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

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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 northeastern 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 pallidiore; lobis corollae aliquantum angustioribus, non imbricatis, plus oblongis quam obovatis (typus: lobi plus obovati quam oblongi); longitudine corollina calcar includente 13-21 mm, calcari 6-11 mm; pubescentia in corona labii inferioris corollae uniformiter capitata cum 3-6 segmentis fere aequilongis, pubescentia faucis cum 3 segmentis basalibus longis angustisque capitatis cum 1 segmento tulipiformi et 6-7 segmentis terminalibus ellipticis, segmentum ultimum saepe divisum, pubescentia tubi breviore, segmentis terminalibus diminuentibus et aliquibus segmentis ultimis apiculatis; capsula globosa calycem vix superante. Hab. in scopulis humidis et umbrosis (raro in paludibus) Californiae septentrio-occidentalissimae Oregonaeque austro-occidentalissimae. Habitatione saxicola (ophiolithica) 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 northwesternmost 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; phototypes (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: 4/21/29 D. Kildare, 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); Stoney 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-R5E-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. Rolle, NDDB, Sac., Ca.); mm 8.9, [T15N-R2E-sec 5 & 23], near Big Flat Stat. Cpgd, Gasq.-Orleans 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 Seats 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 spp.*

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*, *vulgaris*, *leptoceras* and *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), *Komiya* (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 ovate-subglobular seed capsules. *Casper*'s research (1962) was based on measurements of several hundred flowers of both *P. macroceras* an *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 isoamplitudes 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 Kamtchatka and Japan *P. macroceras* grows within a maximum range of about 100 km (62 mi.) from the sea.

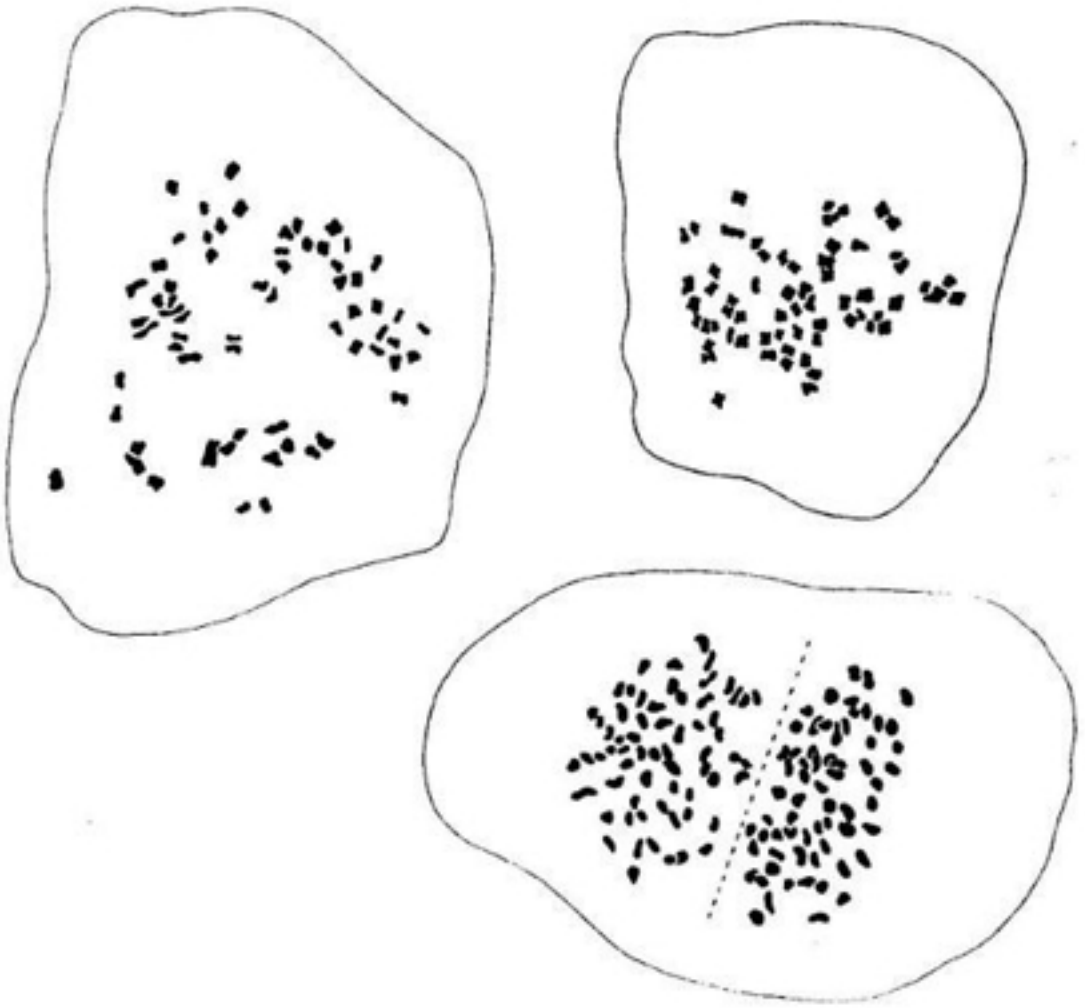
	Ping. macroceras	*Ping. vulgaris*
Flower length	18-27mm (spur included)	14-21mm (spur included)
Spur	6-9mm	3-6mm
Corolla lobes	obovate, broad rounded, often overlapping each other	oblong, usually not overlapping each other
Calyx	two lower tips only grown together to the half of their length	two lower 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 Quarternary. 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?



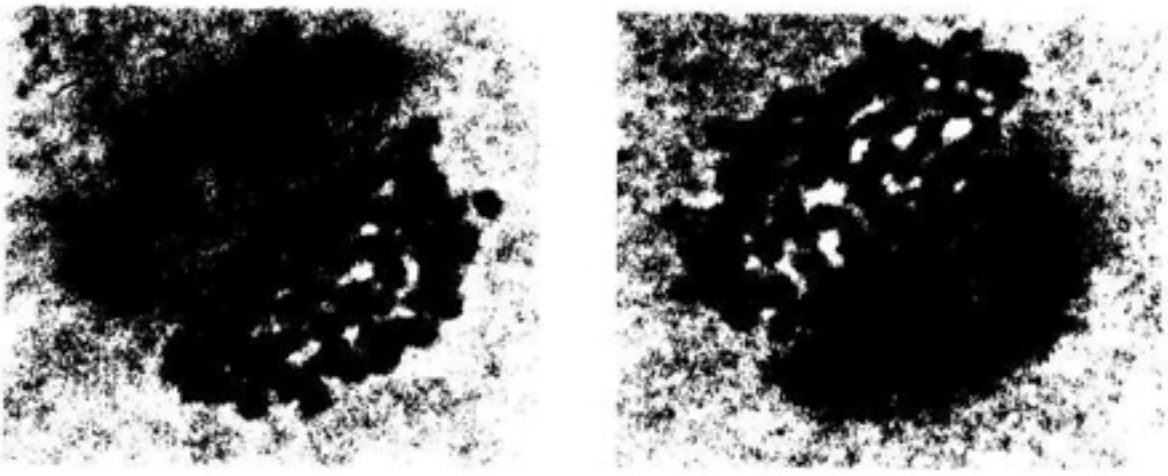


Fig. 1: Somatic chromosomes of *Ping. macroceras supsp. nortensis* from the typus site (root tips, 2n = 64). Top: 2 metaphases. Middle: Anaphase. Bottom: Anaphase, showing the two diverging chromosome sets (two pictures out of a multi layer shot series; the original photography gives more details than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

n 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 *nortensis*. 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).

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