



**ENHANCING FINANCIAL SUSTAINABILITY OF THE PROTECTED AREAS SYSTEM IN GEORGIA  
TECHNICAL ASSISTANCE GRANT AGREEMENT**

**Monitoring of Short-listed Species Indicators in Selected Protected  
Areas in Georgia:**

**Eastern Tur (*Capra cylindricornis*)**

***Final Report***

*[Draft]*



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**Photo on the cover:** Camera trap photo, NACRES/WWF

## Contents

Background .....	4
1 Introduction .....	4
2 The population of the Eastern tur in Georgia .....	4
3 Study areas.....	6
3.1 Tusheti National Park.....	6
3.2 Pshav-Khevsureti Protected Areas.....	7
4 Methodology.....	7
5 Eastern tur survey in Pshav-Khevsureti protected areas.....	8
5.1 Data collection .....	8
5.2 Results.....	9
5.2.1 The size and sex/age composition of observed tur groups .....	9
5.2.2 Population size .....	9
6 Eastern tur count in Tusheti protected areas .....	10
6.1 Data collection .....	10
6.2 Results.....	10
6.2.1 The size and sex/age composition of observed tur groups .....	10
6.2.2 Population size .....	11
7 Discussion.....	12
7.1 Pshav-Khevsureti PA .....	12
7.2 Tusheti PAs.....	12
7.3 Threats to Eastern tur populations .....	13
8 The Eastern tur population of Georgian central Great Caucasus .....	14
9 Recommendations .....	14
References .....	16
APPENDICES .....	18
Appendix #1. Eastern tur ( <i>Capra cylindricornis</i> ) distribution in the Caucasus (source: IUCN) .....	19
Appendix #2 Eastern tur observation form – Double observer point count .....	20
Appendix #3 Eastern tur observation points and group locations in Pshav-Khevsureti PAs.....	22
Appendix #4 Eastern tur range in Pshav-Khevsureti protected areas .....	23
Appendix #6. Eastern tur range in Tusheti .....	25
Appendix #7. Core sections of the Eastern tur range on the main watershed ridge of the Great Caucasus. ....	26

## Background

As part of the GEF/UNDP project “Enhancing financial sustainability of the Protected Areas (PA) system in Georgia” (the “GEF/UNDP Project”), in May 2020 CNF commissioned a Technical Assistance to provide **technical support to prioritize biodiversity monitoring indicators (species and habitats) for 12 target PAs in Georgia to support the development of standardized PA-specific Management Effectiveness Assessment plans (Biodiversity Monitoring Indicators)** with agreed monitoring methodologies for each prioritized indicator. As the result of the Technical Assistance, an agreed shortlist of fauna indicators was elaborated through an intensive and participatory process that involved all leading relevant experts and key stockholders, conducted in close cooperation with the main beneficiaries – the Agency of Protected Areas (APA) and the Ministry of Environmental Protection and Agriculture (MEPA).

The East Caucasian tur (*Capra cylindricornis*) was selected as one of the high priority indicators for Lagodekhi, Tusheti, Pshav-Khevsureti and Kazbegi PAs.

## 1 Introduction

NACRES carried out East Caucasian tur (*Capra cylindricornis*) population surveys in Pshav-Khevsureti and Tusheti protected areas during spring and autumn 2021 as part of the *Technical Assistance Grant Agreement* signed between CNF and NACRES on 21 February, 2021. We used the *double observer count method* as a robust and scientifically acknowledged field technique for assessing this mountain ungulate in the two study areas.

This report describes the results of the surveys and their analysis.

## 2 The population of the East Caucasian Tur in Georgia

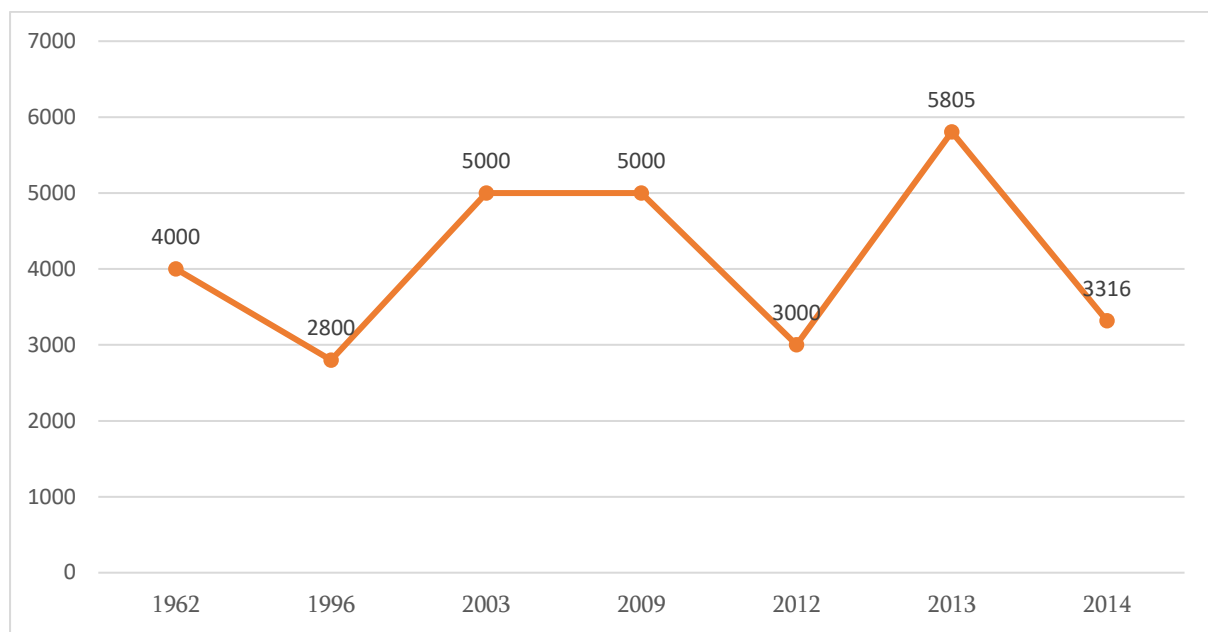
The East Caucasian tur is found in the Greater Caucasus mountain range from the headwaters of the Enguri river and Shkhara mountain (Janashvili 1950; Janashvili, 1977; Kokhodze, 1991; Georgian Country Study Report, 1996) to Gyumyushlyu of the Babadagh mountain massif (Weinberg, P., et al., 2010, Lortkipanidze, Weinberg, 2020). However, it has been suggested that its range may in fact continue further to the north-west, to the headwaters of the Nacra river (Lortkipanidze, Weinberg, 2020). The species range is much wider on the northern slopes of the Greater Caucasus than on the southern slopes due to topographic features (see Appendix #1). According to some authors, the density of the eastern tur was highest in Lagodekhi reserve throughout the Georgian range (Janashvili 1950; Chlaidze, 1967). However, the distribution on the Georgian side of the range is not continuous with a gap between Lagodekhi and Tusheti (Kopaliani, Gurielidze, 2009). Tur are not found in most parts of South Ossetia mountains – in this section of the Greater Caucasus the tur prefers northern slopes (Chlaidze, 1967, 1975).

According to the earlier literature the Eastern tur distribution in Georgia, to the west, extends to Pasis Mta mountain, on the border of the Svaneti and Racha regions (Chlaidze, 1967; Arabuli 1985). Later, Chalildze (1975) specified that typical eastern tur forms (as opposed to western tur or hybrids) were found only up to the slopes of Karaugomi mountain close to South Ossetia administration border.

