

Pinguicula × *Gresivaudanica* (Lentibulariaceae), A NEW BUTTERWORT
HYBRID FROM THE FRENCH ALPS

AYMERIC ROCCIA • La Terrasse • France • aymeric.roccia@live.fr

Keywords: field studies: taxa: *Pinguicula* × *gresivaudanica*, French Alps

Abstract: A new natural hybrid of *Pinguicula* is here reported from the French Alps. It proceeds from the natural crossing of *P. grandiflora* Lam. subsp. *rosea* (Mutel) Casper with *P. vulgaris* L. subsp. *vulgaris*. The newly recorded hybrid is named *Pinguicula* × *gresivaudanica* because of the region where it has been discovered. The characters distinguishing this hybrid from other taxa are described, together with figures, a distribution map and a table. Fertility and chromosome number were also studied, supporting the hybrid nature of this plant.

Introduction

The butterwort genus (*Pinguicula* L., Lentibulariaceae) is composed of approximately 100 species (Rodondi *et al.* 2010; Yıldırım *et al.* 2012). They occur in the Old World from Europe to Japan via Siberia. In America, they can be found in Alaska, Canada, the Rocky Mountains, the Andes, and Tierra del Fuego. A few species can also be found in southeastern USA, one in Himalaya, and two in northern Africa. But the centers of diversity of this genus are found in Mexico, Cuba, and around the Mediterranean Sea (Steiger 1998; Yıldırım *et al.* 2012). However, only two natural hybrids have been described so far: *Pinguicula* × *hybrida* Wettst. (Wettstein 1919) and *P.* × *scullyi* Druce (Druce 1922).

Pinguicula × *scullyi* was described in 1922 by Druce from Irish material. It is a hybrid between the large-flowered butterwort (*P. grandiflora* Lam. subsp. *grandiflora*) and the common butterwort (*P. vulgaris* L.) that has also been recorded from Andorra (Partrat 2001) and the Alps (pers. obs.). *Pinguicula vulgaris* is a circumboreal species, quite common in suitable habitats in Alaska, Canada, northern USA, Iceland, Europe, and Russia. *Pinguicula grandiflora* only occurs in western Europe, from northern Spain, France (Pyrénées, Massif Central, Jura, and the Alps) and Ireland. It is also known from two locations in Switzerland and has been introduced in Britain (Heslop-Harrison 2004). In addition, it has recently been discovered in Northern Italy (Compostella *et al.* 2010). This species shows a great morphological variation and several infraspecific taxa have been described: i) *P. grandiflora* Lam. subsp. *rosea* (Mutel) Casper (Casper 1966), the pink-flowered butterwort occurring in the Isère, Savoie, and Haute Savoie departments in France (Fig. 1), ii) *P. grandiflora* Lam. f. *pallida* (Gaud.) Casper (Gaudin 1828), a light-blue flowered form native to the Jura Mountains, and iii) *P. grandiflora* Lam. f. *chionopetra* Nelson (Nelson 1993), a white-flowered form originating from Ireland and the Pyrénées (pers. comm.). Although these infraspecific taxa are known to occur sympatrically with *P. vulgaris* subsp. *vulgaris* in certain locations, only natural hybrids with *P. grandiflora* subsp. *grandiflora* have been recorded so far.

During fieldtrips to observe *P. grandiflora* subsp. *rosea* in its habitat, some unusual butterworts with larger and bluish flowers were found always growing sympatrically. Evidence is here provided for the hybridogenic origin of this odd plant and it is described under the name *Pinguicula* × *gresivaudanica* Roccia, *hybrida nova*.

Material and methods

Vegetative and floral morphology and morphometry: morphological (shape and color of leaves, calyx lobes, spur, corolla, and stigma) and morphometric (leaf number, length and width, scape number and length, calyx lobe size, spur length, corolla length and opening angle, corolla lobe length and width) characters were analyzed in habitat for 15 individuals. Measurements are presented as mean value \pm standard deviation (Table 1).

Chromosome number: chromosomes were counted on plates prepared as described in Casper & Stimper (2007). Root tips were treated with 0.002 M 8-hydroxyquinoline for 1.5 h at 14°C and fixed in ethanol:acetic acid (3:1) for 4 h at 4°C. They were then hydrolyzed in 2 M HCl for 10 min at 60°C. Root tips were water rinsed and squashed on glass slides. Chromosomes were stained with carmine acetic acid (50 ml acetic acid, 50 ml water and 4 g carmin powder) and counted using a light microscope.

Results

Pinguicula \times *gresivaudanica* Roccia, *hybrida nova* *P. grandiflora* Lam. subsp. *rosea* (Mutel) Casper \times *P. vulgaris* L. subsp. *vulgaris*.

Differs from *Pinguicula grandiflora* subsp. *grandiflora* in having a lavender corolla, corolla lobes as long as wide, a spur curved downwards and slightly shorter than in *P. grandiflora* subsp. *grandiflora* (proportionally to the full corolla length), a throat macula rounded in shape, outer corolla tube surface whitish, and above all in being sterile.

