

## PINGUICULA gigantea.

SPECIES NOVA A H. LUHR'S DESCRIPTUS ET SPECIMINA A S. LAMPARD ILLUSTRATA

Habitus in rupibus humidis, in declivibus apricis montium NOVÆ HISPANIÆ  
adhuc in civitatibus OAXACA, prope AVAUTLA hinc inde invenit.

# INTERNATIONAL PINGICULA STUDY GROUP

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## AIMS OF THE I.P.S.G.

1. To meet with other collectors of the species and primary hybrids.
2. To provide a forum for the exchange of information between any interested parties.
3. To assist exchange of seeds internationally.
4. To encourage the use of botanically correct names.
5. To encourage accurate record keeping.
6. To re-introduce "lost species" to cultivation.
7. To encourage the production and selection of new primary hybrids.
8. To encourage and help the conservation of plants in their natural habitats in all countries.

## MEMBERSHIP DETAILS AND BENEFITS:

Two Newsletters will be produced annually, in Spring and Autumn.  
Articles are welcome from members covering all aspects of interest, such as cultivation, taxonomy, ecology and conservation of *Pingicula*.  
Copy deadlines are January 31st, for Spring & July 31st for the Autumn Newsletter.

Membership is acknowledged upon payment of an annual subscription in advance of:

- £6 by UK MEMBERS,
- £7 by EU MEMBERS,
- £8 by REST OF WORLD.

Cheques should be made payable to:  
"International Pingicula Study Group" and sent to Phil Wilson.  
For details of rates in other currencies please contact Phil.  
Phil also has a stock of back issues, please enquire for details.

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## EDITORIAL

S.E. Lampard

Welcome to IPSG. I am pleased at long last to bring to you this, our eighth Newsletter. I apologise to you all for the protracted delay in doing so, particularly those authors who have contributed articles, expecting them to appear in print sometime during 1996.

The restructuring of IPSG has required much thought and lengthy discussion, in which you were all invited to take part. The outcome of the new method of payment by advance subscription, will be that IPSG should be financially self sustaining. As a consequence, we will be able to plan ahead more effectively and aim to keep closely to our publication dates.

Almost as soon as agreeing to take on the responsibility of editing the IPSG Newsletter, changes in Ron's work circumstances began to loom on the horizon. 1995/6 was an incredibly difficult year for him, culminating in his decision to accept a challenging move to Taiwan. This means that he is no longer able to play an active part in running IPSG. Since the formation of IPSG Ron has been very active indeed, I must thank him greatly both personally, for his friendship, support and initiative in the development of IPSG and on behalf of everyone for his sheer hard work as Membership Secretary during IPSG's first four years and as Editor for the past year.

I must thank Phil Wilson for volunteering to take on the job of Membership Secretary, in spite of his already heavy workload as editor of the UK Carnivorous Plant Society Journal. Chris and Loyd continue to offer their services as seed exchange co-ordinator and Internet co-ordinator on our behalf, while I have resumed the role of editor.

Newsletter 8 is special for a number of reasons, notably for the breadth of coverage including as it does, major articles on plants from three different Continents, including four new taxa. It contains more illustrations and photographs than others before, though most of these have been reproduced in black and white to keep within our budget. However, the most significant step forward is with the inclusion of the paper by J.H. Rondeau & Jurg Steiger in which the new taxon: *Pinguicula macroceras* subsp. *nortensis* is formally described.

I thank the authors for their immense efforts and hope that IPSG proves to be a worthy vehicle.

Finally, I have been consulted by Madeline Groves who co-edits the World Conservation Union's 'Carnivorous Plant Specialist Group News'. She has asked for IPSG members to produce a list of the top 10 recommendations for conservation / research projects in connection with threatened Butterworts. If it leads to some positive action, we should try to support it. So let's have some ideas now.

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## *Pinguicula macroceras* subsp. *nortensis*, a new subspecies of *Pinguicula* (Lentibulariaceae) from the California-Oregon border

J. Hawkeye Rondeau, PhD; 37 Sunnyslope Avenue, San Jose, Ca. 95127, USA

Jürg F. Steiger, MD; IAWF, University of Bern, Inselspital 37a, CH-3010 Bern, Switzerland

**Abstract:** *Pinguicula macroceras* subspecies *nortensis*, a new taxon with a limited distribution along the westernmost sector of the California-Oregon border. It differs from related taxa in the shape of the calyx and corolla lobes, and in the characteristic pubescence found on the lower lip and throat regions. Distribution is markedly disjunct from *P. macroceras* with the nearest known populations in north-eastern Oregon, 600 km (370 mi.) and south-central Washington, 500 km (310 mi.).

### *Pinguicula macroceras* Link subsp. *nortensis* J. Steiger & J. H. Rondeau, subsp. nov.

*Differt a typo foliis tenuioribus; lobis calycinis obtusatis; corolla aliquantum pallidior; lobis corollae aliquantum angustioribus, non imbricatis, plus oblongis quam obovatis (typus: lobis plus obovatis quam oblongis); longitudine corollina calcar incidente 13-21 mm, calcar 6-11 mm; pubescencia in corona labii inferioris corollae uniformiter capitata cum 3-6 segmentis fere aequilongis, pubescencia faucis cum 3 segmentis basalibus longis angustisque capitatis cum 1 segmento tulpiiformi et 6-7 segmentis terminalibus ellipticis, segmentum ultimum saepe divisum, pubescencia tubi brevior, segmentis terminalibus diminuentibus et aliquibus segmentis ultimis apiculatis; capsula globosa calycem vix superans. Hab. in scopulis humidis et umbratis (raro in paludibus) Californiae septentrionalis et occidentalis et Oregonae austro-occidentalis. Habitatiorne saxicola (ophiolitica) et distributione geographica disjuncta distincte circumscripta. Floret IV-VI (VII). Chromosomata 2n=64.*

Differing from type species *macroceras* in that the calyx lobes are blunt-tipped; the central corolla lobe is oblongate and lateral lobes are oblong to obovate and not overlapping. Corolla length is 13-21 mm (including spur); spur 6-11 mm. Pubescence on crown of the lower lip is uniformly capitate with 3-6 terminal segments of nearly equal size; pubescence in throat region has 3 long and narrow basal segments capped by one tulip-shaped and then 6-7 elliptic-shaped terminal segments, the ultimate segment is often centrally divided; pubescence in the tube area is shorter, with the terminal segments becoming increasingly smaller with some ultimate segments nearly acute-tipped. Grows on wet and shaded rocks (rarely in swampy meadows) of northwestern-most California and southwesternmost Oregon. It is well characterized by its petrophilous affinity (to serpentine) and its disjunct, well defined distribution. Flowers April-June (July). Chromosomes: 2n=64 (det. Steiger); initially reported as 2n=32 (Steiger 1975).



**Etymology:** from Norte-ensis, belonging to this northernmost coastal county of California (Del Norte), where the subspecies was first noted.

**Holotype:** Del Norte Co., S. Fork Smith River, Hiouchi, at Sheep Pen Creek x Douglas Park Rd. [T16N-R1E-sw1/4-sw1/4 sec 10], 100 m, J. Steiger, May 7, 1971. Holotype: BERN95/2; photocopies (slides) of same site: BERN sj71.10-sj71.19, partly published in Steiger 1978 and 1982, also available in the Carnivorous Plant Database of the Web at <http://www.hpl.hp.com/bot/cp\_home> or <http://www.192.6.19.66/bot/cp\_home> (query for 'Pinguicula').

