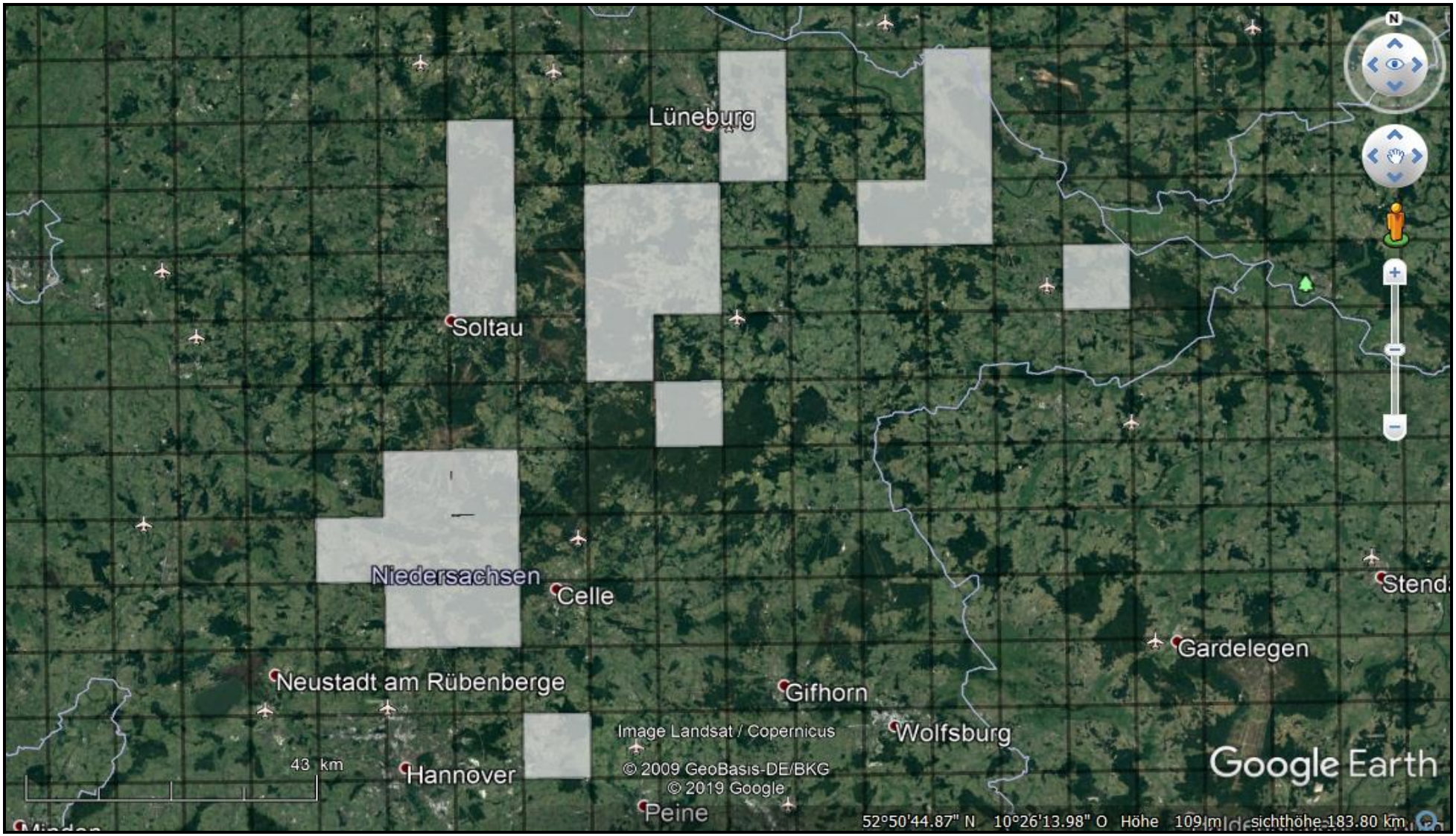


Figure 2.2b. 24 EEA grid cells in which wolf scat samples were collected.

In week 1 and pre-expedition, 20 scat samples were scored as C1, 23 as C2, five as C3 and 48 as C3a. In week 2, five scat samples were scored as C1, nine C2, six as C3 and 41 as C3a (Fig. 2.2c).

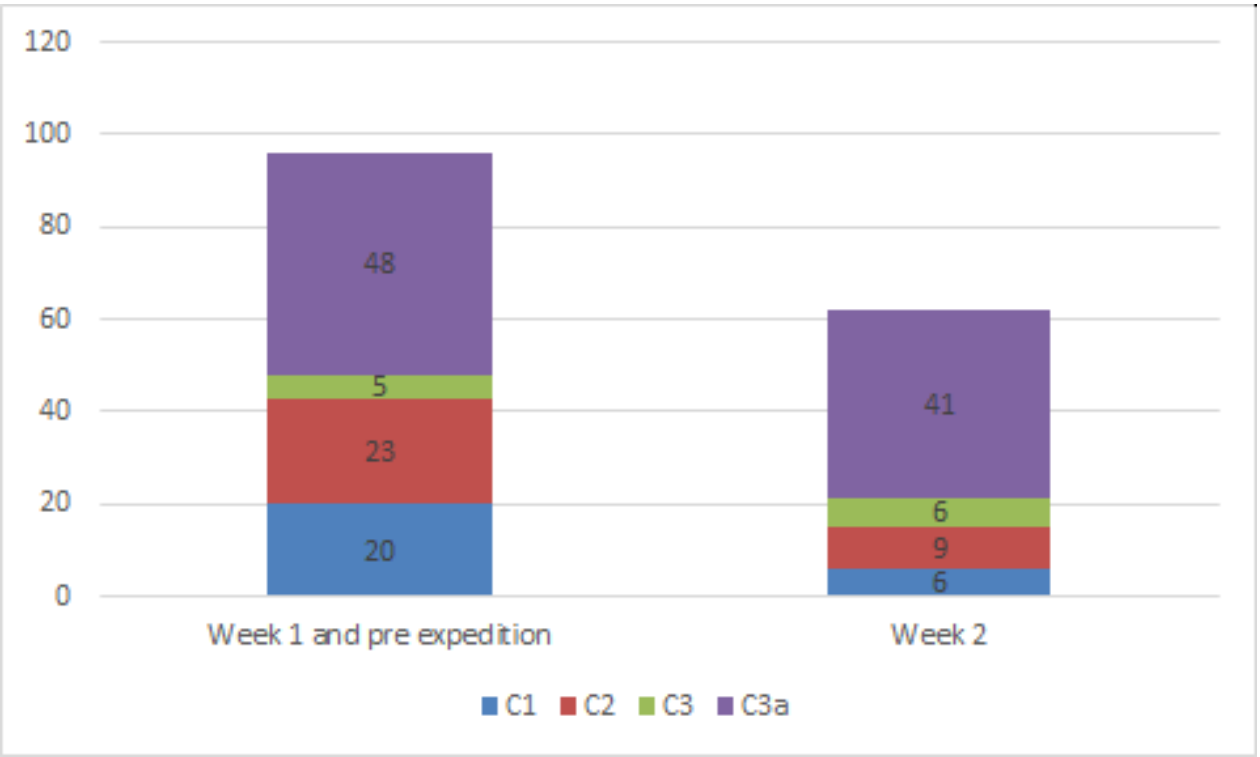


Figure 2.2c. The 156 scat samples collected by the expedition by their SCALP classification.

