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## Rediscovery of *Androsace hausmannii* (Primulaceae) and *Braya alpina* (Brassicaceae) in North Tyrol: Implications for Geobotany and Listings of Alpine Taxa in Red Lists

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With 4 Figures

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### Summary

SPITALER R. & ZIDORN C. 2006. Rediscovery of *Androsace hausmannii* (Primulaceae) and *Braya alpina* (Brassicaceae) in North Tyrol: Implications for geobotany and listings of alpine taxa in Red Lists. – *Phyton* (Horn, Austria) 46 (1): 83 – 98, with 4 figures. – English with German summary.

*Androsace hausmannii* and *Braya alpina* STERNB. & HOPPE were rediscovered at the Ulricher Nieder saddle in the Loferer Steinberge and at Mount Großer Solstein in the Karwendel range (both North Tyrol/Austria), respectively. The two species are listed as regionally extinct in the current version of the Red List for the North Tyrol (NEUNER & POLATSCHEK 2001).

*Androsace hausmannii* LEYB. had formerly been reported from the Loferer (NEUMAYER 1929) and Leoganger Steinberge (HANDEL-MAZZETTI 1943) in the outermost eastern part of the North Tyrol (Bezirk Kitzbühel) and *B. alpina* had sporadically been reported from the Karwendel range (Bezirk Innsbruck-Land) between 1836 (SAUTER 1838, HAUSMANN 1851: 63) and 1940 (HANDEL-MAZZETTI 1941, 1943). Additionally, there are two to the best of our knowledge unsubstantiated literature reports for *B. alpina* in North Tyrol: one from the Zillertaler Alpen (DALLA TORRE &

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SARNTHEIN 1892) and one from the Lechtaler Alpen (SCHULTZE-MOTEL 1986: 273–275). *A. hausmannii* and *B. alpina* are besides the recently rediscovered *Crepis rhaetica* HEGETSCHW. (ZIDORN & al. 1999) the second and the third alpine (in the sense of the altitudinal zone, not in the sense of the geographic region covering the European Alps) taxon recently rediscovered in North Tyrol. In this context, the 94 taxa currently regarded as extinct in the North Tyrol are discussed with a special focus on the 13 taxa, which are distributed in the alpine zone.

Alpine regions and high alpine regions in particular are notoriously hard to reach and the distribution of rare and inconspicuous high alpine taxa is therefore difficult to monitor. To highlight this fact we propose a new IUCN category for the (potentially) threatened status of alpine taxa, which have not been reported for more than a decade but where an actual extinction was not observed. This proposed new category is named „missing alpine taxon“ (MAT) and should be accompanied by the year of the last substantiated report on the occurrence (voucher specimen or publication) of the particular taxon in the region the Red List is designed for. To complement this new category a „rare alpine taxon“ (RAT) for rare alpine taxa for which no endangerment is currently obvious is proposed. Both categories will serve to build a solid data basis for informed choices for the preservation of alpine taxa, for both, plants and animals and will contribute to a more precise definition of the categories „extinct“ (EX) and „regionally extinct“ (RE).

#### Zusammenfassung

SPITALER R. & ZIDORN C. 2006. Wiederentdeckung von *Androsace hausmannii* (Primulaceae) und *Braya alpina* (Brassicaceae) in Nordtirol: Geobotanische Bedeutung und Implikationen für die Einstufung von alpinen Taxa in Roten Listen. – Phytion (Horn, Austria) 46 (1): 83 – 98, mit 4 Abbildungen. – Englisch mit deutscher Zusammenfassung.

*Androsace hausmannii* LEYB. und *Braya alpina* STERNB. & HOPPE wurden am Ulricher Nieder in den Loferer Steinbergen bzw. am Großen Solstein im Karwendel (beide Nordtirol/Österreich) wiederentdeckt. Beide Arten sind in der aktuellen Version der Roten Liste für Nordtirol als ausgestorben aufgeführt (NEUNER & POLATSCHKE 2001).

