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Monitoring of the Pasvik-Inari brown bear (*Ursus arctos*) population in 2023 using hair traps

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TITTEL/TITLE

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SAMMENDRAG/SUMMARY:

Sammendrag

Siden 2005 har populasjonen av grenseoverskridene brunbjørn (*Ursus arctos*) i Pasvik-Enare trilaterale park (Norge-Finland-Russland) blitt overvåket ved å bruke genetiske analyser av hår- og ekskrement-prøver samlet inn tilfeldig i felt. En mer systematiske metode med hårfeller hvert fjerde år ble i 2007 startet opp for å samle inn bjørnehår til genetisk analyse. Metoden besto i å sette ut 56 hårfeller med luktstoff i Norge, Finland og Russland i et 5 x 5 km² rutenett (totalt ca. 1400 km²). Dette prosjektet ble gjentatt i 2011, 2015, 2019 og nå i sesongen 2023. Årets studie ble utført i Pasvik (Norge) – Inari (Finland) området med 43 ruter (1075 km²) ved bruk av samme metode som i de foregående studiene. Det ble samlet inn 97 prøver, der 45 av disse var fra Finland og 52 fra Norge. For 71 (73 %) av 97 hårprøvene var det positivt resultat i den bjørnespesifikke analysen, og en komplett DNA-profil kunne bestemmes for 63 av de positive prøvene. Det ble totalt påvist 22 forskjellige bjørner (10 hunner og 12 hanner). Av disse 22 individene var 12 påvist i tidligere år, mens 10 var til nå ukjente bjørner. Totalt ble det påvist 13 bjørner i Finland og 11 bjørner i Norge. Årets prøveinnsamling har nest høyest suksessrate når det gjelder antall bjørneindivider per antall ruter med 0,51 individ per rute, sammenlignet med 0,81 individ i 2019 (høyest suksessrate), 0,49 i 2015, 0,35 i 2011 og 0,42 i 2009. Våre resultater viser at selv med mindre studieområde (antall ruter) gir

hårfelleprosjektet som gjennomføres hvert fjerde år verdifull informasjon om individene av bjørn i området i tillegg til tilfeldig innsamling av ekstrementer og hår (det nasjonale overvåkingsprogrammet for brunbjørn i Norge).

LAND/COUNTRY:	Finland, Norway
FYLKE/COUNTY:	Lapland län, Troms-Finnmark fylke
KOMMUNE/MUNICIPALITY:	Ivalo, Sør-Varanger
STED/LOKALITET:	Inari, Øvre Pasvik

GODKJENT /APPROVED	**FORFATTER/AUTHOR**
Snorre Hagen	David Kniha
NAVN/NAME	**NAVN/NAME**

Abstract

Since 2005, the population of the trans-border brown bear (*Ursus arctos*) in Trilateral Park Pasvik-Inari (Norway-Finland-Russia) has been monitored by using genetic analyses of hair and faeces collected randomly in the field. A more systematic method using hair traps every fourth year was initiated in 2007 to collect brown bear hairs for genetic analysis. The method consisted of 56 hair traps in Norway, Finland and Russia in a 5 x 5 km^2 grid cell system (ca 1400 km^2). The project was repeated in 2011, 2015, 2019 and now in 2023. This season's sampling was carried out in Pasvik (Norway) - Inari (Finland) area (43 squares, 1075 km^2), using the same methodology as in the previous studies. A total of 97 samples were collected, where 45 samples came from Finland and 52 samples from Norway. In the bear specific analysis, 71 (73 %) of the 97 hair samples were positive. A complete DNA profile could be determined for 63 of the positive samples. In total, 22 different bear individuals were detected (10 females and 12 males). Of these 22 bears, 12 bears were detected in previous years, while 10 were previously unknown bears. In total, 13 bears were detected in Finland and 11 bears in Norway. This year's sampling has the 2nd highest success rate in number of individuals detected per grid square, with 0,51 individual per grid square compared to 0,81 individuals in 2019 (highest success rate), 0,49 in 2015, 0,35 in 2011 and 0,42 in 2009. Our results showed that even with a smaller study area, the hair trap project every 4th year provides valuable information on the brown bear individuals in addition to a random sampling in the field (The National Monitoring Program for brown bears in Norway).

Svanvik, 01.02.24

David Kniha & Hans Geir Eiken

Innhold

1 Introduction

Monitoring and estimating populations of wildlife are critical for their effective management but can prove very challenging when dealing with small populations of brown bear (*Ursus arctos*); an elusive, rare, highly mobile, and mostly nocturnal species (Sentilles et al. 2021; Ciucci et al. 2017). The use of non-invasive sampling in conjunction with genetic methods has become more important, as it allows researchers to investigate the animal without the need of disturbing it or even observing it directly (Berezowska-Cnota et al. 2017; Kendall et al. 2019). One of the widely used non-invasive sampling methods is hair trapping (using hair traps, also known as hair snares), a method acknowledged for its effectiveness in systematic collection of hair samples of bears. When evenly distributed over the research area, the traps have been shown to be highly effective in sampling individuals in larger geographic areas (Woods et al. 1999; Mowat and Strobeck 2000; Romain-Bondi et al. 2004; Waits & Paetkau 2005; Kendall 1999; Kendall et al. 2005, 2008a, 2008b; Kendall et al. 2009). NIBIO Svanhovd (former Bioforsk Svanhovd) has been applying hair trapping methods since 2007 to monitor the brown bear populations in Norway, Finland and Russia (Smith et al. 2007, 2008; Wartiainen et al. 2008, Eiken et al. 2009a, 2009b, 2011, Kopatz et al. 2011, 2012, 2013, Beddari et al. 2020, Fløystad et al. 2020b, 2021 and 2022). These studies have had hair traps placed in an area divided into a grid net of 5 x 5 km squares over the course of 2 months and provided us with estimates about the minimal population of brown bears in the area, as well as their spatial distribution and movement during the study time (Fløystad et al. 2022).

Previously, four tri-lateral projects have been conducted to monitor and estimate the brown bear population in the neighbouring protected areas of Pasvik in Norway, Inari in Finland and Pechenga in Russia. The tri-lateral projects were done in 4-years intervals (2007, 2011, 2015, 2019) in a study area of approximately 1400 km^2, where in total 675 hair samples were collected, resulting in identification of 117 unique bears (Smith et al 2007; Kopatz et al 2011; Aarnes et al. 2015; Beddari et al 2020).