Food analysis

The 2019 expedition submitted 156 scat samples for wolf food spectrum analyses to the University of Veterinary Medicine Hannover (this compares to 200 scats for the 2018 and 75 scats for the 2017 expedition). The analyses of the 2018 and 2019 scat samples are still ongoing and the aim is to publish results in the 2020 abridged (because of the coronavirus pandemic) expedition report. As reported in the 2017 expedition report (Schütte and Hammer 2018), the most frequent prey in the 2017 scat samples were roe deer (30%) and wild boar (29%), followed by red deer (18%), fallow deer (8%) and a general deer species category (8%) for deer remains that could not be identified down to species level. No livestock remains were found in them.

Genetics

28 scat samples were sent for DNA analysis of which 26 originated from wolves (Table 2.2c). It was not possible to determine the originating species for the remaining two samples, because the sample quality was too poor (too old, too wet) and therefore DNA could not be extracted. 20 samples could be assigned to individual known wolves through comparison of existing DNA material. Some individuals were confirmed twice or more. All in all, six male wolves and four female wolves were identified, of which two males and one female could be confirmed twice. Two other females could even be confirmed three times (Table 2.2d). For eight samples the species wolf, but no single individual, could be identified. Two male individuals were logged for the first time through the expedition.

Table 2.2c. Results of genetic analyses.

	DNA wolf	DNA no wolf	Species not determinable	Total DNA samples
Pre-expedition	1	0	0	1
Week 1	20	0	1	20
Week 2	5	0	1	6
Total	**26**	**0**	**2**	**28**

Table 2.2d. DNA samples that could be assigned to individual wolves in 2019.

No.	Individual ID*	Gender	Territory	Sampled in week (times)
1	GW1027m	male	Ebstorf	1 (2x)
2	GW1320f	female	Ebstorf	1 (2x)
3	GW1429m	male	Schneverdingen	1
4	GW1430m	male	Göhrde	1
5	GW191f	female	Walle?	1,2 (3x)
6	GW359f	female	Ebstorf	1, 2 (3x)
7	GW472f	female	Schneverdingen	1
8	GW825m	male	Amt Neuhaus	1
9	GW906m	male	Walle?	1,2 (2x)
10	GW911m	male	Walle?	2

*wolf ID assigned by the Forschungsinstitut Seckenberg, the reference institute for wolf genetics in Germany. The “G” stands for “genetic code”, the “W” for the species “wolf”, the “m” respectively “f” indicate the sex.

GW1027

This male wolf was confirmed in the Munster area in late June 2018. Its origin pack is the Munster pack. This wolf was then identified in Amt Neuhaus by the 2018 expedition, suggesting that it was a transient wolf on the move. This assumption was corroborated by the 2019 expedition, when this individual was confirmed in another area again, near Ebstorf. Additional samples from 2020 revealed that GW1027m had actually settled in the Ebstorf area and had become the new male wolf of the Ebstorf pack.

GW1320f

This female wolf is a descendant of the Ebstorf pack and was first identified in February 2019, five month before the expedition. Its father is not GW1027m, but the former male wolf of the Ebstorf pack GW832m.
GW1429m: This male wolf was identified with the help of the expedition participants. It is a descendant of the Schneverdingen pack in the Luneburg Heath.

GW1430m

The existence of this male wolf was also proven for the first time by the expedition. It is a descendant of the Göhrde pack in the eastern part of Lower Saxony, where expedition partner Kenny Kenner works as a wolf commissioner.

GW191f

This female wolf is one of the founders of the Lower Saxony wolf population, originating from a pack in Saxony. It was first recorded during the 2013/2014 monitoring year, together with its brother GW188m. The latter was found dead on 30 October 2019 near Dörverden, far from the Bergen territory. The GW191f samples were found in the very southern part of the Bergen territory, suggesting that the territory might have shifted. More genetic information is needed fully to understand the new structure of territorial wolves in that area.

GW359f

This wolf is the female of the Ebstorf pack and a descendant of the Rheinmetall pack.

GW472f

This is the female wolf of the Schneverdingen pack, mother of GW1429m and descendant of the Gartow pack.

GW825m

This is the male of the Amt Neuhaus pack and was also identified through the expedition in 2017. Its origin pack as well as that of its female partner are unknown.

GW906m

This male wolf is a descendant of the Wietzendorf wolf pack and was first identified in 2017. The sample was collected near Walle, where a confirmed wolf pack is located. However, it is unclear which pack this wolf belongs to.

GW911m

This wolf is the male of the Walle pack and was first identified in October 2017. It migrated to Lower Saxony from the federal state of Brandenburg.

Other possible wolf signs

During the expedition, other possible signs of wolf presence were recorded, but did not pass quality assessment procedures and as such were not submitted to official records. Instead they serve as hints for upcoming investigations and expeditions. Of this type of signs, one track (conditions or measurements for rating not met) and 84 scats (too old, not clear, no wolf-like smell) were recorded (Fig. 2.2d).

Scent dogs

Wildlife Detection Dogs e.V. kindly supported the expedition with one scent dog accompanying a group for a full survey day each day. The dog is trained to find and indicate wolf scats by sitting down next to them. This method piggybacks on the dogs' great olfaction and represents a great help for the monitoring of elusive animal species whose presence is mostly proven through indirect hints. Scat collection can be conducted much more effectively with a "helping nose" as there are scats that are too rotten or covered so that even experienced human eyes can not find them. The expedition participants were very interested to see the detection dog working and were exited and fascinating seeing "Molly" cooperating with her owner and indicating the first wolf scat at the beginning of the expedition. A total of 30 wolf scats were found by groups with dog assistance. Four of them would not have been found without a scent dog. Surveys with dog assistance took place primarily in areas with little knowledge about wolf presence in order to investigate new and univestigated areas.

Direct sightings

There were two wolf sightings during the expedition. Two participants observed two pups in the Goehrde. Another participant and one of the wolf commissioners spotted an adult individual in the Süsing forest area. Two other participants were very close and missed the wolf by just a minute. The two encounters were scored as C3 unconfirmed hints as there were no photos or videos taken of the observations – the sightings came as a surprise and only lasted a few seconds. As wolves tend to avoid direct human contact, sightings are relatively rare and are not encouraged or promoted by the expedition.