Racha-Lechkhumi ridge and an adjacent part of Svaneti are considered as hybridisation zone (Chlaidze, 1967; Chalildze, 1975, Arabuli, 1985; Kopaliani and Gurielidze, 2009).

In the IUCN Red List the East Caucasian tur (*Capra cylindricornis*) is listed under the category Near Threatened (NT) (Lortkipanidze, Weinberg, 2020). The species is included in the Georgian red list as *Vulnerable* (Government of Georgia, 2014), which means that the species is protected from any type of hunting. Although, the control of illegal hunting in Georgia is weak, especially in the mountains (NACRES, 2010). Ilia state university assessed the population status East Caucasian tur in Georgia and proposed that the species should be assigned the category *Endanger* (EN) (Georgian Biodiversity Database, 2021).

We summarized all available results of tur population assessments for all Georgia (see Figure #1). Ilia state university completed a tur population census in 2012, 2013 and 2014. They used the areal count method and distance sampling approach to estimate the East Caucasian tur population numbers in Kazbegi, Khevsureti, Tusheti and Lagodekhi. According to their last assessment there were 3,316 individuals in Georgia in 2014 (Ilia state University, 2014). Their estimate was almost double that amount in 2013 (Table #1), but the confidence interval was so large that it covered all the other assessment results. Based on these results the population was probably more or less stable during the period 2012 through 2014.



**Figure #1** The dynamics of the East Caucasian tur population in Georgia. Sources: Chlaidze, 1962; Biodiversity Country Study Report 1996; NACRES Data Base 2003; Kopaliani, Gurielidze, 2009; Ilia State University; Official National Census Report 2012; Ilia State University; Official National Census Report 2013; Ilia State University; Official National Census Report 2014.

Many researchers have indicated devastating effects of hunting on the tur population (Gabliani, 1930; Markov, 1934; Markov, 1938; Claidze, 1967; Chlaidze, 1975; Janashvili, 1977; Chlaidze, 1967; Chlaidze, 1975; Eriashvili, 1989; Arabuli, 1985; Kokhodze, 1991). The impact was apparently particularly severe after long-range rifles became commonly available in from 1900s (Gabliani, 1930; Claidze, 1967; Chlaidze, 1975). According to Chlaidze (1975), shepherds and herders hunted tur on the summer

pastures and the tur numbers outside protected areas were always low. After the breakup of Soviet Union, illegal hunting became even more widespread and tur poaching became common even inside protected areas (Badridze et al., 2000). Since then the population recovered, but poaching still remains one of the major limiting factors (Kopaliani, Gurielidze, 2009; NACRES, 2017).

### 3 Study areas

#### 3.1 Tusheti National Park

Tusheti protected areas are situated in Tusheti province in the North-East of Georgia and geographically they encompass (i) northern slopes of the main watershed range of the Great Caucasus, (ii) southern slopes of the Pirikita Range that is a northern side-range of the Great Caucasus and is notably higher than the main range attaining 4,500 m.a.s.l. , (iii) the Tusheti depression that is found between the main watershed and the Pirikita range, and (iv) the Speroza area. To the north and east the park border coincides with the state border with Russian Federation, namely with Chechnia and Ingushetia on the north and with Dagestan on the east. To the south the park borders on Kakheti District, where the boundary lies along the main watershed of the Great Caucasus and to the west on Khevsureti, where the boundary is marked with the Atsunta Range and *m. Tebulo*.

Tusheti PA consist of Tusheti State Reserve (IUCN Category I) and Tusheti National Park (IUCN Category II) that are managed by the same Tusheti PA administration under the Agency of Protected Areas (APA).

The region is characterized by temperately humid climate with relatively dry cold winters and short summers.

Physically the region represents a depression comprised of two valleys, basins of Pirikita Alazani and Gometsari Alazani. The two basins are divided by Makratela watershed which stems out of Atsunta range and ends at the Omalo plateau where the two rivers (the two Alazanis) converge at 1600 m.a.s.l.

The mammalian fauna is very diverse and includes more than 30 small, medium-sized and large mammal species, while the ungulate community is especially noteworthy because it includes three out of four species of mountain ungulates found in Georgia – bezoar goat (*Capra aegagrus*), East Caucasian tur (*Capra cylindricornis*) and chamois (*Rupicapra rupicapra*), plus there are also roe deer (*Capreolus capreolus*), wild Boar (*Sus scrofa*) and red deer (*Cervus elaphus*). The mammalian carnivore community that can prey on the tur and their young includes wolf (*Canis lupus*), lynx (*Lynx lynx*) and brown bear (*Ursus arctos*). Recently a Persian leopard (*Panthera pardus tulliana*) was also spotted via a camera trap (NACRES report 2022). Tusheti is also remarkably rich in large birds of prey such as greater spotted eagle (*Clanga clanga*), Eastern imperial eagle (*Aquila heliaca*), golden eagle (*Aquila chrysaetos*).

Transhumant sheep farming and tourism are the two main human activities in Tusheti and both take place in the wider summer season from May to October. During the winter months the main and only access road to Tusheti is closed and the whole province becomes almost completely isolated and deserted; only a few local people remaining in some villages and there are border police bases along the Russian border. Helicopter is the only means of transportation during this period of year.

As Tusheti sheep farming is totally transhumant, much of alpine and subalpine grasslands are used for summer grazing and the landscapes are often completely dominated by sheep. While for winter, all the sheep are driven down to the lowlands. The sheep are usually accompanied by shepherds and sheep dogs that are sometimes very aggressive to humans and probably also even to non-predator wildlife.

### 3.2 Pshav-Khevsureti Protected Areas

Pshav-Khevsureti PA are situated in eastern Georgia and include both the southern and northern slopes of the Caucasus. Administratively, they are within the Dusheti municipality of Mtskheta-Mtianeti region. The park is bordered by the Russian Federation to the north, and the park's northwestern, northern, and northeastern borders in this section coincide with the Georgian-Russian state border, namely with the republics of Ingushetia and Chechnya. To the west, the park borders on the municipality of Kazbegi, to the east on Akhmeta and to the southeast on Tianeti.

Pshav-Khevsureti PA are characterized by an extremely rugged very and fragmented terrain, steep slopes (30-35 °) and alpine cliffs. The main orographic units are the main watershed ridge of the Great Caucasus and a lateral ridge with the erosive valleys of the rivers Asa, Arghuni, Khevsureti Aragvi and their numerous tributaries as well as high mountains and passes, such as: Arkhoti Pass (2,970 m). Tsroli (3,442 m.), Anatorisgheli pass (2,768 m.), Datvisjvari pass (2,676 m.), Andaki pass (2,887 m.).

For the purposes of this assessment, the study area encompassed the Pirikita Khevsureti, namely the gorges of the rivers Asa and Arghuni.

The Pirikita (northern Caucasus) Khevsureti has drier and colder climate and relatively sharp seasonal fluctuations, while Piraketa (south Caucasus) Khevsureti and Pshavi are wetter, warmer and more homogeneous during the season.

The fauna of the protected area includes up to 55 species of mammals, while the mountain ungulate community, in addition to the East Caucasian tur (*Capra cylindricornis*), includes Bezoar goat (*Capra aegagrus*) and Chamois (*Rupicapra rupicapra*). Carnivores include wolves (*Canis lupus*), brown bears (*Ursus arctos*), lynx (*Lynx lynx*), and possibly also leopard (*Panthera pardus tulliana*). The area is rich in large birds of prey such as greater spotted eagle (*Clanga clanga*), Eastern imperial eagle (*Aquila heliaca*), golden eagle (*Aquila chrysaetos*).

