

Northern Chamois (*Rupicapra rupicapra tatrica*) – Slovakia



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Conservation status	Global IUCN: Critically Endangered EU27 IUCN: Critically Endangered SK: U1 (+)
Protection status	Habitats Directive: Annexes II and IV Habitats Directive: Annex V (<i>R. rupicapra</i> whole species) Bern Convention: Appendix III (<i>R. rupicapra</i> whole species)
EU population (2007-12)	EU: 786–1,341 individuals SK: 500–1,055 individuals
MS where increasing	PL, SK
Other MS	

Summary: The *tatica* subspecies of Northern Chamois is endemic to the Tatra mountains of Slovakia and Poland, occurring entirely within protected areas. The population declined to a low point in 1999 in response to changes in the management and more disturbing recreational use of national parks, and, poaching. This trend was reversed through the implementation of site and species action plans, and in particular, the employment of 52 park guards (previously 1). As a result, the main population in Slovakia's Tatranský National Park rose from 162 individuals in 1999, to 488 in 2006 and then to 1,096 in 2012.

Background

Status and EU occurrence

Northern Chamois (*Rupicapra rupicapra*) comprises five subspecies in Europe. Three of the subspecies are in favourable conservation status and the overall population of all five was estimated to be well in excess of 400,000 mature individuals in 2004/5. However, two subspecies, *R. r. cartusiana* of France and *R. r. tatrica*¹ of Poland and Slovakia are much rarer, and are considered Vulnerable and Critically Endangered respectively at the global and European levels. The *tatica* ssp. of Northern Chamois occurs in the Tatra mountains in the Western Carpathians – south central Poland and north central Slovakia (Aulagnier, Giannatos and Herrero, 2008; Deinet et al, 2013).

The population estimates for *tatica* ssp. Northern Chamois in 2012 were 500–1,055 individuals in Slovakia and 286 individuals in Poland. An international count in 2013 gave a total figure of 1,186 for the High Tatras with the Low Tatras (Slovakia) holding around 100 (Bačkor and Velič, 2008; Urban, 2013). The subspecies is confined to the Alpine biogeographic region (ETCBD, 2014). The High Tatras and the Low Tatras are both national parks, the limits of which are separated from each other by the Váh river, E50 motorway and approximately 10 km of buffer zone and undesignated land.

High Tatras

The Slovakian population experienced low points during the two world wars and at the end of the last century. Interwar recovery was strong, attaining 1,705 individuals, but following WWII when it probably reached its low point of 132–230 individuals, the population only partially recovered, with 822–944 individuals in 1958–64. From then on, the trend was essentially downward until 1999, when the estimated number of individuals was 220 in the High Tatras (Jurdíková, 2000; Deinet et al, 2013). Conservation and monitoring efforts, particularly the 2001–2005 Tatra Chamois Rescue Programme, reversed the declines. For example, in the north-eastern (Belianske) part of the Slovakian Tatras, numbers increased from 60 individuals in 2000 to 198 in 2005 (Ksiažek and Sedláková, 2005), and the National Park's total numbers now exceed 1,200 (TANAP, undated).

Low Tatras

¹ Habitats Directive species code: 4006 (general *R. rupicapra* species code: 1369)

Historical references from the 13th to 15th centuries indicate that the Low Tatras held Northern Chamois, but it was absent by the late 19th Century, when the first of several failed reintroduction attempts was made. Prompted by the steep decline in the High Tatras population in the late 1960s increased efforts were made to conserve Northern Chamois in Czechoslovakia. From 1969–1976, a carefully-managed reintroduction programme translocated 30 individuals from the High Tatras to a nine hectare enclosure in the Low Tatras (Jurdíková, 2000; Bačkor and Velič, 2008). This founder population increased in numbers and range once released, with 85–143 individuals through the 1990s, but fell back to 93–103 individuals in the following decade (Bačkor and Velič, 2008; Rigg and Ondruš, 2008). The late 1990s were preceded by four years of poor recruitment to the population in both the Low and High Tatra mountains (Rigg and Ondruš, 2008). In the 1950s and 1960s, 27 chamois were introduced from the Jeseníky mountains in modern-day Czech Republic to two mountain areas near the Low Tatras, one of which is effectively contiguous. *R. r. tatrica* was only recognised as a distinct subspecies in 1972 (and only genetically confirmed in 2000). Unfortunately, the Jeseníky population, itself reintroduced from the Swiss Alps, is nominate *R. r. rupicapra*. As a result, the Low Tatras population has been genetically contaminated through occasional movements from the adjacent populations (Jurdíková, 2000; Bačkor and Velič, 2008; Bačkor and Urban, 2009; Urban, 2013; Feriancova pers comm, 2018).