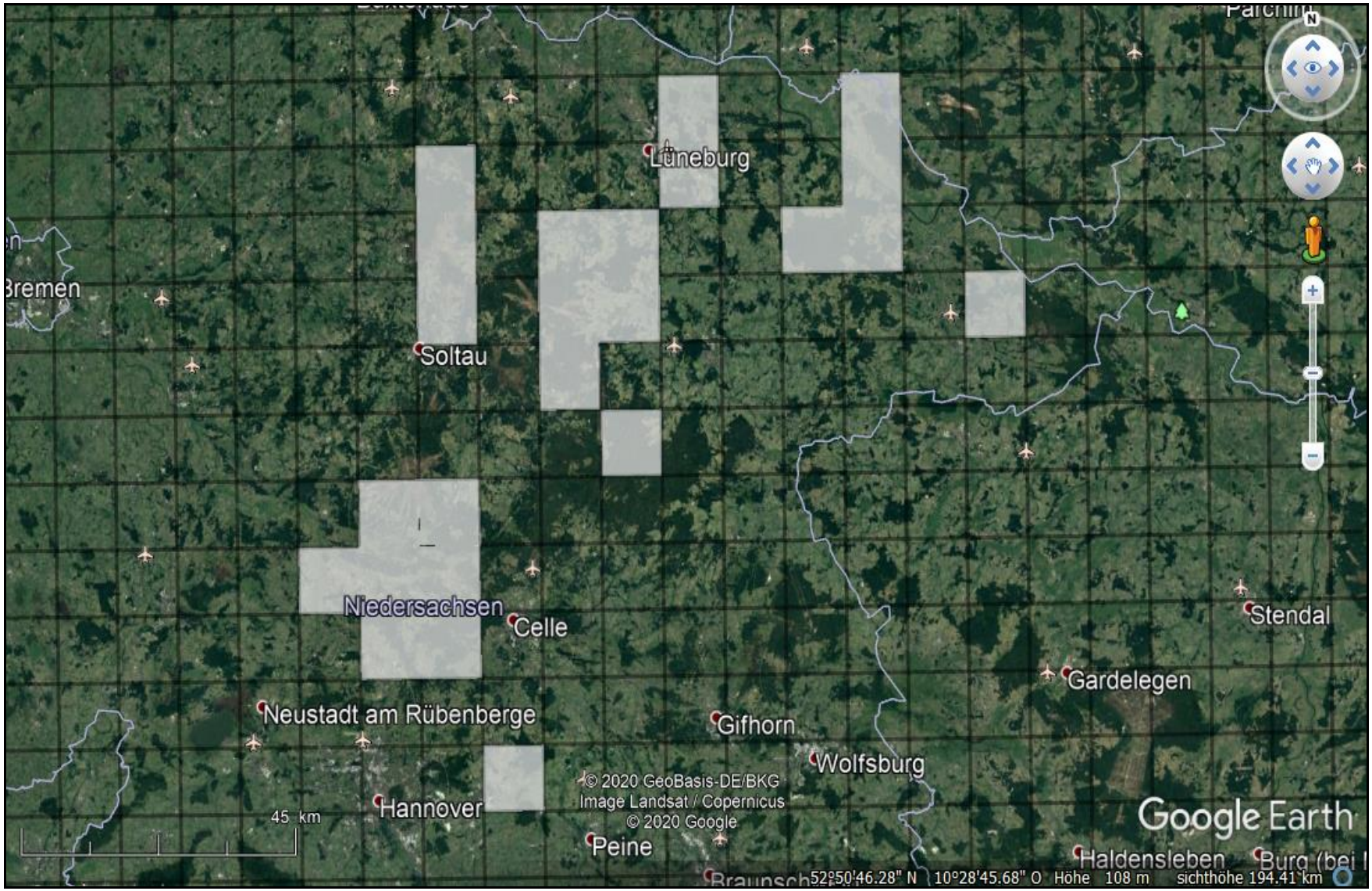


Figure 2.2d. Possible wolf signs (tracks, old scats) recorded during the 2019 expedition in 24 EEA grid cells.

2.3. Discussion & conclusions

Efficiency of effort – data quantity and quality

The total number of 157 scat samples, collected by the expedition over only two weeks in 2019 (during which 743 km were walked) to assist official wolf monitoring efforts, is an outstanding result. For comparison, the official wolf monitoring programme recorded a total of 261 C1 and C2 scat samples (503 including C3) in the entire year of 2019 (without the scats that were sampled by the expedition) (LJN 2019a,b,c,d). Therefore, the work of the participants of the expedition in 2019 has made a very significant contribution to wolf monitoring efforts in Lower Saxony in terms of quantity.

In terms of quality, the work of the citizen scientists was excellent too. The amount of C1 and C2 scats collected by the expedition was 36% in 2019, 37% in 2018 and 54% in 2017. The same number of the official wolf monitoring programme in the whole year of 2019 is 59% (LJN 2019a,b,c,d). C3 and C3a scat samples were also collected and sent to the laboratory due to the demand for samples for the analysis of the food spectrum of wolves in Lower Saxony.

All this shows that with a day and a half of training, citizen scientists can make high quality and high quantity contributions.

Areas of wolf activity

The 2019 expedition focused on collecting wolf scat samples for identification of individual wolves via DNA and for dietary analyses. The number of scat samples found in the survey areas allowed the expedition to identify one area of high wolf activity in the district of Luechow-Dannenberg. 51 (32%) of the 157 scat samples were collected here (Figs. 2.3a & b). All the other survey areas (the districts of Celle, Uelzen, Harburg/Heidekreis, Lueneburg and Hannover) reach from 8% to 12% of all scat records (Figs. 2.3a & b).

The key factor for successful surveys is the availability of information about the wolf territories in the areas surveyed. A targetted and therefore highly successful search for wolf signs, such as demonstrated by this expedition, is only possible through good information flow between the expedition and local stakeholders with detailed knowledge of wildlife and wilderness, such as the local wolf commissioners, foresters and hunters.

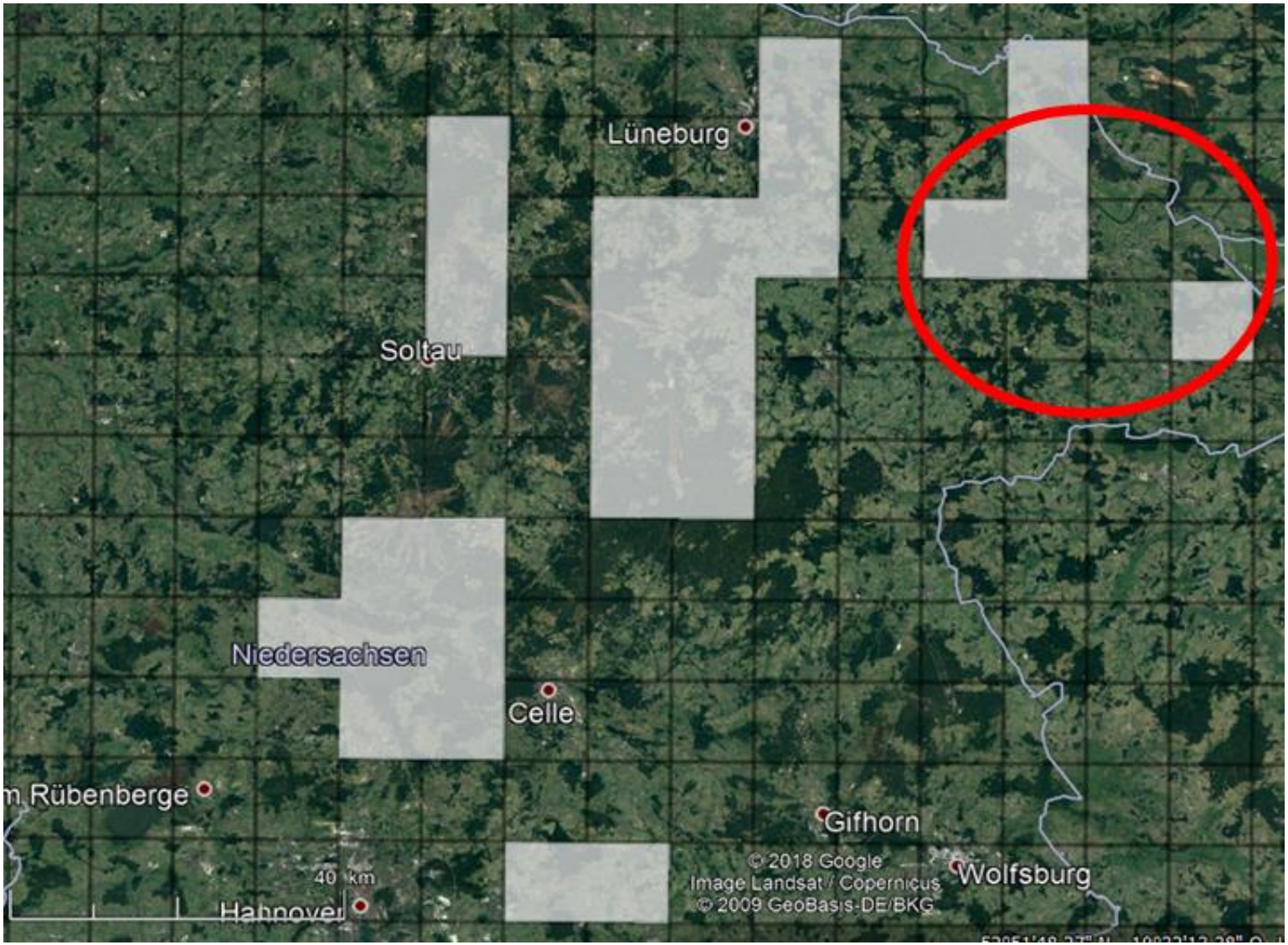


Figure 2.3a. Area of high wolf activity (red circle) identified by the 2019 expedition.