## 4 Methodology

We used the double observer method to count tur in Pshav-Khevsureti and Tusheti protected areas. We largely followed *Guidelines of Ungulates Monitoring in Iran – Technical report* (Egli L. et al, 2017). At the same time, we took into account the adaptations to this method that we had to make during the bezoar goat counts that were conducted earlier in the same year (for details see the Final Report: Bezoar goat (*Capra aegagrus*), 2022).

We developed a field data sheet (Appendix #2) based on our experience of bezoar goats counts in Khevsureti. Observations were conducted in early morning, just after sunrise, or in late evening two hours before sundown. Each observer made an independent 15 minutes-observation four times. The

location and sex and age composition of observed groups were recorded. The two observers discussed and compared their independent observation results after each observation session.

The data were subsequently sorted and analyzed at the office. The average group size was calculated based on the field data sheets. We developed a matrix according to the above guideline (Egli L. et al, 2017) and analyzed it using the free software *Dobserv*. This software is often used to analyze point count data to calculate detection probability and abundance. To calculate tur on the surveyed areas, we multiplied the results by the average group size (Egli L. et al, 2017).

We used *Arc GIS* and based on the Digital Elevation Model (DEM) we carried out so called viewshed analysis and identified areas where the tur were counted. Viewshed analysis allow to identify the areas that were visible from particular observation points and hence, identify areas over which the observation data could be extrapolated. We finally estimated the population number by multiplying the density by the tur range area.

## 5 East Caucasian Tur survey in Pshav-Khevsureti protected areas

### 5.1 Data collection

We had a short meeting with the new director of Pshav-Khevsureti PA, Mr. David Kobakhidze and the natural resources specialist Mrs. Nazi Razhamashvili in Dusheti where the PA administration was temporarily based. We discussed the details of planned activities and methodology for the tur counts in Khevsureti. Mrs Nazi Razhamashvili mentioned that their rangers had a good knowledge of tur herds locations in Khevsureti. We agreed that the park rangers would join us in our field surveys and participate in tur observations. We had a planning meeting in Shatili, Pirikita Khevsureti with park rangers. They helped us identify the best areas to observe tur in Pirikita Khevsureti and pinpoint observation points on the map; we developed a preliminary field survey schedule and also agreed to create joint observation groups.

The plan was to begin the fieldwork on May 20th, but the road to village Shatili was closed due to a large rock fall. We went to Khevsureti on May 27th 2021 as soon as the road was opened. The NACRES field team members - Joni Kevlishvili, Teimuraz Popiashvili, Ivane Skhirtladze, Zviad Khutsishvili and Bejan Lortkipanidze participated in the census. Giorgi Arabuli and Tanya Rosen from CNF also joined the team for part of the survey. We organised a base at Shatili and had a short training and testing of the new method on bezoar goats, after which we began data collection in Pirikita Khevsureti. Later we moved to Arkhoti and collected data from 5 observation points. We counted tur from a total of 12 observation points (see Appendix #3). Sometimes, heavy rain and mist made observations impossible and we had to repeat observation sessions from those points. Pshav-Khevsureti PA rangers actively participated in the fieldwork together with NACRES team.

We conducted the second field survey in autumn. We went to Arkhoti in late September. This was the latest possible time to go there because the pass to Arkhoti, which is very high in elevation, could become impassable any moment later on. We intended to count tur from exactly the same observation points. We were able to access and conduct observations from 4 out of 5 observation points in Arkhoti. However, no animals were actually observed. Heavy fog might have been one of the reasons for this failure to record any tur. Our observations also coincided with a border police personnel rotation and intensified helicopter flights could have scared the animals, forcing them to



take shelter and become less visible. Unfortunately, we did not have the opportunity to conduct repeated observations due to an upcoming bad weather (snowstorm) and the possibility of the pass closing. Thus, the team decided to leave immediately.

We went back to Pirikita Khevsureti in late October. We could reach 4 out of 7 observation points. Deep snow cover at elevations above 2500 m restricted our movement and three observation points were completely out of reach. We recorded only few individuals – three females from one of the points and additionally one single male from another point. Hence, our field data from the autumn 2021 survey for Pshav-Khevsureti protected area were extremely poor and did not lend themselves to analysis and number calculation. Therefore, our tur assessment in Khevsureti was solely based on the results of the early summer counts.

## 5.2 Results

### 5.2.1 The size and sex/age composition of observed tur groups

During the summer field surveys, out of the total of 12 observation points, we were able to observe tur only from 6 points i.e. half of the completed observation points yielded zero number of counted animals. All observed tur groups were subsequently mapped (Appendix #3).

The average group size was 9.4 individuals. The largest group consisted of 30 adult individuals and it was spotted at Tergha in Arkhoti, close to the Russian border. It was impossible to identify sex/age of the members of this herd because of the long observation distance and poor visibility. The largest male group consisting of 16 individuals was observed near village Shatili. The largest female group included 24 adults and 18 kids and was seen near village Khone.

We observed the following group categories by compositions: small female groups (four observations), females with kids (four observations), all male groups (six observations), and mixed male and female group (two observations). For ten groups sex/age composition was very difficult to identify due to long (>2000 m.) observation distance. Often, direct sunlight also affected visibility. The sex ratio in our observation data was very close to 1 : 1.

### 5.2.2 Population size

We directly observed at least 88 individuals during the summer counts. Based on the field data we developed a matrix in Notepad as ASCII extension file and ran it through the *Dobserv* software. The result was 21.13 individuals. We multiplied this number by the average group size – 9.4 individuals, hence the total number of tur for the surveyed areas is 198.6. The total surveyed area was calculated as about 88,83 km<sup>2</sup> through the viewshed analysis. Hence, the estimated tur density for Khevsureti was 2,24 individuals per km<sup>2</sup>.

On the basis of new field data we elaborated the range of tur in Khevsureti which includes all the available typical tur habitat (Appendix #4) and it covers a total of about 203 km<sup>2</sup>. In the process of tur range mapping, we mostly outlined areas where tur are regularly observed. There is a small patch of tur habitat close to village Ardoti, but we had never observed tur groups there. According to local people and rangers tur were not found in that area as of 1950s. This is a small isolated fragment of habitat and the animals would have no sufficient space to retreat and take shelter if disturbed. We

outlined three main sections where tur are regularly seen and likely there is some movement of individuals between them.

Using the above mentioned tur density (2,24 individual per km<sup>2</sup>) and the total area of the range, we calculated the total Khevsureti population as **455 individuals**.

## 6 East Caucasian tur count in Tusheti protected areas

### 6.1 Data collection

Tusheti fieldwork began on July 15, much later than originally planned. This was due to the delay of the Khevsureti survey, which affected the preparation for the Tusheti field trip. The same NACRES field team as in the case of Khevsureti survey together with Giorgi Arabuli and Tanya Rosen collected data in Tusheti. Shortly after arrival in Tusheti, we had a meeting with the Tusheti PA director, Mr. Vakhtang Guinaidze and Head of Ranger Service, Mr. Onise Ichirauli. We jointly worked on the map and agreed on the observation points for tur survey. According to the park managers, tur groups were found in Tsokhva area too, near so-called Black Mountain. We decided to include that site in our survey and added a relevant observation point.