The *tatica* ssp. Northern Chamois conservation status in 2007–2012 was assessed as Favourable in Poland and Unfavourable – Inadequate in Slovakia, with each of the components reflecting the overall status in both cases. Both these statuses were improvements on the 2001–2006 assessments and the trend in both countries was positive in 2007–2012 (ETCBD, 2014).

Ecological requirements

Northern Chamois eat grasses, herbs, leaves, buds and fungi (Deinet et al, 2013). In Slovakia, they mainly use the following Habitats Directive Annex I habitats: siliceous alpine and boreal grasslands (6150), alpine level hydrophilous tall herb fringe communities (6430), mountain hay meadows (6520) and siliceous scree of the mountain to snow level with *Androsacetalia alpinae* and *Galeopsetalia ladani* (8110) (Bačkor and Urban, 2009). They are also found in forested habitats close to the treeline. Population density is influenced by the pattern of the relief and the variety of food on limestone and siliceous substrates (Ksiažek and Sedláková, 2005; Janák, Černecký and Saxa, 2015).

Females tend to live in groups of 5–30 individuals, while males are solitary. Sexual maturity is reached at 2.5 years in females and 1–1.5 years in males. The young are born in May and June (Aulagnier, Giannatos and Herrero, 2008; Deinet et al, 2013), during which period Northern Chamois are especially vulnerable to human disturbance (Jurdíková, 2000).

Pressures and threats

Pressures identified in the Slovakian Article 17 reporting (ETCBD, 2014), include:

- hunting and poaching;
- pillaging of floristic stations [such as uncontrolled picking of wild fruit];
- a wide variety of outdoor sports and recreational activities;
- interspecific faunal relations; and
- avalanches.

Among these, illegal hunting, low level flights for tourism and rescue, cross-country/off-piste skiing, climbing and mountaineering, and, habitat loss caused by tourism have received particular attention in the literature. Activities involving overnight camping away from designated huts, and dog-walking, are thought to be particularly disturbing, especially during rutting, birthing and nursing seasons. There has been a boom in the popularity of wild fruit, notably Cranberries (*Viburnum opulus*) and Bilberries (*Vaccinium myrtillus*), which are picked by large numbers of people across Tatranský [High Tatras] National Park, (at least until recently) without any controls (Jurdíková, 2000; Janiga and Švajda, 2002; Aulagnier, Giannatos and Herrero, 2008; Janák, Černecký and Saxa, 2015). Poaching of Northern Chamois occurs, and may be significant because it represents a selective pressure on males and older animals. However, indirect effects of hunting may be more important. Increased hunting and poaching of deer (Cervidae) and Wild Boar (*Sus scrofa*) are significant in reducing the availability of the preferred prey of large wild predators, especially at lower altitudes in the national parks. Predation, notably by Grey Wolves (*Canis lupus*) and Eurasian Lynx (*Lynx lynx*), has been recorded. Various analyses of Grey Wolves' dung found the presence of chamois remains in 0.3%–25% of scats. Overall, Northern Chamois are not considered to form a significant part of Grey Wolves' diet, and seems to be restricted to late autumn and spring

(Jurdíková, 2000; Janiga and Švajda, 2002; Ksiažek and Sedláková, 2005; Bačkor and Urban, 2009; Deinet et al, 2013).