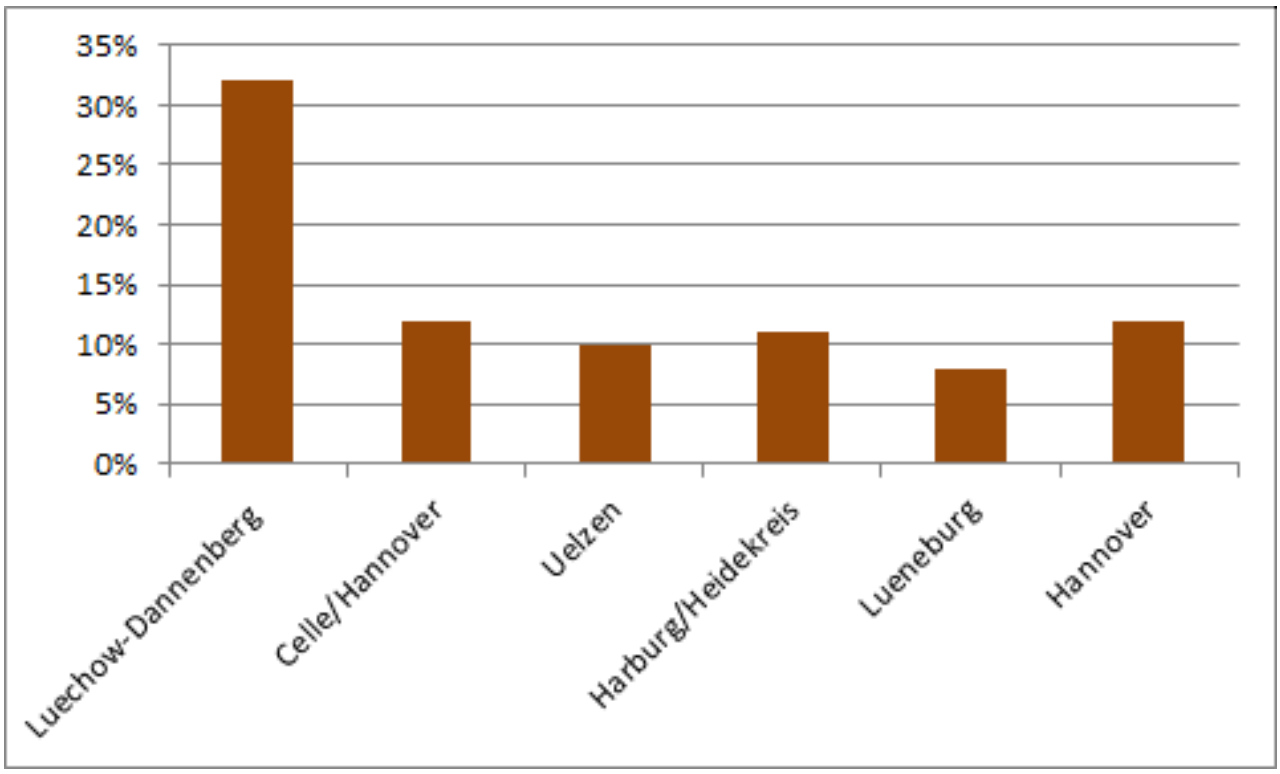


Figure 2.3b. Scat samples (n = 156) by area collected by the 2019 expedition.

Wolf population dynamics

A total of ten individual wolves were identified via DNA samples collected by the expedition in 2019 (also ten in 2018, six in 2017), three of them twice, namely GW1027m, GW1320f and GW906m, two others three times, namely GW191f and GW359f. Two wolves were genetically identified for the first time through samples collected by the expedition: GW1429m a descendant of the Schneverdingen pack and GW1430m, a descendent of the Goehrde area pack. In addition – by identifying GW1027m (Munster/Bispingen), GW191f (Bergen) and GW906m (Wietzendorf) – insights into the movement ranges of wolves could be gained.

Thus far there has been no more genetic proof of other animals. GW1027m, originating in Munster, sampled in Amt Neuhaus during the expedition in 2018 and in the Ebstorf region in 2019, demonstrates the migration of (young) wolves through other territories in search of their own. Exact information about territory borders, kinship and offspring or migration routes can only be gleaned partially by the official wolf monitoring programme. For a comprehensive picture, there is simply not enough information in the form of DNA samples. In other words, despite considerable efforts, not least of the expedition, many more samples and a well-planned active monitoring effort are necessary.

For the monitoring year 2018/19 reproduction was detected in 95% of all wolf packs in Germany (DBBW 2019). This means that an increase in the wolf population is highly likely and that more territories will be occupied throughout the country, Lower Saxony included. Active monitoring remains essential to track those changes, as well as shifts of territories or territory borders and changes in pack composition (which become increasingly difficult to track with increasing density of territories).

Over 743 km of survey effort, two wolf encounters were registered by the expedition in 2019 (2018: one encounter over 750 km, 2017: zero encounters over 1,100 km). From this it is clear that the chances of encountering a wolf during daytime, even when looking for wolf signs in suitable habitat, are very small. Reports in the media and by anti-wolf campaigners of the state being “overrun” by wolves are therefore clearly exaggerated.

Wolf feeding ecology

Results of the analysis of wolf scats are based on prey remains. They do not represent the food spectrum of wolves in general, but give indications about the food items of wolves, as well as information about more and less important prey species. Based on scat analysis, statements about the acquistion process of food items are not possible – they may have been either actively hunted or ingested as carrion.

The investigation of the 45 scats sampled during the expedition in 2017 indicated that wild ungulates (mainly roe deer, wild boar and red deer) represent the food base of wolves in Lower Saxony. It was significant that no remains of livestock were found. This corrobarates previous studies, which showed that the proportion of livestock in the wolf’s diet is very low or absent altogether (DBBW 2018). This may vary regionally, depending on the availability of wildlife prey and insufficiently protected livestock - wolves attack, kill and consume livestock. Even if livestock might be underrepresented in scat samples to a certain degree as livestock owners are legally obliged to remove carcasses from their meadows, the data collected by the expedition in 2017 strongly suggests that, in general, its consumption is rare compared to the consumption of wild ungulates. The analysis of scats collected in 2018 and 2019 is expected to shed more light on this, in particular whether this pattern repeats itself.

Local stakeholder and cooperations

Our main aim was to collect indirect wolf signs, with an emphasis on finding scat samples in order to assist official wolf monitoring efforts and supplement the wolf monitoring database. This aim was achieved. In addition, data collected by the expedition also allowed important conclusions to be drawn about some of the wolf territories and newly identified individual wolves. We conducted the 2019 surveys by and large in areas with similar or the same survey routes as in the previous year (Schütte and Hammer 2019). But new areas were added too. Thanks to the noteable and much welcomed cooperation of local stakeholders such as wolf commissioners first and foremost, but also hunters and foresters, study areas could be selected with a high degree of specficity, so that a high number of usable scat samples could be collected. This is also the main reason why the inaugural 2017 expedition collected only 76 scats with four groups (Schütte and Hammer 2018), whereas the 2018 expedition collected 218 scats with two groups and the 2019 expedition 156 scats, also with two groups.