*Androsace hausmannii* war früher für die Loferer (NEUMAYER 1929) und Leoganger Steinberge (HANDEL-MAZZETTI 1943) im äußersten Osten Nordtirols (Bezirk Kitzbühel) angegeben worden. *B. alpina* wurde zwischen 1836 (SAUTER 1838, HAUSMANN 1851: 63) und 1940 (HANDEL-MAZZETTI 1941, 1943) sporadisch im Karwendel nachgewiesen. Daneben gibt es zwei alte und offenbar nicht belegte Berichte aus Nordtirol, für die Zillertaler (DALLA TORRE & SARNTHEIN 1892) und die Lechtaler Alpen (SCHULTZE-MOTEL 1986: 273–275). *A. hausmannii* und *B. alpina* sind neben *Crepis rhaetica* HEGETSCHW. (ZIDORN & al. 1999) zwei weitere als ausgestorben betrachtete alpine (im Sinne der Höhenstufe) Taxa, welche kürzlich in Nordtirol wiederentdeckt wurden. Aus diesem Anlass wird auf die 94 in der Roten Liste für die Flora Nordtirols als ausgestorben gemeldeten Taxa eingegangen, näher werden die 13 davon in der alpinen Stufe vorkommenden Taxa diskutiert.

Alpine und im Besonderen hochalpine Regionen sind sehr schwer zugänglich und die Verbreitung von seltenen und unauffälligen hochalpinen Taxa ist daher besonders schwer zu erheben. Daher wird, in Ergänzung der IUCN-Kategorien, eine

eigene Kategorie (verschollene alpine Sippe) für (möglicherweise) gefährdete oder ausgestorbene alpine Taxa vorgeschlagen, welche seit mehr als einem Jahrzehnt nicht mehr beobachtet worden sind, für welche aber keine Berichte über ein Aussterben an den ehemals bekannten Fundorten vorliegen. Diese neue Kategorie verschollene alpine Sippe („missing alpine taxon“, MAT) soll durch die Angabe des Jahres des letzten dokumentierten Nachweises (Herbarbeleg oder Publikation) ergänzt werden. Zusätzlich zu dieser neuen Kategorie schlagen wir eine weitere neue Kategorie „seltenes alpines Taxon“ „rare alpine taxon“ (RAT) vor, welche auf seltene alpine Sippen angewendet werden kann, für die keine offensichtliche Gefährdung besteht. Beide Kategorien sollen der Schaffung einer soliden Datengrundlage für den Schutz alpiner Sippen sowohl aus dem Pflanzen- als auch aus dem Tierreich dienen und eine schärfere Fassung der Kategorien „ausgestorben“ (EX) und „regional ausgestorben“ (RE) ermöglichen.

### 1. Introduction

*Androsace hausmannii* LEYB. (*Primulaceae*) is an endemic of the Eastern Alps, with the center of its distribution in the Southern limestone ranges (MERXMÜLLER 1953, MEUSEL & al. 1978: 74, 342, AESCHIMANN & al. 2004: 652–653).

*Braya alpina* STERNB. & HOPPE (*Brassicaceae*) is endemic to the Eastern Alps (MEUSEL & JÄGER 1965: 341, 166, AESCHIMANN & al. 2004: 486–487). Its distribution range covers South Tyrol (Italy) and the Austrian states of Tyrol (East and North), Salzburg, and Carinthia (AESCHIMANN & al. 2004: 486–487). A point map displaying the total distribution of *B. alpina* was provided by SCHULTZE-MOTEL 1986: 274. The main distribution area of *B. alpina* is located in the Hohe Tauern system in the border region of East Tyrol, Carinthia, and Salzburg (HANDEL-MAZZETTI 1941, HARTL & al. 1992, GRIEHSER & WITTMANN 1993, POLATSCHKEK 1999: 39–40). A second smaller area is situated in the South Western part of the Zillertaler Alpen (Finsterstern, Kramerspizze, Wilde Kreuzspitze, Grabspitze, Brenneralp, PIGNATTI 1997: 380). Furthermore, three growing sites in between these areas have been described: a) above Luttach in the Ahrn valley (South Tyrol), b) Sundergrund in the Central part of the Zillertaler Alpen (North Tyrol), and c) above Prägraten in the Virgental (East Tyrol) (DALLA TORRE & SARNTHEIN 1909: 405–406; SCHULTZE-MOTEL 1986: 273–275, PIGNATTI 1997: 380). Recently, *B. alpina* was also discovered in the South Tyrolean Dolomites (FISCHER & al. 2005: 618). Besides these Central and Southern alpine localities, *B. alpina* was reported from two ranges in the Northern Alps: from the Lechtaler Alpen [Passeier Gebiet (= Parseier according to the latest official edition of the Austrian map), SCHULTZE-MOTEL 1986: 273–275] and from the Karwendel [Großer Solstein, Hohe Warte, and Brandjochkreuz (HANDEL-MAZZETTI 1941, 1943, POLATSCHKEK 1999: 39–40)].