**Isotypes:** 4/12/29 D. Kidare, 179461 (DS), 4/15/32 Parks & Parks, 238540 (DS), 4/12/66 D. Forbes, 477382 (CAS), 5/19/62 D. Anderson, 15316 (HSC), D. Anderson & J. Smith Jr., 01914 (HSC).

## Observed and reported sites

### California, Del Norte Co.

**Sites observed:** (Details on holotype site see above). Hiouchi (S. Fork Rd., mm 8.62 & 8.71); Stony Creek x N. Fork Smith River [T17N-R2E-se 1/4 sec 16 sw 1/4 sec 15], Middle Fork Gasquet Rd. 0.5 mi N. of Gasquet [T17N-R2E-sw 1/4 sec 21]; Pioneer Rd. x Hwy 199 (Gasquet); Siskiyou Co.: Cracker Meadow [T17N-R2E-sw 1/4 sec 9].

**Sites reported:** Darlingtonia Bog RNA, N-Fk, Sm R, [T18N-R1E-sec 24.25, 36] (T. Jimerson, USFS, Crescent City); Below Brown's Mine [T18N-R1E-sec 28] (York & Baker, NDDB, Sac. Ca.); On Wimer Rd. [T18N-R2E-sec 4] (York & Baker, NDDB, Sac. Ca.); Diamond Creek [T18N-R2E-sec 9, 15, 16] (W. Rolfe, NDDB, Sac. Ca.); mm 8.9, [T15N-R2E-sec 5 & 23], near Big Flat Stat. Cpgd, Gasq.-Oleans Rd./FS 15N01, mm 5.55, [T14N-R2E-sec 6] (Changaris & Bonar, ICPS).

### California, Siskiyou Co.

**Sites reported:** Poker Flat [T18N-R6E-sw 1/4 sec 20] 1597 m, (L. Janeway, NDDB, Sac. Ca.); Youngs Valley [T17N-R5E-sec 15] 1533 m; Preston Peak [T17N-R5E-sw 1/4 sec 22] 1661 m near Raspberry Lake (B. Williams, USFS, Klamath).

### Oregon, Josephine Co.

**Sites observed:** Eight Dollars Mt. Rd. (FS 4201) [T39S-R9W-se sec 25]; Days Gulch at Josephine Creek [T39S-R9W-nw sec 36].

**Sites reported:** [T38S-R8W-sec 20 1/4 ne] seep crosses 4201 ~ 1 mi. E of bridge ~2600; Josephine Cr. W of Illinois R. S.P., sec 25 nw 1/4 on jeep rd E of Cr., ~1600; sec 26 ne 1/4, E edge nr spring, N of Cr ~2000 (Anita Seda, USFS, Cave Junction, Or.); Rough & Ready Cr. [T40S-R4E-sec 13, nr Seals dam in ditch, ne sec 14; se sec 15] (B. Ullian, Grants Pass, Or.); Eagle Gap, [T38S-R9W-sec 17/20] also off FS 4201 (V. Stansell, USFS, Gold Beach).

### Oregon, Curry Co.

**Site reported:** Lemmingsworth Gulch-Packsaddle Mt. Trail, [T41-R11-s-4/33] (V. Stansell, USFS, Gold Beach).

## Distribution and Habitat

*Pinguicula macroceras* subsp. *nortensis* is consistently found in rocky (serpentine) perennial seeps and creek drainages, but only rarely in meadows. As many as 10'000 plants may be found on some of these very steep and often north facing slopes. Most populations are found along the Smith River and its many tributaries in California and southern Oregon, or along the Illinois River in Oregon ranging from 100 m to 600 m, but

a few colonies can be found as high as 1661 m in western Siskiyou County, California. The few associated species are as follows: *Sphagnum* sp., *Darlingtonia californica*, *Carex serratodens*, *Cypripedium californicum*, *Platanthera sparsiflora* and *Hastingsia ssp.*

## Relationships

In 1820 Link named a new butterwort species, *Pinguicula macroceras*, from Unalaska (Aleutian Islands) and characterized it primarily by its long spur (Link in Sprengel et al. 1820, Sprengel 1825). The type specimens, collected by Pallas and stored in Berlin, were destroyed during World War II. However specimens collected later by several botanists at the same locality are likely to be equivalents to those described by Link. In 1831 Chamisso found short spurred specimens in Unalaska and named those *P. microceras*. Observations of several northern *Pinguicula* species (e.g. *P. alpina*, *P. vulgaris*, *P. leucoceras*, and *P. balcanica*) has also revealed the presence of occasionally stubby spurred flowers, particularly in extreme climate zones or in years with adverse weather conditions. The same plant may have flowers with both long and short spurs. Therefore, Casper (1966) does not assign the *microceras* specimens the rank of species, subspecies, or variety.

Hultén (1948, 1960, 1968), Komiyu (1972) and some other authors asserted that *P. macroceras* was only a large flowered subspecies of *P. vulgaris*. In 1847/49 Ledebour added to Link's diagnosis the characteristics of the obovate corolla lobes and the obovate-subglobular seed capsules. Casper's research (1962) was based on measurements of several hundred flowers of both *P. macroceras* and *P. vulgaris*, and he found significant differences.

In the table on next page the *P. macroceras* figures were derived from "normal", long-spurred specimens, excluding "microceras" flowers, based on the findings of Casper (1962). Both *P. vulgaris* and *P. macroceras* are very variable species, sometimes not differing in single characteristics of single specimens, but distinctly different when comparing the total pattern of all characteristics in a larger population of specimens. Both species are classified within the same subgenus (*Pinguicula*) and within the same section (*Pinguicula*).

In North America *P. macroceras* remains within a maximum distance of about 750 km (465 mi.) from the Pacific coast, while *P. vulgaris* is more tolerant to continental climate conditions (several records from Siberia, where summer/winter isotherm amplitudes may have a range up to 65°C). It is mainly distributed in the central and eastern northern boreal regions of the continent. *P. vulgaris* reaches the Pacific only in the climatically demanding area near the Arctic Circle (approx. 66.5 degrees N. latitude). In northern British Columbia, Yukon Territory, and Alaska the distributions of both species appear to join or even to slightly overlap. It isn't yet clear if there is really a larger area where both species are sympatric. Future investigations of these regions will undoubtedly yield additional pertinent information. In Kamchatka and Japan *P. macroceras* grows within a maximum range of about 100 km (62 mi.) from the sea.