We completed 9 observation sessions from 7 observation points. (Appendix #5). We visited Tsokhva area, recommended by the PA administration and observed small female groups in the black mountain area. We carried out a repeated observation if visibility was not good or when the area had been disturbed by sheep flocks. We were unable to collect data from observation point #8 (see map in Appendix #5), because on the day of observation the whole area was totally covered by fog while we were also unable to go back to that site afterwards to conduct a repeated observation.

We went back to Tusheti for the second round of fieldwork on October 11. It was impossible to go there earlier because the road to Tusheti was blocked by multiple landslides during September. We organized three observation groups consisting of two observers. Deep snow cover at higher elevations such as >2,500 m. restricted our movement and we could not access the Tsokhva area and upstream of the Ortskali river (*Observation points #9 and #8*). Observation points #1, #2 and #3 in the Larovani gorge were not accessible either. We learnt from local shepherds that the trail within the Larovani gorge was covered with ice and it was not safe for horses. We knew this trail was not very safe even in summer because during the summer trip one of the horses nearly fell off the cliff. Hence, we had to cancel our observations in the Larovani gorge. We completed additional observation points near Kvakhidi (*Observation points #6 and #7*) in order to compensate for skipping the Larovani observation points. We carried out 6 observation sessions and had to leave afterwards because the Abano pass on the only access road to Tusheti was likely to close soon due to deteriorating weather.

### 6.2 Results

#### 6.2.1 The size and sex/age composition of observed tur groups

Among the observed groups during the summer survey, the largest consisted of 21 adult individuals and it was recorded in the Chigo gorge. We could not identify sex or age of the individuals due to a long observation distance. We observed few males during the summer counts. Younger males were

mostly seen in mix groups. Based on the recorded independent groups the male to female ratio was 1: 4 and the average group size was 11 individuals. We observed the following group compositions: female with kids, females only and mixed groups - young males, female and young. Group locations were placed on the map (Appendix #5).

The largest group observed during the autumn counts was a group of 26 males that was recorded near Kvakhidi, at the Russian border. We recorded more males in autumn as compared to the summer counts and according to the observed independent groups the male to female ratio was 1 : 2. The average group size was 10 individuals. We observed various group compositions: female with kids, male-female mixed groups, single males and male groups. Group locations were placed on the map (See Appendix #5).

### 6.2.2 Population size

Out of 9 summer observation sessions 5 yielded zero number of counted animals. No animals were observed in the Chesho and Madniskhorkhi gorges. Both gorges – specifically alpine meadows – were dominated by sheep and the tur must have moved to higher elevations, possibly even across the border.

During the autumn counts, 50% of observation sessions resulted in zero number of counted animals. We recorded tur groups in the Chesho and Madniskhorkhi gorges, probably because sheep had left and the tur were no longer disturbed. No animals were observed from the observation point in Chigo valley. According to park rangers the tur had moved out of sight from the observation point and to areas that were still free of snow cover. We also checked the northern slopes of the Ruana ridge that borders on the Larovani gorge. All the northern slopes were already covered with snow and the animals must have taken shelter in southern slopes that were still free of snow. We could not see tur there too.

We directly observed at least 76 individuals in summer and 78 individuals in autumn 2021. Time between the counts was nearly two months. During the autumn counts, we recorded tur in areas where no animals were observed during the summer and *vice versa*. We assume that we counted different groups during the two counts because the locations where animals were actually recorded in both seasons were at least 5 km apart and largely separated by deep gorges (see group locations in Appendix #5). Based on the tur telemetry data from Lagodekhi we know that in respect of movement the females are generally very conservative all year round and are unlikely to move over more than 5 km Euclidean distance. Adult and sub-adult males may cover long distances (up to 22 km Euclidean distance) but they mostly move vertically rather than horizontally. So, their movement between the gorges must be rare. Therefore, we assume that the observed tur groups were highly unlikely to have mixed during the time between the two counts and therefore they should be considered as independent samples. Hence, the results of the two counts may be combined.

Field data were transformed into a relevant matrix that we ran through the Dobserv software. The result was multiplied by the average group size in Tusheti i.e. 10.3 individuals (summer and autumn combined average group size) and the total was animal number for all the surveyed area was calculated as 241 individuals. Then, we ran the viewshed analysis in order to estimate the total size of the observed area that was 49.17 km<sup>2</sup>. Hence, tur density in Tusheti was 4.9 individuals per km<sup>2</sup>.

Based on the new field data we updated the earlier tur distribution map in Tusheti with core areas of the species range (Appendix #6). The core areas cover all sections where tur are regularly observed excluding areas that lack primary tur habitat. The main tur habitats in Tusheti are found to the west namely around the mountains of Borbalo, Amugo and Tebulo, along the district border with Khevsureti and continue along the Russian border (Appendix #6). The total area of the main tur habitat is 250 km<sup>2</sup>. Using the above density (4.9 individual per km<sup>2</sup>) the total number of tur on the main tur habitat is 1,225 individuals. A narrow strip of tur habitat is also found on the main watershed of the Greater Caucasus to the south of the national park (Appendix #6). While it is without doubt that tur are found there, we were unable to collect any data on that section of the tur range due to poor weather conditions. So the actual tur density for that section is not available. Because of smaller size and relative isolation, and more importantly apparently higher disturbance, tur density should be expected to be slightly lower than that in the northern sections. However, if we *do* assume that the density 4.9 individual per km<sup>2</sup> can be extrapolated over this section too, another 294 individuals should be added to the total Tusheti population. Hence, the total tur population in Tusheti is estimated at **1,519 individuals**.

## 7 Discussion

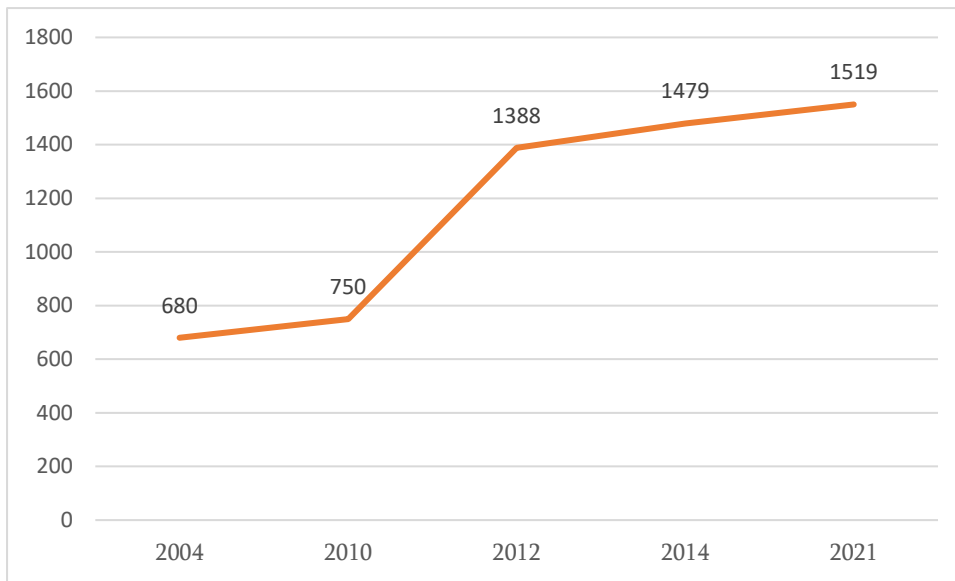
### 7.1 Pshav-Khevsureti PA

This assessment covered almost all areas with suitable tur habitats within Khevsureti protected areas using the double observer method and. As mentioned, our approach was to conduct two separate counts one in summer and the other in Autumn. However, during the autumn (October) counts, we were unable to collect sufficient volume of data to calculate population numbers; we in fact recorded only few tur groups, much less than in summer. This could have been because snow patches on slopes interfered with the detectability of tur groups, or the animals were less active due to bad weather. It can be assumed that it is best to conduct tur counts in late November and December, when snow cover would be more or less even and the animals would be taking shelter at lower elevations. However, during this period the study area is only accessible by helicopter.