In addition, and thanks to the cooperation of the State Forestry Department (Niedersächsische Landesforsten), new areas were included in our monitoring activities and in some areas we were asked by the State Forestry Department to conduct surveys. This is in marked contrast to the State Forestry Department's conduct during the expedition's inaugural year of 2017, when the State Forestry Department forbade the expedition to enter certain areas due to smear and misinformation campaigns by anti-wolf elements amongst the hunting community and/or political class (see Schütte and Hammer 2019 for details). The expedition appreciates the trust and cooperation now shown by the State Forestry Department.

It is also worth noting that hostility towards the expedition shown in 2017 (Schütte and Hammer 2018) and less so in 2018 (Schütte and Hammer 2019) by the media and the anti-wolf lobby has ebbed away. It is unknown whether this is because it has been accepted that the expedition's efforts are worthwhile or whether other targets have been found.

Summary

The wolf has returned to Germany to stay. Those who do not like this and employ misinformation, populism and demagogy to incite conflict and highly emotional, politically charged and irrational arguments against wolves must be countered each time with calm, factual and science-based discourse. Those who are exposed to real risks through wolves, namely livestock owners, should be listened to, supported and compensated as necessary, ideally through an effective, unbureaucractic and nationwide support and advice system.

We believe that a system of regionally active, trained professionals is needed, who can respond to questions about and issues around wolves directly, unbureaucratically and competently, and act close to the ground and in close cooperation with the local population and stakeholders. So far the federal and state goverments, as well as agricultural and veterinarian bodies, have failed to create appropriate structures, which are necessary when a large carnivore returns to a cultural landscape.

In addition, we believe that more must be done to stop illegal wolf killings. The records of wolves found dead, taken since 2003, show that illegal killing of this protected species (a criminal offence in Germany) is the second most common form of death (12%) after traffic accidents (77%); the remaining 11% are due to diseases or other reasons (NLWKN 2019). A particularly sad example of an illegal killing is male wolf GW1039m, whose existence was shown by the expedition in 2018, only to be found shot dead shortly after the expedition in August 2018. Presumably there is a high percentage of unreported killings. Here, the investigative authorities and courts must work harder to stop this and prosecute perpetrators, as for example in the neighbouring federal state of Saxony-Anhalt.

Whilst there are challenges that come with wolf presence, there are opportunities too. The wolf hunts and anti-wolf headlines seem to have been largely ignored so far. We see the biggest potential in rural communities generating income through tourism based on nature and wolf presence. Furthermore, wolf presence can contribute to the regulation of browsing by large wild herbivores and thus be supportive to regeneration of forests CHWOLF 2020).

Next to large-scale, national issues, this project on a Lower Saxony state and regional scale, and in close collaboration with the State Wolf Bureau, not only reached its goals, it exceeded, now also in its third year, all expectations. It is clear that the efforts of well-trained citizen scientists deployed as part of a well-planned fieldwork expedition can be very productive and that highly valuable data can be acquired through targeted active wolf monitoring work conducted by citizen scientists. This refutes those who doubted that citizen science could make a useful contribution. This doubt was especially prevalent amongst hunters, hunting associations and some forestry officials and landowners before and during the inaugural 2017 expedition, but has changed in some quarters after the results of the 2017 expedition were published.

For example, the State Forestry Department now supports the expedition and it is hoped that the results presented here will encourage others too to give up their negative and non-collaborative stance, as well as their publicly voiced populist prejudices based on erroneous assumptions and assertions. The authors are, and always have been, ready to collaborate in the spirit of successful wolf conservation and wolf-human co-existence in Lower Saxony.

Recommendations for future expeditions

The coronavirus pandemic has made a citizen science expedition in 2020 impossible. Instead, a community expedition with local staff only is being planned at the time of writing to ensure that monitoring and conservation efforts are continued. The community expedition will also produce an abridged report, which will include dietary analysis.

As soon as possible, the citizen science expeditions should be repeated on an annual basis and they should:

- Adapt/improve methods and logistics as necessary, based on an annual review of activities.
- Establish camera trapping efforts wherever possible within the limitations of privacy and property laws.
- Find funding to extend the use of scent dogs during the expedition to establish and promote their effectiveness for wolf monitoring purposes.
- Find possibilities to test methods such as video scats (Canu et al. 2017).
- Gain support from more wolf commissioners and district nature conservation authorities for active monitoring in areas of specific interest.

Improve communications with stakeholders:

- Repeat offers to stakeholders, such as hunting associations and forestry departments, to use/involve/allow the efforts of Biosphere Expeditions, e.g. camera trapping and sign surveys.

Involve local, national and international citizen scientists:

- Seek grant and other support, or fund internally, free placements for local people on the expedition.

- Work with the media to encourage more local participation.

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Appendix I: Overview of temperature and rainfall values at Gut Sunder during the expedition (own records of author P. Schütte)

Date	°C at 07:00	°C at 17:00	Rainfall (mm) 07:00 / 16:00
07 July 2019	09	17	2.0 / 0
08 July 2019	09	17	0 / 0
09 July 2019	10	17	0 / 0
10 July 2019	12	19	0 / 0
11 July 2019	12	21	1.1 / 0
14 July 2019	14	15	9.0 / 0
15 July 2019	12	15	0 / 0
16 July 2019	12	17	0 / 0
17 July 2019	12	20	0 / 0
18 July 2019	13	22	0 / 0

Appendix II: Week-by-week survey results

Effort & results week 1

Survey days		5
EEA 10x10 km grid cells covered		17
Scats found / in EEA cells		151 / 15
Day	Distance covered by teams (km)	Remarks
Sun, 07 July	7.8	One training group only
Mon, 08 July	85.7	Maximum four small groups
Tue, 09 July	80.62	Maximum four small groups
Wed, 10 July	81.61	Maximum four small groups
Thu, 11 July	100.64	Maximum four small groups
Total	**356.37**	