Description: perennial rosette-forming herb with numerous fibrous roots, forming hibernacula during winter. Summer leaves 5-7, obovate-oblong, obtuse, 6-8 \times 2-3.5 cm, flat on the ground, with entire and slightly involute margins, the upper surface covered with mucilaginous glands. Scapes (1-) 2-4 (-5), 10-18 cm in length, green, from sparsely glandular at the base to densely glandular just below the flower. Flowers (26-) 30-34 (-36) mm in length (spur included). Calyx pentamerous bilabiate, glandular; upper lip with 3 lobes, divided nearly to the base, obovate to triangular, acute to subobtuse, (3-) 3.5-4.5 (-5) mm in length; lower lip with 2 lobes, united from the base for (1/4-) 1/3 (-1/2) of their length, obovate to triangular, acute to subobtuse, 3.5-4.5 mm in length. Corolla bilabiate, lavender to Persian blue (see Table 1 for color), (26-) 30-34 (-36) mm in length; upper lip with 2 lobes, suborbicular, approximately as long as wide, 6-8 \times 6-8 mm; lower lip with 3 lobes, somewhat wavy and slightly overlapping, suborbicular, nearly as wide as long, the lateral ones 8-10 \times 8-10 mm, the median lobe bigger, 10-12 \times 10-12 mm; palate hairy, bearing a large white rounded spot, with violet veins; throat densely hairy, white with 2 dark spots at the base; spur approximately 3/10 of the total corolla length, (7-) 8-11 (-11.5) mm in length, darker than the corolla (columbine), cylindrical, curved downwards. Capsule never observed (drying before maturation). Seeds never observed (presumed sterile). Flowering from the second half of May to the first half of June. (Fig. 2 and 3)

Holotype: Crêt de Chazay (Les Adrets, Isère, France), 26 May 2012, Roccia, MHNGr.2012.35958 (GRM)

Paratype: Tourbière de la Grande Côte (Chapareillan, Isère, France), 28 May 2012, Roccia, MHNGr.2012.35960 (GRM)

Etymology: the epithet “*gresivaudanica*” refers to the Grésivaudan valley along which the hybrid has been discovered.

Chromosome number: $2n = \sim 40-50$

Table 1. Comparative vegetative and floral morphometry between *Pinguicula x gresivaudanica*, *Pinguicula grandiflora* subsp. *rosea*, *Pinguicula vulgaris* subsp. *vulgaris*, *Pinguicula x scullyi*, and *Pinguicula grandiflora* subsp. *grandiflora*. All observations and measurements were made at anthesis. Values are expressed as (mean value) ± (standard deviation) of 15 measurements (when possible). Due to grazing damage, it was not possible to complete measures for *Pinguicula x gresivaudanica* from the Tourbière du Bois de la Belle Aiguette.

Taxon	Tourbière du Bois de la Belle Aiguette					Tourbière de la Grande Côle				
	<i>Pinguicula x gresivaudanica</i>	<i>Pinguicula grandiflora</i> subsp. <i>rosea</i>	<i>Pinguicula vulgaris</i> subsp. <i>vulgaris</i>	<i>Pinguicula x scullyi</i>	<i>Pinguicula grandiflora</i> subsp. <i>grandiflora</i>	<i>Pinguicula x gresivaudanica</i>	<i>Pinguicula grandiflora</i> subsp. <i>rosea</i>	<i>Pinguicula vulgaris</i> subsp. <i>vulgaris</i>		
Station	Tourbière du Bois de la Belle Aiguette					Tourbière de la Grande Côle				
Number of flowering plants	19	6	50+	6	1	4	191	128		
Growth type	temperate	temperate	temperate	temperate	temperate	temperate	temperate	temperate		
Rosette type	homophyllous	homophyllous	homophyllous	homophyllous	homophyllous	homophyllous	homophyllous	homophyllous		
Number	6.4 ± 0.8	5.5 ± 0.5	4.9 ± 0.8	5.0 ± 0.0	7.0 ± 0.0	5.3 ± 0.6	5.0 ± 0.7	5.7 ± 0.9		
Shape	obovate-oblong	obovate-oblong	obovate-oblong	obovate-oblong	obovate-oblong	obovate-oblong	obovate-oblong	obovate-oblong		
Length (mm)	73.5 ± 6.1	46.5 ± 4.5	33.8 ± 5.8	41.9 ± 3.7	63.0 ± 5.7	64.0 ± 3.7	36.5 ± 3.3	41.6 ± 11.6		
Width (mm)	31.2 ± 4.5	24.7 ± 5.3	17.3 ± 2.9	15.5 ± 2.7	23.6 ± 2.1	24.3 ± 3.3	15.9 ± 2.7	15.4 ± 4.2		
Number	3.9 ± 1.2	2.0 ± 1.2	1.7 ± 0.9	1.0 ± 0.0	6.0 ± 0.0	2.3 ± 1.3	1.4 ± 0.5	1.8 ± 0.8		
Size (mm)	157.0 ± 28.3	105.4 ± 17.9	75.7 ± 10.4	102.8 ± 9.4	155.7 ± 11.0	145 ± 34.7	85.8 ± 12.6	108.8 ± 18.8		
Upper lobe shape	obovate to triangular, acute at the apex of the medium one often divided in 2	obovate, obtuse	obovate to triangular, obtuse	obovate	triangular, the apex of the medium one often divided in 2	obovate to triangular, acute	obovate, acute	triangular, acute		
Upper lobe size (mm)	3.7 ± 0.4	3.2 ± 0.6	3.1 ± 0.4	2.8 ± 0.3	4.8 ± 0.6	3.6 ± 0.4	2.8 ± 0.4	3.7 ± 0.6		
Bottom lobe shape	obovate to triangular, acute, united at the base on 1/3 to 1/2	obovate, obtuse, united at the base on 2/3 to 3/4	obovate, obtuse, united at the base on 1/2 to 1/3	obovate, united at the base on 1/2 to 1/3	triangular, united at the base on 2/5	obovate to triangular, acute united at the base on 1/4	obovate, obtuse, united at the base on 2/3	triangular, acute, divided in the base to united at the base on 1/3		
Bottom lobe size (mm)	4.9 ± 0.5	3.4 ± 0.5	3.8 ± 0.5	3.5 ± 0.4	4.8 ± 0.3	4.2 ± 0.6	3.2 ± 0.4	3.2 ± 0.4		
Color and shape	columnine, curved downwards	amaranth purple, slightly curved downwards	amaranth purple, slightly curved downwards	columnine, straight	dark violet, slightly curved downwards	columnine, curved downwards	amaranth purple, slightly curved downwards	dark violet, curved downwards		
Length (mm)	10.8 ± 0.8	10.1 ± 1.1	8.6 ± 0.6	7.5 ± 0.5	11.5 ± 0.5	8.4 ± 1.5	7.6 ± 0.6	5.0 ± 0.7		
Length, spur included (mm)	34.1 ± 2.2	32.0 ± 2.5	27.4 ± 2.6	25.5 ± 0.7	33.0 ± 1.7	29.8 ± 3.7	25.0 ± 2.0	23.0 ± 2.1		
Color	oral lamellae	snow	snow	dark violet	dark violet	dark violet	dark violet	dark violet		
Lower lip lobe	marginis not or a little wavy, lobes not overlapping	marginis wavy, lobes overlapping	marginis wavy, lobes not overlapping	marginis not wavy, lobes overlapping, divergent	marginis a little wavy, lobes overlapping	marginis not or a little wavy, lobes overlapping	marginis wavy, lobes overlapping	marginis not wavy, lobes overlapping, divergent		
Throat	white rounded spot with white stripes	greenish rounded spot with pink stripes	greenish rounded spot with white stripes	white rounded spot with white stripes	white rectangular spot with white stripes	white rounded spot with white stripes	greenish rounded spot with not pink stripes	greenish rounded spot with white stripes meeting a yellow spot		