In 2023 we have replicated the four previous studies to estimate the minimum size of the population of brown bears in the area, their movement patterns and eventual changes compared to previous years. The use of the same methodology facilitated a direct comparison of the results from these four projects, thus allowing for more reliable assessment of possible changes and their biological significance. Unfortunately, due the current political situation (2022-2024) we were unable to coordinate sampling on the Russian side, and thus we only carried out sampling in Norway and Finland. However, the project still represents an international collaboration of the trans-border population of brown bears and contributes with valuable data on the current brown bear population, movement patterns and behaviour.

2 Materials and methods

2.1 Permits

For Norway, permissions to conduct this project were obtained from The Troms and Finnmark County Governor (Statsforvalteren i Troms og Finnmark), Finnmark Estate (Finnmarkseiendommen -FeFo) and the Board of the Øvre Pasvik National Park (Øvre Pasvik nasjonalparkstyre). Any permits in Finland were given by their authorities, when needed.

2.2 Study Area

Like our previous studies, the location of the monitored area was in the border area of Norway, Finland and Russia (approximately 69.4° North and 29.3° East), although this time not covering the area beyond the Russian border. The study area was divided into grid squares of 5 km x 5 km, resulting in 43 squares. These were divided between Norway and Finland with 23 squares being within the Finnish jurisdiction (Lapland, Inari municipality) and 20 within the Norwegian jurisdiction (Troms and Finnmark, Sør-Varanger) (Figure 1 and Figure 2). This area is dominated by both arctic and northern boreal ecosystems, represented by peatlands and forests. Non-forest areas can be described as low arctic and sub-arctic, whereas the forested areas are of the north boreal forest type, dominated by downy birch (*Betula pubescens*) and Scots pine (*Pinus silvestris*).

Figure 1: The study area is dominated by arctic and northern boreal ecosystems (Pasvik Valley summer 2023, photo Jan Helmer Olsen)

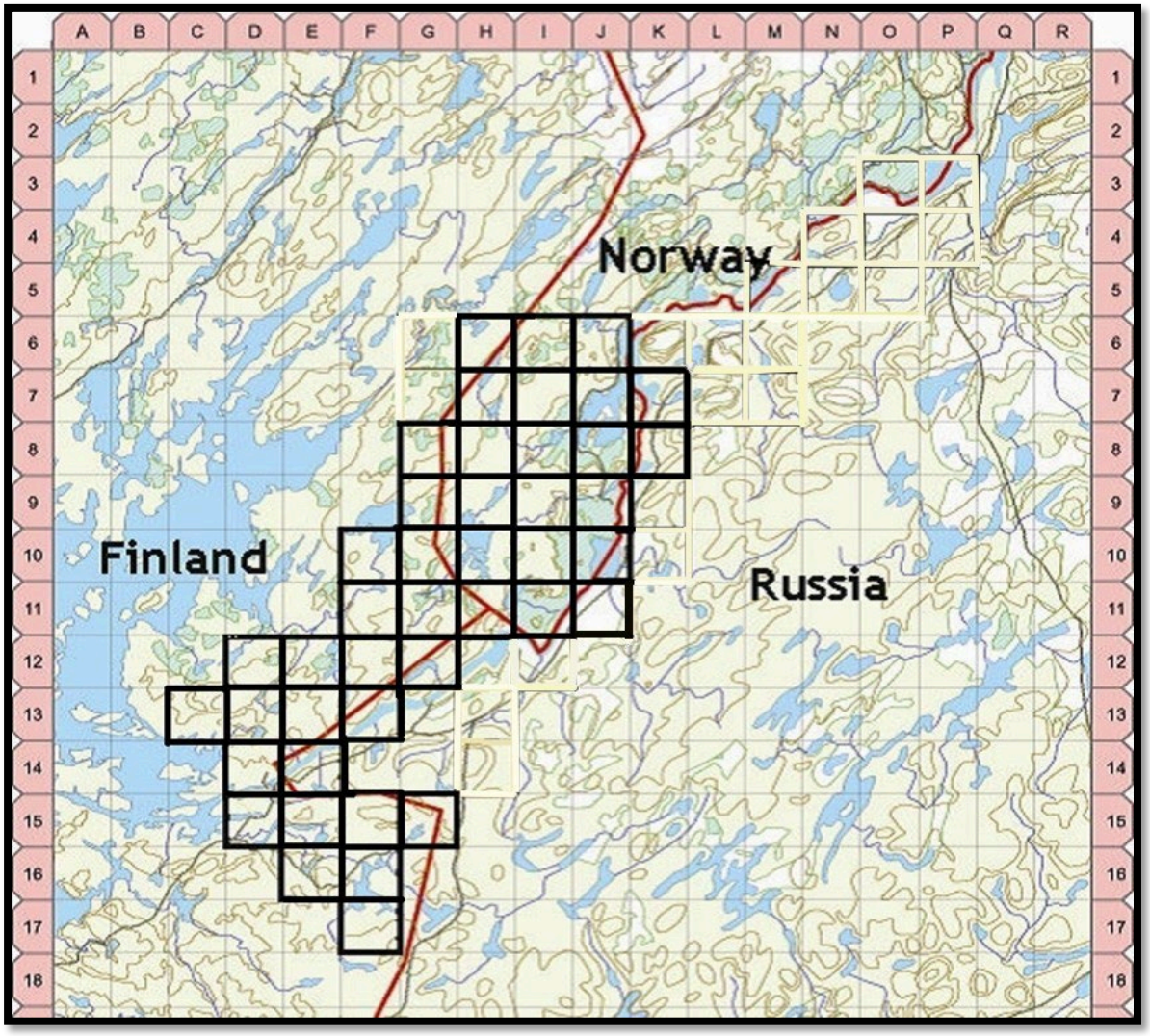

Figure 2: The trans-border study area in 2023 included areas in Norway (Øvre Pasvik) and Finland (Inari). The study area was divided in 43 squares (5 km x 5 km) with one hair trap in each. Hair traps were moved to a second location within the same square half-way through the collection period (after four weeks).