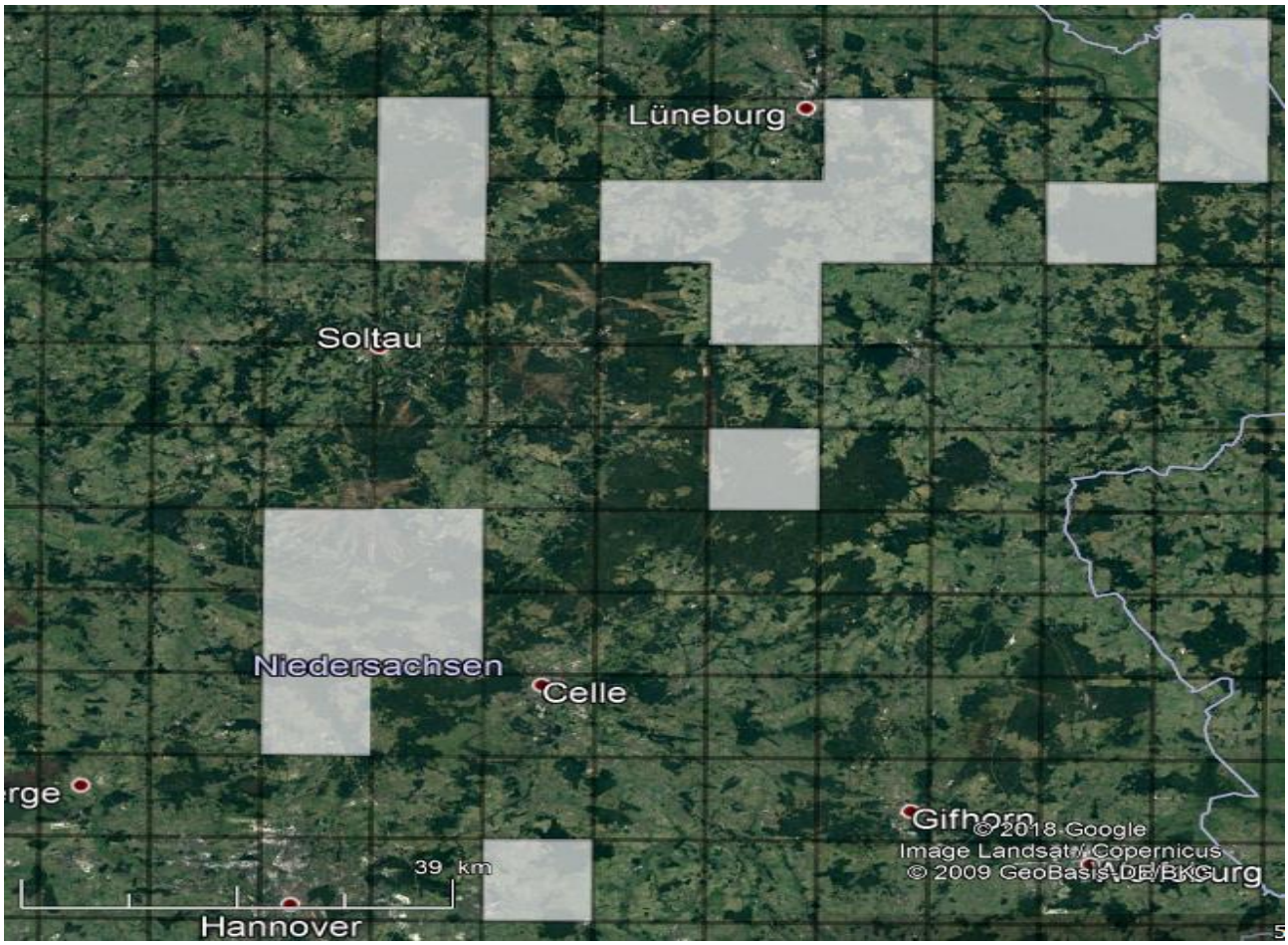

Figure IIa. 17 EEA grid cells covered during week 1 of the 2019 expedition (indicated as pale shading).

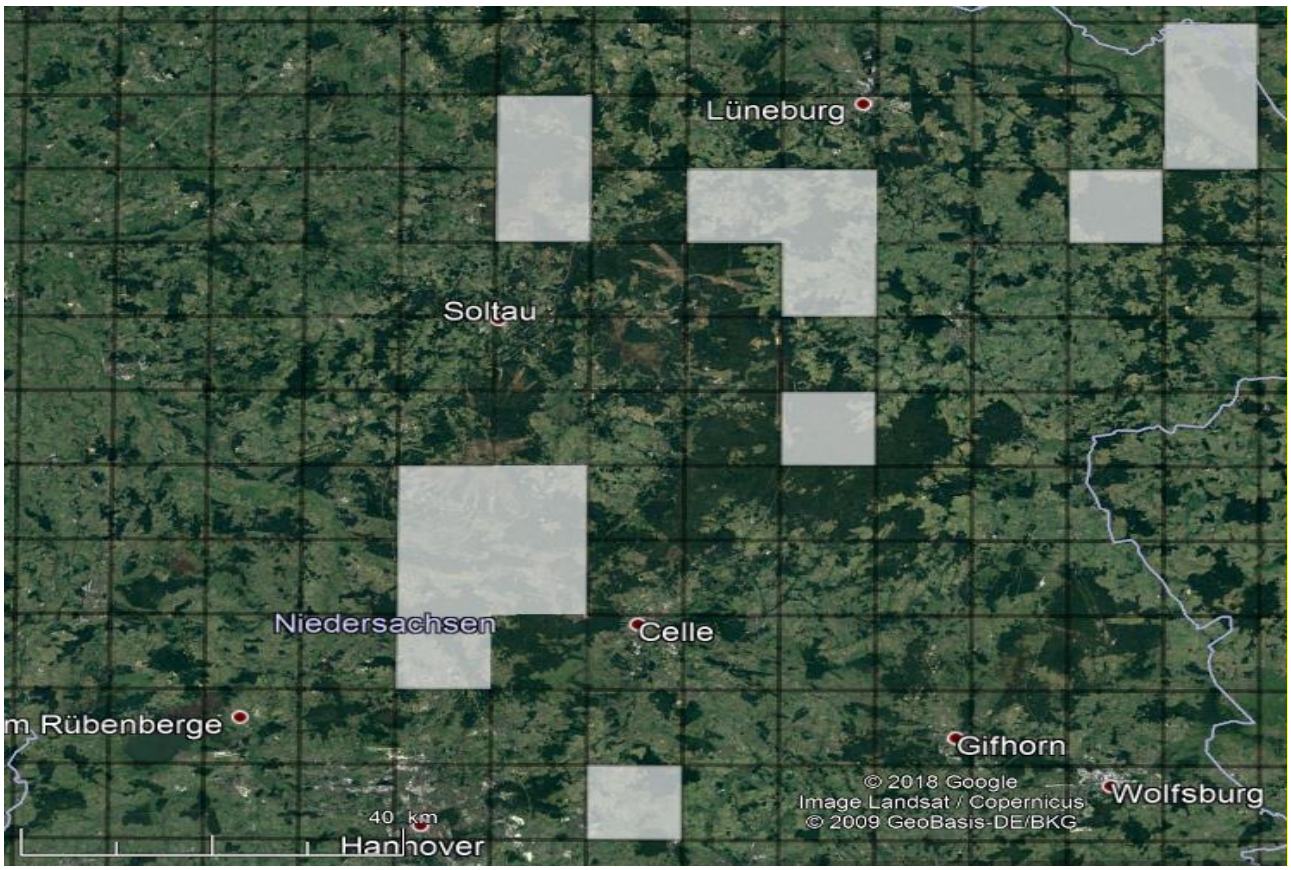

Fig IIb. 15 EEA grid cells in which wolf scat samples were collected during week 1 of the 2019 expedition.