## 2. Rediscovery of *Androsace hausmannii* in the Loferer Steinberge and of *Braya alpina* at Mount Solstein

*A. hausmannii* was found in the Ulricher Nieder saddle between Mount Mitterhorn and Mount Großes Rothorn in July 2006 in an altitude of 2320 m above mean sea level (a.m.s.l.) [coordinates (WGS84): N 47°33'03", E 12°37'17"]. Fig. 1 shows one out of a total of three flowering plants of *A. hausmannii* found at that site. However, due to the in-



Fig. 1. Plant of *A. hausmannii* in the Loferer Steinberge/N-Tyrol/Austria (July 2006).

accessibility of the surrounding terrain, the occurrence of more plants in the vicinity is possible. *A. hausmannii* was reported from the Loferer and Leoganger Steinberge in the outermost East of the North Tyrol (Bezirk Kitzbühel) by NEUMAYER 1929 and by HANDEL-MAZZETTI 1943. Notably, these reports were not cited by POLATSCHKE (2000: 593), though the species was included as regionally extinct (RE) in both versions of the Red List for the North Tyrol (NEUNER & POLATSCHKE 1997, 2001). The rediscovery of *A. hausmannii* in the Tyrolean part of the Loferer Steinberge is not too surprising as the species is known to occur in those parts of the Leoganger and Loferer Steinberge, which belong to the territory of the state of Salzburg (WITTMANN & al. 1987: 52 and 357–358). However, the present report is the first about an occurrence of *A. hausmannii* in the North Tyrol for more than 60 years and for the Tyrolean part of the Loferer Steinberge since 1929 (NEUMAYER 1929, HANDEL-MAZZETTI 1943). The current site is not identical to the one described by NEUMAYER 1929 but situated approxi-



Fig. 2. A plant of *B. alpina* with flowers and unripe fruits at Mount Solstein WNW Innsbruck/N-Tyrol/Austria (August 2005).

mately 1 km to the West of the historic site in the Waideringer Nieder region of the Loferer Steinberge. Due to the limited number of plants, no voucher specimens were collected. More digital pictures of the North Tyrolean population in the Loferer Steinberge are available on request from the authors.

*B. alpina* was rediscovered in August 2005 on the Eastern ridge of „Waidböden“ South East of the summit of Mount Großer Solstein in an altitude between 2400 and 2420 m a.m.s.l. [coordinates (WGS84): N 47°17'50", E 11°18'39" to N 47°17'53", E 11°18'43"]. Fig. 2 shows a flowering plant of *B. alpina* at Mount Großer Solstein. The discovered population of *B. alpina* was sparse, but consisted of at least 50 fertile individuals, which were dispersed over the „Waidböden“ ridge. The current site is not identical to the one described by DALLA TORRE & SARNTHEIN (1909: 405; „Solstein: spärlich im Gerölle von der Schoberwaldalpe aus bei 1900 m“ also described as „im Krenach“). The historic growing site „im Krenach“ is situated 1 km to the South West from the current site of rediscovery at an altitude of 1900 m a.m.s.l. (500 m lower than the site described here). The current discovery site might be identical or close to the site where Hermann HANDEL-MAZZETTI collected *B. alpina* in 1900 (Heinrich HANDEL-MAZZETTI 1902). The label of a voucher specimen collected by Hermann HANDEL-MAZZETTI at Mount Großer Solstein on July the 21<sup>st</sup> 1900, which is preserved in the Innsbruck University herbarium (IB), reads „Großer

Sollstein b. Innsbruck am Wege ins Wörgelthal c. 2400 m am 21. Juli 1900“. Conclusively, HANDEL-MAZZETTI's collection site was situated at an altitude of approximately 2400 m, 500 m above the site where GIOVANELLI and HEUFLER discovered *Braya* in 1836 (SAUTER 1838). The „Wörglital“ is the gully separating Mount Großer Solstein and the ridge named „Waidböden“, where we rediscovered *B. alpina* in 2005. We therefore assume that the growing site indicated on the label from HANDEL-MAZZETTI's collection of *B. alpina* from the year 1900 and the current growing site are close to each other or identical.