	<i>Ping. macroceras</i>	<i>Ping. vulgaris</i>
Flower length	18-27mm (spur included)	14-21mm (spur included)
Spur	6-9mm	3-6mm
Corolla lobes	obovate, broad rounded, often overlapping each other	oblong, usually not overlapping each other
Calyx	two lower tips only grown together to the half of their length	two lower tips grown together to 2/3 of their length
Seed capsule	ovate-subglobular	ovate-pyriforme (pear-shaped)
Distribution	amphi-boreo-pacific, avoids continental climate	Boreal North America, Greenland, Island, Eurasia
Substrate	granite, basalt, volcanic, usually not on calcareous soil	all sorts of substrate as acid bogs, granite, loam, calcareous swamps, pure limestone

Table 1: Main differences between *Ping. macroceras* and *vulgaris*

As Casper (1966) noted, the climatical distribution pattern of *P. macroceras* has similarities with the distribution pattern of *P. grandiflora* in Europe. Possibly *P. macroceras* has survived the ice ages in the Bering Sea region which had just entered into a continental phase at the beginning of the Quaternary. There it developed its specific 'oceanic-alpine' genomes enabling it to colonize the mountain ranges of both Pacific coasts. The high chromosome number ( $2n=64=8x$ ) reveals this species to be relatively young within the genus *Pinguicula* and made it adaptable to a rather wide range of ecological conditions. The octoploidy (basic number  $x=8$ ) is at least confirmed for the southern populations, both in Japan (Uchiyama 1990) as in the U.S. (*subsp. nortensis*).

The *subsp. nortensis* taxon was first published in 1975 by one of the authors (J.F.S.), based on the variation in the form of the corolla and calyx, the serpentine affinity, and the apparent geographic isolation, but was not formally validated by latin diagnosis. The planned publication of a more detailed paper was unexpectedly delayed because of the loss of almost all type specimens and paper files when his car was totally ransacked the day before shipping it back to Europe in 1971. However, in the interim he had determined that the chromosome number was  $2n=64$  (not  $2n=32$ , as erroneously indicated in 1975). In the nineties, the first author (J.H.R.) picked up these taxonomic threads while continuing research on 'Carnivorous Plants of the West Volume II'.

The disjunction of more than 500 km (~310 mi.) between the southernmost sites of *P. macroceras* in southern Washington and the distribution area of its *subsp. nortensis* (approx. 42-43 degrees N. latitude) is remarkable considering the extensive potential habitat existing throughout the Oregon Cascades. Or was it overlooked during many decades, still waiting to be discovered?

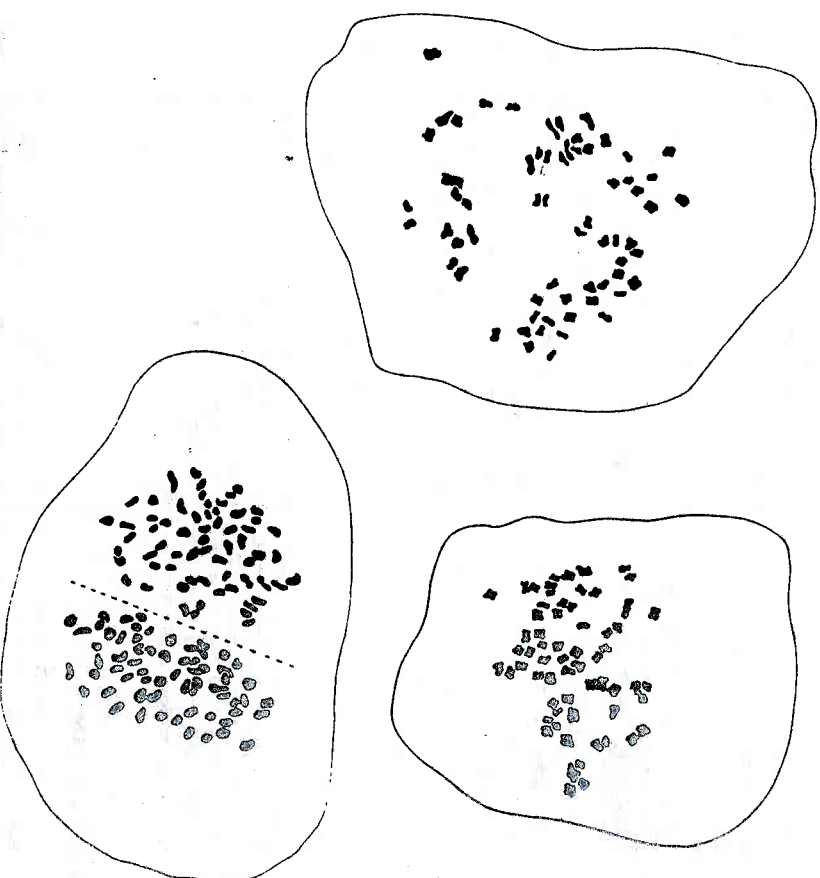


Fig. 1: Somatic chromosomes of *Ping. macroceras subsp. nortensis* from the typus site (root tips,  $2n = 64$ ). Top: 2 metaphases. Middle: Anaphase. Bottom: Anaphase, showing the two diverging chromosome sets (two pictures out of a multi layer shot series; the original photography gives more details than this photocopy).



In Japan the southern distribution of *P. macroceras* shows a similar pattern. With an isolated site in the Mie prefecture and one or two isolated sites on Shikoku Island, its range extends to 34 degrees N. latitude. It appears that the specimens at these southern Japanese sites have some morphological similarities with subspecies *notensis*. Due to suitable microclimatic conditions in shady, seepy, and often vertical rocky sites most southern *P. macroceras* populations on both sides of the Pacific are very petrophilous. Their serpentine or basalt habitats are quite similar to the calcareous habitats of the European *P. longifolia* and *P. vallisneriifolia* group.

The type of pubescence noted on the lower lip and within the corolla tube are extensively elaborated upon because they are believed to have taxonomic significance, as noted earlier by several authors (Sprengel 1825; Ernst 1961; Wood & Godfrey 1957; Godfrey & Stripling 1961; Casper 1966). A microscopic review of this feature in 1995 indicated that the pubescence, especially in the throat region, did vary significantly from that illustrated by Casper (1966) for *P. macroceras* (Rondeau 1995).

## Acknowledgements

Special thanks to Markus Bolliger (Bern), Patricia Geissler (Geneva), Kirk Martin (Klamath Falls), Craig & Carrie Breitong (McKinleyville), Anita Seda (USFS), Veva Stansell (USFS), Barbara Williams (USFS), Lisa Hoover and Tom Jimereson (USFS), Barbara Ullian (Siskiyou Regional Ed. Project), Mark Skinner (CNPS), Roxanne Bittman and Heather Townsend (NDDP), Donald Schneff, Joe Mazinias, Peter D'Amato, Bruce Bonar and Stephanie Changaris of the International Carnivorous Plant Society for their many contributions.

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## *Pinguicula crystallina* in SE Turkey Lubomir Adamec Czech Republic

*Pinguicula crystallina* is a European evergreen subalpine species distributed predominantly in the Troodos mountains in West Cyprus and has sometimes been considered endemic to Cyprus. However, it has also been collected very rarely in the past from the coastal region of S.E. Turkey, though the German herbarium material was destroyed in World War II.

During my holiday in 1991 I rediscovered this isolated population in the SE tip of Turkey at a site which is not more than 300km from that in Cyprus. During October I camped with my friends by the eastern coast of Iskenderun bay ca. 10 km south of the small district town of Uluçinar and ca. 40 km north of the Syrian border. Close by was the small fishing village of Konacık in the foothills of the steep mountain chain known as Nur Dağları. The mountain peaks rise to over 1500m as close as 2-3 km from the coast. Iskenderun bay belongs to the warmest parts of the Mediterranean Sea, with summer temperatures at the coast between 35-40°C, falling to around 10°C in winter.