2.3 Sampling

Between the 7-9th of June 2023, the hair traps were established within each cell. We set up the traps by stretching a barbed-wire between several trees while encircling an intense-smelling scent lure of 1,5 L (Figure 3). As in our previous studies, we set up the barbed wire approximately 40 cm high from the ground, which is proven to be an effective height both from our experience and other studies (e.g., Quinn et al. 2022). We used stable, larger trees to stretch the wire around, while keeping the distance between trees under 5 metres (to prevent having a slack wire). The area of one trap is usually around 25-30 m^2 (5 x 5 m). In the middle of a trap, a small pile of logs, branches and moss was set up, on which we spilled the liquid scent-lure. This was done to achieve easier distribution and increased range of the scent from the lure. The lure is made of fermented oils from groundfish remains mixed with cattle blood. The mixture is fermenting for several months until it becomes liquified (Figure 3), and then transported in airtight containers during the fieldwork. It is important for the study set-up that the lure is thin liquid and absorbed by the log pile and the ground, as we want to ensure that the bears are attracted to the lure without getting any positive reinforcement in form of food.

Figure 3: Paul Eric Aspholm preparing for the fieldwork - filling the air-tight containers (1,5 L) with the lure. (photo Jan Helmer Olsen)

A completed trap attracts bears that want to investigate the scent. To come close to the scent source, they must either climb over or crawl under the wire (Figure 4). While doing this, the bears will hopefully leave some hair with roots on the barbed wire. There have not been any reports on animal injuries due to the barbed wire in other studies, nor have surveillance with trap cameras observed any during our continuous hair-trapping projects. (see e.g. Woods et al. 1999, Mowat and Strobeck 2000; Kopatz et al. 2011 & 2012, Beddari et al. 2020, Fløystad et al. 2022).

Figure 4: A brown bear stepping over the barbed wire, while leaving hair samples on it. (Camera 4, July 2023)

The traps were checked every second week through the field period (beginning of June – beginning of August, see Table 1). Each knot of the barbed wire was inspected carefully in addition to the vegetation and ground inside the trap area. Hair samples were collected in separate paper envelopes, and the wire was cauterized with a burner to prevent collecting the same hair in the next checkup. To keep the same level of attraction for the bears during the whole study period, a new scent-lure (1,5 L) was applied to the pile in the trap after the checkup. Half-way through the project all the traps were relocated within the same grid square. This is done to increase the probability of more bear visits and is discussed by e.g., Mowat and Strobeck (2000); and Boulanger et al. (2006). The traps were then taken down after two months (beginning of August), thus concluding the field part of the study.

Table 1: Schedule and sessions of the hair-trapping project in Pasvik-Inari- in 2023

Day 1	Trap set up (point A)
Day 14	1st check, Scent-lure refill (point A)
Day 28	2nd check (point A), relocation to point B within the same grid (new set up)
Day 42	1st check, Scent-lure refill (point B)
Day 56	2nd check (point B), Trap removal

Figure 5: To the left: Kristine Thujord setting up a trap (photo: Runa Gulliksen). To the right: David Kniha spilling the scent lure in the middle of the trap. (photo Hans Geir Eiken)

2.4 Additional field sampling

To observe the behaviour and get a visual confirmation on the bears visiting the hair traps, we installed 5 wildlife cameras (Reolink Go Plus) in front of 5 different traps. Video footage from the cameras was later linked with the hair samples collected from these traps and thus allowing us to get a more thorough data (ID, date and visual) on the individual bears visiting the traps.

In addition to the hair sampling, an opportunistic collection of bear faeces was conducted close to the traps or alternatively within the camera range. Those collected samples would be subject to DNA analysis at NIBIO Svanhovd. In case of finding brown bear faeces not related to the hair trap project, these would be delivered to the Norwegian Environmental Agency (Statens Naturoppsyn) for the national brown bear monitoring project.

2.5 DNA analysis

2.5.1 DNA-extraction

DNA was extracted from the hair samples using DNeasy Blood and Tissue Kit (Qiagen). Before the extraction, the hair samples were inspected and the roots from 1 to 12 hairs (depending on the number of roots available) were cut and transferred to a 1.5 mL Eppendorf tube containing 180 µl ATL Buffer (Figure 4. and 5.). If the sample consisted of very small hairs or hairs knotted together, the entire hair or a 0.3 - 0.5 cm wide section of the knotted hair, were transferred to the tube. Extraction of the DNA from the hair samples then followed the protocol "Purification of total DNA from animal tissues (Spin-Column protocol)" as described by the manufacturer, with exception of a modified elution volume in step 7, to increase the DNA concentration. DNA was eluted in a reduced volume of 30 µl or 50 µl elution buffer. The volume of elution buffer was reduced to 30 µl when the sample contained 1 to 6 hairs or knotted hairs, and 50 µl when containing 7-12 hairs. The DNA extraction method is further described in Tobiassen et al. (2011) and Smith et al. (2007).

2.5.2 Analysis of DNA profiles and sex

Genetic analysis of STRs (short tandem repeats) on the brown bear followed a modified protocol from Taberlet et al. (1997). We used eight different genetic markers (Mu05, Mu09, G10L, Mu10, Mu23, Mu50, Mu51 and Mu59) to construct DNA profiles (Paetkau and Strobeck 1994, 1995; Paetkau et al. 1995; Taberlet et al. 1997; see Eiken et al. 2009a and Andreassen et al. 2012). Three additional STR-markers: G1D, G10Band G1A (Andreassen et al 2012), were used for some of the samples so that the complete genetic profile consists of 11 STR-markers and sex. Sex determination was based on the X-and Y-specific DNA sequences of the amelogenin gene (Yamamoto et al. 2002). In addition, for new individuals a second test for molecular sexing was applied (Bidon et al 2013). This is a bear-specific test showing three bands for males and one for females. The DNA profile was subsequently compared to previously registered bears in Svanhovd's database containing brown bears from Norway, Sweden, Finland, and Russia.

The PCR protocol, capillary electrophoresis, determination of DNA profiles and the comparisons with DNA profiles from Svanhovd's Genetic database have been described in earlier publications (Tobiassen et al. 2011, Andreassen et al 2012). However, modifications have been made to the PCR protocol as a multiplex PCR approach has been implemented in this project (Fløystad et al 2020a). The laboratory no longer holds an ISO/IEC 17025 accreditation, but still follows the same guidelines making the results directly comparable with earlier studies. All procedures were done in accordance with the guidelines of the analysis of forensic animal material, published by Linacre et al. (2011).