We counted 455 individuals during the summer census. This number is higher compared to the previous independent assessment that was carried out by Ilia State University – using aerial census method and distance approach. They counted 218 individuals in 2012 and only 100 individuals (with 95% CI 70 – 143) in 2014 (Ilia state university 2012., 2014). Hence, a significant growth of tur numbers over the last 8 - 10 years.

### 7.2 Tusheti PAs

Good independent information on the Tusheti tur population is available (see Figure #2). The first assessment was carried out by NACRES in summer 2004 and the estimate was 680 individuals (NACRES, 2004). The next assessment that was carried out in summer 2010 estimated the population at about 750 tur (NACRES 2010). In 2012 and 2014 Ilia State University conducted mountain ungulate surveys using helicopters and distance sampling approach. According to their data there were 1,388 individuals in 2012 (with 95% CI 1148 – 1678) and 1,479 individuals (with 95% CI 617 – 3542) in 2014 (Ilia state university, 2012., 2014). Thus, considering the indicated confidence interval margins the tur population in Tusheti appears to be more or less stable since 2012.



**Figure #2.** The dynamics of the Tusheti tur population since 2004.

It should be ensured during the next assessment that sufficient time resources are allocated to the surveys of the tur habitats situated on the main watershed of the Greater Caucasus. As mentioned, tur density is likely to be lower here compared to the northern part of the range because human pressure on this part of the tur population may be higher as the area is more accessible year round from the Pankisi gorge.

### 7.3 Threats to East Caucasian tur populations

Based on our random interviews with local population we **believe that the most severe factor affecting the tur populations in the two protected areas is poaching**. Hunters target tur mostly from late autumn through the end of winter, during which time less people (tourists, local population) are present both in Khevsureti and Tusheti; hence there is weaker protection and less possibility of interference from witnesses.

Sheep use high elevation area that proximates to or coincides with primary tur habitat. Some scientists think that **intensive use of summer pastures can influence the use of habitat by tur, sometimes even forcing them to take shelter in less favorable areas** (Ekvtimishvili, 1952; Chlaidze, 1967; Kokhia et al. 1973; Chlaidze, 1975; Kopaliani, Gurielidze, 2009, Gavashelishvili et al 2018). Our observations have confirmed this notion. We did not see any individuals in Chesho and Madniskhorkhi gorges during summer, but recorded large herds in autumn i.e. after the sheep had left for the lowland winter pastures. As mentioned above, it can be speculated that, during our summer counts, avoiding contact with sheep/shepherds as well as with their dogs the tur could be taking refuge into more secure areas at higher elevation or even had moved across the border into Russian Federation. More information is necessary on tur movement in Tusheti to help understand seasonal changes in habitat use and its underlying human-related causes, which in turn should have very important implications for the species management not only in Tusheti PA but elsewhere in similar environments.

**Various diseases might threaten tur population in both protected areas.** Recently there have been alarming reports of tur dying in significant numbers in Dagestan. The cause has not been established yet. According to some sources more than 200 tur carcasses were found in winter 2022. According to Valerii Shmunk, WWF-Russia, pasteurellosis, sheep and goat pox, foot and mouth disease, lumpy dermatitis were not confirmed by PCR-tests. He noted that “based on the results of the autopsy, it is possible to exclude the presence of anthrax in the fallen animals...taking into account the season of the year, the possible cause may be either a disease that has been absent on the territory of the Russian Federation for a long time (for example, contagious caprine pleuropneumonia, rinderpest and similar diseases), or some high pathogenic common infectious agent (such as Covid-19 for humans)”. He proposed to introduce disease monitoring.

Notably, one of the NACRES’ radio collared tur in Lagodekhi PA also died in winter 2022 and it is possible that the individual had same disease. The carcass of the tagged individual was found in the Lagodekhi gorge along with other tur carcasses. It is important to note that Tusheti borders on Dagestan and the risk of spreading of the disease that appears to be killing tur in Dagestan is extremely high.

## 8 The Eastern Caucasian tur population of Georgian central Great Caucasus

The largest part of the Georgian East Caucasian tur population is found in Tusheti, Khevsureti and Kazbegi and tur habitats between these areas are interconnected, creating one population that can be referred to as Georgian central Great Caucasus population. According to these surveys, there are about **2,000 individuals in Khevsureti and Tusheti combined**. The tur population assessment in Kazbegi PA that is planned for summer 2022 will fill in the remaining gap and the status of the largest East Caucasian tur population in Georgia will be established.

The areas between the mountains of Borbalo, Amugo and Tebulo on the border of Tusheti and Khevsureti protected areas and tur habitats on the Pirikita range, along the Russian border in the north (see Appendix #7) are large expanses of tur habitats with little human disturbance and almost no tourist trails (except the trail on the Atsunta pass that connects Khevsureti and Tusheti) represent one of the most important core sections of the Eastern tur range in Georgia.

## 9 Recommendations

- Tur monitoring in Khevsureti and Tusheti should be repeated in 2024. First survey should be carried out in June and the second as late in the year as logistically possible. It should be ensured during the next assessment that sufficient time and resources are allocated to the surveys of the tur habitats situated on the main watershed of the Greater Caucasus.
- It is highly desirable to increase observation points in both study areas and more information should be obtained on tur movement in Tusheti to help understand seasonal changes in habitat use and its underlying human-related causes.
- Increase the general anti-poaching capacity of both Tusheti and Pshav-Khevsureti PAs and intensify law enforcement measures especially during late autumn and winter months.

- Monitor tur for any sign of disease and any reports from local people or visitors about seeing a tur or other ungulate carcass should be immediately dealt with in order to detect the spread of the disease that caused mass dying in Dagestan.