Voucher specimens of the current discovery of *B. alpina* were deposited at IB (voucher number: 26448) and in the personal herbarium of C. ZIDORN (voucher numbers: CZ-20050924A-1 and CZ-20050810D-1).

### 3. Geobotanical Importance of the Rediscovery of *Androsace hausmannii* in the North Tyrol

*A. hausmannii* is very rare in its North alpine part of the distribution area in the Northern Alps. Here, the taxon has been reported only from the „Totes Gebirge“ [Mount Mölbling (= Hochmölbling) NNW Liezen/Styria and Upper Austria/Austria], the Berchtesgadener Alps (Bavaria/Germany), and the Loferer and Leoganger Steinberge (Salzburg and North Tyrol/Austria) (MERXMÜLLER 1953, WITTMANN & al. 1987: 52 and 357–358, AESCHIMANN & al. 2004: 652). Two more rather speculative former occurrences are the Kaisergebirge and the Gaisstein (= Geißstein SE Jochberg) in the Kitzbühel district (both North Tyrol/Austria) (MERXMÜLLER 1953). The North Tyrolean populations formed (and the newly discovered one forms) the Western distribution limit of *A. hausmannii* in its North alpine part of the distribution area. These North alpine populations of *A. hausmannii* are believed to represent relicts of a larger distribution area and to occur at growing sites, which represent glacial refugia, where the taxon survived the last glaciation(s). Therefore, the few prevailing populations of *A. hausmannii* in the Northern Alps warrant special conservation efforts though the species is not endangered in its Southern alpine main distribution area.

### 4. Geobotanical Importance of the Occurrence of *Braya alpina* in the Karwendel

Mount Großer Solstein is situated WNW of Innsbruck and located approximately 50 km NNW of the next known growing sites of *B. alpina* in the Zillertaler Alpen (e.g. Mount Wilde Kreuzspitze; PIGNATTI 1997). *B. alpina* was formerly regarded to be a relatively recent introduction to the flora of Mount Großer Solstein. DALLA TORRE 1882: 423 speculates that the small seeds of *B. alpina* were distributed by Föhn winds from the populations of *B. alpina* in the Zillertaler Alpen. Indeed the relatively low alti-

tude (1900 m a.m.s.l.) of the former site of *B. alpina* in the Krenach gully at Mount Großer Solstein makes it quite unlikely that this taxon, which is usually occurring in high alpine to subnival sites, has prevailed for a prolonged period of time at this site, which is situated below the timber line. The proposed wind dispersal from the South was even made more appealing by the fact that Mount Wilde Kreuzspitze and Mount Solstein are separated (or connected) by the Wipptal, a valley, which is infamous for its heavy Föhn winds. The plausibility of the Föhn dispersal hypothesis was further corroborated by the fact that *B. alpina* is/was not the only species, mainly occurring in more Southern ranges of the Alps, with an isolated outpost at Mount Großer Solstein. The same held e.g. also true for *Ranunculus parnassifolius* L. (DALLA TORRE 1882: 423). However, the alternative hypothesis that *B. alpina* survived at least the last glacial maximum in the Karwendel Mountains is not to be excluded either, because the highest parts of this range (Großer Solstein 2541 m, Kleiner Solstein 2684 m, Hohe Warte 2597 m, Hintere Brandjochspitze 2599 m, Vordere Brandjochspitze 2559 m a.m.s.l.) including the current rediscovery site ( $\geq 2400$  m a.m.s.l.) were situated above the ice-shield during the last glacial maximum (VAN HUSEN 1987). Indeed it might be speculated that the small 19<sup>th</sup> century growing population of *B. alpina* in the „Krenach“ gully at 1900 m a.m.s.l. (SAUTER 1838) was not a result of wind long distance dispersal from the South but was derived from seeds swept down with wind, rain or snow from a population growing in the area of the site described in this communication.

#### 5. Endangered Status of *A. hausmannii* and *B. alpina* in North Tyrol

*A. hausmannii* and *B. alpina* are both currently regarded as regionally extinct in the North Tyrol (NEUNER & POLATSCHKE 1997, POLATSCHKE 1999: 39–40, NEUNER & POLATSCHKE 2001, AESCHIMANN & al. 2004: 652–653; 486–487, FISCHER & al. 2005: 673 and 618).