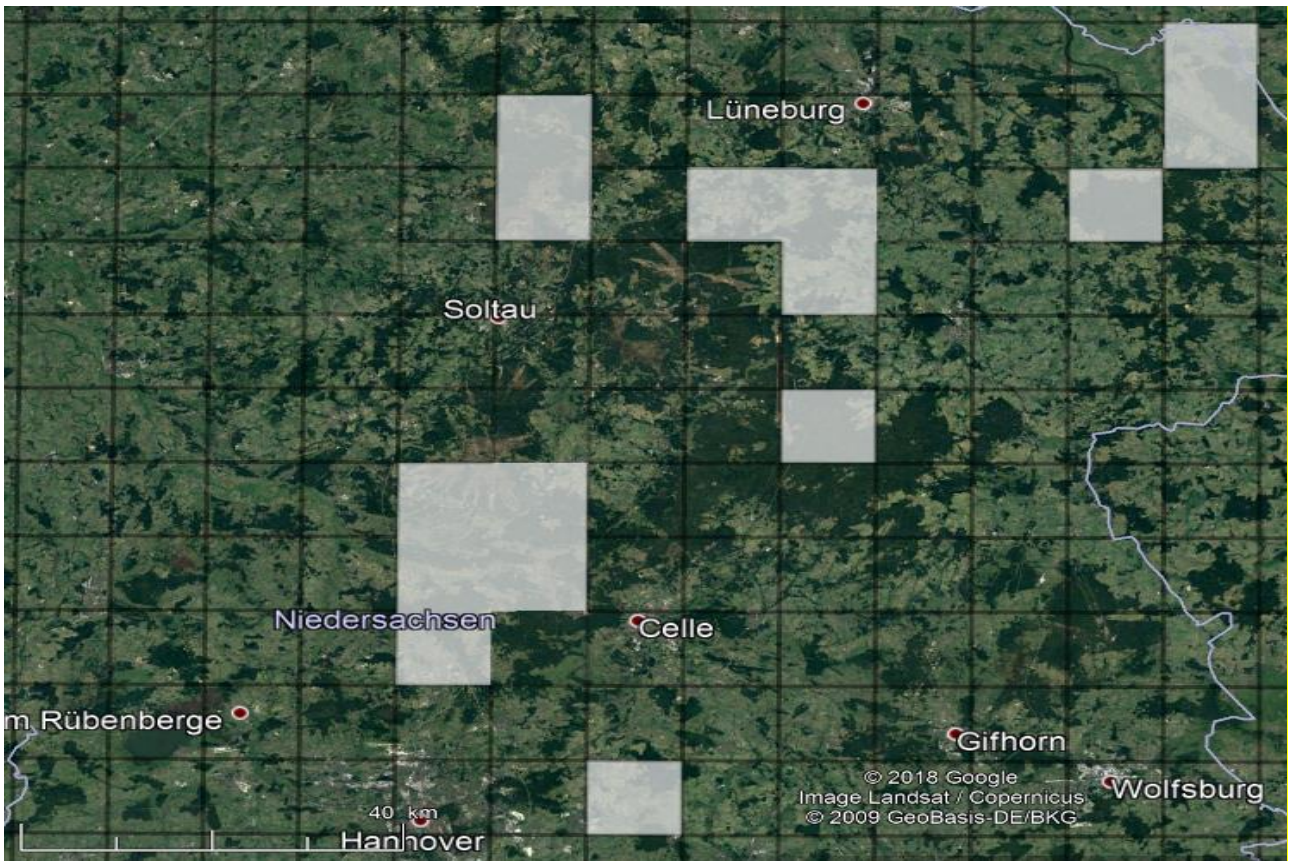

Fig. IIc. Possible wolf signs (tracks, old scats) recorded during week 1 of the 2019 expedition in 15 EEA grid cells.

Effort & results week 2

Survey days		5
EEA 10x10 km grid cells covered		23
Scats found / in EEA cells		88 /17
Day	Distance covered by teams (km)	Remarks
Sun, 14 July	25.4	One training group only
Mon, 15 July	101.8	Maximum four small groups
Tue, 16 July	104.2	Maximum four small groups
Wed, 17 July	97.0	Maximum four small groups
Thu, 18 July	58.7	Maximum four small groups
Total	**387.1**	

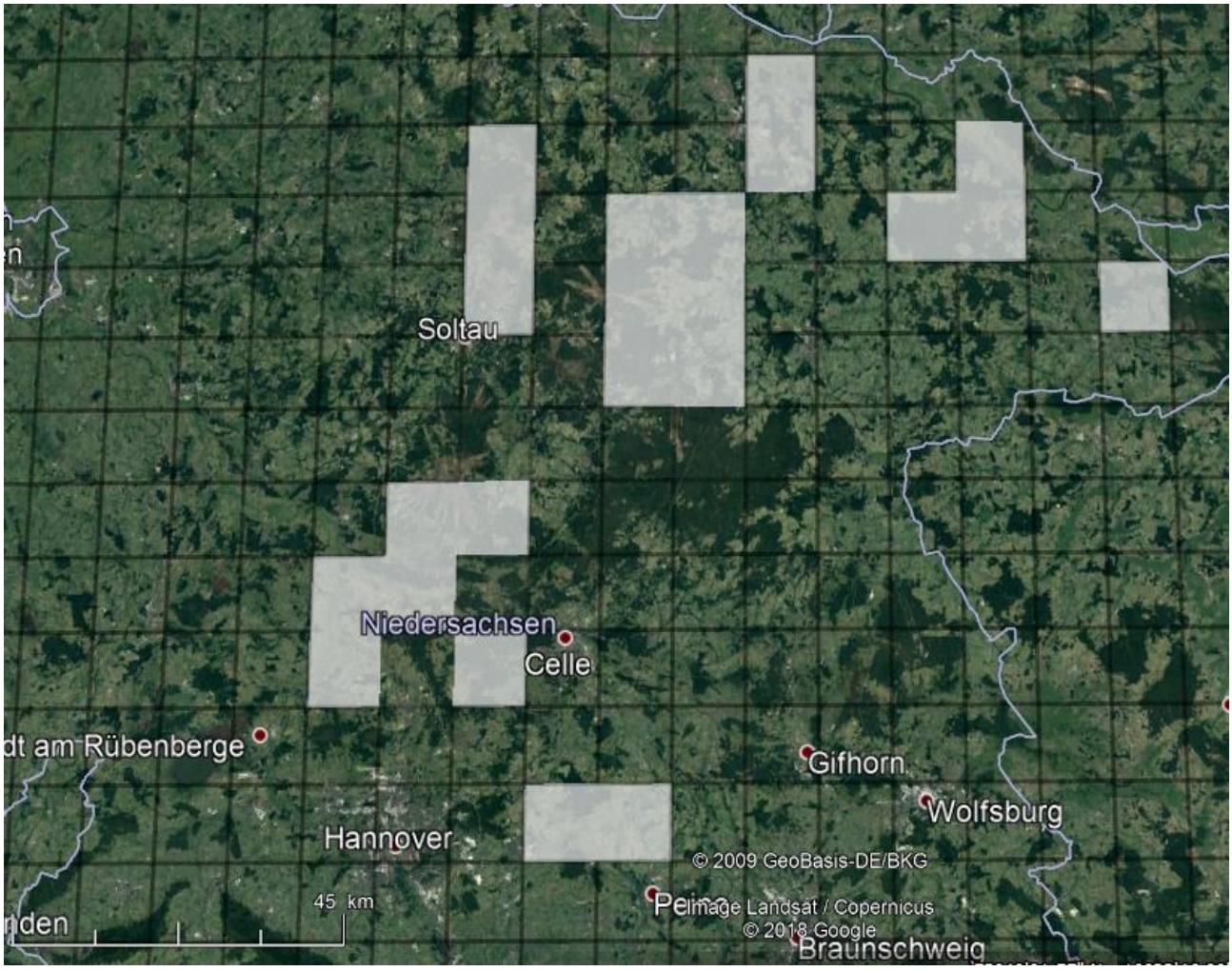

Figure IId. 23 EEA grid cells covered during week 2 of the 2019 expedition (indicated as pale shading).