About 1 km beyond the village we set out along a dry river bed or "vadi" heading eastward toward the mountains. The stony river bed narrowed and a stream appeared at the surface after about a half km which gradually got stronger. It became evident later on that the stream flows through a deep mountain valley, clearly visible from the coast. Two kilometres from the coast the stream had cut a deep and very narrow pass and it became very dangerous as we had to climb over rocks or along water pipes going along the pass. The pass came to an abrupt end about 2.5 km from the coast at an altitude of about 250m where we were met by a 5 metre high waterfall plunging into a deep pool. The pool was almost completely surrounded by vertical rock walls. Two of these walls were clothed with typical butterwort rosettes, the outline of the leaf-tips unmistakable as *P. crystallina*. Adult plants have a rosette diameter between 7-8 cm and much resemble the better known *P. primuliflora*. Only one plant was still in flower.

Here in this remarkable habitat there were just two stands with a total of between 500-1000 individuals. My friends claimed they had seen such plants on rocks a little further downstream and it is possible that it also occurs more abundantly in the upper reaches of the stream above the waterfall. Water trickled through the stands so that some plants had permanently wet leaves. The plants grew on the rock in a thin layer (10-15mm) of humus. Their fibrous roots were only 10-15mm long. The rock substratum was basaltic so it can be assumed that both water and humus were neutral. Growing in the deep dark pass, it is probable that the plants are never exposed to direct sunlight, and I estimate that only about 10-20% of the full irradiance penetrated to the level of the plants.

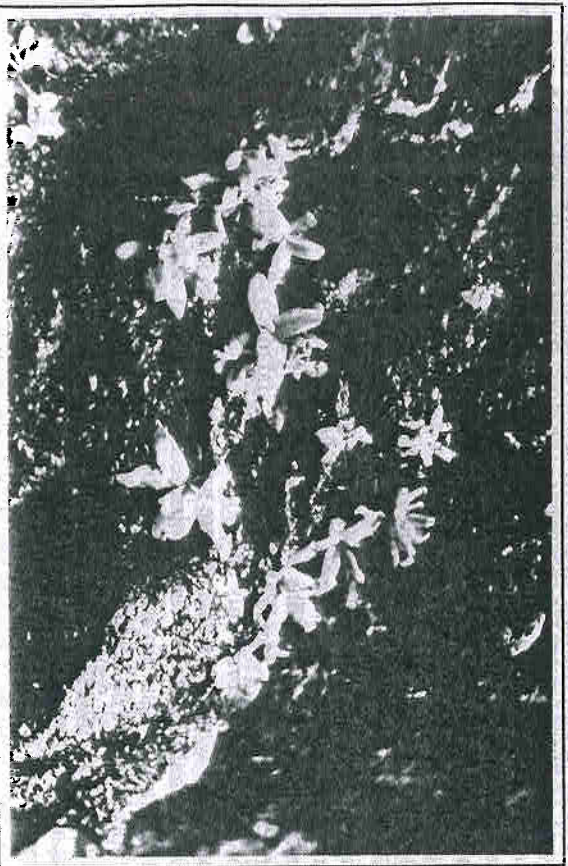


We can consider *P. crystallina* to be a very hygrophilous and rather sciophilous species, tolerant of only moderate fluctuations in temperature on both a daily and seasonal basis.

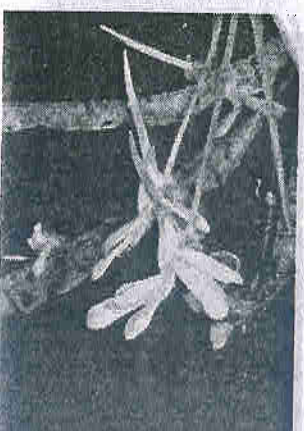
*Pinguicula crystallina* is clearly a highly susceptible and very demanding species, for which it has proved difficult to prepare suitable conditions in the greenhouse. I found them short-lived in cultivation at the Institute of Botany in Trebon. The three adult plants I collected flowered in the first two years, though capsules did not develop. The plants grew poorly, even though the roots were up to 25mm long, the old leaves decayed rapidly. Unfortunately, these and the three juvenile plants collected all died within three years.

I used a moderately alkaline soil mixture of fen soil and ground limestone and kept the plants well shaded and frequently sprayed with tap water. The key to more successful cultivation might be to use a very thin soil through which fresh water is allowed to percolate continuously to ensure that there is always sufficient oxygen at the roots.

Should any readers visit the SE tip of Turkey it would be of great interest to further investigate the distribution of this species.



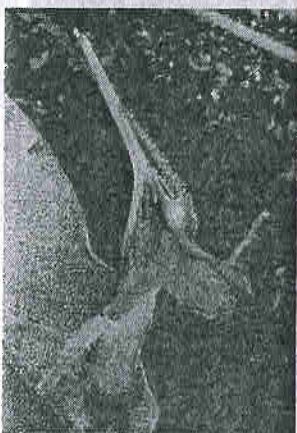
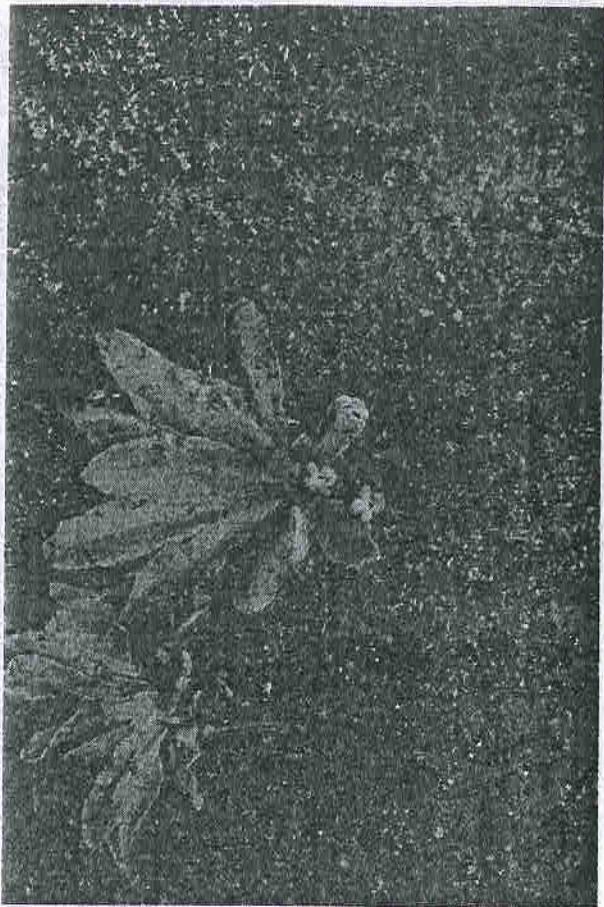
*Pinguicula crystallina* in SE Turkey



*Pinguicula vallisneriifolia*  
"Cerrada de Elias", Sierra de Segura.