Figure 6: To the left: Ida Fløystad working on samples from hair traps. To the right: A sample from the hair trap ready for cutting. (Photo to the left: Alexander Kopatz, to the right: Ida Fløystad)

3 Results and Discussion

3.1 Hair sampling

A total of 97 hair samples were collected during the study period: 52 from Norway and 45 from Finland. (Appendix table 1A) Hair samples were found in 27 out of 43 traps (63% success rate), specifically in 14 traps (out of 23) in Finland and in 13 (out of 20) in Norway. This gives an average success rate of 1,13 hair sample per trap per one month. In addition to the hair samples, four bear scats were collected near the traps during the sampling period.

Hair traps I10, H11 (Norway) and F10 (Finland) contained hair samples in each inspection (sampling round). In total, the highest sampling success rate was achieved in the first round (15 traps with a hair sample), followed by the 4th round (13 positive traps) and 2nd and 3rd round (12 positive traps). When divided between the two countries, in Norway the highest sampling success rate was in the 1st and 3rd inspection (8 positive traps), while in Finland the 2nd inspection was the most successful with 9 positive traps (see Figure 7).

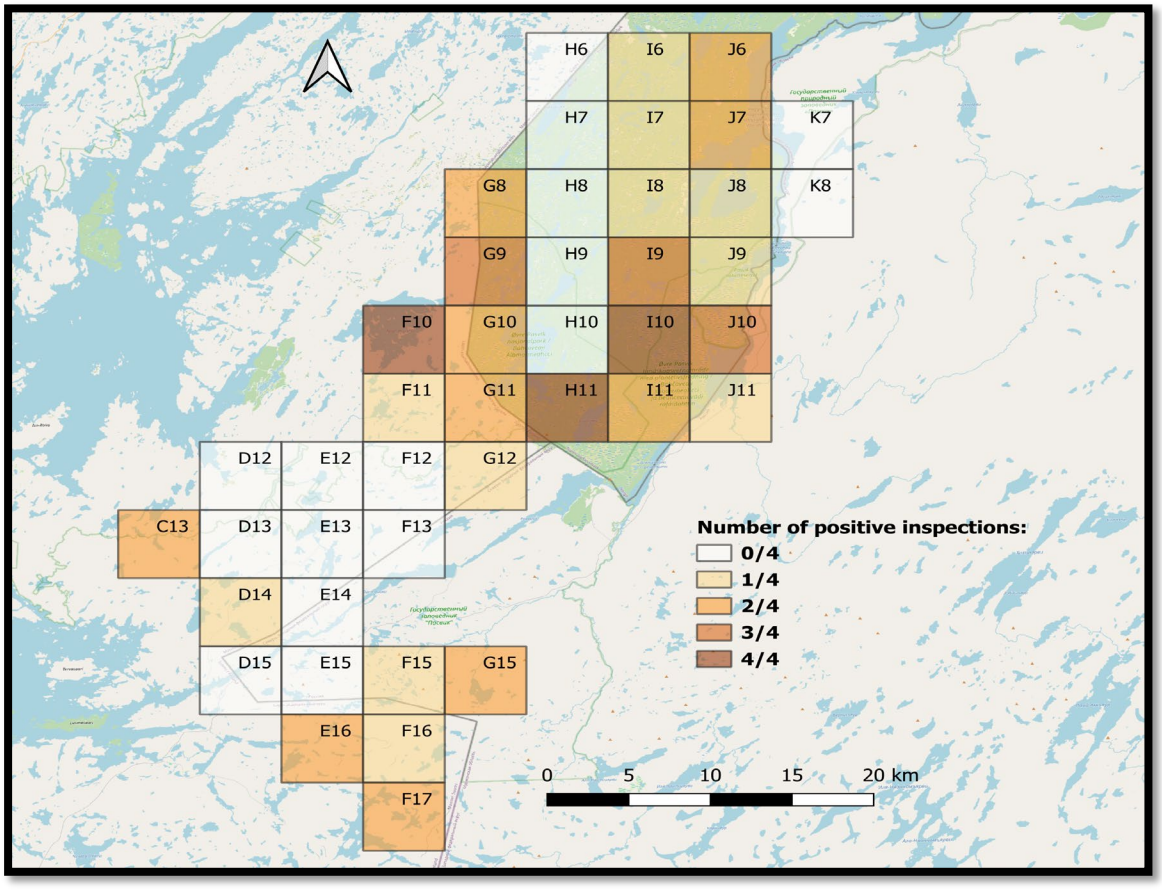

Figure 7: A map showing the number of positive (hair samples collected) inspections during the field season.

3.2 DNA analysis

Out of 97 collected and analysed samples, 71 were positive (73%) in the brown-specific analysis, and 63 of these positive samples (89%) were of such quality to be assigned an identity. A total of 22 brown bear individuals were determined, of which 12 males (55%) and 10 females (45%) (Table 2). A comparison with previously registered brown bear individuals in Svanhovd's database consisting of individuals from Norway, Sweden, Finland, and Russia resulted in a match for 12 of the individuals,

whereas 10 of the individuals were new to our database and were given new names and added to the database. Based on number of detected individuals, the average minimum bear-density in our study area (1000 km²) is 0,22 bear/10 km².

3.3 Individuals

Six of the individuals from Finland were previously registered in our database: FI183/LL53, LL53, LL61/FI328 (males) and FI218/LL63, LL54, LL57 (females); while seven more bears were registered as new individuals: LL69, LL70, LL73 (males) and LL71, LL72, LL74 and LL75 (females). In Norway, eight of the individuals were previously registered in our database. These were: FI123/LL43/MO50, FI247, FI310, FI325 and LL61 (males), and FI218/LL63, MO90/FI280 and MO92/FI272 (females). Female FI218/LL63 and male LL61/FI328 were thus registered in both countries. The three new individuals were registered as FI329 (female), FI330 and FI331 (males) (see Table 2, Figures 8 and 9).

Two of the four collected scat samples (50%) were positive, and both were assigned an identity. The two bears were a new male (FI331) and a previously registered female (MO92/FI272). Both bears were also identified from the collected hair samples.