Distribution: *Pinguicula* × *gresivaudanica* occurs in the Chartreuse and Belledonne mountain ranges where *P. grandiflora* subsp. *rosea* and *P. vulgaris* subsp. *vulgaris* can also be found (Fig. 1). The hybrid has only been found so far in three localities. The Haute-Savoie department is also home to *P. grandiflora* subsp. *rosea* and *P. vulgaris*. Their hybrid may also be present there.

Habitat and ecology: *Pinguicula* × *gresivaudanica* grows on calcareous seepages covered by mosses and in alkaline bogs. However, it is always found in shady places, well covered by trees, which is not a suitable lightning environment for most European butterworts (Fig. 2D).

At the type location, *P.* × *gresivaudanica* and *P. grandiflora* subsp. *rosea* grow in Hypnaceae mosses. This seepage is located at the edge of a spruce plantation and the butterworts share their habitat with *Carex hostiana* DC. (Cyperaceae), *Aquilegia vulgaris* L. (Ranunculaceae), *Rubus* sp. (Rosaceae), *Geranium robertianum* L. subsp. *robertianum* (Geraniaceae), *Ligustrum vulgare* L. (Oleaceae), *Lonicera xylosteum* L. (Caprifoliaceae) and some seedlings of *Acer pseudoplatanus* L. (Aceraceae).

At the Tourbière du Bois de la Belle Aiguette bog, *P.* × *gresivaudanica* grows along a small stream under the shade of *Betula pendula* Roth (Betulaceae) and is competing with *Caltha palustris* L. (Ranunculaceae). *Pinguicula grandiflora* subsp. *rosea* and *P. vulgaris* subsp. *vulgaris* can be found along the same stream but in sunnier places along with *Carex davalliana* Sm., *C. nigra* (L.) Reichard (Cyperaceae), *Viola palustris* L. (Violaceae) and *Saxifraga stellaris* L. (Saxifragaceae) among others. *Pinguicula grandiflora* subsp. *grandiflora* and *P.* × *scullyi* are growing in higher parts of the bog where *Sphagnum* species (Sphagnaceae) begin to colonize the peat surface. However, grazing has greatly reduced the numbers of plants of *P.* × *gresivaudanica* and *P. grandiflora* subsp. *grandiflora*, resulting in incomplete measurements in Table 1 for both taxa.

Table 1 Continued.

Opening angle (°)	82.0 ± 15.4	105.0 ± 13.1		105.3 ± 12.9	62.3 ± 14.4	90 ± 7.1	110.0 ± 18.0	111 ± 10.2	110.4 ± 13.4	54.3 ± 8.2
Upper lobe length (mm)	7.5 ± 1.1	5.6 ± 0.9		5.9 ± 0.6	3.5 ± 0.6	5.1 ± 0.2	8.0 ± 0.0	7.1 ± 1.1	5.7 ± 0.8	5.3 ± 0.5
Upper lobe (width) (mm)	7.3 ± 0.8	9.3 ± 1.3		6.5 ± 0.7	3.9 ± 0.4	5.3 ± 0.6	7.3 ± 0.6	7.4 ± 1.1	6.7 ± 0.7	5.3 ± 0.7
Lateral lobe length (mm)	9.6 ± 1.3	7.5 ± 1.4		5.4 ± 0.5	4.4 ± 0.7	5.4 ± 0.4	8.8 ± 1.0	9.2 ± 1.0	6.2 ± 0.8	7.5 ± 0.7
Lateral lobe width (mm)	9.5 ± 1.1	10.4 ± 1.5		7.2 ± 0.8	4.1 ± 0.5	5.5 ± 0.4	7.5 ± 0.9	8.4 ± 1.1	7.3 ± 0.8	5.5 ± 0.7
Median lobe length (mm)	11.2 ± 1.0	9.5 ± 0.8		7.5 ± 0.5	4.9 ± 0.7	7.2 ± 0.5	10.3 ± 0.5	10.9 ± 1.3	7.4 ± 0.9	8.7 ± 1.0
Median lobe width (mm)	10.5 ± 1.3	11.9 ± 1.5	pink	9.0 ± 1.1	4.7 ± 0.5	8.8 ± 0.3	8.8 ± 0.3	10.4 ± 2.1	8.7 ± 1.1	5.5 ± 0.7
Stigma		white	pink		light violet	light violet	light violet	white	pink	light violet