As described above, *A. hausmannii* was always very rare in the North Tyrol. The North Tyrolean populations are the western most within the North alpine distribution area of the species. The newly discovered growing site comprises only three plants and is situated directly besides an alpine path, and therefore potentially endangered by alpinists. These facts justify to list *A. hausmannii* as critically endangered (CR) in the North Tyrolean regional Red List.

As outlined above, *B. alpina* was formerly reported from three ranges in the North Tyrol: the Zillertaler Alpen (DALLA TORRE & SARNTHEIN 1892, 1909: 405–406, POLATSCHKE 1999: 39–40), the Lechtaler Alpen (SCHULTZEMOTEL 1986: 273–275), and from the Karwendel range (SAUTER 1838, HAUSMANN 1851: 63, 1854: 1403, DALLA TORRE 1882: 423, DALLA TORRE &

SARNTHEIN 1909: 405–406, DALLA TORRE 1913: 156, HANDEL-MAZZETTI 1941, 1943, POLATSCHKEK 1999: 39–40, FISCHER & al. 2005: 618).

Currently *B. alpina* is known only from one site, the one reported in this communication, and it is likely that *B. alpina* was continuously growing at Mount Solstein for at least the last 100 years. The only sporadic documentation of the occurrence of *B. alpina* in the Karwendel might be explained by its inconspicuous habit, its small size and the limited number of observers and excursions undertaken by these observers. *B. alpina* is currently known only from one out of a total of six historically known growing sites (four from the Karwendel, one from the North Tyrolean part of the Zillertaler Alpen and one from the Lechtaler Alpen). Therefore, the category critically endangered (CR) might seem to be the most appropriate status for *B. alpina* for North Tyrol. However, we feel that data about the actual extinction at the other growing sites are not sufficient to exclude a present occurrence of *B. alpina* on some or even all of the former sites. *B. alpina* is definitely a very rare high alpine plant in the North Tyrol. Therefore, a monitoring of the number of individuals of *B. alpina* at the rediscovered growing site and excursions aimed at the rediscovery of *B. alpina* at other historic growing sites in the North Tyrol are of significant interest.

## 6. Some General Remarks on Red Lists for Alpine Taxa and a Proposal for Two New IUCN Categories

Scarce (high) alpine plants often have a very short flowering period and inhabit extreme environments, which are only infrequently visited by humans and very rarely by botanists. If these taxa are in addition inconspicuous, like *Braya alpina*, or easily mixed up with more common species like *Crepis rhaetica* [which is easily confused with some alpine *Hieracium* species (SELL 1976: 348)], chances are high that populations of these taxa, though permanently present, are not reported within one human generation. This leads to the sometimes false statement that the taxa at hand are extinct at a given site (or in a given district, region or state) and they are therefore declared regionally extinct (RE) in the respective Red Lists (NEUNER & POLATSCHKEK 1997, IUCN 2001, NEUNER & POLATSCHKEK 2001). As the factors causing these misinterpretations (inconspicuous habit, flowering period, inaccessibility of growing sites, and the availability of qualified botanists) are not or not easily controlled, a new category for the threatened status of rare not continuously reported alpine taxa is proposed: „missing alpine taxon“ (MAT). We feel that this new category is better suited to meet the special challenges in studying and conserving high alpine taxa than the alarmist and often false declaration of regional extinction. On the other hand the MAT category, which ideally should be specified by the year of the last observation of the taxon at hand (e.g. MAT-1943



for a taxon last documented in the year 1943) is more precise than the rather vague designation data deficient (DD) (IUCN 2001). The data deficient category might e.g. apply to situations, a) in which the circumscription of the taxon at hand is unclear or disputed; b) in situations, in which the former occurrence of the taxon in the region covered by the regional Red List is doubtful or c) in situations similar to the situation described for alpine habitats, where the number of observers and observations is too low to effectively monitor the area and their populations of potentially endangered taxa. The separate missing alpine taxon (MAT) category indicates that the taxon at hand is taxonomically undisputed and that reliable historic data for a former existence in the covered region are available. It moreover indicates in which year the taxon was last reported for the region covered by the regional Red List.

To get a more profound knowledge about the current distribution of rare alpine taxa, which have not been reported to be extinct yet or which are continuously reported from a limited number of growing sites, we propose a second new category „rare alpine taxon“ (RAT) to complement the MAT category. The RAT category should be employed for rare alpine taxa for which no actual endangerment is obvious. This applies e.g. for the occurrence of *B. alpina* in North Tyrol. The rediscovered population at Mount Großer Solstein faces no obvious danger of extinction and the not confirmed historic sites are at the moment not sufficiently studied to prove an actual extinction. The monitoring of *B. alpina* and other RAT taxa should be given priority in conservation efforts for alpine taxa to allow for informed nature preservation projects in high alpine areas.