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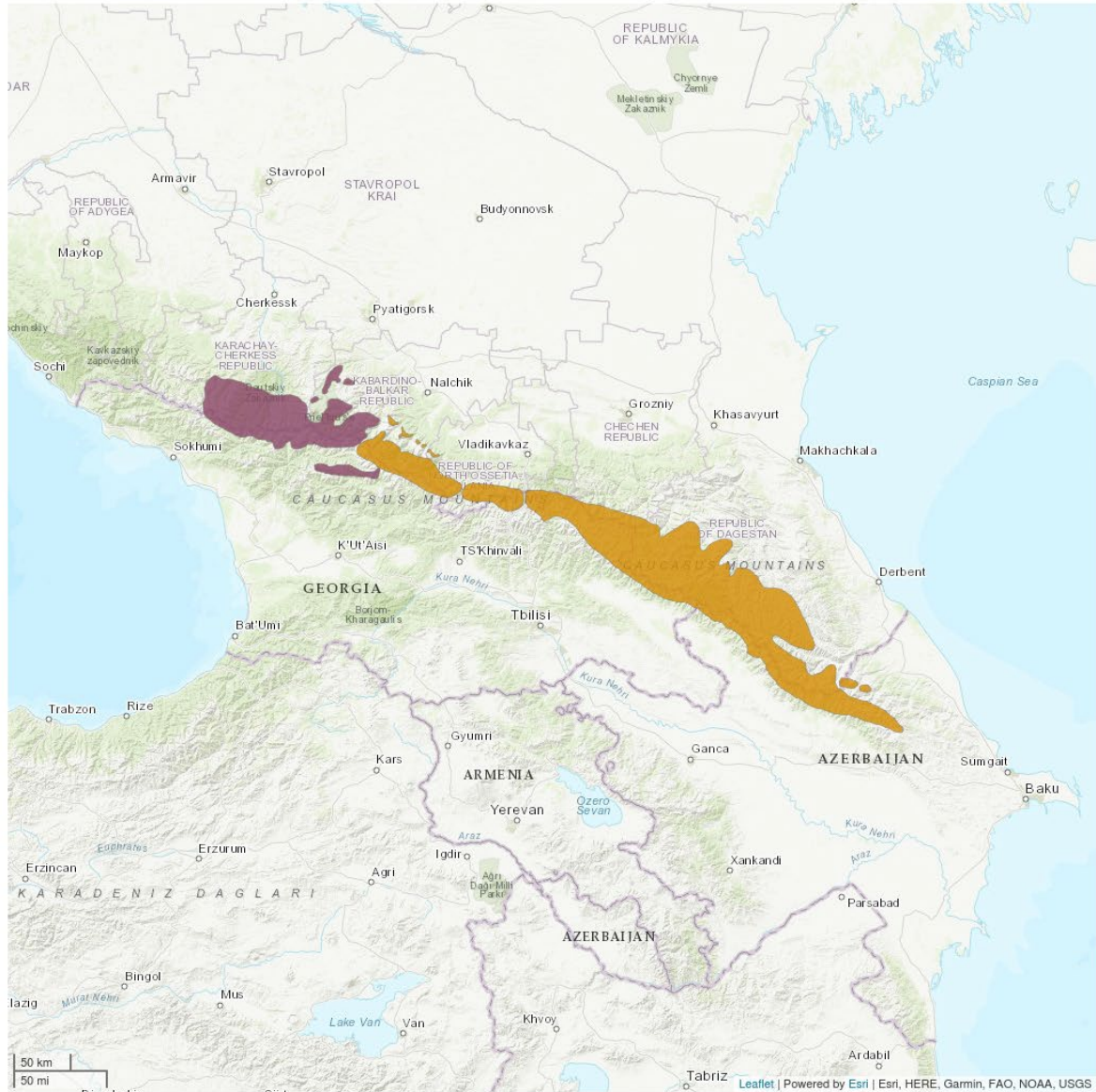
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## APPENDICES

# Appendix #1. East Caucasian tur (*Capra cylindricornis*) distribution in the Caucasus (source: IUCN)

## Distribution Map

*Capra cylindricornis*



### Legend

- EXTANT (RESIDENT)
- POSSIBLY EXTANT (RESIDENT)

Compiled by:

IUCN (International Union for Conservation of Nature) 2020

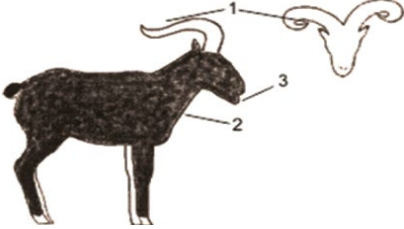

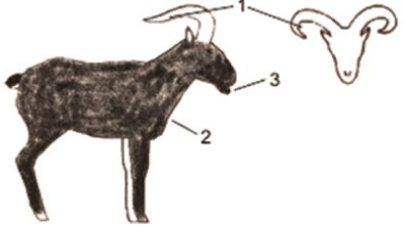
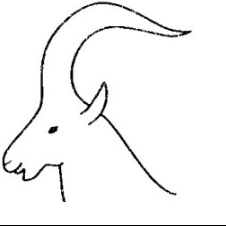
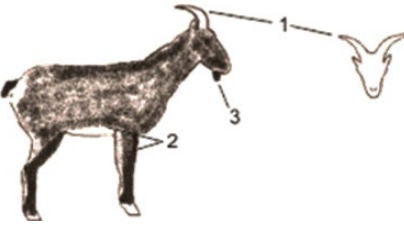