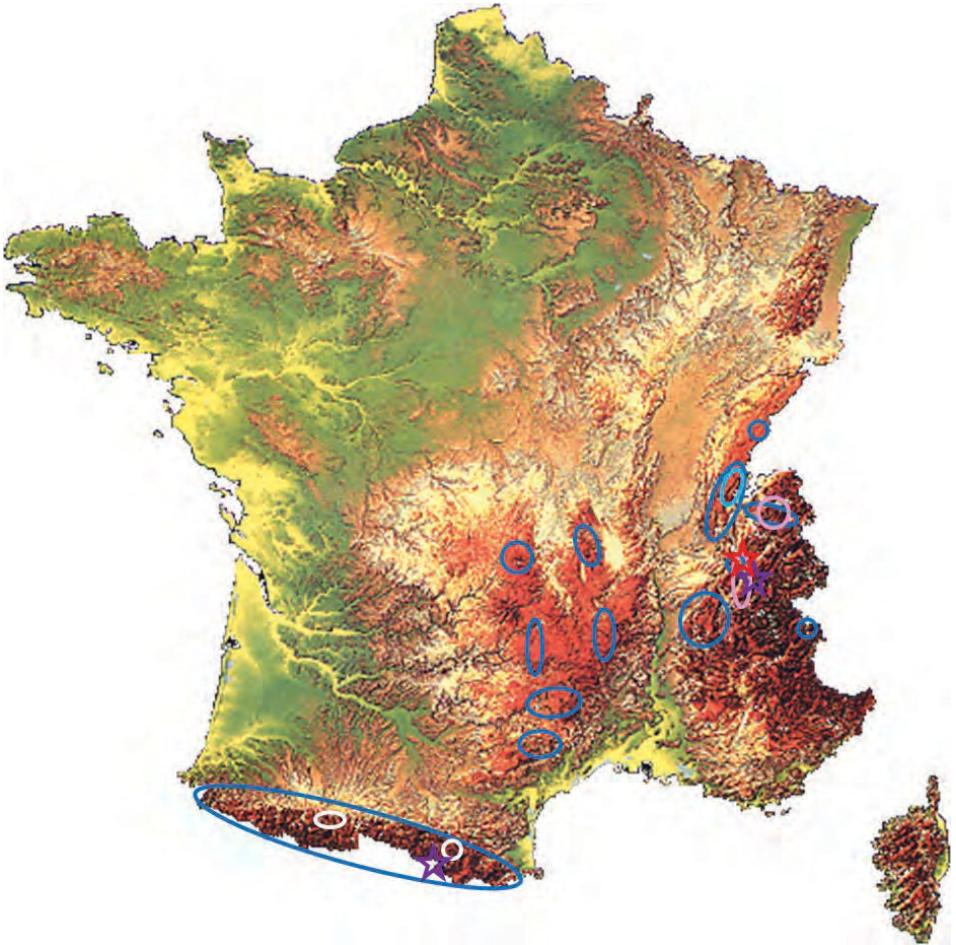


Figure 1: Distribution of *Pinguicula grandiflora* subsp. *grandiflora* (blue circles), *P. grandiflora* subsp. *rosea* (pink circles), *P. grandiflora* f. *pallida* (light blue circle), *P. grandiflora* f. *chionopetra* (white circles), *P. × scullyi* (violet stars), and *P. × gresivaudanica* (red star).

At the Tourbière de la Grande Côte bog, *P. × gresivaudanica* grows along a little stream among *Carex davalliana* Sm. (Cyperaceae) and *Equisetum* sp. (Equisetaceae), under pines and some willows and *Amelanchier ovalis* Medik (Rosaceae). *Pinguicula grandiflora* subsp. *rosea* and *P. vulgaris* subsp. *vulgaris* can be found in sunnier places, in a *Caricion davallianae* bog, sometimes dominated by *Phragmites australis* (Cav.) Steud. (Poaceae). *Pinguicula alpina* L. is also found growing near this site.

Relationship: The hybrid is morphologically close to *P. × scullyi* and *P. grandiflora* subsp. *grandiflora*. Both hybrids have long been mistaken for *P. grandiflora* subsp. *grandiflora*, explaining why *P. × gresivaudanica* remained unknown even if its localities were well botanized.

The hybrids of the two subspecies of *P. grandiflora* with *P. vulgaris* can be distinguished at first sight from their respective parent species by a corolla angle that is intermediate between both