Conclusively, the new categories are defined as specified in the following paragraphs:

**Missing Alpine Taxon (MAT):** A taxon is encompassed in this category, when all of the following criteria are fulfilled for the region the Red List is intended for. a) There are no records for a current occurrence of the taxon. b) There are reliable historic records for an earlier occurrence. c) There is reasonable doubt that the last individual has died. d) The taxon is occurring mainly or exclusively in the alpine altitudinal zone.

**Rare Alpine Taxon (RAT):** A taxon is encompassed in this category, when all of the following criteria are fulfilled for the region the Red List is intended for. a) There is one current record or there are a limited number of records for a current occurrence of the taxon. b) The number of records has not significantly changed in the past. c) There are no obvious threats for the future existence of the taxon, except its rarity, which might result in extinction if the only or few sites are disturbed or destroyed. d) The taxon is occurring mainly or exclusively in the alpine altitudinal zone.

## 7. Notes on Red Lists for North Tyrol

The unsatisfying state of knowledge about the endangered status of higher plants in Western Austria (Tyrol and Vorarlberg) has been discussed before (SCHÖNSWETTER & TRIBSCH 2003). An extensive re-evaluation of the first two editions of the Red Lists for Tyrol and Vorarlberg by NEUNER & POLATSCHKE 1997, 2001 is beyond the scope of this paper. However, two points shall be discussed here. The first one is a mere formality: We deem it inappropriate to include a Red List, which is (potentially) an important guideline for political decisions at different levels into an expensive multi-volume flora. We suggest that the information of up-dated editions of the Red Lists are either distributed as stand-alone brochures or ideally are made freely available on the World Wide Web (GÄRDENFORS & al. 2001). The second point of criticism is more severe: The present authors are convinced that it is impossible for two authors to extensively compile data for three areas with very complex morphology covering a total area of 15248 km<sup>2</sup> [Tyrol (E + N): 12647 km<sup>2</sup> and Vorarlberg: 2601 km<sup>2</sup> (GRILL 1992: 168)] without regional advisors and without a staff of collaborators working in the field. Additionally, it is highly desirable for the future to have separate Red Lists from all districts (Bezirke) in Western Austria [North Tyrol (Figure 3): Landeck, Reutte, Imst, Innsbruck, Innsbruck-Land, Kufstein, and Kitzbühel; East Tyrol: Lienz; Vorarlberg: Bregenz, Dornbirn, Feldkirch, and Bludenz]. This holds especially true for the Tyrol, because in this state the districts are the primary authorities in charge of nature conservation issues (FARASIN 1993: 16).

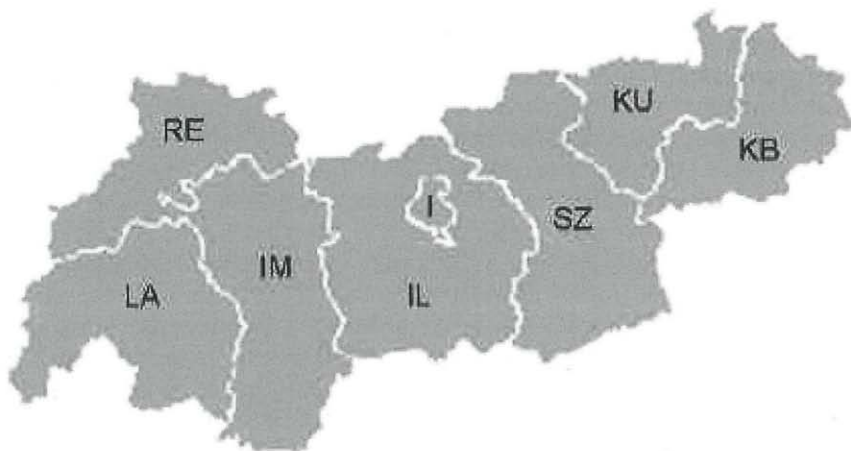


Fig. 3. The districts of North Tyrol. Abbreviations (analogous to the Austrian number plate system): I Innsbruck, IL Innsbruck-Land, IM Imst, KB Kitzbühel, KU Kufstein, LA Landeck, RE Reutte, SZ Schwaz.