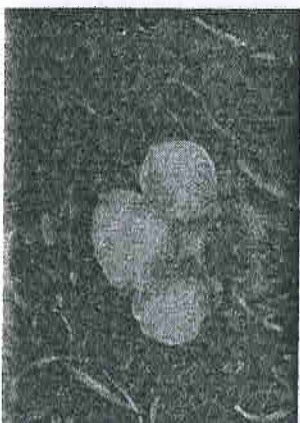
top: plants growing on the side of the gorge.  
bottom left: flower, front view  
bottom right: flower, side view





*Pinguicula mundi*  
"Nacimiento del Rio Mundo",  
Calar del Mundo.

top: plants growing on the vertical rock face.  
bottom left: flower, front view.  
bottom right: flower, side view.



*Pinguicula nevadensis*  
"Aguas verdes" & "Laguna del Majano",  
Sierra Nevada.

top: plants growing amongst sedges.  
bottom left: flower, front view  
bottom right: flower, side view



## THE DISCOVERY OF SPANISH BUTTERWORTS

(part 2)

(Continued from part 1, IPSG News No.5)

SLAVAYSSIÈRE

Neauphle-le-Château

FRANCE

Having arrived in Grenada early in the afternoon, our first aim was to have a quick glance at the site since we had no idea of what was awaiting us in the Sierra. Access was easy because the Spanish area very proud of their "Carratera la mas alta de Europa", the most elevated road in Europe, which rises to 3370m, close to the top of the *Pico de Velela*. We had no need to go higher than that since *Pinguicula nevadensis* is believed to grow at such an altitude around *Pico de Velela* and *Mulhacen*, twin peaks which rise with only a few hundred metres between them.

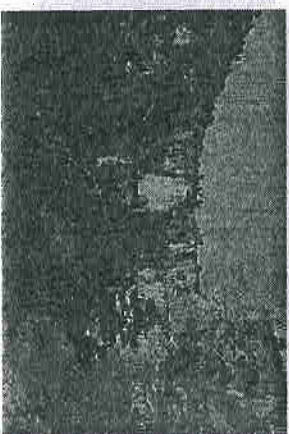
### Initial visit.

Immediately on leaving Granada the inexorable ascent begins. Even though long enough by car, it doesn't seem to discourage the many cyclists (Indurian syndrome !!). For the first eight kilometres the road passes through the suburbs of Granada ( *Lancha de Cenes*, *Cenes de la Vega*.. ) Upon leaving the urban area at 800m the vegetation is typically mediterranean: olive, orange, juniper, hawthorn and fig trees, the cactus *Opuntia ficus-indica*, and xerophytic herbs such as sage, lavender, rosemary and thyme. The last gas station, (not to be missed), is at the 22nd kilometre at 1600m. high. At the 31st kilometre at an altitude of 2100m is the ski resort. Above 2,500m the vegetation becomes sparse, with lichens and lithophytes such as saxifrages scattered between the schist rocks. Once and a while, some small moist depressions appear beside the road giving us some hope of finding

*P. nevadensis* in these green oases. The road finally ends about 20 metres from the summit of the " *Pico de Velela* " (3,394m); a windy and cold spot even at mid-afternoon in mid-summer. Thus we descend, convinced that our quest will be an easy one since the sites with potential for supporting *Pinguicula* seem to be both small in number and area.

The next day, taking advantage of the fact that we had some shopping to do in town, we paid a visit to a specialist bookstore ( address at end of article ) Here we acquired excellent maps ( 1/25,000 scale ) and read through a flora that displayed a picture of *P. nevadensis*. Though of poor quality, the picture showed the resemblance of this species to *P. vulgaris*, as much by its leaves as in its flower. As we expected, its habitat lies within the " *Borreguiles* ", the elevated moist lawns. So, we were finally ready for the next day.

Before going any further on the discovery of this plant, it will be useful to know more about its highly unique environment.



*Pinguicula submediterranea*

"Hoz de Beteta"

Serranía de Cuenca.

top: plants growing in crevices on vertical limestone cliff face.

bottom left: population in the shelter of shrubs beneath overhang.

bottom right: canyon, the butterworts are on the lower part of the cliff, right.



### Formation of the Sierra Nevada

The emergence of the Sierra Nevada dates back 20 million years ago and is a consequence of the collision of the African and Eurasian tectonic plates. The African plate has been elevated, with the result that the northern faces of the Sierra are more abrupt than the southern slopes. The basal rocks making up the mountain chain are metamorphic, formed 200 million years ago at the bottom of the "Tetis" ocean from siliceous sediments and animal remains which have now been transformed into graphite, explaining the dark grey colour of the present day schists. Equally numerous are the inlays of more recent materials (180 million years ago) : marble, granite, serpentine, gneiss, these latter ones having volcanic origin.

Even though the last period of glaciation 1 million years ago did not reach the Iberian peninsula, it significantly affected the original African savannah fauna and flora. Thus, the history of African, north European and Mediterranean influence, combined with the natural isolation caused by its great elevation, have transformed the *Sierra Nevada* into an 'island of evolution' supporting a flora and fauna with highly pronounced endemic characteristics.

### Climate

Because of the oceanic influence, generating eastward winds, combined with the proximity of the Mediterranean ( 50 km south ) and steep slopes, atmospheric conditions vary greatly from one spot to the next.

Since *P. nevadensis* is restricted to the most elevated summits , we need only consider conditions above 2,500 m.

January:	max. 2C
	min -10C
August:	max. 14C
	min 0C

A few lakes remain partially frozen until the end of June!

Virtually no rain falls in July and August, though there can be severe storms in May and June as well as September and October.

There is snow cover from October until May, sometimes June.

Thus prepared, we take off in the early afternoon, stopping for our first break beside a small mountain stream, 2,500m high up. It moistened a meadow spangled with small alpine flowers growing at ground level. These included Gentians, Campanulas, Ranunculus as well as the superb endemic *Plantago nivalis*, whose Spanish name "Estrella de las Nieves", meaning "snow star", gives an accurate description of its appearance. The prostrate leaf rosette is 10 cm in diameter and is made of triangular leaves covered with a whitish fleece. We searched here for *P. nevadensis* for an hour without success before moving on to higher altitudes. We spent the rest of the afternoon exploring all of the "Borregules" alongside the road without any luck.

A little discouraged, we walked along a stony track which deviated from the main road a couple of hundred metres from the summit of *Pico de Veleza*, heading towards *Mulhacen*. A short stop at the Felix Mendés mountain house next to the lakes called "Lagunas de Rio Seco" revealed nothing new to us, so we decided to keep going further to end our day-trip at "Laguna de la Calderera" a few hundred metres down the trail to the base of *Mulhacen*.

This site is much visited, since there were many cars parked beside the road and a few walkers circling the lake at the bottom of a kind of crater. Because of the lack of vegetation next to the lake, and our tired and aching legs, we decided to end our day's search. A last look at the map to decide where to resume our search the next day revealed the existence of a tiny lake 750m south of the road. The contour lines were well spaced indicating that the slopes were not steep, so we decided to head for that spot, knowing that the decreasing light intensity would not leave us much free time.

Luckily, we were descending, and right beyond a rocky spur, we noticed a wide expanse of green, facing south at an altitude of 2,950m, with small scattered pools and winding streams. A few Ibexes, surprised in the middle of their meal, watched us with distracted eye but didn't quit eating for long. We approached the site at a slow pace, finding again the same vegetation as before. Just at the point when we decided to finally return to the car, I narrowly missed treading on a tiny green rosette, just 3cm wide. There was no doubt that this really was a butterwort, it could only be *P. nevadensis* !