Summer livestock grazing in the 20th Century was positively correlated with Northern Chamois numbers through the maintenance and fertilisation of soils, except when stocking densities were too high. The exclusion of livestock from the Central and Eastern High Tatras from 1955 onwards is associated with a moderate decline in the Northern Chamois in the 1960s (Janiga and Švajda, 2002). Janák, Černecký and Saxa (2015) list habitat succession as a threat.

Hybridisation between nominate *R. r. rupicapra* and the *tatrica* ssp. Northern Chamois is a major concern for the Low Tatras population. Preliminary genetic analyses indicate that interbreeding has occurred but is uncommon (Jurdíková, 2000; Aulagnier, Giannatos and Herrero, 2008; Bačkor and Velič, 2008; Bačkor and Urban, 2009; Zemanová et al, 2010 cited in Urban, 2013; Deinet et al, 2013). Conservationists' proposals to remove the alien form, which are legal game, have been resisted because of conflict with hunting interests (Bačkor and Urban, 2009).

Extreme winter weather has had a serious impact on the population in some years (Jurdíková, 2000). Falls from cliffs or in avalanches were the only confirmed causes of death during five years' monitoring in the Belianske Tatras (Ksiažek and Sedláková, 2005).

The fluctuations observed in the subspecies' populations have been found to be driven largely by variation in reproductive success, rather than in mortality. However, many of the pressures outlined above could hypothetically cause reductions in recruitment rates (Rigg and Ondruš, 2007). More recently, the main factors causing negative trends in the population have been hunting, poaching, predation, violations of the Tatranský National Park (TANAP) regulations, and extreme weather, especially continuous snow cover during the spring months (Feriancova pers comm, 2018).

Anticipated future threats are essentially the same as the current pressures (ETCBD, 2014), although the genetic issues will have increasing ramifications.

Drivers of improvements: actors, actions and their implementation approaches

Organisers, partners, supporters and other stakeholders

The [High] Tatranský and Nízke [Low] Tatra National Parks (TANAP and NAPANT, respectively) are both administered locally under the auspices of the State Nature Conservancy of the Slovak Republic (ŠOPSR), which is the professional agency of the Ministry of Environment (NAPANT, undated; TANAP, undated). The State Forests TANAP administration (an agency of the Ministry of Agriculture) and TANAP administration have a formal cooperation agreement to protect nature and the countryside, in order to clarify competencies and solve conflicts and divergence in the management of national park (Švajda, 2008; TANAP, 2012b). TANAP is recognised as a Man and Biosphere Reserve, so its management involves UNESCO. Cooperation with the Polish Tatras National Park (Tatrzański Park Narodowy), which jointly forms the bilateral Man and Biosphere Reserve, authority is regular (ŠOPSR/TANAP, 2002; Feriancova pers comm, 2018; Švajda pers comm, 2018).

Landowner and other stakeholder awareness and support plays a major role in the protection of the species. TANAP is 55% State-owned and 45% privately owned; 60% of the land is forested. The entire State-owned part is managed by the State Forests Administration, so is not the key Northern Chamois habitat. Consequently, significant support from local stakeholders is important. NGOs, such as A-projekt, have been important in resolving conflicts and helping stakeholders find commonly-agreed compromises (ŠOPSR/TANAP, 2002; Švajda, 2008; Švajda pers comm, 2018; MS response to Genuine Improvement Database questionnaire).

State funding comes from the Environment Fund and the Ministry of Environment.

Research institutions both nationally and internationally have participated in many ways, including Institute of Mountain Biology and Ecology, Tatranská Javorina; Institute of Vertebrate Biology of the Academy of Sciences (Czech Republic); National Forest Centre - Lesnícký Research Institute of Zvolen; National Park Gran Paradiso (Italy); Technical University in Zvolen; University of Veterinary Medicine in Košice; and ZOO Bojnice (Bačkor and Urban, 2009; Feriancova pers comm, 2018).

Contributions / relevance of strategic plans

Several programmes were significant in the improved conservation status of Northern Chamois in Slovakia. In general, these take the form of a five-year strategic programme, with an annual action plan that may be updated in subsequent years. They include:

- The action plans/annual master task schedules and similar management documents for NAPANT and TANAP national parks.
- The Tatra Mountains Chamois Recovery Programme for the years 2001–2005 (ŠOPSR/TANAP, 2002; NAPANT, 2007; Feriancova pers comm, 2018; Švajda pers comm, 2018).