Fig. 4. Important mountain ranges in the North Tyrol and neighboring regions. The Steinberge (1) comprise the Loferer (Northern range) and the Leoganger Steinberge (Southern range).

In the context at hand it is of special interest to focus on the 94 taxa currently listed as regionally extinct (RE) in North Tyrol. At least seven of these taxa [*Alopecurus myosuroides* HUDS., *Bupleurum rotundifolium* L., *Galega officinalis* L., *Rosa majalis* J. HERRM., *Silene armeria* L., *Vicia casubica* L., and *Vulpia bromoides* (L.) GRAY] have been reported only as rare casuals or garden escapes for North Tyrol and should therefore be completely removed from the Red List. From the remaining 87 taxa listed as extinct in the North Tyrol, 28 are belonging to the notoriously difficult (and therefore generally data deficient) apomictic genera *Hieracium* (20 taxa) and *Rubus* (8 Taxa), thus leaving 55 non-apomictic taxa currently listed as extinct for North Tyrol.

Thirteen of these taxa [*Androsace hausmannii*, *Braya alpina*, *Bupleurum ranunculoides*, *Cerastium carinthiacum* subsp. *carinthiacum*, *Gentiana terglouensis*, *Helianthemum nummularium* subsp. *glabrum*, *Herniaria alpina*, *Luzula glabrata*, *Oxytropis neglecta*, *Primula daonensis*, *Rorippa islandica*, *Thalictrum alpinum*, and *Trisetum alpestre*] have a vertical distribution range (ADLER & al. 1994), which also or exclusively encompasses the alpine altitudinal zone. These taxa will be discussed in more detail in the following paragraphs. The geographical position of the most important North Tyrolean mountain ranges is displayed in Figure 4.

#### 8. Discussion of Alpine Taxa Currently Listed as Extinct (RE) for North Tyrol

*Gentiana terglouensis* HACQ. most probably never occurred in North Tyrol (DALLA TORRE & SARNTHEIN 1912: 101) and should therefore be removed from the Red List for this region. The former existence of *Oxytropis*

*neglecta* J.GAY ex TENORE (synonym: *O. pyrenaica* GODR. & GREN.) [no substantiated report (DALLA TORRE & SARNTHEIN 1909: 700, no location at all in POLATSCHKEK 2000: 81) and *Trisetum alpestre* (HOST) P. BEAUV. [assumed mix-up with *T. distichophyllum* (VILL.) P. BEAUV., MAIER & al. 2001: 266] is also questionable and these taxa should therefore also be excluded from the Red List for the North Tyrol.

The rediscoveries of *A. hausmannii* and *B. alpina* were described in this communication. The actual destruction of the only known North Tyrolean growing site of *Rorippa islandica* (GUNNERUS) BORBAS near Nauders (Bezirk Landeck) was observed and reported by POLATSCHKEK 1999: 112. However, the new missing alpine taxon (MAT) category can be applied to the remaining seven alpine taxa currently considered to be extinct in the North Tyrol based on the following data:

1. *Bupleurum ranunculoides* L. was last reported by SENDTNER 1854: 779 from the Roßberg SW Vils in the Außerfern (Bezirk Reutte) region (MAT-1854). Another report for *B. ranunculoides* is from the height of the Arlberg pass (HAUSMANN 1854: 1434). However, it is hard to decide whether this report refers to a site in Tyrol (Bezirk Landeck), Vorarlberg (Bezirk Bludenz) or encompasses both states, because the Arlberg pass is situated just at the border between the two states.

2. According to POLATSCHKEK 1999: 242 a voucher of *Cerastium carinthiacum* VEST subsp. *carinthiacum* from the Geißstein SE Jochberg in the district of Kitzbühel is deposited in W; however due to the unorthodox citation system in this flora (POLATSCHKEK 1997: 969–1012, FISCHER 2000a, 2000b, 2003) no exact date and collector are indicated and the MAT category has therefore to be applied without the indication of the last year of documented occurrence.

3. *Helianthemum nummularium* (L.) MILL. subsp. *glabrum* (W.D.J.KOCH) WILCZEK was found a few times in the SE part (Bezirk Kitzbühel) of North Tyrol (POLATSCHKEK 1999: 646). One of these sites is marked with the signature for still existing growing sites in the accompanying distribution map. Here as in the preceding taxon no exact date can be extracted from the data in POLATSCHKEK 1999. However, recently this taxon was also found in the Tyrolean part of the Chiemgauer Alpen (SMETTAN 2006).