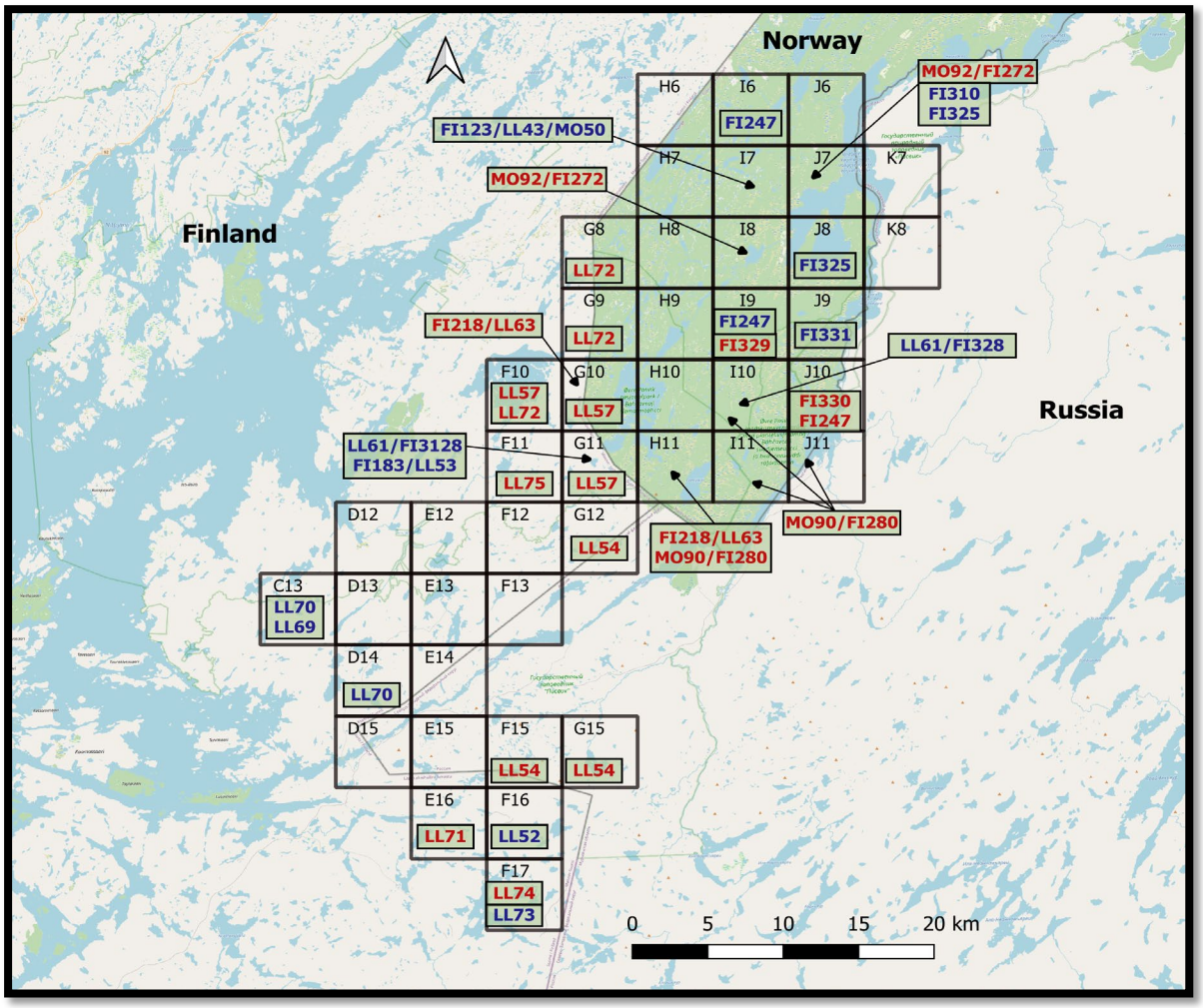

Figure 8: Brown bears detected in the hair trap project of 2023 in the trans-border area of Pasvik (Norway) and Inari (Finland). Sex of the individuals is represented by its colour (red = females, blue = males).