The Chamois Recovery Programme involved:

- patrolling, habitat improvement work and other activities carried out by 52 park guards;
- legislative measures;
- scientific research (genetic analysis, field monitoring, documentation and collection of samples); and
- environmental awareness-raising (education in schools, lectures, interpretation boards in the field and a website) (Koren et al, 2001; Janiga and Švajda, 2002; Feriancova pers comm, 2018; Švajda pers comm, 2018).

The TANAP Action Plan 2001–2005 included a number of measures specific to Northern Chamois conservation:

- prohibition of hunting;
- practical implementation of the Chamois recovery project of the Tatra Mountains in cooperation with the Polish Tatras National Park;
- research on the causes of the decreasing abundance of Chamois; and
- monitoring of the species.

Other elements were more widely beneficial, such as:

- management of wetland and forest ecosystems to ensure ecological stability;
- cooperation and alignment with spatial planning authorities;
- training park guards and tourist guides; and
- publicity, awareness raising and environmental education actions (ŠOPSR/TANAP, 2002).

The NAPANT plans cover species monitoring, including Northern Chamois, and recognise the need for additional actions relating to its Recovery Plan, as well as generally beneficial national park management actions (ŠOPSR/NAPANT, 2005).

Measures taken and their effectiveness

Specific information about the conservation measures that have benefitted Northern Chamois largely relates to the period 2001–2005. These measures turned a declining population trend into an increasing one, and consequently formed the basis for the accelerated growth in the population during 2007–2012 (see Achievements section) and consequently are summarised here.

Prior to 2001, one park guard was responsible for covering all 80,000 ha of the Tatra mountains, with a little seasonal assistance. Clearly the employment of 52 park guards from 2001 was a key driver of the improvement of the species' status, especially as patrolling was seen as the only way to prevent poaching. Supplemental feeding was trialled in 2001. During the programme, radio telemetry was used, but the steep terrain produced black-spots and made monitoring difficult, with resultant inaccuracies in the data. In terms of legislation, Slovakia has five levels of site protection, with TANAP and NAPANT both being rated as level 3, with level 2 buffer zones. They include more strongly protected nature reserves at levels 4 and 5 within or adjacent to their boundaries (Koren et al, 2001; Janiga and Švajda, 2002; Bačkor and Urban, 2009; Ústredný portál verejnej správy, 2018; Feriancova pers comm, 2018; Švajda pers comm, 2018; NAPANT, undated; TANAP undated).

Ongoing national park services such as biological monitoring, the work of rangers and occasional veterinary support have continued (Janák, Černecký and Saxa, 2015; ŠOPSR KIMS, 2018; TANAP, undated). Site based actions within the Natura 2000 network and the enforcement of legislation were considered to have played major roles, while maintaining, improving and restoring habitat condition and quality had a moderate impact (MS response to Genuine Improvement Database questionnaire).

Slovakia reported that in 2008 to 2012 the following conservation measures were taken for Northern Chamois.

Application of conservation measures for Northern Chamois *R. r. tatrica* for 2008-2012 in Slovakia

Measure	Type	Ranking	Inside/outside N2k	Broad evaluation
6.1 - Establish protected areas/sites	Legal	High	Inside	Maintain Enhance Long-term
6.3 - Legal protection of habitats and species	Legal	High	Both	Maintain Enhance Long-term
7.0 - Other species management measures	Legal	Medium	Inside	Maintain Enhance Long-term

Source: Slovakia Article 17 report 2013 at <https://bd.eionet.europa.eu/article17/reports2012/>

A collaboration between TANAP and the electricity generation company Slovenských elektrární AS, delivered a project to monitor the Tatra subspecies of Northern Chamois and Alpine Marmot (*Marmota m. latirostris*) and protect their habitat during 2008–2010 (TANAP, 2012a).