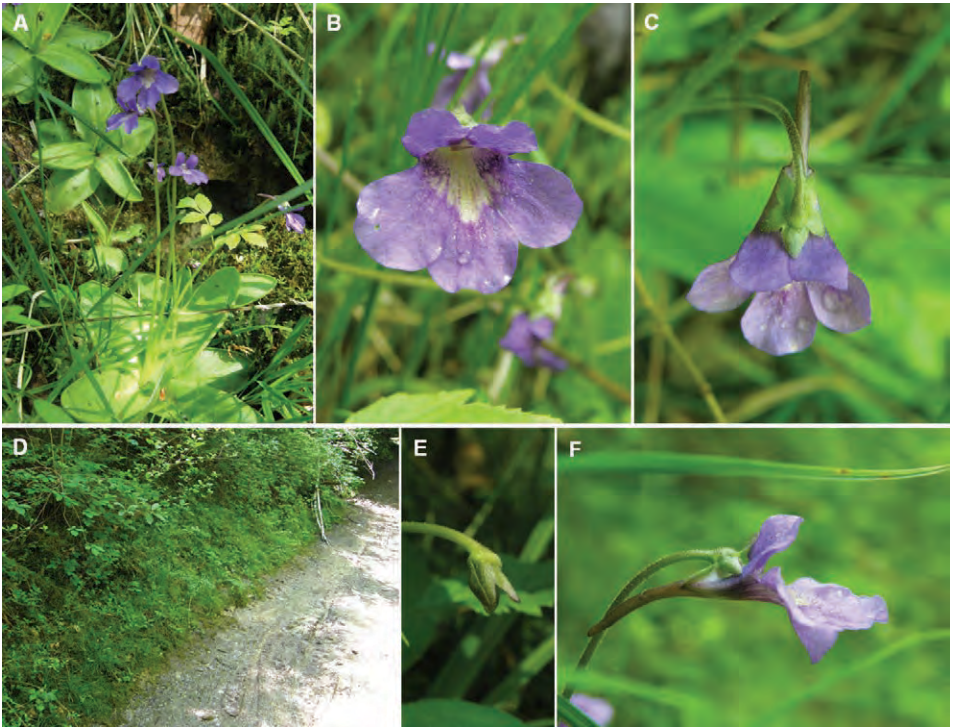


Figure 2: *Pinguicula* × *gresivaudanica*. A: habit; B: front view of the flower; C: view from above; D: habitat; E: fruit at maximum development; F: lateral view of the flower. All pictures were taken at the type location.

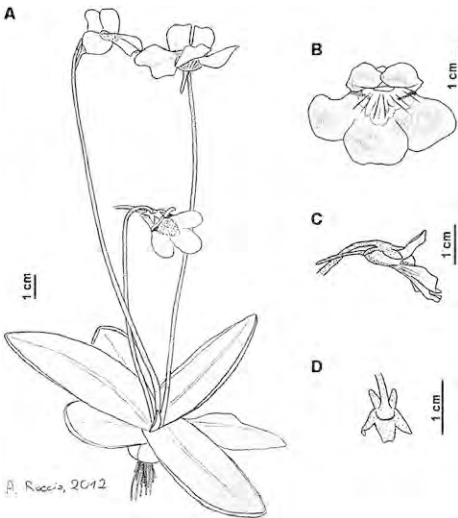


Figure 3: *Pinguicula* × *gresivaudanica* from the type location. A: habit; B: front view of the flower; C: lateral view of the flower; D: calyx.

parents (Fig. 4 and Table 1). They bear a well-defined palate macula similar to the one of *P. grandiflora* subsp. *grandiflora* but it is rounded in the hybrids and rectangular in this subspecies. It is noteworthy that *P. × gresivaudanica* has corolla lobes that are constantly as long as wide whereas they are constantly wider than long in *P. grandiflora* subsp. *rosea* and longer than wide for the lower lip lobes in *P. grandiflora* subsp. *grandiflora* and *P. vulgaris* subsp. *vulgaris*. The spur of *P. × gresivaudanica* is also more curved downwards than in *P. grandiflora*, a character reminiscent of the spur found in *P. vulgaris*. *Pinguicula × scullyi* has flowers of a dark violet such as those of *Pinguicula vulgaris* subsp. *vulgaris* whereas *P. × gresivaudanica* has a lavender to Persian blue corolla, quite intermediate in color between *P. grandiflora* subsp. *rosea* and *P. vulgaris* subsp. *vulgaris*. The

outer side of the corolla tube has the same color as the corolla lobes and spur in *P. × scullyi* whereas it is whitish in *P. × gresivaudanica*.

At its type location, *P. × gresivaudanica* grows along with a very few pale *P. grandiflora* subsp. *rosea* that tend to disappear because of the lack of luminosity in this shaded place. At the Tourbière du Bois de la Belle Aiguette, a single plant of the hybrid was found growing behind a small birch under a pine, where it does not receive any direct sunlight. Only 50 cm away, in direct sunlight, one can find *P. grandiflora* subsp. *rosea* and *P. vulgaris* subsp. *vulgaris*, both parents of this hybrid. Nearby in this same bog, *P. vulgaris* subsp. *vulgaris* grows sympatrically with *P. grandiflora* subsp. *grandiflora* and there, some *P. × scullyi* can be found. At its only known site in the Chartreuse massif, namely Tourbière de la Grande Côte, *P. × gresivaudanica* grows in absence of any of the putative parent species, but *P. grandiflora* subsp. *rosea* occurs in a bog at 20 m distance, and *P. vulgaris* subsp. *vulgaris* at 120 m distance. Ten years ago, *P. grandiflora* subsp. *rosea* was known to be much more widespread than today in this site (pers. comm.). It is possible that the hybrid once grew among the parental species and that rock movements and closure of the biotope led to the separation of the three taxa in this habitat of continuously moving screes with rapid movements.

The presence of *P. grandiflora* subsp. *rosea* growing sympatrically with or very close to *P. × gresivaudanica* at the three known locations of the hybrid, supports the assumed parentage. The second assumed parental species, *P. vulgaris* subsp. *vulgaris* is found growing sympatrically with or close to the hybrid in two of its three known sites. It is important to note that both *P. grandiflora* subsp. *rosea* and *P. vulgaris* subsp. *vulgaris* flower at the same period in their common locations. It is very unlikely that *P. grandiflora* subsp. *grandiflora* is one of the parents of this hybrid instead of *P. grandiflora* subsp. *rosea*, as the former is not known to grow at two of the three hybrid locations whereas in the last site it grows further distant. It is noteworthy that *P. × scullyi* is also known to