This was the first one to show up, then, as we got closer to the pools we found many more covering the spongy soil. By now we were on all fours in order to better appreciate our exciting find. This reassured the Ibexes which now encircled us, the more reckless ones grazing a couple of metres away from us !

The largest plants approached 5 cm in diameter, with leaves, some with a pinkish tint, curled at the margin to form an upward facing bowl. Numerous flower stems bore visible but fading flowers, with many seed pods ripening nicely. As they approach maturity, the ovoid seed pods develop a wine-red tint, becoming almost black as they open. We discovered two pods that had already split open.

Sadly, it was soon nightfall and we had to return to the car, with our heads and cameras full of unforgettable images. We stayed one more week in Granada before heading back on the return journey. During a stop-over with J.J. Labat, he suggested that we might want to stop 130 km east of Madrid in the "Serranía de Cuenca" where S.J. Casper had reported the existence of *P. vallisneriifolia* at a place called "Hoz de Beteta".

After following the gorge of "Rio Guadaleja" we reached Beteta, a mountain village. Here white cliffs overhang the road and stream in marked contrast to the "Sierra Nevada". Upon arrival we were unable to find any tourist information centre, from which to gain precise information or maps, so we retraced our steps to a campsite close to the village of Canizares.



The next day, while on route back to Beteta, we decided to stop at a picnic site next to the "Rio Guadalupe" called "Fuente de los Tilos". A trail led half way to the top of the cliff on the left bank of the Rio before following the gorge. At an altitude of nearly 1,200 m, a couple of butterworts could be seen hanging upon an apparently dry natural wall. They were clearly not *P. valliserifolia*. They looked more like a form of *P. longifolia* judging by their downward curled leaf margins and the smaller sized rosettes none of which exceeded 15 cm in diameter. By mid-afternoon the sun reached into the valley because of its south west/ north east orientation. This did not seem to harm the plants, even though the smaller seedlings, just a few mm wide were turning reddish brown. After taking some photographs and collecting some of the seeds remaining at the bottom of the seed pods, we continued on the trail. We reached a more humid area where the rock face was tightly packed with butterworts! On our return to the car, with eyes well acquainted with the plants, we noticed many more specimens growing on the cliff face at inaccessible heights.

All the plants seen on our trip to Spain are of great interest, some may even prove to be new species or sub-species \*. We took great care not to contribute in any way to the spoilage of their natural habitats. Bear in mind that the plants that have survived in nature are those that are best adapted to their natural environment. However, they will have little chance of survival if removed. By contrast, the seeds collected will harbour wide ranging yet slight genetic differences. The process of selection will also occur in cultivation, with the result that only plants best adapted to your growing conditions will germinate and thrive. For these reasons we collected a few seeds and no plants. The seeds collected during our trip have germinated very well, especially *P. grandiflora* "Rio Mundo" (see IPSSG Newsletter 5). The only exception is *P. nevadensis* for which I cannot provide the alpine conditions required. We did not collect enough seed to donate to the seedbank but were able to send some to J.J. Labat, J. Steiger and S. Lampard. I hope that between us we will succeed in bringing these new plants into flower so that they can be further studied in cultivation, permitting precise identification and eventually a broader circulation of these plants.

#### References:

- Asejo (C.), Gonzales (C.), Guía Criscar de Sierra Nevada. Pamphlet available at campsites and bookstore.
- \*Editorial note: The two butterworts named by location as *P. "Rio Mundo"* (IPSSG Newsletter No.5) and *P. Hoz de Beteta* have since been described as *Pinguicula mundi* and *P. submediterranea* respectively, by: Zamora R., Jamillema M., Ruiz Rejon M. & Blanca G. 1996. Two new species of the carnivorous genus *Pinguicula* (Lentibulariaceae) from Mediterranean habitats. Plant Systematics and Evolution, 1996. Vol. 200: p. 41-60

#### *Pinguicula moctezumae* : A new species in culture.

Miloslav Studnička  
Botanic Gardens, 460 01 Liberec  
Czech Republic.

*Pinguicula gypsicola* was discovered in 1910 and was described as a "botanical bomb" (Brandege 1911, Purpus 1912). *P. gypsicola* has been regarded as a unique phenomenon within the genus and nobody imagined that there were any other similar species. However, in 1994, several decades later, R.Z. Ortega discovered *P. moctezumae* Zamudio et Ortega, a species that strongly resembles *P. gypsicola* !

Both species are so-called stenocendemies (species restricted to a very small area) from central Mexico. The location of *P. gypsicola* (San Luis Potosi, Minas de San Rafael, near Villa Juarez) is situated about 170km in a bee-line north of the *P. moctezumae* locations in the Rio Moctezuma canyon (Querétaro & Hidalgo; see Zamudio & Ortega 1994). They are isolated by a deeply furrowed, arid landscape.

#### Habitat

According to the authors, the new species is bound to semiaquatic sites, close to streams on dripping wet calcareous rocks, at 900-1100 m altitude. The habitat is quite different to that of *P. gypsicola*, especially with respect to soil moisture. Despite the fact that both species grow at comparable altitudes (*P. gypsicola* only about 250m higher) and both are petrophilous, (rock growers), *P. gypsicola* is a xerophyte.

Of course, the erect filiform leaves formed during the summer season by both species are very similar, and at this time *P. gypsicola* does not look like a xeromorphic plant. It seems likely that this feature is an adaptation in both species for absorbing atmospheric moisture especially the night dews. The accompanying vegetation to *Pinguicula gypsicola* mentioned by authorities (Purpus 1912, Ruiz & Rzedowski 1986) is essentially xerophytic:

*Agave striata*, *Dasylistron longissimum*, *Dodonaea viscosa*, *Hectia glomerata*, *Selaginella cuspidata* and *Cactaceae*.

#### Behaviour in artificial conditions.

Thanks to Dr. Sergio Zamudio who kindly afforded seeds of *P. moctezumae* to the Botanical Gardens Liberec for scientific purposes, we are able to write more about the ecology of the new butterwort.

The previous comments suggest that the growing conditions for *P. gypsicola* and *P. moctezumae* differ. I have previously described a method for cultivating butterworts in pots, ensuring movement of water through the soil (Studnička 1994). This has proved very appropriate for *P. moctezumae* including the recommended substratum (o.c., p.16).



The soil must be kept very wet from March through to the end of November. This will result in a growth pattern in keeping with conditions in Mexico. The life-rhythm of *P. moctezumae* is not so strict as that of *P. gypsicola*, the summer stage of the former persisting for longer, provided there is sufficient water. The latter begins to make it's characteristic winter-rosettes in the middle of October under greenhouse conditions. *P. moctezumae* also makes succulent winter-rosettes though of a quite different shape.