Slovakia’s 2002 Nature and Landscape Protection Act was amended in 2007 following accession to the EU in 2004. Among other things, the 2007 amendment implemented the EU Birds and Habitats Directives. Sites of Community Importance including parts of the High and Low Tatras were declared in 2004, with additions and amendments in 2011. A series of SPAs were declared during the 2007–12 Article 17 reporting period, including the 98,169 ha Low Tatras SPA and the 54,611 ha High Tatras SPA in 2010. The SPA declarations limited mechanised mowing or mulching of permanent grassland in NAPANT, and, forest protection, the limitation of mechanised forest management and mining activities during the bird breeding season near protected bird sites in TANAP. Given that Northern Chamois are sensitive to disturbance, especially at this time of year, these measures support its conservation. On a wider level, ŠOPSR carried out management and conservation programmes to protect biodiversity, particularly across the Natura 2000 network during 2007–13 (Jurdíková, 2000; Act no. 454/2007; Ministry of Environment, 2015 (and embedded documents)).

In practice, the agencies have found the non-co-operation between public organisations, public and private owners and lack of landowner buy-in challenging in agreeing and implementing management plans across the species range. In TANAP, however, the administration authority engaged in a 30-month participatory process to reach a common vision among stakeholders and park authorities and to help frame the development of a sustainable management programme. The contrast between this and the country’s socio-political history meant that the approach was slow to get off the ground and initially confrontational. With time, however, the process started to involve more stakeholders, more positively with the following outcomes that improve the long-term sustainability of the national park:

- a non-technical plan that generated local understanding of the history, nature and landscape values, organisation and objectives of the park and its future plans;
- trust in discussions about the national park’s management and among the stakeholders involved;
- the desire for continued dialogue;
- increased capacities and abilities of TANAP staff; and
- the presentation of a final management plan to Ministry of Agriculture and Ministry of Environment staff as part of the approval process.

The national park authorities adjusted the zoning of the national park to reflect local input. For their part, landowners’ representatives publicly expressed agreement with the overall goals of the national park and acceptance of the needs for nature protection, although they also stated that restrictions in ownership rights must result in appropriate compensation. In 2013 legislation enabling financial compensation was introduced to address this challenge (Janiga and Švajda, 2002; Ministry of Environment, 2015).

Agri-environmental payments aimed at protecting the permanent grassland habitats of selected species were used effectively during the 2007–13 funding cycle (Ministry of Environment, 2015). It is not clear whether these were applied in areas used by Northern Chamois.

Some of the actions in the national Chamois Recovery Programme (2001–05) were applicable in the Low Tatras population, for example, in the Nature and Landscape Protection legislation, which saw the designation of Skalka (2,660 ha) and Ďumbier (2,044 ha) National Nature Reserves. These sites were given the strict level 5 protection. As in TANAP, park guards and other staff patrol chamois habitats and collect data on occurrence, number, spatial

distribution, sexual composition as well as carrying out biannual monitoring. They also monitor pressures and control skiing and winter mountaineering, organise closures of sensitive areas when Northern Chamois are giving birth, and put out salt licks for the species. Research is organised with partner organisations. Publicity and awareness-raising activities are carried out across the local area (Bačkor and Urban, 2009).

Funding sources (current and long-term) and costs (one-off and ongoing)

The Slovakian State Environmental Fund contributed two million Slovakian Korunas (€66,000) towards the Chamois Recovery Programme in 2001. Approximately 57% of the funds paid for monitoring and the employment of park guards (Janiga and Švajda, 2002; Feriancova pers comm, 2018).

The total budget for the 2001–2005 TANAP Action Plan was 47 million Slovakian Korunas (€1.55 million), of which 11% was from the Ministry of Environment, 79% was from the State Environment Fund and 10% was from other sources (ŠOPSR/TANAP, 2002). The 2002–04 participatory development of the subsequent TANAP management programme was funded by the Danish Cooperation for Environment in Eastern Europe (Švajda, 2008). As an example, the 2005 NAPANT master plan's funding sources are listed as: Phare Twining Project; Bilateral Project; Swiss Revolving Fund; Stiftung für Bildung und Behindertevörderung (a German education fund); EU Structural Funds; and, the Slovakian Environmental Fund (ŠOPSR/NAPANT, 2005).