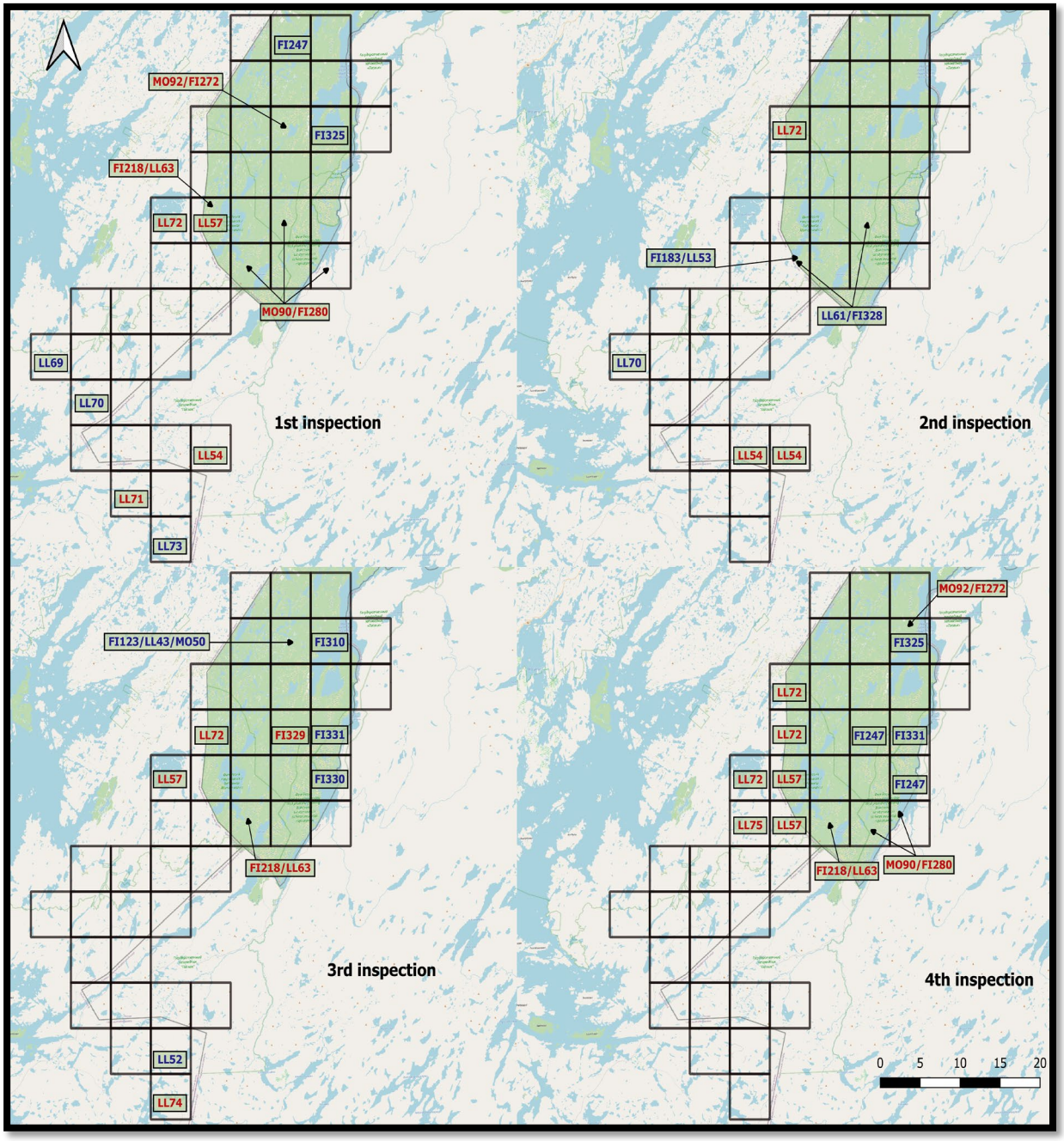

Figure 9: Brown bears detected in the hair trap project of divided to the four inspections of the field season (with approximately 2 weeks' time difference between the inspections).

Figure 10: Trap I10 being visited by a male (left-LL61/FI328) and a female (right-MO90/FI280) bear one week after each other (Photo: Camera 5, July 2023).

Table 2: Identity of the 22 brown bears individuals documented in hair-trapping 2023 (Pasvik-Inari)

Individual	Rovbase ID	Sex*	Previously registered	Hair trap
FI123/LL43/MO50	BI060009	M	2011 (Fin) 2011 - 2017, 2019 - 2022 (Nor) 2015, 2019 (Rus)	I7
FI247	BI412840	M	2018 - 2022 (Nor)	I6, I9, J10
FI310	BI418806	M	2022 (Nor)	J7
FI325	BI418821	M	2022 (Nor)	J7, J8
LL61/FI328	BI420158	M	2019 (Fin)	G11, I10
FI218/LL63	BI408099	F	2017-2018 (Nor) 2019 (Fin)	G10, H11
MO90/FI280	BI414763	F	2019 (Rus) 2020-2022 (Nor)	H11, I10, I11, J11
MO92/FI272	BI414351	F	2019 (Rus) 2020-2022 (Nor)	I8, J7
FI329	BI420159	F	New individual	I9
FI330	BI420162	M	New individual	J10
FI331	BI420163	M	New individual	J9
FI183/LL53	BI405748	M	2015 (Nor), 2019 (Nor, Fin), 2021 (Nor)	G11
LL52	-	M	2019 (Fin)	F16
LL54	-	F	2019 (Fin)	F15, G12, G15
LL57	-	F	2019 (Fin)	F10, G10, G11
LL69	-	M	New individual	C13
LL70	-	M	New individual	C13, D14
LL71	-	F	New individual	E16
LL72	-	F	New individual	F10, G8, G9
LL73	-	M	New individual	F17
LL74	-	F	New individual	F17
LL75	-	F	New individual	F11

3.4 Wildlife cameras

Remote wildlife cameras were mounted at five different traps (grids) on the Norwegian site. Camera 1 at J8, camera 2 at J6, camera 3 at I6, camera 4 at J7, and camera 5 at I9 (moved to I10 halfway through the study period). The cameras proved to be a valuable addition to the study, providing us with visual footage of the individuals and their behavior in relation to the traps (see Figure 10). Two of the cameras were taken down and damaged by a bear (Figure 11). DNA analysis from the hair samples, and the spatial and time proximity suggest that this was done by the same male individual – FI310.

Figure 11: One of the two cameras that got destroyed by a bear. The top picture is taken by the camera moments before it was destroyed. (Photos: Camera 4 and David Kniha)

3.5 Comparison of the results from 2007, 2011, 2015, 2019 and 2023

The monitoring effort in 2023 (43 grid cells) was executed in a similar setup as in the previous years, with exception of not having grids on the Russian side in this year's project. However, the number of grids/traps on the Norwegian and Finish side remained the same as in the last year (20 traps in Norway and 23 in Finland).

Due to the limitation of excluding 10 grids the 2023 project had a 26% decrease in the monitoring effort compared to 2019. This year's project had the lowest number of grids and the 2nd lowest number of samples collected (after 2011). In 2007, 196 samples were collected in the hair traps, with 129 (66%) successfully genotyped, resulting in the identification of 24 individuals (10 females, 14 males; Smith et

al. 2007). In 2011, 88 hair samples were collected, of which 56 (64 %) were successfully genotyped, identifying 20 individuals (12 females and 8 males; Kopatz et al. 2011). The project in 2015 collected the highest sample size of 209. This gave 158 (76%) successfully genotyped samples, identifying 26 bears (17 females and 9 males) (see Table 3). In 2019 182 samples were collected from which 136 (75%) were successfully genotyped. That year's sampling gave us the highest number (47) of unique individuals.

When comparing this year's results to previous results, it is important to mention that even though the sampling area (number of grid squares) was smallest this year, the number of unique individuals we identified was 22. In ratio with the sample size, this gives the 2nd most successful year (0,51 individuals identified per trap) after 2019 (0,81) following 2015 (0,49), 2011 (0,35) and 2009 (0,42) when it comes effectivity of unique individuals identified per sample size area.

Table 3: Comparison of the number of traps, samples, and unique individuals from all the years

Year	Country	Number of traps	Number of samples	Number of bears
2007	Norway	23	124	9
	Finland	23	56	9
	Russia	10	16	6
	Total	56	196	24
2011	Norway	20	66	11
	Finland	26	14	7
	Russia	10	8	6
	Total	56	88	20
2015	Norway	20	147	16
	Finland	23	20	5
	Russia	10	42	9
	Total	53	209	26
2019	Norway	20	60	14
	Finland	23	66	20
	Russia	18	57	16
	Total	58	183	47
2023	Norway	20	52	11
	Finland	23	45	13
	Russia	-	-	-
	Total	43	97	22

4 Conclusion

A total of 71 (73 %) of the 97 hair samples collected during this hair trap project were positive in the bear specific analysis, and a complete DNA profile could be determined for 63 of these samples. Twenty-two unique individuals were detected (10 females and 12 males). This is the 2nd highest number of unique individuals detected per sampling effort (sampling area), 0,51 individual per trap/grid square.