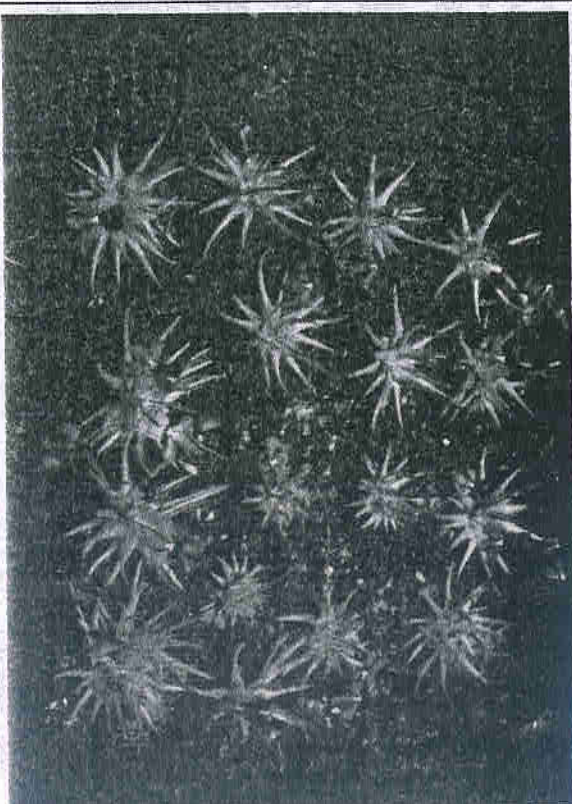
Flowers are produced at any time in the summer cycle in both species, I have never seen flowers on the winter-rosettes of *P. gypsicola* despite Casper's statement that "auch *P. gypsicola* blüht wie *P. moranensis* aus Sommer- und Winterrosette" (Casper 1996: 134).

#### Methodical comments

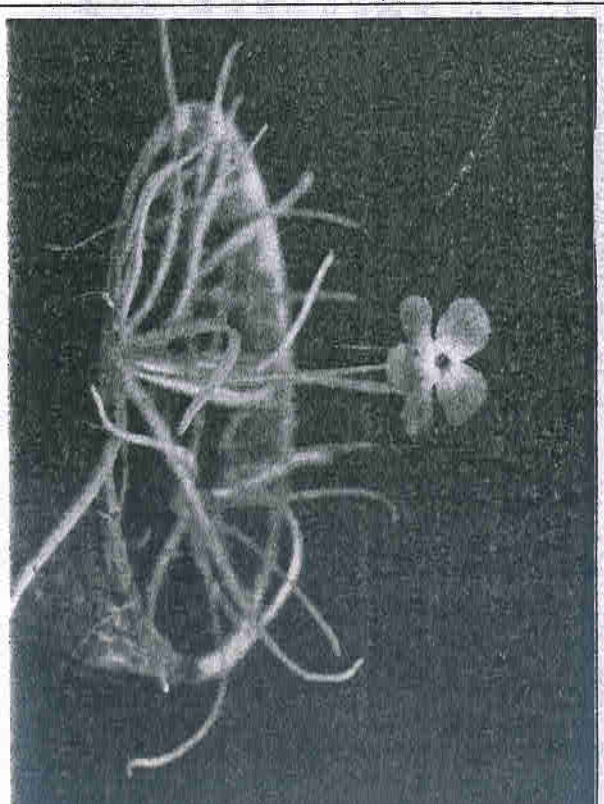
The photograph presented here is of the first flower to be produced in cultivation during the summer of 1995 by a plant grown from seed sown in November 1994! Development of the plant was accelerated by means of culture "in vitro". I use a special medium for butterworts, but one can also apply Murashige-Skoog medium with 20g of sucrose per litre ( Murashige & Skoog 1962 ). The method works best for butterworts if agar gel is not used. Instead I use 20ml of the liquid plus 25 cm3 of white silica sand in each flask. This gives a better exchange of materials between the plant and the medium. This is important because old leaves produce abscisic acid (ABA) a potent inhibitor of growth. The ABA tends to concentrate around the plant in gel cultures but diffuses away more easily in liquid culture so that growth is not suppressed so much.

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 Purpus A. (1912): *Pinguicula gypsicola* Brandege, ein hochinteressantes, neues Ferkraut - Deutsche Gartner - Zeitung, Erfurt, 27: 1-3.  
 Ruiz S. Z. & Rzedowski J. (1986): Three new *Pinguicula* species (Lentibulariaceae) of Mexico.- *Phytologia*, New Jersey, 60/4: 255-263.  
 Studnicka M. (1994): Comments to "difficult" *Pinguicula* species. *IPSG Newsletter*, Birmingham, No. 4: 16-24.  
 Zamudio S. & Ortega R. Z. (1994): Una Nueva Especie de *Pinguicula* (Lentibulariaceae) de los Estados de Queretaro e Hidalgo, Mexico. *Acta Bot. Mexic., Patzcuaro*, 28: 57-62



*Pinguicula gypsicola*



*Pinguicula moctezumae*



## Literature Review

- Zamudio S, Ortega R. Z, 1994 Una nueva especie de *Pinguicula* (Lentibulariaceae) de los estados de Querétaro e Hidalgo, México. Acta Botanica Mexicana, 1994. Vol. 28: p57-62.
- A distinctive new species *Pinguicula moctezumae* is described from the canyon of the Rio Moctezuma in the states of Querétaro and Hidalgo, Mexico. This exciting and distinctive new species was discovered during an assessment of the ecological impact of the construction of the Zimapan Hydro-electric dam. It is found growing on the wet limestone slopes of a small side canyon at altitudes around 1000 m in the otherwise arid central plateau of Mexico. It has only been collected from this site and is considered a very restricted endemic.
- P. moctezumae* is a dimorphic species which produces erect, linear-lanceolate, densely glandular, carnivorous leaves whenever there is sufficient moisture in the substrate; whilst resorting to the production of a more resistant water conserving rosette of elyptical succulent leaves to assist survival during the dry season. It's large rose to violet - purple flowers are produced throughout the wetter months of the year. The corolla is bilabiate, has a short infundibulate tube and large spur; upon which basis, along with the characteristic linear leaf form, the authors place it alongside *P. gypsicola* in section *Orchecosanthus*, sub-section *Violiflorinis*. There are similarities in the form of the petals, which are often almost circular and can overlap strongly, with *P. colimensis* from sub-section *Orchidopsis*.
- Cheek M, 1994 *Pinguicula greenwoodii* (Lentibulariaceae) A new Butterwort from Mexico. Kew Bulletin, Vol. 49(4) p. 813-815.
- The author describes a new species of *Pinguicula* from wet limestone cliffs, at an altitude of 1500 m, within the montane tropical forests of the Sierra Madre del Sur, 30km from the Atlantic coast in the state of Oaxaca, Mexico. This new species has membranous monomorphic leaves and an unusual though rather small flower which is broadly obconic, strongly dorsiventrally compressed and lacking a palate. This combination of characteristics is seen in only one other species, *P. jackii* from Cuba with which it is united by the author in the previously monotypic Section *Homophyllum*.. This phylogeographic link between a species restricted to the Trinidad mountains of Central Cuba and the mountains of the Atlantic coast on the opposite side of Mexico is intriguing. Most unusually for the genus, this species is said to have a stigma with the upper lip absent.
- This species is presently known only from herbarium material.

Turner B. L, 1994 Two new gypsophilic species of *Pinguicula* (Lentibulariaceae) from Nuevo Leon, Mexico. Phytologia, 1994 Vol. 76: p.69-72.

Two new species *P. jorgehinonii* & *P. hintoniorum* are described as gypsophilous endemics. Similarities with *P. esseriana* are suggested by the author for what are said to be annuals (?) with reduced, thin leaves.