Biological monitoring is co-financed by the European Regional Development Fund (Janák, Černecký and Saxa, 2015; ŠOPSR KIMS, 2018), although this may not have been the case during 2007–2012.

Nationally, €357 million was disbursed in agri-environmental payments through the Rural Development Programme (EAFRD), among which, there was particularly high take-up of payments for permanent grasslands.

The Operational Programme for Environment, part of the European Regional Development Fund (ERDF), was used to support ŠOPSR's management and conservation actions during 2007–13. Contractual expenditure for projects with Poland (which could include the Tatras) was approximately €7.8 million. However, this was well below the €27.8 million that was originally allocated, because administrative burdens and complex procurement requirements, which there is a lack of capacity to fulfil, were obstacles to the implementation of some potentially applicable projects (Ministry of Environment, 2015).

Future actions and actions since 2012

Recent assessments of the species' habitat have resulted in the division of the conservation status and prospects into favourable in the High Tatras and Unfavourable – inadequate in the Low Tatras (ŠOPSR KIMS, 2018).

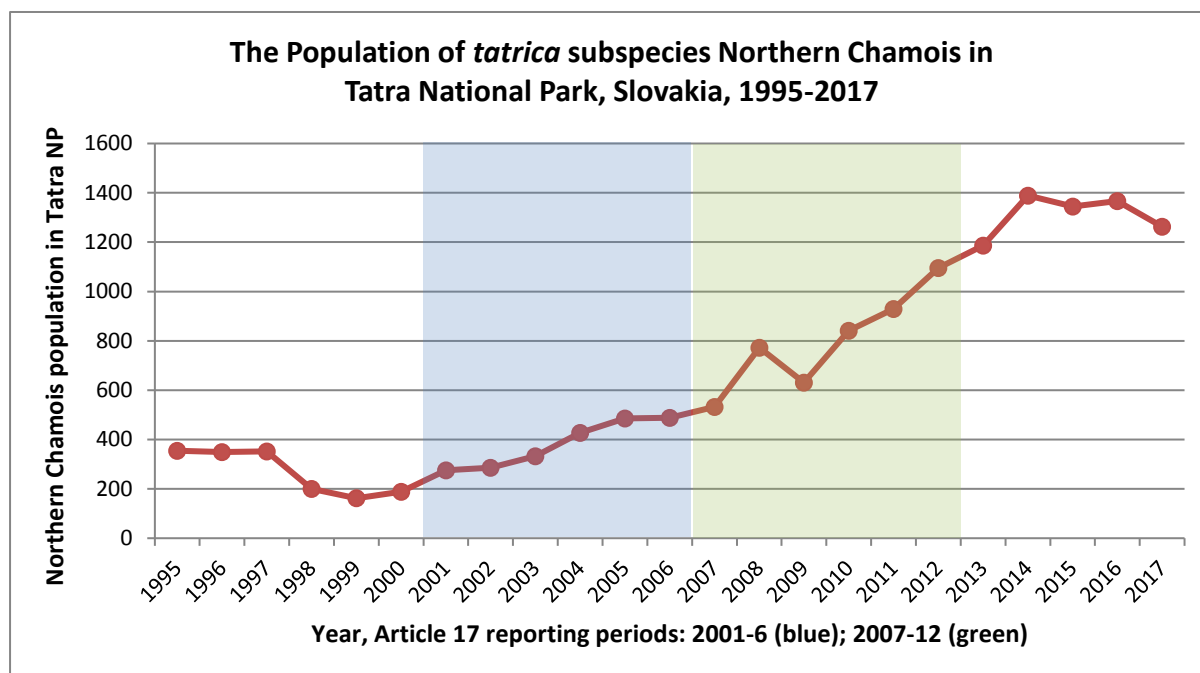
The Slovakian Prioritised Action Framework (PAF) for Natura 2000 in 2014-2020 identifies improvement in the conservation status of Northern Chamois as a key target, and lists processing and implementation of a conservation programme for the species as a means to achieve this. Measures are proposed to rise to the challenge involving landowners in the protection and management of sites and maintaining ongoing dialogue with them, as well as to raise public awareness of Natura 2000 more widely. Payments will be used to compensate for costs and income foregone on agricultural and forest land within the Natura 2000 network, and this may deliver wider application of conservation measures on private land (Ministry of Environment, 2015).