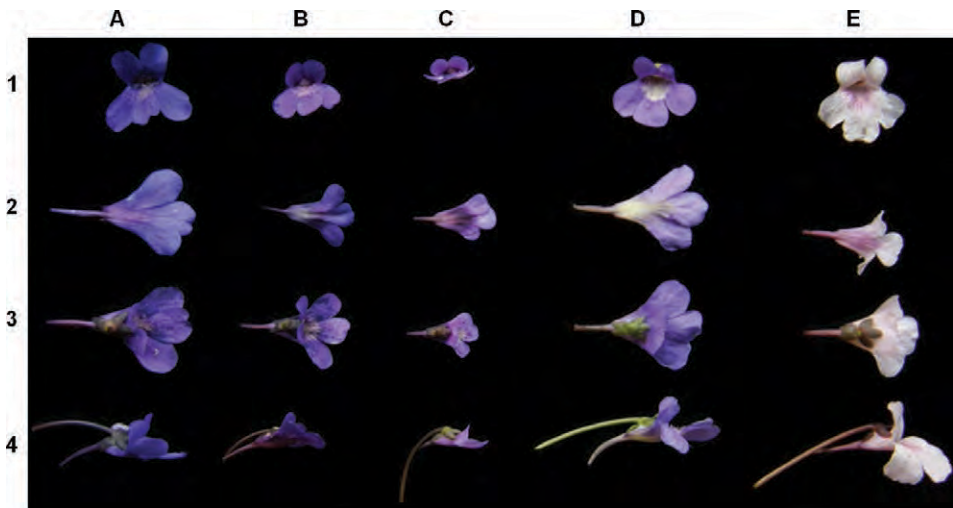


Figure 4: Comparative photographs of the studied species. Row A: *Pinguicula grandiflora* subsp. *grandiflora*; B: *Pinguicula × scullyi*; C: *Pinguicula vulgaris* subsp. *vulgaris*; D: *Pinguicula × gresivaudanica*; E: *Pinguicula grandiflora* subsp. *rosea*. Line 1: frontal view of the flower; 2: view from below; 3: view from above; 4 lateral view. All specimens are from the Tourbière du Bois de la Belle Aiguette, except *Pinguicula × gresivaudanica* that is from its type location. Photographs were taken according to Steiger, 1976. All flowers used for this figure are deposited in the voucher MHNGr.2012.35966.

grow in this bog and can be distinguished from *P. × gresivaudanica* (see above, Fig. 4 and Table 1). However, because *P. × gresivaudanica* occurs in shady places that are seemingly not suitable for either of the parental species, it is possible that new localities of the hybrid will be found where *P. grandiflora* subsp. *rosea* and *P. vulgaris* subsp. *vulgaris* would be absent, as it begins to happen in the site in the Chartreuse range.

Sterility: Flower visitors of this plant have been studied at the type location. Small insects belonging to the bee genus *Halictus* (Halictidae) (sweet bees) were observed entering and getting out of a flower to visit another in search of nectar or pollen (Fig. 5). However, returning to the site one month later, no seedpods could be found. It seems that ovaries of this plant soon desiccate after the corolla has been shed (Fig. 6). It is not a matter of environmental conditions as *P. grandiflora* subsp. *rosea* of this site do produce mature seedpods and seeds. During this study, it was also observed that *P. × scullyi* does not produce mature seedpods nor seeds while all other taxa, except *P. × gresivaudanica*, at the same location do make seeds.

Cultivation specimens of the plant studied in this article were also observed for this character. Flowers were hand-pollinated but only two mature capsules out of six pollinated flowers were obtained. However, those seedpods did not contain any seeds. So it is very likely that this plant is totally sterile, not a single seed grain could be observed, neither in *in situ* specimens nor in *ex situ* hand-pollinated plants. The infertility of a hybrid between *Pinguicula grandiflora* and *Pinguicula vulgaris* was predictable as both parents have different chromosome numbers, leading in a triploid sterile hybrid.

Although *P. × gresivaudanica* cannot reproduce in a sexual way, it produces many plantlets by gemmae formation around the winter hibernacula. This production is even greater than in *P. gran-*



Figure 5: Flower visitor of *Pinguicula × gresivaudanica*. A: the *Halictus* sp. on the flower lower lip after landing; B: the *Halictus* sp. visiting the corolla tube. Pictures were taken at the type location.

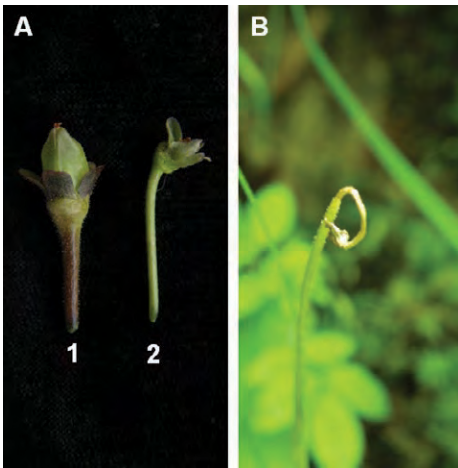


Figure 6: Different views of seedpods. A: Capsules at maximal development stage (1: *Pinguicula grandiflora* subsp. *rosea*; 2: *P. x gresivaudanica*), both have approximately the same age; B: typical drying *P. x gresivaudanica* seedpod. All plants are from the type location.

hybrid involving *P. grandiflora* subsp. *rosea* ($2n=32$ (Casper & Stimper 2007)) and *P. vulgaris* ($2n=64$ (Casper & Stimper 2007)) would be of $2n=48$. Thus, I assume that the real chromosome number of this plant is 48. This important fact supports the hybrid origin of *P. x gresivaudanica*.

Conservation: The total number of flowering plants of *P. x gresivaudanica* observed in its three known locations do not exceed 50 individuals. Thus, this taxon can be considered as “Critically Endangered” (CR) D following IUCN criteria. Moreover, as it only reproduces vegetatively, it cannot pretend to colonize new habitat as easily as its parents. Logging activities may represent a real danger. As *P. x gresivaudanica* tends to grow in shade, clearings in its habitat may be damageable (even if a single plant has been found in semi-shaded area in the Chartreuse site so that this taxon may survive in not so degraded conditions). In addition, grazing pressure has also shown to be damageable for *P. x gresivaudanica* and thus may be limited and/or plants protected from grazing.