Schlauner J, 1994 Auf der Suche nach den Fettkrautern (*Pinguicula* L., Lentibulariaceae) der Abruzzien - nebst einigen Anmerkungen zur Systematik von *Pinguicula* im Mitteleuropa.

Palmenarten, 1994. Vol 58: p. 60-67.

The author examines a number of European *Pinguiculas*, reaching the following conclusions:

After visiting the natural habitats of plants in Abruzzo, Italy, the author believes that *P. fiorii* Tammaro & Pace 1987. is not specifically distinct from other *Pinguiculas*. He finds it more related to *P. longifolia* ssp *reichenbachiana* than *P. balcanica*, ( an affinity suggested by the original authors. ) and with no further explanation, reduces it to synonymy with *P. longifolia* ssp *reichenbachiana*.

Upon examining the classic location, in the Ports of Tortosa, Spain, of *P. grandiflora* var. *derosensis* Canigüeral, the author states that these plants have nothing to do with *P. grandiflora* but belong instead with *P. longifolia* for which he makes the new elevated combination: *P. longifolia* ssp *derosensis*.

No further description is made.

After examining specimens in the Barcelona (BC) herbarium, the author deduces that *P. grandiflora* occurs (together with *P. vulgaris*) in Morocco, representing a new record for Africa.

Luhns H, 1995. New additions to the genus *Pinguicula* (Lentibulariaceae) of Mexico. Phytologia, 1995. Vol 79(2): p.114-122.

Two new species of *Pinguicula* from Mexico are described and illustrated: *Pinguicula stolonifera* (subgen. *Pinguicula*) from the state of Oaxaca, and *P. laxifolia* (subgen. *Pinguicula*) from the state of Tamaulipas.

*Pinguicula stolonifera* belongs to the section *Orchecosanthus*, subsection *Caudatopsis*. A new section *Orchidioides* is proposed to include *P. laxifolia*.

The taxonomic status of *P. jorgehinonii* B.L.Turner, *P. hintoniorum* B.L. Turner, and *P. reticulata* J. Schlauner, is discussed. The author presents evidence that they should be considered to be synonymous with *P. rotundiflora* Smolnicka, *P. eltersae* Spea & Fuchs, and *P. kondoii* Casper, respectively.



Luhurs, H. 1995.

A new species of *Pinguicula* from Mexico. *Phytologia*, 1995. Vol 79: p. 389-392.

A new species of *Pinguicula* from Mexico is described as *P. gigantea* with illustrations. It belongs in subgen. *Isoloba*, section *Agnata* and is clearly related to, yet distinct in many characters from, *P. agnata*. Collected in the state of Oaxaca by A. Lau in 1987, this species has been subsequently cultivated from seed. Examination of many cultivated clones which have since matured and flowered, in combination with the study of habitat photographs has resulted in the description of this species.

Zamora R, Jamliena M, Ruiz Rejon M & Blanca G. 1996.

Two new species of the carnivorous genus *Pinguicula* (Lentibulariaceae) from Mediterranean habitats. *Plant Systematics and Evolution*, 1996. Vol. 200: p. 41-60.

Two new species of *Pinguicula*: *P. submediterranea* & *P. mundi* are described from the south and east of the Iberian Peninsula. A thorough interdisciplinary approach has been employed to distinguish these new taxa from each other as well as from other species (*P. grandiflora* ssp *grandiflora*, *P. longifolia* ssp *longifolia*, *P. nevadensis*, *P. vallisnerifolia*). Cytogenetics and molecular analysis of DNA as well as morphometric measurements and cross-pollination experiments were performed. Both new species are hexaploid ( $2n = 48$ ), a chromosome number not previously reported for the genus. *P. mundi* is predominantly outbreeding, whereas *P. submediterranea* both inbreeds and outbreeds. Both new species are threatened with extinction because suitable habitats are diminishing in size, or even disappearing, due to the current aridity of the region.

Romo A, Peris J.B, Stubing G. 1996. The genus *Pinguicula* in Morocco. *Annales Botanici Sennici*, 1996. Vol 33(1): p. 29-32.

The authors have described a new species of butterwort endemic to the central Rif mountains in Morocco named as *Pinguicula fontiqueriana*. Their decision is based upon re-examination of herbarium material, found in the BC & MPU herbaria. These specimens have been previously interpreted by others as *P. corsica* or *P. vulgaris*, the presence of which the authors now rule out in Morocco. *Pinguicula fontiqueriana* is illustrated by line drawings made from herbarium material.

Zamora R, Gomez J. 1996. ....

*Journal of Animal Ecology*, 1996. Vol. 65: p.154-60.

A kleptoparasitic slug *Deroceras hilbrandi* is reported which steals the insect prey captured by *Pinguicula vallisnerifolia* whilst doing no direct harm to the plant itself.

## GROWING MEXICAN BUTTERWORTS FROM SEED

S.E. Lampard

You may you have not had much luck growing Butterworts from seed. Don't be put off, this was probably either because very little 'good' seed has been readily available, or due to a lack of understanding of germination and growth requirements. This has now changed.

Good fresh seed, derived from habitat, or by careful cross pollination of plants in cultivation, is now more frequently available. We are also better aware of the conditions for correct cultivation.

The majority of Mexican species are intolerant of the wet, acidic, peaty soils in which most other C.P. thrive. Just one species, *P. emarginata*, likes to be permanently wet and grows on slightly acid sandstone. Most grow on alkaline substrates, several in crevices on pure limestone rockfaces, others in gypsum. Many grow on mountain ridges, others in montane cloud forest, both types rely only on frequent mists as their source of moisture for much of the year.

**Germination:** Simply sprinkle the seed on the surface of some cooled boiled water in a suitable container - I use plastic Petri dishes for this purpose, keep in semi-shade or under a fluorescent strip light at about 25 Centigrade. Germination should be evident within 1-4 weeks.

As soon as the seedling has emerged, carefully transfer to the surface of moist compost and keep under the same conditions of light and temperature, maintaining even high humidity within a propagator.

**Compost:** It is important to use an open mineral compost - I prefer a mixture of perlite/vermiculite/sand for newly germinated seed, adding limestone chips or crushed tufa or gypsum to raise the pH of the soil into which they are

subsequently transplanted after 3-6 months. If these substances are not available in your country you can still succeed so long as whatever compost you use has a good open crumbly texture. The compost should be moist but never saturated as air at the root system is essential.

**Water, light & warmth:** Established plants like to be misted in the early morning or evening or at both times if the weather is hot and dry. Water should only be given at the root system when the plants are in full growth, the compost must not become waterlogged.

All should be given good but diffuse rather than direct sunlight.

I have noticed two peak growing periods for most species. They first 'awaken' from dormancy in late Spring/early Summer, then enter a quiescent phase during the height of Summer when few new leaves are produced. This is followed by a second and sometimes longer period of growth, from late Summer into Autumn. I have not established whether this is a phenomenon controlled by daylength or by temperature.

The majority of Mexican *Pinguiculas* grow best when the photoperiod is approximately 12 hours duration and when the daytime temperature rises to between 25-30C, falling by at least 10C overnight, as these are the conditions that most will experience in habitat.