4. *Herniaria alpina* CHAIX was found in the Tuxer Alpen: Nasse Tux (border region between Bezirk Schwaz and Innsbruck-Land) at the transition to the Wattental by ROTH before 1878 (MAT-1878; DALLA TORRE & SARNTHEIN 1900, 1909). Another earlier record of a site near Schmirn (Bezirk Innsbruck-Land; HAUSMANN 1851: 313) was omitted by POLATSCHKEK 1999: 270 but also has not been confirmed ever since.

5. *Luzula glabrata* (HOPPE) DESV. was reported for a total of four sites from various regions in North Tyrol: Am Krähkogel (Bezirk Landeck,

HAUSMANN 1852: 902), Kellerjoch bei Schwaz (Bezirk Schwaz, HAUSMANN 1852: 902), am Mohrenkogel W Glungezer before 1898 (Bezirk Innsbruck-Land, HANDEL-MAZZETTI 1955, POLATSCHKEK 2001: 641), St. Anton and St. Christoph (Bezirk Landeck, SCHWIMMER 1931), and Nauders (Bezirk Landeck, UECHTRITZ 1865). Conclusively, the last report, to the best of our knowledge, was the one from SCHWIMMER in 1931 from the Arlberg region (MAT-1931).

6. *Primula daonensis* (LEYB.) LEYB. was found in the so called Sannengebiet near Galtür by DALLA TORRE 1882: 303 and at Mount Geißpleiskof NE Nauders (both Bezirk Landeck) by FREYN in 1887 (MAT-1887).

7. *Thalictrum alpinum* L. was reported from the Arlberg region (Bezirk Landeck, DALLA TORRE & SARNTHEIN 1909: 296), the Fimbertal (Bezirk Landeck, DALLA TORRE & SARNTHEIN 1909: 296), Zwieselstein in the Ötztal (Bezirk Imst, POLATSCHKEK 2000: 760). The last report was an undated report from RICEK in POLATSCHKEK 2000 from the 1950s, 1960s or 1970s. The location „Regensburger Hütte“ in the Stubai range, which was listed in POLATSCHKEK 2000 is an erroneous citation. The site described in HANDEL-MAZZETTI 1936 is near the Regensburger Hütte/Rifugio Firenze, which is situated in the South Tyrolean Dolomites (Provincia autonoma di Bolzano, Italy), whereas the site referred to in POLATSCHKEK 2000: 760 is the „Neue Regensburger Hütte“, which indeed is situated in the Stubaitaler Alpen, but where *T. alpinum* has never been found.

## 9. Conclusion

These examples from the North Tyrol show that a category for alpine taxa, which have not been found for more than ten years is needed. The authors feel that the proposed missing alpine taxon category will be an useful additional IUCN category at least at the regional level (GÄRDENFORS 2001, IUCN 2001). Moreover, the new categories MAT and RAT will help to get a more realistic estimate of the threatened status of alpine taxa and they will allow highlighting taxa, whose taxonomic placement is undisputed and whose former occurrence in the region at hand is well documented but whose current distributions have to be studied in more detail. Successively, more data on potentially endangered alpine taxa will be available and informed choices about conservation priorities will be possible. The proposed category will of course not only be useful to assess alpine taxa occurring in Western Austria but also for alpine taxa occurring in alpine sites all over the Alps and in extra-alpine high mountain systems all over the world. Indeed, we think that for mountain systems less inhabited than the Alps, which are therefore also usually less often visited by scientists, it will be even a bigger challenge to get a realistic picture of distribution and endangerment of high alpine taxa growing in these areas. Therefore, the proposed new categories „missing alpine taxon“ and „rare

alpine taxon“ will potentially be of more interest for these areas than for the European Alps. Though the present paper is a botanical one, the two new categories will of course also be applicable to taxa from the animal kingdom.

Arguably, there are other groups of taxa occurring in rarely accessed habitats or having special life forms, which are difficult to monitor, but for which actual extinction (EX) or regional extinctions (RE) have not been proven. In these instances analogous categories (e.g. MPT: missing polar taxon; MGT: missing geophyte taxon) can be applied. The priority of these „missing taxon“ (MT) categories is between the actual extinct categories (EX and RE) and the category data deficient (DD).

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