Conclusion

The presence of *P. grandiflora* subsp. *grandiflora* in northern French Prealps may be overestimated due to confusion with *P. x gresivaudanica*. This hybrid is only known from three sites but its occurrence has not been studied in Haute Savoie where it is very likely to grow. Due to the very low number of flowering plants observed, it is considered as critically endangered following IUCN criteria.

Acknowledgements: The author would like to thank the Conservatoire Botanique National Alpin, the Parc Naturel Régional de Chartreuse and the Réserve Naturelle des Hauts de Chartreuse for permits to collect living material of protected taxa and on protected areas (arrêtés préfectoraux n° 2012-072-0045, DDT/SEEF n°2012-205 and n°2012-160-0024). The author also acknowledges R. Stimper for giving hints on kariotype preparation, and A. Fleischmann and F. Rivadavia for advice on this article. A. Fleischmann is also thanked for the flower visitor identification. Julie Delavie, cu-

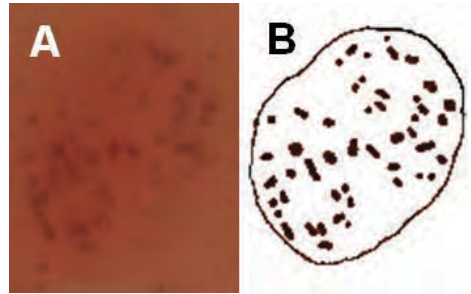


Figure 7: Karyotype of *Pinguicula x gresivaudanica* showing 48 chromosomes. A: light microscope photograph; B: interpretation drawing.

diflora and plantlets become adult in a much shorter time than for the species (pers. obs.).

Chromosome number: The chromosome number was difficult to obtain for *P. x gresivaudanica* due to the tiny size of the mitotic chromosomes, as in most butterwort species. However, most results gave a number between 40 and 50 (Fig. 7). The expected number for a

rator of the Muséum d'Histoires Naturelles de Grenoble herbarium, is also thanked for her advices on herbarium specimens.

Appendix

Other specimens examined:

- Pinguicula grandiflora* Lam. subsp. *grandiflora*; FRANCE. Tourbière du Bois de la Belle Aiguette (Saint Pierre d'Allevard, Isère, France), 16 June 2012, *Roccia*, *MHNGr.2012.35966* (GRM)
- Pinguicula grandiflora* Lam. subsp. *rosea* (Mutel) Casper: FRANCE. Crêt de Chazay (Les Adrets, Isère, France), 26 May 2012, *Roccia*, *MHNGr.2012.35959* (GRM); Tourbière de la Grande Côte (Chapareillan, Isère, France), 28 May 2012, *Roccia*, *MHNGr.2012.35961* (GRM); Tourbière du Bois de la Belle Aiguette (Saint Pierre d'Allevard, Isère, France), 16 June 2012, *Roccia*, *MHNGr.2012.35963* (GRM); Tourbière du Bois de la Belle Aiguette (Saint Pierre d'Allevard, Isère, France), 16 June 2012, *Roccia*, *MHNGr.2012.35966* (GRM).
- Pinguicula vulgaris* L. subsp. *vulgaris* L.: FRANCE. Tourbière de la Grande Côte (Chapareillan, Isère, France), 28 May 2012, *Roccia*, *MHNGr.2012.35962* (GRM); Tourbière du Bois de la Belle Aiguette (Saint Pierre d'Allevard, Isère, France), 16 June 2012, *Roccia*, *MHNGr.2012.35964* (GRM); Tourbière du Bois de la Belle Aiguette (Saint Pierre d'Allevard, Isère, France), 16 June 2012, *Roccia*, *MHNGr.2012.35966* (GRM).
- Pinguicula* × *gresivaudanica* Roccia: FRANCE. Crêt de Chazay (Les Adrets, Isère, France), 16 June 2012, *Roccia*, *MHNGr.2012.35966* (GRM)
- Pinguicula* × *scullyi* Druce: FRANCE. Tourbière du Bois de la Belle Aiguette (Saint Pierre d'Allevard, Isère, France), 16 June 2012, *Roccia*, *MHNGr.2012.35965* (GRM) ; Tourbière du Bois de la Belle Aiguette (Saint Pierre d'Allevard, Isère, France), 16 June 2012, *Roccia*, *MHNGr.2012.35966* (GRM)

References:

- Casper, S.J. 1966. Monographie der Gattung *Pinguicula* L. Bibliotheca Botanica 127/128: 1-209.
- Casper, S.J., and Stimper, R. 2007. Chromosome numbers in *Pinguicula* (Lentibulariaceae): survey, atlas, and taxonomic conclusions. *Plant Syst. Evol.* 277: 21-60.
- Compostella, C., Beretta, M., and Caccianiga, M. 2010. *Pinguicula grandiflora* (Lentibulariaceae), specie nuova per la flora italiana. *Informatore Botanico Italiano* 42(1): 63-66.
- Druce, G.C. 1922 Secretary's Report for 1922. The Botanical Society and Exchange Club of the British Isles 6: 159.
- Gaudin, I. 1828. Sive Historia stirpium hucusque cognitarum in Helvetia et in tractibus conterminis aut sponte nascentium aut in hominis animaliumque usus vulgo cultarum continuata. Turici. Sumptibus Orellii, Fuesslini et Sociorum. Vol. I.
- Heslop-Harrison, Y. 2004. *Pinguicula* L. *Journal of Ecology* 92: 1071-1118.
- Nelson, E.C. 1993. White-blossomed *Pinguicula grandiflora* Lam. (Lentibulariaceae) in the Burren, County Clare, Ireland. *Watsonia* 19: 273-275.
- Partrat, E. 2001. *Pinguicula* × *scullyi*. http://www.pinguicula.org/pages/plantes/pinguicula_x_scullyi.htm, accessed 7 March 2013.
- Rodondi, G., Beretta, M., and Andreis, C. 2010. Pollen morphology of alpine butterworts (*Pinguicula* L., Lentibulariaceae). *Review of Palaeobotany and Palynology* 162: 1-10.
- Steiger, J.F. 1976. Standardized photography of *Pinguicula* blossoms. *Carnivorous Plant Newsletter* 7: 43-50.