Twelve of the individuals detected this year were individuals previously registered in the database providing us with more information about their current movement patterns, habitat use and behaviour.

Ten of the detected bears were new individuals (previously unidentified). This highlights the importance of systemized hair trapping in addition to random DNA sampling in order to effectively monitor the brown bear population development in the Pasvik area.

Comparing this year's monitoring results to the last monitoring (2019), the number of detected unique individuals was 53% lower, while the monitoring area was only 26% smaller. We can hypothesize that this is due to: a) lower bear activity in the monitored area; b) smaller spatial-temporal overlap between distribution of the individuals and the placement of traps.

Additional camera monitoring proved to be an asset to the study set up, providing us with the visuals on the sampled individuals as well as their behaviour towards the traps.

As in previous studies, no harm to wildlife was documented or observed.

5 Acknowledgment

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Appendix

Table A 1: All the collected samples in the project and the results of the brown bear DNA analysis and the determination of individual identity.

Internal number (Svanhovd)	External sample number	Date of sampling	Material	Trap	Land	Fieldworker*	Positive/ Negative**	Sex***	Name
23FH001	B00077030	28.06.2023	Hair	C13	Finland	SM	P	M	LL69
23FH002	B00077029	28.06.2023	Hair	C13	Finland	SM	P	M	LL69
23FH003	B00077028	29.06.2023	Hair	D14	Finland	SM	P	M	LL70
23FH004	B00077027	30.06.2023	Hair	E16	Finland	SM	P	F	LL71
23FH005	B00077026	30.06.2023	Hair	E16	Finland	SM	N		
23FH006	B00077025	30.06.2023	Hair	E16	Finland	SM	P	F	LL71
23FH007	B00082554	06.07.2023	Hair	F10	Finland	SM	P	F	LL72
23FH008	B00082555	06.07.2023	Hair	F10	Finland	SM	P	F	LL72
23FH009	B00082556	06.07.2023	Hair	F10	Finland	SM	P	F	LL72
23FH010	B00082557	30.06.2023	Hair	F17	Finland	SM	P	M	LL73
23FH011	B00082558	06.07.2023	Hair	G10	Finland	SM	P	F	LL57
23FH012	B00082559	04.07.2023	Hair	G15	Finland	SM	P	F	LL54
23FH013	B00082560	23.06.2023	Hair	G10	Finland	SM	P	F	FI218/LL63
23FH014	B00082561	13.07.2023	Hair	C13	Finland	SM	P	M	LL70
23FH015	B00082562	13.07.2023	Hair	C13	Finland	SM	P	M	LL70
23FH016	B00082563	13.07.2023	Hair	C13	Finland	SM	P	M	LL70
23FH017	B00082564	13.07.2023	Hair	C13	Finland	SM	P	M	LL70
23FH018	B00082565	15.07.2023	Hair	E16	Finland	SM	P		No ID
23FH019	B00082566	23.07.2023	Hair	F10	Finland	SM	N		
23FH020	B00082567	18.07.2023	Hair	F15	Finland	SM	P	F	LL54
23FH021	B00082568	18.07.2023	Hair	F15	Finland	SM	N		
23FH022	B00082569	22.07.2023	Hair	G8	Finland	SM	P	F	LL72
23FH023	B00082570	22.07.2023	Hair	G8	Finland	SM	P	F	LL72

23FH024	B00082571	22.07.2023	Hair	G9	Finland	SM	P		No ID
23FH025	B00082572	23.07.2023	Hair	G11	Finland	SM	N		
23FH026	B00082573	23.07.2023	Hair	G11	Finland	SM	P	M	FI183/LL53
23FH027	B00082574	23.07.2023	Hair	G11	Finland	SM	P	M	LL61/FI328
23FH028	B00082575	20.07.2023	Hair	G12	Finland	SM	N		
23FH029	B00082576	18.07.2023	Hair	G15	Finland	SM	P	F	LL54
23FH030	B00082577	18.07.2023	Hair	G15	Finland	SM	N		
23FH031	B00082578	18.07.2023	Hair	G15	Finland	SM	P	F	LL54
23FH032	B00082579	09.08.2023	Hair	F10	Finland	SM	N		
23FH033	B00082580	09.08.2023	Hair	F10	Finland	SM	P	F	LL57
23FH034	B00082581	02.08.2023	Hair	F16	Finland	SM	P	M	LL52
23FH035	B00082582	29.07.2023	Hair	F17	Finland	SM	P	F	LL74
23FH036	B00082583	08.08.2023	Hair	G9	Finland	SM	P	F	LL72
23FH037	B00077841	21.08.2023	Hair	F10	Finland	SM	P	F	LL72
23FH038	B00086137	21.08.2023	Hair	F11	Finland	SM	P	F	LL75
23FH039	B00086138	20.08.2023	Hair	G8	Finland	SM	P	F	LL72
23FH040	B00086139	20.08.2023	Hair	G9	Finland	SM	P	F	LL72
23FH041	B00086140	20.08.2023	Hair	G10	Finland	SM	P	(F)	LL57
23FH042	B00086141	20.08.2023	Hair	G10	Finland	SM	P		No ID
23FH043	B00086142	21.08.2023	Hair	G11	Finland	SM	N		
23FH044	B00086143	21.08.2023	Hair	G11	Finland	SM	P	F	LL57
23FH045	B00086144	21.08.2023	Hair	G11	Finland	SM	P	F	LL57
23NF001	B00077194	03.07.2023	Feces	J9	Norway	RR	N		
23NF002	B00077127	31.07.2023	Feces	J7	Norway	DK, RK	N		
23NF003	B00077126	31.07.2023	Feces	J7	Norway	DK, RK	P	F	MO92/FI272
23NF004	B00077125	31.07.2023	Feces	J9	Norway	LB, RR	P	M	FI331
23NH001_ABC	B00085203	20.06.2023	Hair	H11	Norway	DK	P	F	MO90/FI280
23NH002	B00085204	13.06.2023	Hair	J8	Norway	PA, LM	N		