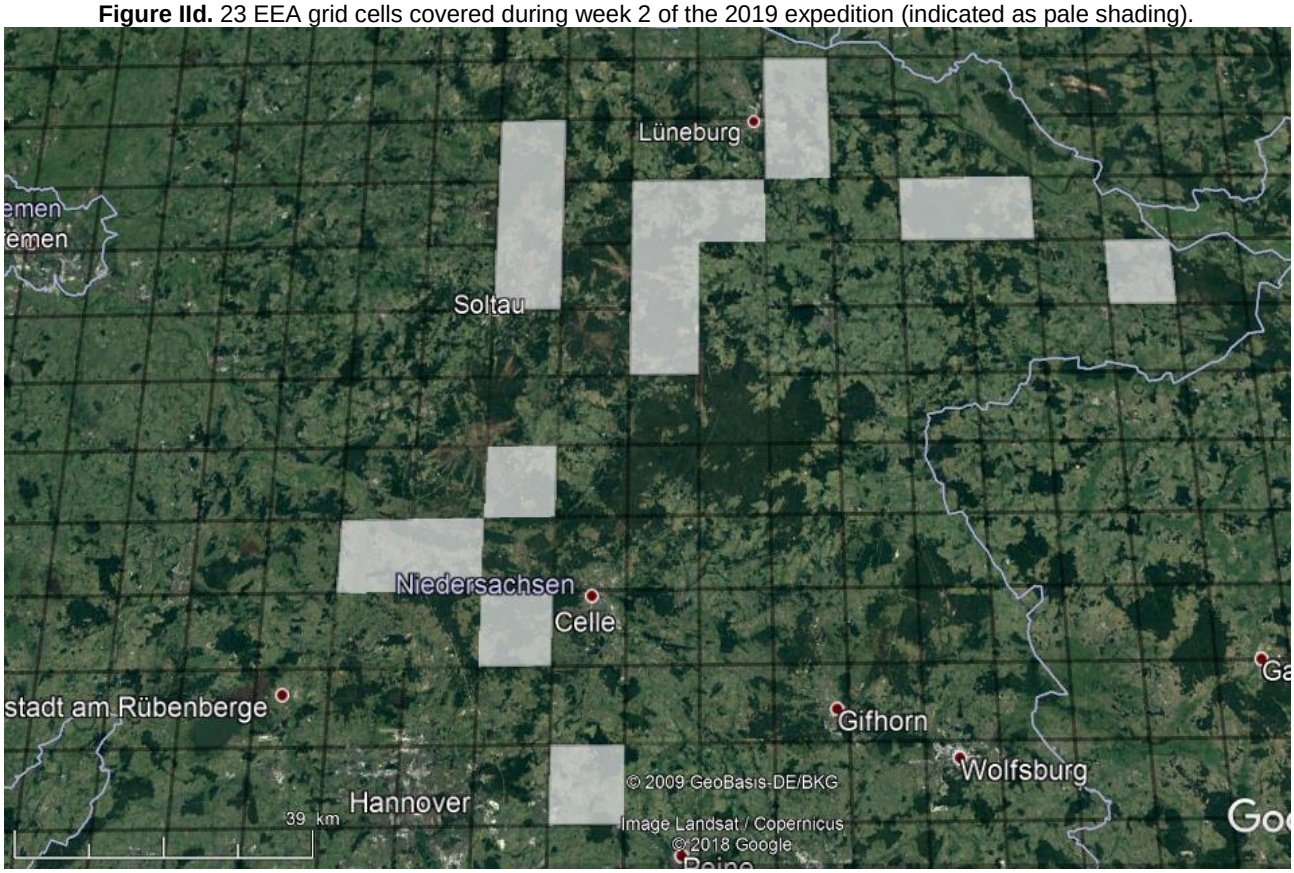

Fig IIe. 17 EEA grid cells in which wolf scat samples were collected druing week 2 of the 2019 expedition.

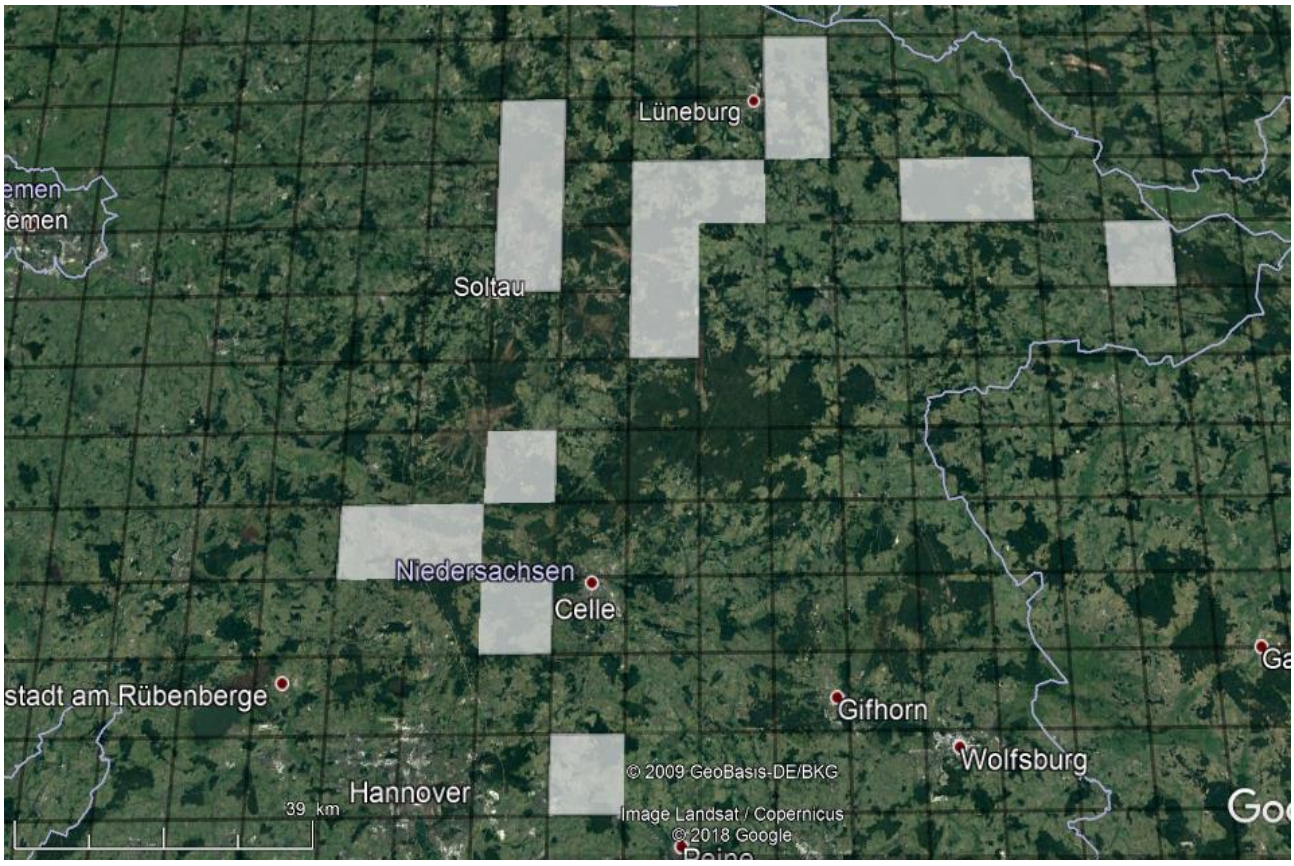

Fig. IIf. Possible wolf signs (tracks, old scats) recorded during week 2 of the 2019 expedition in 17 EEA grid cells

Appendix III: Photo impressions

Figure IIIa. Briefing of expedition team as part of training on day one.

Figure IIIb. Expedition research equipment ready for use.

Figure IIIc. First survey in one group as part of training on day one.

Figure IIId. Wolf track.

Figure IIIe. Scat collection kit with finding.

Figure IIIf. Breakfast in the Herrenhaus expedition base, with Herrenhaus staff in the background.

Figure IIIg. After a long survey (from left Lea Wirk of Wildlife Detection Dogs e.V., citizen scientist Luqing Yin and wildlife detection dog Molly).

Figure IIIh. Overnight camp Dübbekold.

Appendix IV: Expedition diary and reports

A multimedia expedition diary is available on https://blog.biosphere-expeditions.org/category/expedition-blogs/germany-2019/.

All expedition reports, including this and previous expedition reports, are available on www.biosphere-expeditions.org/reports.