Steiger, J.F. 1998. *Pinguicula* (Lentibulariaceae): the cool climate species of the Northern hemisphere. Morphology, biology, cultivation. 2nd International Conference of the International Carnivorous Plant Society, ICPS, Fullerton, California, USA, 1-16.

Wettstein, F. 1919. Floristische mitteilungen aus den Alpen. Österreichische Botanische Zeitschrift LXVIII (11-12): 295-296.

Yildirim, H., Şenol, S.G., and Pirhan, A.F. 2012. *Pinguicula habilii* (Lentibulariaceae), a new carnivorous species from South-West Anatolia, Turkey. Phytotaxa 64: 46-58.



CASCADE CARNIVORES

Carnivorous Plant Nursery

- ***Drosophyllum lusitanicum***
- Yes, we ship Dewy Pine plants - live delivery guarantee
- ***Nepenthes***
- highland species are our specialty
- ***Drosera, Pinguicula, Utricularia, Byblis, Heliamphora, VFTs and more***

Visit us on the web - www.cascadecarnivores.com
phone - 425.336.1420 email - support@cascadecarnivores.com



ExoticPlantBooks.com



Two NewField Guides



Genlisea



Dionaea
The Venus's Flytrap

Low Prices - Fast Shipping - Easy Ordering

1-855-838-2233 | info@exoticplantbooks.com

C Z P

WWW.CZPLANTS.COM

carnivorous & exotic plants



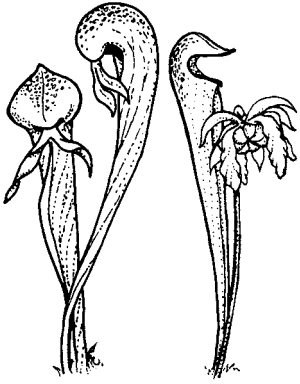
CARNIVOROUS PLANT NEWSLETTER

Journal of the International Carnivorous Plant Society

Volume 42, No. 2

June 2013

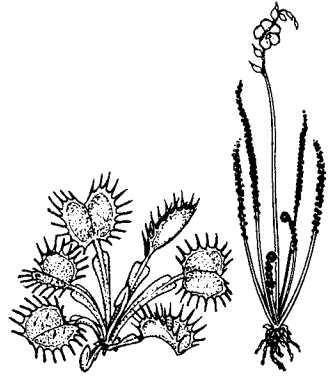




CARNIVOROUS PLANT NEWSLETTER

Journal of the International
Carnivorous Plant Society
www.carnivorousplants.org

Volume 42, Number 2
June 2013



Front Cover: *Pinguicula x gresivaudanica* growing in the French Alps. Photo by Aymeric Roccia. Article on page 36.

Back Cover: *Aldrovanda vesiculosa* var. *rubescens* (A. Cross & L. Adamec) from southwest Western Australia, displaying a gradient of coloration due to variable sun exposure. All individuals originate from the same maternal plant, but have been independently grown from left to right in full sun, 50%, 70%, and 90% shade. Photo by Adam Cross. Article on page 57.

Carnivorous Plant Newsletter is dedicated to spreading knowledge and news related to carnivorous plants. Reader contributions are essential for this mission to be successful. Do not hesitate to contact the editors with information about your plants, conservation projects, field trips, or noteworthy events. Advertisers should contact the editors. Views expressed in this publication are those of the authors, not the editorial staff.

All correspondence regarding dues, address changes and missing issues should be sent to the Membership Coordinator at the ICPS. Do not send such correspondence to the editors. Checks for subscriptions should be made to the ICPS in US funds. Dues for 2013 are \$35 for the first year of membership; renewals are \$30 per year.

ICPS, Inc.
2530 Patra Drive
Richmond, CA 94803, USA
icps@carnivorousplants.org

President
Vice President
Secretary/Treasurer
Board Member
Board Member
Board Member
Board Member

Michael Baldwin, michael@carnivorousplants.org
Marcel van den Broek, marcel@carnivorousplants.org
Richard Myers, richard@carnivorousplants.org
Brian Barnes, Conservation Director, brian@carnivorousplants.org
Richard Nunn, richardnunn@carnivorousplants.org
Jan Schlauer, jan@carnivorousplants.org
Bob Ziemer, bob@carnivorousplants.org

Administrator
Seed Bank Manager

Cindy Slezak, cindy@carnivorousplants.org
John Brittner, john@carnivorousplants.org

CPN Editors
Managing Editor
Editor
Science Editor
Science Editor

editor@carnivorousplants.org
Bob Ziemer
Barry Rice
Fernando Rivadavia
Jan Schlauer

Date of effective publication of the March 2013 issue of Carnivorous Plant Newsletter: 25 February 2013.

The ICPS is the International Cultivar Registration Authority (ICRA) for the names of cultivated carnivorous plants according to the International Code of Nomenclature for Cultivated Plants. Send relevant correspondence to the ICPS, Inc.

Carnivorous Plant Newsletter is published quarterly in March, June, September, and December by the ICPS, Inc., 2530 Patra Drive, Richmond, CA 94803, USA. Periodicals postage paid at Richmond, CA and additional mailing offices. Postmaster: Send address changes to ICPS, Inc., PMB 322, 1564-A Fitzgerald Drive, Pinole, CA 94564-2229, USA. Printed by Allen Press, Inc., 810 E. 10th Street, Lawrence, KS 66044. Logo and masthead art: Paul Milauskas. © 2013 Carnivorous Plant Newsletter. All rights reserved. ISSN #0190-9215