Achievements

Impacts on the target species

Within TANAP, the measures taken to protect the species correlate with the improvement in its status. From a low point of 162 individuals in 1999, the population rose to 488 in 2006 and then to 1,096 in 2012. After that, it rose slightly further and has now plateaued at around 1,250 to 1,400 individuals.

The results of monitoring of the Northern Chamois in Tatranský National Park, 1995–2017



Source: TANAP/Feriancova *pers comm*, 2018

The population in the Low Tatras was around 100 individuals from the late 1990s until 2006, slightly lower than it had been from the late 1980s to the mid 1990s (Bačkor and Velič, 2008).

Other impacts (e.g. other habitats and species, ecosystem services, economic and social)

The *latirostris* subspecies of Alpine Marmot is also restricted to the Tatras Mountains. The two species benefit from many of the conservation actions take for each other. The Annex I habitats that Northern Chamois occupy (listed in the ecological requirements section) also benefit from measures taken and vice versa.

Conclusions and lessons learnt

The key targeted conservation measures that led to the improvements

- Legacy effects of the 2001–05 programme for Northern Chamois and the management plans for Tatranský and Nízke Tatry National Parks in the early-mid 2000s, in particular, the employment of park guards.
- A conservation programme for the species during 2008–10.
- The design and implementation of management programmes for National Parks and protected sites, and, site based actions.
- Enforcement of legislation.

Conservation measures that have not been sufficiently effective

- Conservation of the species within the Nízke Tatry (Low Tatras) National Park, where the status remains Unfavourable – inadequate.

Factors that supported the conservation measures

- New legislation and new Natura 2000 site designations.
- Funding from the electricity generation company Slovenských elektrární AS and from national and/or European funds.
- A participatory process with the public, administrative authorities and other stakeholders to generate a common vision and management programme for Tatranský (High Tatras) National Park that would be sustainable in the medium- to long-term.

Factors that constrained conservation measures

- Concerns over the hybridisation of the Low Tatras population with the nominate form *R. r. rupicapra*.
- Lack of institutional capacity around procurement in relation to EU procurement standards reduced the drawdown of funds for nature conservation activities.
- The administrative burden of applications for agri-environmental measures was seen as a barrier to drawdown of these funds.
- Increasing use of the national parks for sporting and other potentially disturbing recreational purposes.
- Conflict and lack of trust between local people, landowners, stakeholders and administrative authorities over the management of national parks and the lack of positive engagement of private landowners with conservation measures in Natura 2000 sites.

Examples of good practice, which could be applied to other species

- The participatory process bringing stakeholders together around the vision and plans for Tatranský National Park was imperfect, but generated many positive outcomes and is an in eastern European example of a great leap forward in improving the sustainability of national park management.
- A measure that has perhaps been less apparent in other case studies is the level of training and involvement of National Park guards/wardens in monitoring and conservation activities.

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Annex 1 Northern Chamois *Rupicapra rupicapra tatrica* 4006 conservation status at EU and Member State levels

Favourable	FV	Unknown	XX	Unfavourable - inadequate	U1	Unfavourable - bad	U2
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Qualifier (+) improving (-) deteriorating (=) stable (x) unknown (n/a) not reported

	2001-06	2007-12				
	Overall	Range	Population	Habitat for species	Future	Overall (with trend)
[PL] [ALP]	U1	FV	FV	FV	FV	FV (+)
[SK] [ALP]	U2	U1	U1	U1	U1	U1 (+)
EU [ALP] overall	U2	FV	U1	U1	U1	U1 (+)

Source: Member State Article 17 reports as compiled by ETC-BD on EIONET <https://bd.eionet.europa.eu/article17/reports2012/>