The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

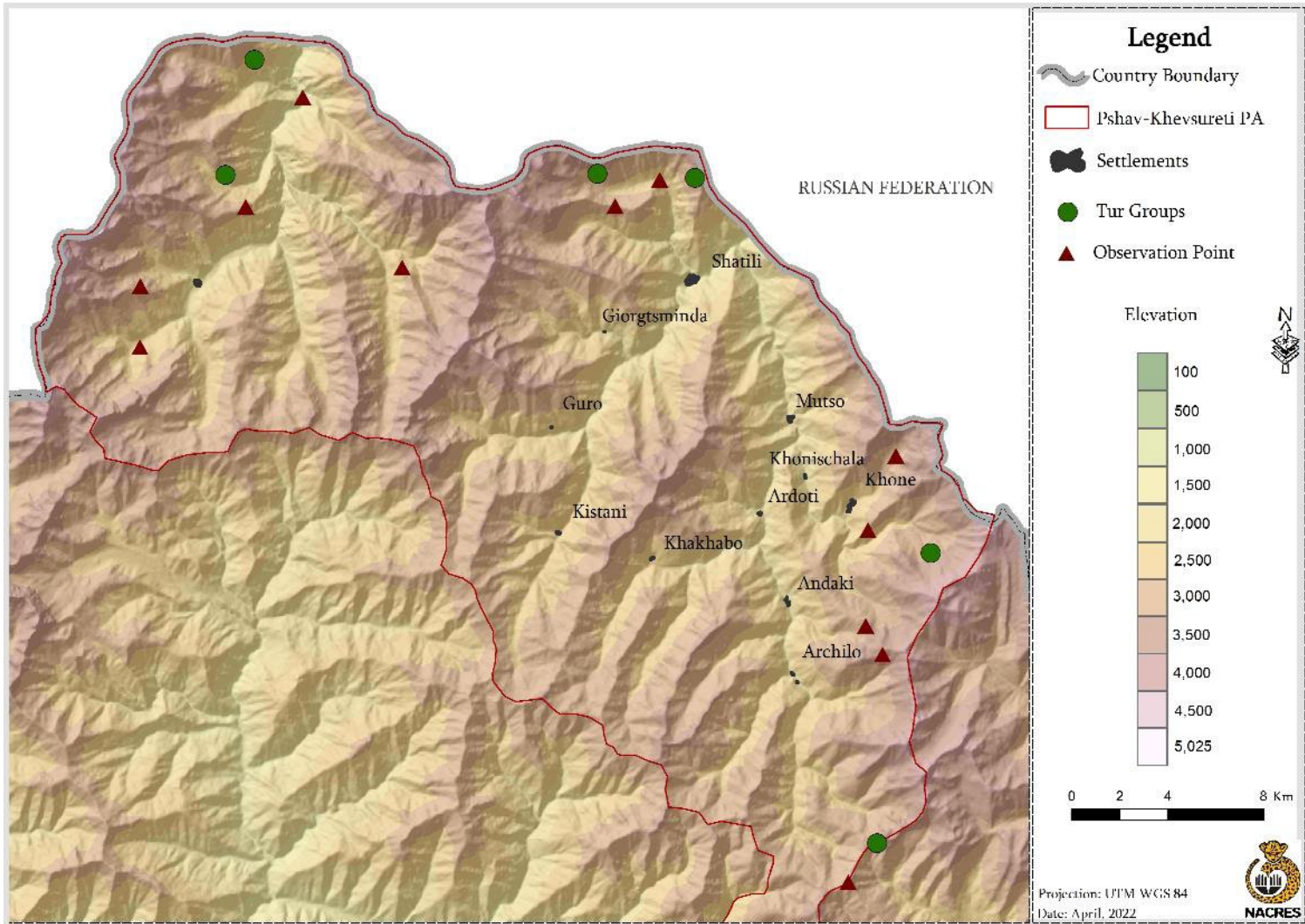


## Appendix #2 East Caucasian tur observation form – Double observer point count

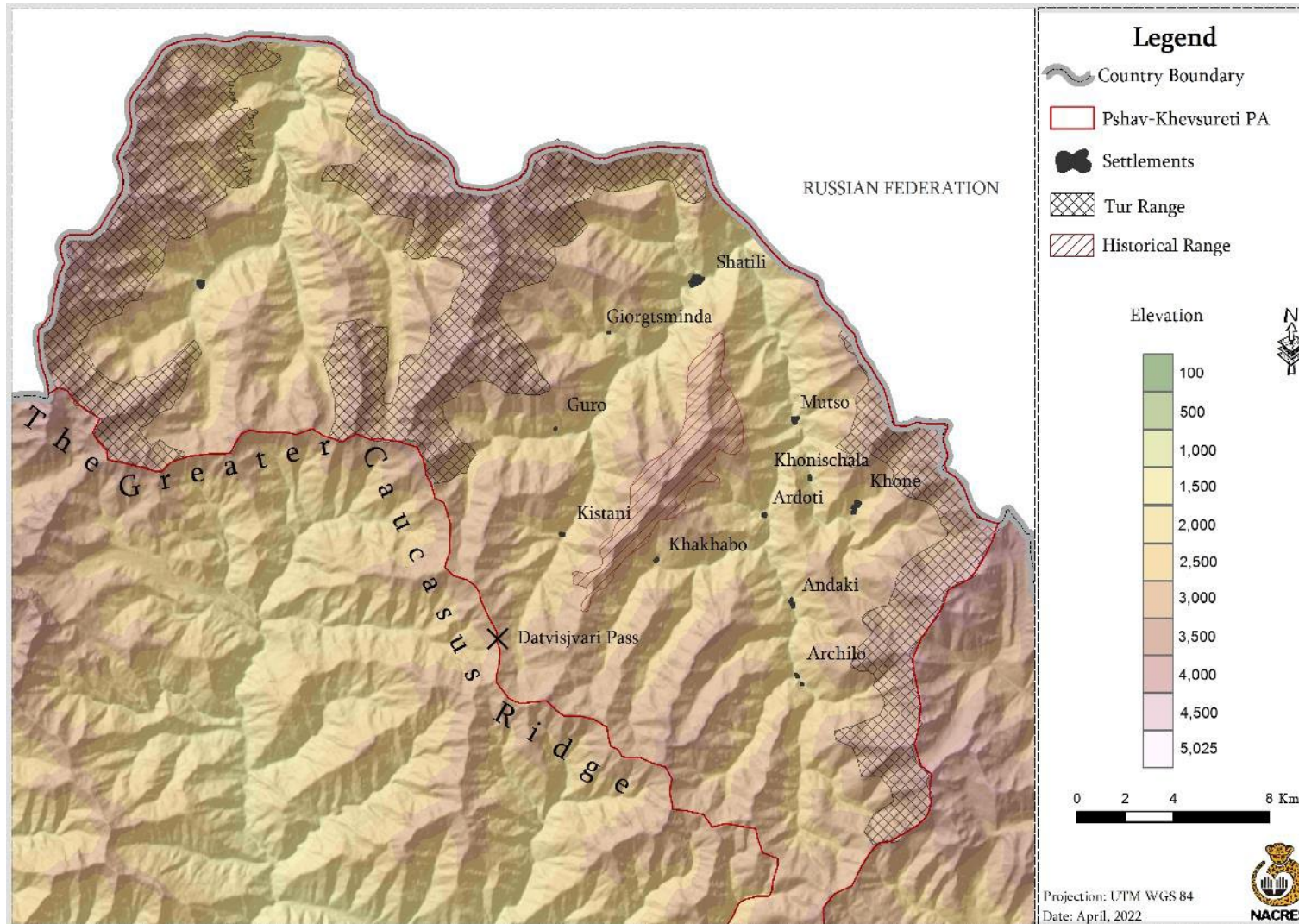
Date		Weather		Place		Point #			First Observers					
1 <sup>st</sup> . Observation start time		2 <sup>nd</sup> . Observation start time		3 <sup>rd</sup> Observation start time		4 <sup>th</sup> Observation start time			Second Observer					
1 <sup>st</sup> . Observation end time		2 <sup>nd</sup> . Observation end time		3 <sup>rd</sup> Observation end time		4 <sup>th</sup> Observation end time			Observation distance (mean)					
Point coordinates (WGS84)				X					Y					
Group #	Exact time of animal detection	Altitudinal zone F: forest A: subalpine-alpine	Surface type S: scree C: cliffs SM: smooth	Exposure (In degrees) and observation distance (meters)	Adult Male (6 year and older)	Male 5-6 year old	2-3 year old male	1 year old male	Adult female	1 year female	Yearling	unknown	Total	Observation results - difference between observed groups

According to Weinberg P. 2012	According to Magomedov R. et. al. 2001	Description
		<p style="text-align: center;"><b>Adult male</b></p> <ol style="list-style-type: none"> <li>1. Horn tips curved up</li> <li>2. Dark coloration</li> <li>3. Solid beard pointed forward</li> </ol>
		<p style="text-align: center;"><b>Young male (4-5 years)</b></p> <ol style="list-style-type: none"> <li>1. Horn tips curved in</li> <li>2. Dark coloration</li> <li>3. Solid beard pointed forward</li> </ol>
		<p style="text-align: center;"><b>Young male (2-3 years)</b></p> <ol style="list-style-type: none"> <li>1. Horns thick at base, widely diverging, tips curved back</li> <li>2. Animal coloration dark but belly and back sides of the legs light-colored</li> <li>3. Beard wispy and hanging down</li> </ol>
		<p style="text-align: center;"><b>Yearling male</b></p> <ol style="list-style-type: none"> <li>1. Horns thick at base, sharply bent, widely diverging, tips curved back</li> <li>2. No beard</li> </ol>
		<p style="text-align: center;"><b>Adult female</b></p> <ol style="list-style-type: none"> <li>1. Horns thin, a bit longer than ears</li> <li>2. Animal coloration greyish-brown</li> <li>2. No beard</li> </ol>
		<p style="text-align: center;"><b>Yearling females</b></p> <ol style="list-style-type: none"> <li>1. Horns usually shorter than ears</li> </ol>
		<p style="text-align: center;"><b>Juvenile</b></p>