23NH003	B00085205	13.06.2023	Hair	J8	Norway	PA, LM	P	M	FI325
23NH004	B00085206	20.06.2023	Hair	I10	Norway	DK	P	F	MO90/FI280
23NH005	B00085207	20.06.2023	Hair	I10	Norway	DK	P	F	MO90/FI280
23NH006	B00085208	20.06.2023	Hair	J11	Norway	DK	P	F	MO90/FI280
23NH007	B00085209	20.06.2023	Hair	I11	Norway	DK	N		
23NH008	B00085210	20.06.2023	Hair	I8	Norway	LB, RR	N		
23NH009	B00085211	20.06.2023	Hair	I8	Norway	LB, RR	N		
23NH010	B00085212	20.06.2023	Hair	I8	Norway	LB, RR	P	F	MO92/FI272
23NH011	B00076973	13.06.2023	Hair	J8	Norway	PA, LM	P	M	FI325
23NH012	B00076972	20.06.2023	Hair	I9	Norway	LB, RR	P		No ID
23NH013	B00076971	20.06.2023	Hair	I9	Norway	LB, RR	N		
23NH014_AB	B00076970	20.06.2023	Hair	I9	Norway	LB, RR	N		
23NH015	B00076969	20.06.2023	Hair	I9	Norway	LB, RR	P		No ID
23NH016	B00076968	20.06.2023	Hair	I9	Norway	LB, RR	P		No ID
23NH017	B00076967	20.06.2023	Hair	I9	Norway	LB, RR	N		
23NH018	B00076966	19.06.2023	Hair	I6	Norway	LB, RR	P	M	FI247
23NH040	B00077643	04.07.2023	Hair	K7	Norway	DK, KT			
23NH063	B00077619	03.07.2023	Hair	I10	Norway	LB	N		
23NH064	B00077620	03.07.2023	Hair	I10	Norway	LB	P	M	LL61/FI328
23NH065	B00077618	03.07.2023	Hair	H11	Norway	LB	N		
23NH066	B00077617	04.07.2023	Hair	J10	Norway	LB	P		No ID
23NH082	B00077193	17.07.2023	Hair	J7	Norway	DK, IF	P	M	FI310
23NH083	B00077192	17.07.2023	Hair	J7	Norway	DK, IF	P	M	FI310
23NH084	B00077191	17.07.2023	Hair	J7	Norway	DK, IF	P	M	FI310
23NH085	B00077190	17.07.2023	Hair	J6	Norway	DK, IF	N		
23NH086	B00077189	17.07.2023	Hair	I7	Norway	DK, IF	P	M	FI123/LL43/MO50
23NH087	B00077188	17.07.2023	Hair	I10	Norway	RR	P		No ID
23NH088	B00077157	17.07.2023	Hair	I9	Norway	RR	P	F	FI329

23NH089	B00077156	17.07.2023	Hair	H11	Norway	LB	P	F	FI218/LL63
23NH090	B00077155	17.07.2023	Hair	H11	Norway	LB	N		
23NH091	B00077154	17.07.2023	Hair	J10	Norway	LB	N		
23NH092	B00077153	17.07.2023	Hair	J10	Norway	LB	N		
23NH093	B00077152	17.07.2023	Hair	J10	Norway	LB	P	M	FI330
23NH094	B00077151	17.07.2023	Hair	J10	Norway	LB	N		
23NH095	B00077150	17.07.2023	Hair	J10	Norway	LB	P	M	FI330
23NH096	B00077149	18.07.2023	Hair	J9	Norway	LB	P	M	FI331
23NH097	B00077148	18.07.2023	Hair	J9	Norway	LB	N		
23NH114	B00077135	31.07.2023	Hair	J7	Norway	RK, DK	P	M	FI325
23NH115	B00077134	31.07.2023	Hair	J7	Norway	DK, RK	P	M	FI325
23NH116	B00077133	31.07.2023	Hair	J7	Norway	DK, RK	P	M	FI325
23NH117	B00077131	31.07.2023	Hair	J6	Norway	DK, RK	N		
23NH118	B00077132	31.07.2023	Hair	J6	Norway	DK, RK	N		
23NH119	B00077130	31.07.2023	Hair	J10	Norway	LB, RR	P	M	FI247
23NH120	B00077128	31.07.2023	Hair	I9	Norway	LB, RR	P	M	FI247
23NH121_ABC	B00077129	31.07.2023	Hair	I10	Norway	LB, RR	P	F	MO90/FI280
23NH122	B00077124	01.08.2023	Hair	H8	Norway	DK, NSS	N		
23NH123	B00077123	01.08.2023	Hair	I11	Norway	RR	P	F	MO90/FI280
23NH124	B00077122	01.08.2023	Hair	H11	Norway	LB	P	F	FI218/LL63
23NH125	B00077121	01.08.2023	Hair	H11	Norway	LB	P	F	FI218/LL63
23NH126	B00077120	01.08.2023	Hair	H11	Norway	LB	P	F	FI218/LL63
23NH127	B00077119	01.08.2023	Hair	H11	Norway	LB	P	F	FI218/LL63

* - Fieldworkers initials

** - P = Positive, N = Negative

*** - M =Male, F = Female

NIBIO
NORSK INSTITUTT FOR BIOØKONOMI

Norsk institutt for bioøkonomi (NIBIO) ble opprettet 1. juli 2015 som en fusjon av Bioforsk, Norsk institutt for landbruksøkonomisk forskning (NILF) og Norsk institutt for skog og landskap.

Bioøkonomi baserer seg på utnyttelse og forvaltning av biologiske ressurser fra jord og hav, fremfor en fossil økonomi som er basert på kull, olje og gass. NIBIO skal være nasjonalt ledende for utvikling av kunnskap om bioøkonomi.

Gjennom forskning og kunnskapsproduksjon skal instituttet bidra til matsikkerhet, bærekraftig ressursforvaltning, innovasjon og verdiskaping innenfor verdikjedene for mat, skog og andre biobaserte næringer. Instituttet skal levere forskning, forvaltningsstøtte og kunnskap til anvendelse i nasjonal beredskap, forvaltning, næringsliv og samfunnet for øvrig.

NIBIO er eid av Landbruks- og matdepartementet som et forvaltningsorgan med særskilte fullmakter og eget styre. Hovedkontoret er på Ås. Instituttet har flere regionale enheter.

Forsidefoto: Taken from a video recorder by Camera 5 during the field season 2023 in Pasvik

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