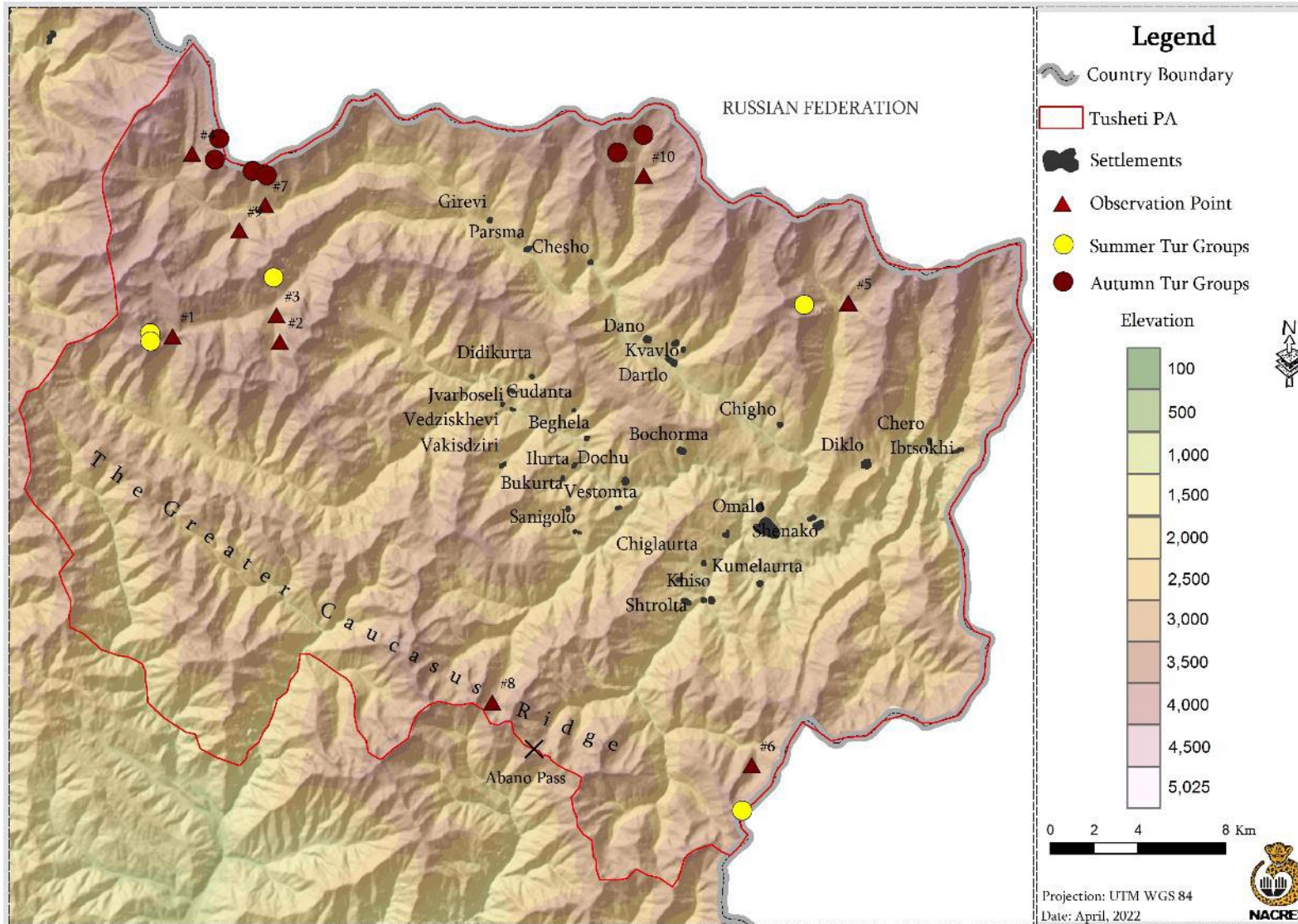
### Appendix #3 East Caucasian tur observation points and group locations in Pshav-Khevsureti PAs



## Appendix #4 East Caucasian tur range in Pshav-Khevsureti protected areas

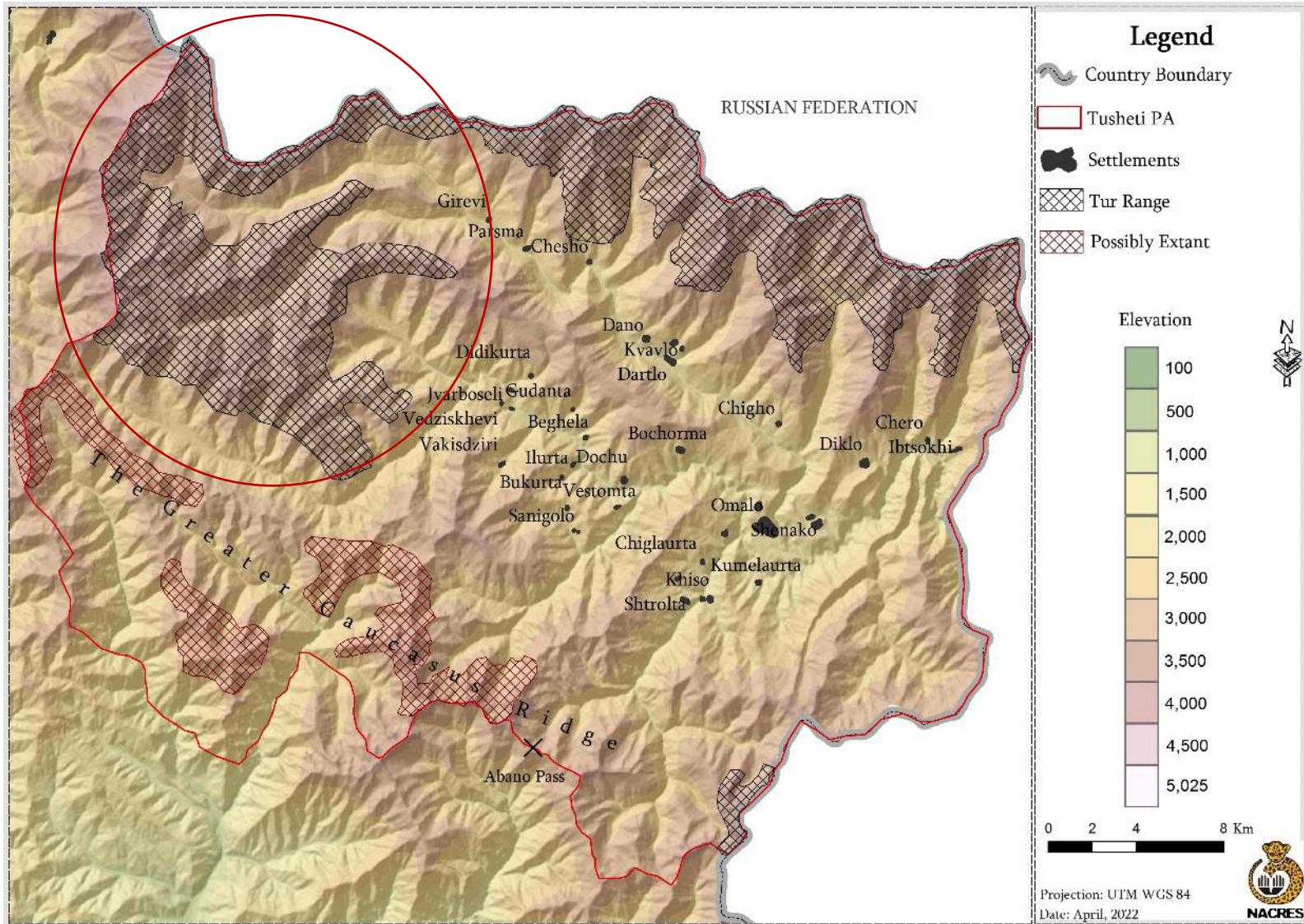


## Appendix #5 East Caucasian tur observation points and group locations in Tusheti protected areas





## Appendix #6. East Caucasian tur range in Tusheti



Appendix #7. Core sections of the East Caucasian tur range on the main watershed ridge of the Great Caucasus.

